Workshop Manual
Amarok 2011 ➤
Electrical system

Edition 01.2011

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Repair Group

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

Contents

27 – Starter, current supply, CCS

1 Battery

WARNING

Danger of injury! Comply with the warning notices and safety regulations *⇒ page 2* *!*

Caution

To prevent damage to the battery and vehicle, observe the following concerning types of battery *⇒ page 1* *.*

1.1 Fundamentals for batteries

To ensure long use of the battery, the battery must be checked, serviced and maintained according to the instructions in this manual.

Apart from supplying energy for starting the engine, the battery has other tasks: it acts as a buffer and supplies electrical energy to the complete electrical onboard supply of the vehicle.

Note

⇒ Self-study programme No. 234 ; Vehicle batteries - See programme.

1.2 Types of batteries

General notes

Caution

The description for the following batteries is for maintenance-free batteries. No stickers may be removed and do not replenish with distilled water. Only make visual inspections. Note the battery test chapter *⇒ page 5* *.*

1.2.1 „Standard“ maintenance-free battery

Maintenance-free battery with liquid electrolyte (wet battery)

This is a lead-acid battery with colour indicator in the cover to monitor the battery acid level.

1.2.2 „Enhanced“ maintenance-free battery

This is a maintenance-free battery with liquid electrolyte (wet battery), which is used for heavy duty applications in certain stop-start vehicles. The battery can be identified by the lettering „EFB“ on top of the battery housing. The „EFB“ battery is only used on some engine/gearbox combinations.

„EFB“ stands for „enhanced flooded battery“.

Note

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

The „EFB“ battery also has a colour indicator in the cover to monitor the battery acid level.

1.2.3 Absorbent glass mat battery

Maintenance-free battery with a contained electrolyte

Lead-acid battery in which the electrolyte is contained within a microscopic glass mat (AGM). The battery is sealed and fitted with valves.

„AGM“ stands for „absorbent glass mat“.

Since the glass mat binds the electrolyte, these batteries do not have a colour indicator to monitor the battery acid level. Absorbent glass mat batteries are identified by the abbreviation „AGM“ on the battery.

Note

Always replace an absorbent glass mat battery with another absorbent glass mat battery.

1.3 Warning notices and safety regulations

1.3.1 Dangers when handling vehicle batteries

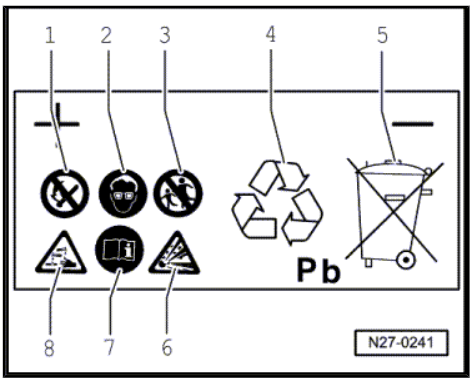
Recognition and avoidance of dangers

Batteries can be dangerous. These dangers can be avoided when the warnings on the battery and in the owners/instruction manual and in ELSA are observed.

WARNING

- *Untrained personnel e.g. apprentices, trainees etc. may only work on batteries when supervised by a vehicle mechanic/foreman or vehicle electrician/foreman.*
- *Acid is highly corrosive. There is a considerable danger of acid burns if personnel do not handle batteries correctly. Therefore suitable measures must be taken to ensure that equipment/solutions etc. are available to neutralize acid burns. A suitable solution is: e.g. a soap solution.*
- *If electrolyte leaks from a battery it may cause skin burns and acid corrosion, rusting on the vehicle. This may damage safety relevant components on the vehicle.*
- *The gas which forms when charging and the gas which may escape through vent valves is explosive. In extreme cases a battery may explode if the battery is not handled correctly.*
- *Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle! There is a risk of explosion while checking and charging the battery, including during slave starting.*
- *It is prohibited to cause sparks through grinding, welding, cutting operations and use naked lights in the vicinity of batteries. Smoking is also prohibited. Sparks generated by electrostatic charging must also be avoided. Always touch the vehicle body before touching the battery.*
- *Only work on batteries in well ventilated and suitable rooms.*

1.3.2 Safety markings on battery



Safety markings on battery

1. - When handling batteries, fires, sparks, naked lights and smoking are prohibited. Avoid sparks as well as electrostatic discharge when working with cables and electrical units. Avoid short circuits. Therefore never lay a tool on a battery.

2. - Wear eye protection before commencing work on battery.

3. - Keep children away from acid and batteries.

4. - Disposal: old batteries are classed as hazardous waste. They may only be disposed of through a suitable collection centre and only in accordance with respective legislation.

5. - Never dispose of old batteries in household waste system!

6. - There is a danger of an explosion when working with batteries. A highly explosive gas is produced when batteries are charged.

7. - Follow instructions concerning batteries, in ELSA "electrical system" and in owner's manual.

8. - Battery acid is very caustic, therefore wear eye protection and gloves when working with batteries. Do not tilt battery. Acid can leak out of the gas vents of some batteries.

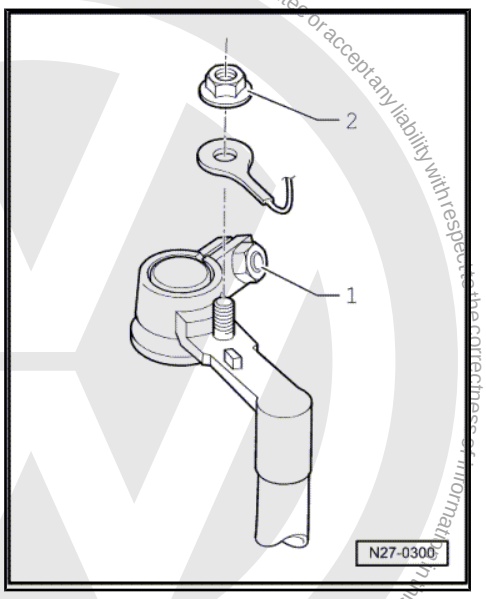
1.4 Battery terminal connection

Caution

To prevent damage to the battery clamps and battery terminals, the following should be observed:

- *The battery clamps should only be fitted by hand and without using force.*
- *Battery terminals should not be coated with grease.*
- *The battery clamps should be fitted so that the battery terminal is either flush with the clamp or protruding from it.*
- *Once the battery clamps have been tightened to the specified torque, the threaded connections should not be tightened any further.*

The specified torque for the battery terminal clamps -1- and additional clamps -2- can be obtained from the „Specified torque: Battery“ table ⇒ page 55 .



2 Checking battery

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

Caution

To prevent damage to the battery and vehicle, observe the following concerning types of battery ⇒ page 1 .

2.1 Checking the various types of batteries

2.1.1 Checking a battery with colour indicator

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

Carry out procedure in sequence as follows:

1. Visual check ⇒ page 6
2. Checking colour indicator in battery cover, „3 colour“, ⇒ page 6 or „2 colour“, ⇒ page 7

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

3. Perform battery check using battery tester with printer -VAS 6161- ⇒ page 14 or battery discharge test using battery tester with printer -VAS 5097 A- ⇒ page 10 .
4. Depending on the result of the battery test, „perform current draw test“ ⇒ page 19 .

Note

For warranty claims: Battery tester with printer -VAS 5097 A- is soon to be replaced in favour of battery tester -VAS 6161- .

2.2 Visual check

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

It is essential to visually inspect the external condition, to check the terminals and to ensure proper attachment of the battery before performing extensive tests.

Caution

- *The battery will be damaged if the battery is not secured correctly.*
- *Vibrations shorten the life of the battery, there is a danger of an explosion, the cell plates may be damaged and the clamping bracket may damage the battery housing.*
- *Check battery is securely seated, if necessary tighten securing bolt to specified torque.*

Performing this test establishes:

- If battery housing is damaged Electrolyte can leak out if the housing is damaged. If battery acid leaks out, serious damage to the vehicle could be caused. Treat components affected by leaked battery acid immediately with acid neutraliser or a soap solution.
- Check whether the battery terminals (battery wire connections) are damaged. The necessary contact on the battery clamps cannot be guaranteed if the battery terminals are damaged. When connecting the battery clamps, tighten the battery clamps to torque specified in this workshop manual „Electrical system“ for the respective vehicle. If the battery clamps are not correctly seated and tightened, the wiring may burn. Which will cause malfunctions in the electrical system. Safe operation of the vehicle is no longer guaranteed.

2.3 Checking colour indicator in battery cover

2.3.1 Checking colour indicator in battery cover, „3 colour“

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

General information about colour indicator:

Applies for all batteries with „1J0“, „7N0“ and „3B0“ indexes in original equipment and for all replacement batteries 191 915 105 AB and from „000 915 105 AX“ index.

The colour indicator provides information about the electrolyte level and the charge state of the battery.

Before carrying out a visual check, tap the colour indicator in the battery cover lightly and carefully using the handle of a screwdriver. The air bubbles, which can influence the display, will dissipate when doing this. This will make the colour indicator reading more accurate.

Note

- *Air bubbles can form under the sight glass especially when the battery is being charged, i.e. also during normal vehicle operation. These falsify the reading of the colour indicator.*
- *Since the colour indicator is only located in one battery cell, the indicator also only applies to this battery cell. An exact determination of the battery condition is only possible through a battery load test* *⇒ page 10* *or a battery test* *⇒ page 14* *.*
- *The colour indicator can be located at various positions on the battery.*

Three different colour displays are possible:

- »Green«, battery is charged sufficiently.
- »Black«, battery partly discharged, charge state < 65 % or completely discharged
- »Colourless or light yellow«, battery must be renewed.

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

2.3.2 Checking colour indicator in battery cover, „2 colour“

WARNING

Danger of injury! Observe warning notices and safety regulations *⇒ page 2* *!*

General information about 2 colour indicator:

Introduction of the new 2 colour indicator will be gradual during model year 2009, i.e. there will be a transition period for both indicators. On the new 2 colour indicator, »green« is no longer included.

The 2 colour indicator provides information about the electrolyte level of the battery.

The battery charge level can no longer be ascertained from the colour indicator. To do this, a battery check must be performed ⇒ page 14 .

Before carrying out a visual check, tap the colour indicator in the battery cover lightly and carefully using the handle of a screwdriver. The air bubbles, which can influence the display, will

dissipate when doing this. This will make the colour indicator reading more accurate.

Note

- *Air bubbles can form under the sight glass especially when the battery is being charged, i.e. also during normal vehicle operation. These falsify the reading of the colour indicator.*
- *Since the colour indicator is only located in one battery cell, the indicator also only applies to this battery cell. Determining the exact condition of the battery is only possible by means of a battery test* ⇒ page 14 .
- *The colour indicator can be located at various positions on the battery.*

Two different colour displays are possible:

- »Black«, electrolyte level is OK.
- »Colourless or light yellow«, electrolyte level too low. The battery must be renewed.

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

2.4 Absorbent glass mat battery

Carry out procedure in sequence as follows:

1. Visual check ⇒ page 6
2. Perform battery check using battery tester with printer -VAS 6161- ⇒ page 14 or battery discharge test using battery tester with printer -VAS 5097 A- ⇒ page 10 .
3. Depending on the result of the battery load test, „perform current draw test“ ⇒ page 19 .

Note

For warranty claims: Battery tester with printer -VAS 5097 A- is soon to be replaced in favour of battery tester -VAS 6161- .

2.5 Battery tester with printer -VAS 5097 A-

Note

For warranty claims: Battery tester with printer -VAS 5097 A- is soon to be replaced in favour of battery tester -VAS 6161- .

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

It is not necessary to remove or disconnect battery when using battery tester with printer -VAS 5097 A- .

Battery tester with printer -VAS 5097 A- can be used to test 12 V starter batteries according to

- 80 - 499 A low-temperature test current according to DIN (Deutsche Industrie Norm (German Industrial Standard))[1)]
- 95 - 574 A low-temperature test current according to IEC (International Engineering Consortium)
- 136 - 855 A low-temperature test current according to EN/ SAE (European Norm/Standard of Automotive Engineers)

1) Batteries with a low-temperature test current of 520 A according to DIN can be tested using setting for 499A according to DIN.

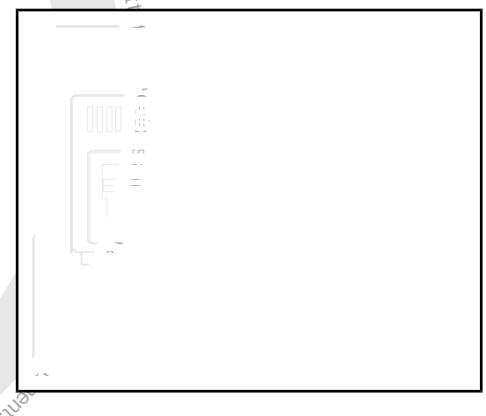
.

For test purposes the battery is loaded with a current which is similar to the starting current required to start the vehicle. The battery is assessed on this loading and the result is printed out.

Note

- *Observe the ⇒ Instruction Manual for battery tester with printer -VAS 5097 A- or the sticker ⇒ Brief instructions for battery tester with printer -VAS 5097 A- stuck on the unit or the table entitled Low-temperature current ⇒ page 12 .*
- *Observe battery manufacturer's handling instructions!*

2.5.1 Description of battery tester with printer -VAS 5097 A-



Battery tester with printer -VAS 5097 A-

1 - Green LED, „unit operating“

2 - Red LED, „unit reverse-polarity connected“

3 - Red LED, „battery cannot be tested“, recharge battery.

4 - Ignition button

5 - Low-temperature test current selection switch

6 - ON/OFF and functions switch

7 - Selection switch (battery tester to pick-off point on battery/ external test point in engine compartment)

8 - Paper feed button

9 - Printer

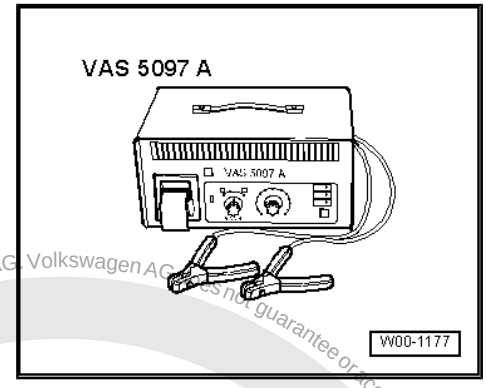
2.5.2 Performing battery load test using battery tester with printer -VAS 5097 A-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

Special tools and workshop equipment required

- Battery tester with printer -VAS 5097 A-



Note

Observe technical product information TPI 2012182 for battery tester with printer -VAS 5097 A- .

Performing battery load test:

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Note

The battery must have a temperature of at least 10 °C.

– Switch off ignition and all electrical consumers.
– On vehicles with colour indicator, take reading from indicator ⇒ page 6 .
– Ascertain low temperature test current in amperes (A) according to DIN from details on battery and adjust setting range on battery tester with printer -VAS 5097 A- according to table ⇒ „2.5.3 Table: low-temperature test current“, page 12 .

Note

If the battery values are shown in IEC or EN/SAE instead of DIN, then convert figures using table ⇒ „2.5.3 Table: low-temperature test current“, page 12 or using table on unit.

– Set low-temperature test current with low-temperature test current selection switch ⇒ page 9 .
– Select measuring range 80 - 379 A or 380 - 499 A with ON/OFF function switch ⇒ page 9 .

Note

Batteries with a low-temperature test current of 520 A according to DIN can be tested using setting for 499A according to DIN.

– Connect red terminal „+“ of tester to positive terminal.
– Connect black terminal „-“ of tester to negative terminal.

Note

- *Make sure test terminals make good contact!*
- *Observe technical product information TPI 2012182 for battery tester with printer -VAS 5097 A- .*

– Select connection point of test terminals with selection switch ⇒ page 9 .

1 - Connected directly to battery.
2 - Connected to external test points in engine compartment.

– Check whether the figures given on the battery are correct for the settings on the battery tester.
– Press ignition button ⇒ page 9 .

The green LED lights up ⇒ page 9 . The test program runs through automatically. The test result is printed out by the printer ⇒ page 12 . If the unit does not start (LED does not light up, no print out), recharge battery ⇒ page 21 .

– Switch off unit ⇒ page 9 .
– Remove test terminals.

Note

- *The test is completed after about 20 seconds.*
- *The result of the test is printed out by the printer.*
- *Only perform test once. Repeating the test falsifies the result.*
- *The tester requires approx. 30 minutes to cool down before it is ready for the next test.*

2.5.3 Table: low-temperature test current

Low-temperature test current in A			
EN/ SAE	**IEC**	**⇒**	**DIN**
136 – 17	95 – 124	⇒	80 – 104
178 – 219	125 – 154	⇒	105 – 129
220 – 261	155 – 184	⇒	130 – 154
262 – 303	185 – 214	⇒	155 – 179
304 – 345	215 – 244	⇒	180 – 204
346 – 387	245 – 274	⇒	204 – 229
388 – 429	275 – 304	⇒	230 – 254
430 – 471	305 – 334	⇒	255 – 279
472 – 513	335 – 364	⇒	280 – 304
514 – 555	365 – 394	⇒	305 –329
556 – 597	395 – 424	⇒	330 – 354
598 – 639	425 – 454	⇒	355 – 379
640 – 657	455 – 464	⇒	380 – 389
658 – 675	465 – 474	⇒	390 – 399
676 – 693	475 – 484	⇒	400 – 409
694 – 711	485 – 494	⇒	410 – 419
712 – 729	495 – 504	⇒	420 – 429
730 – 747	505 – 514	⇒	430 – 439
748 – 765	515 – 524	⇒	440 – 449
766 – 783	525 – 534	⇒	450 – 459
784 – 801	535 – 544	⇒	460 – 469
802 – 819	545 – 554	⇒	470 – 479
820 – 837	555 – 564	⇒	480 – 489
838 – 855	565 – 574	⇒	490 – 499[2)]

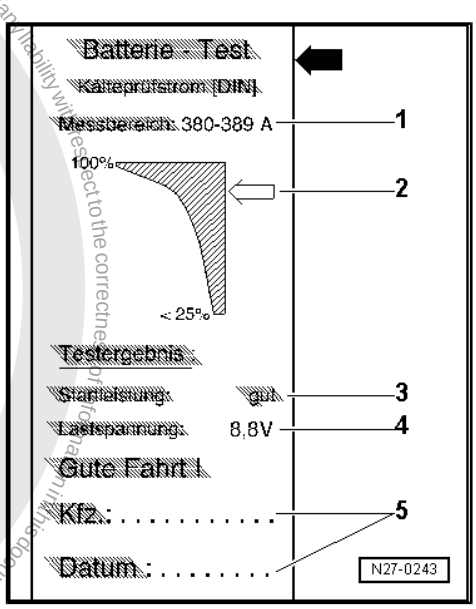
2) Batteries with a low-temperature test current of 520 A according to DIN can be tested using setting for 499A according to DIN.

2.6 Evaluating test result of battery load test

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

- If the battery is OK, the voltage value drops only to the minimum voltage.
- If the battery is defective or has a low charge, the battery voltage quickly drops below the minimum voltage.
- After the test, the voltage level remains low for a long period of time. It only increases again slowly.
- Perform test once only. Repeating the test falsifies the result.
- The tester requires approx. 30 minutes to cool down before carrying out another test or testing another battery to ensure the results are not falsified.

2.6.1 Comments concerning test print out



1 - Test range selected on tester

2 - Diagram -arrow- indicates battery condition.

3 - Test result

4 - Battery voltage during load test

5 - Vehicle data and date are to be recorded on test printout by person performing test

Note

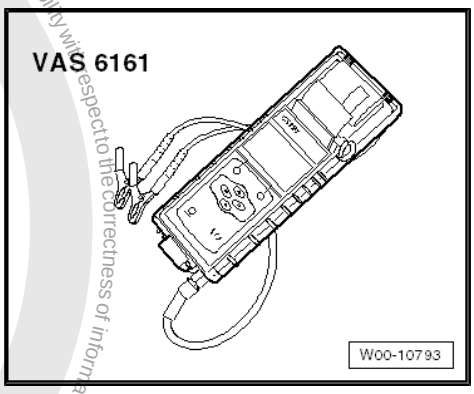
- *The test printout is required for warranty claims.*
- *Only perform test once. Repeating the test falsifies the result.*

2.6.2 Assessing test results

Printout from battery tester	Measure to be performed
Starting capability very good	Battery OK.
Starting capability good	Battery OK.
Starting output sufficient	Evaluation by carrying out a current draw test when charging ⇒ page 19
Starting output poor	Evaluation by carrying out a current draw test when charging ⇒ page 19
Starting output very poor	Evaluation by carrying out a current draw test when charging ⇒ page 19
Cannot be tested	Charge battery ⇒ page 21 and repeat test

2.7 Battery tester with printer -VAS 6161-

General description:



WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

It is not necessary to remove or disconnect battery when using battery tester with printer -VAS 6161- .

The battery tester with printer -VAS 6161- does not load the battery any more. It works on the principle of dynamic conductance acquisition.

Every battery type is stored in the tester.

Data can be stored on an SD card.

The battery tester with printer -VAS 6161- can be updated via an interface or an SD card, thereby ensuring that all battery details from Volkswagen are always up to date.

The integrated temperature sensor improves measurement quality.

A 2D scanner is available as an option to read data directly from the 2D code of the battery.

Note

Observe the ⇒ operating manual of the battery tester with printer -VAS 6161- .

2.7.1 Description of battery tester with printer -VAS 6161-

1 - Integrated printer

2 - Operating lever for paper compartment

3 - Paper slot

4 - LCD screen with main menu

5 - Control panel with On/Off button

6 - Connection for battery test cable

7 - Memory card slot

8 - Infrared temperature sensor

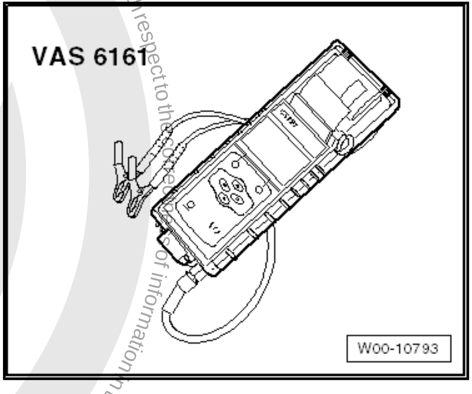
9 - Data transmitter for PC

2.7.2 Perform battery test with battery tester with printer -VAS 6161-.

> ⚠ WARNING
>
> *Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !*

Special tools and workshop equipment required

- Battery tester with printer -VAS 6161-



Performing battery test:

> ⚠ WARNING
>
> *Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!*
>
> *There is a risk of explosion while checking and charging the battery, including during slave starting.*
>
> *These batteries must be renewed.*

– Switch off ignition and all electrical consumers.

– Checking colour indicator on batteries with colour indicator in battery cover ⇒ page 6 .

– Switch on unit.

– Connect red terminal „+“ of tester to positive terminal.

– Connect black terminal „-“ of tester to negative terminal.

Note

Ensure test clamps have a good contact!

– Select one of the following functions:

- Maintenance test (only in new cars before registration, in stationary and stock maintenance programme ⇒ page 16)
- Warranty claims ⇒ page 17
- Service test for batteries no longer covered under warranty and third party batteries ⇒ page 16

Note

- *The test is completed after about 10 seconds.*
- *The result of the test is printed out by the printer.*
- *The tester requires no cooling phase before it is ready for the next measurement.*

2.7.3 Performing maintenance test

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Select „Maintenance test“ in the menu.
– Connect scanner.

Note

If no scanner is available, write vehicle identification number on test printout by hand.

– Scan in vehicle identification number.
– Select „On battery terminal“ or „On jump-start point“.
– Scan in 2D code of battery or select type and make manually in menu.
– Measure temperature. Hold temperature sensor about 5 cm above terminal connection until temperature stabilises.
– Start test.
– Print out test log if necessary.

2.7.4 Performing service test for batteries no longer covered under warranty and third party batteries

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Select „Service test“ in the menu.
– Select „On battery terminal“ or „On jump-start point“.

– Select battery type „Normal“, „AGM“, „2*6V“ or „Gel“.
– Select „CCA“, „JIS“, „DIN“, „SAE“, „IEC“ or „EN“ norm.
– Select battery value (current level in A).
– Measure temperature. Hold temperature sensor about 5 cm above one battery terminal until temperature stabilises.
– Start test.
– Print out test log if necessary.

2.7.5 Performing test for warranty claims

WARNING

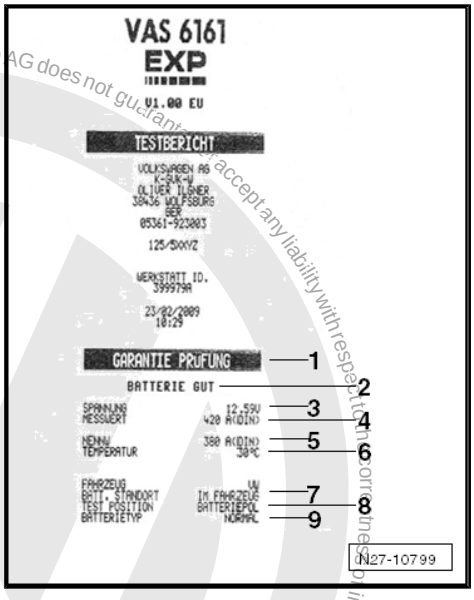
Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Select „Guarantee test“ in the menu.
– Select „In vehicle“ or „Outside vehicle“.
– Select „On battery terminal“ or „On jump-start point“.
– Scan in 2D code of battery or select „type“ in menu and battery value (current level in A).
– Measure temperature. Hold temperature sensor about 5 cm above one battery terminal until temperature stabilises.
– Start test.
– Print out test log if necessary.

2.7.6 Comments concerning test print out



Note

Indicated on the test print-out is the firmware version number of the battery tester, which in this instance is version number „V1.00 EU“, for example. Since versions are superseded relatively frequently, always be aware of the version number and ensure work is always performed with the latest firmware. The latest firmware is available for download from the ServiceNet.

1 - Type of test
2 - Battery test result
3 - Measured voltage
4 - Measured cold start value of battery
5 - Nominal cold start value of battery selected on tester
6 - Measured temperature of battery
7 - Installation location of battery
8 - Position of battery terminal clamp selected on tester
9 - Selected battery technology

Note

The test printout is required for warranty claims.

2.7.7 Assessing test results

Evaluating battery test results for guarantee and service tests

Battery test results	Measures
Battery OK	No measures on battery
Battery OK - recharge.	Charge battery ⇒ page 21 . In case of discharging, look for fault
Perform current draw test	Perform current draw test ⇒ page 19 . Fully charge battery ⇒ page 21 and repeat test.
Renew battery.	Disconnect battery and repeat test. The result „Renew battery“ may be caused by a weak cable contact.
Battery cell defective - renew.	Renew battery.
Check connection.	Connect cable directly to battery and not to jump start terminal.

Evaluating battery test results for maintenance test

Battery test results	Measures
Battery OK	No measure
Charge battery immediately.	Charge battery fully ⇒ page 21 .
Mark as defective.	Mark as defective.

Battery test results	Measures
Check tester connection.	Disconnect battery and repeat test. The result „Check tester connection“ may be caused by a weak cable contact.
Check connection.	Connect cable directly to battery and not to jump start terminal.
Noises	Wait until measured value appears on display.

2.8 Current draw test

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Note

- *Ensure that the correct charging mode is set on the charger so that the current draw test is not falsified.*
- *VAS 5095 A* ⇒ page 21
- *VAS 5900* ⇒ page 26
- *VAS 5903* ⇒ page 36

To quickly ascertain the state of discharged batteries, the battery current draw test whilst charging helps to determine whether the battery must be replaced or fully recharged.

The current draw test should always be performed in conjunction with the following results:

If the result of the test with battery tester with printer -VAS 5097A- leads to the following results:

1 - Starting output sufficient

2 - Starting output poor

3 - Starting output very poor

4 - Cannot be tested – charge battery and repeat test

- and when the tester will not switch on (no LED, no printout)

If the result of the test with battery tester with printer -VAS 6161- leads to the following result:

1 - Perform current draw test

Performing a current draw test whilst charging a battery will quickly establish whether a partly or fully discharged battery can be recharged to return it to a serviceable condition.

Test prerequisites:

- When charging a battery, battery temperature must be at least ≥ +10 °C.

- The charger must be capable of outputting a charge current of at least 30 A, as for example with VAS 5095A, VAS 5900, VAS 5903
- The battery's current draw must be measured with a current pick-up clamp, e.g. VAS 5051B/7, when charging with battery charger -VAS 5095A- . Battery charger -VAS 5900- and battery charger -VAS 5903- display the current draw on the unit. Battery charger -VAS 5903- performs the current draw test automatically with menu guidance.

– Connect battery to battery charger and start charging procedure.

– Measure charge current of battery after 5 minutes.

Test result

5 minutes after charging has commenced, the charge current must be greater than 10% of the nominal capacity in amperes.

For example

For a 60 Ah battery the charge current must the higher than 6 A after 5 minutes of starting the charging sequence.

– Battery is fully charged if charge current is greater than 10 % of the nominal capacity in amperes.

– After 2 hours of battery resting time, perform a battery test ⇒ page 14 .

If the charge current, in amperes, lies below 10% of the rated capacity 5 minutes after the start of charging (example for a 60 Ah battery < 6A), renew battery. In the event of warranty and goodwill gestures, fill out the battery test sheet.

3 Charging battery

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

Caution

To prevent damage to the battery and vehicle, observe the following concerning types of battery ⇒ page 1 .

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

3.1 Battery charger -VAS 5095 A-

This chapter describes the basic functions of the battery charger -VAS 5095 A- . For additional information refer to ⇒ Operating instructions for battery charger -VAS 5095 A- .

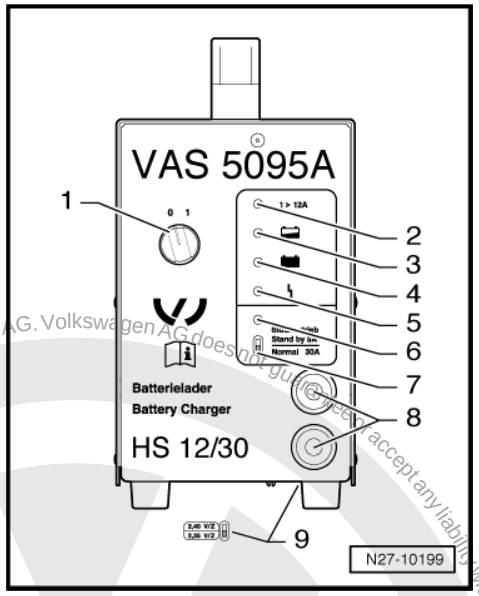
Note

- *The effective charge current can not be read on these units. The charge current must be read externally using a pick-up clamp.*
- *Observe ⇒ operating instructions for battery charger -VAS 5095 A- .*

3.1.1 Description of battery charger -VAS 5095 A-

The battery charger -VAS 5095- is suitable for charging all 12V batteries supplied by Volkswagen.

The battery charger charges without peaks in amperage or voltage. This will not adversely effect the onboard electronics. The battery can remain in the vehicle while it is being charged and need not be disconnected.



Battery charger -VAS 5095 A-

1 - ON / OFF switch (0 = charger OFF)

2 - Charging current indicator (I > 12 A)

3 - Charging current indicator, battery partially charged > 90 %

4 - Maintaining charge; lights up green when battery is fully charged

5 - Malfunction indicator

6 - Support mode indicator

7 - Support mode/normal mode changer-over switch

8 - Charger cable, red terminal „+“, black terminal „-“

9 - Battery type change-over switch (on base of charger unit)

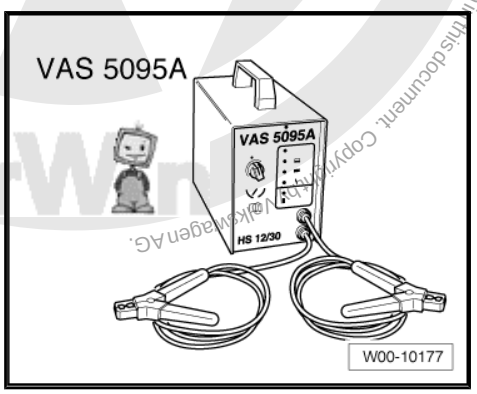
3.1.2 Charging battery with battery charger - VAS 5095 A-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

Special tools and workshop equipment required

- Battery charger -VAS 5095 A-



Caution

Always set battery type 2.4 V/C (volts/battery cell) when charging! This applies for all batteries.

Note

The battery must have a temperature of at least 10 °C.

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Switch off ignition and all electrical consumers.
– Check battery type setting on battery type change-over switch ⇒ page 21 . Must be set to 2.4 V/C (volts/battery cell).
– Connect red charger terminal „+“ of charger to positive terminal of battery.
– Connect black charger terminal „-“ of charger to negative terminal of battery.
– Switch on charger ⇒ page 21 .

The charging current indicators ⇒ page 22 -2- and -3- light up yellow. When only the light emitting diode (LED) -3- lights up yellow, battery is partially discharged (approx. 90 %).

If the LED lights up green ⇒ page 22 -4- the charger has switched to "maintaining charge". The battery is fully charged.

– Switch off charger ⇒ page 21 .
– Remove charger terminals from battery clamps.

3.1.3 Charging totally discharged battery with battery charger -VAS 5095 A-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

The charger unit automatically recognises totally discharged batteries and initiates a gentle charging procedure with a low charging current. The charging current is automatically adapted to suit the charge condition of the battery.

Note

- *Follow instructions in chapter ⇒ page 49 .*
- *The battery voltage must be at least 0.6 V.*

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Charge battery ⇒ page 22 .

3.1.4 Charging battery in support mode with battery charger -VAS 5095 A-

General notes:

The support mode provides the onboard supply with power when the battery is removed or disconnected.

For further information, refer to the ⇒ operating manual VAS 5095A .

The support mode is suitable in the following situations:

- Support mode of onboard supplies without installed battery
- Power conservation when renewing the battery
- Ancillaries test without battery

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Switch off ignition and all electrical consumers.

Caution

- *The terminal polarity protection in operating mode „charging totally discharged batteries/support mode“ is not active. Connect battery charger terminal clamps correctly to battery terminals.*
- *It can cause sparks through a short-circuit.*
- *Danger of explosion*
- *Ensure charger terminals are fitted securely.*
- *Do not press START / STOP button if charger unit cables are connected incorrectly. The charger unit may be damaged.*

– Removing battery.

Caution

When battery is removed, ensure there is no contact between terminal clamp connected to positive clamp and body earth. Also ensure there is no contact between battery clamps.

– Connect red charger terminal „+“ to positive terminal of vehicle.
– Connect black charger terminal „-“ to negative terminal of vehicle.
– Check battery type setting on support mode/normal mode changer-over switch ⇒ page 21 . It must be switched on support mode.
– Check that connections of charger terminals have correct polarity.
– Switch on charger.

The battery charger starts with support mode.

End battery support mode:

– Switch off charger.
– Disconnect black charger terminal „-“ of charger from negative terminal of vehicle.
– Disconnect red charger terminal „+“ of charger from positive terminal of vehicle.
– Pull out mains plug of charger.

3.1.5 Charging battery in maintenance mode with battery charger -VAS 5095 A-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

In the buffer mode the battery charger -VAS 5095 A- is charged correctly and is maintained in a fully charged condition.

– Procedure same as for battery charging ⇒ page 22 .

Note

- *If the battery is discharged in buffer mode via an electrical consumer, the battery charger -VAS 5095 A- automatically compensates the charge.*
- *The buffer mode can be continued for an unlimited period.*
- *The battery is always ready for use.*

3.2 Battery charger -VAS 5900-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

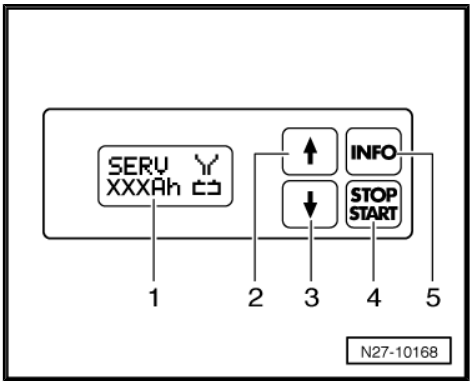
This chapter describes the basic functions of the battery charger -VAS 5900- . For additional information refer to ⇒ Operating instructions for battery charger -VAS 5900- .

Note

- *The effective charge current can be read directly on this battery charger.*
- *Observe ⇒ operating instructions for battery charger -VAS 5900- .*

3.2.1 Description of battery charger -VAS 5900-

The battery charger -VAS 5900- is suitable for charging all 12V batteries supplied by Volkswagen.



Battery charger -VAS 5900-

1 - Display

2 - Adjustment button „Up“ [↑]

3 - Adjustment button „Down“ [↓]

4 - [START / STOP]

5 - [INFO]

3.2.2 Charging battery with battery charger - VAS 5900-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

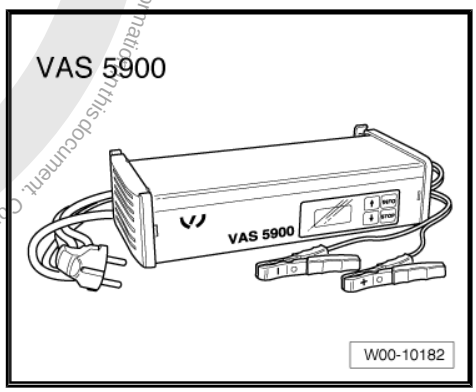
Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Special tools and workshop equipment required

- Battery charger -VAS 5900-



Note

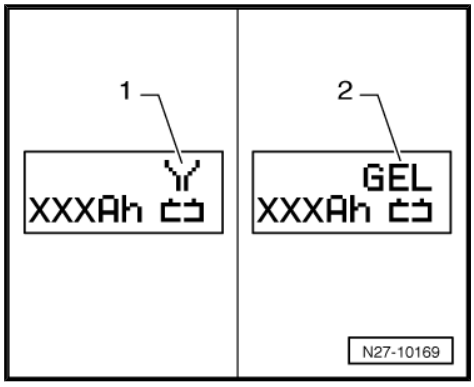
The battery must have a temperature of at least 10 °C.

– Switch off ignition and all electrical consumers.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 27 .

– Set battery to respective operating mode with INFO.

On the display, the symbol -1- for „standard charging of wet batteries“ or the symbol -2- for „standard charging of gel/absorbent glass mat batteries“ will appear.



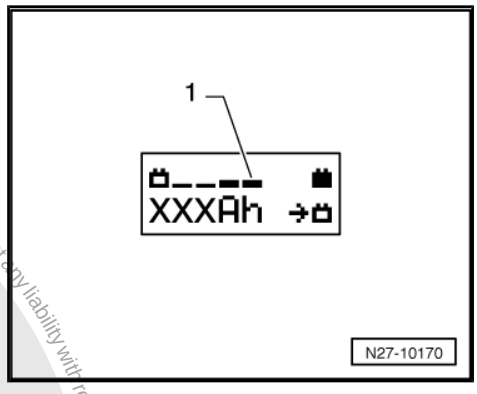
– Set battery capacity (Ah) of battery to be charged using corresponding button „Up“ ↑ or „Down“ ↓.

– Connect red charger terminal „+“ to positive terminal of battery.

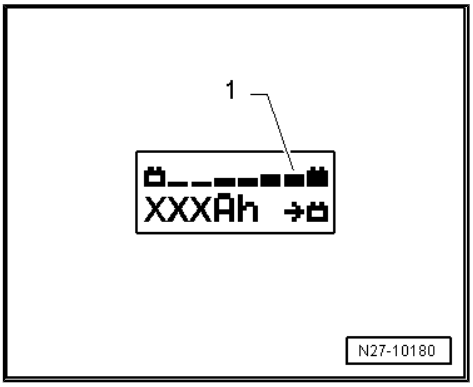
– Connect black charger terminal „-“ to negative terminal of battery.

The charger unit recognises the voltage required for the connected battery (6 V, 12 V or 24 V) and initiates the charging sequence.

At a charge condition of approx. 80 - 85 % the battery charger switches to the „final charge“ mode. The fourth bar appears in display -1-. The battery is ready for use.



At a charge condition of 100 % all bars appear in display.



Note

- *In „standard charge“ operating mode, the parallel operation of consumers while charging is possible. The charging period will be longer.*
- *The battery charger will switch to maintenance mode after about 1-7 hours, depending on type of battery. To achieve a 100 % charge, the battery should remain connected for this period.*

Possible faults and fault rectification:

1 - Displayed battery voltage is not as per nominal voltage:

– Hold down corresponding button „Up“ ↑ or „Down“ ↓ until charging sequence starts.

2 - Displayed battery voltage is not as per nominal voltage – charging sequence already started:

– Press START / STOP twice.

– Hold down corresponding button „Up“ ↑ or „Down“ ↓ until charging sequence starts again.

3 - Battery charger does not detect a battery, when battery voltage is less than 2 V:

Display remains unchanged.

The operating mode and ampere hours (Ah) as set are displayed.

Ending battery charging sequence:

– Press START / STOP.

– Disconnect black charger terminal „-“ of charger from negative terminal of battery.

– Disconnect red charger terminal „+“ of charger from positive terminal of battery.

– Pull out mains plug of charger.

3.2.3 Charging battery in service mode with battery charger -VAS 5900-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

Caution

The operating mode „service charge“ is not permitted on VW vehicles as the voltage peaks will damage the onboard electronics.

If „service charge“ operating mode is used nevertheless, the battery must be disconnected from the onboard supply.

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Caution

When charging always set the battery charger to the correct type of battery ⇒ Operating instructions for battery charger - VAS 5900- !

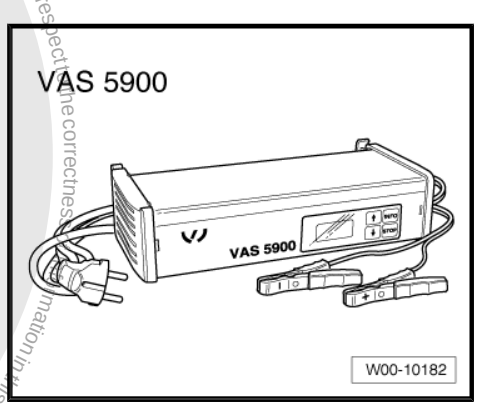
The „service mode“ is suitable for:

- *Wet batteries on which the colour indicator permits battery charging.*

The operating mode „service charge (SERV)“ is only used on sulphated batteries. The battery is charged at a voltage of >14.4 V. This can result in a partial reduction of the sulphated layer. After charging, it is essential that the colour indicator is checked before continuing to use the battery ⇒ page 6 .

Special tools and workshop equipment required

- Battery charger -VAS 5900-



Note

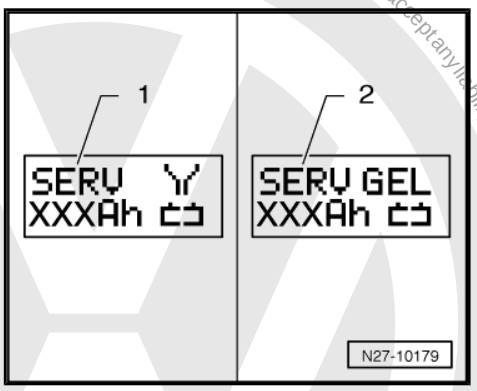
The battery must have a temperature of at least 10 °C.

– Switch off ignition and all electrical consumers.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 27 .

– Set battery to respective operating mode with INFO.

In the display, the symbol -1- for „Service charge for wet batteries“ or symbol -2- for „Service charge for gel/absorbent glass mat batteries“ will appear.



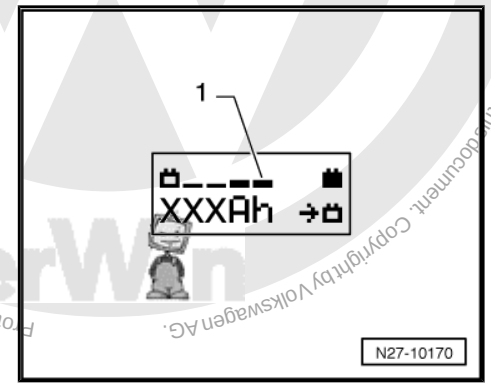
– Set battery capacity (Ah) of battery to be charged using corresponding button „Up“ ↑ or „Down“ ↓.

– Connect red charger terminal „+“ to positive terminal of battery.

– Connect black charger terminal „-“ to negative terminal of battery.

The charger unit recognises the voltage required for the connected battery (6 V, 12 V or 24 V) and initiates the charging sequence.

At a charge condition of approx. 80 - 85 % the charger unit switches to the „final charge“ mode. The fourth bar appears in display -1-. The battery is ready for use.



Note

The success of the „service charge“ depends on the severity of the sulphation of the battery

Possible faults and fault rectification:

1 - Displayed battery voltage is not as per nominal voltage:

– Hold down corresponding button „Up“ ↑ or „Down“ ↓ until charging sequence starts.

2 - Displayed battery voltage is not as per nominal voltage – charging sequence already started:

– Press START / STOP twice.

– Hold down corresponding button „Up“ ↑ or „Down“ ↓ until charging sequence starts.

3 - Battery charger does not detect a battery, when battery voltage is less than 2 V:

Display remains unchanged.

The operating mode and ampere hours (Ah) as set are displayed.

Ending battery charging sequence:

– Press START / STOP.

– Disconnect black charger terminal „-“ of charger from negative terminal of battery.

– Disconnect red charger terminal „+“ of charger from positive terminal of battery.

– Pull out mains plug of charger.

3.2.4 Charging totally discharged battery with battery charger -VAS 5900-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

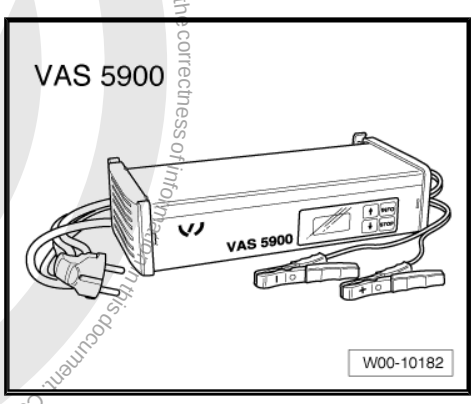
Caution

- *The terminal polarity protection in operating mode „charging totally discharged batteries/support mode“ is not active. Connect battery charger terminal clamps correctly to battery terminals.*
- *When charging always set the battery charger to the correct type of battery ⇒ Operating instructions for battery charger -VAS 5900- !*
- *Totally discharged battery is not recognised by battery charger ⇒ page 49 .*
- *Do not press START / STOP button if charger unit cables are connected incorrectly. The charger unit may be damaged.*

Batteries with a voltage of less than 2 volts will not be recognised automatically by battery charger -VAS 5900- .

Special tools and workshop equipment required

- Battery charger -VAS 5900-



Note

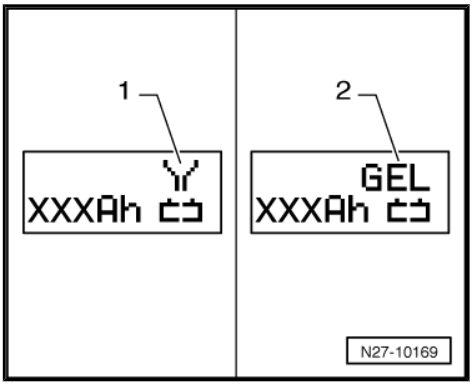
- *The battery must have a temperature of at least 10 °C.*
- *If the battery has cell sealing plugs, do not open them while the battery is being charged.*

– Switch off ignition and all electrical consumers.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 27 .

– Set battery to respective operating mode with INFO.

On the display, the symbol -1- for „Service charge for wet batteries“ or symbol -2- for „Service charge for gel/absorbent glass mat batteries“ will appear.



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

– Connect red charger terminal „+“ to positive terminal of battery.

– Connect black charger terminal „-“ to negative terminal of battery.

– Press START / STOP for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.

– Press „Up“ ↑ or „Down“ ↓ button to set appropriate battery voltage (6 V, 12 V or 24 V).

Note

If a button is not pressed within 5 seconds, the charger will return to the main menu (select operating mode).

– Confirm selected battery voltage with START / STOP.

Then follows the enquiry for "is charger cable terminal polarity correct".

– Check that connections of charger terminals have correct polarity.

– Confirm that connections of charger terminals have correct polarity with START / STOP.

Charger will start charging sequence for totally discharged battery.

Ending battery charging sequence:

– Press START / STOP.

– Disconnect black charger terminal „-“ of charger from negative terminal of battery.

– Disconnect red charger terminal „+“ of charger from positive terminal of battery.

– Pull out mains plug of charger.

3.2.5 Charging battery in support mode with battery charger -VAS 5900-

General notes:

The support mode provides the onboard supply with power when the battery is removed or disconnected.

For further information, refer to the ⇒ operating manual VAS 5900 .

The support mode is suitable in the following situations:

- Support mode of onboard supplies without installed battery
- Power conservation when renewing the battery
- Ancillaries test without battery

> WARNING
>
> *Danger of injury! Comply with the warning notices and safety regulations* *⇒ page 2* *!*

> WARNING
>
> *Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!*
>
> *There is a risk of explosion while checking and charging the battery, including during slave starting.*
>
> *These batteries must be renewed.*

– Switch off ignition and all electrical consumers.

> Caution
>
> ♦ *The terminal polarity protection in operating mode „charging totally discharged batteries/support mode“ is not active. Connect battery charger terminal clamps correctly to battery terminals.*
>
> ♦ *It can cause sparks through a short-circuit.*
>
> ♦ *Danger of explosion*
>
> ♦ *Ensure charger terminals are fitted securely.*
>
> ♦ *Do not press* **START / STOP** *button if charger unit cables are connected incorrectly. The charger unit may be damaged.*

– Removing battery.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 27 .

> Caution
>
> *When battery is removed, ensure there is no contact between terminal clamp connected to positive clamp and body earth. Also ensure there is no contact between battery clamps.*

– Connect red charger terminal „+“ to positive terminal of vehicle.

– Connect black charger terminal „-“ to negative terminal of vehicle.

– Press START / STOP for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.

– Press „Up“ ↑ or „Down“ ↓ button to set appropriate battery voltage (6 V, 12 V or 24 V).

Note

If a button is not pressed within 5 seconds, the charger will return to the main menu (select operating mode).

– Confirm selected battery voltage with START / STOP.

Then follows the enquiry for "is charger cable terminal polarity correct".

– Check that connections of charger terminals have correct polarity.

– Confirm that connections of charger terminals have correct polarity with START / STOP.

The battery charger starts with support mode.

End battery support mode:

– Press START / STOP.

– Disconnect black charger terminal „-“ of charger from negative terminal of vehicle.

– Disconnect red charger terminal „+“ of charger from positive terminal of vehicle.

– Pull out mains plug of charger.

3.2.6 Charging battery in maintenance mode with battery charger -VAS 5900-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

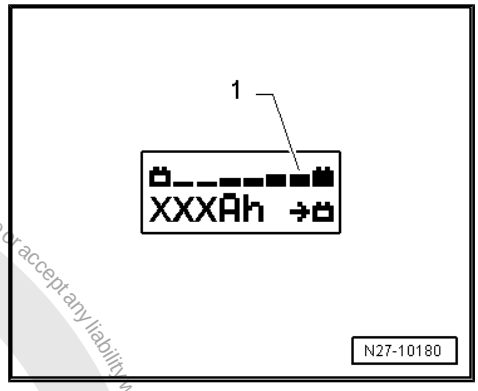
There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

When the battery is fully charged the battery charger -VAS 5900- switches to maintenance mode.

– Procedure same as for battery charging ⇒ page 27 .

At a charge condition of 100 % all bars appear in display.



Note

- *When a battery is being charged in the maintenance mode and an electrical consumer draws current from the battery, the battery charger -VAS 5900- automatically compensates the charge.*
- *The maintenance mode can be continued for an unlimited period.*
- *The battery is always ready for use.*
- *Observe battery manufacturer's maintenance instructions as well.*

3.3 Battery charger -VAS 5903-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

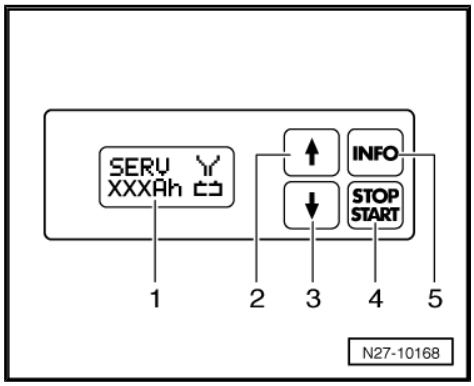
This chapter describes the basic functions of the battery charger -VAS 5903- . For additional information refer to ⇒ Operating instructions for battery charger -VAS 5903- .

Note

Observe ⇒ operating instructions for battery charger -VAS 5903- .

3.3.1 Description of battery charger -VAS 5903-

The battery charger -VAS 5903- is suitable for charging all 12V batteries supplied by Volkswagen.



Battery charger -VAS 5903-

1 - Display

2 - Adjustment button „Up“ [↑]

3 - Adjustment button „Down“ [↓]

4 - [START / STOP]

5 - [INFO]

3.3.2 Charging battery with battery charger - VAS 5903-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

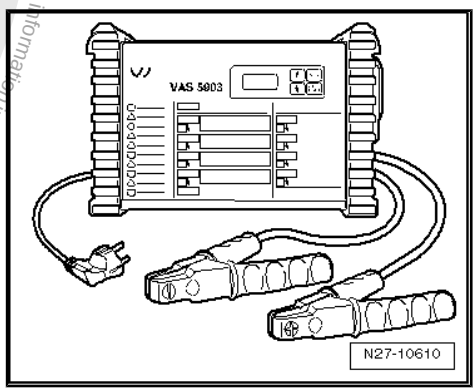
Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Special tools and workshop equipment required

- Battery charger -VAS 5903-



Note

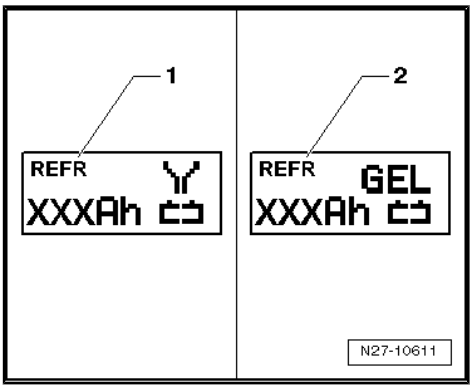
The battery must have a temperature of at least 10 °C.

– Switch off ignition and all electrical consumers.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 36 .

– Set battery to respective operating mode with INFO.

On the display, the symbol -1- for „standard charging of wet batteries“ or the symbol -2- for „standard charging of gel/absorbent glass mat batteries“ will appear.



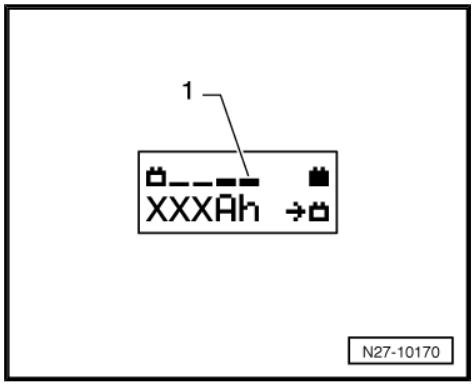
– Set battery capacity (Ah) of battery to be charged using corresponding button „Up“ ↑ or „Down“ ↓.

– Connect red charger terminal „+“ to positive terminal of battery.

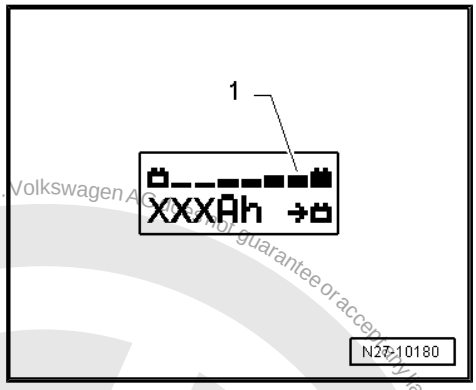
– Connect black charger terminal „-“ to negative terminal of battery.

The charger unit recognises the voltage required for the connected battery (6 V, 12 V or 24 V) and initiates the charging sequence.

At a charge condition of approx. 80 - 85 % the battery charger switches to the „final charge“ mode. The fourth bar appears in display -1-. The battery is ready for use.



At a charge condition of 100 % all bars appear in display.



Note

- *During „standard charge“ battery mode, the parallel operation of consumers while charging is possible. The charging period will be longer.*
- *The battery charger will switch to maintenance mode after about 1-7 hours, depending on type of battery. To achieve a 100 % charge, the battery should remain connected for this period.*

Possible faults and fault rectification:

1 - Displayed battery voltage is not as per nominal voltage:

– Hold down corresponding button „Up“ [↑] or „Down“ [↓] until charging sequence starts.

2 - Displayed battery voltage is not as per nominal voltage – charging sequence already started:

– Press [START / STOP] twice.

– Hold down corresponding button „Up“ [↑] or „Down“ [↓] until charging sequence starts again.

3 - Battery charger does not detect a battery, when battery voltage is less than 2 V:

Display remains unchanged.

The battery type and ampere hours (Ah) as set is displayed.

Ending battery charging sequence:

– Press [START / STOP].

– Disconnect black charger terminal „-“ of charger from negative terminal of battery.

– Disconnect red charger terminal „+“ of charger from positive terminal of battery.

– Pull out mains plug of charger.

3.3.3 Charging battery in refresh charge mode with battery charger -VAS 5903-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Caution

The operating mode „refresh charge“ is not permitted on VW vehicles as the voltage peaks will damage the onboard electronics.

If „refresh charge“ operating mode is used nevertheless, the battery must be disconnected from the onboard supply.

Caution

When charging always set the battery charger to the correct type of battery ⇒ Operating instructions for battery charger - VAS 5903- !

The „refresh charge“ mode is suitable for:

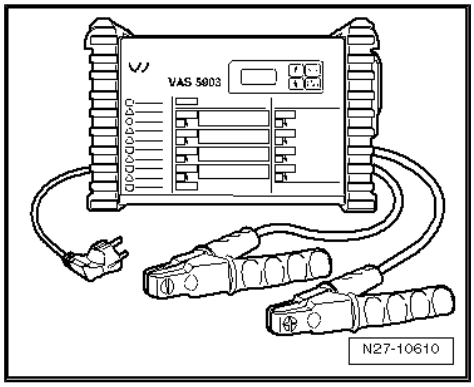
- *Wet batteries, where distilled water can be replenished.*

Do not use „Refresh Charge“ mode for maintenance-free wet batteries.

The „refresh charge (Refr)“ operating mode is only used on suspect defective batteries (e.g. sulphation). The battery will be charged to maximum specific gravity and the plates will be reactivated (dissipation of sulphur layer).

Special tools and workshop equipment required

♦ Battery charger -VAS 5900-

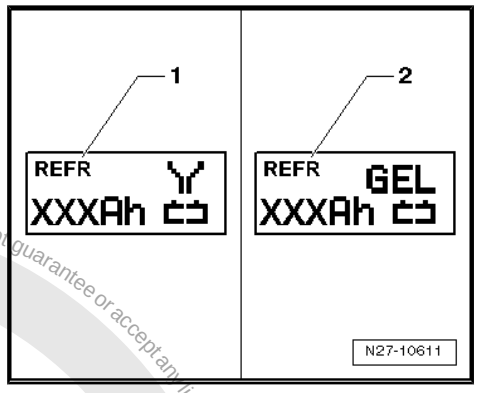


Note

The battery must have a temperature of at least 10 °C.

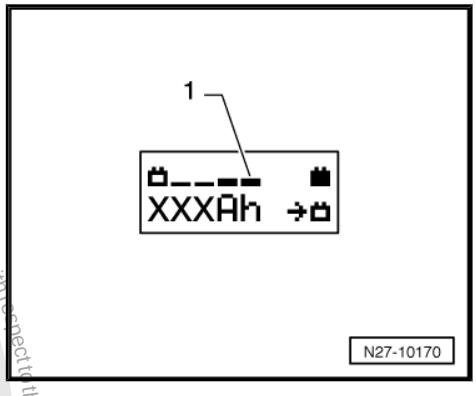
– Switch off ignition and all electrical consumers.
– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 36 .
– Set battery to respective operating mode with INFO.

In the display the symbol -1- for „Refresh Charge for wet batteries“ or symbol -2- for „Refresh Charge for gel/absorbent glass mat batteries“ will appear.



– Set battery capacity (Ah) of battery to be charged using corresponding button „Up“ ↑ or „Down“ ↓.
– Connect red charger terminal „+“ to positive terminal of battery.
– Connect black charger terminal „-“ to negative terminal of battery.

The charger unit recognises the voltage required for the connected battery (6 V, 12 V or 24 V) and initiates the charging sequence.



At a charge condition of approx. 80 - 85 % the charger unit switches to the „final charge“ mode. The fourth bar appears in display -1-. The battery is ready for use.

Note

The success of the „refresh charge“ depends on the severity of the sulphation of the battery.

Possible faults and fault rectification:

1 - Displayed battery voltage is not as per nominal voltage:

– Hold down corresponding button „Up“ ↑ or „Down“ ↓ until charging sequence starts.

2 - Displayed battery voltage does not agree with nominal voltage – charging sequence already started:

– Press START / STOP twice.

– Hold down corresponding button „Up“ ↑ or „Down“ ↓ until charging sequence starts.

3 - Battery charger does not detect a battery, when battery voltage is less than 2 V:

Display remains unchanged.

The operating mode and ampere hours (Ah) as set are displayed.

Ending battery charging sequence:

– Press START / STOP.

– Disconnect black charger terminal „-“ of charger from negative terminal of battery.

– Disconnect red charger terminal „+“ of charger from positive terminal of battery.

– Pull out mains plug of charger.

3.3.4 Charging totally discharged battery with battery charger -VAS 5903-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

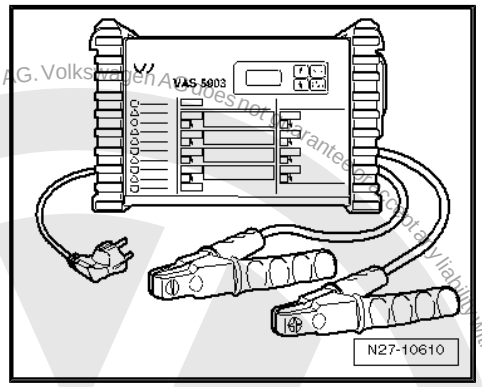
Caution

- *The terminal polarity protection in operating mode „charging totally discharged batteries/support mode“ is not active. Connect battery charger terminal clamps correctly to battery terminals.*
- *When charging always set the battery charger to the correct type of battery ⇒ Operating instructions for battery charger -VAS 5903- !*
- *Totally discharged battery is not recognised by battery charger ⇒ page 49 .*
- *Do not press START / STOP button if charger unit cables are connected incorrectly. The charger unit may be damaged.*

Batteries with a voltage of less than 2 volts will not be recognised automatically by battery charger -VAS 5903- .

Special tools and workshop equipment required

- Battery charger -VAS 5903-



Note

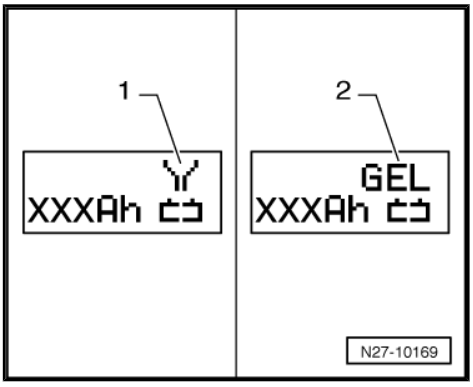
The battery must have a temperature of at least 10 °C.

– Switch off ignition and all electrical consumers.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 36 .

– Set battery to respective operating mode with INFO.

On the display, the symbol -1- for „Service charge for wet batteries“ or symbol -2- for „Service charge for gel/absorbent glass mat batteries“ will appear.



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

– Connect red charger terminal „+“ to positive terminal of battery.

– Connect black charger terminal „-“ to negative terminal of battery.

– Press START / STOP for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.

– Press „Up“ ↑ or „Down“ ↓ button to set appropriate battery voltage (6 V, 12 V or 24 V).

Note

If a button is not pressed within 5 seconds, the charger will return to the main menu (select operating mode).

– Confirm selected battery voltage with START / STOP.

Then follows the enquiry for "is charger cable terminal polarity correct".

– Check that connections of charger terminals have correct polarity.

– Confirm that connections of charger terminals have correct polarity with START / STOP.

Charger will start charging sequence for totally discharged battery.

Ending battery charging sequence:

– Press START / STOP.

– Disconnect black charger terminal „-“ of charger from negative terminal of battery.

– Disconnect red charger terminal „+“ of charger from positive terminal of battery.

– Pull out mains plug of charger.

3.3.5 Charging battery in support mode with battery charger -VAS 5903-

General notes:

The support mode provides the onboard supply with power when the battery is removed or disconnected.

For further information, refer to the ⇒ operating manual VAS 5903 .

The support mode is suitable in the following situations:

- Support mode of onboard supplies without installed battery
- Power conservation when renewing the battery
- Ancillaries test without battery

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

– Switch off ignition and all electrical consumers.

Caution

- *The terminal polarity protection in operating mode „charging totally discharged batteries/support mode“ is not active. Connect battery charger terminal clamps correctly to battery terminals.*
- *It can cause sparks through a short-circuit.*
- *Danger of explosion*
- *Ensure charger terminals are fitted securely.*
- *Do not press START / STOP button if charger unit cables are connected incorrectly. The charger unit may be damaged.*

– Removing battery.

– Plug in mains plug of charger. The last selected operating mode will appear on display ⇒ page 27 .

Caution

When battery is removed, ensure there is no contact between terminal clamp connected to positive clamp and body earth. Also ensure there is no contact between battery clamps.

– Connect red charger terminal „+“ to positive terminal of vehicle.

– Connect black charger terminal „-“ to negative terminal of vehicle.

– Press START / STOP for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.

– Press „Up“ ↑ or „Down“ ↓ button to set appropriate battery voltage (6 V, 12 V or 24 V).

Note

If a button is not pressed within 5 seconds, the charger will return to the main menu (select operating mode).

– Confirm selected battery voltage with START / STOP.

Then follows the enquiry for "is charger cable terminal polarity correct".

– Check that connections of charger terminals have correct polarity.
– Confirm that connections of charger terminals have correct polarity with START / STOP.

The battery charger starts with support mode.

End battery support mode:

– Press START / STOP.
– Disconnect black charger terminal „-“ of charger from negative terminal of vehicle.
– Disconnect red charger terminal „+“ of charger from positive terminal of vehicle.
– Pull out mains plug of charger.

3.3.6 Charging battery in maintenance mode with battery charger -VAS 5903-

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

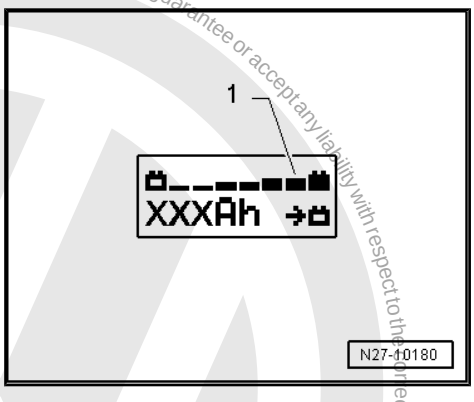
There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

When the battery is fully charged the battery charger -VAS 5903- switches to maintenance mode.

– Procedure same as for battery charging ⇒ page 37 .

At a charge condition of 100 % all bars appear in display.



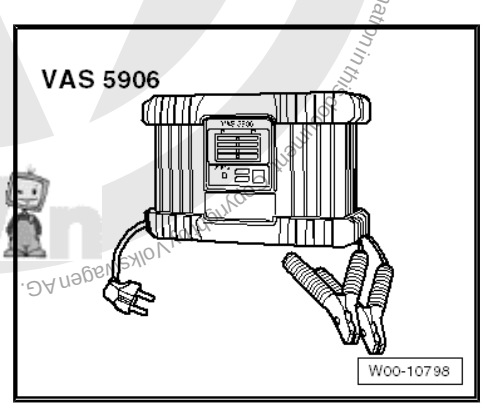
Note

- *When a battery is being charged in the maintenance mode and an electrical consumer draws current from the battery, the battery charger -VAS 5903- automatically compensates the charge.*
- *The maintenance mode can be continued for an unlimited period.*
- *The battery is always ready for use.*
- *Observe battery manufacturer's maintenance instructions as well.*

3.4 Battery charger -VAS 5906-

3.4.1 General description

Battery charger - VAS 5906-



WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Battery charger -VAS 5906- has been specially developed for charging in vehicle onboard supply during vehicle presentation.

It has an automatic charging characteristic for starter batteries, 3 - 300 AH.

The maximum charging voltage 14.4 V is not exceeded. All electrical loads are supported by up to 30 A by the trickle charging.

For sustained operation, battery charger -VAS 5906- changes to trickle charging once battery is fully charged.

Tester starts fully automatically and does not require any settings. All that is required is to connect crocodile clips and mains cable.

For further information, refer to the ⇒ operating manual VAS 5906 .

3.4.2 Charging battery with battery charger - VAS 5906-

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

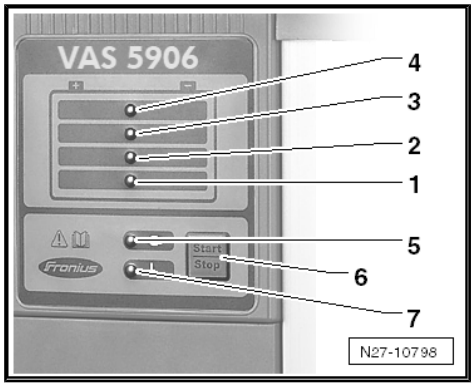
WARNING

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

Overview of operating panel:



1 - Charge condition display 25 %.

2 - Charge condition display 50 %.

3 - Charge condition display 75 %.

4 - Charge condition display 100 %.

5 - Display ready

6 - Start/stop and Setup buttons for interrupting and resuming charging process. Entry to Setup menu and selection of characteristic type (press for 10 s).

7 - Malfunction display.

– Place charger in engine compartment or under vehicle.

– Connect mains cable to charger and plug it into mains.

Charger is in no-load operation - ready light is on.

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

– Switch off ignition.

– Connect red charging cable to positive terminal „+“ on battery.

Note

In vehicles with start/stop function and battery monitor control unit -J367- fitted, black terminal clamp must be connected to body earth. Connecting it to battery negative terminal will cause start/stop system to malfunction.

– Connect black charging cable to negative terminal „-“ on battery.

Charging starts after about 2 seconds.

Number of LEDs lit indicates charge condition of battery. Battery has been charged up once all lights are lit.

When battery is fully charged, battery charger -VAS 5906- automatically switches over to trickle charging.

Caution

Danger of sparking if charging terminals are removed too soon. Terminate charging by pressing start/stop button.

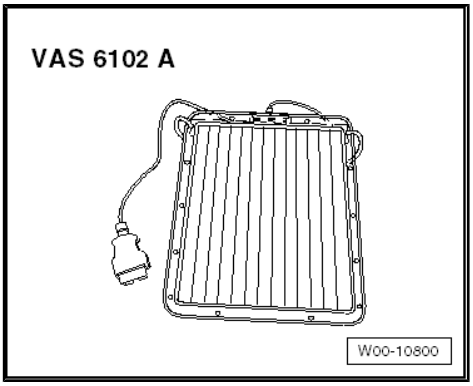
– Press start/stop button to terminate charging.

– Disconnect black charging cable from negative terminal „-“ on battery.

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

3.5 Solar panel -VAS 6102A-

3.5.1 Charging battery in maintenance mode with solar panel -VAS 6102A-



Solar panel VAS 6102A

General description:

Solar panel -VAS 6102A- supports onboard supply and prevents spontaneous battery discharging.

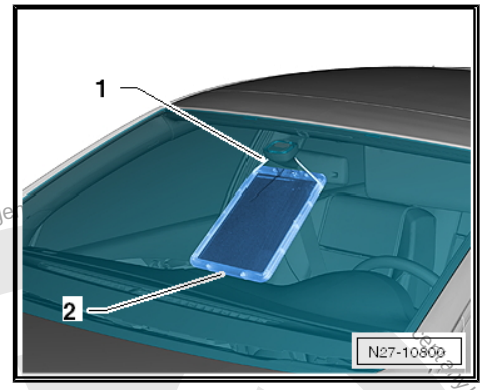
Solar panel -VAS 6102A- achieves max. voltage of 14.3 V and a charging current of max. 255 mA.

Solar panel -VAS 6102A- is allowed to be used for charging all rechargeable lead or lead gel batteries.

Solar panel -VAS 6102A- is connected to diagnostic connection in vehicle.

A green LED is integrated in the frame to indicate its function. The brighter the LED, the higher the charging current.

Integrated electronics prevent battery overcharging.



– Secure solar panel -VAS 6102A- on interior mirror -1-.
– Place underside on dash panel -2-.

Note

Solar panel -VAS 6102A- is not allowed to lie fully on dash panel. It is only allowed to be positioned with the bottom edge for support. Placing it fully on the surface can result in discolouration of the dash panel.

– Pull attachment string tight so that solar panel -VAS 6102A- is positioned close to windscreen.
– Connect solar panel -VAS 6102A- to diagnostic connection of vehicle. Connect in same way as vehicle diagnosis tester ⇒ page 179 .
– Check function of solar panel -VAS 6102A- . Green LED indicates function of solar panel -VAS 6102A- .

3.6 Totally discharged batteries

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

Batteries on which the colour indicator is neutral or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

There is a risk of explosion while checking and charging the battery, including during slave starting.

These batteries must be renewed.

A battery is deemed „completely discharged“ if the open-circuit voltage is less than 11.6 V.

Caution

- *Totally discharged batteries freeze prematurely.*
- *Frozen batteries should no longer be used.*

Note

- *Totally discharged batteries in vehicles before registration must be exchanged prior to delivery. Preliminary damage cannot be excluded.*
- *Batteries that have not been used for a long period of time discharge themselves, e.g. those fitted in stored vehicles.*
- *In totally discharged batteries, the electrolyte is comprised almost entirely of water because the acid content is so low.*
- *Totally discharged batteries sulphate, that means, the entire plate surfaces of the battery harden.*
- *If a battery is recharged shortly after it has totally lost its charge, the sulphation will mostly dissipate.*
- *If these batteries are not recharged, the plates continue to harden and the ability to recharge is reduced. The result of which is a reduction in the battery output.*

– Check battery no-load voltage ⇒ page 21 .

4 Disconnecting and reconnecting battery

WARNING

Danger of injury! Comply with the warning notices and safety regulations ⇒ page 4 !

4.1 Disconnecting and reconnecting battery

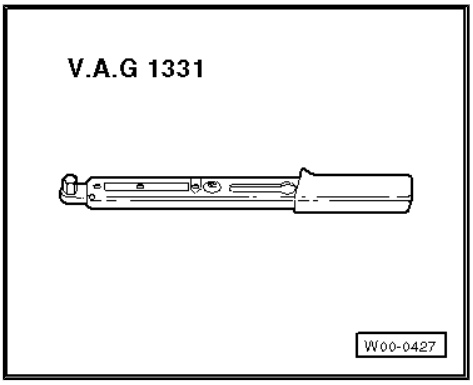
A battery with colour indicator and either covered cell plugs or no cell plugs is installed in the vehicle ex-factory on the left in the engine compartment.

Note

- *The order in which the work steps is carried out should be followed carefully.*
- *Disconnecting the battery earth strap (open circuit) provides a safe working environment for repairs to the electrical system.*
- *The battery positive wire need only be disconnected for removal of the battery. However, you should in any case observe the notes on connecting the battery.*

Special tools and workshop equipment required

- Torque wrench -V.A.G 1331-



4.1.1 Disconnecting battery

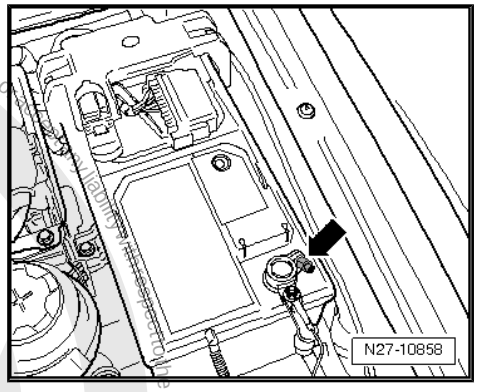
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

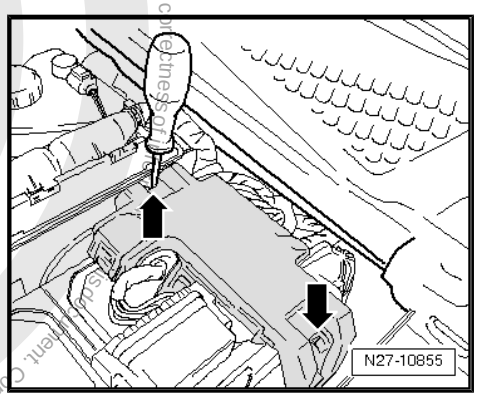
After waiting 60 seconds:

Disconnect battery in following sequence:

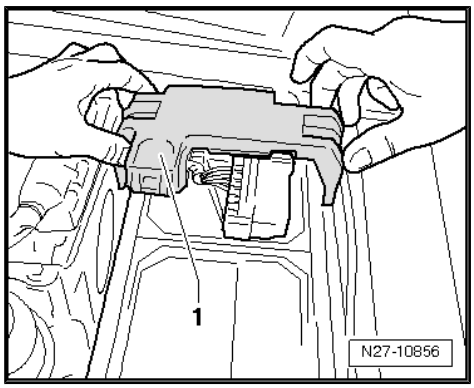
– First disconnect battery earth cable -arrow- from battery negative terminal.



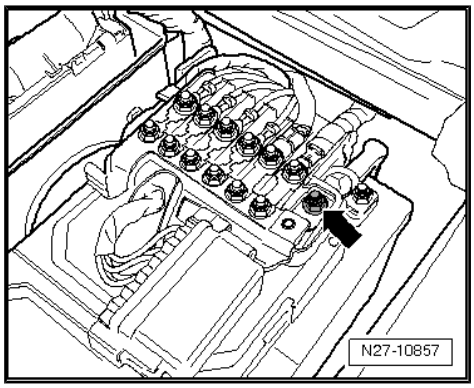
– Unclip cover of fuse holder on positive terminal using a suitable screwdriver -arrows-.



– Remove cover of fuse holder -1- on positive terminal.



– Remove securing nut -arrow- from fuse holder. Remove fuse holder and put it to one side.
– Then disconnect the battery positive wire on battery positive terminal.



4.1.2 Connecting battery:

Caution

Battery terminal clamps must be fitted only by hand without force to prevent damage to battery housing.

Battery terminals must not be greased.

Carry out the following work:

– Fit positive cable clamp onto battery positive terminal.
– Tighten battery positive terminal clamp securing bolt to 6 Nm.
– Install fuse holder on battery positive terminal.
– Connect battery negative terminal clamp to negative terminal of battery.
– Tighten securing bolt of battery negative terminal clamp to 6 Nm.
– Perform steps according to table ⇒ page 53 .

4.2 Steps after connecting battery

Procedure	Performed
Using ignition key, switch ignition: on and then off again	
Read fault memory: ⇒ Guided fault finding using VAS 5051	
Steering angle sender - carry out zero compensation: ⇒ Guided fault finding using VAS 5051	
Clock: Check clock setting, adjust if necessary.	
Electric window regulators: Fully open and then close all windows.	
Functional check: All electrical consumers	

Chart can be printed out as required.

5 Removing and installing battery

WARNING

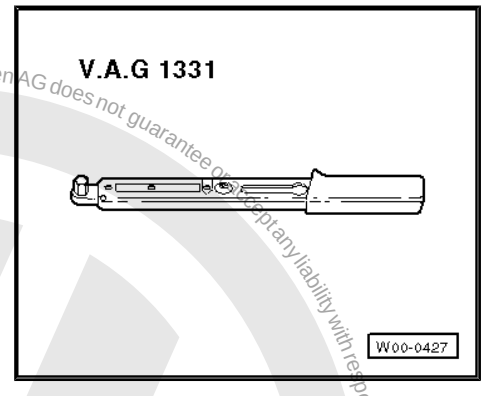
Danger of injury! Comply with the warning notices and safety regulations ⇒ page 2 !

5.1 Removing and installing battery

5.1.1 Removing:

Special tools and workshop equipment required

- Torque wrench -V.A.G 1331-



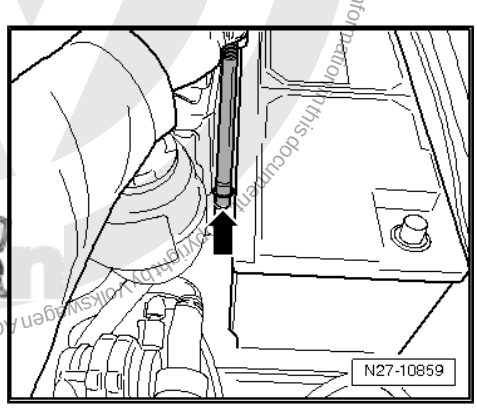
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

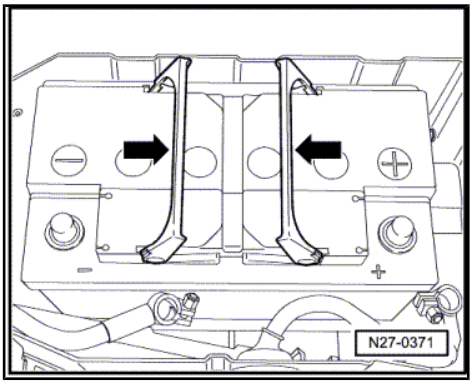
– Disconnect battery ⇒ page 51 .

– Disconnect hose for central gas venting, if present, from battery.

– Unscrew securing screw -arrow- and remove battery carrier.



– Swivel up battery handles -arrows-.
– Grip battery on handles and lift it out.



5.1.2 Installing:

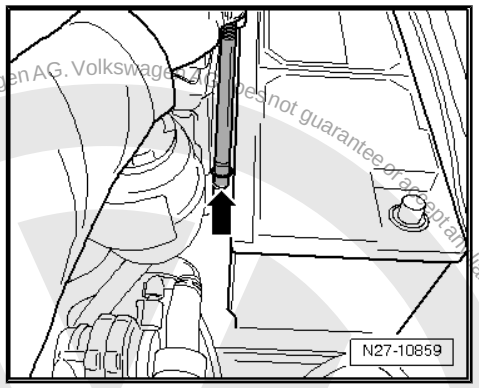
Caution

A loosely fitted battery creates the following dangers:

- *Reduced service life due to damage from vibration (danger of explosion)*
- *The cells in the battery will be damaged if the battery is not secured correctly.*
- *Damage to battery housing by securing bracket (possibility of acid leaking, with high consequential costs)*
- *Poor crash safety*

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Insert holder and tighten securing bolt -arrow- to a specified torque of 23 Nm.



When doing this, ensure that hose for central gas venting (if fitted) is installed on battery and is not trapped during installation. Only then can the battery vent freely.

– After installing battery, check it is firmly seated. A loosely fitted battery creates the following dangers:

- Shortened service life due to damage from vibration (danger of explosion)
- The plates in the battery cells will be damaged if the battery is not secured correctly.
- Damage to battery housing by securing bracket (possibility of acid leaking, with high consequential costs)
- Poor crash safety

– Connecting battery ⇒ page 53 .

Note

When batteries are connected, the procedure described in the workshop manual must be strictly followed ⇒ page 51 .

5.2 Specified torques: battery

Threaded connection		Specified torques
Terminal clamps battery -A-	M6	6 Nm

Threaded connection	Specified torques
Bracket securing bolt battery -A- M 8x35	23 Nm

6 Starter

Caution

To disconnect and connect the battery, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 *.*

6.1 Checking starter

– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179

– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .

– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Body
- Electrical system
- 27 - Starter, current supply
- Electrical components
- B - Starter

6.2 Removing and installing starter, 4-cylinder diesel engine with manual gearbox

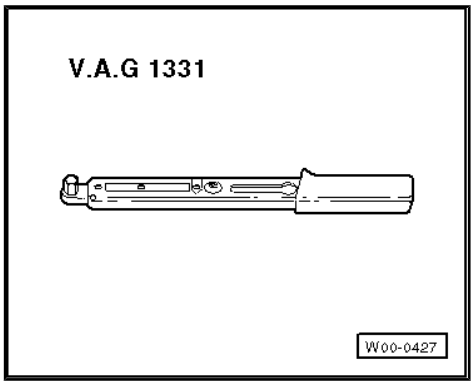
Caution

Please note the following points during all assembly work, in particular in the engine compartment, due to the narrow installation conditions:

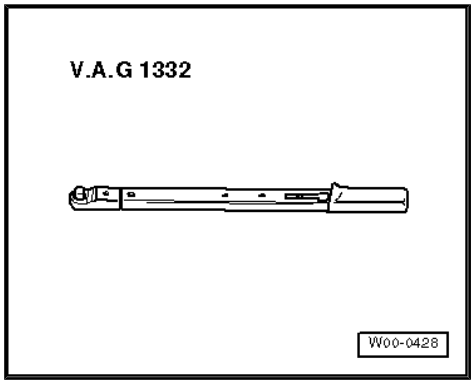
- *Route electrical wiring so that original wiring layout is restored.*
- *Make sure there is adequate clearance from all moving or hot components.*

Special tools and workshop equipment required

- Torque wrench (5 - 50 Nm) -V.A.G 1331-



♦ Torque wrench (40 - 200 Nm) -V.A.G 1332-



6.2.1 Removing:

Caution

To disconnect and connect the battery, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 .

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

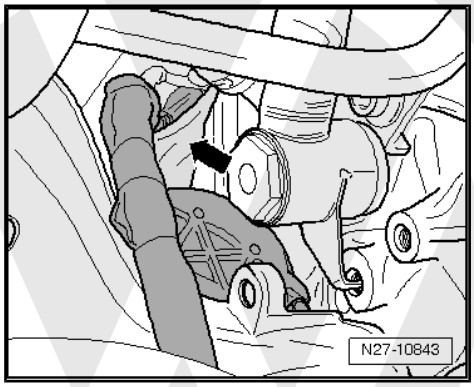
– Disconnect battery ⇒ page 51 .

– Remove underbody guard.

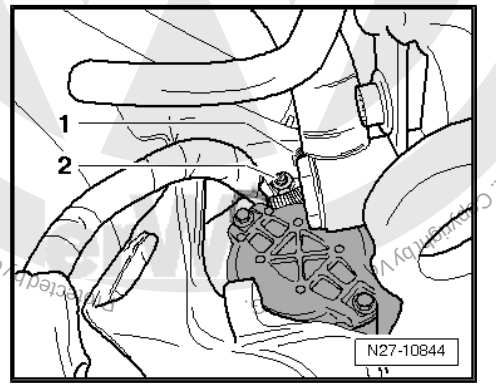
In order to tighten the securing bolts of the starter with a torque wrench during installation, it is necessary to remove the particulate filter so that sufficient space can be provided for the tool.

– Removing particulate filter ⇒ Rep. gr. 26 .

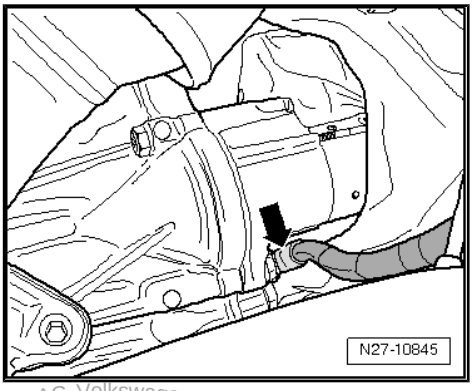
– Unclip sheathing of cable connections -arrows- to starter and pull down.



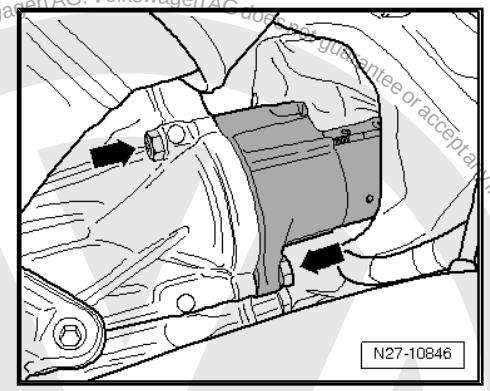
– Release terminal 50 connector -1- from starter and pull off. Unscrew securing nut -2- of terminal 30 from starter.



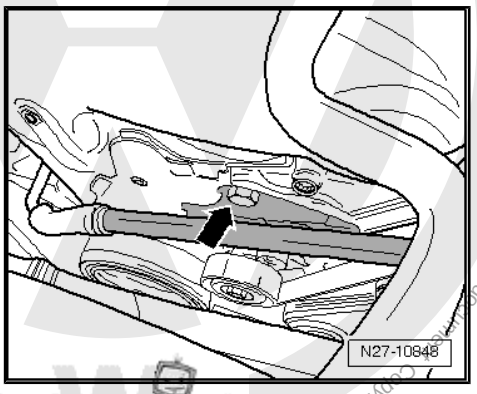
– Unscrew earth connection from starter -arrow-.



– Remove securing bolts -arrows- from starter. The best way to reach upper bolt is from gearbox side. The best way to reach lower bolt is from engine side.

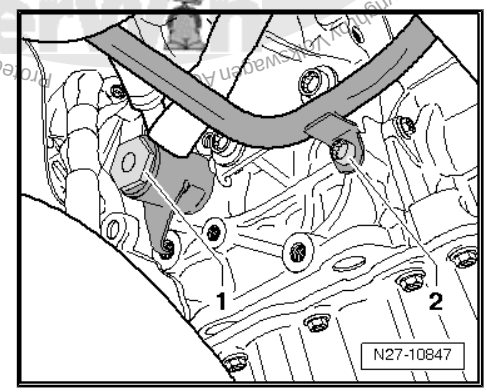


– To remove starter, unscrew bracket of coolant line from engine at top -arrow-.

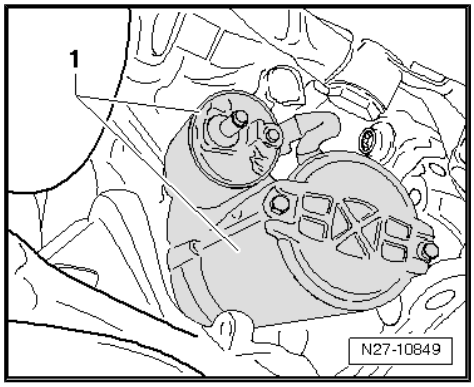


– Unscrew oil return connection piece -1- and place to one side. Wipe up any escaping engine oil with a cloth. Also unscrew bracket of coolant line -2- and push coolant line upwards.

– Release oil return line from turbocharger at bottom. Push oil return line a little away from cylinder block so that starter can be guided out.



– Rotate starter -1- a little if required and remove it forwards.



6.2.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Tighten threaded connections to specified torque given in assembly overview ⇒ page 63 .

6.3 Removing and installing starter, 4-cylinder TFSI petrol engine with manual gearbox

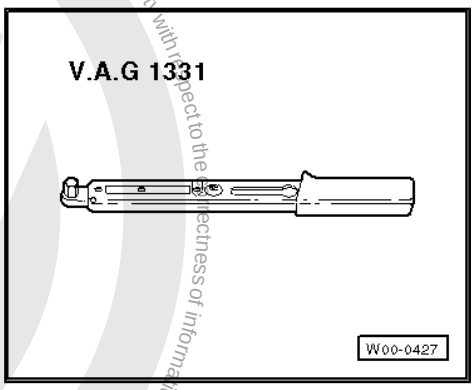
Caution

Please note the following points during all assembly work, in particular in the engine compartment, due to the narrow installation conditions:

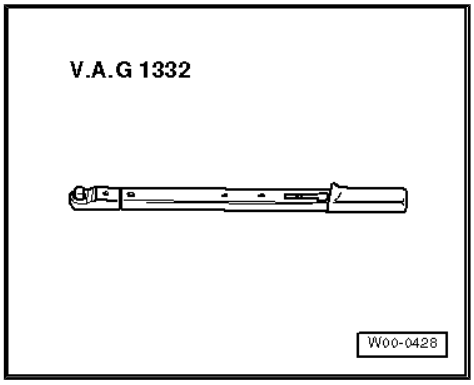
- ***Route electrical wiring so that original wiring layout is restored.***
- ***Make sure there is adequate clearance from all moving or hot components.***

Special tools and workshop equipment required

- Torque wrench (5 - 50 Nm) -V.A.G 1331-



♦ Torque wrench (40 - 200 Nm) -V.A.G 1332-



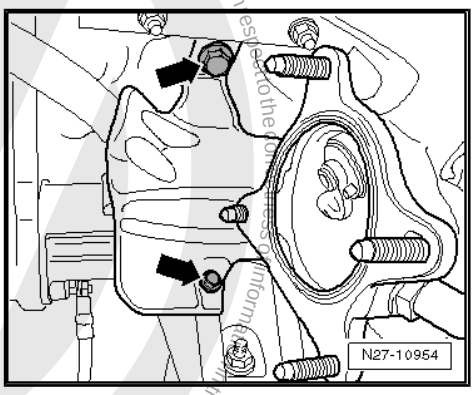
6.3.1 Removing:

Caution

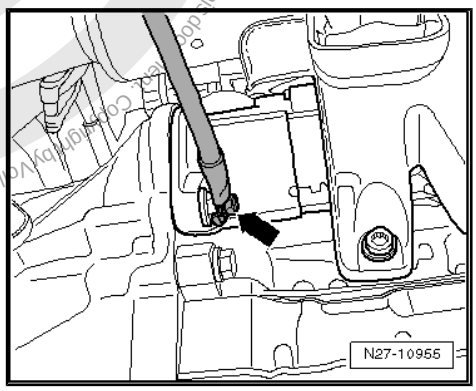
To disconnect and connect the battery, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 .

Carry out the following work:

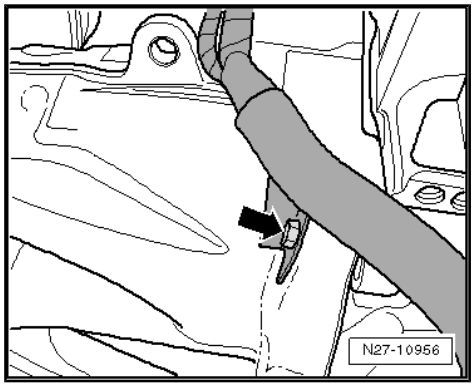
– Switch off ignition and all electrical loads, and pull out ignition key.
– Disconnect battery ⇒ page 51 .
– Remove underbody guard.
– Removing catalytic converter ⇒ Rep. gr. 26 .
– Unscrew bolts -arrows- on heat shield above starter and remove heat shield.



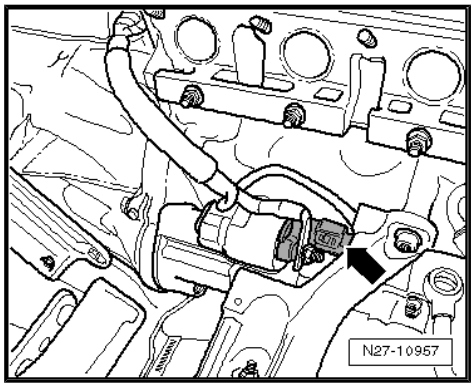
– Unscrew earth cable connection -arrow- on starter.



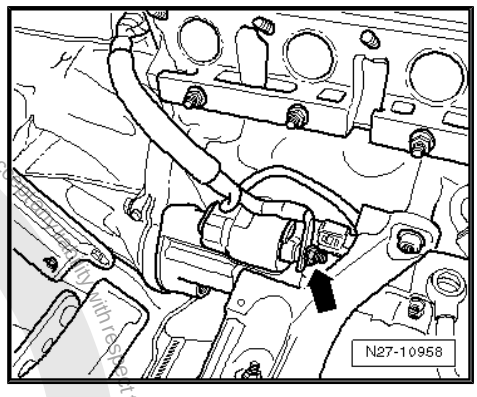
– Detach guide tube for wiring connections from starter by unscrewing gearbox securing bolt -arrow-.
– Unclip wiring connections on plastic bracket on top of gearbox.



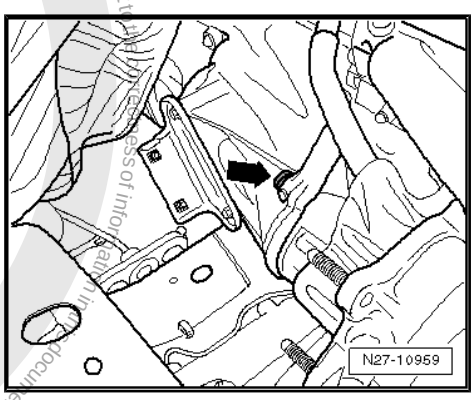
– Release and pull off terminal 50 connector -arrow- on starter.



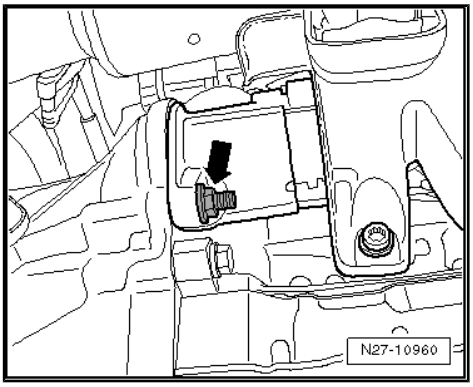
– Unscrew terminal 30 securing nut -arrow- on starter.
– Unscrew earth connection from starter -arrow-.



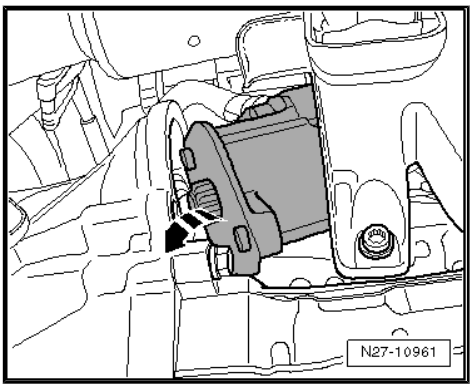
– Unscrew securing bolt -arrow- on starter. The best way to reach upper bolt is from gearbox side.



– Unscrew securing bolt -arrow- on starter. The best way to reach lower bolt is from engine side.



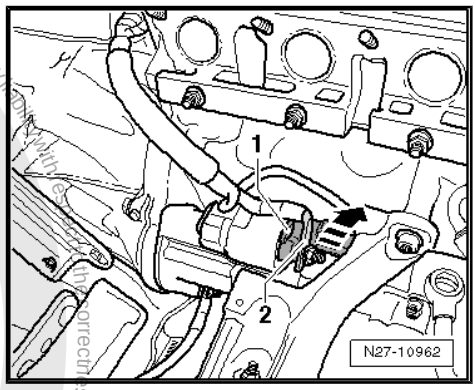
– Guide out starter in direction of -arrow- between engine support and gear casing (gearbox).



6.3.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

When connecting terminal 30 on starter, it is essential that connection terminal 30 -2- is turned on mounting pin in direction of arrow until it comes into contact with plastic stop -1- on starter. Tighten nut in this position.



DANGER!

If this is not done, the terminal 30 connection of the starter may come into contact with the turbocharger housing, which in turn would cause a short circuit between the starter motor and the battery.

– Tighten threaded connections to torque specified in assembly overview ⇒ page 63 .

6.4 Specified torques: starter

Threaded connection	Specified torques
Securing bolts of starter -B- M12	75 Nm
Securing nuts for positive cable or negative cable and cable bracket	20 Nm

7 Alternator

Caution

Please note the following points during all assembly work, in particular in the engine compartment, due to the narrow installation conditions:

- ***Route electrical wiring so that original wiring layout is restored.***
- ***Make sure there is adequate clearance from all moving or hot components.***

7.1 Checking alternator

– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179

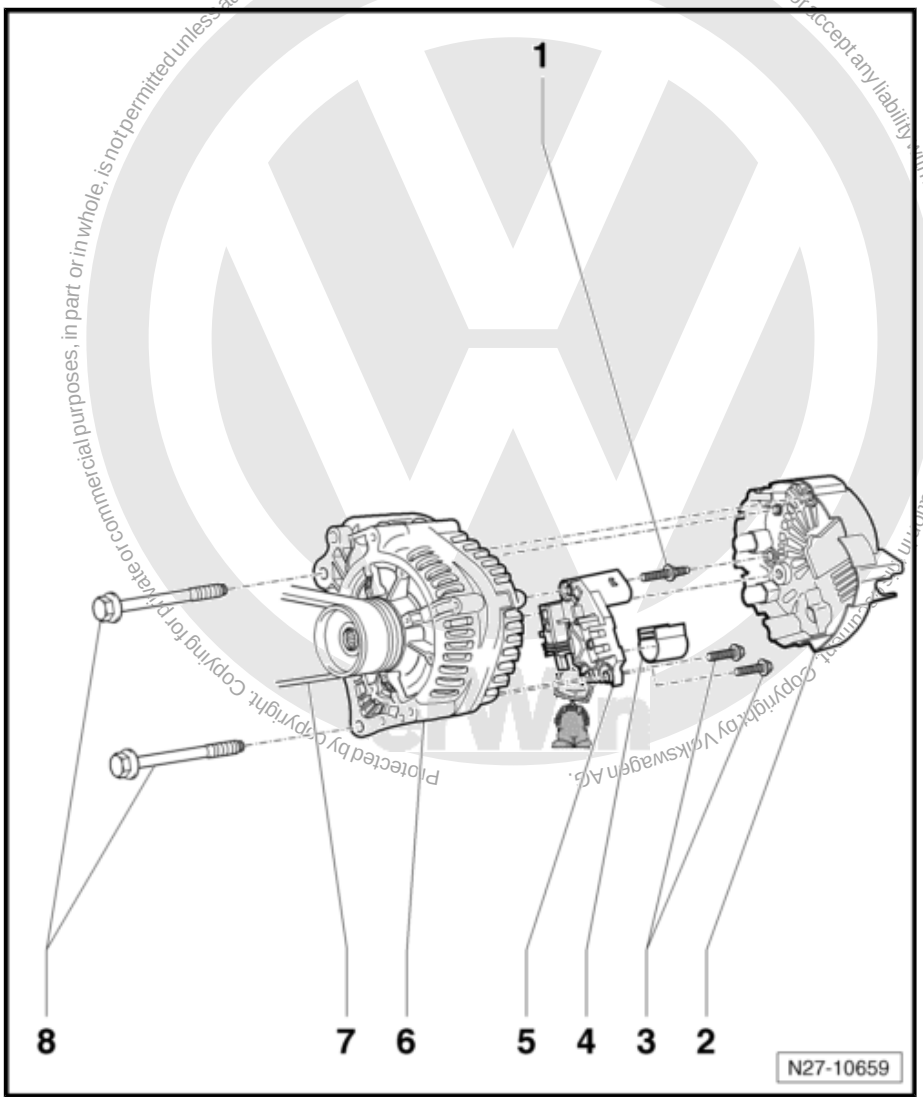
– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .

– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Body
- Electrical system
- 27 - Starter, current supply
- Electrical components
- C - Alternator

7.2 Removing and installing alternator, 4-cylinder diesel engine with manual gearbox

7.2.1 Assembly overview - alternator



1 - Hexagon bolt with washer and threaded element

- ❑ M4 x 20, M4 x 15.
- ❑ 2 Nm

2 - Protective cap for alternator

3 - Cross-head screws

- ❑ M4 x 20.
- ❑ 2 Nm

4 - Protective cap for carbon brushes

5 - Voltage regulator

- ❑ Removing and installing voltage regulator ⇒ page 73

6 - Alternator

- ❑ Removing and installing alternator ⇒ page 65
- ❑ Checking alternator ⇒ page 64
- ❑ Securing B+ wire to alternator ⇒ page 73
- ❑ Removing and installing poly V-belt pulley on alternator ⇒ page 75

7 - Poly V-belt

8 - Hexagon head flange bolts

- ❑ M8 x 90.
- ❑ 20 Nm

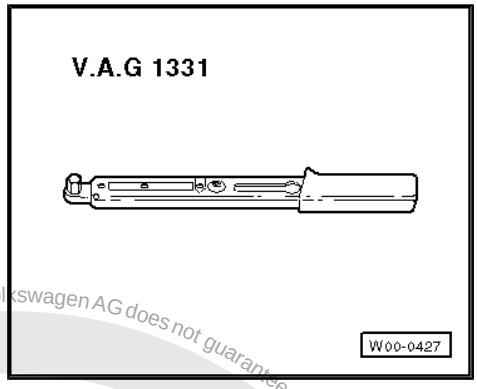
7.2.2 Removing and installing alternator

Caution

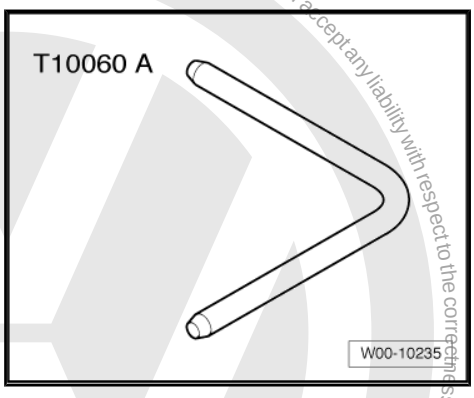
When batteries are disconnected and reconnected, the procedure described in the workshop manual must be strictly observed ⇒ page 51 .

Special tools and workshop equipment required

♦ Torque wrench -V.A.G 1331-



♦ Locking pin -T10060 A-



Removing:

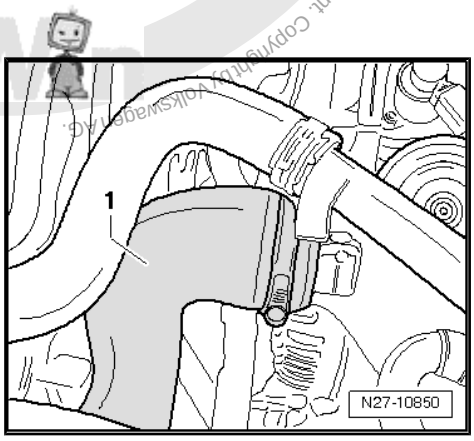
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

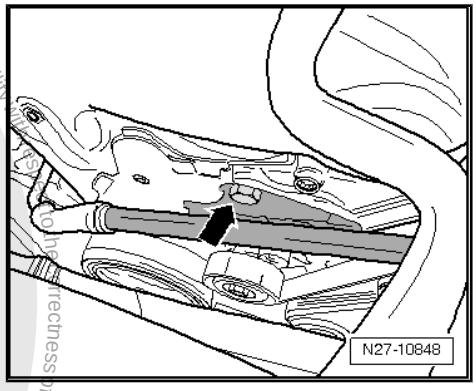
– Disconnect battery ⇒ page 51 .

– Loosen poly V-belt ⇒ Power unit; Rep. gr. 13 ; Dismantling and assembling engine .

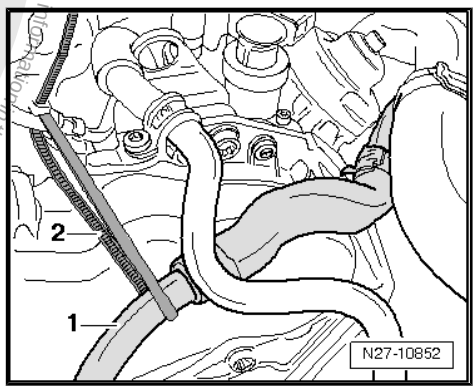
– Remove charge pressure pipes -1- in area of alternator.



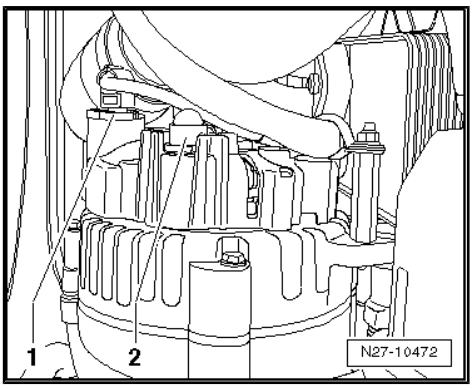
– Unscrew bracket of coolant line from engine at top -arrow-.



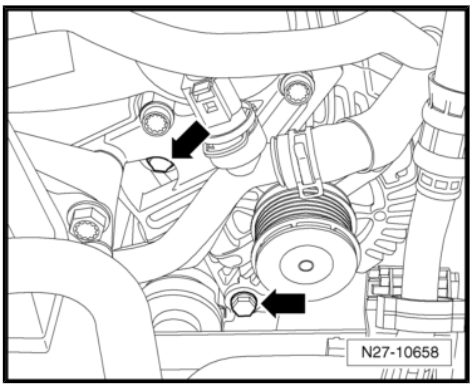
– Push coolant line -1- to one side and secure to fuel line using a cable tie -2-.



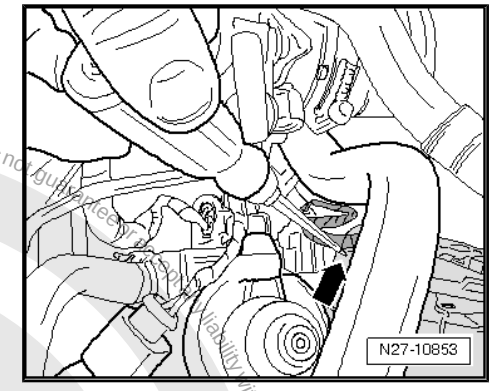
– Unlock and separate connector of DF cable -1-.
– Lever off deflector cap -2-.
– Unscrew securing nut and B+ cable below it from connection thread of alternator.



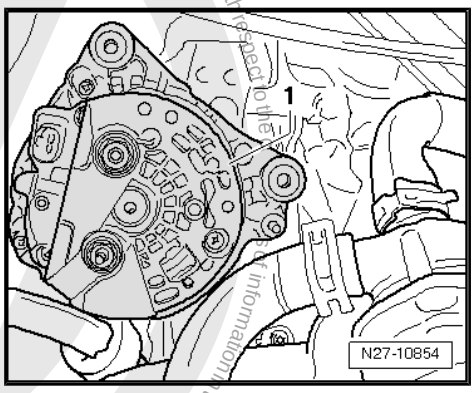
– Remove both securing bolts -arrows- of alternator.
– Remove alternator from bracket and turn it so rear side is facing upwards.



– Use a long screwdriver to release retaining clip -arrow- of wiring connector from alternator.



– Remove alternator -1- upwards out of engine compartment.



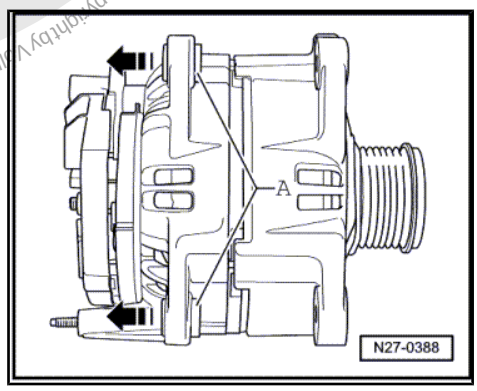
Installing:

Installation is carried out in reverse order of removal. Observe the following when doing this:

Caution

- *When fitting used poly V-belts observe the direction of rotation marked on removal!*
- *Before installing poly V-belt, ensure that all ancillaries (alternator, air conditioner compressor) are secure.*
- *When fitting belt, ensure that poly V-belt seats correctly in pulleys!*

– Drive threaded sleeve -A- about 4 mm in direction of arrow out of alternator housing.



– Tighten threaded connections to specified torque given in assembly overview ⇒ page 72 .

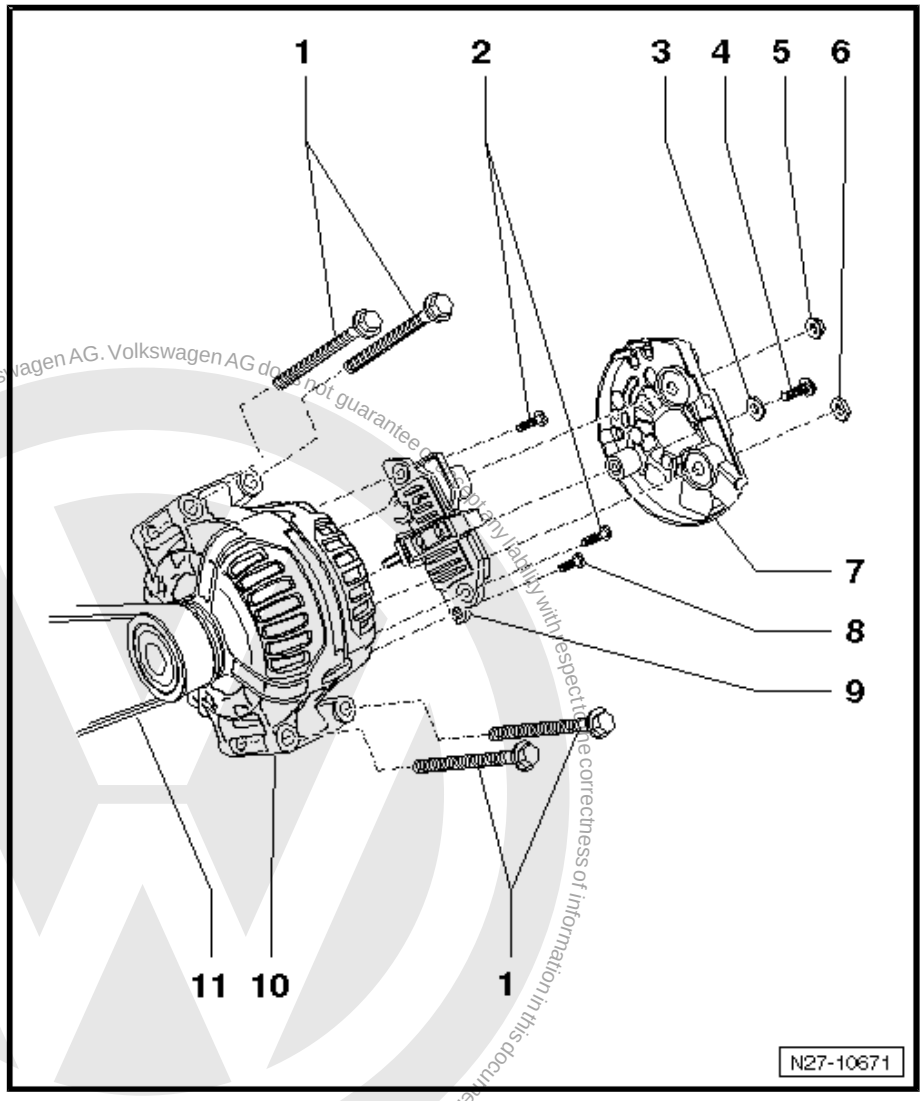
Caution

When batteries are disconnected and reconnected, the procedure described in the workshop manual must be strictly observed ⇒ page 51 .

– Connecting battery ⇒ page 51 .
– Start engine and check belt running.
– Stop engine.

7.3 Removing and installing alternator, 4-cylinder TSI petrol engine

7.3.1 Assembly overview - alternator



1 - Hexagon head flange bolt
- ❑ M8x110
- ❑ 20 Nm

2 - Cross-head screws
- ❑ M4x19
- ❑ 2 Nm

3 - Washer
- ❑ M5

4 - Cross-head screw
- ❑ M5x21
- ❑ 4.5 Nm

5 - Hexagon nut
- ❑ M8
- ❑ 15 Nm

6 - Hexagon nut, flat
- ❑ M8

7 - Protective cap for alternator

8 - Cross-head screw
- ❑ M4x13
- ❑ 2 Nm

9 - Voltage regulator
- ❑ Removing and installing voltage regulator ⇒ page 73

10 - Alternator
- ❑ Removing and installing alternator ⇒ page 70
- ❑ Checking alternator ⇒ page 64
- ❑ Securing B+ wire to alternator ⇒ page 73
- ❑ Removing and installing poly V-belt pulley ⇒ page 75

11 - Poly V-belt
- ❑ Removing and installing ⇒ Power unit; Rep. gr. 13 ; Dismantling and assembling engine
- ❑ Checking ⇒ page 73
- ❑ Poly V-belt routing ⇒ Power unit; Rep. gr. 13 ; Dismantling and assembling engine

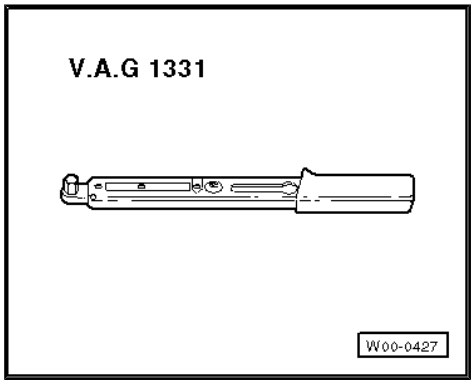
7.3.2 Removing and installing alternator

Caution

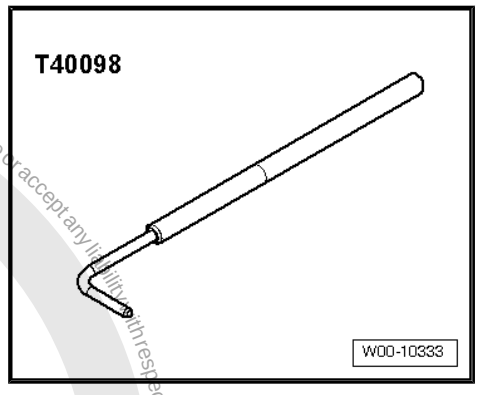
When batteries are disconnected and reconnected, the procedure described in the workshop manual must be strictly observed ⇒ page 51 .

Special tools and workshop equipment required

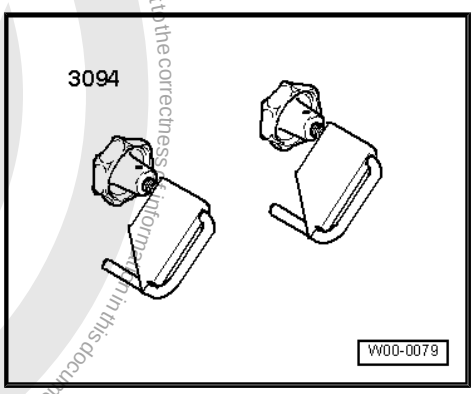
- Torque wrench -V.A.G 1331-



- Bit -T40098-



- Hose clamps up to 25 mm dia. -3094-



Removing:

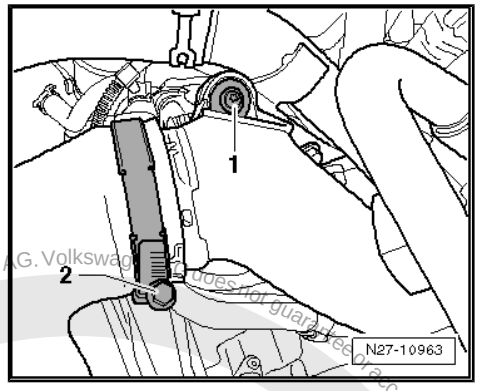
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

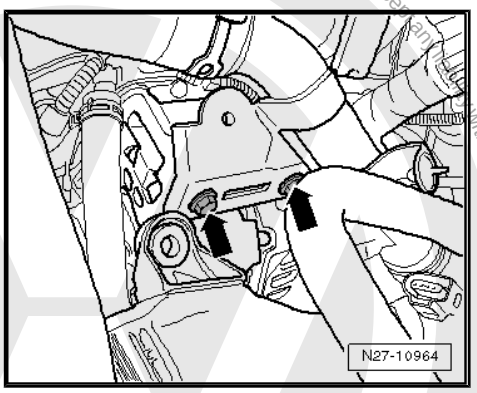
– Disconnect battery ⇒ page 51 .

– Loosen poly V-belt ⇒ Power unit; Rep. gr. 13 ; Dismantling and assembling engine .

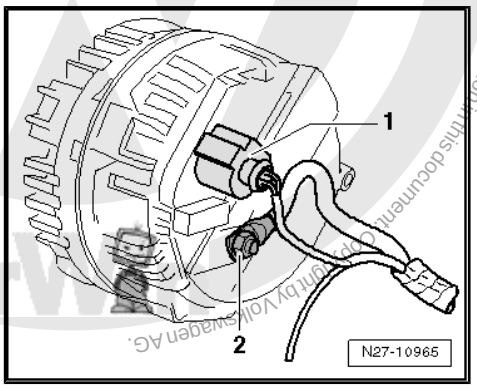
– Unscrew hose connection on charge pressure pipe -2- and pull off. Unscrew bolt -1- and place charge pressure pipe to one side.
– Clamp off coolant hose on upper radiator connection using hose clamps up to 25 mm -3094- and pull off.



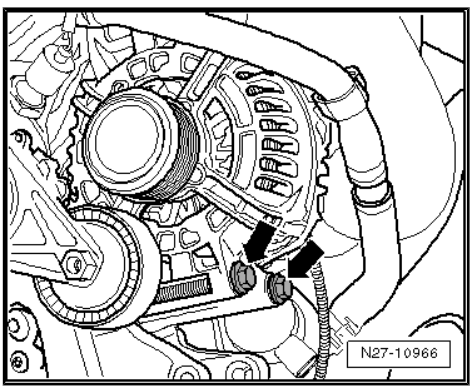
– Unscrew bolts -arrows- on top of alternator and place bracket with radiator hose to one side.



– Disconnect connector -1-.

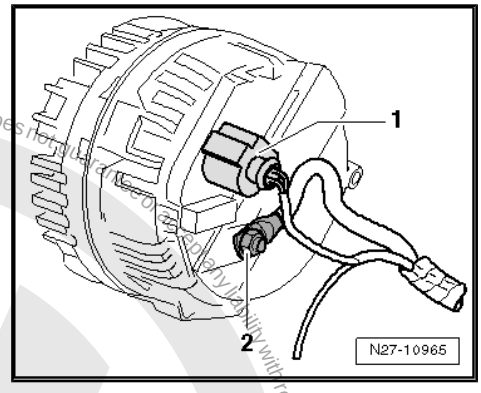


– Unscrew bolts -arrows- on bottom of alternator.
– Swing alternator to side.



– Unscrew positive connection -2-.

– Remove alternator upwards.



Installing:

Installation is carried out in reverse order of removal. Observe the following when doing this:

Caution

- *When fitting used poly V-belts observe the direction of rotation marked on removal!*
- *Before installing poly V-belt, ensure that all ancillaries (alternator, air conditioner compressor) are secure.*
- *When fitting belt, ensure that poly V-belt seats correctly in pulleys!*

– Tighten threaded connections to specified torque given in assembly overview ⇒ page 72 .

Caution

When batteries are disconnected and reconnected, the procedure described in the workshop manual must be strictly observed ⇒ page 51 .

– Connecting battery ⇒ page 51 .

– Start engine and check belt running.

– Stop engine.

7.4 Specified torques: alternator

Threaded connection		Specified torques
B+ cable on alternator	M8	15 Nm
Tensioning element securing bolts	M8	20 Nm
Alternator bracket to cylinder block	M8	20 Nm

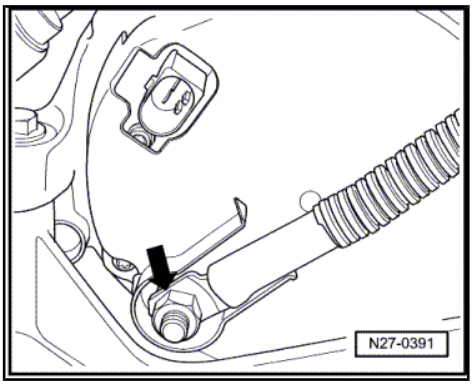
8 Repairing alternator

Caution

To disconnect and connect the battery, the procedure described in the workshop manual should be strictly adhered to *⇒ page 51* *.*

8.1 Securing B+ cable on alternator

The specified torque for the battery positive cable -arrow- securing nut is 15 Nm.



Caution

If the battery positive cable is not tightened to the specified torque, the following risks exist:

- *The battery will not be charged fully.*
- *Vehicle electrics or electronics fail completely (breakdown).*
- *Danger of fires from sparks*
- *Damage to electronic components and control units due to excessive voltage*

8.2 Checking poly V-belt

Carry out the following work:

– Crank engine at vibration damper on pulley using a socket.

– Check poly V-belt for:

- Sub-surface cracks (cracks, core ruptures, cross sectional breaks)
- Layer separation (top layer, cord strands)
- Base break-up
- Fraying of cord strands
- Flank wear (material wear, frayed flanks, flank brittleness - glassy flanks-, surface cracks)
- Traces of oil and grease

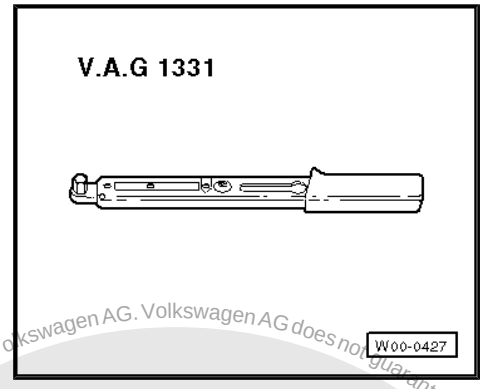
Caution

If faults are found, it is essential for the poly V-belt to be renewed. This will avoid possible breakdowns or operating problems.

8.3 Removing and installing voltage regulator

Special tools and workshop equipment required

♦ Torque wrench (5 - 50 Nm) -V.A.G 1331-

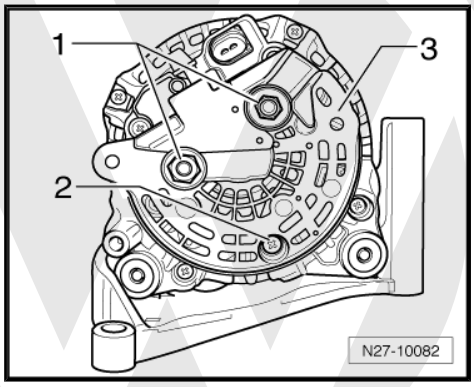


Removing:

Carry out the following work:

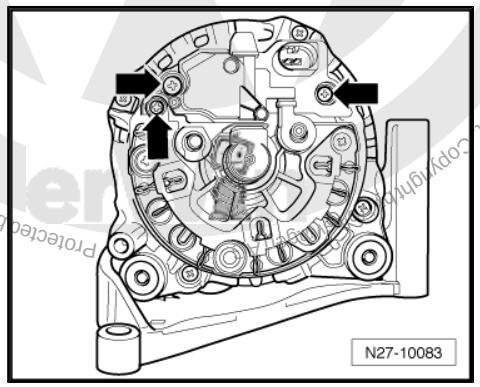
– Remove alternator.

– Unscrew nuts -1- and bolt -2- and remove deflector cap -3-.



– Remove securing bolts -arrows- of voltage regulator.

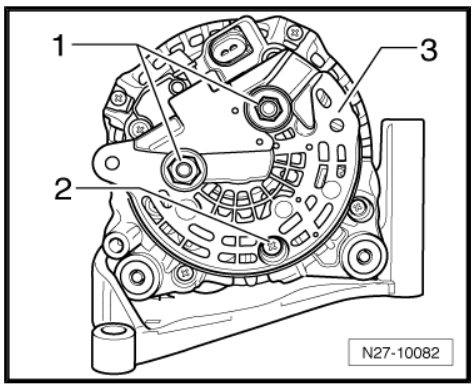
– Carefully remove voltage regulator from alternator.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Tighten nuts -1- of deflector cap -3- to 15 Nm.



8.4 Checking alternator carbon brushes

Note

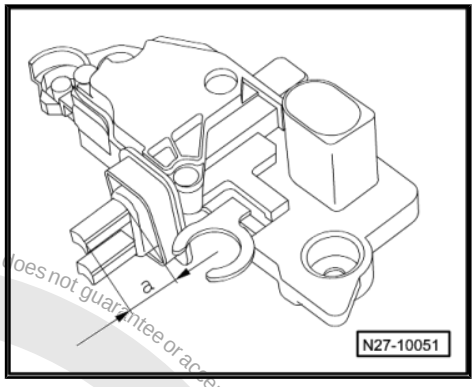
The carbon brushes are permanently attached to the voltage regulator. In the event of repair, renew voltage regulator.

Carry out the following work:

– Removing voltage regulator ⇒ page 73 .

– Measure length of carbon brushes, dimension -a-.

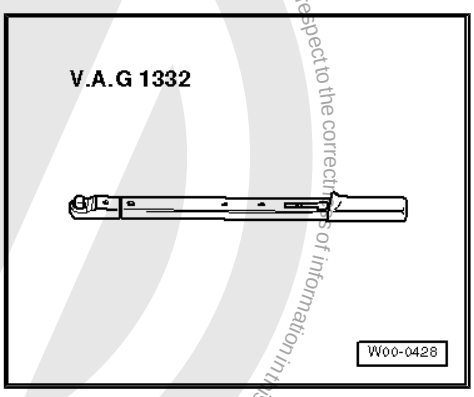
Carbon brushes	Length -a-
New	12 mm
Wear limit	5 mm
Tolerances to one another	+1 mm



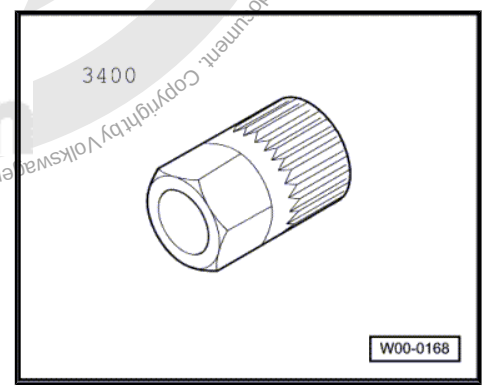
8.5 Removing and installing pulley on alternator

Special tools and workshop equipment required

♦ Torque wrench (40 - 200 Nm) -V.A.G 1332-



♦ Multipoint adapter -3400-



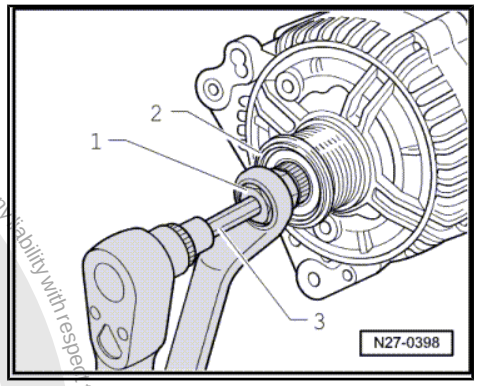
Removing:

Carry out the following work:

– Remove alternator.

– Clamp alternator in a vice.

– Remove deflector cap from belt pulley.
– Screw in multipoint adapter 3400 -1- with ring spanner (17 mm) in belt pulley -2- of alternator. Then insert multipoint bit -M10- -3- in alternator shaft.
– Unscrew threaded connection whilst counterholding with ring spanner.
– Hold pulley stationary by hand and turn alternator input shaft until pulley can be removed.



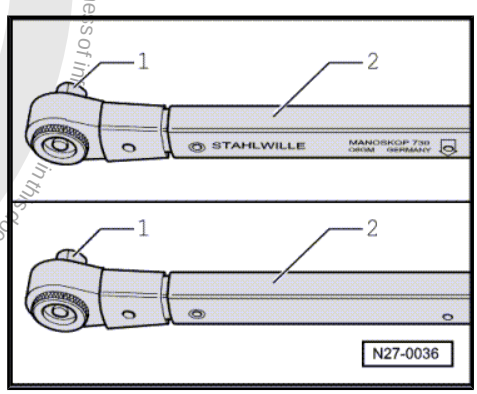
Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

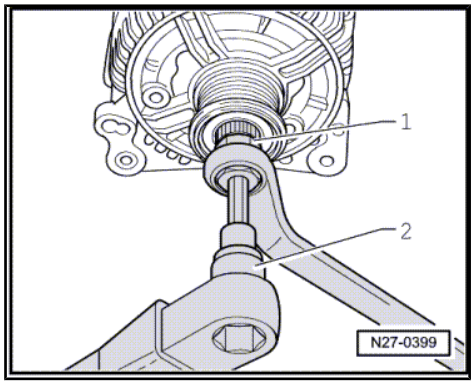
– First screw belt pulley on drive shaft of alternator by hand onto stop.

For assembly of belt pulley, torque wrench must be modified as follows:

– Release socket drive -1- and pull off grip -2-.
– Turn torque wrench grip -2- 180° and reinsert socket drive.
– Set turning direction of torque wrench to anti-clockwise at socket drive.

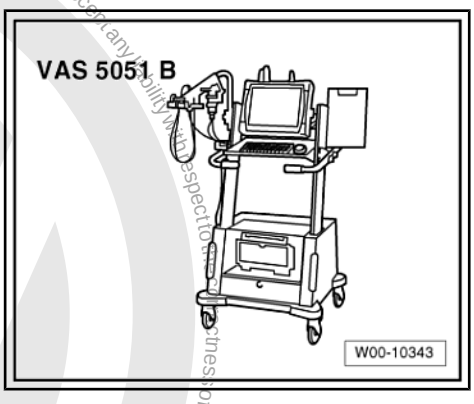


– Counterhold multipoint adapter 3400 -1- using ring spanner (17 mm). Tighten poly V-belt by turning drive shaft of alternator anticlockwise using the torque wrench -2-. Tightening torque is 80 Nm.
– Clip deflector cap in place on belt pulley.
– Install alternator.



9 Cruise control system (CCS)

9.1 Activating and deactivating cruise control system (CCS)

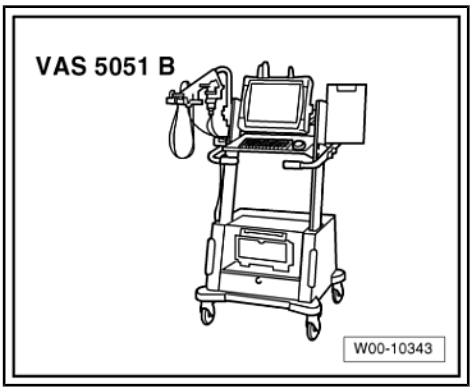


– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179 .
– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .
– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Drive
- Select the engine installed in each case
- 01 - On Board Diagnostic capable systems
- Motronic engine management system (petrol engine)
- Diesel direct injection system and glow plug system EDC 16 (for diesel engine)
- Functions
- Activating and deactivating cruise control system (CCS)

9.2 CCS switch

The injection control unit also controls the functions of the cruise control system. The cruise control system is operated using the CCS switch -E45- in the steering column switch.



The self-diagnosis of the CCS switch -E45- is carried out using the vehicle diagnosis, testing and information system -VAS 5051- .

– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179 .
– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .
– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Drive
- 01 - On Board Diagnostic capable systems
- Electrical components
- CCS switch -E45-

Removing and installing steering column switch ⇒ page 143 .

90 – Gauges, instruments

1 Dash panel insert

Note

The control unit in the dash panel insert -J285- , control unit for immobiliser -J362- and the diagnosis interface for data bus -J533- are integrated in the dash panel insert and cannot be renewed individually.

Fault detection and fault display:

The dash panel insert is equipped with self-diagnosis to ease fault finding.

For fault finding, use vehicle diagnosis, testing and information system -VAS 5051- in „Guided fault finding“ mode.

1.1 Renewing dash panel insert

Note

- *If a new dash panel insert is installed in the vehicle, the control unit of the dash panel insert must be adjusted to the different combination possibilities depending on the associated country settings, number of cylinders and engine type.*
- *To adapt the integrated immobiliser to the engine control unit, the data from the engine control unit has to be stored in the replacement dash panel insert.*
- *After installing a new dash panel insert, all ignition keys must be adapted.*

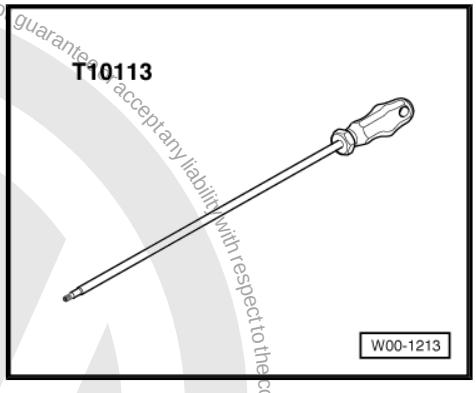
– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179
– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .
– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Body
- Electrical system
- 01 - On Board Diagnostic capable systems
- Dash panel insert
- Functions of dash panel insert
- Adapting/renewing dash panel insert

1.2 Removing and installing dash panel insert

Special tools and workshop equipment required

♦ Socket -T10113-



Removing:

Note

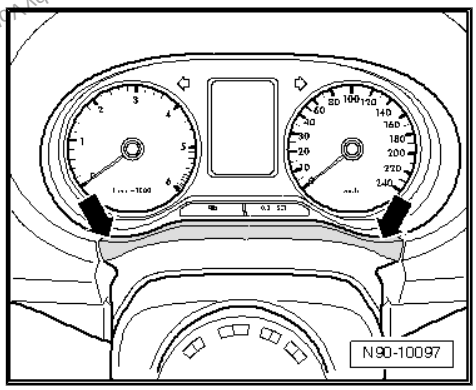
If dash panel insert is to be renewed ⇒ page 78 .

Carry out the following work:

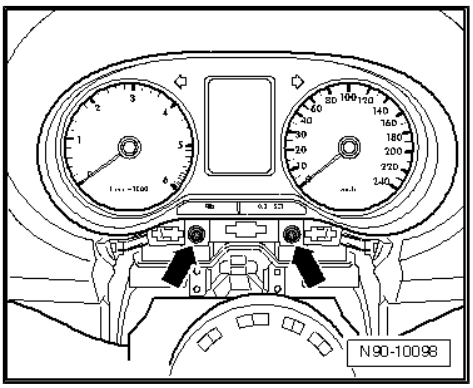
– Switch off ignition and all electrical loads, and pull out ignition key.

– Using electric or mechanical adjustment mechanism, extend steering wheel completely and move to lowest position.

– Unclip trim between steering column and dash panel insert -arrows-.



– Using socket -T10113- , unscrew securing bolts -arrows- of dash panel insert.

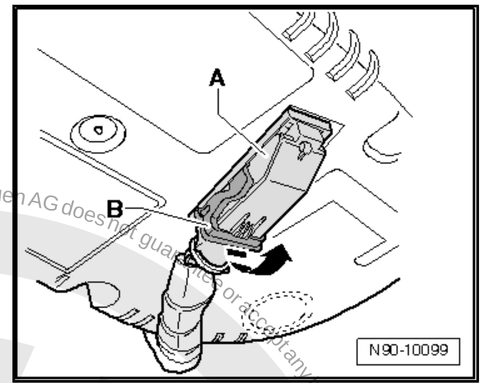


Note

Steering wheel and steering column trim do not have to be removed to do this.

– Take out dash panel insert.

– Disconnect connector -A- on rear of dash panel insert by pressing clip and moving bar -B- in -direction of arrow-.



Note

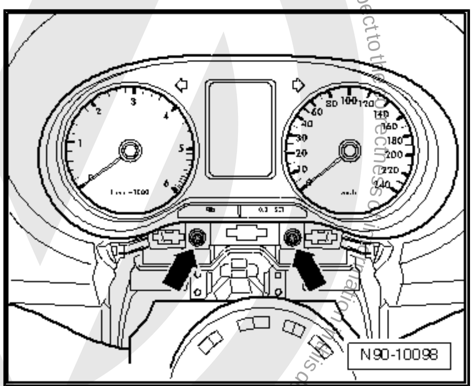
The dash panel insert must not be dismantled.

Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Connect connector and insert dash panel insert into dash panel insert aperture.

– Tighten securing bolts -arrows- of dash panel insert using socket -T10113- .



Torque setting: 1.5 Nm.

– Following installation, check functions of dash panel insert.

1.3 Adjusting functions on dash panel insert

– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179

– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .

– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

♦ Body

♦ Electrical system

♦ 01 - On Board Diagnostic capable systems

♦ Dash panel insert

♦ Functions of dash panel insert

– Select corresponding step on vehicle diagnosis, testing and information system -VAS 5051- .

2 Service interval display

2.1 Resetting service interval display

Resetting the service interval display ⇒ Maintenance ; Booklet 11 or ⇒ page 80

92 – Windscreen wash/wipe system

1 Windscreen wiper system

Note

Additional information in ⇒ Maintenance ; Booklet 11 .

1.1 Removing and installing wiper blades

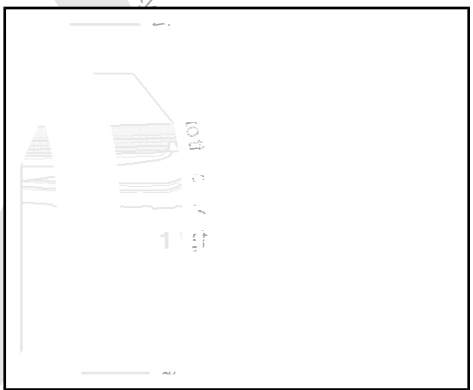
1.1.1 Removing:

Carry out the following work:

To remove the wiper blades, the wiper arms should be placed in the „service/winter position“. The „service/winter position“ is activated within 10 seconds after ignition is switched off by pressing windscreen wiper lever in „tip wipe“ position ⇒ Operating manual of vehicle .

– Switch off ignition and all electrical loads, and pull out ignition key.

– Fold windscreen wiper arm -2- away from windscreen.



Note

- *Avoid bending windscreen wiper arm and blade.*
- *Avoid wiper arm springing back unintentionally and damaging the glass.*

– Look for a position between windscreen wiper arm and wiper blade where joint can easily be removed (this may differ from what is shown in illustration).

– Push wiper blade securing spring -1- in the direction of -arrow 1-.

– Disengage windscreen wiper blade -1- and remove it from wiper arm -2- in direction of -arrow 2-.

1.1.2 Installing:

– Attach windscreen wiper blade -1- in the opposite sequence. When doing this, make sure that longer windscreen wiper blade is mounted on driver side.

– Look for a position between windscreen wiper arm and wiper blade where joint can easily be installed (this may differ from what is shown in illustration).

– Insert joint piece of wiper blade -1- into guide of wiper arm -2-.

– Press securing spring -arrow 1- thereby pushing the joint piece into the guide -arrow 2- until it is positioned fully in the guide.

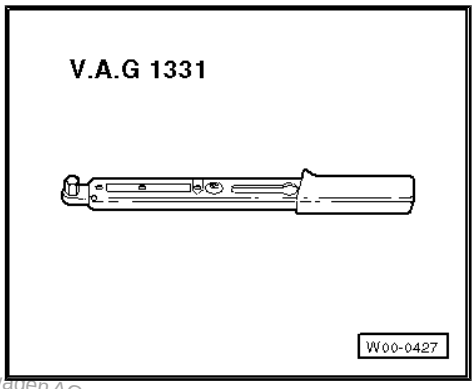
– Fold windscreen wiper arm back against windscreen.

– Check park position of windscreen wiper blades and adjust if necessary ⇒ page 89 .

1.2 Removing wiper arms

Special tools and workshop equipment required

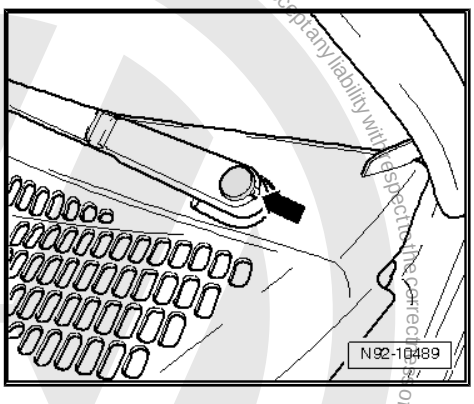
- Torque wrench (5 - 50 Nm) -V.A.G 1331-



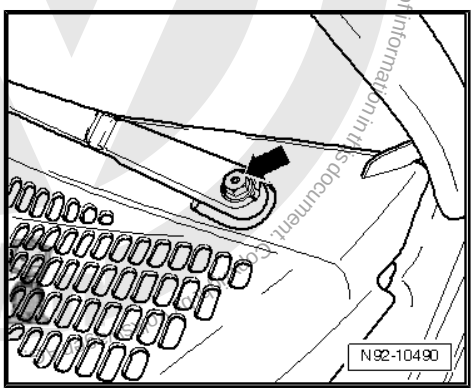
1.2.1 Removing:

Carry out the following work:

– Lever off cap -arrow- using screwdriver.



– Loosen hexagon nut -arrow- but do not remove completely.
– Move wiper arm lightly until it becomes loose.
– Unscrew hexagon nut fully and pull wiper arm off wiper arm shaft.
– Remove second wiper arm in same way.



1.2.2 Installing:

– Put wiper arms on their shafts on driver and front passenger sides.
– Screw securing nut loosely onto wiper arm shaft.

Note

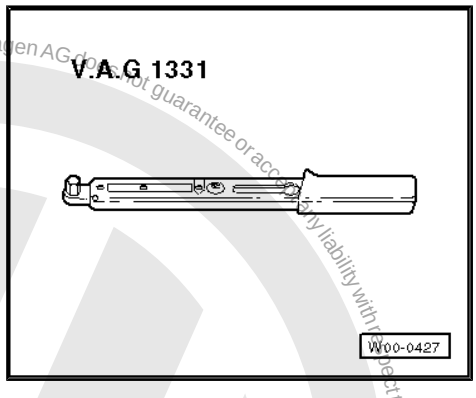
- *The securing nut of the wiper arm shaft should not be tightened until the windscreen wiper blade parking position has been adjusted.*
- *If wiper arms are secured with self-locking nuts, these must be renewed on reinstallation.*

– Adjust wiper blade park position ⇒ page 89 .
– Tighten securing nuts of wiper arms to 20 Nm.
– Fit caps.

1.3 Removing wiper frame with linkage and wiper motor

Special tools and workshop equipment required

♦ Torque wrench (5 - 50 Nm) -V.A.G 1331-



Note

♦ *On RHD vehicles, the wiper blades are a mirror image of those on LHD vehicles.*
♦ *In order for wiper frame to be removed with linkage and wiper motor, wiper arms and plenum chamber cover must be removed.*
♦ *Before removing wiper arms, make sure that wiper motor is in park position. Only then can the wiper arm park position be correctly set when installing.*

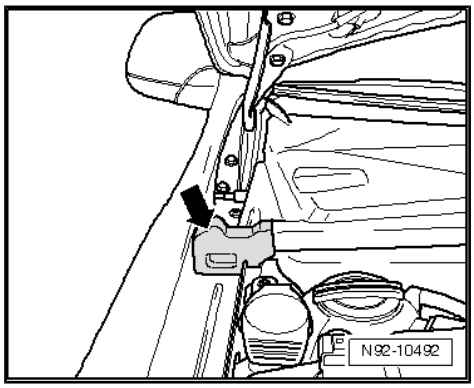
1.3.1 Removing:

Carry out the following work:

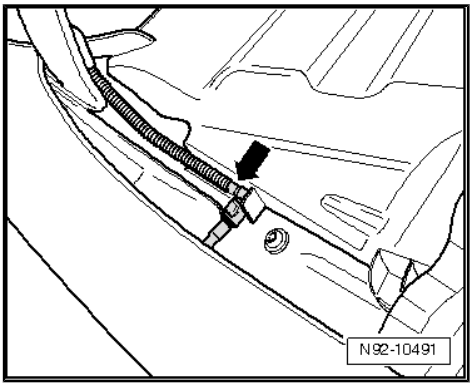
– Move wipers to park position.
– Switch off ignition and all electrical loads, and pull out ignition key.
– Removing wiper arms ⇒ page 83

The plenum chamber cover is inserted into a guide rail beneath the windscreen.

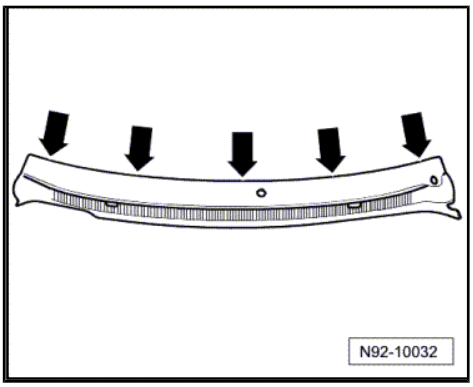
– Remove end sections -arrow- from rubber guide rail on left and right.



– Unclip angle piece -arrow- of washer fluid line from plenum chamber cover.



– Carefully unclip plenum chamber cover upwards -arrows-.

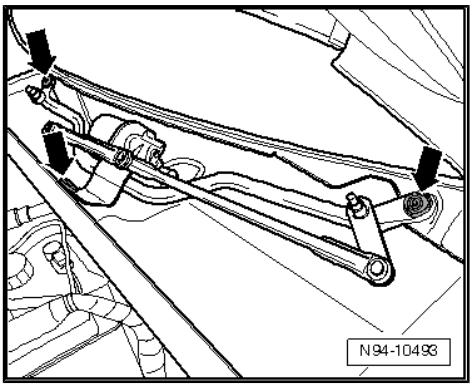


Note

For reasons of clarity, the figure shows a plenum chamber cover which has been removed.

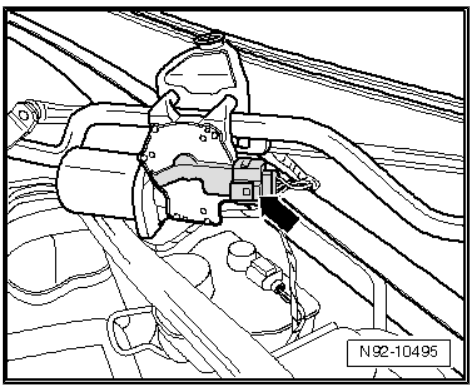
– Remove cover.

– Remove securing bolts -arrows-.



– Remove wiper linkage from plenum chamber and turn so that connector -arrow- can be pulled off.

– Remove wiper frame complete.



1.3.2 Installing:

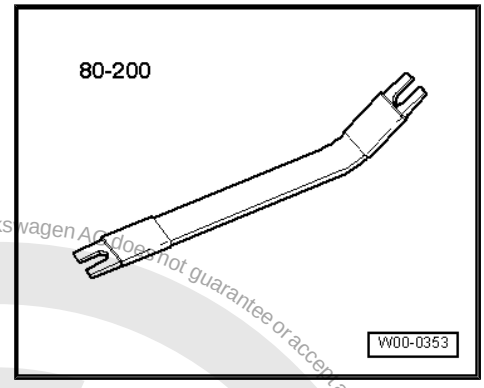
Installation is carried out in the reverse sequence. Observe the following when doing this:

– Tighten securing bolts for wiper frame to 5 Nm.

1.4 Removing and installing windscreen wiper motor

Special tools and workshop equipment required

- Release lever -80-200-



Note

- *On RHD vehicles, the wiper blades are a mirror image of those on LHD vehicles.*
- *In order for wiper motor to be removed, wiper frame must be removed with linkage and wiper motor.*

1.4.1 Removing:

Carry out the following work:

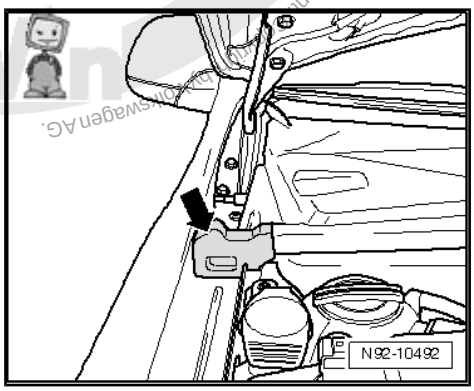
– Move wipers to park position.

– Switch off ignition and all electrical consumers.

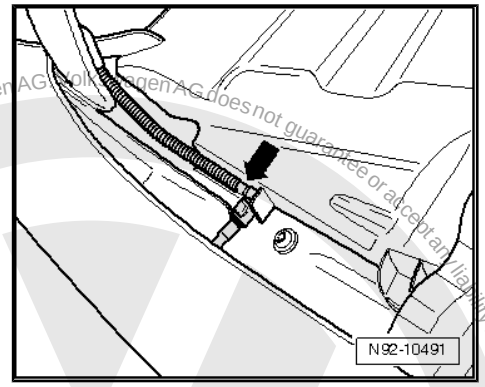
– Removing wiper arms ⇒ page 83

The plenum chamber cover is inserted into a guide rail beneath the windscreen.

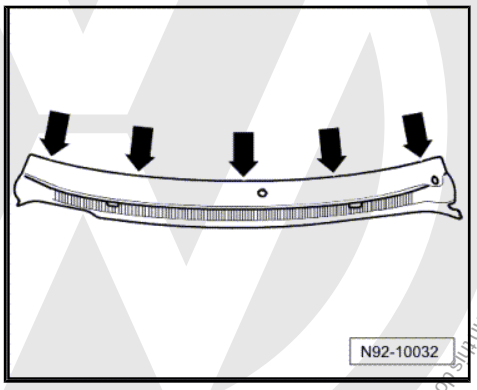
– Remove end sections -arrow- from rubber guide rail on left and right.



– Unclip angle piece -arrow- of washer fluid line from plenum chamber cover.



– Carefully unclip plenum chamber cover upwards -arrows-.



Note

For reasons of clarity, the figure shows a plenum chamber cover which has been removed.

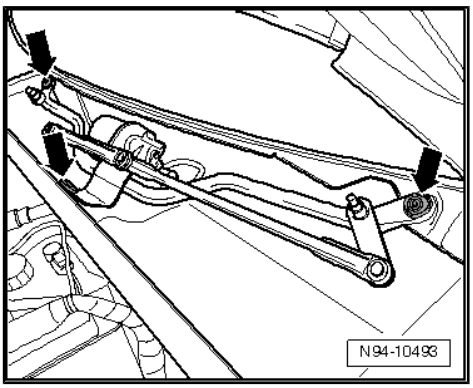
– Remove cover.

Note

Make sure that the wiper crank is in such a position that no securing bolts of the bearing are hidden. Therefore, before removing wiper frame with linkage and wiper motor, switch on windscreen wipers and have an assistant observe wiper crank. Then, at a suitable moment (no mounting bolt concealed), switch off the ignition.

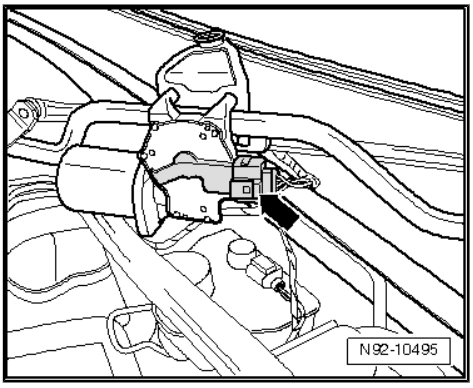
– Switch off ignition and all electrical loads, and pull out ignition key.

– Remove securing bolts -arrows-.

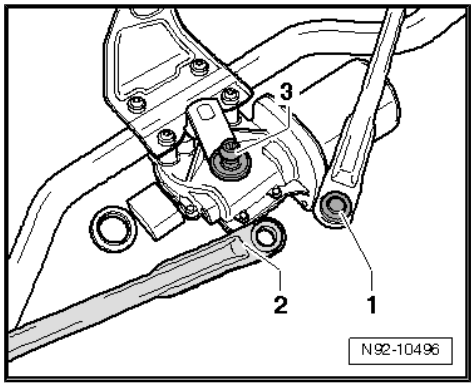


– Remove wiper linkage from plenum chamber and turn so that connector -arrow- can be pulled off.

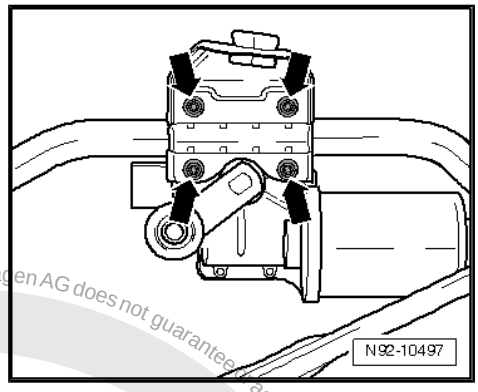
– Remove wiper frame complete.



– Use release lever -80-200- to lever drive rods -1- and -2- of wiper arms off crank -3- of wiper motor.



– Unscrew wiper motor from wiper frame -arrows-.

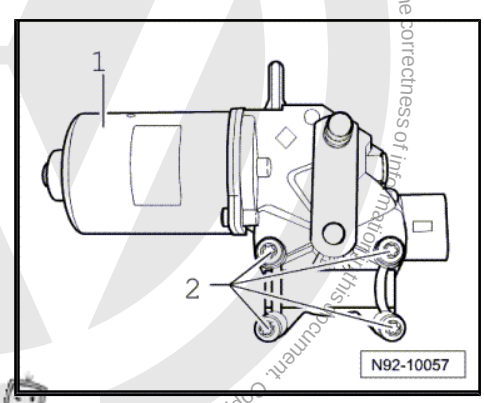


1.4.2 Installing:

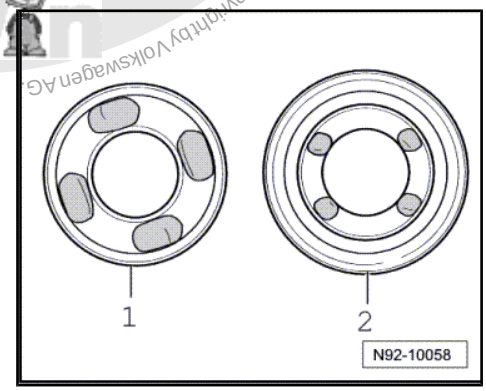
Note

On new wiper motors, the wiper crank is already set to the correct installation position. Therefore, do not operate the wiper motor electrically until the entire wiper unit has been installed.

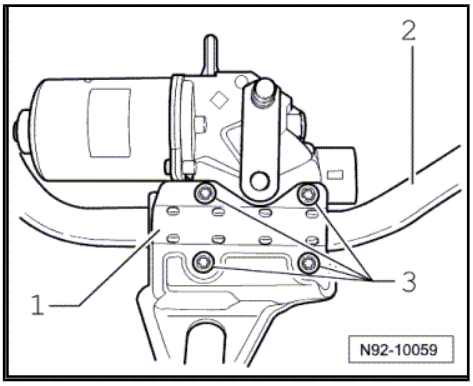
– On new wiper motor -1- unscrew securing bolts -2- out of pre-tapped holes in bracket.



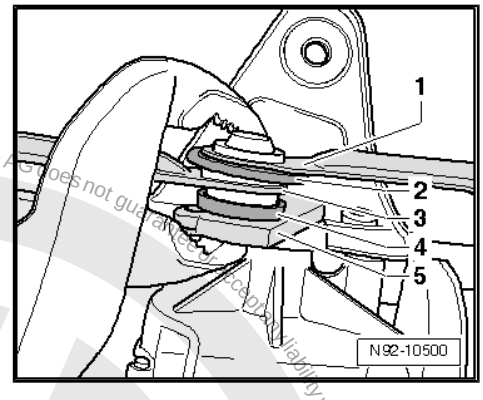
– Lubricate seals -1- (small outer ∅) and -2- (larger outer ∅) using grease from repair kit (see illustration).
– Insert wiper motor into bracket of wiper linkage and align in upper part of bracket.
– Put on upper part of bracket and position self-tapping securing bolts -3-. When installing, ensure that the bolts are not canted in the pre-tapped holes and ensure that the wiper linkage is engaged correctly in the upper part of the bracket.



– Insert wiper motor into bracket of wiper linkage -2- and align in upper part of bracket in line with locking bracket.
– Put on upper part of bracket and position self-tapping securing bolts -3-. When installing, ensure that the bolts are not canted in the pre-tapped holes and ensure that the wiper linkage is engaged correctly in the upper part of the bracket.
– Next, tighten securing bolts to 8 Nm.



– Press lubricated seal -4- (small outer ∅) over ball head of crank -5- of wiper motor.
– Press articulated rod for right wiper -3- over ball head of wiper motor.
– Press lubricated seal -2- (larger outer ∅) onto articulated rod -3-.



Note

Pay attention to installation position of seals during installation.

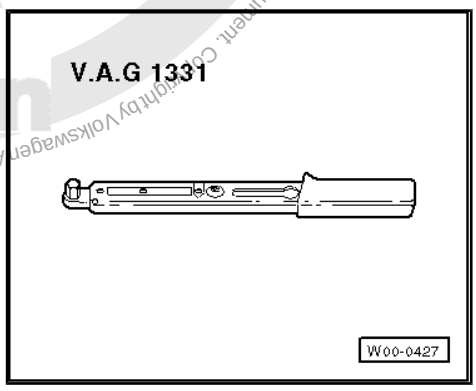
– Press articulated rod of left side -1- onto ball head.
– Attach connector to wiper motor.
– Install wiper frame with linkage and wiper motor ⇒ page 84 .
– To maintain end position of wiper motor, switch windscreen wiper to stage 1 for approx. 3 seconds.
– Switch off ignition. Install plenum chamber cover and wiper arms ⇒ page 83 .

1.5 Adjusting wiper blade park position

1.5.1 Adjusting wiper blade park position

Special tools and workshop equipment required

♦ Torque wrench (5 - 50 Nm) -V.A.G 1331-

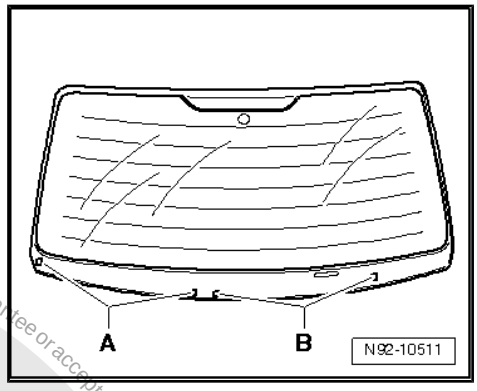


Note

On RHD vehicles, the wiper blades are a mirror image of those on LHD vehicles.

Carry out the following work:

- Adjust wiper arms so that ends of wiper blades are located on windscreen in area of markings -A- or -B-.
- Tighten securing nuts of wiper arms to 20 Nm.
- Allow windscreen wiper system to operate in wipe/wash function as a test. When doing this, make sure that wiper blades do not strike against upper or lower end positions. If necessary, correct windscreen wiper blade end position again.



2 Windscreen washer system

Note

Additional information in ⇒ Maintenance ; Booklet 11 .

2.1 Assembly overview - windscreen washer system

1 - Left and right-hand windscreen wiper arms

2 - Spray jets for windscreen washer system

- ❑ Vertical adjustment only, setting spray jets ⇒ page 95
- ❑ Removing and installing ⇒ page 94 .
- ❑ Checking ⇒ page 95

3 - Wiper frame with linkage and wiper motor

- ❑ Removing and installing ⇒ page 84 .

4 - Y-piece

- ❑ Distribution of washer fluid line to windscreen spray jets

5 - Windscreen wash pump - V59-

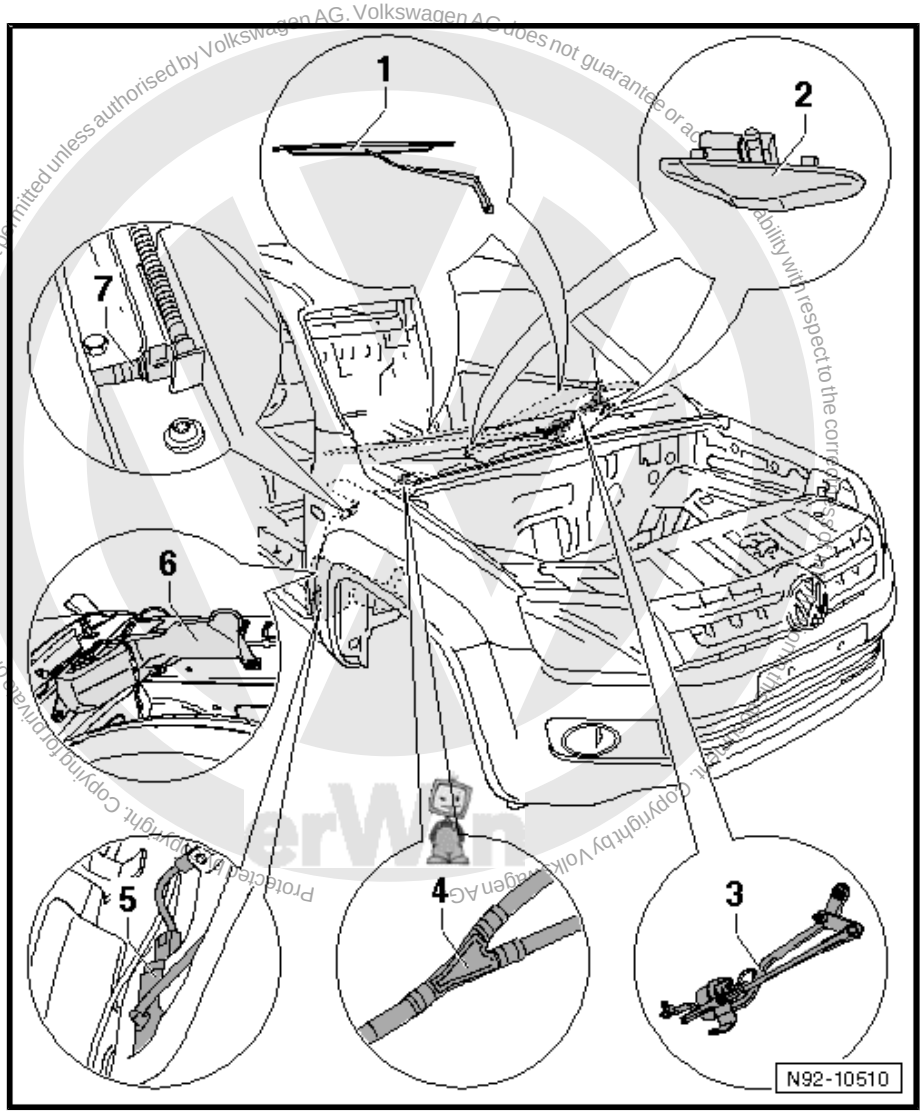
- ❑ Removing and installing ⇒ page 93 .

6 - Washer fluid reservoir

- ❑ Removing and installing ⇒ page 92 .

7 - Connection piece

- ❑ Connection to washer fluid lines for spray jet for windscreen washer system



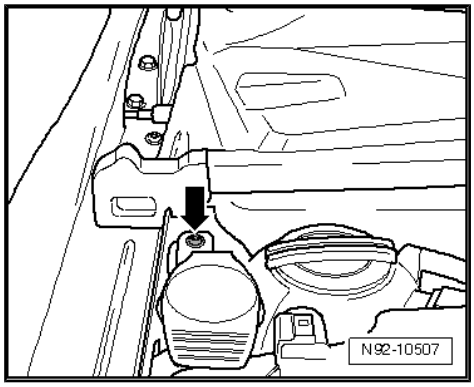
2.2 Removing and installing filler pipe for windscreen washer reservoir

2.2.1 Removing:

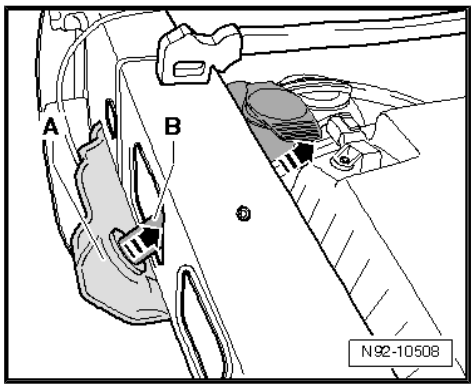
Carry out the following work:

– Drain windscreen washer reservoir until water level has dropped below opening for filler pipe.

– Remove securing bolt -arrow- of filler pipe.



– Pull filler pipe -B- out of windscreen washer reservoir -A- in -direction of arrow-.



2.2.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Check seal at base of filler pipe for signs of damage, renew if necessary.

– Insert filler pipe in windscreen washer reservoir onto stop (use lubrication if necessary). When doing this, note position of anti-rotation tab.

– Tighten securing bolt for filler pipe to 2 Nm.

2.3 Removing and installing windscreen washer reservoir

2.3.1 Removing:

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

Removing and installing filler pipe for windscreen washer reservoir ⇒ page 91 .

– Remove front right wheel housing trim.

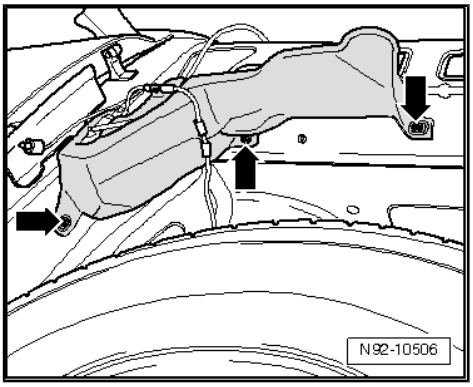
– Pull black hose connector off windscreen wash pump.

– Collect leaking fluid in accordance with regulations.

– Disconnect electric cable connectors for windscreen wash pump.

– Unclip wiring connector attachment from bracket of windscreen washer reservoir.

– Remove bolts -arrows- from windscreen washer reservoir.
– Remove windscreen washer reservoir.



Note

For improved clarity, installation location of windscreen washer reservoir is shown in illustration without wing.

2.3.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Check seal at base of filler pipe for signs of damage, renew if necessary.
– Insert filler pipe in windscreen washer reservoir onto stop (use lubrication if necessary). When doing this, note position of anti-rotation tab.
– Tighten securing bolts of reservoir for windscreen and headlight washer system to 3.5 Nm.

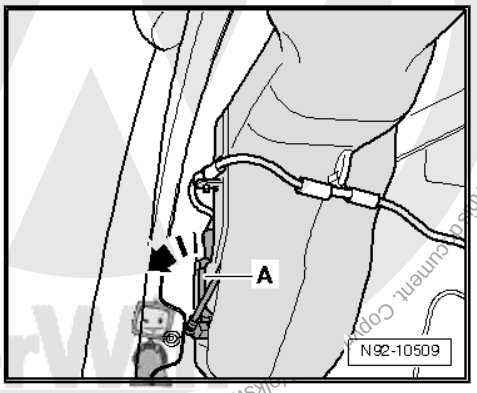
2.4 Removing and installing windscreen wash pump

Windscreen wash pump is mounted on windscreen washer reservoir on right wheel housing.

2.4.1 Removing:

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.
– Remove front right wheel housing trim.
– Remove windscreen wash pump -A- from windscreen washer reservoir in -direction of arrow-.
– Pull black hose connector off windscreen wash pump.
– Collect leaking fluid in accordance with regulations.
– Disconnect electric cable connectors for windscreen wash pump.



2.4.2 Installing:

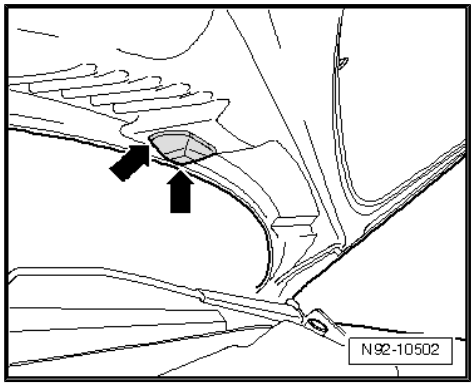
Install in reverse order of removal.

2.5 Removing and installing windscreen washer system spray jets

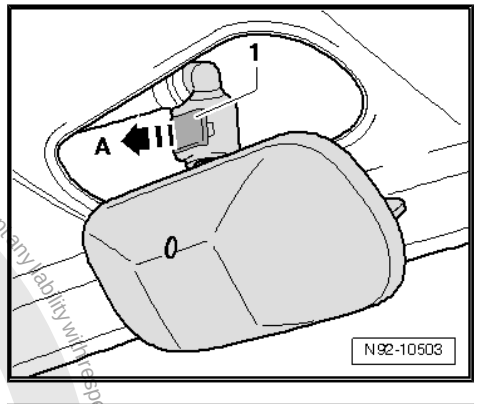
2.5.1 Removing:

Carry out the following work:

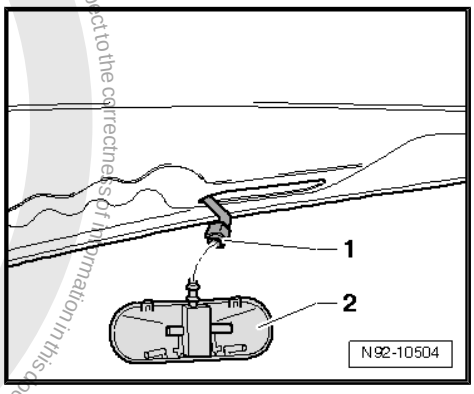
– Lever out spray jet using a suitable screwdriver at points marked with -arrows-.



– Pull out retaining clip -1- in direction of arrow -A-.



– Disconnect hose connection -1- from spray jet -2-.



2.5.2 Installing:

– Push hose connection together.
– Clip spray jet into mounting hole.
– Check spray jet ⇒ page 95 .
– Adjusting washer jets if necessary ⇒ page 95 .

2.6 Checking spray jets for windscreen washer system

Note

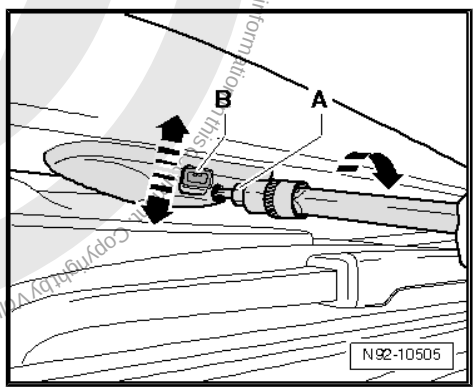
In case of uneven spray field due to impurities in the spray jet: remove spray jet and rinse it through with water. Blowing through with compressed air in both directions is then permitted. Do not use any objects for cleaning spray jets!

2.7 Adjusting windscreen washer system spray jets

The spray jets are preset. However, small differences in height may be corrected.

If both spray fields are not at same height, adjust spray direction upwards or downwards as follows:

– Adjust spray jet at regulator -A- in -direction of arrow-. This causes spray jet -B- to move up or down in -direction of arrow-.

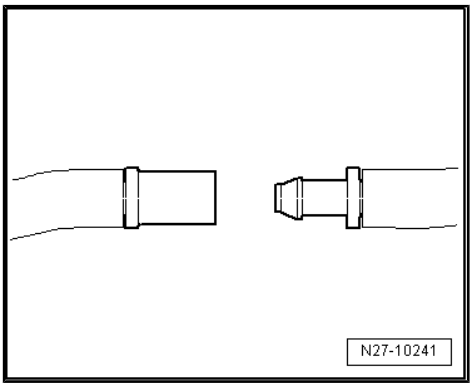


2.8 Washer fluid line hose couplings

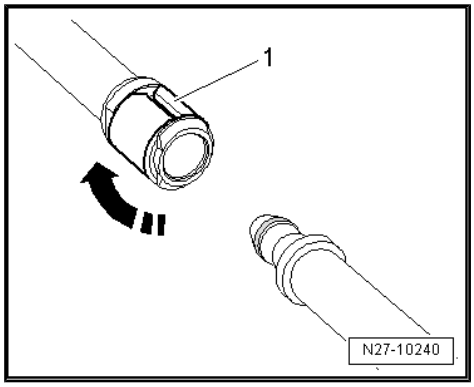
The following hose coupling types are used to connect the hoses to the pump, spray jets or as separation points:

– Pull the two coupling sections apart (no securing device) to loosen the connection.

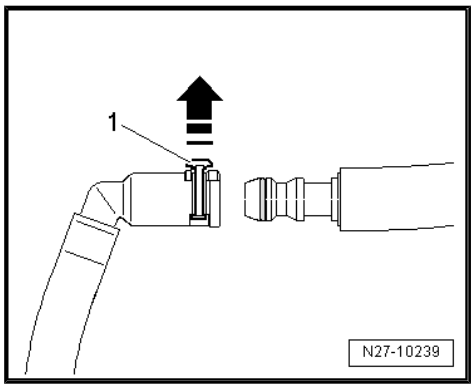
– To secure the connection, push the two coupling sections together until they engage.



– To loosen the connection, rotate the circlip -1- through 90° -arrow- and pull off the hose connection.
– To secure the connection, push on the hose connection and rotate the circlip -1- -arrow- until it engages.



– To loosen the connection, pull the circlip -1- up by approx. 1 mm -arrow- and pull off the hose connection.
– To secure the connection, push on the hose connection and push in the circlip -1- until it engages.



2.9 Hose repair

A new repair concept has been developed for repair work on windscreen washer system hoses. Various hose connectors, special EPDM hoses (ethylene-propylene diene monomer) and heat-shrink hoses are available as replacement parts.

2.9.1 General description

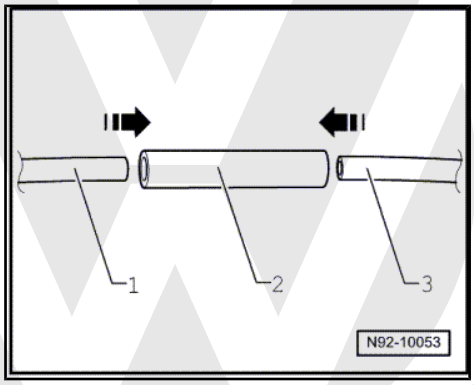
The replacement parts can be found in the electronic parts catalogue (ETKA):

Replacement parts are available for repair of both smooth and corrugated pipes.

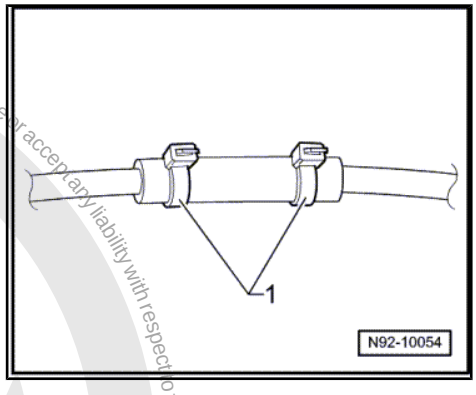
2.9.2 Repairing smooth pipe

Smooth pipes ∅ 5 x 1 mm and ∅ 6 x 1 mm can be repaired using EPDM hose.

– Cut out damaged point from smooth pipe to be repaired, cutting at right angles.
– Select the appropriate EPDM hose -2- and cable ties according to the electronic parts catalogue (ETKA).
– Cut EPDM hose -2- to size so that smooth-type pipe ends -1- and -3- can be inserted approx. 10 mm in EPDM hose -2-.



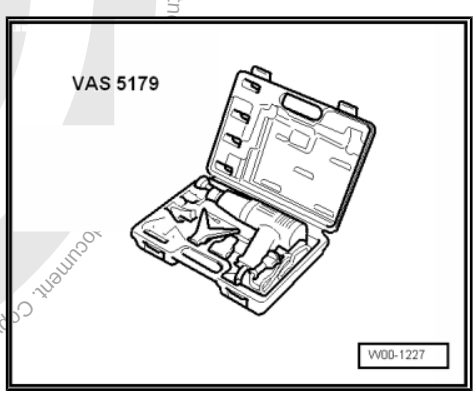
– Secure repair point with cable ties -1-.



2.9.3 Repairing corrugated pipe

Special tools and workshop equipment required

♦ Hot air blower -VAS 5179- or



♦ Hot air blower -V.A.G 1416- or

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

Note

♦ *Repair points must not be subjected to pulling or bending forces.*

♦ *If the damaged section is longer than 20 mm, a new piece of corrugated pipe must be used and the procedure described below must be performed twice.*

– Cut out damaged point from corrugated pipe to be repaired, cutting at right angles.

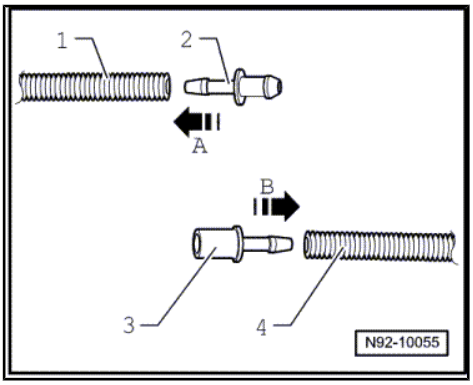
– Select the appropriate hose connectors -2- and -3- and appropriate heat-shrink hose from the Parts Catalogue (ETKA).

– Heat end of corrugated pipe -1-.

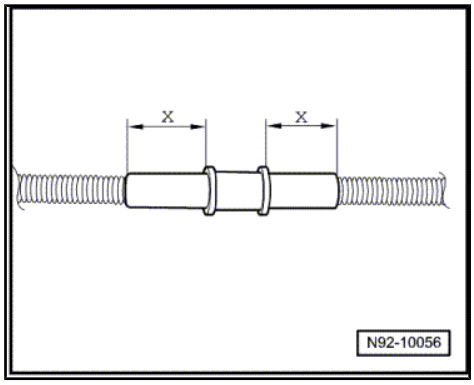
– Push hose connector -2- into corrugated pipe -1- -arrow A-.

– Heat end of corrugated pipe -4-.

– Push hose connector -3- into corrugated pipe -4- -arrow B-.



– Cut heat-shrink hose so that ends of corrugated pipe are each covered by about 20 mm -dimension x- of heat-shrink hose.
– Push heat-shrink hose over corrugated pipe. Join hose connectors together. Secure repair point with heat-shrink hose.



94 – Lights, bulbs, switches - exterior

1 Headlight with H1 bulb

Caution

To disconnect and connect the battery, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 .

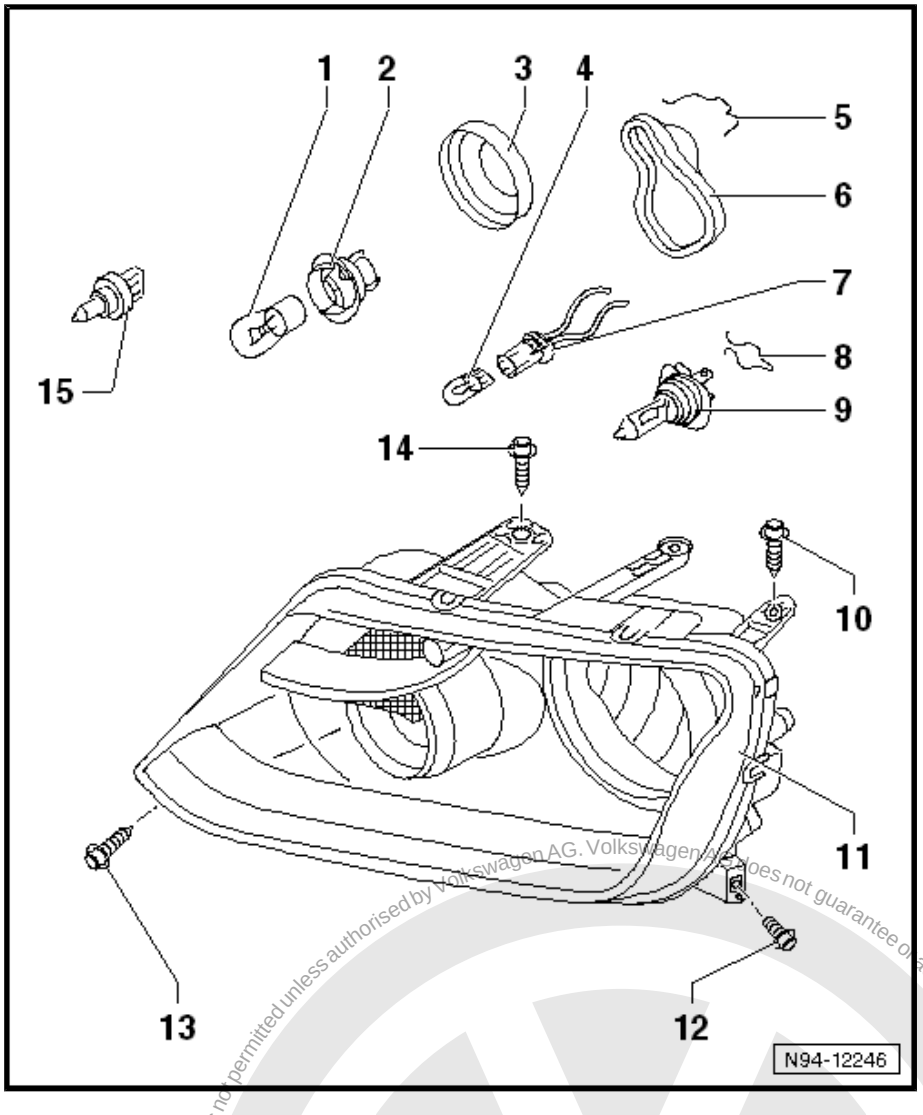
Note

- *Before working on headlights, always switch off the headlights and remove the ignition key.*
- *When dealing with complaints, it is absolutely essential that the function and operation of the lighting system are first understood.*
- *Additional information ⇒ Operating instructions*
- *Further information ⇒ Self-study programme*

1.1 Assembly overview - headlight

Note

Check and, if necessary, adjust headlight setting ⇒ Maintenance ; Booklet 11 .



1 - Front left turn signal bulb -M5- or front right turn signal bulb -M7-

- ❑ Bulb 12 V, PY 21 W.
- ❑ Removing and installing ⇒ page 105 .

2 - Bulb holder for turn signal bulb

3 - Rubber cover cap on rear headlight housing

4 - Left side light bulb -M1- or right side light bulb -M3-

- ❑ Bulb 12 V, W 5 W
- ❑ Removing and installing ⇒ page 106 .

5 - Retaining clip for cover on rear headlight housing

6 - Cover on rear headlight housing

7 - Holder for bulb for side light

8 - Retaining clip for headlight dipped beam bulb

9 - Left headlight dipped beam bulb -M29- or right headlight dipped beam bulb -M31-

- ❑ H 7 bulb.
- ❑ 12 V, 55 W
- ❑ Removing and installing ⇒ page 102 .

10 - Securing bolts for top of headlight housing

11 - Headlight

- ❑ Removing and installing ⇒ page 100 .
- ❑ Repair of the headlight fastening tabs is not envisaged at the moment. In the event of damage, the entire headlight must be renewed.

12 - Securing bolts for bottom of headlight housing

13 - Securing bolts for bottom of headlight housing

14 - Securing bolts for top of headlight housing

15 - Left headlight main beam bulb -M30- and right headlight main beam bulb -M32-

- ❑ H1 bulb
- ❑ 12 V, 55 W
- ❑ Removing and installing ⇒ page 105 .

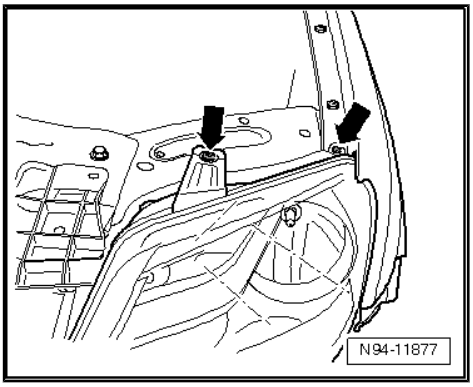
1.2 Removing and installing headlight

1.2.1 Removing:

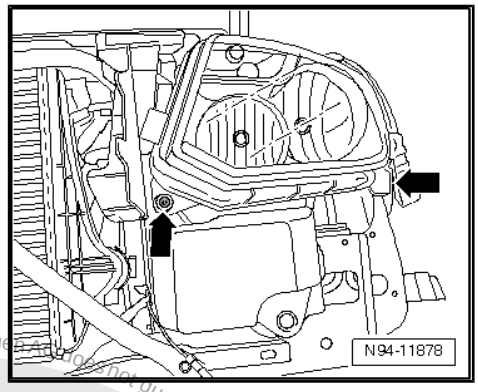
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

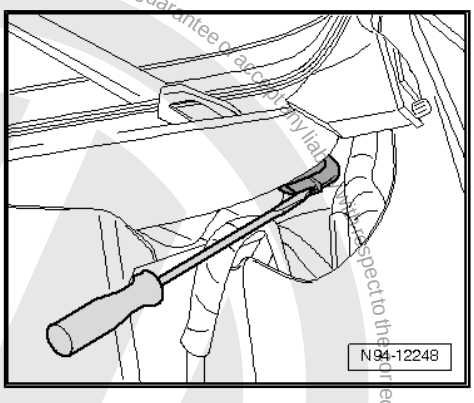
– Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .
– Remove upper securing bolts -arrows- of headlight.



– Remove lower securing bolts -arrows- of headlight.

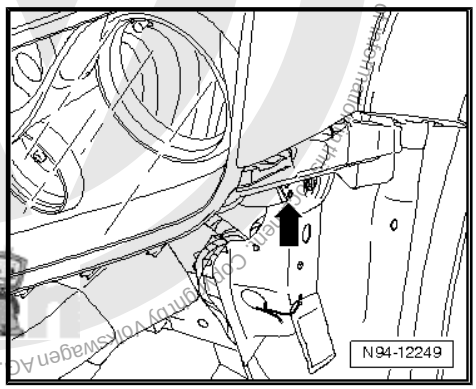


– Using a screwdriver, push connector off headlight from below -arrow-, while lightly pressing headlight upwards and towards the side.
– Take headlight housing out forwards.

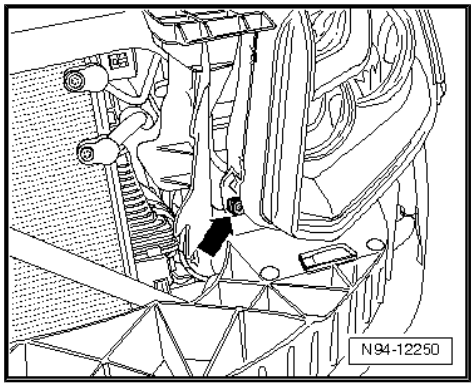


1.2.2 Installing:

– Insert headlight into bracket. When doing this, make sure that the lateral guide -arrow- is correctly seated.
– Put all bolts in position.



– Use adjuster screw to align headlight -arrow- in relation to the body.
– Tighten all bolts.
– Finally, check function of headlight.
– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

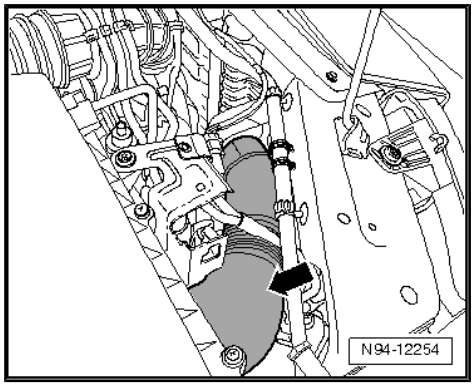


1.3 Renewing headlight bulbs

1.3.1 Renewing dipped beam bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

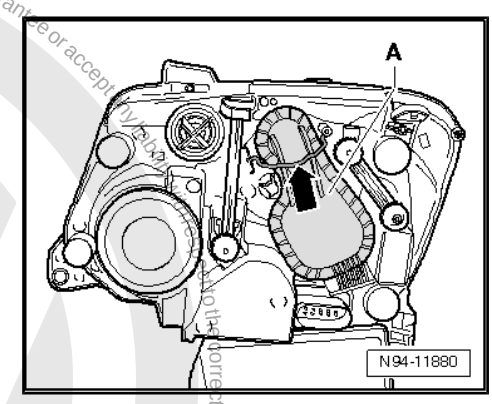


Removing:

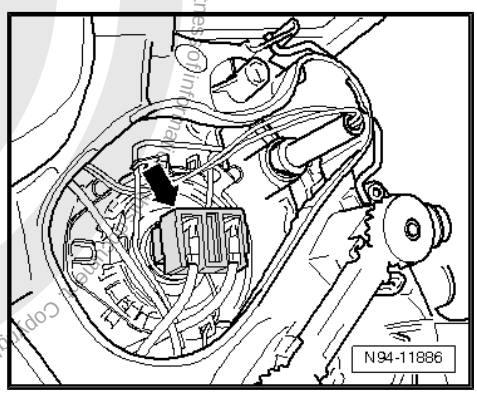
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

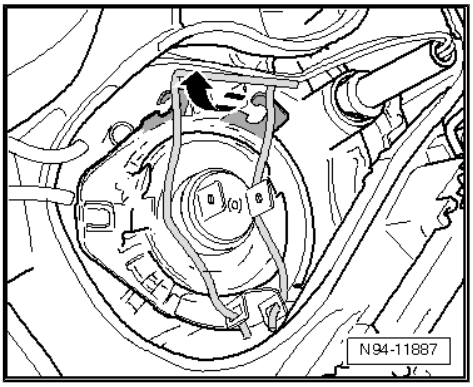
– Unlock retaining clip in -direction of arrow- and remove cover -A- from headlight housing.



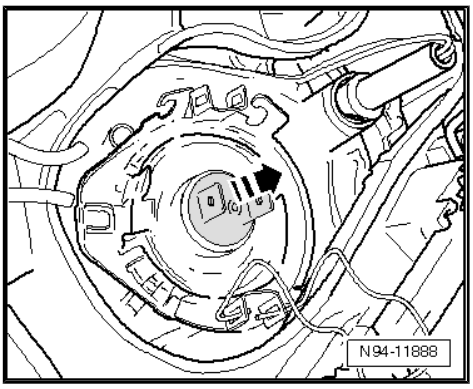
– Pull connector -arrow- off dipped beam bulb.



– To disengage clip in -direction of arrow-, first move it down and then to left.



– Pull dipped beam bulb out of reflector in -direction of arrow-.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Caution

Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.

Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert new bulb with holder so that locking lugs are in recess in reflector.

– Finally, check function of headlight.

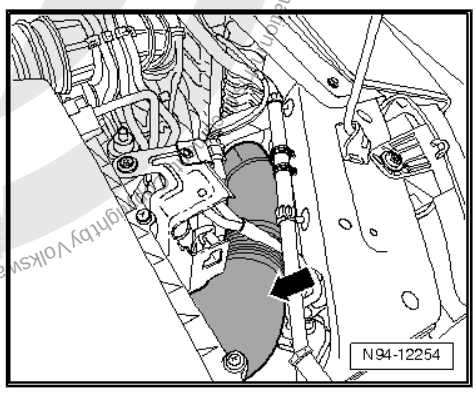
– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

1.3.2 Renewing main beam bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

Exception: If there is a supplementary heater, the left headlight must be removed to change the bulb for the main beam ⇒ page 100 .

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

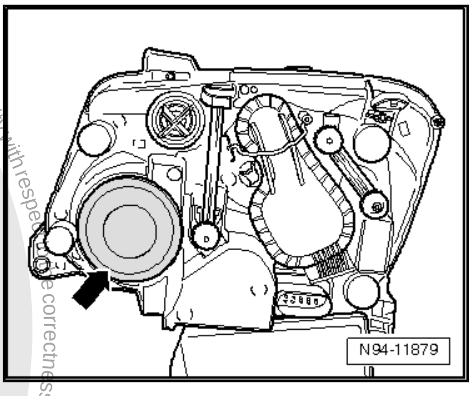


Removing:

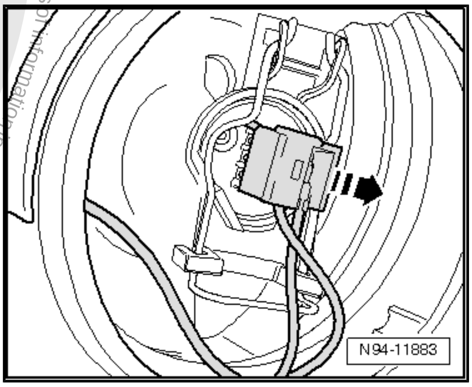
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

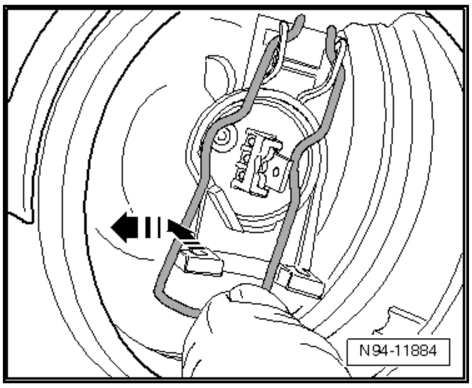
– Remove cover -arrow- from headlight housing.


N94-11879

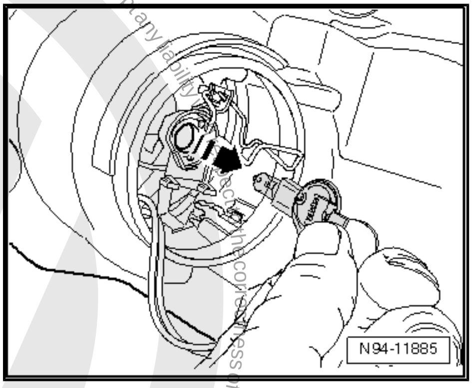
– Pull connector -arrow- off main beam bulb.


N94-11883

– To disengage clip in -direction of arrow-, first move it down and then to left.


N94-11884

– Pull main beam bulb out of reflector in -direction of arrow-.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

> **Caution**
>
> *Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.*

Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert new bulb with holder so that locking lugs are in recess in reflector.

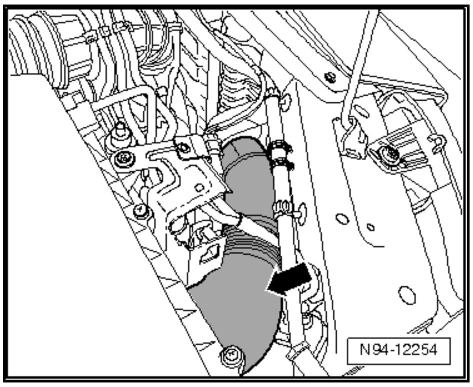
– Finally, check function of headlight.

– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

1.3.3 Renewing turn signal bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

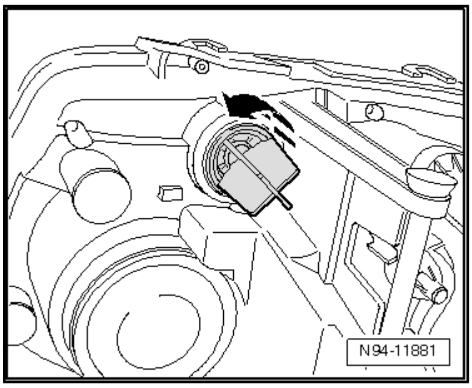


Removing:

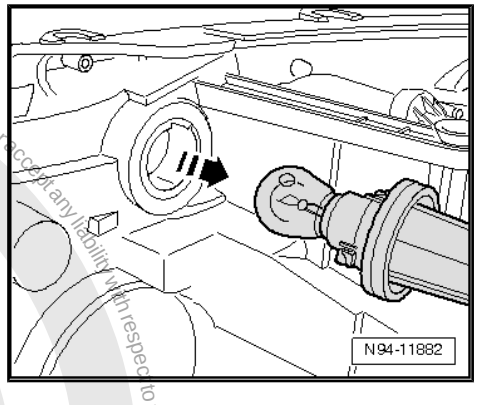
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Rotate turn signal holder in -direction of arrow-.



– Pull turn signal holder with turn signal bulb out together in -direction of arrow-.
– Remove turn signal bulb from holder.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Caution

Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.

Note

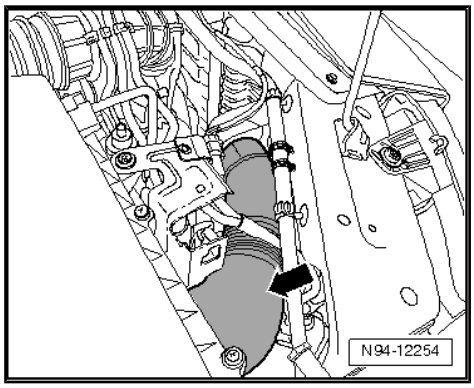
Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert new bulb with holder so that locking lugs are in recess in headlight housing.
– Finally, check function of headlight.
– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

1.3.4 Renewing side light bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

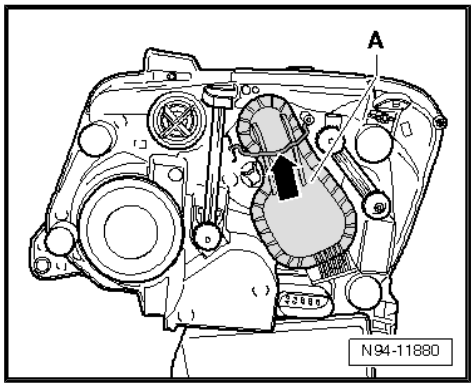


Removing:

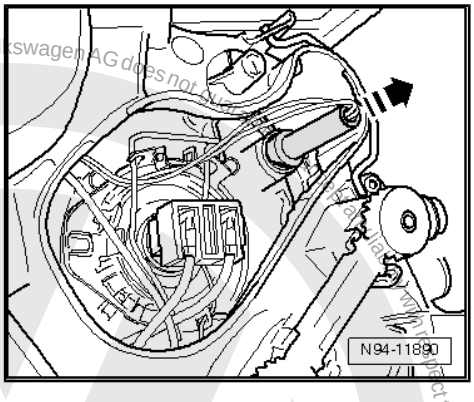
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

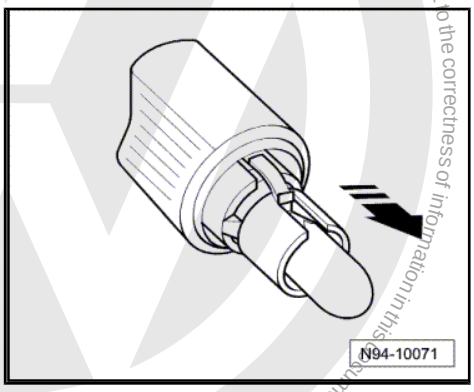
– Unlock retaining clip in -direction of arrow- and remove cover -A- from headlight housing.



– Pull side light bulb holder out of reflector in -direction of arrow-.



– Carefully take bulb out of bulb holder.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Caution

Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.

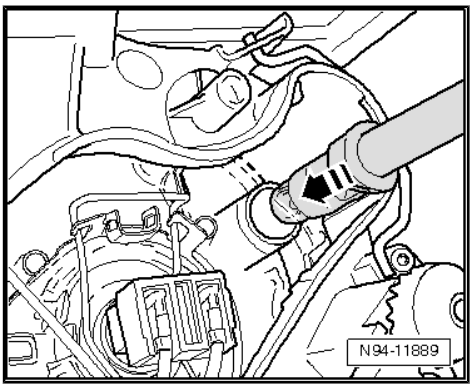
Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert side light bulb holder into reflector in -direction of arrow- up to stop.

– Finally, check function of headlight.

– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .



1.4 Headlight conversion for left-hand/right-hand traffic

Note

- *To avoid dazzling oncoming traffic with the asymmetrical lights, both headlights should be converted relevant to the country (driving on the left or right) in which the vehicle is being driven.*
- *The corresponding headlight conversion set consists of two sections of film.*
- *Conversion of the headlights is not designed as a permanent conversion for other countries. It is only suitable as a „tourist solution“ for a short stay abroad.*
- *Both headlights of a vehicle must always be converted.*
- *The details „right“ and „left“ on the masking film always refer to the direction of travel when looking forwards from inside the vehicle.*
- *The headlight conversion set comprises two pieces of film.*
- *Take account of different part numbers of headlight conversion sets for right to left-hand traffic and from left to right-hand traffic.*
- *Turn light switch to „0“ position.*

1.4.1 Overview of types of masking film for headlight conversion

1 - Masking film for headlight conversion

- ❑ Conversion from driving on right to driving on left
- ❑ For left headlight

2 - Masking film for headlight conversion

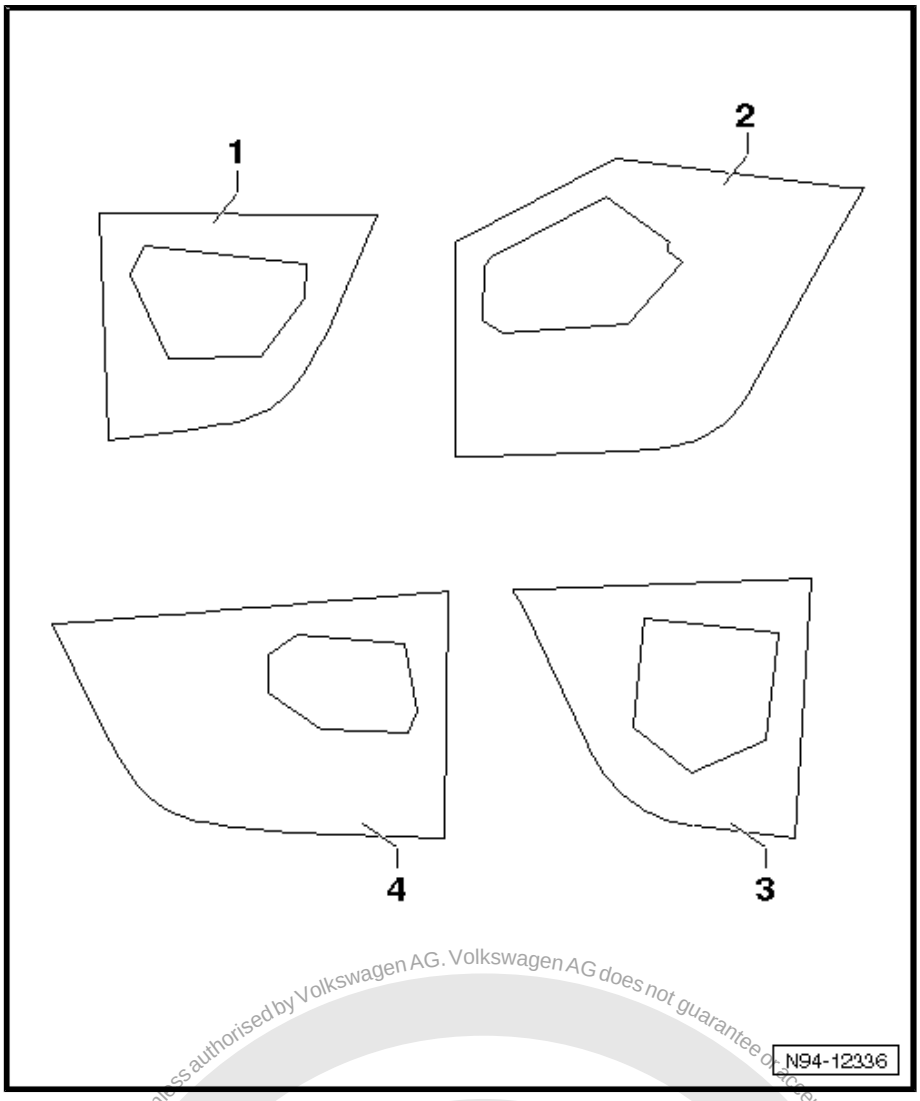
- ❑ Conversion from driving on left to driving on right
- ❑ For left headlight

3 - Masking film for headlight conversion

- ❑ Conversion from driving on left to driving on right
- ❑ For right headlight

4 - Masking film for headlight conversion

- ❑ Conversion from driving on right to driving on left
- ❑ For right headlight



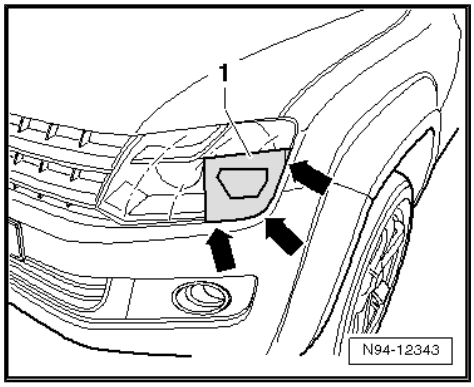
1.4.2 Conversion from driving on right to driving on left for left headlight

– Clean headlight lens.

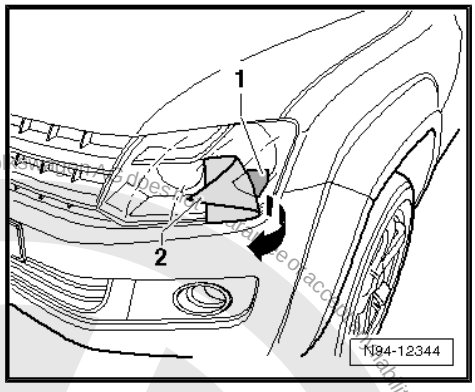
– Choose appropriate masking film (beam bender) for headlight ⇒ page 109 , observe part number.

– Remove release paper from masking film.

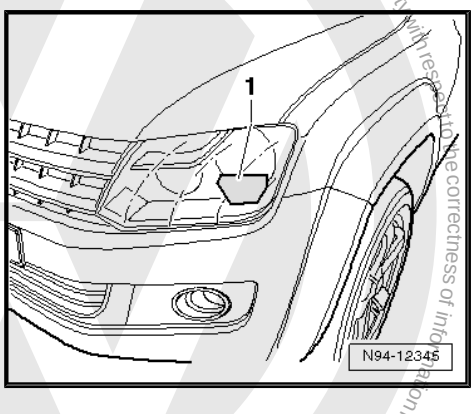
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

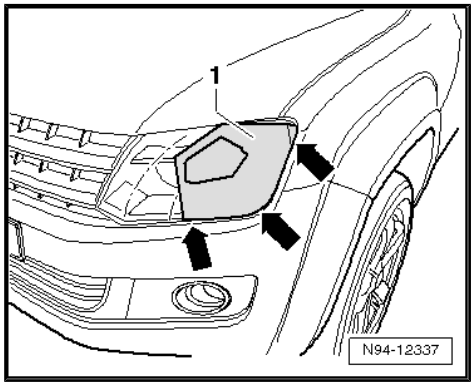
1.4.3 Conversion from driving on left to driving on right for left headlight

– Clean headlight lens.

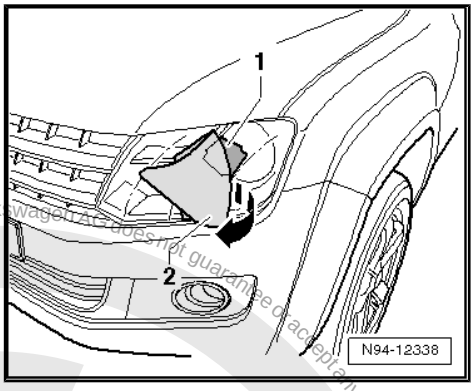
– Choose appropriate masking film (beam bender) for headlight ⇒ page 109 , observe part number.

– Remove release paper from masking film.

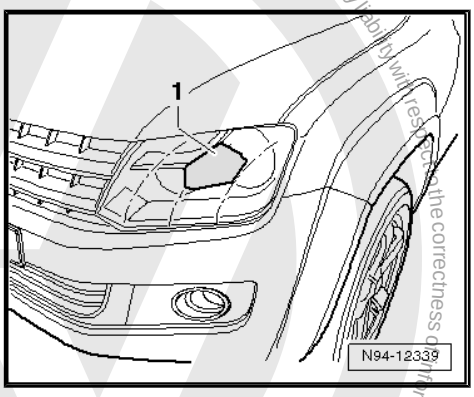
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

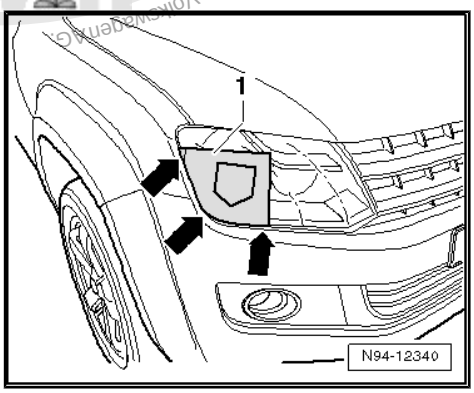
1.4.4 Conversion from driving on left to driving on right for right headlight

– Clean headlight lens.

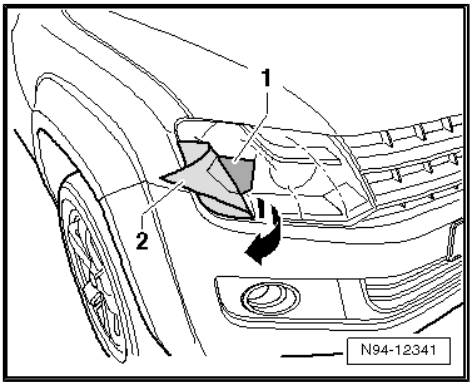
– Choose appropriate masking film (beam bender) for headlight ⇒ page 109 , observe part number.

– Remove release paper from masking film.

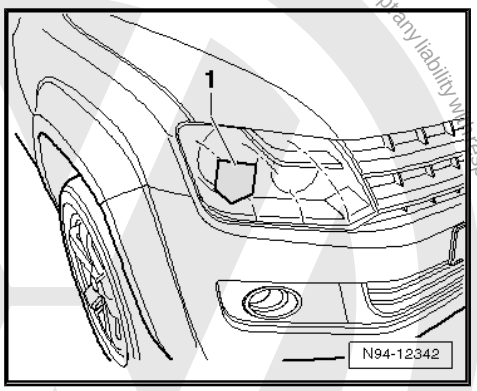
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

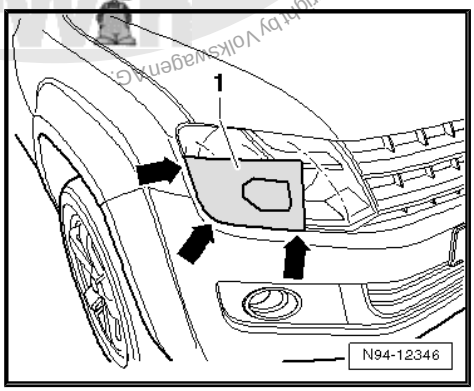
1.4.5 Conversion from driving on right to driving on left for right headlight

– Clean headlight lens.

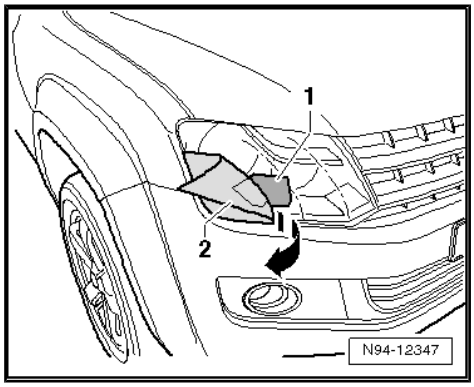
– Choose appropriate masking film (beam bender) for headlight ⇒ page 109 , observe part number.

– Remove release paper from masking film.

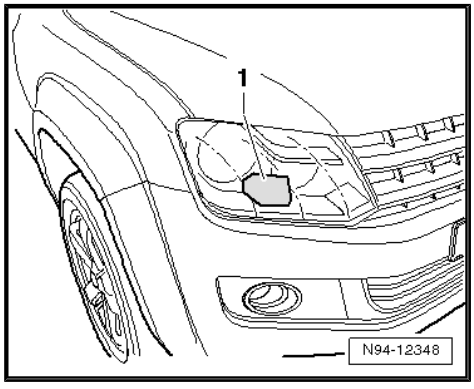
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

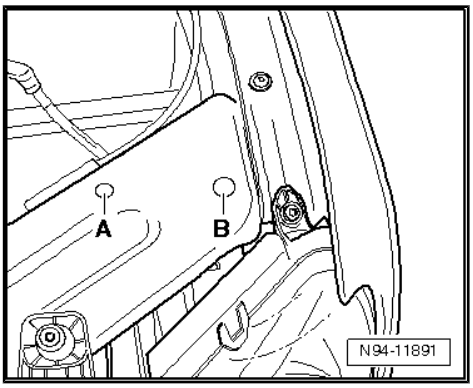
1.5 Adjusting headlights

Adjusting headlights ⇒ Maintenance ; Booklet 11

Adjuster screws for headlight setting are described below with reference to left headlight. Adjuster screws on right headlight are in a mirror-image arrangement.

A - Screw for vertical headlight setting

B - Screw for horizontal headlight setting



2 Headlight with H15 bulb and daytime running light

Caution

To disconnect and connect the battery, the procedure described in the workshop manual should be strictly adhered to ***⇒ page 51*** ***.***

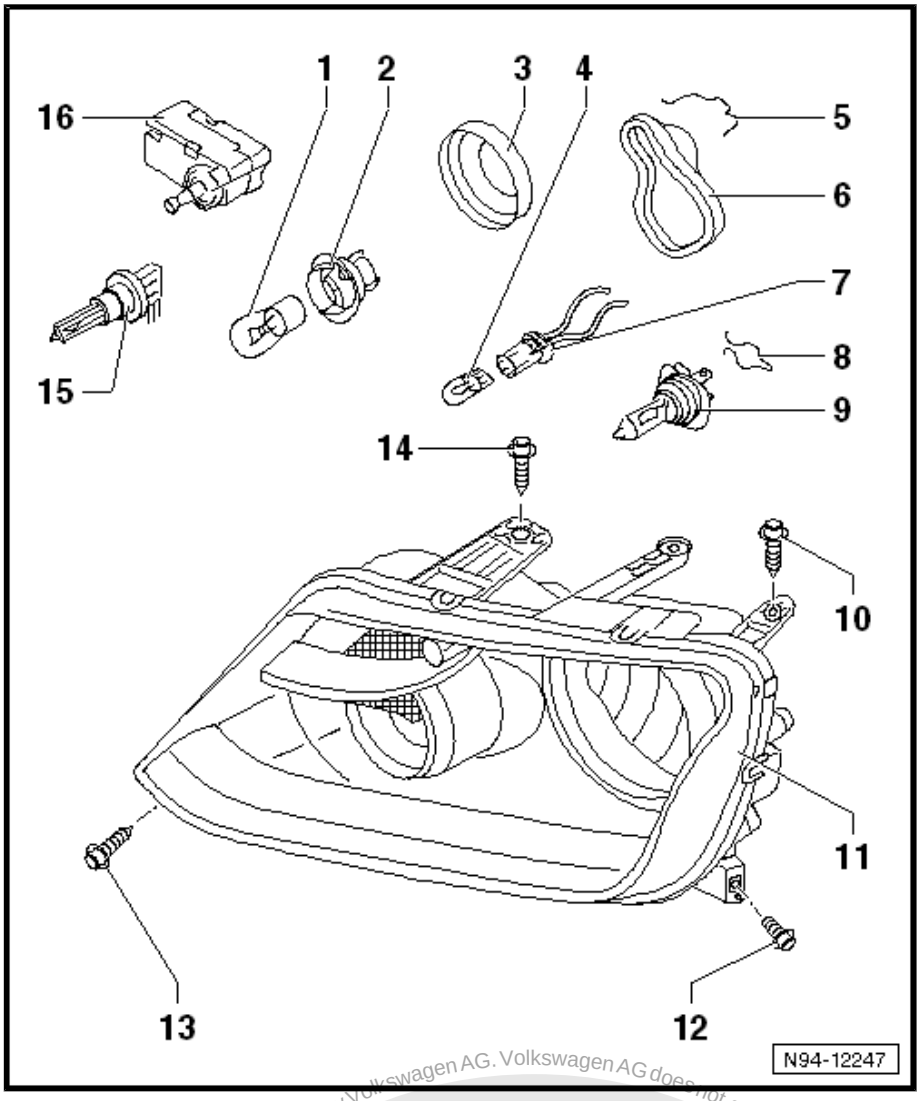
Note

- *Before working on headlights, always switch off the headlights and remove the ignition key.*
- *When dealing with complaints, it is absolutely essential that the function and operation of the lighting system are first understood.*
- *Additional information ⇒ Operating instructions*
- *Further information ⇒ Self-study programme*

2.1 Assembly overview - headlight

Note

Check and, if necessary, adjust headlight setting ⇒ Maintenance ; Booklet 11 .



1 - Front left turn signal bulb -M5- or front right turn signal bulb -M7-

- ❑ Bulb 12 V, PY 21 W.
- ❑ Removing and installing ⇒ page 120 .

2 - Bulb holder for turn signal bulb

3 - Rubber cover cap on rear headlight housing

4 - Left side light bulb -M1- or right side light bulb -M3-

- ❑ Bulb 12 V, W 5 W
- ❑ Removing and installing ⇒ page 121 .

5 - Retaining clip for cover on rear headlight housing

6 - Cover on rear headlight housing

7 - Holder for bulb for side light

8 - Retaining clip for headlight dipped beam bulb

9 - Left headlight dipped beam bulb -M29- or right headlight dipped beam bulb -M31-

- ❑ H 7 bulb.
- ❑ 12 V, 55 W
- ❑ Removing and installing ⇒ page 117 .

10 - Securing bolts for top of headlight housing

11 - Headlight

- ❑ Removing and installing ⇒ page 116 .
- ❑ Repair of the headlight fastening tabs is not envisaged at the moment. In the event of damage, the entire headlight must be renewed.

12 - Securing bolts for bottom of headlight housing

13 - Securing bolts for bottom of headlight housing

14 - Securing bolts for top of headlight housing

15 - Bulb for left main beam and daytime running light or bulb for right main beam and daytime running light

- ❑ H15 bulb.
- ❑ 12 V, 15/55 W
- ❑ Removing and installing ⇒ page 119 .

16 - Left headlight range control motor -V48- or right headlight range control motor -V49-

- ❑ The control motor cannot be renewed individually. In the event of damage, the entire headlight must be renewed.

2.2 Removing headlight

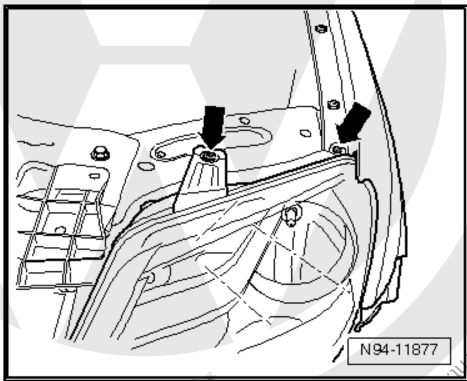
2.2.1 Removing:

Carry out the following work:

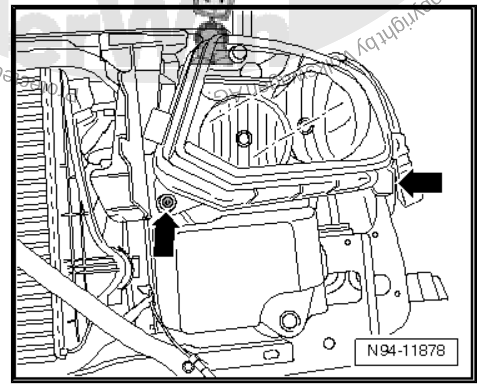
– Switch off ignition and all electrical loads, and pull out ignition key.

– Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .

– Remove upper securing bolts -arrows- of headlight.

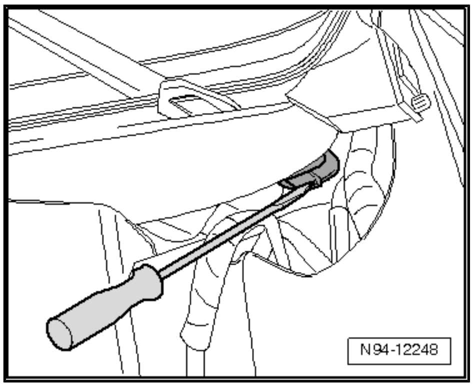

N94-11877

– Remove lower securing bolts -arrows- of headlight.

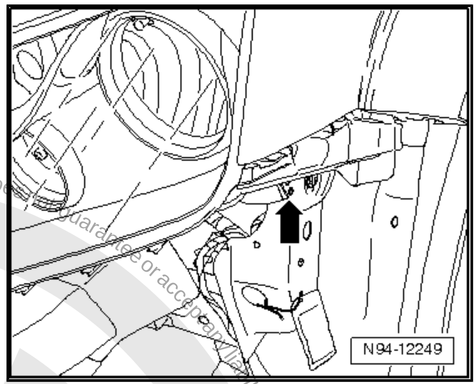

N94-11878

– Using a screwdriver, push connector off headlight from below -arrow-, while lightly pressing headlight upwards and towards the side.

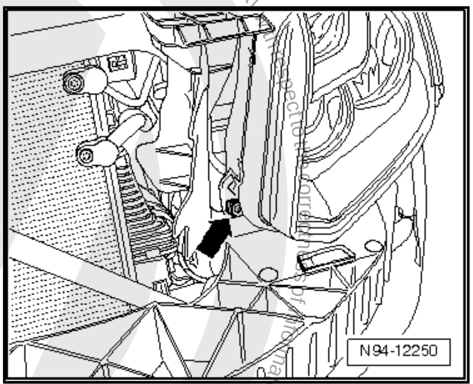
– Take headlight housing out forwards.


N94-12248

2.2.2 Installing:



- Insert headlight into bracket. When doing this, make sure that the lateral guide -arrow- is correctly seated.
- Put all bolts in position.

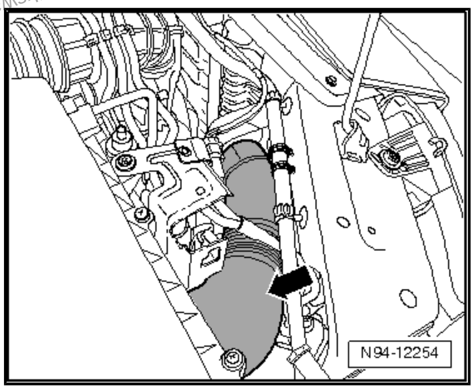


- Use adjuster screw to align headlight -arrow- in relation to the body.
- Tighten all bolts.
- Finally, check function of headlight.
- Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

2.3 Renewing headlight bulbs

2.3.1 Renewing dipped beam bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.



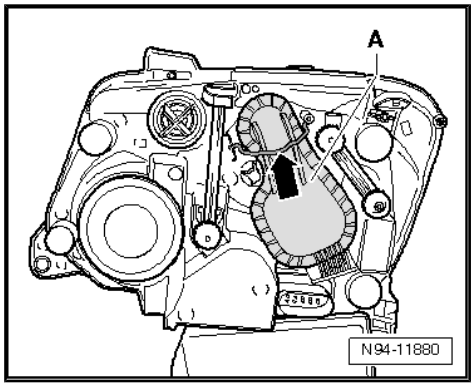
- Before changing the bulb of the right headlight, remove the air duct -arrow-.

Removing:

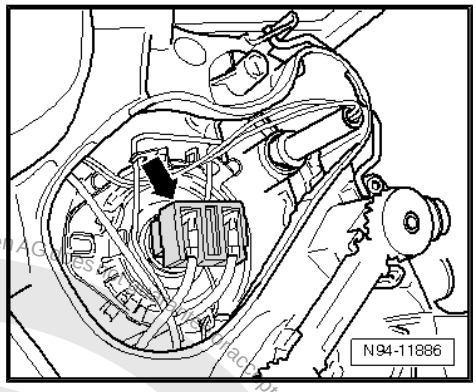
Carry out the following work:

- Switch off ignition and all electrical loads, and pull out ignition key.

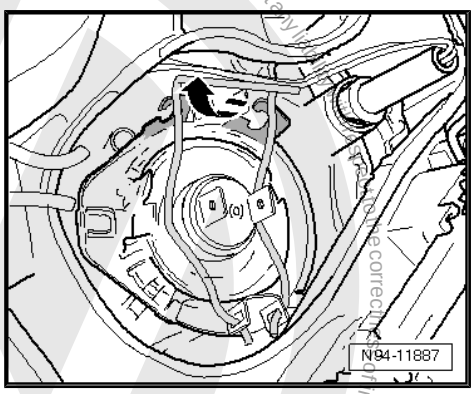
– Unlock retaining clip in -direction of arrow- and remove cover -A- from headlight housing.



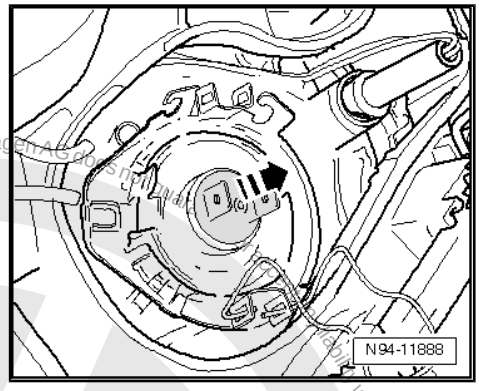
– Pull connector -arrow- off dipped beam bulb.



– To disengage clip in -direction of arrow-, first move it down and then to left.



– Pull dipped beam bulb out of reflector in -direction of arrow-.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Caution

Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.

Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert new bulb with holder so that locking lugs are in recess in reflector.

– Finally, check function of headlight.

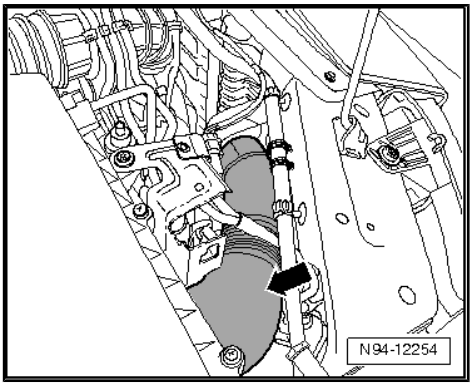
– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

2.3.2 Renewing bulb for main beam and daytime running light

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

Exception: If there is a supplementary heater, the left headlight must be removed to change the bulb for the main beam and daytime running light ⇒ page 100 .

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

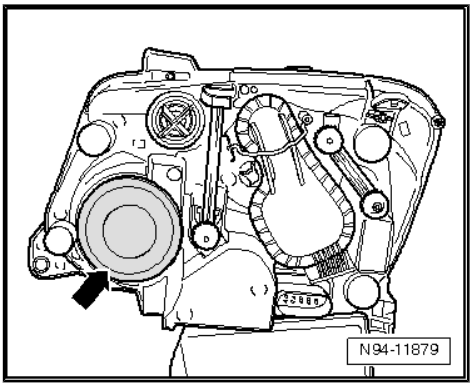


Removing:

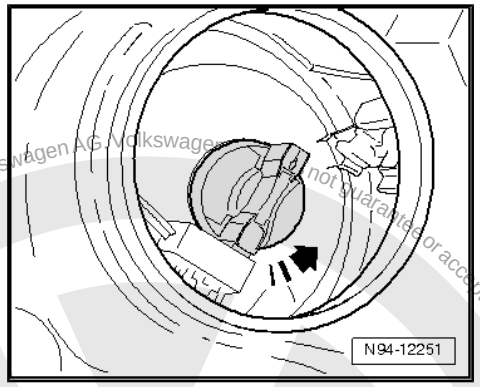
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

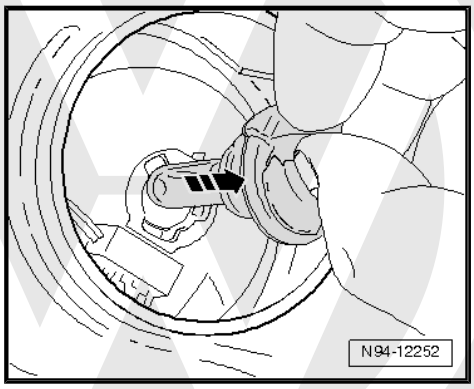
– Remove cover -arrow- from headlight housing.



– Turn bulb for main beam and daytime running light approx. 90° anti-clockwise in -direction of arrow-.



– Pull bulb for main beam and daytime running light out of reflector in -direction of arrow-.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

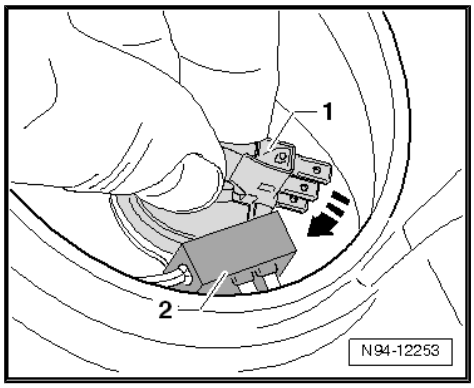
Caution

Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.

Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

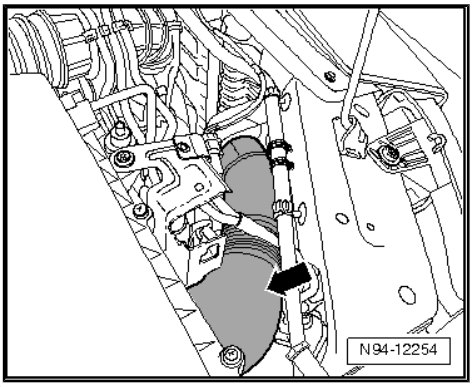
– Turn bulb for main beam and daytime running light -1- in -direction of arrow- until contacts in connection housing -2- have engaged.
– Finally, check function of headlight.
– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .



2.3.3 Renewing turn signal bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

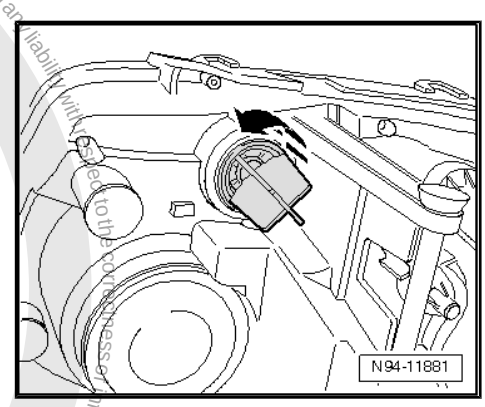


Removing:

Carry out the following work:

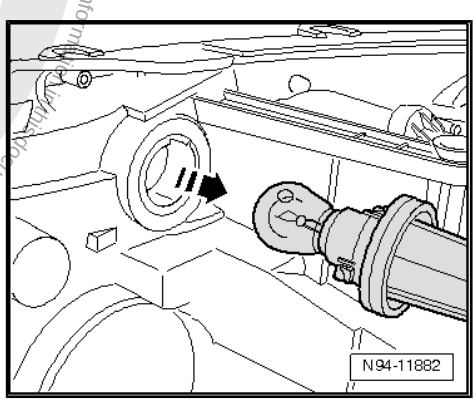
– Switch off ignition and all electrical loads, and pull out ignition key.

– Rotate turn signal holder in -direction of arrow-.



– Pull turn signal holder with turn signal bulb out together in -direction of arrow-.

– Remove turn signal bulb from holder.



Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Caution

Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.

Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert new bulb with holder so that locking lugs are in recess in headlight housing.

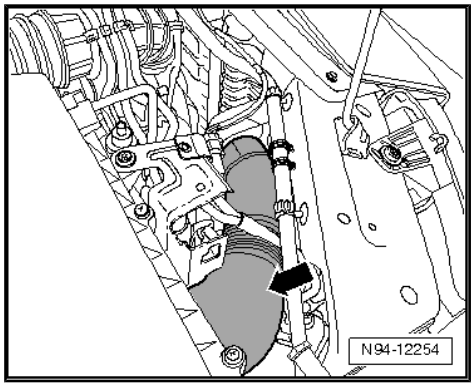
– Finally, check function of headlight.

– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .

2.3.4 Renewing side light bulb

The bulb of the left headlight can be replaced without it being necessary to remove any other components.

– Before changing the bulb of the right headlight, remove the air duct -arrow-.

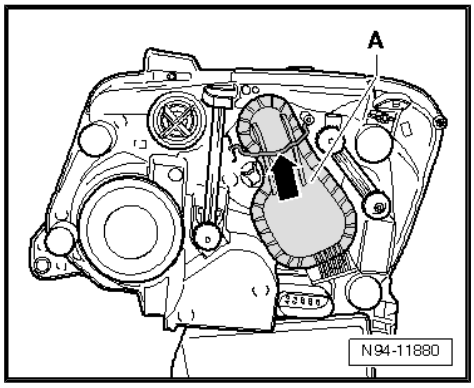


Removing:

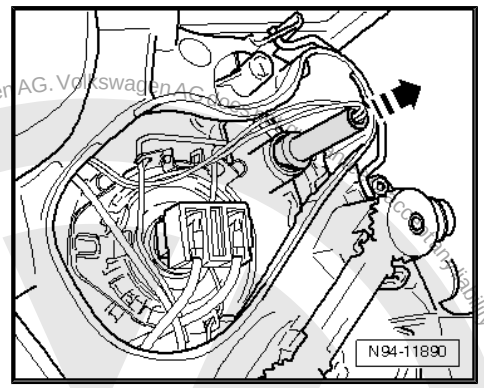
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Unlock retaining clip in -direction of arrow- and remove cover -A- from headlight housing.



– Pull side light bulb holder out of reflector in -direction of arrow-.



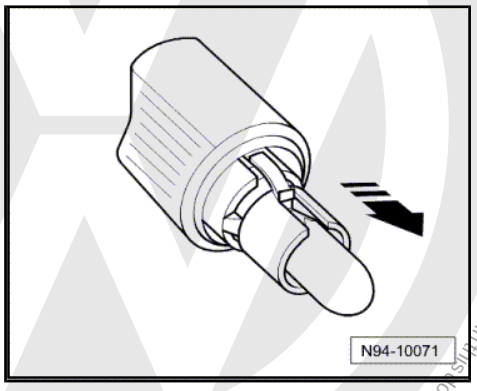
– Carefully take bulb out of bulb holder.

Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Caution

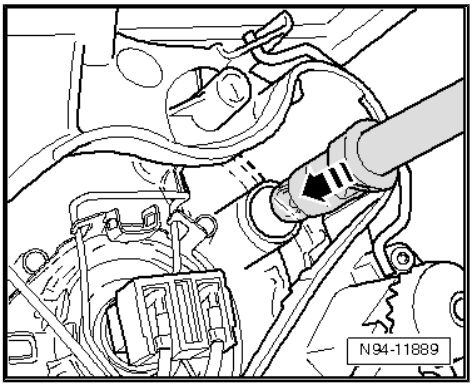
Make sure cover cap is correctly seated when installing. The ingress of water will lead to permanent damage to the headlight.



Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Insert side light bulb holder into reflector in -direction of arrow- up to stop.
– Finally, check function of headlight.
– Checking and, if necessary, adjusting headlight setting ⇒ Maintenance ; Booklet 11 .



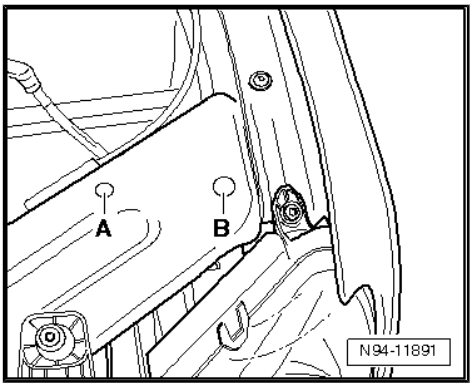
2.4 Adjusting headlights

Adjusting headlights ⇒ Maintenance ; Booklet 11

Adjuster screws for headlight setting are described below with reference to left headlight. Adjuster screws on right headlight are in a mirror-image arrangement.

A - Screw for vertical headlight setting

B - Screw for horizontal headlight setting



2.5 Headlight conversion for left-hand/right-hand traffic

Note

- *To avoid dazzling oncoming traffic with the asymmetrical lights, both headlights should be converted relevant to the country (driving on the left or right) in which the vehicle is being driven.*
- *The corresponding headlight conversion set consists of two sections of film.*
- *Conversion of the headlights is not designed as a permanent conversion for other countries. It is only suitable as a „tourist solution“ for a short stay abroad.*
- *Both headlights of a vehicle must always be converted.*
- *The details „right“ and „left“ on the masking film always refer to the direction of travel when looking forwards from inside the vehicle.*
- *The headlight conversion set comprises two pieces of film.*
- *Take account of different part numbers of headlight conversion sets for right to left-hand traffic and from left to right-hand traffic.*
- *Turn light switch to „0“ position.*

2.5.1 Overview of types of masking film for headlight conversion

1 - Masking film for headlight conversion

- ❑ Conversion from driving on left to driving on right
- ❑ For left headlight
- ❑ Conversion from driving on left to driving on right for left headlight ⇒ page 124

2 - Masking film for headlight conversion

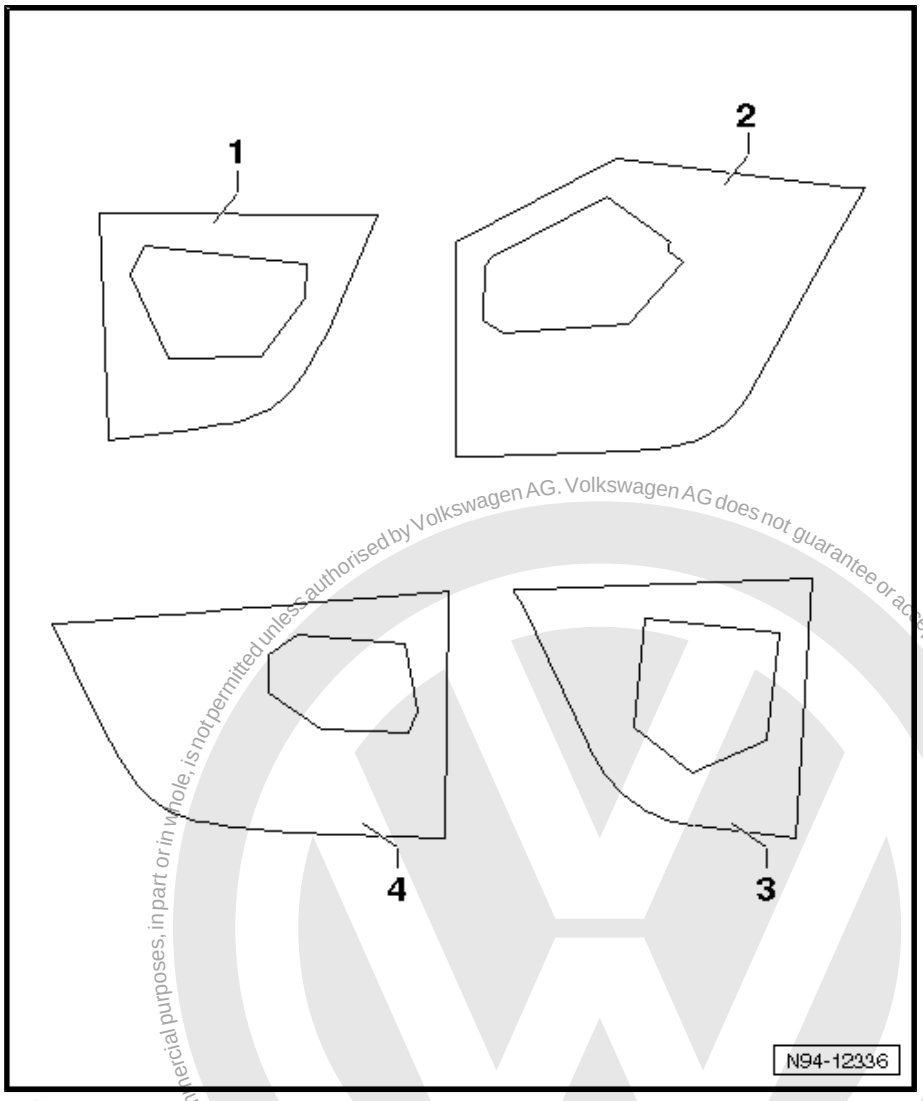
- ❑ Conversion from driving on right to driving on left
- ❑ For left headlight
- ❑ Conversion from driving on right to driving on left for left headlight ⇒ page 125

3 - Masking film for headlight conversion

- ❑ Conversion from driving on right to driving on left
- ❑ For right headlight
- ❑ Conversion from driving on right to driving on left for right headlight ⇒ page 126

4 - Masking film for headlight conversion

- ❑ Conversion from driving on left to driving on right
- ❑ For right headlight
- ❑ Conversion from driving on left to driving on right for right headlight ⇒ page 127



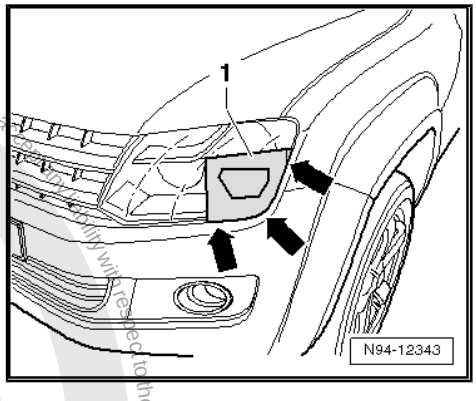
2.5.2 Conversion from driving on left to driving on right for left headlight

– Clean headlight lens.

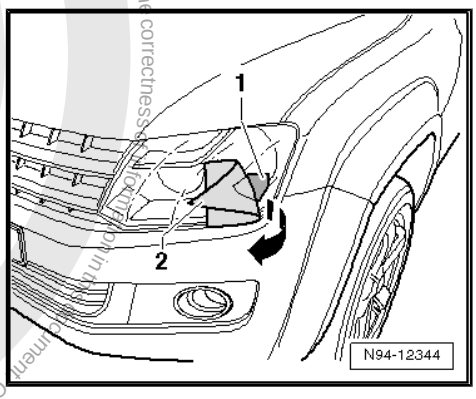
– Choose appropriate masking film (beam bender) for headlight ⇒ page 124 , observe part number.

– Remove release paper from masking film.

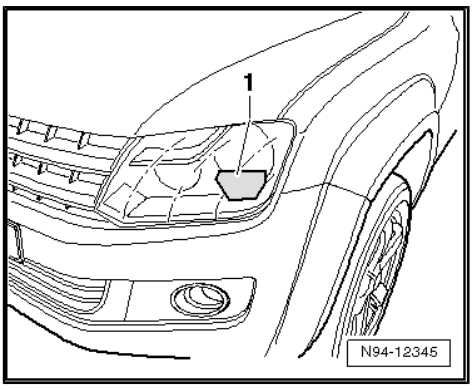
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

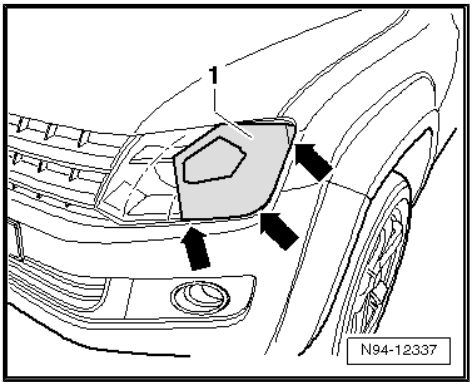
2.5.3 Conversion from driving on right to driving on left for left headlight

– Clean headlight lens.

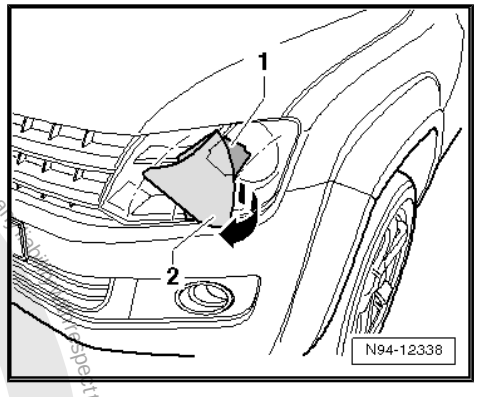
– Choose appropriate masking film (beam bender) for headlight ⇒ page 124 , observe part number.

– Remove release paper from masking film.

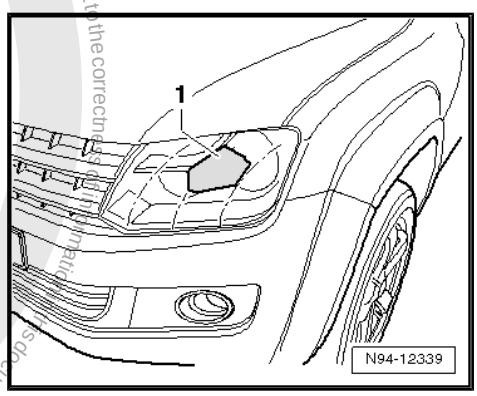
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

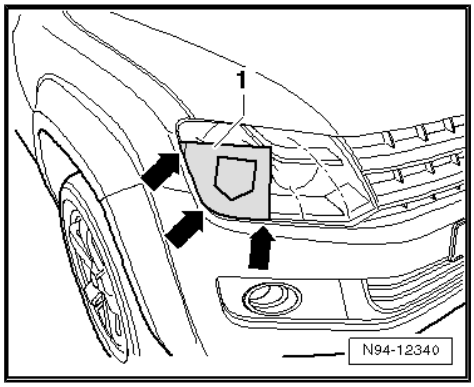
2.5.4 Conversion from driving on right to driving on left for right headlight

– Clean headlight lens.

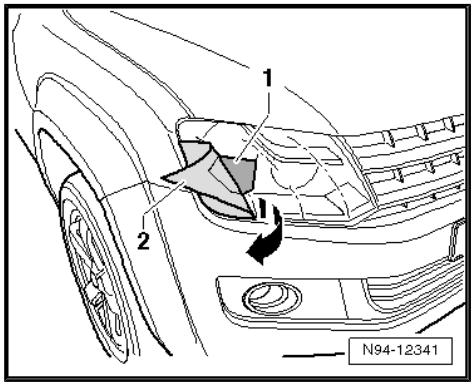
– Choose appropriate masking film (beam bender) for headlight ⇒ page 124 , observe part number.

– Remove release paper from masking film.

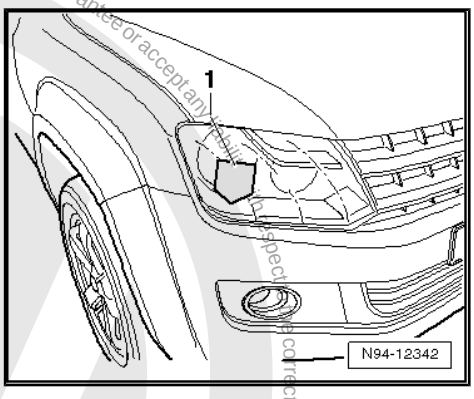
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

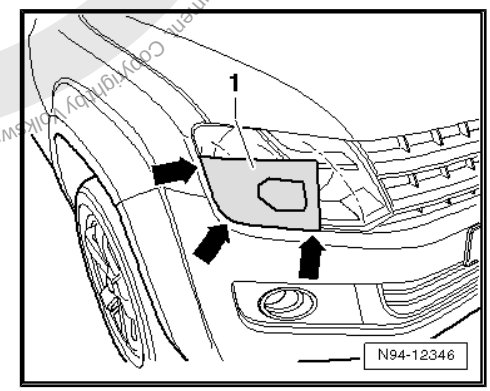
2.5.5 Conversion from driving on left to driving on right for right headlight

– Clean headlight lens.

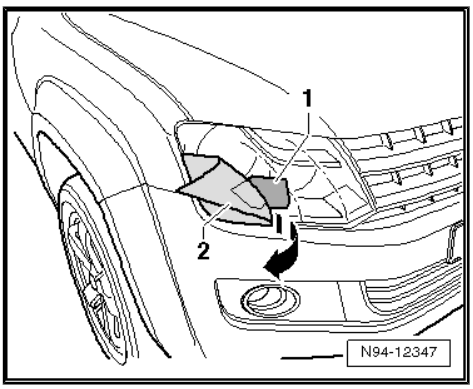
– Choose appropriate masking film (beam bender) for headlight ⇒ page 124 , observe part number.

– Remove release paper from masking film.

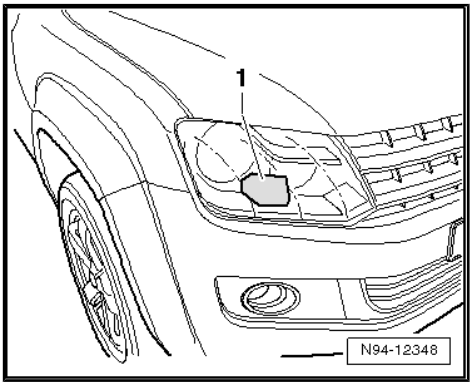
– Press masking film -1- onto headlight and align it so that the lower edge of the masking film -arrows- is flush with the lower contour of the headlight in relation to body.



– Pull masking film -2- off headlight in -direction of arrow-; the cut-out part of the masking film -1- remains on the lens.



This is what the headlight looks like with the cut-out of the masking film -1- after conversion.



Note

If there is any adhesive residue on the plastic lens after the film has been removed, it can be removed using a cloth dipped in isopropanol. Please inform the customer of this as well.

3 Fog lights

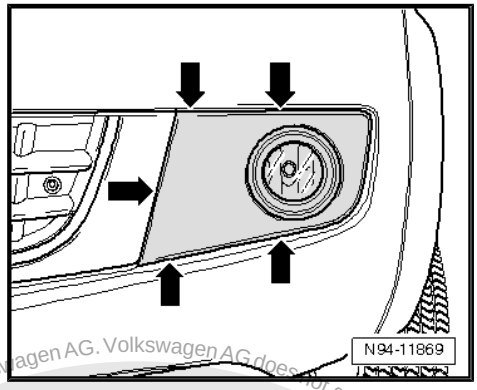
3.1 Removing and installing fog light

3.1.1 Removing:

Carry out the following work:

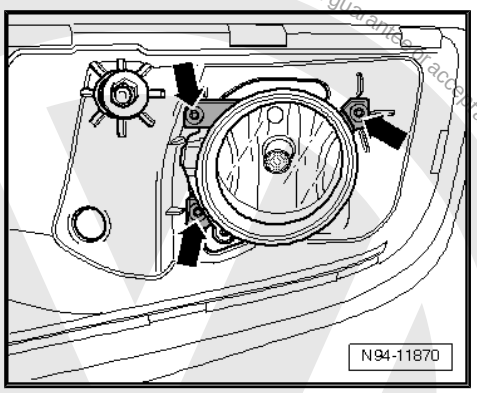
– Switch off ignition and all electrical loads, and pull out ignition key.

– Unclip bumper trim at points marked with -arrows-.



– Remove securing bolts -arrows-.

– Pull fog light housing out of bumper. Release connector and pull off.



3.1.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Finally, check function of fog light.

– Checking fog light settings and, if necessary, adjusting ⇒ Maintenance ; Booklet 11 .

3.2 Removing and installing fog light bulb

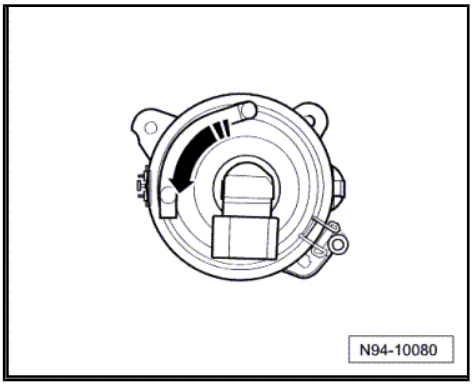
3.2.1 Removing:

– Removing fog light ⇒ page 128

– Turn bulb holder in -direction of arrow- and remove from fog light.

The left fog light bulb -L22- or right fog light bulb -L23- is permanently fixed in the bulb holder and cannot be renewed individually.

Left fog light bulb -L22- or right fog light bulb -L23- : H11 12 V/ 55 W



3.2.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

Note

Do not touch bulb glass when installing a bulb. Fingers leave traces of grease on the glass bulb, which evaporate when the bulb is switched on and cause the glass bulb to cloud over.

– Checking fog light settings and, if necessary, adjusting ⇒ Maintenance ; Booklet 11 .

– Finally, check function of headlight.

3.3 Adjusting fog lights

Adjusting fog light ⇒ Maintenance ; Booklet 11

4 Side turn signals

4.1 Removing and installing turn signal repeater

Caution

It is only possible to remove side turn signal in one direction, therefore great care must be taken during removal. When seen from outside in installed condition, it is not possible to tell on which side of turn signal bearing point is located and on which side spring clip is located.

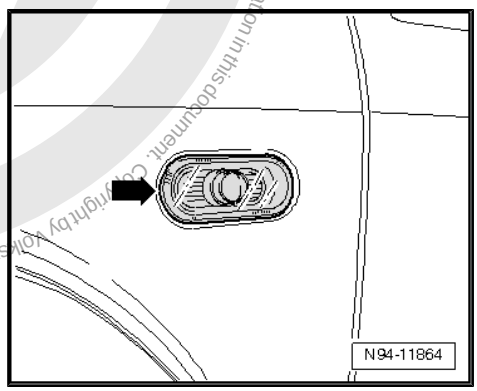
Attempting to lever out the light on the spring clip side by force runs the risk of damaging the turn signal or the vehicle paintwork.

4.1.1 Removing:

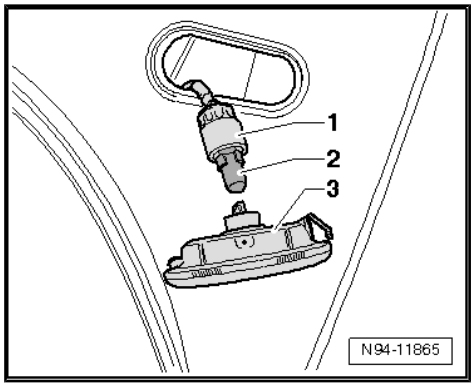
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– On side of bearing point, use a suitable tool to push turn signal in -direction of arrow- against force of spring clip on other side of turn signal. First cover paintwork with adhesive tape if necessary.



– Pull holder -1- with bulb -2- out of side turn signal -3-.



4.1.2 Installing:

– Insert turn signal in wing.

– Following installation, check corresponding bulb for side turn signal is functioning.

4.2 Removing side turn signal bulb

4.2.1 Removing:

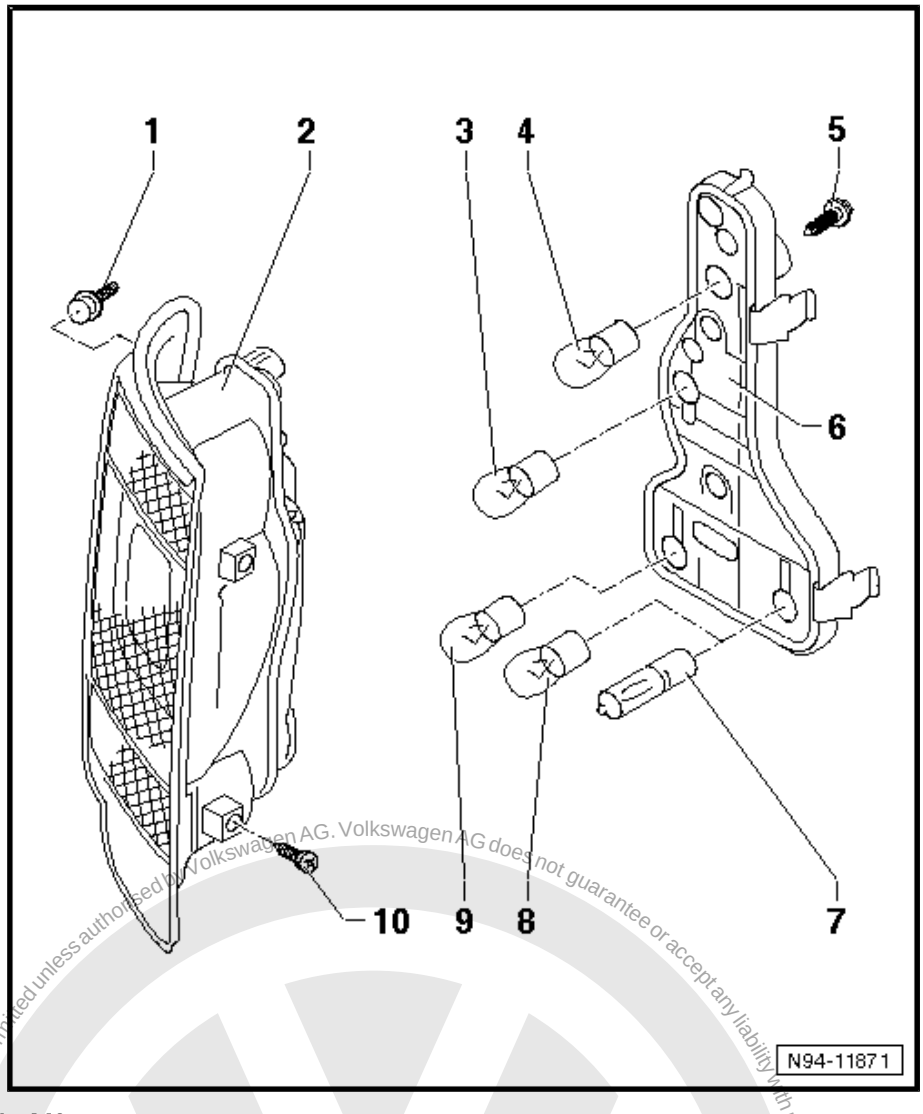
– Remove appropriate side turn signal ⇒ page 130 .
– Pull rubber holder with push-fit bulb off bulb housing.
– Pull push-fit bulb (12 V/5 W) out of holder (do not turn).

4.2.2 Installing:

– Fit rubber holder with push-fit bulb onto bulb housing.
– Insert turn signal in wing.
– Following installation, check corresponding bulb for side turn signal is functioning.

5 Tail lights

5.1 Assembly overview - tail light



1 - Ball head

2 - Tail light

- ❑ Removing and installing ⇒ page 132 .

3 - Left tail light bulb -M4- or right tail light bulb -M2-

- ❑ 12 V/ 5 W/ 21 W
- ❑ 21 W/wiring connector not present
- ❑ Removing and installing ⇒ page 133 .

4 - Left brake light bulb -M21- or right brake light bulb -M22-

- ❑ 12 V/21 W
- ❑ Removing and installing ⇒ page 134 .

5 - Securing bolts of bulb carrier

6 - Bulb carrier

7 - Left rear fog light bulb -L46-

- ❑ Only installed on left
- ❑ 12 V/21 W halogen
- ❑ Removing and installing ⇒ page 134 .

8 - Right reversing light bulb -M17-

- ❑ 12 V/21 W
- ❑ Only installed on right
- ❑ Removing and installing ⇒ page 135 .

9 - Rear left turn signal bulb -M6- or rear right turn signal bulb -M8-

- ❑ 12 V/ PY 21W.
- ❑ Removing and installing ⇒ page 135 .

10 - Securing bolts of tail light

5.2 Removing and installing tail light

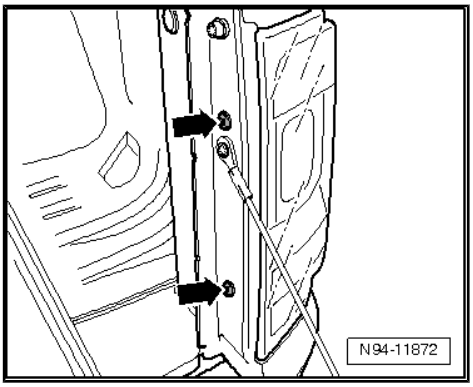
The removal and installation procedure is carried out in the same way on both sides and is described for just one light.

5.2.1 Removing:

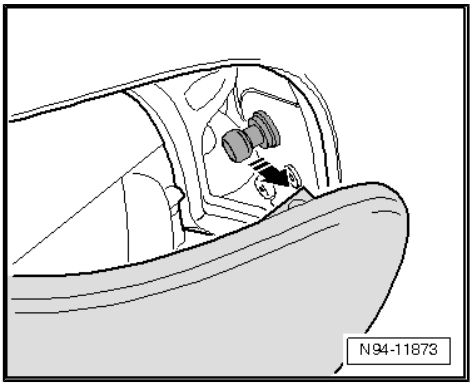
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

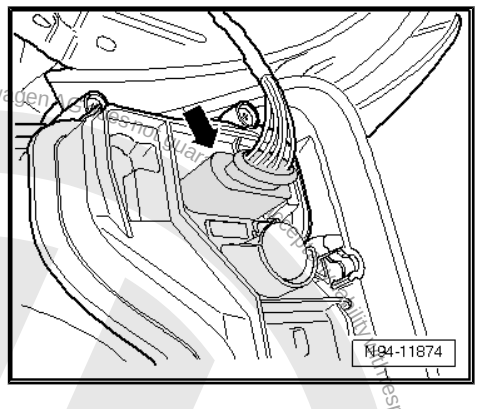
– Open tailboard.
– Remove securing bolts -arrows- from tail light.



– Guide tail light sideways out of ball head in -direction of arrow-.



– Disconnect connector -arrow- at tail light.



5.2.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Reconnect connector.
– Insert tail light in aperture and press fixtures into ball heads.
– Position the tail light properly on body panel by hand, hold securely and then tighten securing bolts.
– Tighten securing bolts to specified torque of 4 Nm.

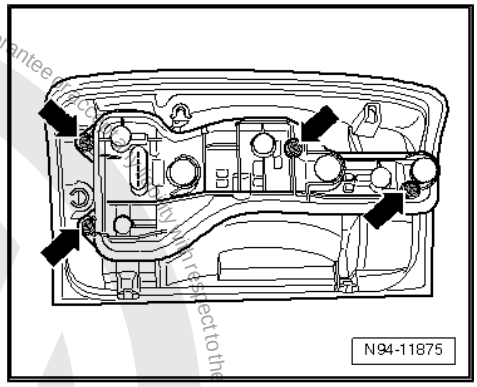
5.3 Renewing bulbs in tail light

5.3.1 Renewing tail light bulb

Removing:

– Remove tail light ⇒ page 132 .

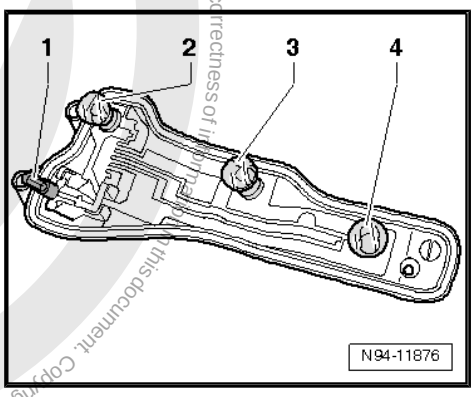
– Remove securing bolts -arrows- from bulb carrier.



– Remove tail light bulb -3-.

Installing:

Install in reverse order of removal.

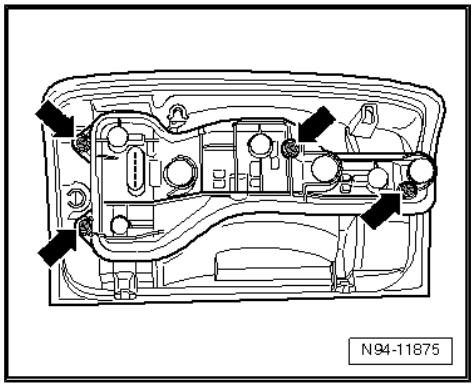


5.3.2 Renewing brake light bulb

Removing:

– Remove tail light ⇒ page 132 .

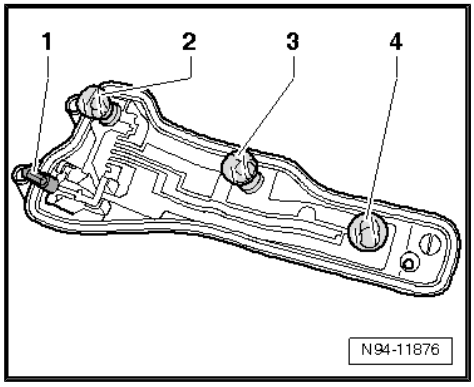
– Remove securing bolts -arrows- from bulb carrier.



– Remove brake light bulb -4-.

Installing:

Install in reverse order of removal.



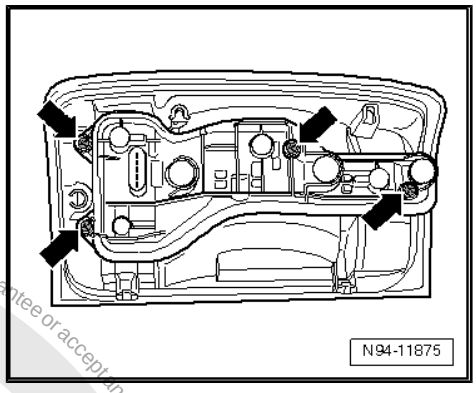
5.3.3 Renewing rear fog light bulb

Rear fog light bulb is only installed in left tail light.

Removing:

– Remove tail light ⇒ page 132 .

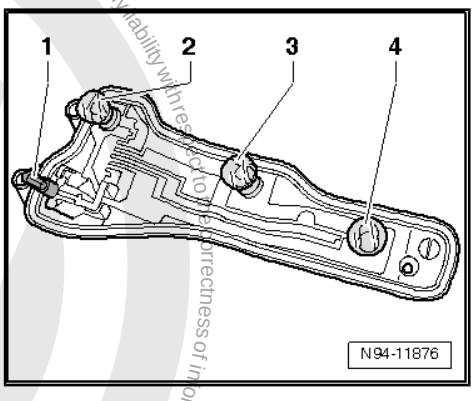
– Remove securing bolts -arrows- from bulb carrier.



– Remove rear fog light bulb -1-.

Installing:

Install in reverse order of removal.



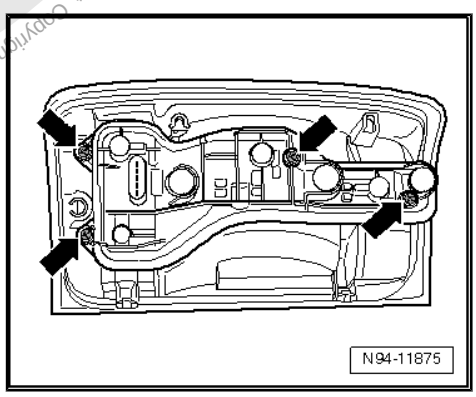
5.3.4 Reversing light bulb

Reversing light bulb is only installed in right tail light.

Removing:

– Remove tail light ⇒ page 132 .

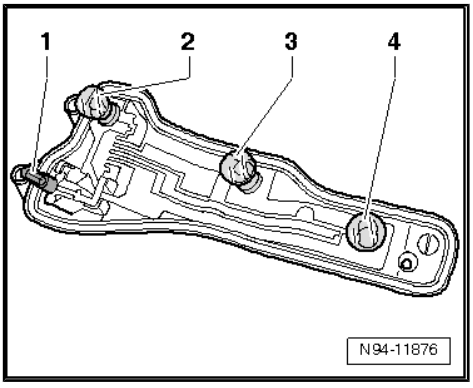
– Remove securing bolts -arrows- from bulb carrier.



– Remove reversing light bulb -1-.

Installing:

Install in reverse order of removal.

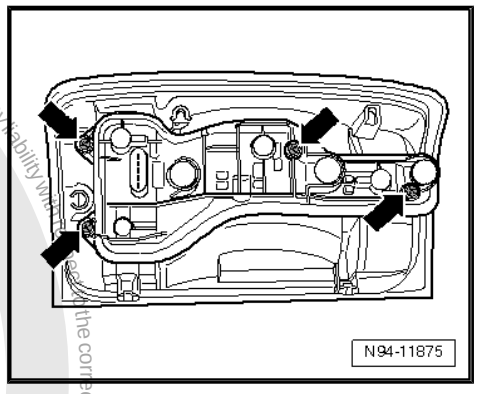


5.3.5 Turn signal bulb

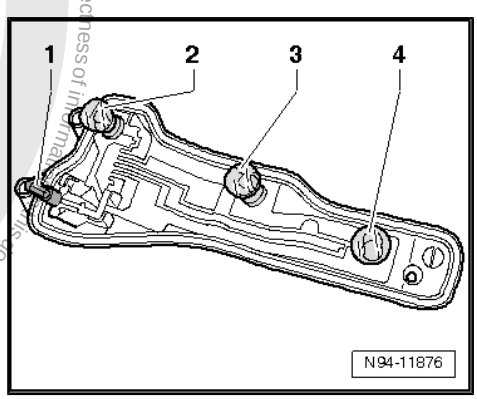
Removing:

– Remove tail light ⇒ page 132 .

– Remove securing bolts -arrows- from bulb carrier.



– Remove turn signal bulb -2-.



Installing:

Install in reverse order of removal.

6 Number plate light

6.1 Removing number plate light

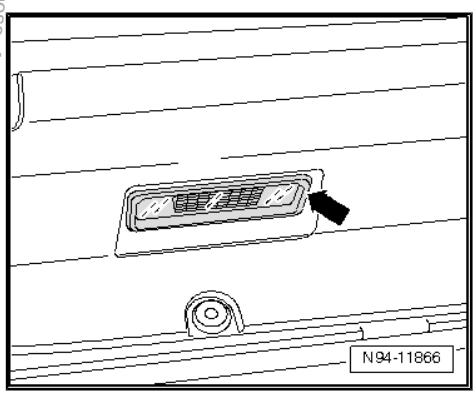
The removal and installation procedure for both number plate lights is carried out in the same way and is only described for one light.

6.1.1 Removing:

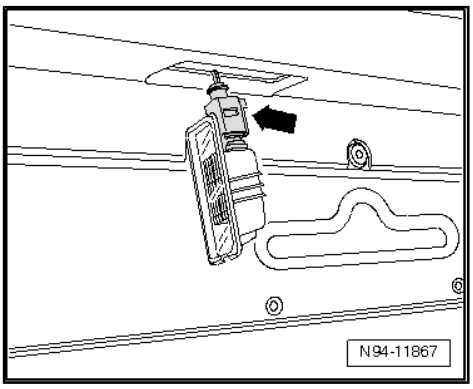
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Lever out number plate light at point market with -arrow-.



– Release connector -arrow- and pull off.



6.1.2 Installing:

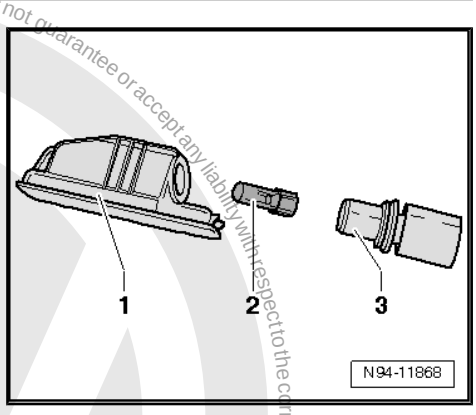
Install in reverse order of removal.

6.2 Renewing bulb of number plate light

6.2.1 Removing:

– Remove number plate light ⇒ page 137 .

– Remove holder -3- together with bulb -2- from number plate light -1-.
– Pull push-fit bulb (12 V/5 W) out of holder (do not turn).



6.2.2 Installing:

Install in reverse order of removal.

7 Additional brake light bulb

7.1 Removing and installing additional brake light bulb

Note

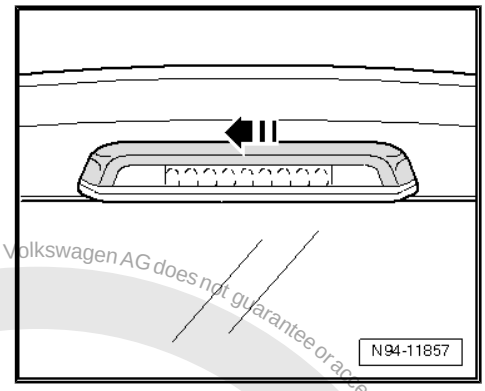
If the brake lighting is defective then the entire light must be renewed. It is not possible to repair light-emitting diodes in interior.

7.1.1 Removing:

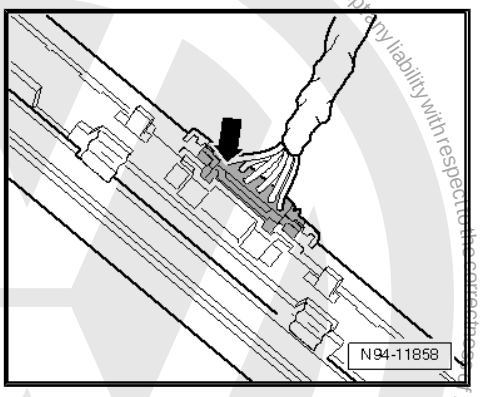
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Push entire light a little in -direction of arrow- and remove light.



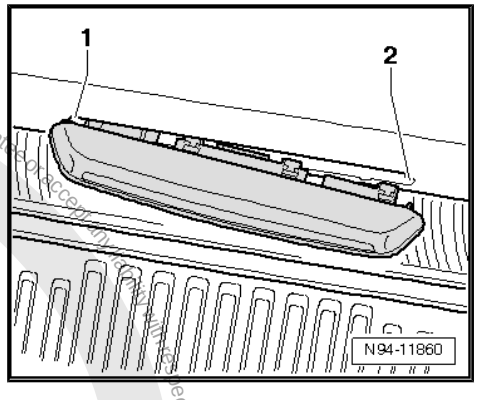
– Disconnect connector -arrow- at light.



7.1.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Insert light in aperture at position -1- and let it clip in at position -2-.



8 Load area illumination bulb

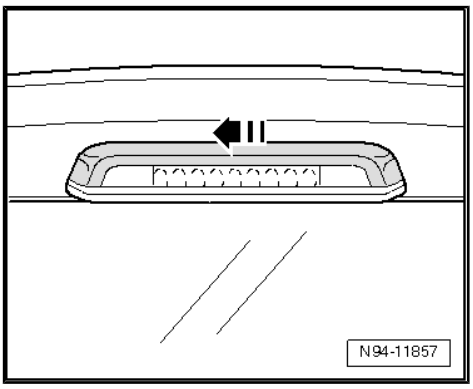
8.1 Removing and installing load area illumination bulb

8.1.1 Removing:

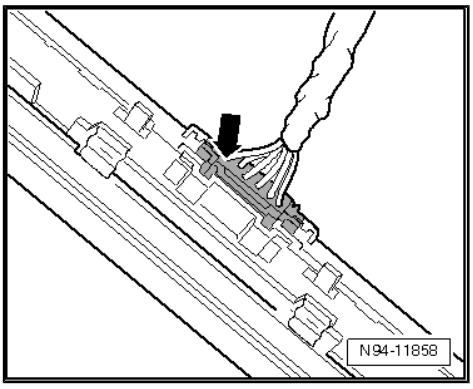
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Push entire light a little in -direction of arrow- and remove light.



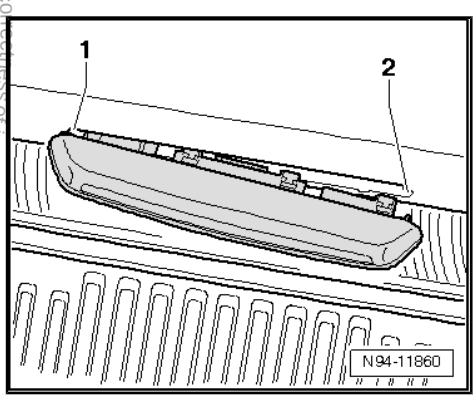
– Disconnect connector -arrow- at light.



8.1.2 Installing:

Installation is carried out in the reverse sequence. Observe the following when doing this:

– Insert light in aperture at position -1- and let it clip in at position -2-.

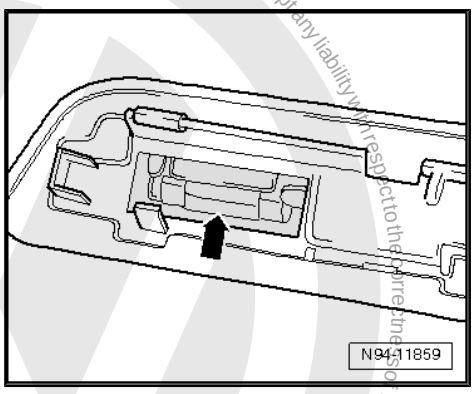


8.2 Renewing load area illumination bulb

8.2.1 Removing:

– Removing load area illumination bulb ⇒ page 141 .

– Unclip bulb -arrow- from light.



8.2.2 Installing:

Installation is carried out in reverse order of removal.

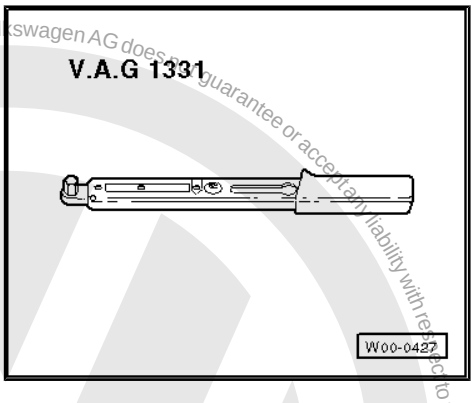
9 Steering column switch

Note

- *The turn signal switch -E2- , the headlight dipper and flasher switch -E4- , the parking light switch -E19- , the intermittent wiper regulator -E38- , the intermittent wipe regulator -E22- , the multifunction display call-up button -E86- and the multifunction display memory switch -E109- are integrated into the steering column switch.*
- *For vehicles equipped with cruise control system, the Cruise control system switch -E45- and the Cruise control system (CCS) SET button -E227- are integrated in the steering column switch.*

Special tools and workshop equipment required

- Torque wrench (5 - 50 Nm) -V.A.G 1331-



9.1 Removing and installing steering column switch

9.1.1 Removing:

Note

- *If the vehicle has a radio with anti-theft coding, obtain code from customer before disconnecting battery.*
- *When the battery is reconnected, check the vehicle ancillaries (radio, clock, convenience electronics, electric window regulators, etc.) in accordance with the workshop manual and/or operating instructions.*
- *Removal and installation of the coil connector with slip ring including steering column switch must be undertaken in the central position (wheels straight ahead).*

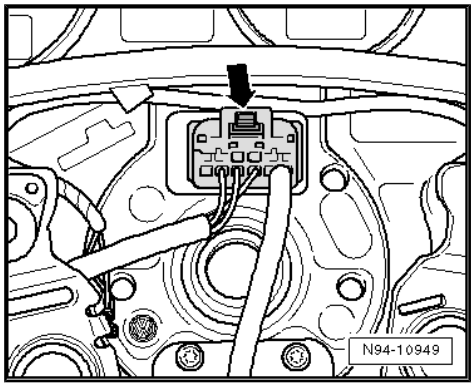
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

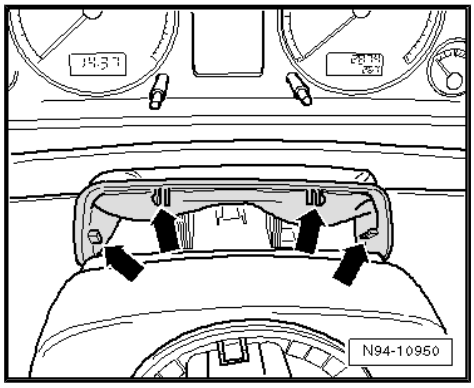
– Disconnect battery ⇒ page 51 .

– Removing steering wheel ⇒ General body repairs, interior; Rep. gr. 69 ; Airbag; Removing and installing steering wheel .

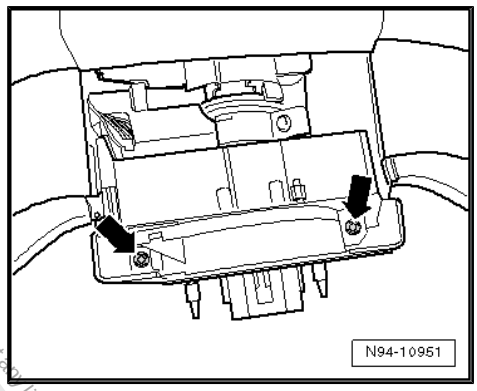
– Unfasten connector catch in -direction of arrow- and pull off connector. Remove steering wheel.



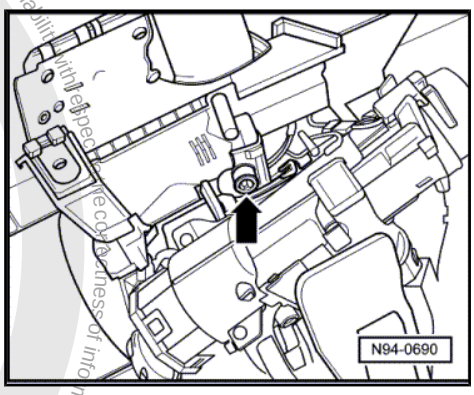
– Unclip cloth trim -arrows- located on top of steering column in front of steering column switch. For reasons of clarity, the illustration shows the trim released.
– Remove upper part of steering column trim.



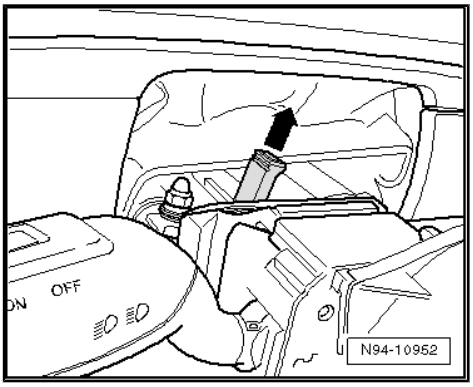
– Unscrew securing bolts on inner side of trim -arrows-.
– Remove lower part of steering column trim.



– Remove clamping bolt -arrow- on steering column switch.



– To release the catch, pull up locking lever on connector on steering column switch in direction of -arrow-.
– Pull steering column switch out of contact connector housings and remove.



Note

The connector catch on the steering column switch runs in a quadrant in the housing. When pulling out the steering column switch, there may be a requirement to pull the locking lever up again to enable the connector to slide easily out of the quadrant.

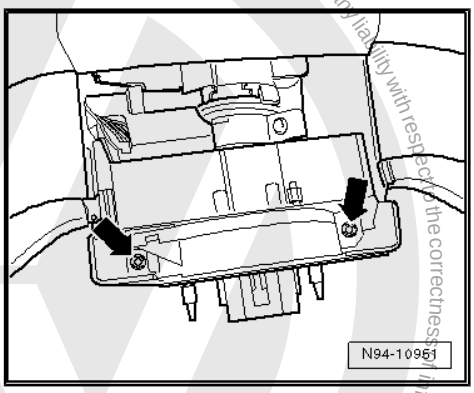
9.1.2 Installing:

Install in reverse order of removal.

Note

When assembling the steering column switch, do not push it completely onto the steering column to avoid cracking sounds when steering.

– Tighten bolts -arrows- inside the trim to a torque of 1.5 Nm.



9.2 Removing and installing airbag coil connector and return ring with slip ring

9.2.1 Removing:

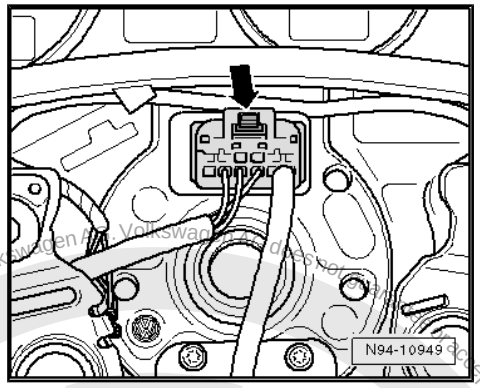
Note

- *If the vehicle has a radio with anti-theft coding, obtain code from customer before disconnecting battery.*
- *When the battery is reconnected, check the vehicle ancillaries (radio, clock, convenience electronics, electric window regulators, etc.) in accordance with the workshop manual and/or operating instructions.*
- *Removal and installation of the coil connector with slip ring including steering column switch must be undertaken in the central position (wheels straight ahead).*

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

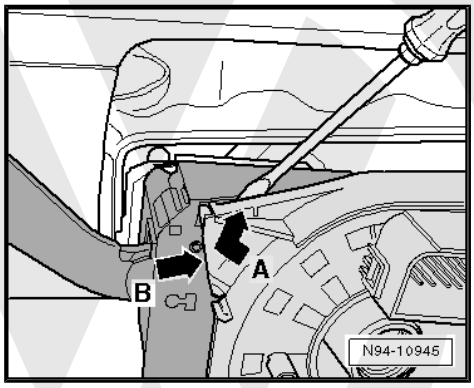
– Removing steering wheel ⇒ General body repairs, interior; Rep. gr. 69 ; Airbag; Removing and installing steering wheel .
– Unfasten connector catch in -direction of arrow- and pull off connector. Remove steering wheel.



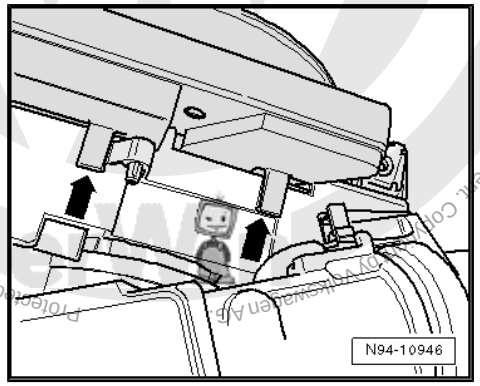
Note

To prevent damage to the coil connector housing, proceed with extreme caution when performing the following procedures.

– At -A-, guide a small screwdriver between coil connector housing and steering column switch. At -B-, press the housing of the coil connector housing upwards slightly until the catch releases (if necessary use a second small screwdriver).

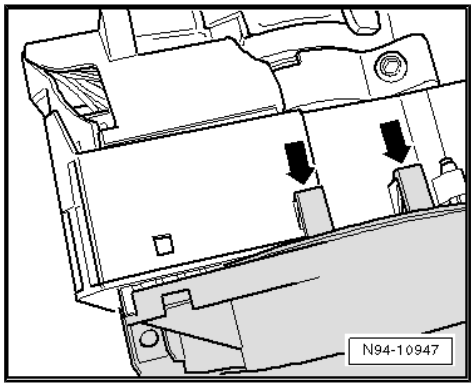


– Release lower clips -arrows- and then hold coil connector housing slightly under tension so that clips cannot engage again.



– Release upper clips -arrows- and then pull coil connector off steering column switch.

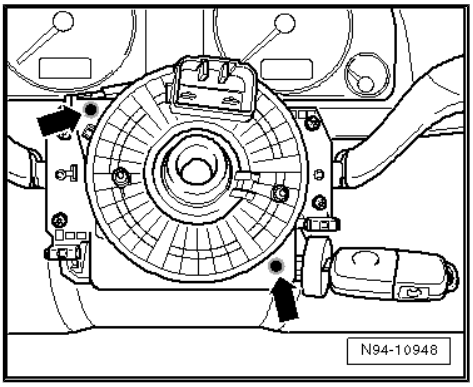
The coil connector is locked by a mechanism to stop it moving when removed. Do not move this mechanism manually otherwise the central position of the coil connector will move.



9.2.2 Installing:

Install in reverse order of removal.

– To engage coil connector, push on coil connector housing at positions marked by the two -arrows-.



10 Lock cylinder

10.1 Removing and installing lock cylinder

10.1.1 Removing:

Note

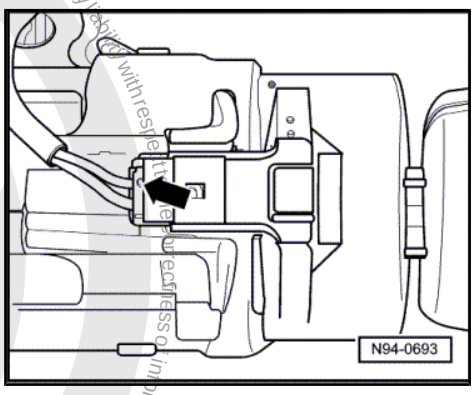
- *If the vehicle has a radio with anti-theft coding, obtain code from customer before disconnecting battery.*
- *When the battery is reconnected, check the vehicle ancillaries (radio, clock, convenience electronics, electric window regulators, etc.) in accordance with the workshop manual and/or operating instructions.*
- *Removal and installation of the coil connector with slip ring including steering column switch must be undertaken in the central position (wheels straight ahead).*

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Remove steering column trim.

– Pull immobiliser reader coil connector -arrow- carefully off lock cylinder.



Note

The immobiliser reading coil is secured to the lock cylinder and cannot be renewed individually.

– Insert ignition key in lock cylinder and turn to position „Drive“.

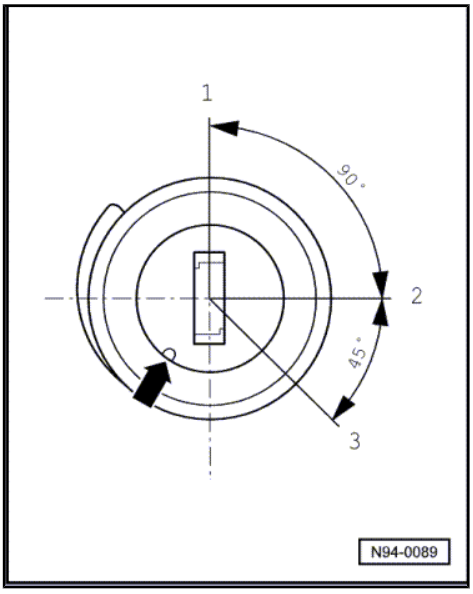
Positions for key in lock cylinder:

1 - Position „Stop“

2 - Position „Drive“

3 - Position „Start“

– Insert a piece of steel wire (approx. ∅ 1.2 mm) in drilling next to ignition key -arrow-.

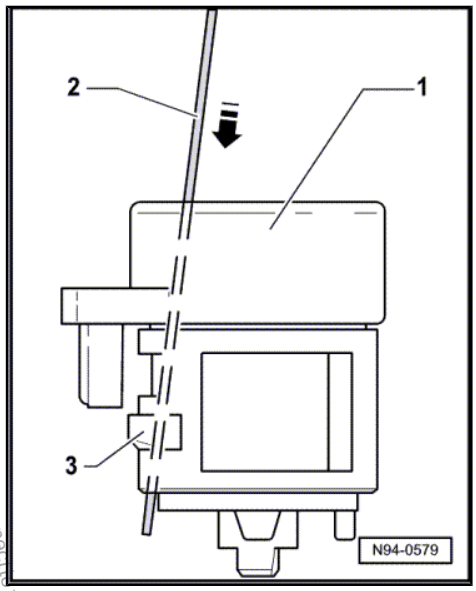


Note

- *In order to insert the steel wire straight into the hole, it may be necessary to dismantle the ignition key and insert key into lock cylinder without key head.*
- *If possible, use the so-called „workshop key“. This has a smaller head and there is no requirement for it to be dismantled.*

– Dismantling ignition key ⇒ General body repairs, exterior; Rep. gr. 57 ; Front door .

– Release lock cylinder securing lever using steel wire -arrow- and remove lock cylinder from steering lock housing.



1 - Lock cylinder

2 - Steel wire (approx. ∅ 1.2 mm)

3 - Securing lever

10.1.2 Installing:

– Insert ignition key in lock cylinder and turn to position „Drive“.

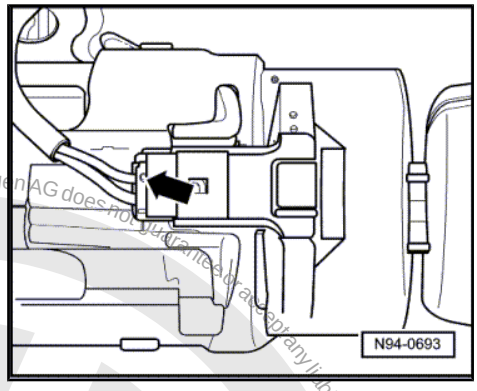
– Release securing lever using a piece of steel wire (approx. ∅ 1.2 mm) and insert lock cylinder in steering lock housing.

Note

When installing lock cylinder, ensure that connection for immobiliser reader coil is in guide of steering lock housing.

– Pull piece of steel wire out of lock cylinder and check that lock cylinder is sitting properly in steering lock housing.

– Connect immobiliser reader coil connector -arrow- to lock cylinder.



11 Ignition/starter switch

11.1 Removing and installing ignition/starter switch

11.1.1 Removing:

Note

- *If the vehicle has a radio with anti-theft coding, obtain code from customer before disconnecting battery.*
- *When the battery is reconnected, check the vehicle ancillaries (radio, clock, convenience electronics, electric window regulators, etc.) in accordance with the workshop manual and/or operating instructions.*
- *Removal and installation of the coil connector with slip ring including steering column switch must be undertaken in the central position (wheels straight ahead).*

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Disconnect battery ⇒ page 51 .

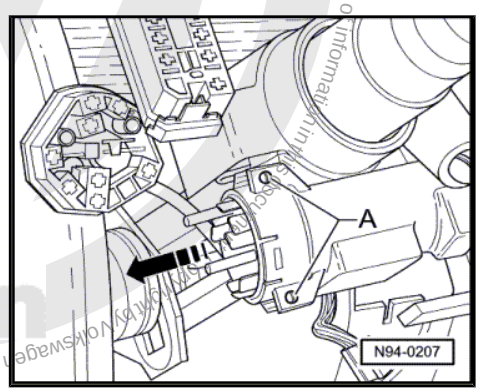
– Remove steering column trim.

– Pull multi-pin connector off ignition/starter switch.

For purposes of clarity, the following graphic shows removal of the ignition/starter switch without steering wheel and steering column switch.

– Remove anti-tamper paint from securing screws -A-.

– Loosen securing bolts -A- slightly and pull ignition/starter switch out from steering lock housing in -direction of arrow-.



11.1.2 Installing:

– Push ignition switch into steering lock housing.

Note

When installing the ignition/starter switch ensure that the ignition/starter switch and the lock cylinder are in the same position, e.g. „ignition on“.

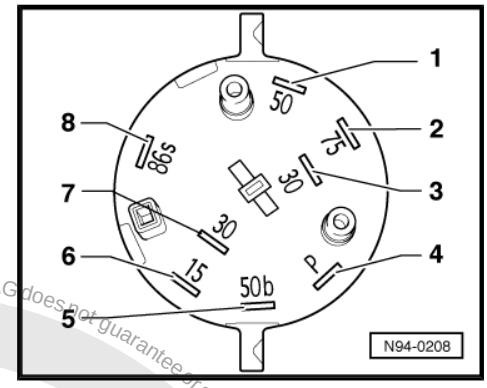
– Tighten securing screws and seal with anti-tamper paint.

– Connect multi-pin connector to ignition/starter switch.
– Install steering column trim.

11.1.3 Pin assignment for ignition/starter switch -D-

Connector, 8-pin

1 - Terminal 50
2 - Terminal 75
3 - Terminal 30
4 - Terminal P
5 - Terminal 50b
6 - Terminal 15
7 - Terminal 30
8 - Terminal 86s



12 Steering lock housing

12.1 Removing and installing steering lock housing

12.1.1 Removing:

Note

- *If the vehicle has a radio with anti-theft coding, obtain code from customer before disconnecting battery.*
- *When the battery is reconnected, check the vehicle ancillaries (radio, clock, convenience electronics, electric window regulators, etc.) in accordance with the workshop manual and/or operating instructions.*
- *Removal and installation of the coil connector with slip ring including steering column switch must be undertaken in the central position (wheels straight ahead).*

Carry out the following work:

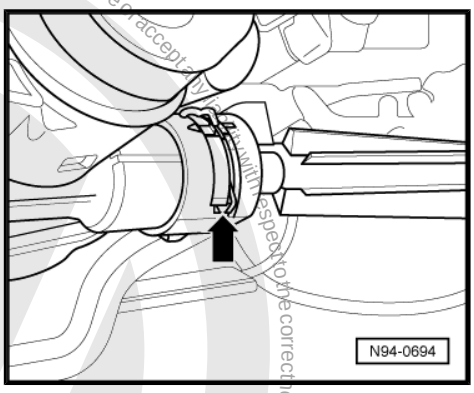
– Switch off ignition and all electrical loads, and pull out ignition key.

– Disconnect battery ⇒ page 51 .

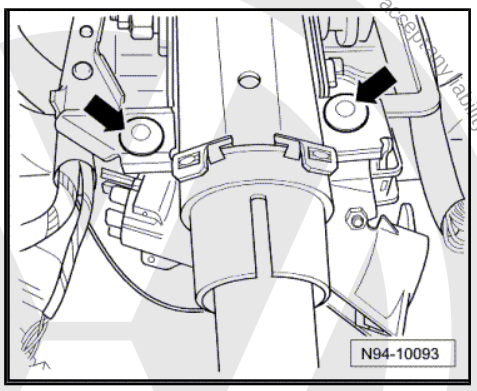
Vehicles with automatic gearbox:

– Unclip clip -arrow- and disconnect locking cable.

Continuation for all vehicles:



– Drill out shear-head bolts -arrows-.



WARNING

Danger of eye injury from drillings.

When drilling out, drillings may fly off which may cause eye injury.

Wear safety goggles.

– Remove steering lock housing.

If steering lock housing is to be renewed, further steps may be necessary:

– Removing and installing lock cylinder ⇒ page 148 .

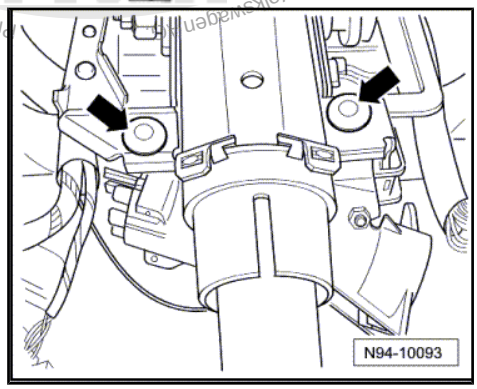
– Removing and installing ignition switch ⇒ page 151 .

12.1.2 Installing:

– Install steering column switch ⇒ page 145 .

– Position steering lock housing on steering column and start screws.

– Tighten shear-head bolts -arrows- for steering lock housing until heads shear off.



Note

Always use new shear-head bolts.

13 12 V socket

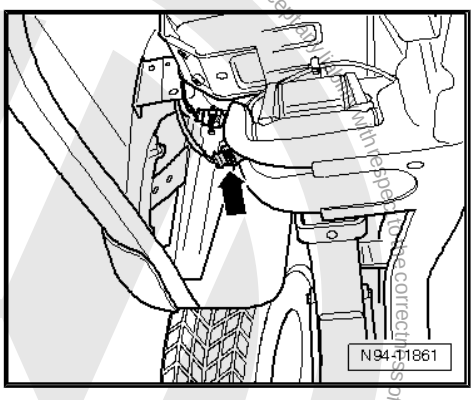
13.1 Removing and installing 12 V socket on load area

13.1.1 Removing:

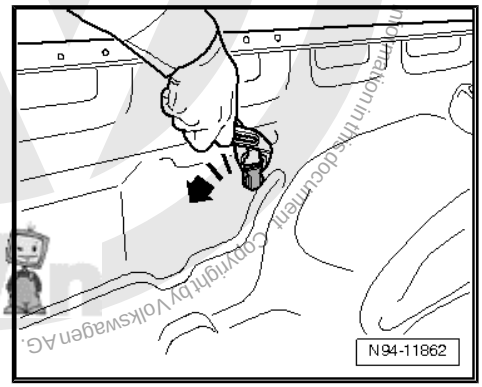
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

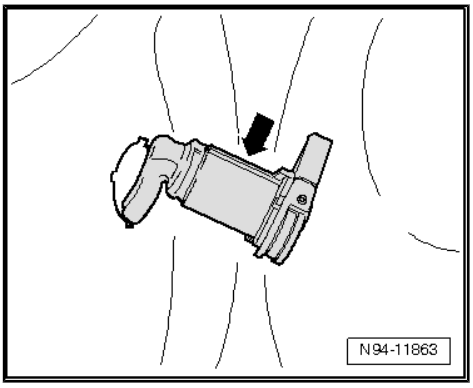
– Disconnect connector -arrow- under vehicle.



– Using pliers, carefully turn electric socket approx. 45° in -direction of arrow-.



– Remove electric socket -arrow- and guide wiring connector outwards through hole in body.



13.1.2 Installing:

Install in reverse order of removal.

96 – Lights, bulbs, switches - interior

1 Switch in dash panel

1.1 Removing and installing light switch

1.1.1 Removing:

Carry out the following work:

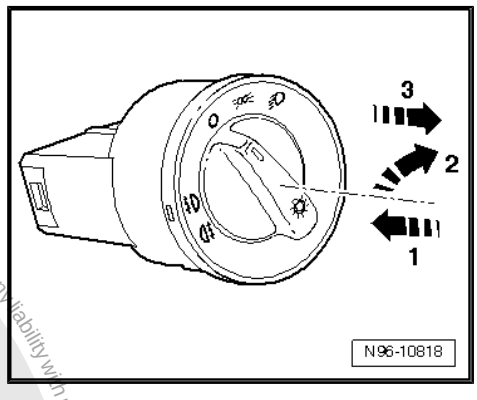
– Switch off ignition and all electrical loads, and pull out ignition key.

– Turn rotary position indicator of light switch to position '0'.

– Press rotary position indicator of light switch -1- and turn slightly to right -2-.

– Hold rotary grip in this position and pull light switch out of dash panel using rotary grip -3-.

– Release connector and pull off.



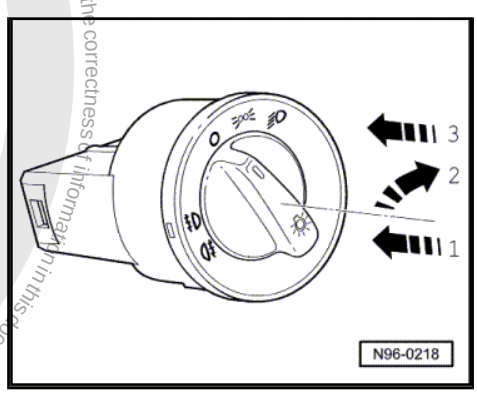
1.1.2 Installing:

– Connect light switch connector.

– Hold light switch stationary. Press rotary position indicator of light switch -1- and turn slightly to right -2-.

– Hold rotary grip in this position and insert light switch in dash panel -3-.

– Turn grip to position '0', release and engage switch.



1.2 Removing and installing headlight range control regulator with switches and instruments illumination regulator

Whether headlight range control regulator is fitted or not depends on equipment and/or country.

1.2.1 Removing:

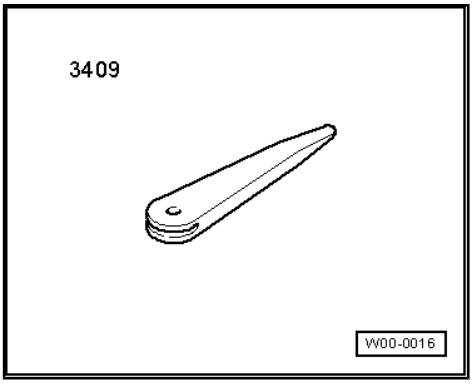
Required special tools, testers, measuring instruments and auxiliary items

- Removal wedge -3409-

Carry out the following work:

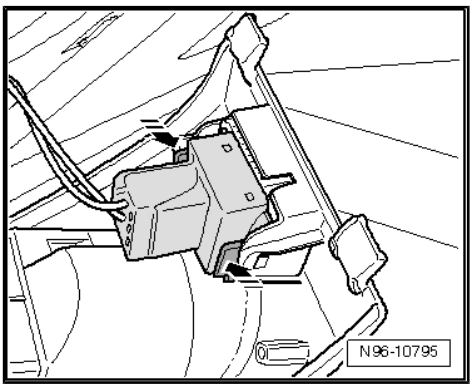
– Switch off ignition and all electrical loads, and pull out ignition key.

– Unclip lateral cover from dash panel on left.

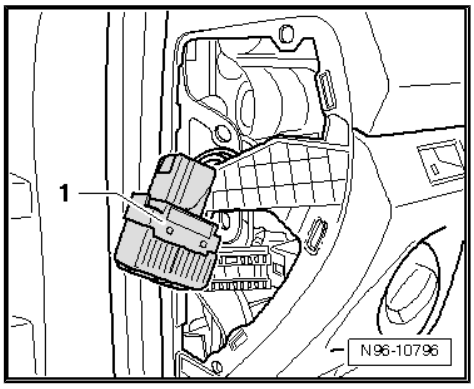


– Press both retaining tabs -arrows- and remove headlight range control regulator inwards.

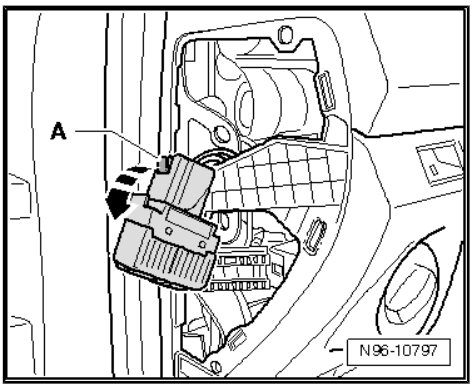
For greater clarity, headlight range control regulator is shown in illustration with trim removed.



– Remove headlight range control regulator -1- sideways out of dash panel.



– Open connector catch -arrow- and pull off connector.



1.2.2 Installing:

Install in reverse order of removal.

1.3 Removing and installing switches in centre of dash panel at top

Depending on the equipment variant, the following switches may be fitted in this installation location.

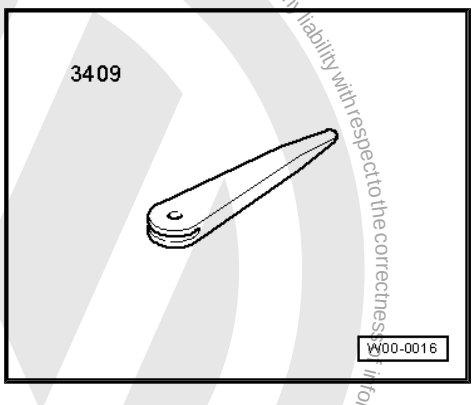
- Hazard warning light switch -E3-
- Front passenger side airbag deactivated warning lamp -K145-
- Load area illumination switch -E481-
- Heated rear window switch -E15- , only fitted in vehicles without Climatronic

Perform installation and removal in same way for all switches.

1.3.1 Removing:

Required special tools, testers, measuring instruments and auxiliary items

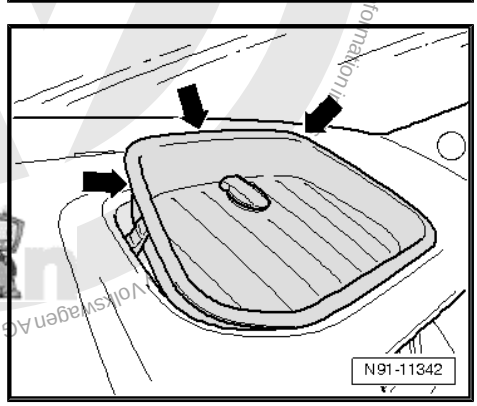
- Removal wedge -3409-



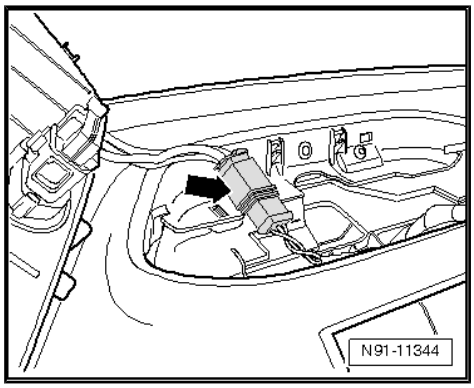
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

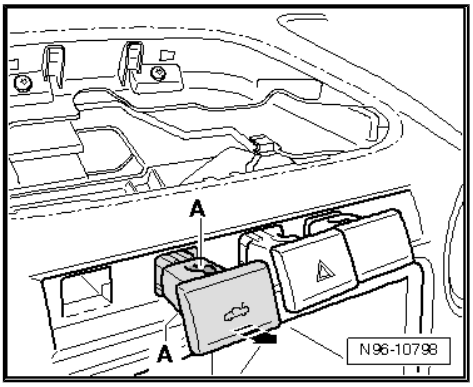
– Unclip compartment in middle on dash panel at points marked with -arrows-.



– Disconnect connector -arrow-.



– Press both detent clips -A- and push switch out forwards in -direction of arrow-.
– Disconnect connector on switch.



1.3.2 Installing:

Install in reverse order of removal.

Connectors for switches are colour-coded.

1.4 Removing and installing switches in centre of dash panel at bottom

Depending on the equipment variant, the following switches may be fitted in this installation location.

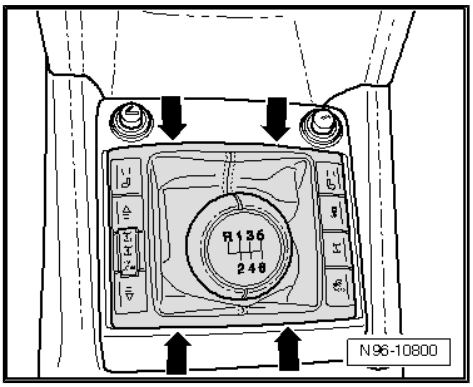
- Heated driver seat regulator -E94-
- Heated front passenger seat regulator -E95-
- Differential lock switch -E121-
- TCS and ESP button -E256-
- Driving program button -E598-
- Running gear program switch -E631- T
- Display unit -K40-
- Running gear program switch -E631-

Perform installation and removal in same way for all switches.

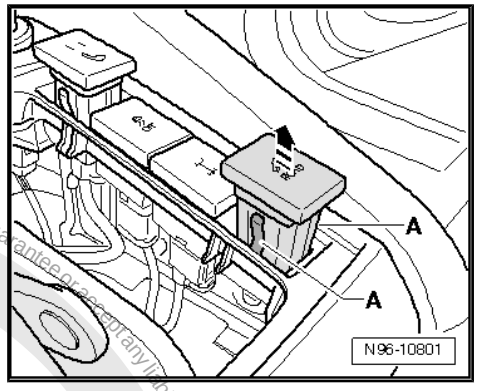
1.4.1 Removing:

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.
– Unclip selector lever cuff with trim at points marked with -arrows-.



– Press both detent clips -A- and push switch out upwards in -direction of arrow-.



1.4.2 Installing:

Install in reverse order of removal.

Connectors for switches are colour-coded.

2 Switches in the doors

2.1 Removing and installing window regulator switches in driver door

Caution

When removing and installing components that are visible in the interior (switches, covers, trims, etc.), mask the areas where levering tools (plastic wedge, screwdriver) are to be applied using adhesive tape.

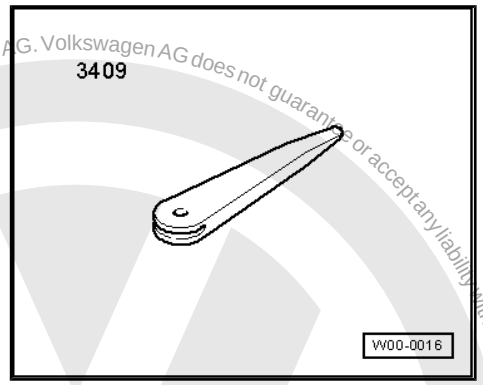
2.1.1 Removing:

Required special tools, testers, measuring instruments and auxiliary items

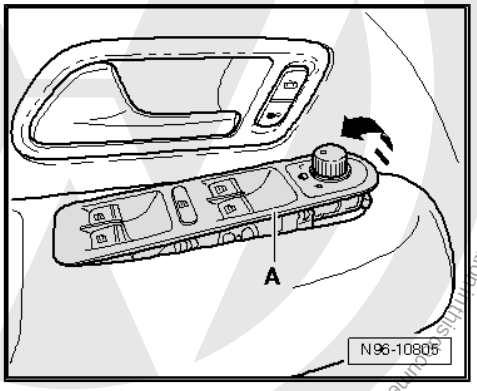
- Removal wedge -3409-

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

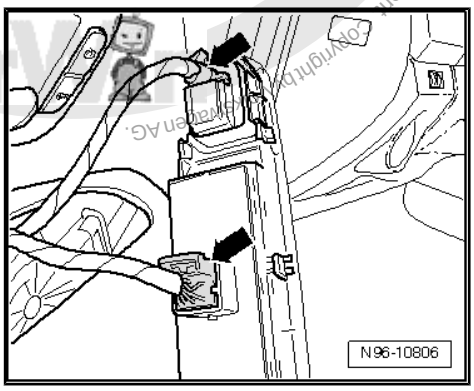


– Carefully lever out installation frame of switches at position -A- in -direction of arrow-.



– Release connectors -arrows- from mounting frame and pull off.

– Unclip mirror adjustment switch from mounting frame.



2.1.2 Installing:

Install in reverse order of removal.

2.2 Removing and installing electric window switches in front passenger and rear doors

Caution

When removing and installing components that are visible in the interior (switches, covers, trims, etc.), mask the areas where levering tools (plastic wedge, screwdriver) are to be applied using adhesive tape.

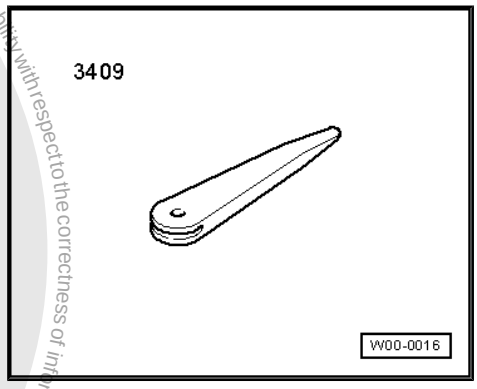
2.2.1 Removing:

Required special tools, testers, measuring instruments and auxiliary items

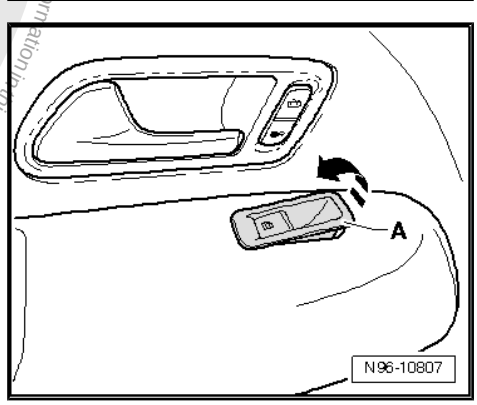
- Removal wedge -3409-

Carry out the following work:

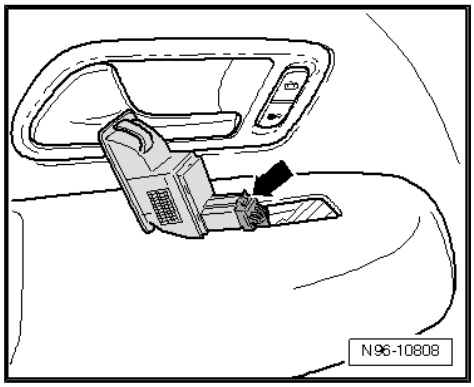
– Switch off ignition and all electrical loads, and pull out ignition key.



– Carefully lever out switches at position -A- in -direction of arrow-.



– Release connector -arrow- from switch and pull off.



2.2.2 Installing:

Install in reverse order of removal.

2.3 Removing and installing mirror adjuster switch

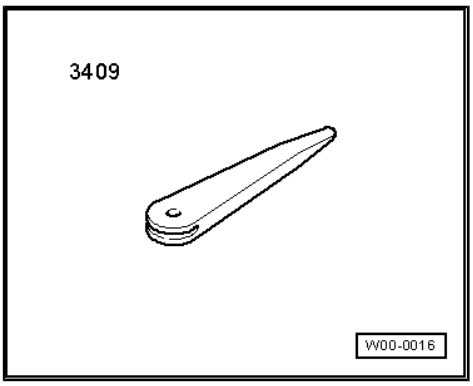
2.3.1 Removing:

Required special tools, testers, measuring instruments and auxiliary items

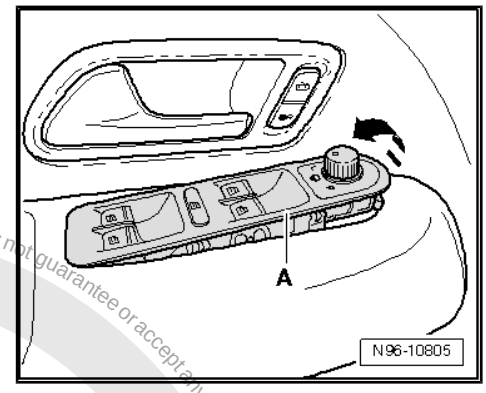
- Removal wedge -3409-

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

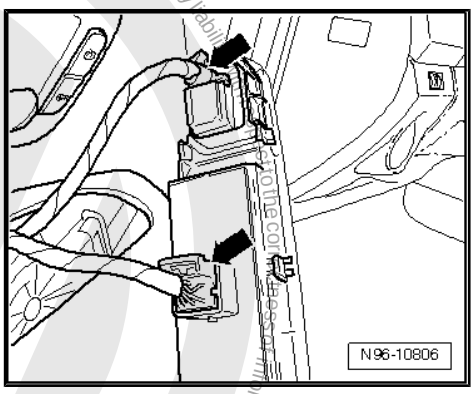


– Carefully lever out installation frame of switches at position -A- in -direction of arrow-.



– Release connectors -arrows- from mounting frame and pull off.

– Unclip mirror adjustment switch from mounting frame.



2.3.2 Installing:

Install in reverse order of removal.

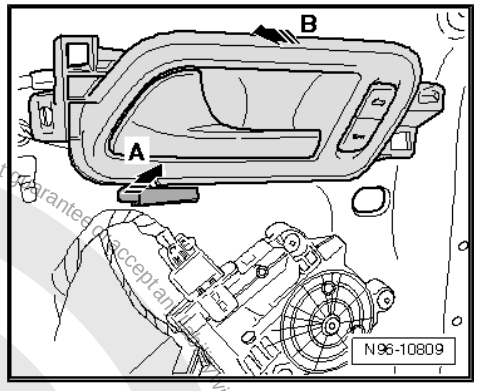
2.4 Removing and installing driver side interior locking button for central locking system

2.4.1 Removing:

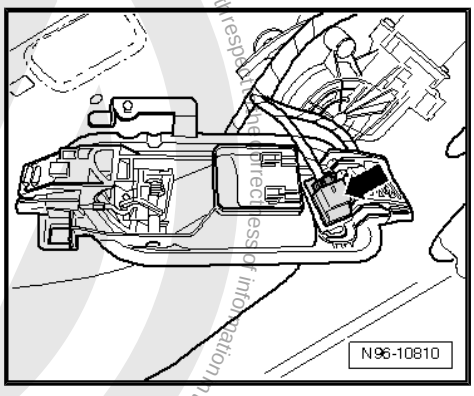
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

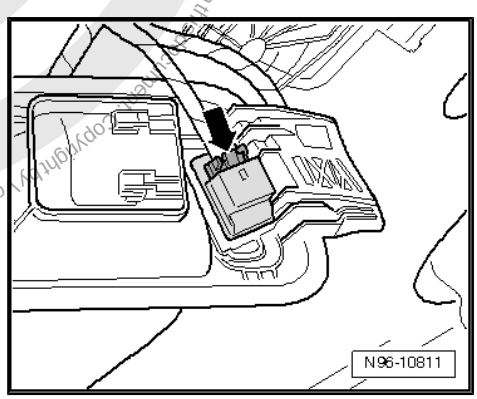
– Move locking lever in -direction of arrow A- whilst pushing door opener handle in -direction of arrow B-.
– Remove door opener handle.



– Unclip interior locking button for central locking system -arrow- from mounting frame of door opener handle.



– Release connector -arrow- from interior locking button for central locking system and pull off.



2.4.2 Installing:

Install in reverse order of removal.

3 Lights and switches in roof trim

3.1 Removing and installing front interior light

3.1.1 Removing:

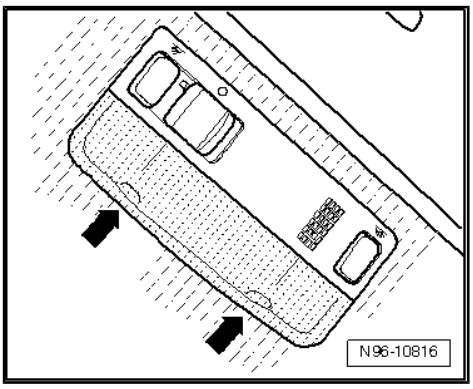
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Unclip lens cover at points marked with -arrows-.

– Remove both screws from interior light and remote interior light.

– Unlock connector on interior light and disconnect.



3.1.2 Installing:

Install in reverse order of removal.

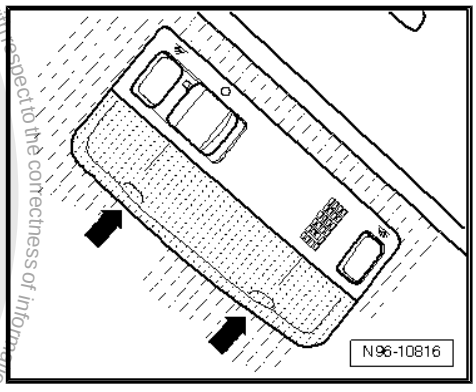
3.1.3 Renewing bulb in front interior light

Removing:

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

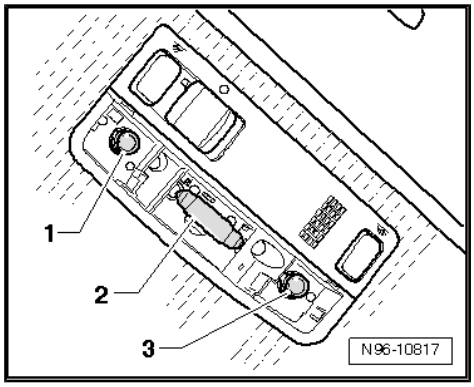
– Unclip lens cover at points marked with -arrows-.



– Inspect bulb -1-, -2- or -3-, remove and renew.

Installing:

Install in reverse order of removal.



3.2 Removing and installing centre interior light

3.2.1 Removing:

Required special tools, testers, measuring instruments and auxiliary items

- Removal wedge -3409-

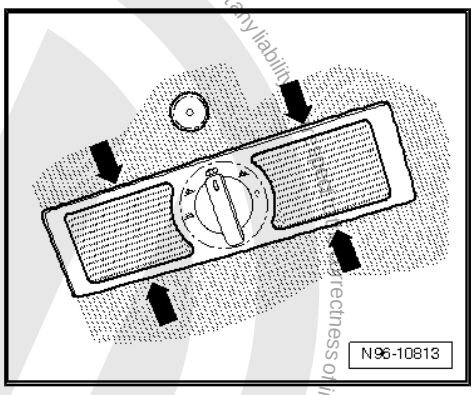
> **Caution**
>
> *When removing and installing components that are visible in the interior (switches, covers, trims, etc.), mask the areas where levering tools (plastic wedge, screwdriver) are to be applied using adhesive tape.*

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Unclip interior light at points marked with -arrows-.

– Unlock connector on interior light and disconnect.



3.2.2 Installing:

Install in reverse order of removal.

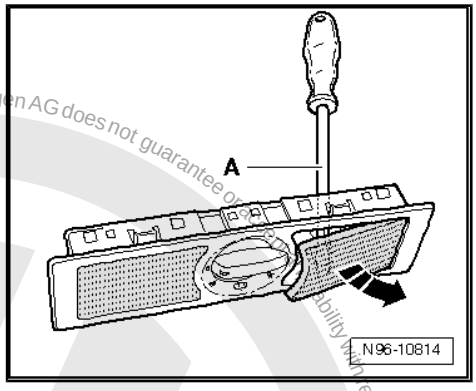
3.2.3 Renewing bulb in centre interior light

Removing:

Carry out the following work:

– Remove centre interior light ⇒ page 166.

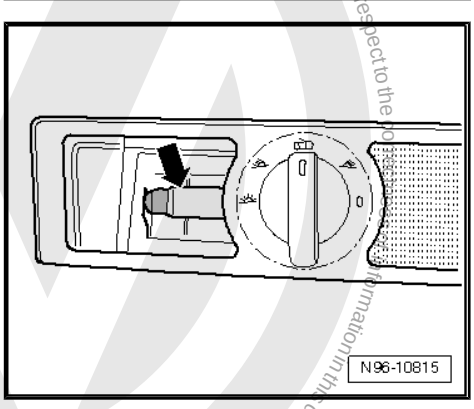
– Pass a screwdriver -A- from rear through interior light and press out lens cover in -direction of arrow-.



– Remove bulb -arrow- from centre interior light.

Installing:

Install in reverse order of removal.



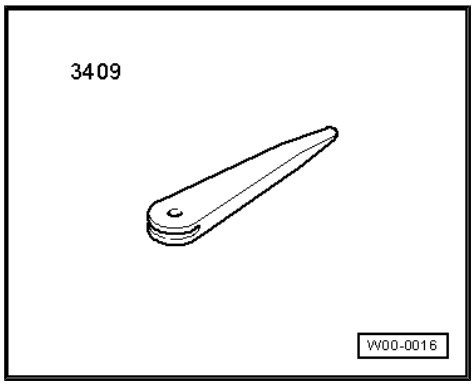
4 Cigarette lighter and 12 V sockets

4.1 Removing and installing 12 V socket in centre dash panel

4.1.1 Removing:

Required special tools, testers, measuring instruments and auxiliary items

- Removal wedge -3409-

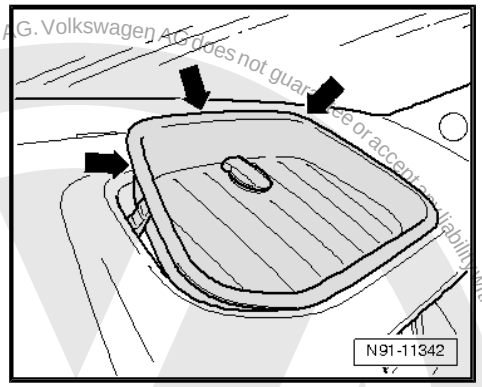


> **Caution**
>
> *When removing and installing components that are visible in the interior (switches, covers, trims, etc.), mask the areas where levering tools (plastic wedge, screwdriver) are to be applied using adhesive tape.*

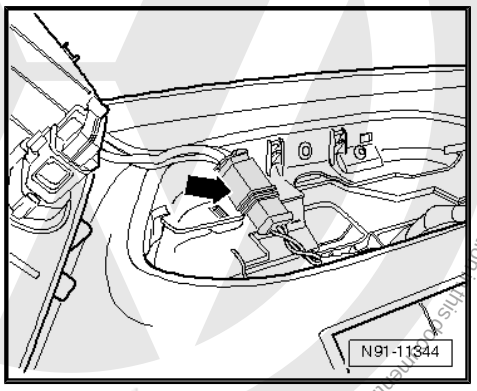
Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

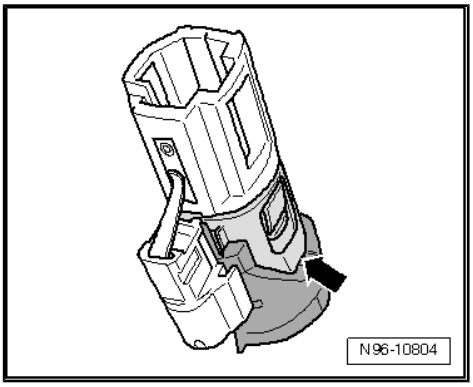
– Unclip compartment in middle on dash panel at points marked with -arrows-.



– Disconnect connector -arrow-.



– Use a small screwdriver to press against point marked with -arrow- in between frame and electric socket. Then push electric socket out of frame. If necessary, also use small screwdriver to press against opposite side of electric socket in between frame and electric socket.



4.1.2 Installing:

Install in reverse order of removal.

4.2 Removing and installing 12 V socket or cigarette lighter in centre dash panel at bottom

4.2.1 Removing:

Caution

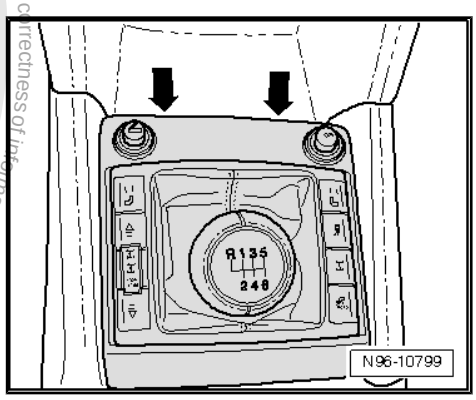
When removing and installing components that are visible in the interior (switches, covers, trims, etc.), mask the areas where levering tools (plastic wedge, screwdriver) are to be applied using adhesive tape.

Carry out the following work:

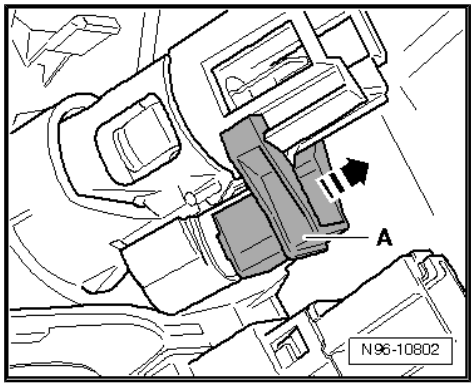
– Switch off ignition and all electrical loads, and pull out ignition key.

– Unclip cover at points marked with -arrows-.

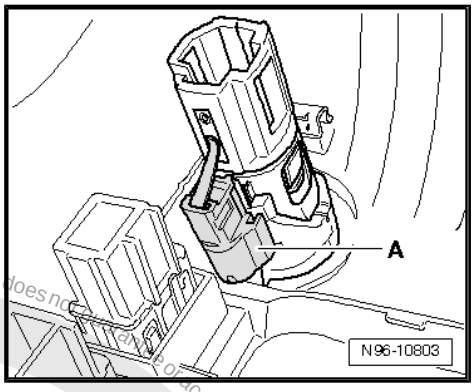
– Unlock and disconnect all connectors from components in the cover.



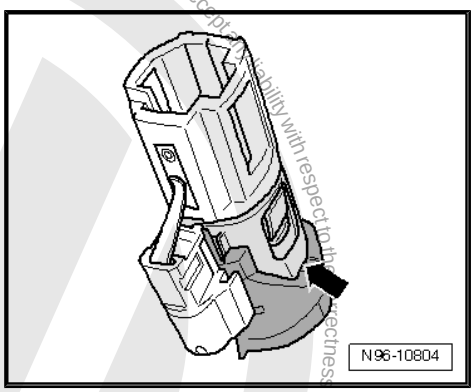
– Pull plastic clip -A- off electric socket in -direction of arrow-.



– Remove bulb carrier -A- from socket.



– Use a small screwdriver to press against point marked with -arrow- in between frame and electric socket, then push electric socket out of frame. If necessary, also use small screwdriver to press against opposite side of electric socket in between frame and electric socket.



4.2.2 Installing:

Install in reverse order of removal.

5 Horn or dual tone horn

Note

Different components may be installed depending on the vehicle equipment level.

5.1 Removing and installing horn or dual tone horn

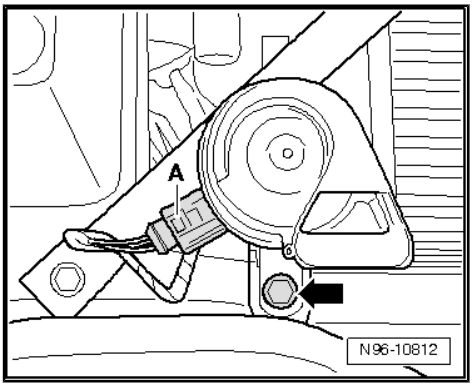
5.1.1 Removing:

Carry out the following work:

– Switch off ignition and all electrical loads, and pull out ignition key.

– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Removing and installing wheel housing liner .

– Remove securing bolt -arrow- from horn, unlock connector -A- and disconnect.



5.1.2 Installing:

Install in reverse order of removal.

6 Anti-theft alarm (ATA)

6.1 General notes

Note

Additional information:

⇒ Operating manual

⇒ Self-study programme No. 423 ; The Golf 2009

The functions of the anti-theft alarm are integrated into the on-board supply control unit -J519- .

After renewal of the onboard supply control unit -J519- , the anti-theft alarm must be adapted ⇒ page 177 .

Fault detection and fault display:

The anti-theft alarm system is equipped with self-diagnosis, which makes fault finding easier.

The anti-theft alarm detects any unauthorised manipulation of the safety circuit and, if necessary, triggers an acoustic alarm via the intelligent siren (alarm horn). If disconnection of the vehicle battery from the onboard power supply system did not cause the alarm, an optical alarm via the flasher switch is triggered.

The anti-theft alarm is a function of the onboard power supply control unit.

Note

In the case of the Amarok, the anti-theft alarm does not feature infrared monitoring and there is no tilt sensor either.

The safety circuit of the anti-theft alarm system includes the following components:

- ♦ Rotary latches of the driver door and front passenger door; in dual-cab vehicles, also the rotary latches of rear doors.
- ♦ States of the door locks
- ♦ Bonnet contact
- ♦ Coupled trailer
- ♦ Intelligent siren (alarm horn)
- ♦ Terminal 15, immobiliser
- ♦ Onboard supply control unit

Note

- *If the battery in the engine compartment is disconnected whilst the vehicle is locked, or the electric cables are severed, the anti-theft alarm system actuates an acoustic alarm signal.*
- *For additional information refer to the ⇒ operating manual of the vehicle.*
- *For fault finding, use vehicle diagnosis, testing and information system -VAS 5051- in „Guided fault finding“ mode.*
- *The tailboard is not monitored.*

6.2 Functional description of the anti-theft alarm system

Activating the anti-theft alarm system

The following requirements must be met in order to activate the anti-theft alarm system.

- „ATA function active“ has been set
- Terminal 15 and terminal S have been switched off
- Driver door closed

Activation of the anti-theft alarm system is initiated by means of a locking command to the central locking system.

The intelligent siren (alarm horn) receives an activation command and, at the same time, the status of the passive components such as terminal 15, rotary latches, door locks, bonnet contact and trailer is checked by the anti-theft alarm system.

When the activation phase ends, the anti-theft alarm system has been armed, i.e. the intelligent siren (alarm horn) as well as the passive components relevant to safety are integrated into the safety circuit and are monitored.

The following general conditions apply:

- An open door is not integrated into the safety circuit until it is closed.
- An open bonnet is not integrated into the safety circuit until it has been closed for at least 5 seconds.
- An attached trailer, the intelligent siren (alarm horn) and the onboard supply control unit are monitored immediately after the end of the activation phase.

Triggering of the anti-theft alarm system is suppressed for a lead time of 30 seconds.

Deactivating the anti-theft alarm system

The anti-theft alarm system can be deactivated in the following ways:

- Opening command for the central locking system by means of remote control with an authorised key.
- Switch-on of terminal 15 with an authorised key.
- Opening command for the central locking system via the lock cylinder of the driver door (this function can be coded).

If an authorised key is not used or detected, the time that passes after activation of the anti-theft alarm system decides on the activation status of the anti-theft alarm system.

The anti-theft alarm system must trigger an alarm 30 seconds after the end of the lead time if terminal 15 was switched on with an unauthorised key during the lead time and is still on after the lead time.

If terminal 15 is switched on more than 30 seconds after activation of the anti-theft alarm system without an authorised key, the anti-theft alarm system remains armed and an alarm is triggered.

The possibility of deactivating the anti-theft alarm system via the lock cylinder of the driver door must have been coded. The behaviour of the anti-theft alarm system is then as follows, depending on the coding „ATA alarm delay if vehicle unlocked via lock key active“:

- If an alarm delay has not been coded, the anti-theft alarm system triggers an alarm unless terminal 15 is switched on with an authorised key within 15 seconds after the driver door has been unlocked.
- If an alarm delay has been coded, the anti-theft alarm system does not trigger an alarm unless terminal 15 is switched on with an authorised key within 15 seconds after the driver door has been opened.

Triggering and emission of alarms

If the anti-theft alarm system has been armed, manipulation of components in the safety circuit leads to immediate triggering of an alarm and thus to emission of an alarm. The alarm is emitted optically via the flashing direction light and acoustically via the intelligent siren (alarm horn).

Intelligent siren (alarm horn)

The intelligent siren (alarm horn) is used for emission of the acoustic anti-theft alarm.

The following conditions lead to triggering of the acoustic intelligent siren (alarm horn):

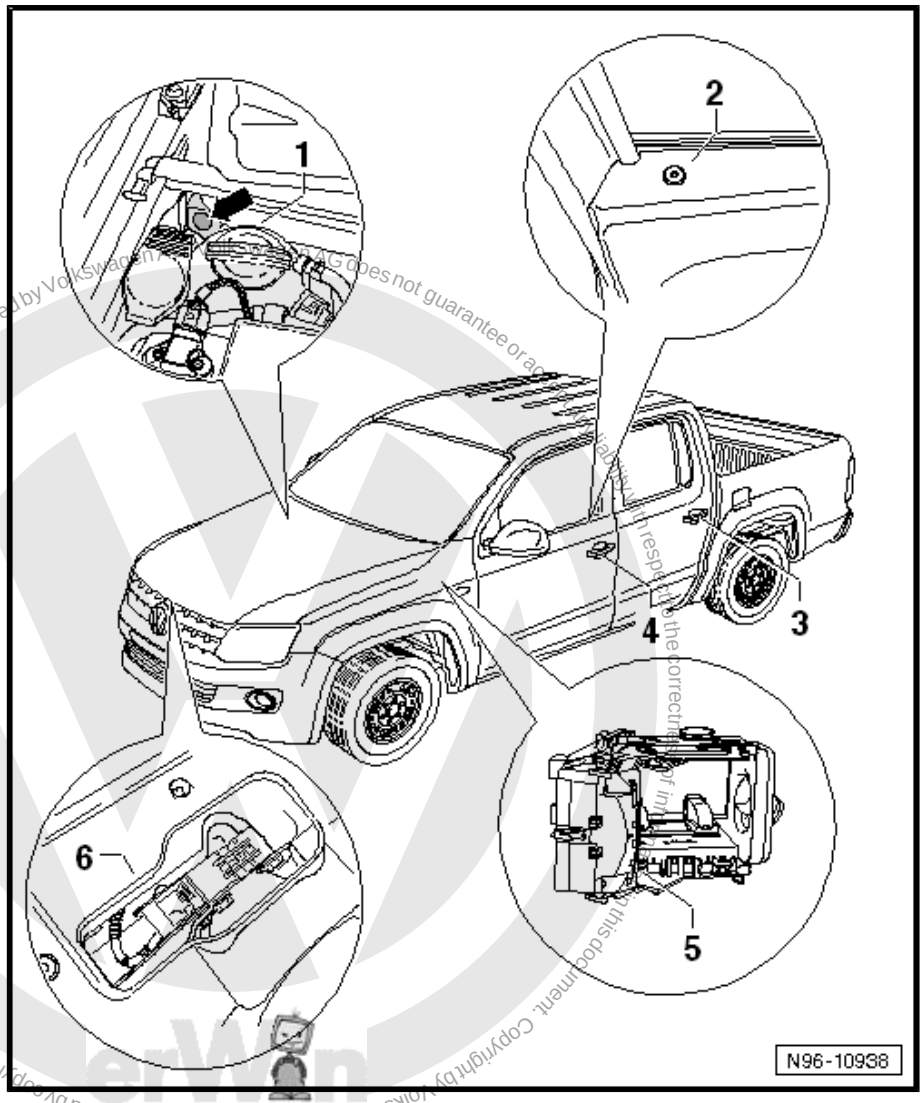
- A corresponding command comes from the onboard power supply control unit
- If the vehicle battery is separated from the intelligent siren (alarm horn) or from the onboard power supply system
- If the ATA LIN bus between the onboard power supply control unit and the intelligent siren (alarm horn) is interrupted

The vehicle battery supplies the power for the intelligent siren (alarm horn). If the connection is interrupted, the intelligent siren (alarm horn) is supplied with voltage via an internal rechargeable NiMH battery.

The following functions can be activated in the intelligent siren (alarm horn):

- Arm
- Disarm
- Alarm emission
- Acknowledgement beep
- Adaptation (setting by means of coding after access-protected login)

6.3 Assembly overview - anti-theft alarm system



1 - Intelligent siren alarm horn -H12-

- ❑ Installed below the plenum chamber on the right-hand side in the engine compartment
- ❑ Removing and installing ⇒ page 175 .

2 - Front passenger door contact switch -F3-

- ❑ In front passenger side central locking lock unit -F221- .
- ❑ Removing and installing door lock ⇒ Rep. gr. 57

3 - Rear right door contact switch -F11-

- ❑ In rear right central locking lock unit -F223- .
- ❑ Removing and installing door lock ⇒ Rep. gr. 58

4 - Rear left door contact switch -F10-

- ❑ In rear left central locking lock unit -F222- .
- ❑ Removing and installing door lock ⇒ Rep. gr. 58

5 - Driver door contact switch -F2-

- ❑ In driver side central locking lock unit -F220- .
- ❑ Removing and installing door lock ⇒ Rep. gr. 57

6 - Central locking deadlock function warning lamp -SAFE- -K133-

- ❑ In front door trim next to locking bar.
- ❑ Removing and installing front door trim ⇒ Rep. gr. 70

7 - Onboard supply control unit -J519-

- ❑ Built into the relay and fuse holder on the left under the dash panel
- ❑ With integrated central locking and anti-theft alarm system aerial -R47-
- ❑ Removing and installing ⇒ page 183 .

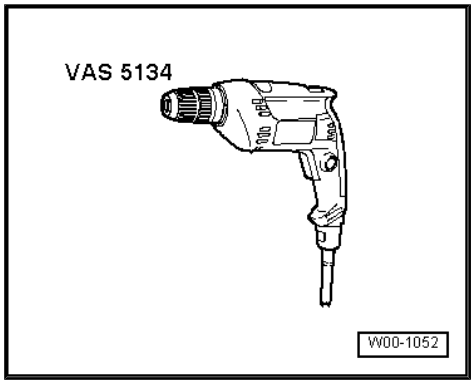
8 - Contact switch for bonnet -F266-

- ❑ In lid lock.
- ❑ Removing and installing ⇒ Rep. gr. 55 .

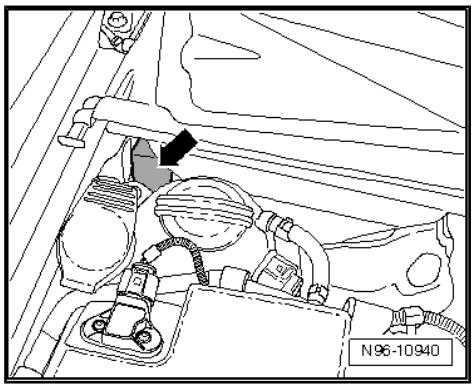
6.4 Removing and installing alarm horn

Special tools and workshop equipment required

- Drill -VAS 5134-



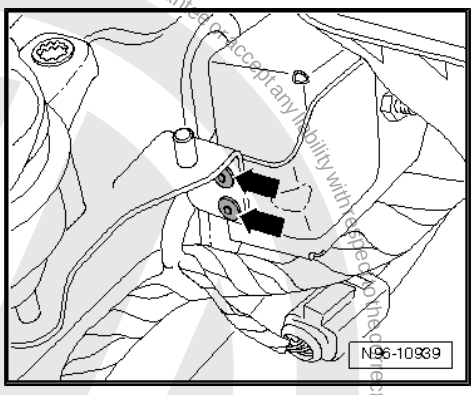
The intelligent siren (alarm horn) -arrow- is below the plenum chamber on the right-hand side in the engine compartment.



6.4.1 Removing:

Carry out the following work:

- In order to deactivate the anti-theft alarm system, unlock the doors with the remote control key.
- Remove the air filter housing on the engine side and place to one side together with the connected wires.
- Remove coolant reservoir and place to one side together with the connected hoses.
- Use drill -VAS 5134- and a drill bit to drill out the heads of both pop rivets -arrows-.
- Release the connector through the opening in the housing with a small screwdriver.
- Remove the remains of the pop rivets.



6.4.2 Installing:

Note

Remove from vehicle all metal swarf and pop rivet residues produced by drilling.

- Perform necessary corrosion protection measures ⇒ Body Repairs; Rep. gr. Allgemeine Hinweise ; Body repairs .

– Connect connector to alarm horn -H12- .

Note

During installation, use appropriate rivets (see Electronic Parts Catalogue).

Further installation is carried out in the reverse order of removal.

– Check and, if necessary, adapt the coding of the anti-theft alarm system ⇒ page 177 .

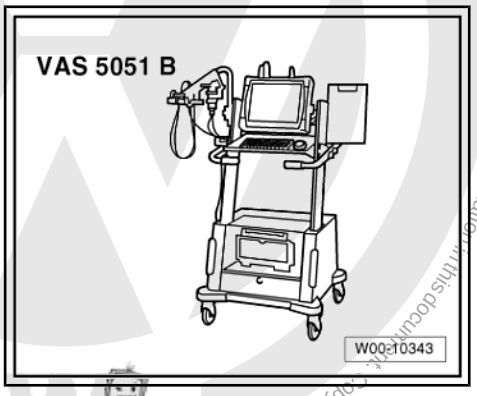
6.4.3 Checking alarm horn -H12-

The alarm horn -H12- can be checked using final control diagnosis for onboard supply control unit -J519- .

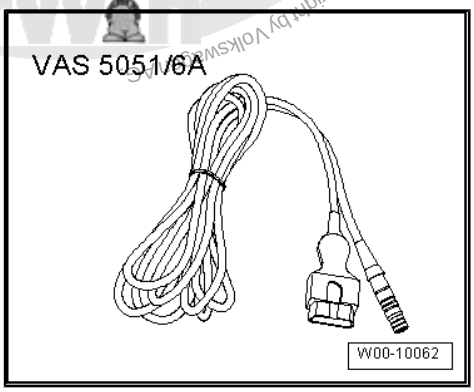
6.5 Adaptations of anti-theft alarm

Special tools and workshop equipment required

♦ Vehicle diagnosis, testing and information system -VAS 5051-



♦ Diagnostic cable -VAS 5051/6A- (5 m)



♦ Diagnostic cable -VAS 5051/5A- (3 m)

– Connect vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179 .

– Select „guided fault finding“ in the vehicle diagnosis, testing and information system -VAS 5051- .

– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

♦ Body

♦ General body repairs

♦ 01 - On Board Diagnostic capable systems

♦ Onboard supply control unit

- Anti-theft alarm (ATA)

6.5.1 Adapting alarm delay on opening driver door

– Connect vehicle diagnosis tester .
– Select „Guided fault finding“ mode in vehicle diagnosis tester .
– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Body
- Electrical system
- 01 - On Board Diagnostic capable systems
- Onboard supply control unit
- Functions
- Adapting alarm delay on opening driver door

6.5.2 Adapting country setting for intelligent alarm horn

– Connect vehicle diagnosis tester .
– Select „Guided fault finding“ mode in vehicle diagnosis tester .
– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Body
- Electrical system
- 01 - On Board Diagnostic capable systems
- Onboard supply control unit
- Functions
- Adapting country setting for intelligent alarm horn

97 – Wiring

1 Vehicle diagnosis, testing and information systems

WARNING

- *During testing or measuring operations using a vehicle diagnosis information system, there is a risk of serious or even fatal injury!*
- *If the vehicle diagnosis information system is lodged in the activity area of an airbag during a testing or measuring operation, a triggered airbag can result in serious or even fatal injury!*
- *During testing and measuring operations, work with a second person who can operate the vehicle diagnosis and information system from one of the back seats.*

Note

- *All the procedures described, e.g. adaptation and coding, can be performed using the vehicle diagnosis, testing and information system -VAS 5051- and the vehicle diagnosis and service information system -VAS 5052 A- .*
- *All work procedures can be found in „guided fault finding“ and „guided functions“ modes.*
- *Additional information:*

⇒ Self-study programme No. 202 ; Vehicle diagnosis, testing and information system VAS 5051

⇒ Self-study programme No. 256 ; VAS 5052

⇒ Self-study programme No. 294 ; Online connection of VAS 5051

– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179

– Connecting vehicle diagnosis and service information system -VAS 5052 A- ⇒ page 180 .

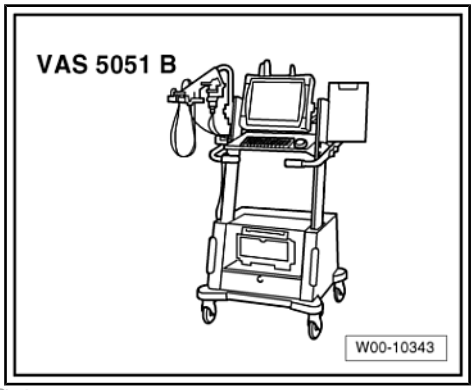
1.1 Connecting vehicle diagnosis, testing and information system -VAS 5051-

Note

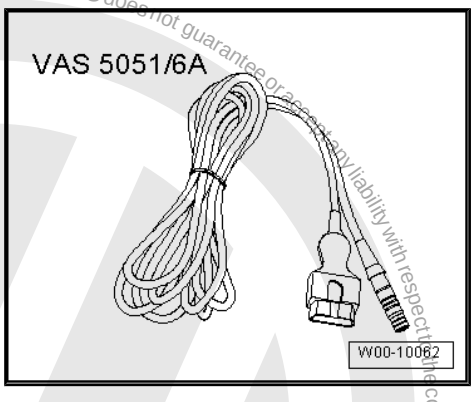
Observe the latest operating instructions for vehicle diagnosis, testing and information system -VAS 5051- , which are displayed after selecting the „Administration“ and „Operating Manual“ keys.

Special tools and workshop equipment required

- Vehicle diagnosis, testing and information system -VAS 5051-



- Diagnostic cable -VAS 5051/6A- (5 m)



- Diagnostic cable -VAS 5051/5A- (3 m)

Note

Only these cables are to be used for diagnosis, as they are the only ones fitted with CAN bus wiring and therefore allowing CAN diagnosis and/or CAN communication.

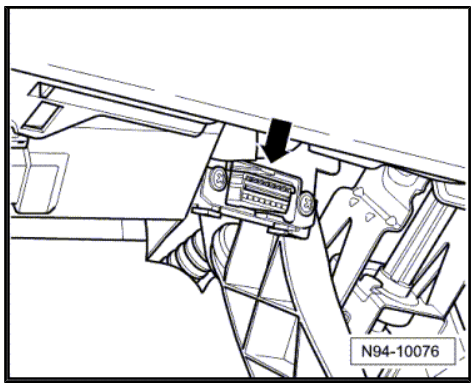
Connecting vehicle diagnosis, testing and information system -VAS 5051- :

– Set handbrake.

– Vehicles with automatic gearbox, move selector lever to position „P“ or „N“.

– Vehicles with manual gearbox, move gear lever to neutral position.

– With the ignition switched off, connect vehicle diagnosis, testing and information system -VAS 5051- using diagnosis cable -VAS 5051/6A- or diagnosis cable -VAS 5051/5A- to diagnostic connection -arrow- in vehicle.



– Switch on ignition.

– Switch off all electrical consumers.

Note

All other and the following vehicle diagnosis, testing and information systems or vehicle diagnosis and service information systems are connected accordingly in the sequence described above.

2 Fuse holder, relay carrier and electronics boxes

Note

To disconnect and connect the battery or batteries, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 .

2.1 Overview of fuse holders and relay carriers

1 - Onboard supply control unit -J519-

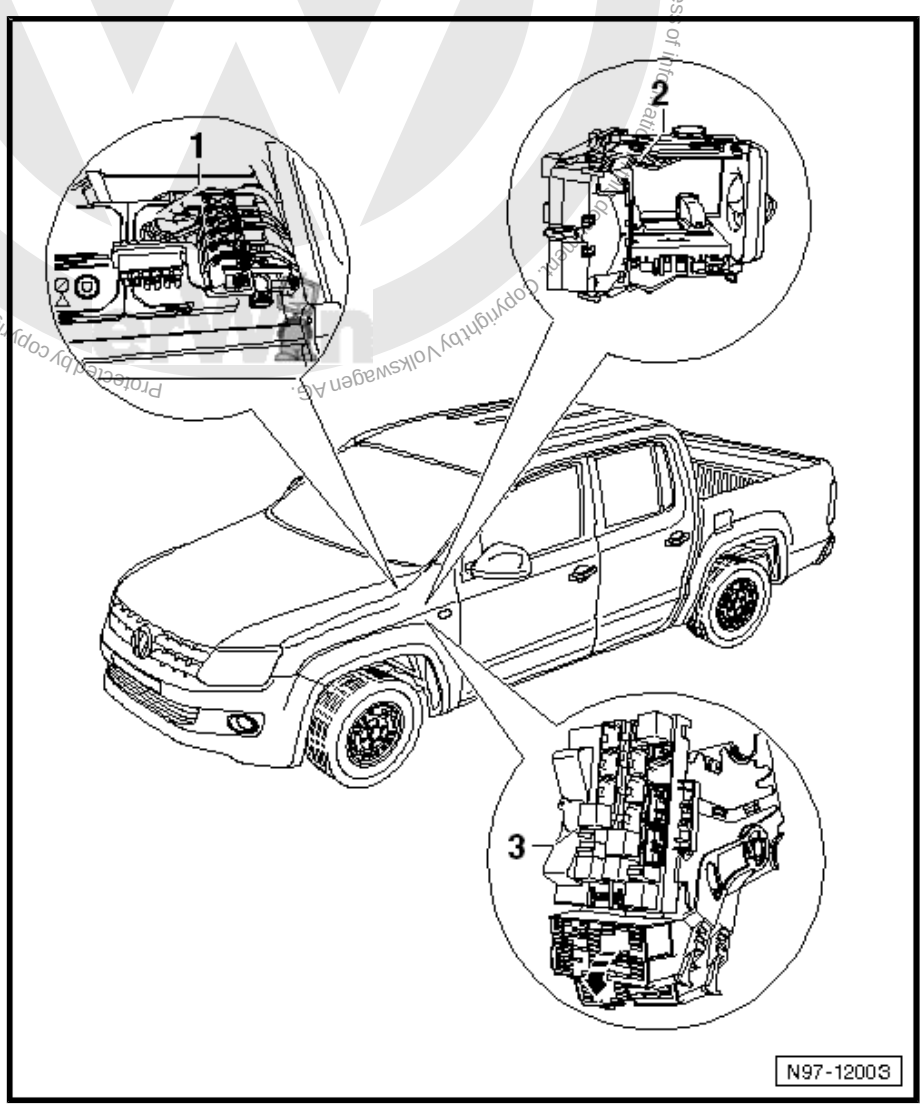
- ❑ Fitted on a bracket on the driver side under the dash panel
- ❑ Removing and installing ⇒ page 183 .

2 - Relay and fuse holder C -SC-

- ❑ Fitted on a bracket on the driver side under the dash panel
- ❑ Removing and installing relay carrier ⇒ page 181
- ❑ Removing and installing fuse holder ⇒ page 182

3 - Fuse holder A -SA-

- ❑ Fitted on left side of battery in engine compartment



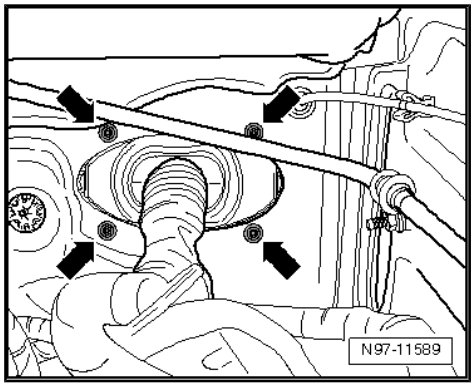
2.2 Removing and installing relay carrier

2.2.1 Removing:

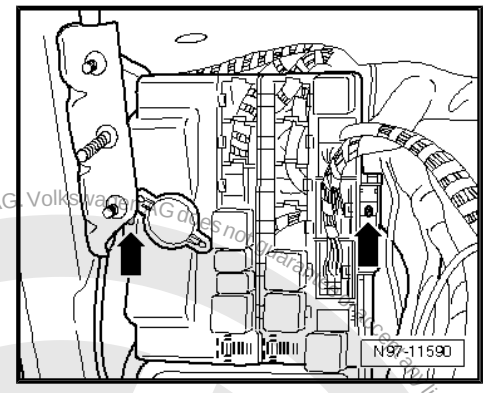
Carry out the following work:

– Remove battery ⇒ page 54 .

– Remove bolts from bulkhead of plenum chamber in engine compartment -arrows-.
– Remove dash panel ⇒ General body repairs, interior; Rep. gr. 70 ; Dash panel .



– Remove bolts from relay carrier -arrows-.
– Remove relay carrier.
– Unlock and disconnect all connectors on relay carrier.



2.2.2 Installing:

Install in reverse order of removal.

2.3 Removing and installing fuse holder

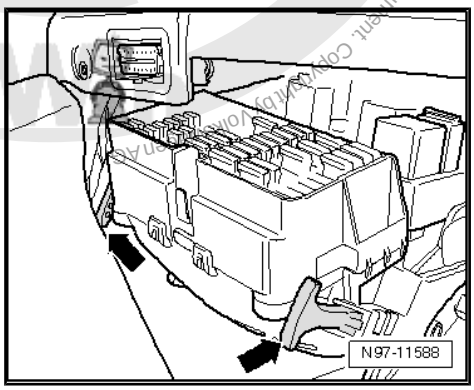
Note

To disconnect and connect the battery or batteries, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 .

2.3.1 Removing:

Carry out the following work:

– Disconnect battery ⇒ page 51 .
– Operate both red levers -arrows- and remove fuse holder.
– Unlock and disconnect all connectors on fuse holder.



2.3.2 Installing:

Install in reverse order of removal.

3 Control units

3.1 Removing and installing onboard supply control unit

3.1.1 Removing:

Note

To disconnect and connect the battery or batteries, the procedure described in the workshop manual should be strictly adhered to ⇒ page 51 .

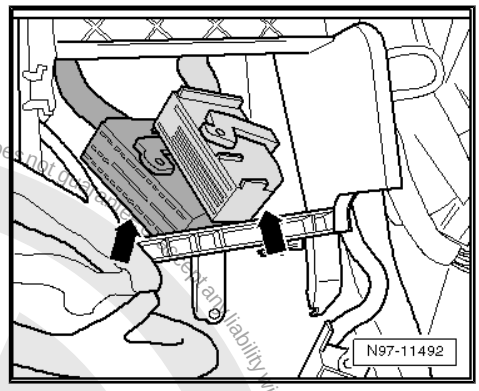
Carry out the following work:

– Disconnect battery ⇒ page 51 .

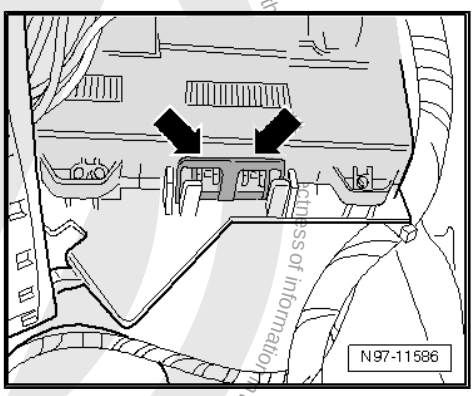
The onboard supply control unit is installed on left under dash panel next to fuse holder.

– Grip behind onboard supply control unit and release both connectors by pressing connector latches from bottom to top.

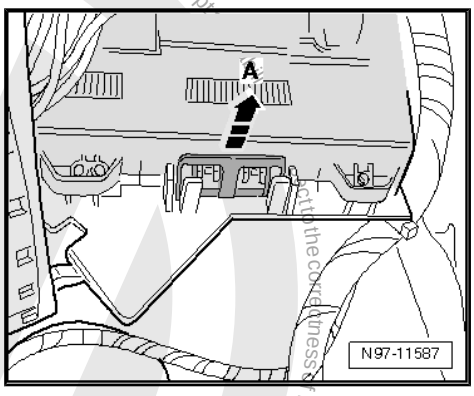
View of both connectors -arrows- with onboard supply control unit removed.



– Push locking lever -arrows- downwards.



– With locking lever pressed, remove onboard supply control unit from bracket in -direction of arrow A-.



3.1.2 Installing:

Installation is carried out in reverse order of removal.

3.1.3 Diagnosis, alignment or coding

– Connecting vehicle diagnosis, testing and information system -VAS 5051- ⇒ page 179

– Select „Guided fault finding“ in vehicle diagnosis, testing and information system -VAS 5051- .

– Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:

- Body
- Electrical system
- 01 - On Board Diagnostic capable systems
- Onboard supply control unit
- Functions of convenience system central control unit

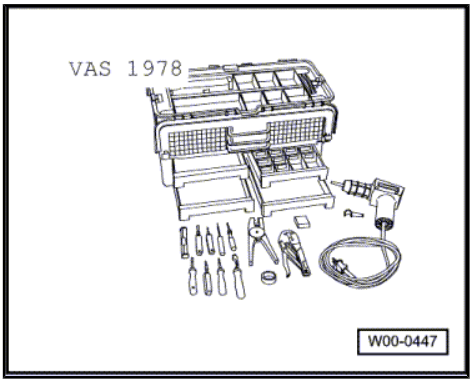
– Select corresponding step on vehicle diagnosis, testing and information system -VAS 5051- .

4 Wiring harness and connector repairs

4.1 Wiring harness repair set

4.1.1 Wiring harness repair set -VAS 1978-

Wiring harness repair set -VAS 1978- allows optimal repair quality to be achieved in the area of vehicle electrics. Using the tools, repairs to connectors and wiring open circuits can be carried out. To do this, complete repair wire sections with contacts already crimped on are used and joined to the vehicle's own wiring harness with the aid of crimp connectors. A special set of pliers with three different crimp recesses and a hot air blower for shrinking the crimp connectors make a perfect electrical connection.



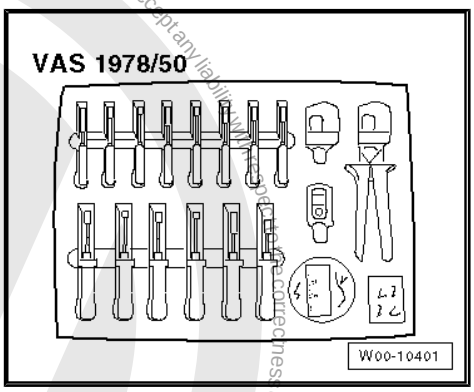
Note

Additional information:

⇒ Operating instructions Wiring harness repair set -VAS 1978-

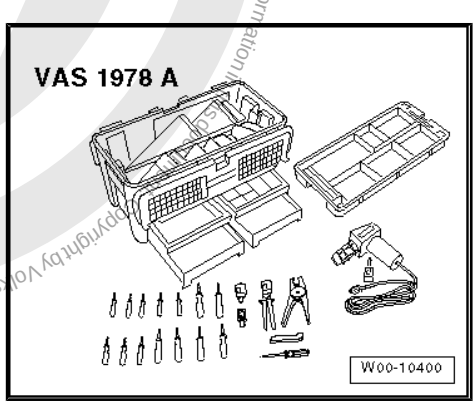
4.1.2 Upgrade kit -VAS 1978/50-

Upgrade kit -VAS 1978/50- is required to bring the „old“ wiring harness repair set -VAS 1978- up to the latest standard of wiring harness repair set -VAS 1978A- . The upgrade kit comprises of 4 assembly and 10 release tools, a new set of crimping pliers for crimp connectors with head adapter 0.35 - 2.5 mm^2 -VAS 1978/1-1- , 4.0 - 6.0 mm^2 -VAS 1978/2 A- and head adapter for JPT contacts -VAS 1978/9-1- . Also included are new stickers, a new set of operating instructions, crimp connectors for 0.35 mm^2 cable cross-section and a roll of black felt adhesive tape.



4.1.3 Wiring harness repair set -VAS 1978A-

The new wiring harness repair set -VAS 1978A- allows optimal repair quality to be achieved in the area of vehicle electrics. Using the new pliers, repairs to connectors and wiring open circuits can be carried out. To do this, complete repair wire sections with contacts already crimped on are used and joined to the vehicle's own wiring harness with the aid of four different types of crimp connectors. A new set of crimping pliers with head adapters and a hot air blower for shrinking the crimp connectors make a perfect electrical connection.



Note

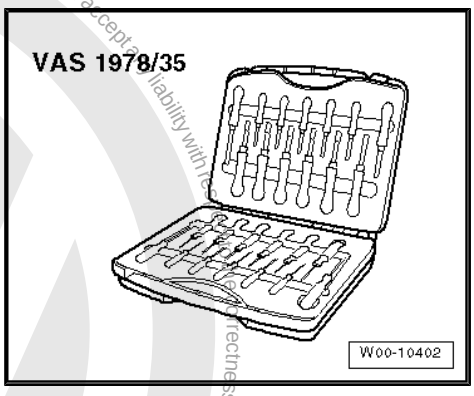
Additional information:

⇒ Operating instructions Wiring harness repair set -VAS 1978A-

4.1.4 Release tool set -VAS 1978/35-

Release tool set -VAS 1978/35- serves as a means of releasing various primary and secondary locking devices in Group vehicles. The set comprises of 26 different tools with which, for example, round connector systems, flat contacts with one or two fasteners and also single wire seals can be released or fitted.

Allocation of the correct release tool to the respective locking devices can be gleaned from the table in the ⇒ operating instructions of -VAS 1978/35- .

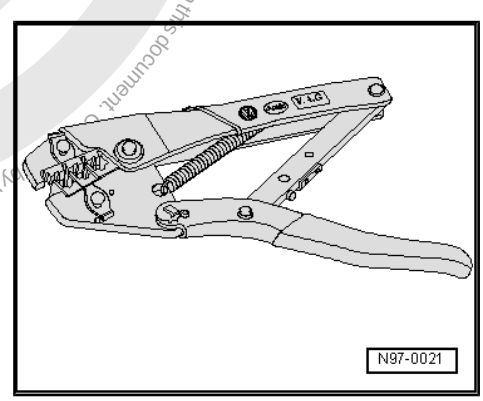


4.2 Tool descriptions

4.2.1 Special pliers with insert

The special pliers without insert -VAS 1978/1- with insert for special pliers -VAS 1978/2- is part of the wiring harness repair set -VAS 1978- and is used to crimp connectors during wiring harness repairs.

Colour of crimp connector	Colour of crimp recess	Wiring 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



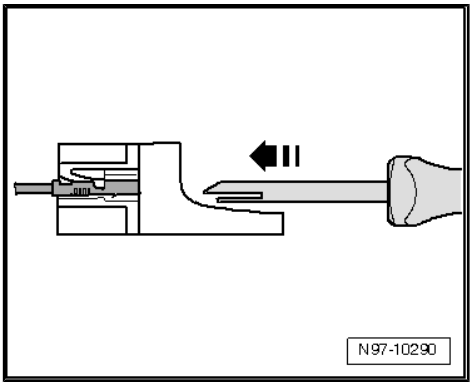
Note

- *As an alternative, the connectors can also be crimped with crimping pliers (base tool) -VAS 1978/1-2- in conjunction with head adapters -VAS 1978/1-1- or -VAS 1978/2A-* *⇒ page 188* .
- *Ensure without fail that the correct crimp recess is chosen for the crimp connectors being used.*
- *The insulation on the wires must not be crimped.*

4.2.2 Release tools for contacts

The various release tools serve as a means of detaching the different contacts from the connector housings without damage.

A selection of release tools is included in wiring harness repair set -VAS 1978- and wiring harness repair set -VAS 1978A- . The complete set of release tools is included in release tool set -VAS 1978/35- ⇒ page 186 .



WARNING

Some tools are equipped with a tool safety device. This must be pushed over the tip of the tool after use in order to protect the tip and prevent personal injury.

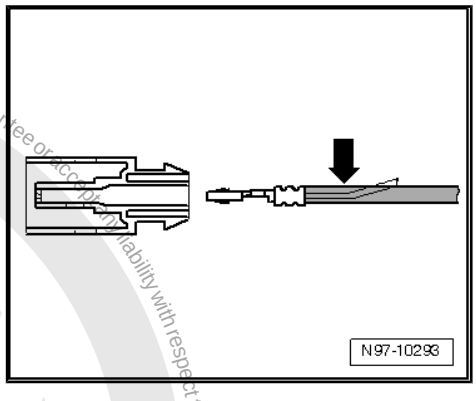
Releasing and dismantling connector housings ⇒ page 204 .

4.2.3 Assembly tools for single wire seals

The assembly tools serve as a means of sliding the single wire seals fully into the connector housing without damage and thereby assure complete sealing between single wire and connector housing.

Four assembly tools for single wire seals are included in each wiring harness repair set -VAS 1978 B- and previous versions.

Assembling single wire seals ⇒ page 201 .



4.2.4 Wire strippers -VAS 1978/3-

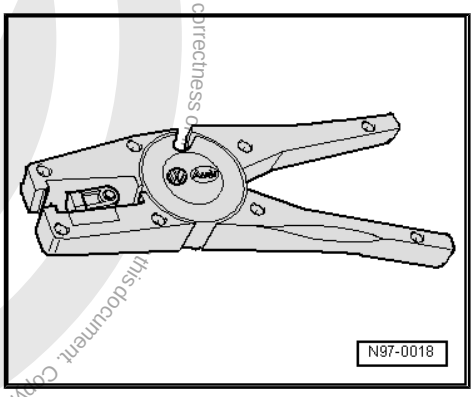
Wire strippers -VAS 1978/3- serve as a means of stripping insulation off wires and cutting wires in the correct manner.

Wire strippers -VAS 1978/3- are included in wiring harness repair set -VAS 1978 B- and previous versions.

The wire strippers have an adjustable limit stop within the pliers jaws, with which the desired length of insulation to be removed can be adjusted.

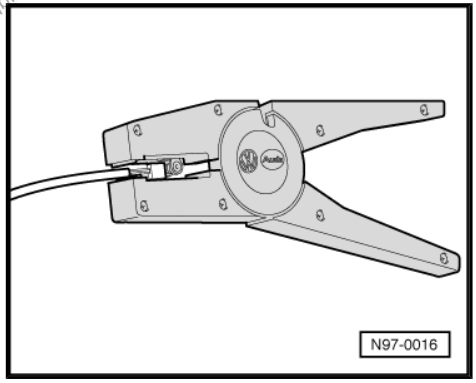
Stripping:

– Adjust the sliding limit stop in the pliers jaws to the desired length of insulation to be removed.

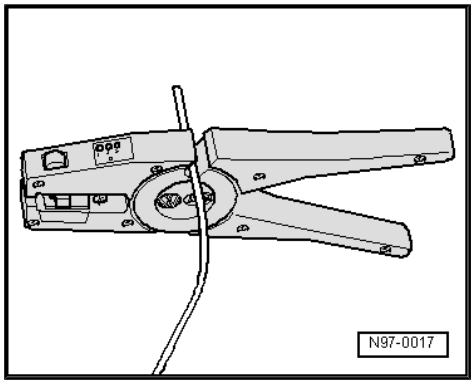


– Insert the end of the wire from the front fully into the pliers jaws and squeeze the pliers together completely.

– Open the pliers and remove the stripped wire end.



– Cut the wire if necessary with the cutting part on the upper side of the wire strippers.

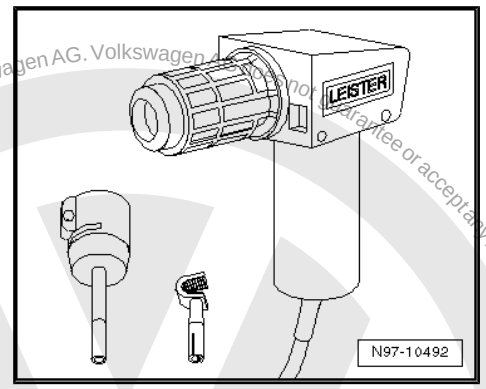


4.2.5 Hot air blower, 220 V/ 50 Hz -VAS 1978/14-

Caution

When shrink-fitting, take care not to damage any other wiring, plastic parts or insulating material with the hot air blower.

Observe the operating instructions of the hot air blower without fail!



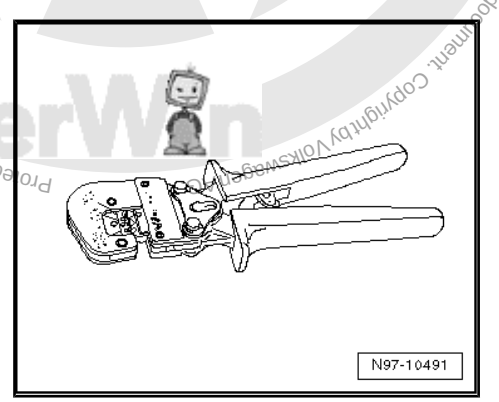
The hot air blower, 220 V / 50 Hz -VAS 1978/14- is used in conjunction with shrink element for hot air blower -VAS 1978/15- to shrink fit the crimp connectors. After crimping, the crimp connector has to be shrink fitted using the hot air blower in order to prevent any ingress of moisture.

Hot air blower, 220 V/50 Hz -VAS 1978/14- is included in wiring harness repair set -VAS 1978 B- and previous versions.

Shrink-fit crimp connectors using hot air blower, 220 V/50 Hz -VAS 1978/14- or ⇒ page 197 .

4.2.6 Crimping pliers -VAS 1978/1A-

Crimping pliers -VAS 1978/1A- or crimping pliers (base tool) -VAS 1978/1-2- together with head adapter 0.35 - 2.5 mm² -VAS 1978/1-1- or head adapter 4.0 - 6.0 mm² -VAS 1978/2A- are used to squeeze together crimp connectors from the wiring harness repair sets.



Crimping connectors using crimping pliers -VAS 1978/1A- ⇒ page 188 .

The following heads adapters are available for crimping pliers (base tool) -VAS 1978/1-2- :

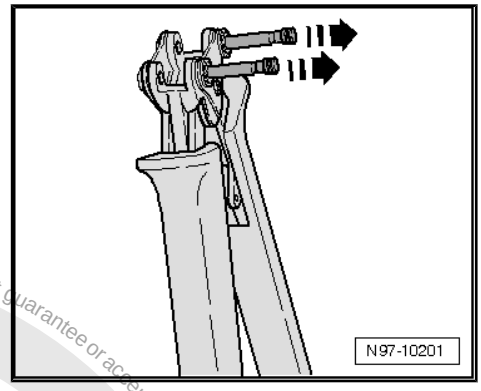
- Head adapter 0.35 mm^2 - 2.5 mm^2 -VAS 1978/1-1-
- Head adapter 4.0 mm^2 - 6.0 mm^2 -VAS 1978/2A-
- Head adapter for JPT contacts -VAS 1978/9-1-

In conjunction with head adapter for JPT contacts -VAS 1978/9-1- , the crimping pliers are used to crimp contacts to single wires during repairs to wiring with cross sections up to 0.35 mm^2 ⇒ page 194 .

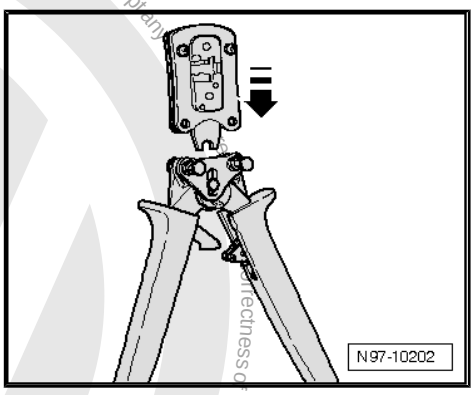
Interchanging head adapter:

– Open up the crimping pliers fully.

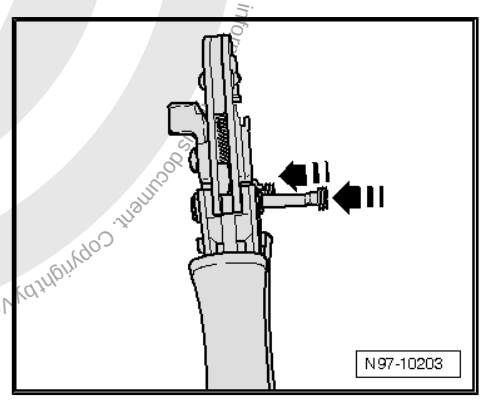
– Unclip both locking pins -arrows- from the body of the crimping pliers.



– Insert the required head adapter from above -arrow- in the body of the crimping pliers.



– Lock the head adapter by engaging the pins -arrows- in the body of the crimping pliers.



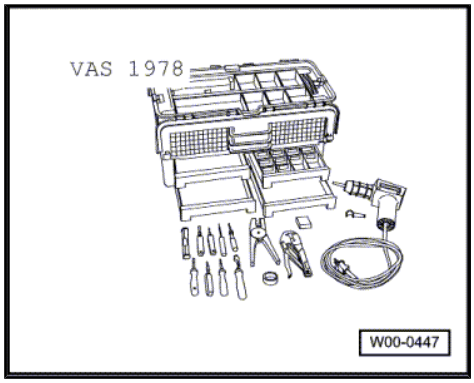
4.3 General notes concerning repairs to vehicle electrical system

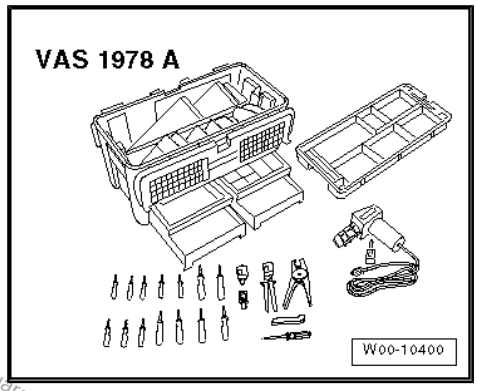
Caution

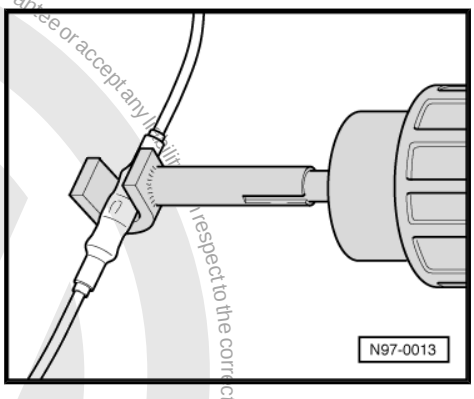
When batteries are disconnected and reconnected, the procedure described in the workshop manual must be strictly observed.

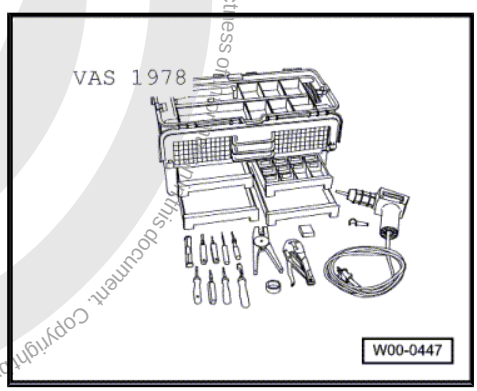
WARNING

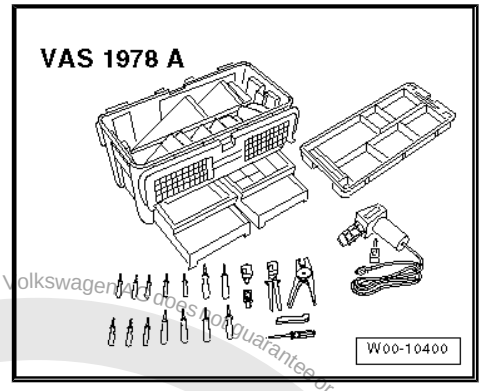
Some tools are equipped with a tool safety device. This must be pushed over the tip of the tool after use in order to protect the tip and prevent personal injury.











- Observe the latest notes in the respective workshop manual when carrying out repairs.
- Observe country-specific regulations.
- Always disconnect the battery earth strap before working on the electrical system. Disconnecting the battery earth strap (open circuit) provides a safe working environment for repairs to the electrical system. The battery positive wire need only be disconnected for removal of the battery.
- Before starting a repair, it is important to identify and rectify the cause of damage (e.g. sharp edges on body panels, defective electrical components, corrosion, etc.).
- For additional information, e.g. removal and installation of individual components, please refer to the relevant workshop manual.
- Soldering is not permitted for repairs to vehicle wiring.
- Wiring harness and connector repairs to vehicle electrical system should be carried out using wiring harness repair set -VAS 1978 B- and previous versions only. Only use yellow wires from wiring harness repair set -VAS 1978 B- .
- Wiring harness repairs may not be integrated in the vehicle's own wiring harness and must be marked with the use of yellow adhesive tape. This indicates a previous repair.
- Crimp connectors may never be repaired. If necessary, lay wiring parallel to the defective wiring. After crimping, crimp connectors must to be shrink fitted using the hot air blower in order to prevent any ingress of moisture.
- It is essential that the supplementary information is observed regarding repairs to wiring harnesses in airbag and belt tensioner systems, fibre optic cables, CAN bus lines, aerial cables and wiring with cross sections up to 0.35 mm^2 ⇒ page 194 .
- Carry out a function test after every repair. It may be necessary for the fault memory to be interrogated, erased and/or for the systems to be reset.
- If possible, do not loosen any earth wires from the body (danger of corrosion).
- Wiring harness repair set -VAS 1978 B- and previous versions do not cover all wiring cross sections that occur in the vehicle. If the required wiring cross section is not available, the next largest one should be used.
- Screened wires must not be repaired. If damaged they must be replaced complete.
- Heat resistant wiring can be found in various places in the vehicle, mainly in the engine compartment. Heat resistant wiring can be identified by its slightly matt and softer insulation. To repair these wires, only heat resistant wiring may be used.

4.4 Repairs to wiring harnesses

Note

Observe the general notes on repairs to the vehicle electrical system ⇒ page 189 .

Notes on repairs to airbag and belt tensioner wiring ⇒ page 192

Notes on repairs to fibre optic cables ⇒ page 193

Notes on repair of CAN bus wiring ⇒ page 194

Notes on replacement of aerial cables ⇒ page 220

Notes on repairs to wiring with cross sections up to 0.35 mm^2 ⇒ page 194

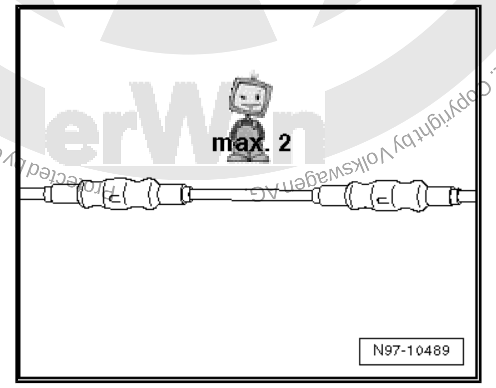
Notes on repair of wiring open circuit with one repair position ⇒ page 197

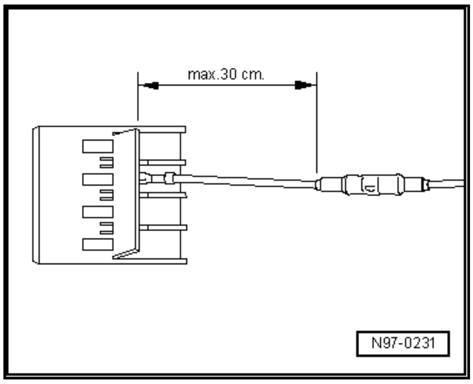
Notes on repair of wiring open circuit with two repair positions ⇒ page 198

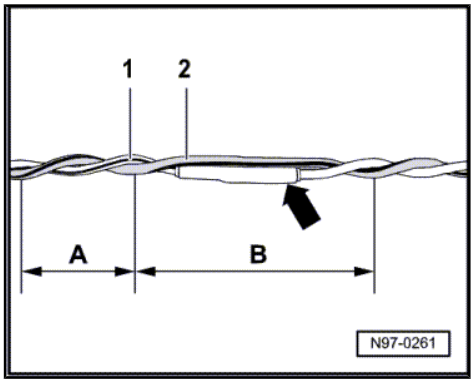
4.4.1 Notes on repairs to airbag and belt tensioner wiring

In addition to the general notes on repairs to wiring harnesses, the following instructions must be observed on how to repair wiring in airbag and belt tensioner systems:

> ⚠ WARNING
>
> - *Airbag and seat belt tensioner can fail.*
> - *Faulty repairs to the airbag and seat belt tensioning system can cause malfunctions in the passenger protection system.*
> - *For repairs to airbag and belt tensioner wiring harnesses, only contacts, connectors and wiring designed specifically for this purpose may be used ⇒ Electronic parts catalogue (ETKA) .*







Note

- *Wires from airbag and belt tensioner wiring harness are only allowed to be repaired using wiring harness repair set -VAS 1978 B- and previous versions.*
- *Observe the general notes on repairs to the vehicle electrical system ⇒ page 189 .*
- *Observe vehicle stickers indicating high voltage components. Before carrying out repairs, discharge residual voltage ⇒ General body repairs, interior; Rep. gr. 69 ; Occupant safety .*
- *For repairs to wiring in the airbag and belt tensioner system, a maximum of two positions may be repaired. The more the repairs there are in the wiring, the greater the resistance and this can trigger faults in the self-diagnosis of the system.*
- *To avoid corrosion, the crimp connectors are always to be shrink-fitted when performing airbag or belt tensioner wiring harness repairs.*
- *Do not incorporate the repaired wiring back in the vehicle's own wiring harness and mark the area of repair clearly with yellow insulating tape.*
- *Repairs in the area of the airbag or belt tensioner should not be conducted more than 30 cm from the next connector housing. Together with the yellow insulating tape, this gives a clear indication of repairs that have already been carried out.*
- *The wires to the triggering units (airbags) are entwined as standard with a twine spacing of 20 mm ± 5. This spacing is assured for series production via industrial standard numbers for wiring pairs and it is essential that it is adhered to on the repair lengths of entwined wiring.*
- *During repairs, the wiring to the triggering units (airbags) must have the same length. When wires -1- and -2- are entwined, the twine spacing of A = 20 mm ± 5 must be adhered to without fail.*
- *There must not be any section of wiring, for example in the vicinity of crimp connectors -arrow-, longer than B = 100 mm with the wires not twisted.*

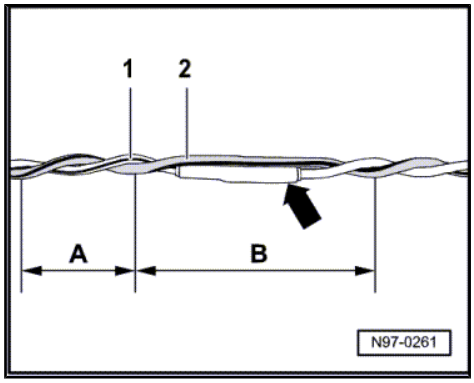
4.4.2 Fibre optic cables (FOC)

There is no provision for fibre optic cable repairs at Volkswagen. In the event of repairs, the entire fibre optic wiring harness must be replaced. To do this, the following safety precautions must be observed:

Note

- *Do not over bend fibre optic cables. Minimum radius for bends is 25 mm.*
- *Do not route fibre optic cables over sharp edges.*
- *The end pieces (lenses) must not be made dirty or touched with bare hands.*
- *Do not expose fibre optic cables to heat.*
- *Entwining two fibre optic cables or a fibre optic cable with a copper wire is not permissible.*

4.4.3 Repairing CAN bus wiring



- An unshielded two-wire line -1- and -2- with a cross section of 0.35 mm^2 or 0.5 mm^2 is used for CAN bus wiring.
- The colour codes of the CAN bus wiring are indicated in the following table:

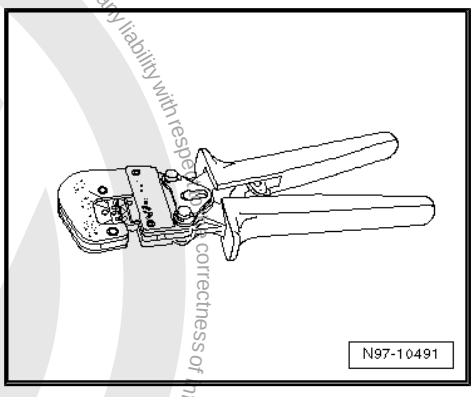
Powertrain CAN, high	orange/black
Convenience CAN, high	orange/green
Infotainment CAN, high	orange/violet
CAN low wire, (all)	orange/brown

- Repairs to CAN bus wiring can be carried out either with sections of repair wiring with the correct cross section or with entwined wires „green/yellow“ or „white/yellow“ from the electronic parts catalogue ⇒ Electronic parts catalogue (ETKA) .
- When repairs are performed, both CAN bus wires must have the same length. When twisting the wires -1- and -2- together, the length of each complete twist must be A = 20 mm.
- There must not be any section of wiring, for example in the vicinity of crimp connectors -arrow-, longer than B = 50 mm with the wires not twisted.
- Mark the area of repair with yellow insulation tape to make it easy to identify.

4.4.4 Repairs to wiring with cross sections up to 0.35 mm^2

Special tools and workshop equipment required

- Crimping pliers, complete -VAS 1978/1 A-
- Head adapter 0.35 mm^2 - 2.5 mm^2 -VAS 1978/1-1-



For repairs to wiring with cross sections up to 0.35 mm^2, it is essential that contacts are crimped on using crimping pliers for JPT contacts -VAS 1978/9A- or crimping pliers (base tool) -VAS 1978/1-2- with attached head adapter for JPT contacts -VAS 1978/9-1- . Due to the low current strength of these wires in the micro and thousandths range, incorrectly crimped contacts cause electrical resistances and result in faults or failure in the respective system. The most common applications of these contacts are:

- Lambda probe
- Engine speed sender
- Air mass meter

With the use of crimping pliers for JPT contacts -VAS 1978/9A- or crimping pliers (base tool) -VAS 1978/1-2- with attached head adapter for JPT contacts -VAS 1978/9-1- , the correct connection

between crimp contact, wire and single wire seal is assured. The tool is only to be used for the application described.

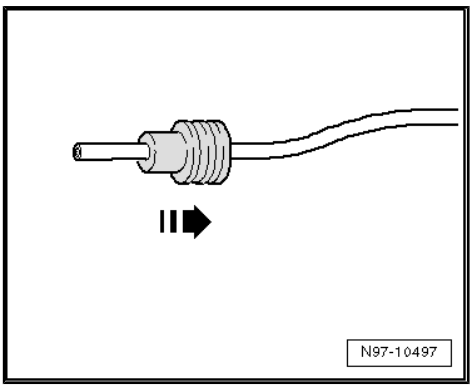
Note

Crimped to the repair wiring are normal contacts and gold-plated contacts. The repair contact must always be the same type as the contact installed in the factory.

Crimping on new contact with single wire seal

– Insert head adapter for JPT contacts -VAS 1978/9-1- in crimping pliers (base tool) -VAS 1978/1-2- ⇒ page 188 .

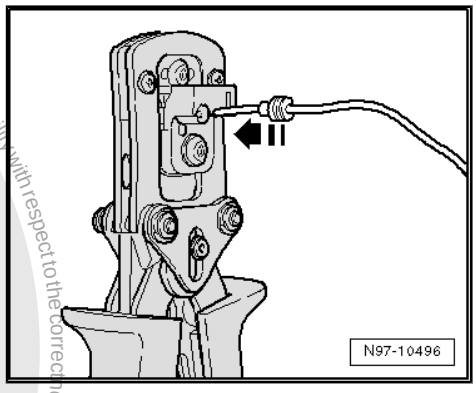
– Attach the single wire seal to the repair wire.



Note

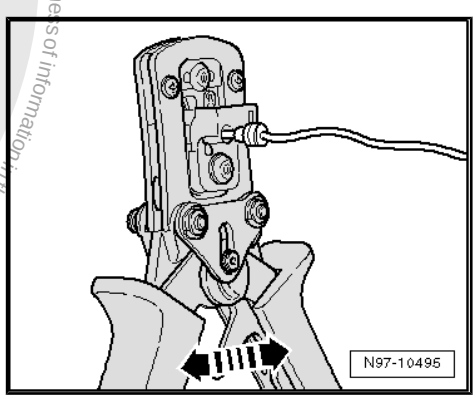
When doing this, the small diameter of the single wire seal must face the contact to be crimped on.

– Open the crimping pliers and insert the end of the repair wire in the opening of the crimping pliers for wire stripping.

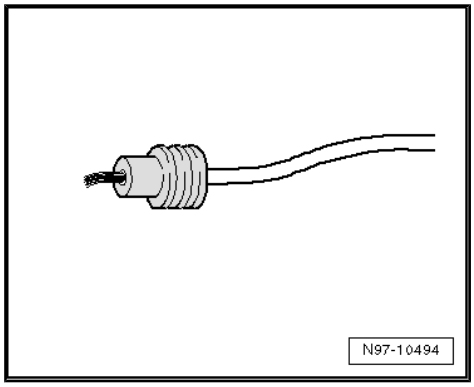


– Close the crimping pliers fully.

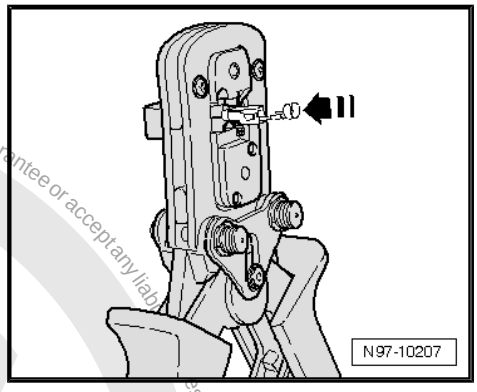
– Open the crimping pliers again and remove the stripped wire end.



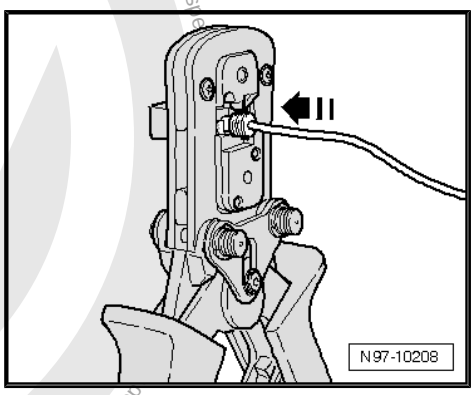
– Push the single wire seal towards the stripped wire end until it is flush with the wiring insulation.



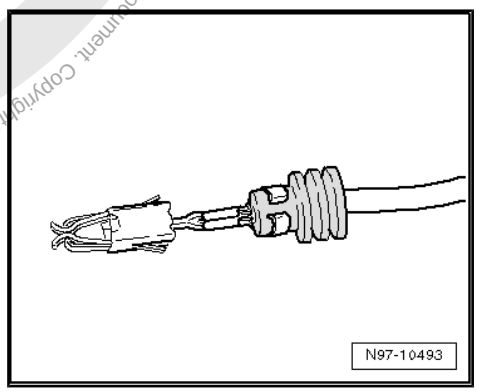
– Insert the new crimp contact in the mounting of the crimping pliers.



– Insert the stripped wire end with the positioned single wire seal in the crimp contact until it comes into contact with the „wire stop“.
– Crimp the contact, wire and single wire seal by closing the crimping pliers fully.
– Open the crimping pliers again and remove the successfully crimped contact.



Successful crimping can be identified by clean and equal application of pressure on the wire and single wire seal in the contact and by a stamp on the rear that indicates the correct tool was used in the correct manner to carry out the crimping process.

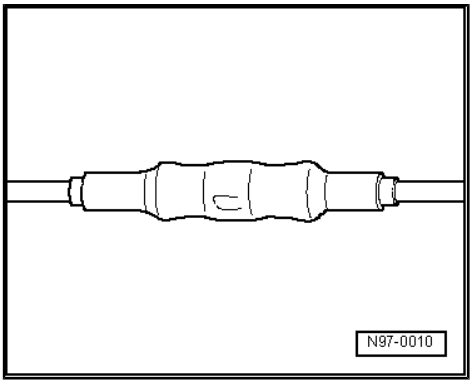


4.4.5 Wiring open circuit with one repair position

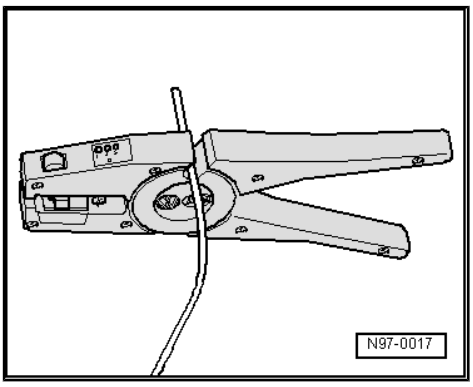
Repair position with single crimp connector

– Place the wire to be repaired to one side (about 20 cm either side of the repair position).

– If necessary, unbind the wiring harness using the folding knife.



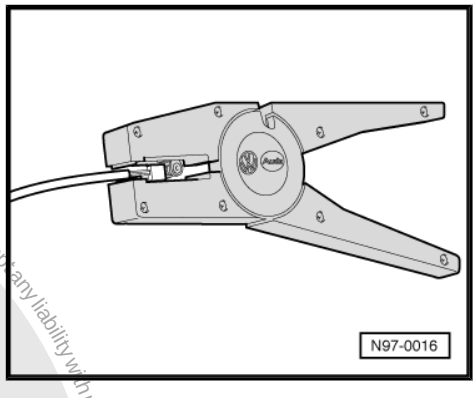
– Cut out the damaged piece of wiring using the wire strippers -VAS 1978/3- .



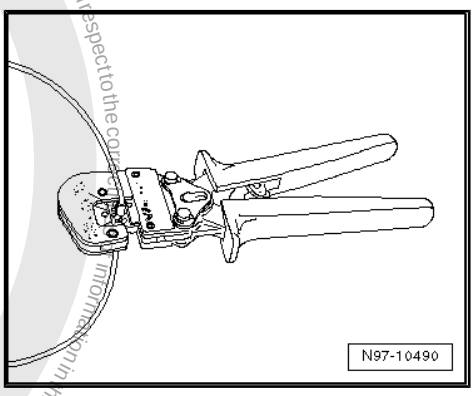
Note

If, after the damaged wire has been cut out, both ends of the vehicle's own wiring are too short for a repair using single crimp connectors, use a piece of repair wire of the appropriate length with two crimp connectors *⇒ page 198* *.*

– Strip the wire ends of insulation by 6 - 7 mm using the wire strippers.



– Push the crimp connector on both stripped wire ends of the vehicle's own single wire and crimp it on using the crimping pliers.



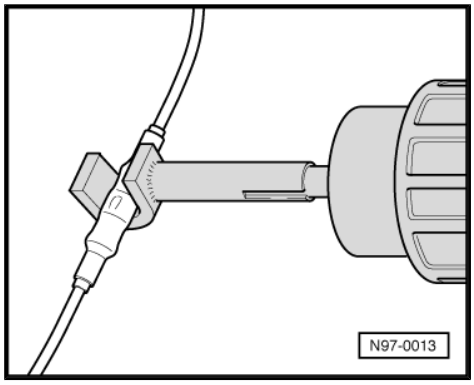
Note

- *Ensure without fail that the correct crimp recess is chosen for the crimp connectors being used.*
- *The insulation on the wires must not be crimped.*

After crimping, the crimp connector has to be shrink fitted using the hot air blower in order to prevent any ingress of moisture.

– Place shrink element for hot air blower -VAS 1978/15- on hot air blower, 220 V / 50 Hz -VAS 1978/14- .

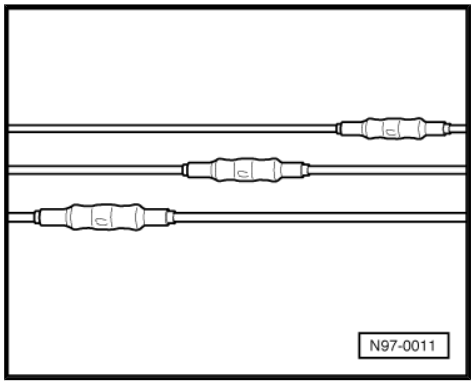
– Heat up the crimp connector using the hot air blower along a straight line, working from the middle outwards, until it is sealed completely and the adhesive escapes from the ends.



Caution

When shrink-fitting, take care not to damage any other wiring, plastic parts or insulating material with the hot air blower.

Observe the operating instructions of the hot air blower without fail!



Note

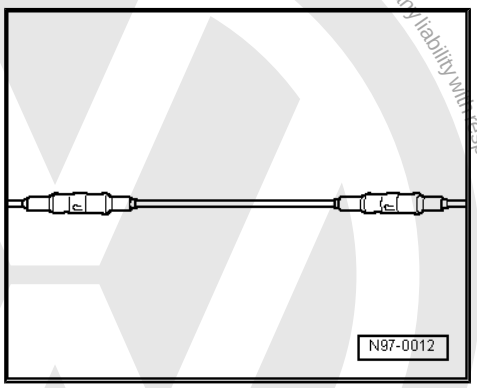
- *Ensure that, where several wires have to be repaired, the crimp connectors are not directly adjacent to each other. To prevent the circumference of the wiring harness from becoming to great, position the crimp connectors so they are offset slightly.*
- *If the repair position was already wrapped, this section has to be wrapped again with yellow insulation tape once the repair has been carried out.*
- *Attach the repaired wiring harness with a cable tie, if necessary, to prevent it from generating noise when the vehicle is in motion.*

4.4.6 Wiring open circuit with two repair positions

Repair position with interlinked wire.

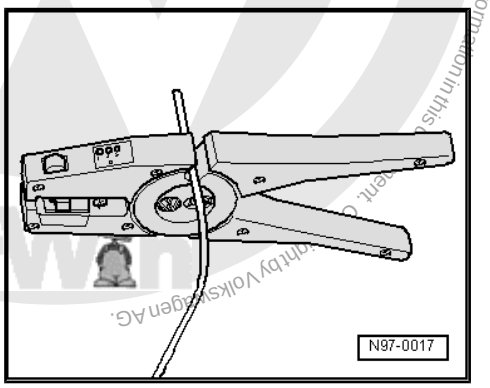
– Place the wire to be repaired to the side at two points (about 20 cm to both sides of the relevant repair position).

– If necessary, unbind the wiring harness using the folding knife.



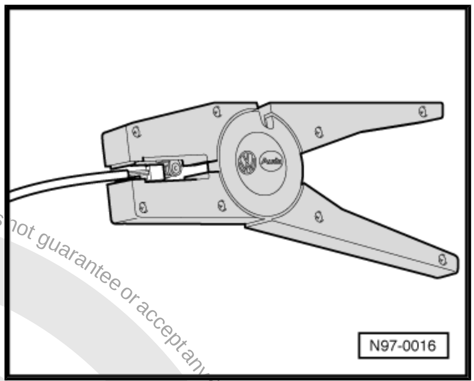
– Place the yellow repair wire next to the damage wiring harness and, using wire strippers -VAS 1978/3- , cut the repair wire to the required length.

– Cut the damaged section of wire out of the vehicle's own single wire.



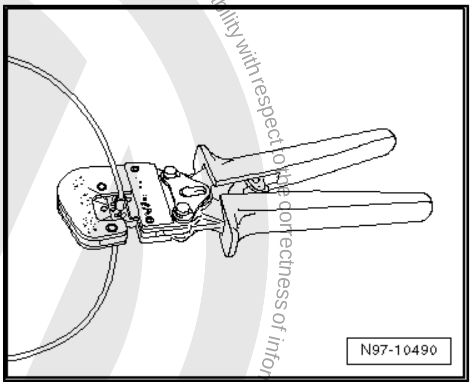
– Strip the wire ends of insulation by 6 - 7 mm using the wire strippers.

– Push the crimp connector onto one side of the vehicle's own single wire and on the other side onto the repair wire.



– Crimp the connector using the crimping pliers to both wire ends.

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



Note

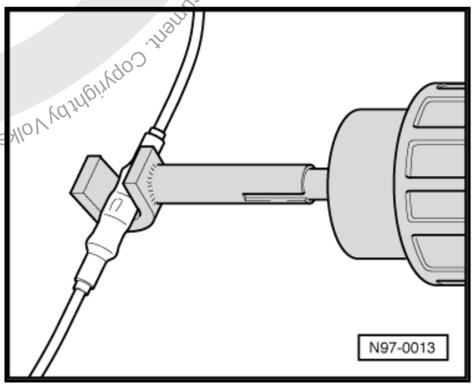
♦ *Ensure without fail that the correct crimp recess is chosen for the crimp connectors being used.*

♦ *The insulation on the wires must not be crimped.*

After crimping, the crimp connector has to be shrink fitted using the hot air blower in order to prevent any ingress of moisture.

– Place shrink element for hot air blower -VAS 1978/15- on hot air blower, 220 V / 50 Hz -VAS 1978/14- .

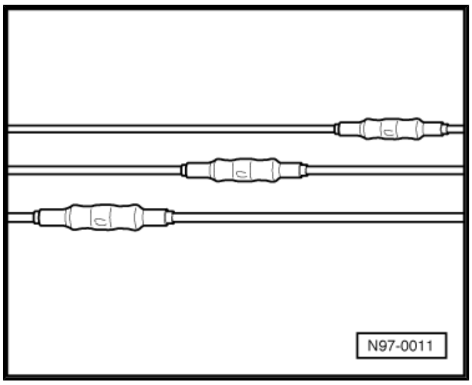
– Heat up the crimp connector using the hot air blower along a straight line, working from the middle outwards, until it is sealed completely and the adhesive escapes from the ends.



Caution

When shrink-fitting, take care not to damage any other wiring, plastic parts or insulating material with the hot air blower.

Observe the operating instructions of the hot air blower without fail!



Note

♦ *Ensure that, where several wires have to be repaired, the crimp connectors are not directly adjacent to each other. To prevent the circumference of the wiring harness from becoming to great, position the crimp connectors so they are offset slightly.*

♦ *If the repair position was already wrapped, this section has to be wrapped again with yellow insulation tape once the repair has been carried out.*

♦ *Attach the repaired wiring harness with a cable tie, if necessary, to prevent it from generating noise when the vehicle is in motion.*

4.5 Repairing connector housings and connectors

4.5.1 Notes on repairs to connector housings and connectors

Note

- *Observe the general notes on repairs to the vehicle electrical system* ⇒ page 189
- *Allocation of the appropriate crimp contacts to the connector housings is by way of the part number stamped on the connector housing. Listed in illustration 198 (electrical connecting elements) in ⇒ Electronic parts catalogue (ETKA) are the part numbers for the connector housings in conjunction with the associated crimp contacts.*
- *Damaged connector housings must always be replaced.*
- *New connector housings can be ordered from OTC Kassel.*

4.5.2 Repairing contacts in connector housings

– If necessary, first open or disengage the secondary locking mechanism of the connector housing ⇒ page 204

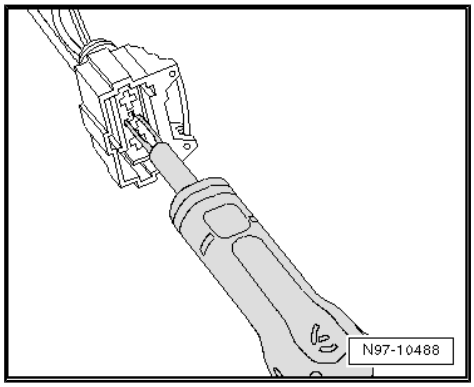
– Disengage the contact (primary locking mechanism) using the appropriate release tool ⇒ page 204 .

– Pull the contact by the single wire out of the connector housing.

– Select the yellow repair wire with the correct contact from the wiring harness repair set .

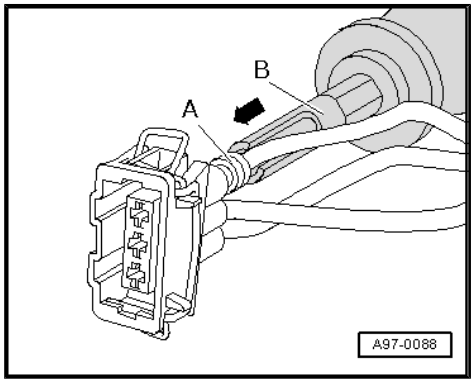
– Place the wire to be repaired from the vehicle's own wiring harness to one side (about 20 cm either side of the repair position).

– If necessary, unbind the wiring harness using the folding knife.



– Push the new contact of the repair wire into the connector housing until it engages.

– Slide the single wire seal onto the repair wire.

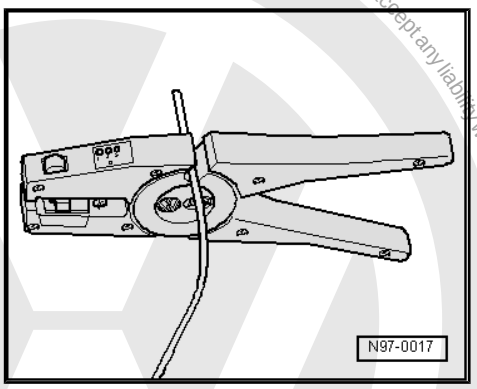


Note

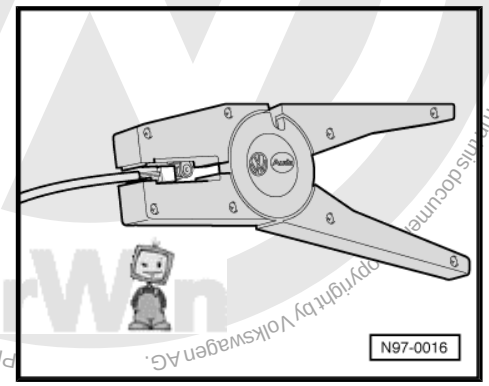
The small diameter of the single wire seal must face the connector housing.

– Slide the single wire seal into the connector housing using the correct assembly tool ⇒ page 201 .

– Trim the repair wire and the single wire of the vehicle's own wiring harness accordingly using wire strippers -VAS 1978/3- .

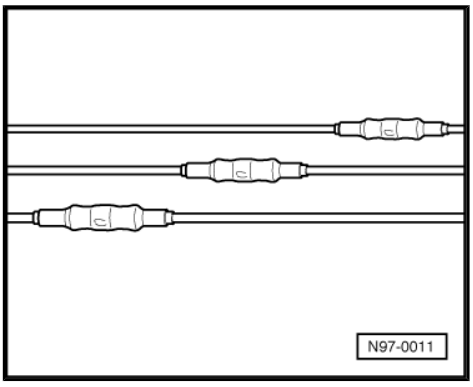


– Strip the 6 - 7 mm of insulation from the end of the repair wire and the vehicle's own single wire using the wire strippers.
– Crimp the stripped ends of the repair wire and single wire of the vehicle's own wiring harness using the crimping pliers and a crimp connector, as described in the chapter entitled „Wiring open circuits with one repair position“ ⇒ page 197 .



Note

- *Ensure that, where several wires have to be repaired, the crimp connectors are not directly adjacent to each other. To prevent the circumference of the wiring harness from becoming to great, position the crimp connectors so they are offset slightly.*
- *If the repair position was already wrapped, this section has to be wrapped again with yellow insulation tape once the repair has been carried out.*
- *Attach the repaired wiring harness with a cable tie, if necessary, to prevent it from generating noise when the vehicle is in motion.*



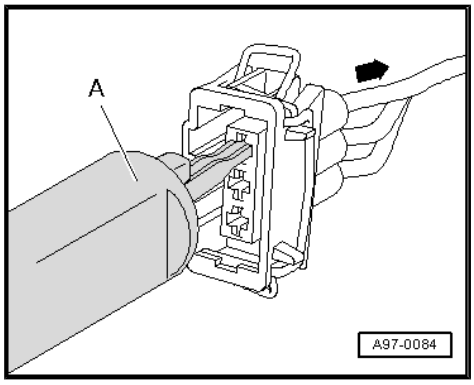
4.5.3 Fitting single wire seals

Note

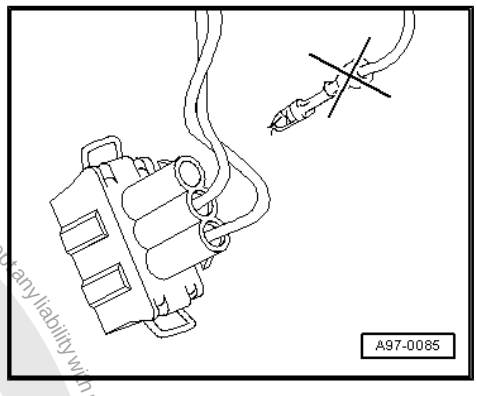
- *Single wire seals prevent the ingress of moisture and dirt in the connector housing. They are installed, for example, in the engine compartment and must always be reinstalled following repairs.*
- *As standard, the single wire seal is crimped together with the contact on the wire; this is not the case with the repair wires. Before crimping the repair line, the single wire seal must therefore first be pushed onto the wire.*
- *It is essential that the single wire seals are of the correct size to fit the cross section of the repair wire. The outer diameter of the single wire seal is based on the socket diameter of the connector housing. Only carry out the repair using the correct assembly tool.*

Assembling single wire seal:

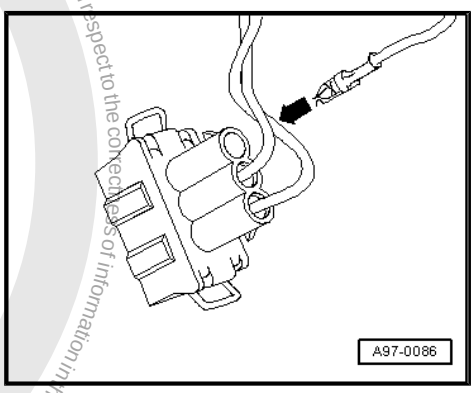
– Disengage the contact locking mechanism using the appropriate release tool -A- and then pull the wire with the single wire seal backwards -arrow- out of the connector housing.



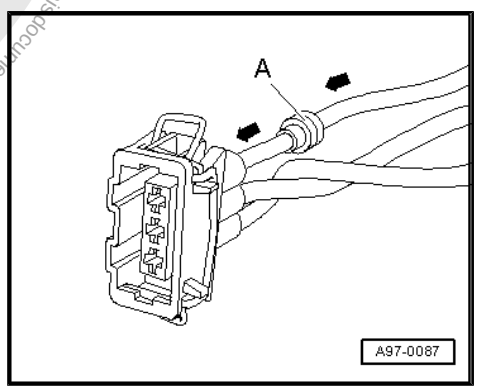
– Cut off the old contact with the single wire seal from the vehicle's own wiring harness.



– Slide the repair wire with the new contact in the respective socket of the connector housing until it engages.



– Place the single wire seal -A- on the free end of the repair wire.

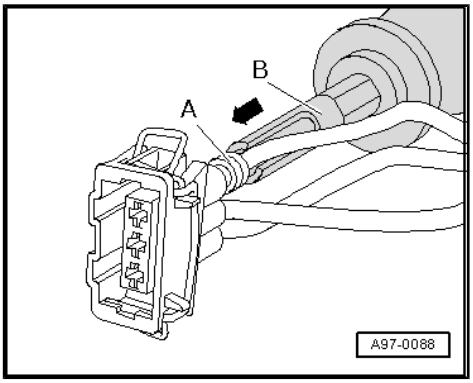


Note

The small diameter of the single wire seal must face the connector housing.

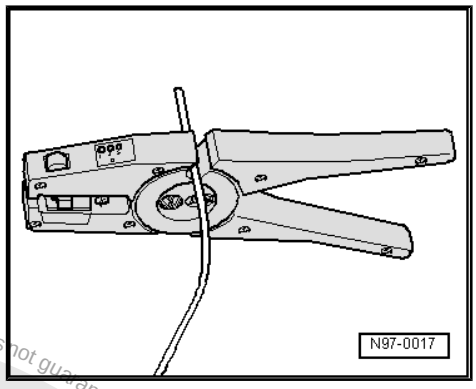
– Slide the single wire seal -A- on the repair wire until it reaches the contact housing.

– Slide the single wire seal -A- using the respective assembly tool -B- fully into the connector housing.



– Trim the repair wire and the single wire of the vehicle's own wiring harness accordingly using wire strippers -VAS 1978/3- .

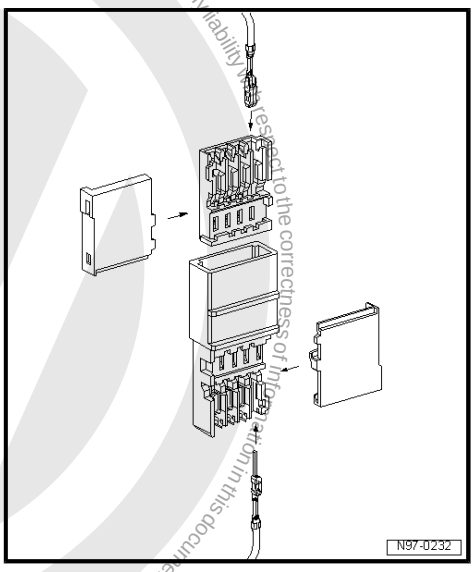
– Crimp the stripped ends of the repair wire and single wire of the vehicle's own wiring harness using the crimping pliers and a crimp connector, as described in the chapter entitled „Wiring open circuits with one repair position“ ⇒ page 197 .



4.5.4 Repairing connector housings using cut and clamp method

Note

- *For technical reasons, the connector housings for the cut and clamp method can only be supplied with the cut and clamp contacts inserted.*
- *These contacts can be removed just like any other connector housing if they are not needed.*
- *Repair wires can be supplied that already have the appropriate contacts crimped on ⇒ Electronics parts catalogue (ETKA) .*



4.6 Releasing and dismantling connector housings

4.6.1 Notes on releasing and dismantling connector housings

Note

- *Observe the general notes on repairs to the vehicle electrical system ⇒ page 189 .*
- *To release, always use the correct release tools. Under no circumstances should the contacts be pulled out of the connector housings with force.*
- *Damaged connector housings must always be replaced. New connector housings can be ordered from OTC Kassel.*
- *As an aid to disengage the secondary locking mechanisms, a small screwdriver can be used.*
- *The socket/pin assignment can be found stamped on the secondary locking mechanism or on the rear of the connector housing.*
- *For more detailed information about the locations of connectors, see ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*

Allocation of the correct release tool to the respective locking devices can be gleaned from the table in the ⇒ operating instructions of -VAS 1978/35- .

4.6.2 Secondary locking element

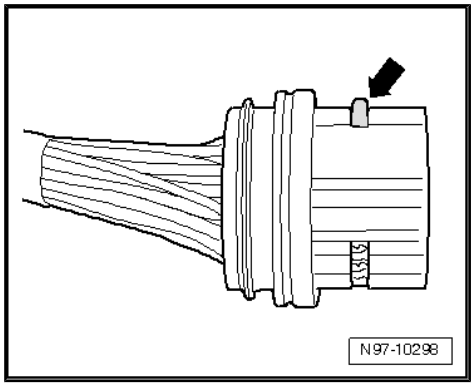
The secondary locking mechanism is a housing catch (second line locking mechanism) that secures all the wires in one connector housing. If a secondary locking mechanism is fitted to a connector housing, this must always be opened or removed using the appropriate tool before releasing and pulling out individual crimp contacts.

The secondary locking mechanism is different in colour from the rest of the connector housing. This makes it easier to identify the secondary locking mechanism and clarifies its intended function.

The types of connector housing shown here are just a few examples to show the different functions of secondary locking mechanism.

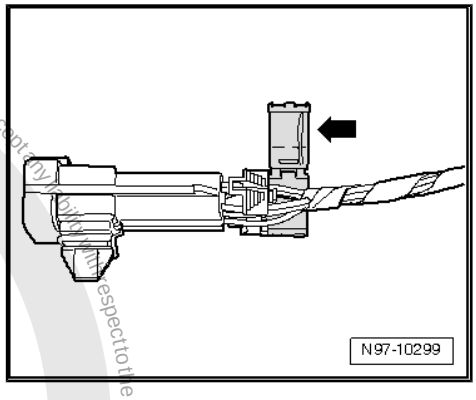
Example 1:

The housing catch is disengaged by removing a „toothed element“ -arrow-.



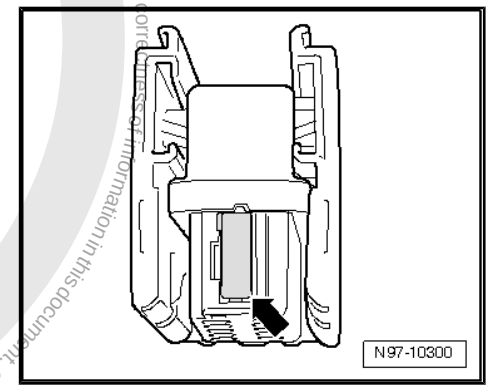
Example 2:

The housing catch is disengaged by opening a „flap“ -arrow-.



Example 3:

The housing catch can be disengaged by detaching a „slide“ -arrow-.



4.6.3 Primary locking element

The primary locking mechanism is what fixes an individual crimp contact in the connector housing.

If necessary, any housing catches in place (secondary locking mechanisms) must be released or removed prior to disengaging the contacts using the prescribed tool ⇒ page 204 .

The types of primary locking mechanisms shown as follows are just a few examples to show the different functions of primary locking mechanism.

- Round connector systems ⇒ page 205
- Flat connector systems ⇒ page 206
- Special connector systems ⇒ page 208

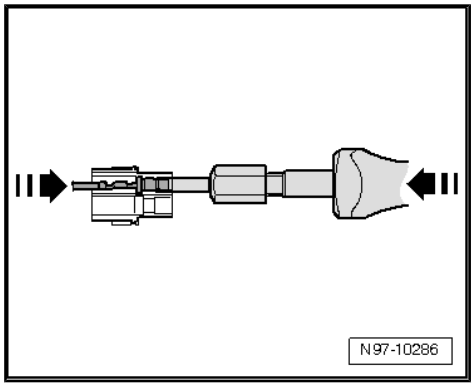
Allocation of the correct release tool to the respective locking device can be gleaned from the table in the ⇒ operating instructions of -VAS 1978/35- .

4.6.4 Round connector systems

Note

If necessary, any housing catches in place (secondary locking mechanisms) must be released or removed prior to disengaging the contacts using the prescribed tool ⇒ page 204 .

– Insert the release tool appropriate for the connector housing in the release port of the connector housing.
– Grab hold of the contact by the wire and push it lightly into the connector housing -arrow-.

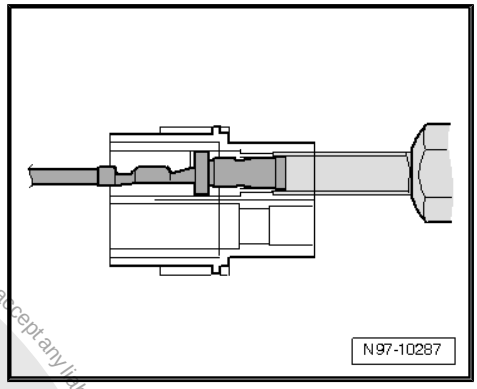


Note

By pushing the contact in the direction of the connector housing, the locking tabs of the contact are lifted up by the housing edge and disengaged using the release tool.

– At the same time, push the release tool in the direction of the connector housing -arrow- and pull out the released contact from the connector housing.

– The release tool can be pulled out of the connector housing again once the contact has been removed.



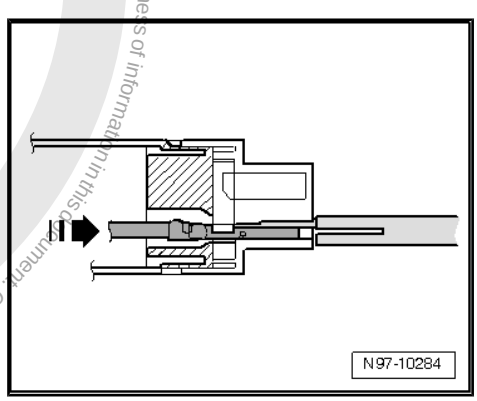
4.6.5 Flat connector systems

Note

If necessary, any housing catches in place (secondary locking mechanisms) must be released or removed prior to disengaging the contacts using the prescribed tool *⇒ page 204* *.*

Flat connector with one locking tab:

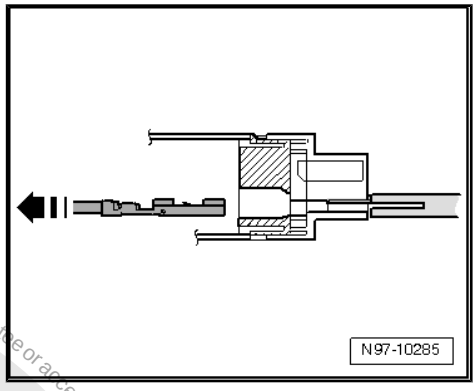
– Insert the release tool appropriate for the connector housing in the release port of the connector housing.
– Grab hold of the contact by the wire and push it lightly into the connector housing -arrow-.



Note

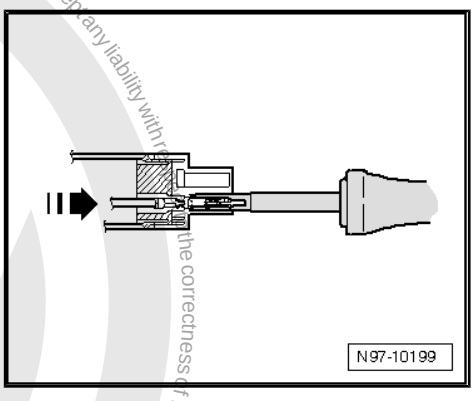
By pushing the contact in the direction of the connector housing, the locking tab of the contact is lifted up by the housing edge and can be disengaged using the release tool.

– At the same time, push the release tool in the direction of the connector housing and pull out the released contact from the connector housing -arrow-.
– The release tool can be pulled out of the connector housing again once the contact has been removed.



Flat connector with two locking tabs:

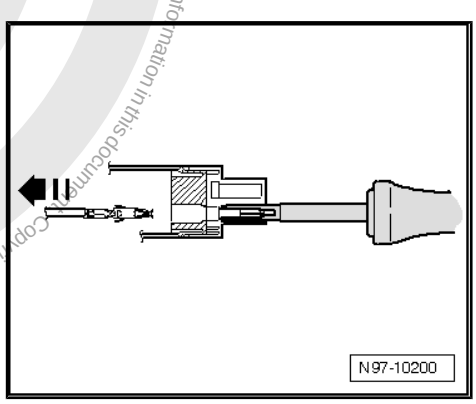
– Insert the release tool appropriate for the connector housing in the release port of the connector housing.
– Grab hold of the contact by the wire and push it fully into the contact housing -arrow-.



Note

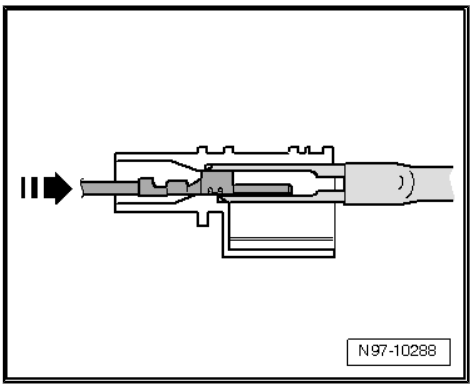
By pushing the contact in the direction of the connector housing, the locking tabs of the contact are lifted up by the housing edge and disengaged using the release tool.

– At the same time, push the release tool in the direction of the connector housing and pull out the released contact from the connector housing -arrow-.
– The release tool can be pulled out of the connector housing again once the contact has been removed.



Asymmetrical:

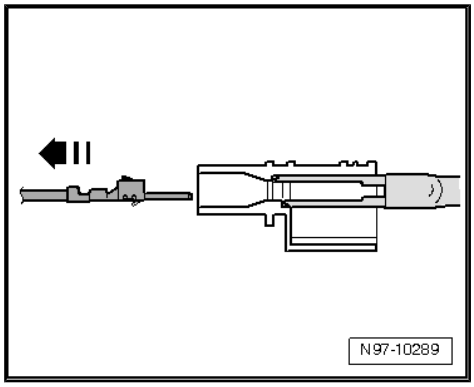
– Insert the release tool appropriate for the connector housing in the release port of the connector housing.
– Grab hold of the contact by the wire and push it lightly into the connector housing -arrow-.



Note

By pushing the contact in the direction of the connector housing, the locking tabs of the contact are lifted up by the housing edge and disengaged using the release tool.

– At the same time, push the release tool in the direction of the connector housing and pull out the released contact from the connector housing -arrow-.
– The release tool can be pulled out of the connector housing again once the contact has been removed.



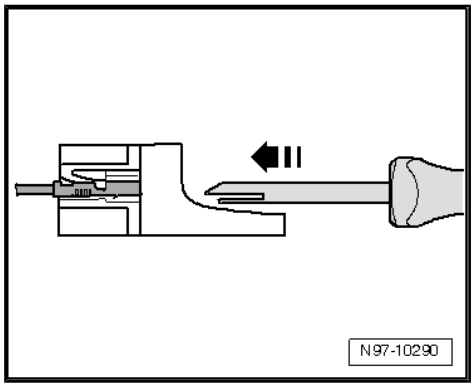
4.6.6 Special connector systems

Note

If necessary, any housing catches in place (secondary locking mechanisms) must be released or removed prior to disengaging the contacts using the prescribed tool ⇒ page 204 .

Faston contacts:

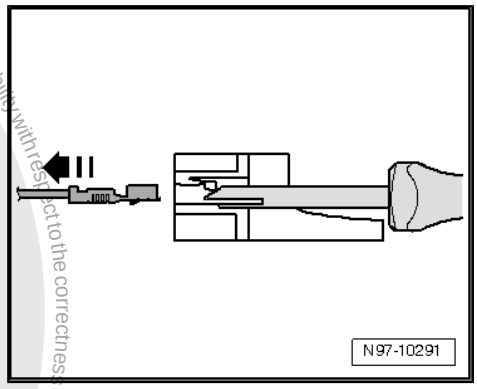
– Insert the release tool appropriate for the connector housing in the release port of the connector housing.
– Grab hold of the contact by the wire and push it lightly into the connector housing.



Note

By pushing the contact in the direction of the connector housing, the locking tabs of the contact are lifted up by the housing edge and disengaged using the release tool.

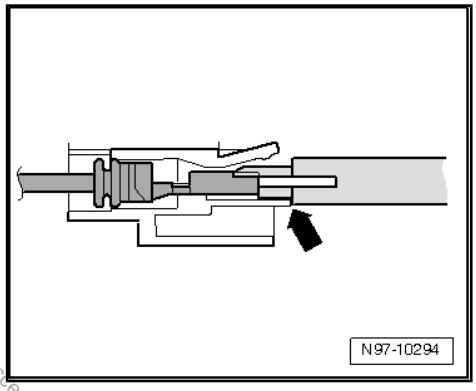
– At the same time, push the release release tool in the direction of the connector housing and pull out the released contact from the connector housing -arrow-.
– The release tool can be pulled out of the connector housing again once the contact has been removed.



GT 150/280 contacts:

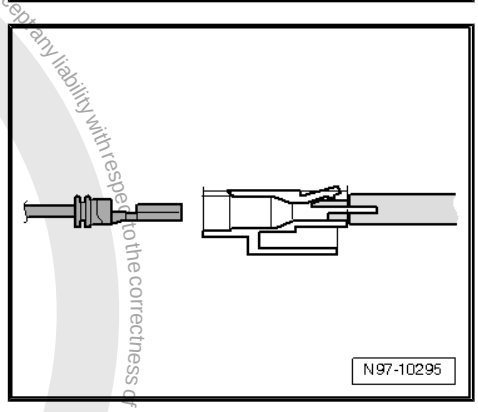
– Insert the release tool appropriate for the connector housing under the locking tab into the connector housing.

– Push the tool onto the limit stop -arrow- in the contact housing.



The contact is ejected from the connector housing.

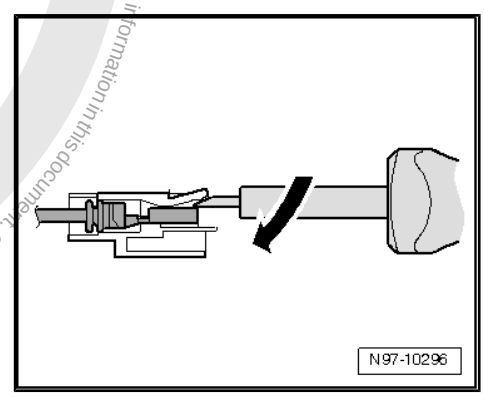
– The release tool can be pulled out of the connector housing again once the contact has been ejected.



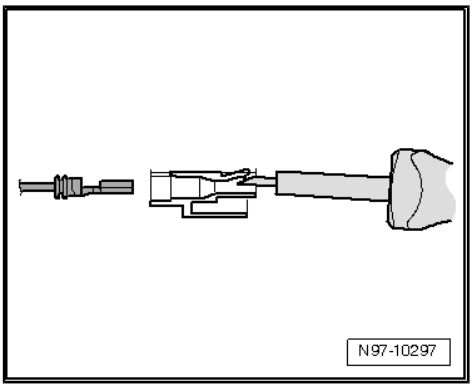
Contacts without locking tabs:

– Insert the release tool under the locking tab of the connector housing.

– Push through the release tool with a light upward movement -arrow- onto the limit stop.



The contact is ejected from the connector housing.



5 Contact surface cleaning set -VAS 6410-

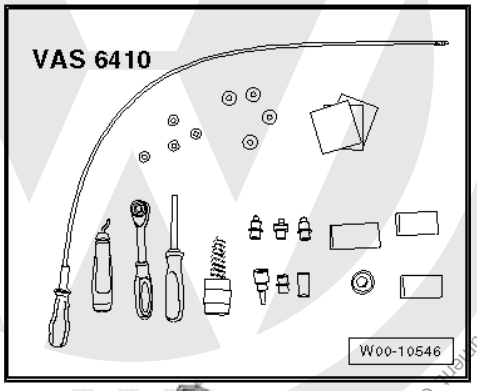
5.1 Using contact surface cleaning set -VAS 6410-

The contact surface cleaning set -VAS 6410- allows optimal repair quality to be achieved in the area of vehicle electrics. The tools allow performing repair work in the area of the sensor in wiring harnesses for threaded connections in the high-current circuit (starting and charging current). The contact surface cleaning set -VAS 6410- is adapted to the structural conditions of vehicles and ensures the process security of repair work as well as a comfortable procedure.

Note

The illustrations shown here are just a few examples of repair work.

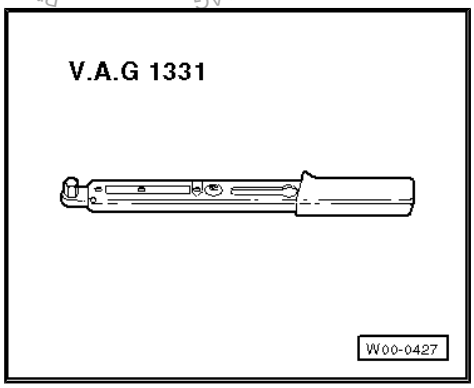
Contact surface cleaning set VAS 6410



5.1.1 Repairing ring terminals

Special tools and workshop equipment required

- VAG 1331



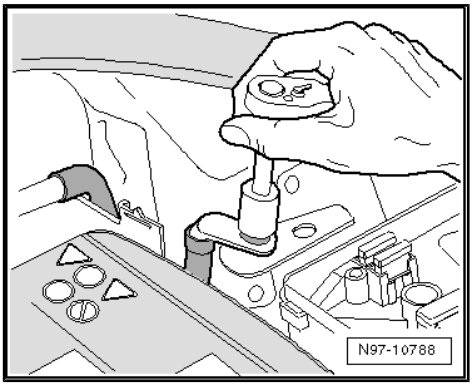
Note

- *The use of penetrating fluid, contact spray or grease etc. is prohibited since the missing adhesion in the threads may cause a torque excess and, therefore, the break of the threaded connection.*
- *The grey sanding pads are suitable for light dirt and "soft surfaces". The red sanding pads are suitable for heavy dirt and "hard surfaces".*

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 189 !

– Disconnect battery.
– Loosen cap nut and remove ring terminal from threaded connection.
– Check ring terminal for corrosion, dirt etc.
– Select suitable adapter and suitable sanding pad.



Note

As an alternative, the sanding block may also be used.

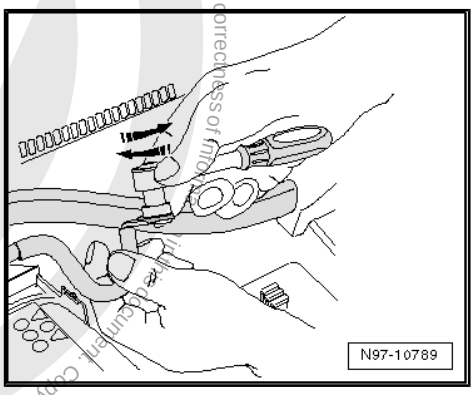
Caution

Take care not to abrade excessively the tin coating and ensure that the copper does not appear. This could produce a galvanic cell which destroys metal and causes faulty repair.

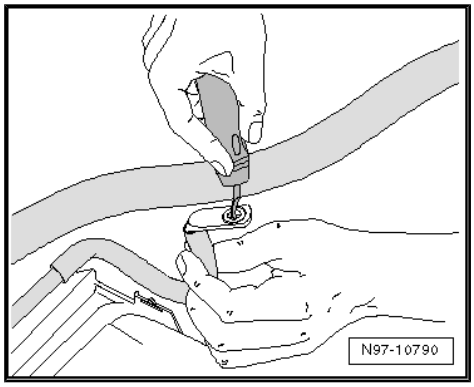
Note

As the thickness of the tin coating may differ according to the design, the cleaning process must be performed step by step and a visual check of the ring terminal is necessary between the steps.

– Insert adapter into ring terminal and grind off corrosion and dirt with circular movements.
– Check ring terminal and regrind if necessary.



– If necessary, remove punching burr on ring terminal using the deburrer.
– Tighten ring terminal to specified torque ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



Note

Optimum contact is ensured when the components to be secured are tightened to the specified torque after cleaning.

– Apply suitable anti-corrosion treatment to connection ⇒ page 215 .
– Reconnect battery.

WARNING

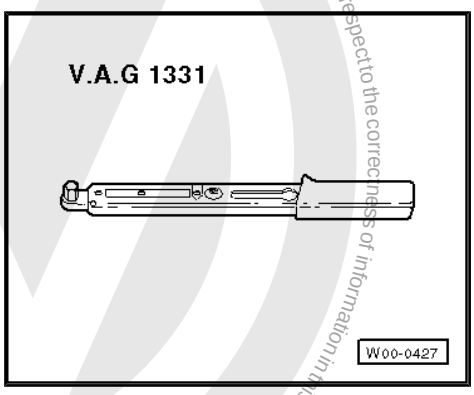
Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

– Teach in electric windows again, enter radio code, set clock and, if necessary, recode control units which emit code signals.

5.1.2 Repairing threaded connections

Special tools and workshop equipment required

♦ VAG 1331



Note

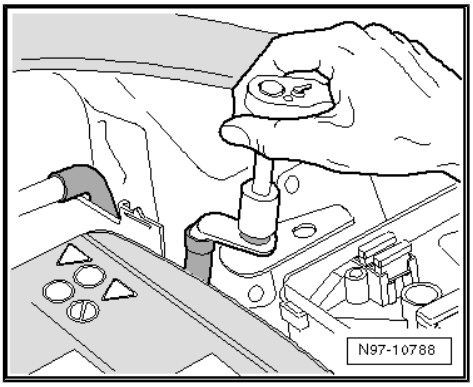
♦ *The use of penetrating fluid, contact spray or grease etc. is prohibited since the missing adhesion in the threads may cause a torque excess and, therefore, the break of the threaded connection.*
♦ *The grey sanding pads are suitable for light dirt and "soft surfaces". The red sanding pads are suitable for heavy dirt and "hard surfaces".*

WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

– Disconnect battery.

– Loosen cap nut and remove ring terminal from threaded connection.
– Check threaded connection for corrosion, dirt etc.
– Select suitable adapter and suitable sanding pad for threaded connection.



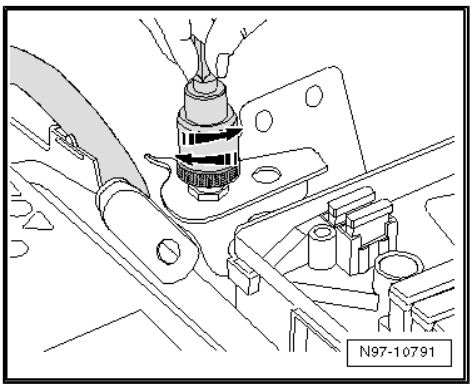
Caution

Take care not to abrade excessively the tin coating and ensure that the copper does not appear. This could produce a galvanic cell which destroys metal and causes faulty repair.

Note

As the thickness of the tin coating may differ according to the design, the cleaning process must be performed step by step and a visual check of the ring terminal is necessary between the steps.

– Set adapter on threaded connection and grind off corrosion and dirt with circular movements.
– Check threaded connection and regrind if necessary.
– Tighten connection and, if necessary, locating element again to specified torque ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



Note

Optimum contact is ensured when the components to be secured are tightened to the specified torque after cleaning.

– Apply suitable anti-corrosion treatment to threaded connection ⇒ page 215 .
– Reconnect battery.

WARNING

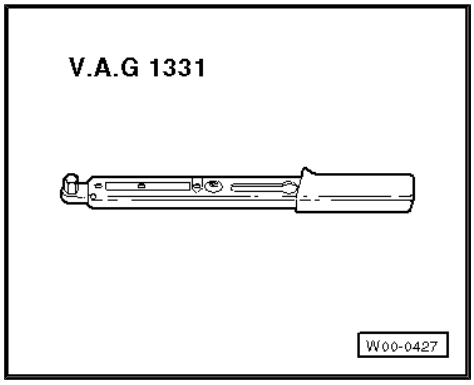
Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

– Teach in electric windows again; enter radio code, set clock and, if necessary, recode control units which emit code signals.

5.1.3 Cleaning battery terminal clamp and battery terminal

Special tools and workshop equipment required

♦ VAG 1331



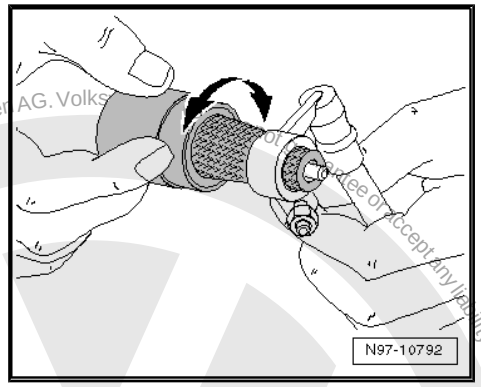
Note

The use of penetrating fluid, contact spray or grease etc. is prohibited since the missing adhesion in the threads may cause a torque excess and, therefore, the break of the threaded connection.

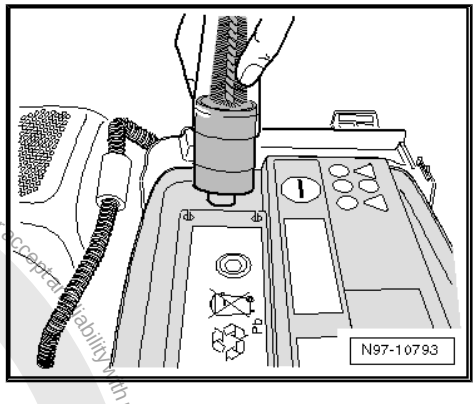
WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

– Disconnect battery.
– Check battery terminal clamp and battery terminal for corrosion or dirt.
– Clean battery terminal clamp using wire brush of battery terminal cleaner with circular movements.



– Clean battery terminal using underside of battery terminal cleaner with circular movements.



WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ page 2 !

– Reconnect battery and tighten battery terminals to specified torque.

Note

Optimum contact is ensured when the components to be secured are tightened to the specified torque after cleaning.

5.1.4 Anti-corrosion treatment

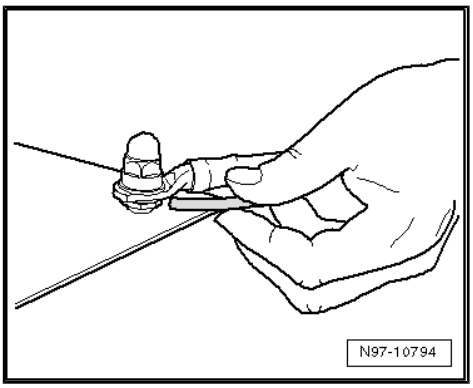
Caution

Missing anti-corrosion treatment results in damage to the on-board supply.

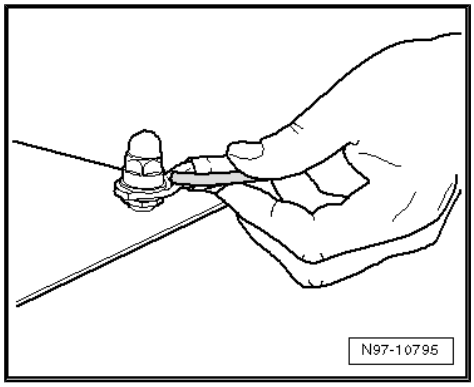
Note

- *All threaded connections must be tightened to specified torque.*
- *When treating against corrosion, always use hose supplied on tin of anti-corrosion agent.*
- *Use protection wax for cold area.*
- *Use cavity sealing agent for warm area.*
- *The sealing agent independently reaches the respective points through capillary action.*

– Hold injector below ring terminal and spray pin all around.



– Hold injector above ring terminal and spray pin and wiring eye all around.



6 Renewing Lambda probe

Note

- *Do not repair lambda probe wires, since this can result in malfunctions.*
- *If necessary, replace attachment parts, cable ties or marking rings to match the uniform probe to the defective probe as specified.*
- *If necessary, identify the lambda probe by means of the protective tube* *⇒ page 219* *.*

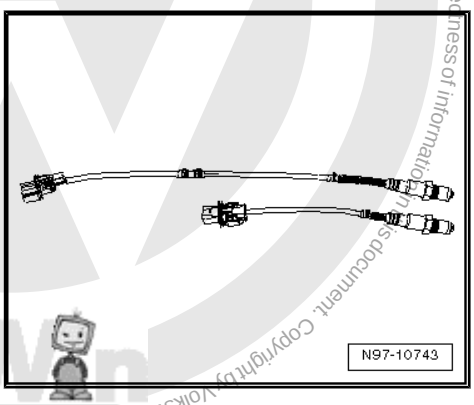
6.1 Renewing LSF lambda probe (4-pin)

Note

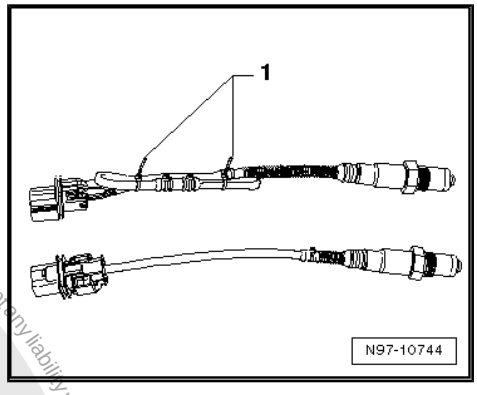
- *If necessary, replace attachment parts, cable ties or marking rings to match the uniform probe to the defective probe as specified.*
- *Do not repair lambda probe wires, since this can result in malfunctions.*

– Remove the defective Lambda probe.

– Place both Lambda probes next to each other so that the sensor housings are at the same height.



– Tie back any excess in the uniform probe length (approx. 50 - 250 mm) to the size of the defective probe and secure with cable ties -1-.
– Check that the connector housing of the lambda probe is compatible with the onboard supply side.
– If necessary, replace the onboard supply system connector with the lambda probe connector housing supplied.



Note

- *The connector housing should only be replaced on older vehicles. On new vehicles, the connector housing coding matches.*
- *Observe pin assignment. For reasons of clarity, respective pins in new connector housing have a colour marking.*
- *Further notes can be found in the leaflet of the new lambda probe.*

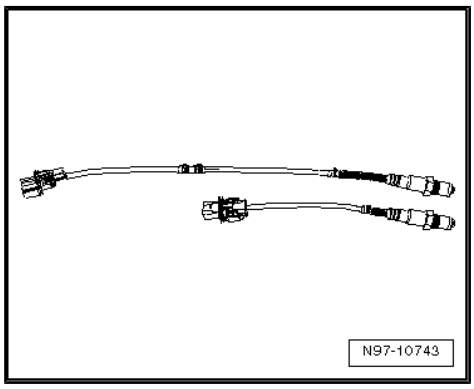
– Install the new Lambda probe in the vehicle.

6.2 Renewing LSU Lambda probe (6-pin)

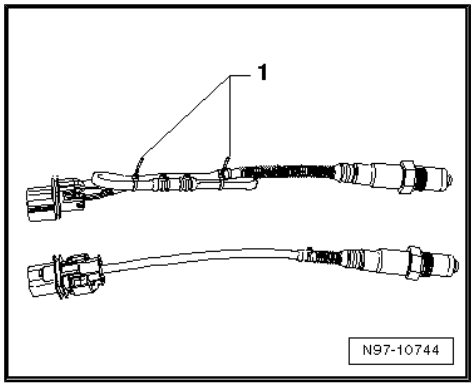
Note

- *If necessary, replace attachment parts, cable ties or marking rings to match the uniform probe to the defective probe as specified.*
- *The wires should not be crimped or cut as otherwise the function of the Lambda probe will be impaired.*

– Remove the old Lambda probe.
– Place both Lambda probes next to each other so that the sensor housings are at the same height.



– Tie back any excess in the uniform probe length (approx. 50 - 250 mm) to the size of the defective probe and secure with cable ties -1-.
– Install the new Lambda probe in the vehicle.



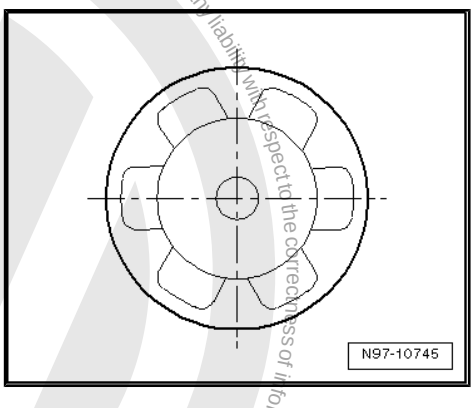
6.3 Types of protective tube on uniform Lambda probes

Note

In addition to identifying by way of the part number, the protective tube can also be used as a means of identification.

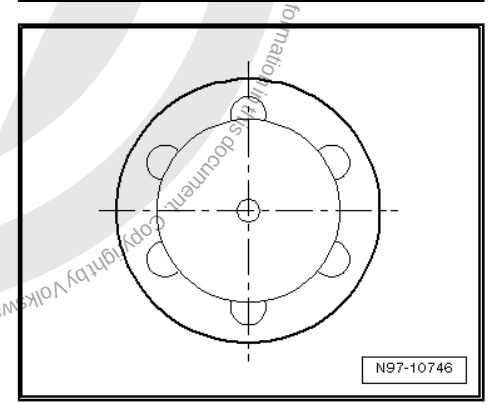
Type D1, 6 openings at 3.5 mm each

Only used on 4-pin LSF lambda probes.



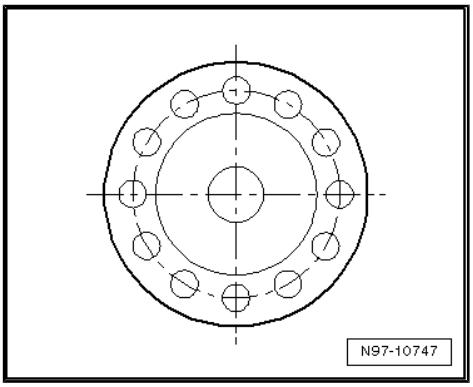
Type D2, 6 openings at 2 mm each

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



Type D4, 12 openings at 1.4 mm each

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



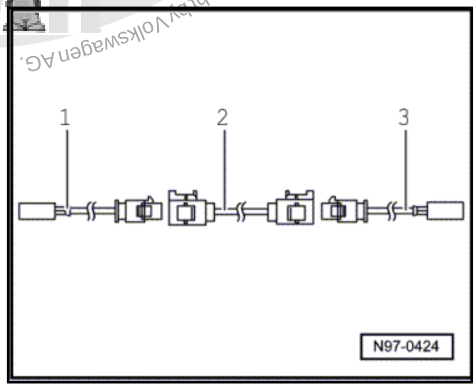
7 Renewal of aerial wiring

A new repair concept has been developed for repair work on aerial wires. Now connecting wires in different lengths and various adapter cables are available as replacement parts instead of a complete aerial wire.

7.1 General description

- Aerial wires must not be repaired, but if repair is required, they must be replaced only by connecting wires and adapter cables offered as genuine parts.
- Replacement parts can be found in the Parts Catalogue (ETKA): Special catalogue; Electrical connections; Genuine accessories; Subgroup 35 from illustration No. 035-20.
- These genuine parts are suitable for all aerial wires and wire diameters which may need to be replaced.
- No provision has been made for replacement of individual aerial connectors in the event of repair.
- The wires can be used retroactively for all VW models, with all installed aerial wire diameters.
- All adapter and connection wires are suitable for all transmitter and receiver signals.
- This repair method can also be used for testing or retrofitting.

7.2 Assembly overview - aerial wire



Example – aerial cable between radio and aerial is defective. The following wires are required for the repair:

1 - Adapter cable, to radio connection. Length approx. 30 cm.

2 - Connecting wire, available in different lengths.

3 - Adapter cable, to aerial connection. Length approx. 30 cm.

7.3 Installing a new aerial wire

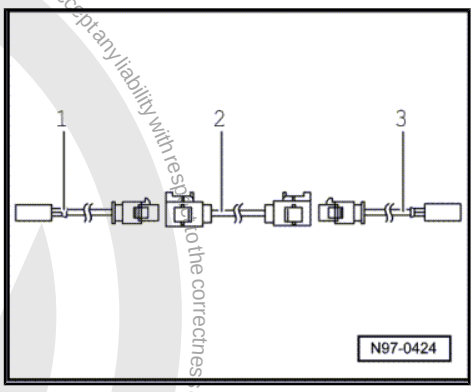
Note

Note that complete route of aerial lead may be split into sections through aerial diversity control unit, traffic data control unit or aerial amplifier depending on vehicle equipment level. Only the defective section of aerial wire must be replaced.

– Disconnect connectors of defective aerial lead from devices.

– Ascertain routing of defective aerial lead in vehicle and measure total length of aerial connection to be renewed in vehicle.

The total length of aerial connecting wire is the sum of the length of adapter cables required -1- and -3- and the connecting wire -2-.



– To determine the length of connecting wire required, subtract 60 cm from the measured total length of aerial connecting wire -2-.
– Procure the required adapter cables -1- and -3- and connecting wire -2- at length calculated as genuine part from the Electronic parts catalogue (ETKA).
– Cut off connectors from defective aerial lead.

The remainder of the defective aerial wire remains in the vehicle.

– Connect adapter cables -1- and -3- to equipment in vehicle.
– Route connecting wire -2- in parallel to former aerial lead and secure it.

Note

Do not kink or excessively bend aerial wires! The bending radius must not be below 50 mm.

– Connect connecting wire to adapter cables.
– Perform a function test.