



27 – Starter, current supply, CCS

1 Battery



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#) !



Caution

To prevent damage to the battery and vehicle, the following should be observed 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 specifications 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.

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 perform a visual check. Refer to chapter, Checking battery ➔ [page 5](#) .

1.2.1 Battery with magic eye

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



Caution

No stickers may be removed and do not replenish with distilled water. Only perform a visual check. Refer to chapter, Checking battery ➔ [page 5](#) .



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting.

These batteries must be renewed.



This battery is equipped with a magic eye. The magic eye provides information concerning the level of the electrolyte and the charge state of the battery via a coloured display. Checking colour display of the magic eye ➔ [page 6](#)

1.2.2 Absorbent glass mat battery

Maintenance-free battery with a contained electrolyte and no magic eye.

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

AGM is the abbreviation for absorbent glass mat.

Due to containment of the electrolyte, this type of battery may not have a magic eye. 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, in the operating manual and in ELSA are observed.



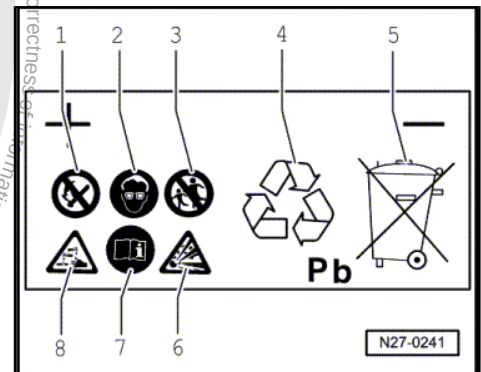
WARNING

- ◆ *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 or acid corrosion and 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 must be renewed where the magic eye is colourless or light yellow. They must not be checked or charged and do not slave/jump start. Danger of explosion when checking and charging or slave/jump 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. - Fires, sparks, naked flames and smoking are prohibited when handling batteries. 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. - Always follow instructions on battery, in ELSA "Electrical System, General Information" 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.*



2 Checking battery



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#)!



Caution

To prevent damage to the battery and vehicle, the following should be observed concerning types of battery ➔ [page 1](#) .

2.1 Checking the various types of batteries

2.1.1 Checking battery with magic eye



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. Check colour display of „3-colour“ magic eye ➔ [page 6](#)
or „2-colour“ magic eye ➔ [page 7](#) .



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

3. Perform a battery load test using battery tester with printer
-VAS 5097 A- ➔ [page 9](#) .
- Battery test with battery tester with printer -VAS 6161-
➔ [page 14](#) .
4. Depending on the result of the battery test, „perform current
draw test“ ➔ [page 22](#) .

2.1.2 Absorbent glass mat battery

Carry out procedure in sequence as follows:

1. Visual check ➔ [page 6](#)
2. Perform a battery load test using battery tester with printer
-VAS 5097 A- ➔ [page 9](#) .
- Battery load test with battery tester with printer -VAS 6161-
➔ [page 14](#)





3. Depending on the result of the battery test, „perform current draw test“ ➔ [page 22](#) .

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. Therefore it can no longer be guaranteed that the vehicle will function correctly.

2.3 Checking colour display of magic eye

2.3.1 Checking colour display of „3-colour“ magic eye



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#) !



General information on magic eye:

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 magic eye provides information concerning electrolyte level and the charge state of the battery.

Before carrying out a visual check, tap the magic eye lightly and carefully using the handle of a screwdriver. The air bubbles, which can influence the display, will dissipate when doing this. The colour display of the magic eye will therefore be more accurate.



Note

- ◆ Air bubbles can form below the magic eye particularly when the battery is being charged, including during normal vehicle operation. These distort the colour displayed by the magic eye.
- ◆ Because the magic eye is located in only one cell, the display applies only to this cell. An exact determination of the battery condition is only possible through a battery load test ⇒ [page 9](#) or a battery test ⇒ [page 14](#).
- ◆ The magic eye 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 where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

23.2 Checking colour display of „2-colour“ magic eye

**WARNING**

Danger of injury! Observe warning notices and safety regulations ⇒ [page 2](#)!



General information on magic eye:

For batteries from „5K0“ index in original equipment and for replacement batteries 191 915 105 AC from „000 915 105 DX“ index, the »green« colour display for charge state display has been discontinued. The introduction of the new colour display will take place gradually, i.e. there will be a transition period for both displays. In the future, the only remaining colours will be »black« or »colourless or light yellow«.

The magic eye provides information concerning the electrolyte level of the battery.

The charge state of the battery can no longer be read from the magic eye, a battery load test must be carried out for this

⇒ [page 9](#)

Before carrying out a visual check, tap the magic eye lightly and carefully using the handle of a screwdriver. The air bubbles, which can influence the display, will dissipate when doing this. The colour display of the magic eye will therefore be more accurate.



Note

- ♦ *Air bubbles can form below the magic eye particularly when the battery is being charged, including during normal vehicle operation. These distort the colour displayed by the magic eye.*
- ♦ *Because the magic eye is located in only one cell, the display applies only to this cell. An exact determination of the battery condition is only possible through a battery load test*
⇒ [page 9](#).
- ♦ *The magic eye can be located at various positions on the battery.*

Three 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 where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

2.4 Battery tester with printer -VAS 5097 A-



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 5097 A- .

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



- ◆ 80 - 520 A low-temperature test current according to DIN (Deutsche Industrie Norm (German Industrial Standard))¹⁾
- ◆ 95 - 574 A cold cranking current according to IEC (International Engineering Consortium)
- ◆ 136 - 855 A cold cranking current according to EN/ SAE (European Norm/Standard of Automotive Engineers)

1) Batteries with cold cranking current higher than 499 A according to DIN (e.g. 520 A, 580 A or 600 A) can be temporarily tested using setting for 499 A 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.



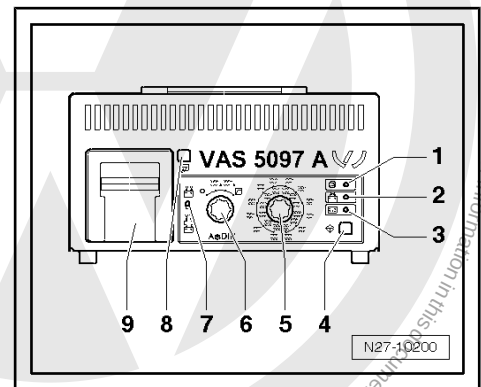
Note

Observe the ⇒ instruction manual of Battery tester with printer - VAS 5097 A- or the sticker ⇒ Brief instructions for battery tester with printer -VAS 5097 A- on the unit or table: Cold cranking current ⇒ [page 11](#) .

2.4.1 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 - Start button
- 5 - Cold cranking 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



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



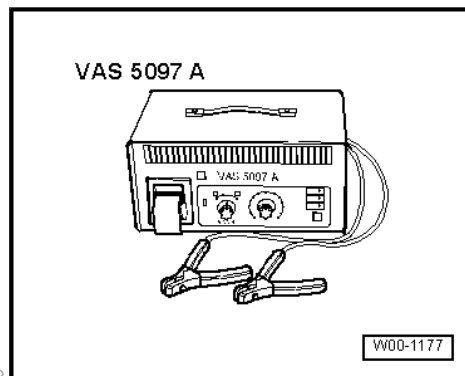
WARNING

Danger of injury! Observe 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 where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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.
- Check magic eye on batteries with magic eye ⇒ [page 5](#) .
- Check low-temperature test current in amperes (A) according to DIN from indications on battery or set setting range on battery tester with printer -VAS 5097 A- according to table ⇒ „2.4.3 Table: cold cranking current“, [page 11](#) .



Note

If the battery values are shown in IEC or EN/SAE instead of DIN then convert figures using table

⇒ „2.4.3 Table: cold cranking current“, [page 11](#) or using table on unit.

- Select low-temperature test current via low-temperature test current selection switch ⇒ [page 9](#) .
- Select measuring range 80 - 379 A or 380 - 499 A with ON/OFF and functions switch ⇒ [page 9](#) .



Note

Batteries with cold cranking current higher than 499 A according to DIN (e.g. 520 A, 580 A or 600 A) can be temporarily tested using setting for 499 A according to DIN.

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



Note

- ◆ Ensure test clamps have a good contact!
- ◆ Observe technical product information TPI 2012182 for battery tester with printer -VAS 5097 A- .

- Select point of connection of test terminals with selection switch ⇒ [page 9](#) .

1 - Connected directly to battery

2 - Connected to external test points in engine compartment

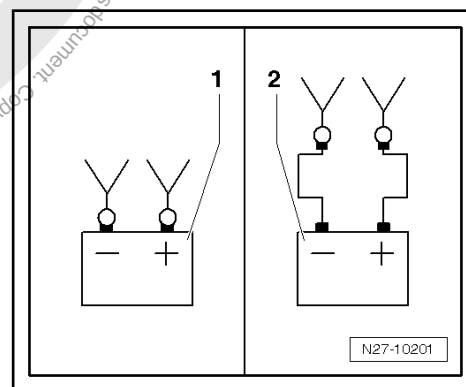
- Check that the figures given on the battery are correct for the settings on the battery tester.

- Press start test 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 25](#) and test again.

- 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.
- ◆ Perform test once only. Repeating the test falsifies the result.
- ◆ The tester requires approx. 30 minutes to cool down before it is ready for the next test.

2.4.3 Table: cold cranking current

Cold cranking 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



Cold cranking current in A			
EN/ SAE	IEC	⇒	DIN
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) 1)}

2) ¹⁾ Batteries with cold cranking current higher than 499 A according to DIN (e.g. 520 A, 580 A or 600 A) can be temporarily tested using setting for 499 A according to DIN.

2.4.4 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 is completed, this low voltage value remains over a longer period, and the voltage increases very slowly again.
- ◆ 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.



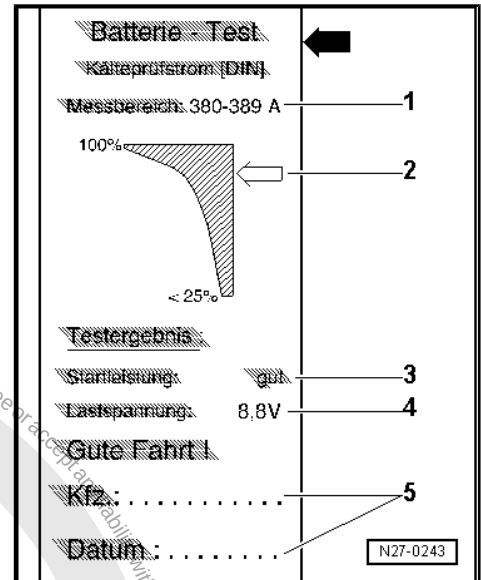
2.4.5 Comments concerning test print out

- 1 - Measuring range selected on tester
- 2 - Diagram -arrow- indicates battery condition.
- 3 - Test result
- 4 - Battery voltage during load test.
- 5 - Vehicle data and date Must be completed by test personnel



Note

- ◆ The test printout is required for warranty claims.
- ◆ Perform test once only. Repeating immediately the test falsifies the result.



2.4.6 Assessing test results

Printout from battery tester	Measure to be performed
Starting capability very good	Battery OK.
Starting capability good	Battery OK.
Starting capability sufficient	Evaluation by carrying out a current draw test when charging ⇒ page 22
Starting capability poor	Evaluation by carrying out a current draw test when charging ⇒ page 22
Starting capability very poor	Evaluation by carrying out a current draw test when charging ⇒ page 22
Cannot be tested	Perform battery charging ⇒ page 25 and repeat test.



2.5 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, so that battery data from Volkswagen are always up to date.

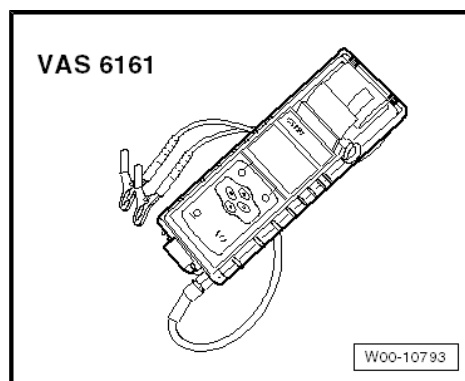
The integrated temperature sensor improves measurement quality.

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



Note

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



2.5.1 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





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

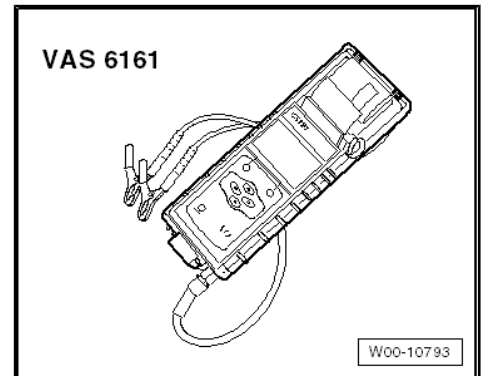


WARNING

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 where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

- Switch off ignition and all electrical consumers.
- Check magic eye on batteries with magic eye ➔ [page 5](#) .
- 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](#))
- ◆ Service test ➔ [page 16](#)
- ◆ Guarantee test ➔ [page 17](#)



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.

2.5.3 Performing maintenance test



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 barcode or select type and manufacturer 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.

2.5.4 Perform service test



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

- Select „Service test“ in the menu.
- Select „On battery terminal“ or „On jump-start point“.
- Select vehicle type.
- Measure temperature. Hold temperature sensor about 5 cm above one battery terminal until temperature stabilises.



- Select battery type „Normal“, „AGM“, „2*6V“ or „Gel“.
- Select „CCA“, „JIS“, „DIN“, „SAE“, „IEC“ or „EN“ norm.
- Start test.
- Print out test log if necessary.

2.5.5 Perform guarantee test



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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“.
- Select vehicle type.
- Measure temperature. Hold temperature sensor about 5 cm above one battery terminal until temperature stabilises.
- Select battery type „Normal“, „AGM“, „2*6V“ or „Gel“ or scan in.
- Select battery capacity or scan in.
- Start test.
- Print out test log if necessary.

2.5.6 Comments concerning test print out

- 1 - Check type.
- 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 - Fitting location of battery
- 8 - Position of battery clamp selected on tester
- 9 - Selected battery technology.



Note

The test printout is required for warranty claims.

2.5.7 Assessing test results

Evaluating battery test results for guarantee and service tests

Battery test results	Measures
Battery OK	No measures on battery



Battery test results	Measures
Battery OK - recharge.	Charge battery ➔ page 25 . In case of discharging, look for fault
Perform current draw test	Perform current draw test ➔ page 22 . Fully charge battery ➔ page 25 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 25 .
Mark as defective.	Mark as defective.
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.

2.6 Midtronics -MCR340V- battery tester only for USA/Canada vehicles

General description ➔ [page 18](#)

Perform battery test with Midtronics -MCR340V- battery tester ➔ [page 19](#) .

Dealing with problems with Midtronics -MCR340V- battery tester ➔ [page 21](#)

2.6.1 General description



WARNING

Danger of injury.

Before working on the battery, read through the warning and safety regulations carefully, and comply with them ➔ [page 2](#) .

Dispose of electrolyte (mixture of sulphuric acid and water) safely! Waste electrolyte is only allowed to be disposed of at appropriately indicated collecting points. Comply with the locally applicable disposal guidelines.

Do not test batteries that are liberating gas. Otherwise, there is a danger of explosion.



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.



Note

To prevent damage to the battery and vehicle, note the types of battery and the remarks given ➔ [page 1](#) .

Batteries in VW vehicles are only allowed to be tested with battery testers approved by VW. In the USA/Canada, it is permitted for the Midtronics -MCR340V- battery tester to be used.

Read all the information about safety, setup and operation in the operating instructions for the Midtronics -MCR340V- battery tester and follow the instructions to the letter.

Refer to ➔ Self-study programme No. ; Vehicle batteries for more information.

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

Always comply with the safety regulations, the regulations for setting up the battery tester, the display menu/display buttons, LEDs and the operating procedures described in the ➔ operating manual MCR340V .



Note

Observe and comply with all subsections, remarks and references to the vehicle and battery type, etc. to be tested.

2.6.2 Performing battery test with Midtronics - MCR340V- battery tester

Prerequisites:



WARNING

Before working on the battery, read through the warning and safety regulations carefully, and comply with them ➔ [page 2](#) .

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

- Read general description ➔ [page 18](#) .
- Perform visual check ➔ [page 6](#) .



- Open bonnet or cover for other installation location of battery.
- Determine whether battery type is „Standard“ or „AGM“.
- Remove covers from battery positive and negative terminals.
- Use wing covers or other kinds of cover before you use equipment in engine compartment or interior.
- Close all doors.



Note

- ♦ *Battery temperature must be at least 10 °C.*
- ♦ *For additional information, refer to the ⇒ operating manual INC 940 .*

Perform test:



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

- Switch off ignition and all electrical consumers.
- Check magic eye on batteries with magic eye ⇒ [page 5](#) .
- Switch on tester.
- 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 „In vehicle“ or „Outside vehicle“.
- Select „Warranty test“.



Note

Use the print function of the Midtronics -MCR340- tester if the test results are required for handling warranty applications.

- Select battery type „Standard “ or „AGM“.
- Make a note of the DIN value of the battery as shown on the battery sticker. If there is no DIN value on the sticker, make a note of the SAE value.
- Enter DIN value in tester and perform battery test ⇒ operating manual MCR340V .
- If you are using SAE value, access „Miscellaneous“ menu and change from „DIN“ to „SAE“ ⇒ operating manual MCR340V .



Note

Always use DIN value from battery sticker! Otherwise, test result will be falsified.

2.6.3 Assessing test results

Results of battery test:

Battery test results	Measures
Battery OK	None
Good - charge	Charge battery ➔ page 55 .
Use Incharge	Charge battery ➔ page 55 .
Renew battery.	Renew battery ➔ Electrical system; Rep. gr. 27 ; Removing and installing battery
Battery cell defective	Renew battery ➔ Electrical system; Rep. gr. 27 ; Removing and installing battery

2.6.4 Dealing with problems with Midtronics - MCR340V- battery tester

Under certain circumstances, the display may show errors or messages according to status.

The most frequent display messages are listed below, together with suggested solutions.



Note

For messages not listed here, please refer to ➔ operating manual MCR340V .

Display message	Measures
No display	– Check whether terminals of battery tester are firmly connected to battery terminals. – Check battery terminals are tightened according to regulations and do not have corrosion. – Charge battery ➔ page 55 .
System noise	– Switch off all electrical consumers. – Wait until all electrical loads monitored by onboard supply control unit have switched off. – Remove ignition key. – Disconnect any suspect electrical equipment not connected to onboard supply as standard.





Wait a few minutes and test again ➔ [page 19](#) .



Note

If you have performed test at jump-start point and message does not disappear, perform test directly on battery.

2.7 Current draw test



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 26](#)

◆ VAS 5900 ➔ [page 30](#)

◆ VAS 5903 ➔ [page 41](#)

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.



Note

For battery tester with printer -VAS 6161- , the current draw test must always be performed when the test result „Perform current draw test“ appears on the display.

The current draw test must be carried out when the test result with battery tester with printer -VAS 5097A- is as follows:

- 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)

Depending on the test result ➔ [page 13](#) with battery tester with printer -VAS 5097A- , further procedures or tests may be required before making a final decision on the condition of the battery.

Performing a current draw test whilst charging a battery will quickly establish whether a partly or fully discharged battery ➔ [page 59](#) can be recharged to return it to a serviceable condition.



Test requirements

- ◆ When charging a battery, battery temperature must be at least $\geq +10^{\circ}\text{C}$.
- ◆ 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.
- Connect battery to battery charger and start charging sequence.
- Measure charging current of battery after 5 minutes.

Test result:

If the current draw A is higher than 10 % of the nominal capacity (e.g. $> 6.1\text{ A}$ for a 61 Ah battery), fully charge battery and test again.



Note

For Eos with two 6V absorbent glass mat batteries, the charge current must only be 5 % higher than the nominal capacity of the battery. Example for Eos: the 50 Ah battery must have a charge current higher than 2.5 A after 5 minutes of starting the charging sequence.

- Fully charge the battery when the charge current is higher than 10 % of the nominal capacity (observe exception for Eos in above note).
- Perform battery test after allowing battery to rest for two hours
⇒ page 9 .

If the charge current, in amperes, lies below 10 % of the nominal capacity after 5 minutes of starting the charging sequence (5 % for the 2 x 6 volt batteries in Eos) (example for 50 Ah battery $< 5\text{A}$), renew battery. For Guarantee and ex-gratia cases: complete battery test sheet and keep it with the battery.

2.8 Checking no-load voltage of battery on stock and stored vehicles



WARNING

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



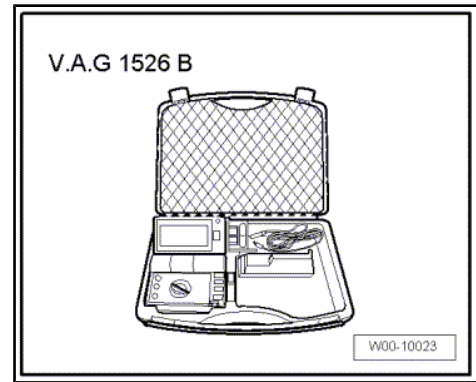
Note

- ◆ *The no-load voltage test may only be carried out to assess the condition of the battery on stock and stored vehicles within the framework of prescribed maintenance.*
- ◆ *The no-load test serves to determine whether a battery on a stock or stored vehicle requires recharging ⇒ Maintenance tables „Service for stock and stored vehicles“.*

Special tools and workshop equipment required



◆ Hand multimeter -V.A.G 1526 B-



Test conditions

The battery must not have been charged or discharged within the last 2 days.

- Check battery no-load voltage with hand multimeter -V.A.G 1526 B- .

No-load voltage	Charge	Condition of battery
11.60 V	0 %	Discharged, no capacity Heavily discharged ➤ page 59 .

Measured value	Measure to be performed
No-load voltage ≥ 12.5 V	No-load voltage OK
No-load voltage < 12.5 V	Charging battery ➤ page 25



3 Charging battery



WARNING

Danger of injury! Observe warning notices and safety regulations ⇒ [page 2](#)!



Caution

To prevent damage to the battery and vehicle, the following should be observed concerning types of battery ⇒ [page 1](#).



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 charging 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-

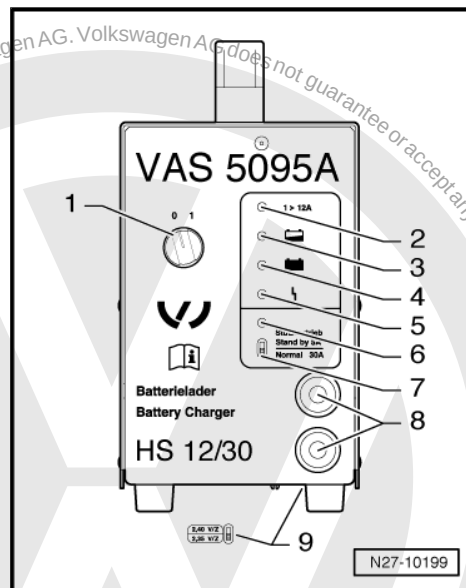
The battery charger -VAS 5095- is suitable for charging all 12V batteries supplied by Volkswagen.



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-

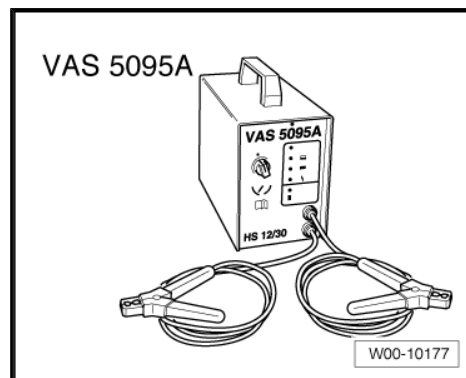


WARNING

Danger of injury! Observe 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 where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

- Switch off ignition and all electrical consumers.
- Check setting for battery type on type of battery switch ⇒ [page 25](#) . Must be set to 2.4 V/C (volts/battery cell).
- Connect red terminal clamp „+“ of charger unit 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 terminal clamp „-“ of battery charger to negative terminal.
- Switch on battery charger ⇒ [page 25](#) .

The charging current indicators ⇒ [page 26](#) -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 26](#) -4- the charger has switched to "maintaining charge". The battery is fully charged.

- Switch off charging unit ⇒ [page 25](#) .
- Remove charger unit terminals from battery terminals.

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



WARNING

Danger of injury! Observe 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

- ◆ *Observe notes in chapter ⇒ [page 59](#) .*
- ◆ *Totally discharged batteries in vehicles before registration must be exchanged prior to delivery. Preliminary damage cannot be excluded.*
- ◆ *The battery voltage must be at least 0.6 V.*



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

- Charge battery ⇒ [page 26](#) .

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

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! Observe warning notices and safety regulations ⇒ [page 2](#) !



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 terminal clamps are seated securely.*
- ◆ *Do not press **START / STOP** button when charger unit cables are connected incorrectly. The charger unit may be damaged.*

- Remove 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 terminal clamp „+“ to positive terminal of vehicle.



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 terminal clamp „+“ to negative terminal of vehicle.
- Check setting for battery type on normal/support mode switch ➔ [page 25](#) . It must be switched on support mode.
- Check polarity of charger unit cables.
- Switch on battery charger.

The battery charger starts with support mode.

End battery support mode:

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



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



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#)!



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

In maintenance mode the battery charger -VAS 5095 A- ensures that the battery is charged correctly and is maintained in fully charged condition.

- Proceed as for charging battery ➔ [page 26](#).



Note

- ◆ *When a battery is being charged in maintenance mode and a electrical consumer draws current from the battery, the battery charger -VAS 5095 A- automatically compensates the charge.*
- ◆ *The maintenance 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! Observe warning notices and safety regulations ➔ [page 2](#)!



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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

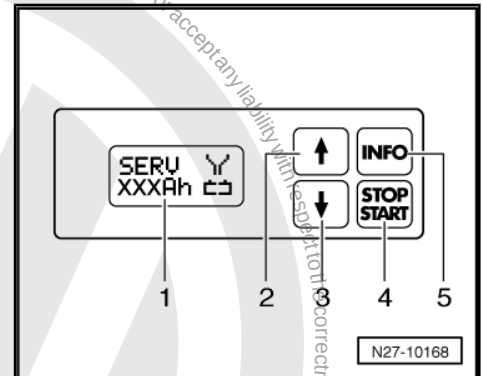
- ◆ The effective charging current can be read directly on these charging units.
- ◆ Observe ⇒ operating instructions for battery charger -VAS 5900-.

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! Observe warning notices and safety regulations ⇒ page 2!



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

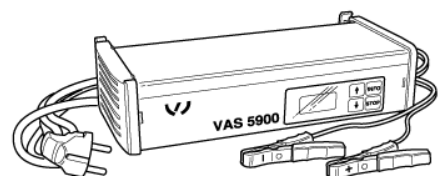
Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

Special tools and workshop equipment required

- ◆ Battery charger -VAS 5900-

VAS 5900



W00-10182



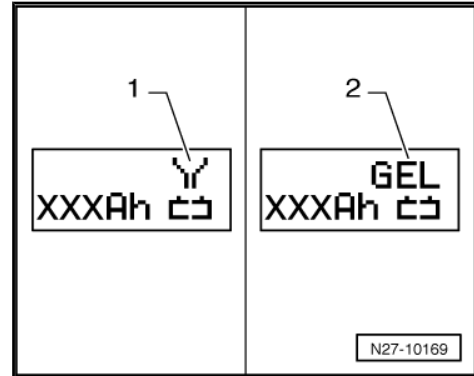
Note

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

- Switch off ignition and all electrical consumers.
- Connect charger plug to battery charger. The last selected type of battery will appear on display.
- Set battery to respective operating mode with **INFO**.

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

- Set battery capacity (Ah) of battery for charging using respective button „Up“ **↑** or „Down“ **↓**.
- Connect red terminal clamp „+“ to positive terminal on battery.



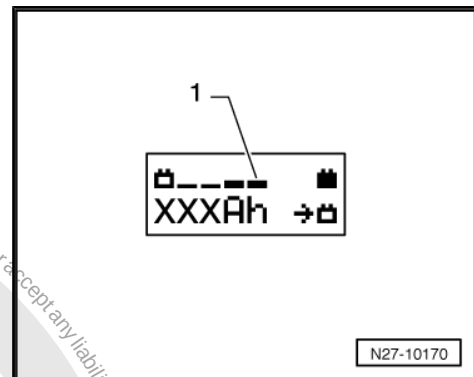
Note

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 terminal clamp „-“ to negative terminal.

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.



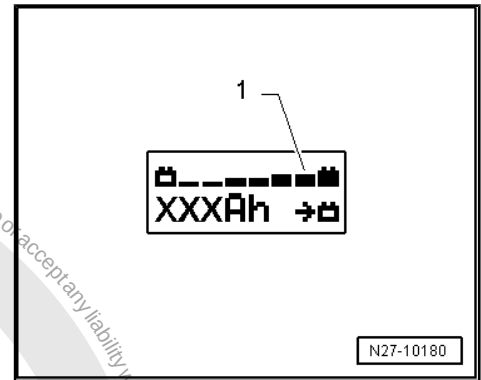


At a charge condition of 100 % all bars appear in display.



Note

- ◆ In the battery type „standard charge“ the parallel use 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:
 - Press respective 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.
 - Press respective 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 terminal clamp „-“ of charger from negative terminal.
- Disconnect red terminal clamp „+“ of charger from positive terminal on battery.
- Pull charger plug out of battery charger.

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



WARNING

Danger of injury! Observe 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 there is a requirement to use „service charge“ the battery must be disconnected from the onboard supply.



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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- !

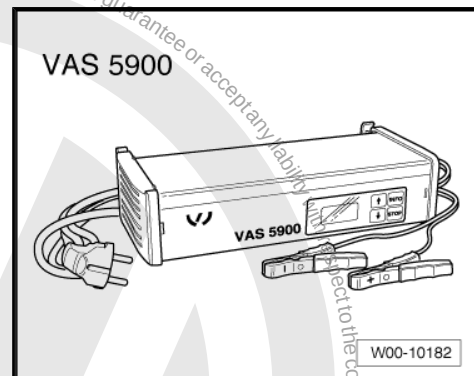
The „service mode“ is suitable for:

- ◆ **Wet batteries where the magic eye allows charging (magic eye black or green)**

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, always check the colour of the magic eye before using 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.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ⇒ [page 31](#) .



- Set battery to respective battery type 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 for charging using respective button „Up“ or „Down“ .
- Connect red terminal clamp „+“ 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 terminal clamp „-“ to negative terminal.

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 % of the battery voltage, the battery charger 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:

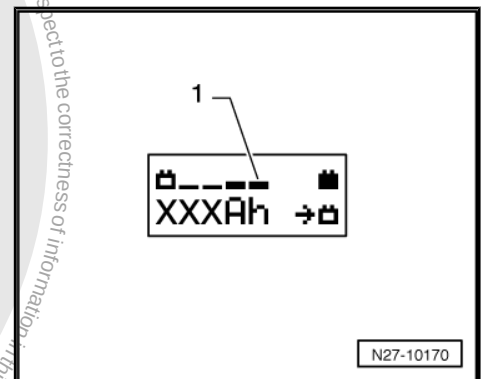
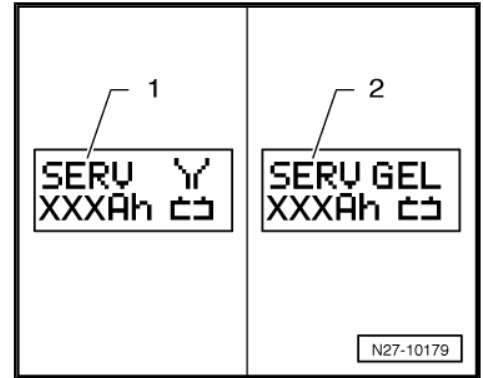
- 1 - Displayed battery voltage is not as per nominal voltage:
 - Press respective button „Up“ or „Down“ until charging sequence starts.
- 2 - Displayed battery voltage is not as per nominal voltage – charging sequence already started:
 - Press **START / STOP** twice.
 - Press respective button „Up“ 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 terminal clamp „-“ of charger from negative terminal.
- Disconnect red terminal clamp „+“ of charger from positive terminal on battery.
- Pull charger plug out of battery charger.





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



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#)!



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.



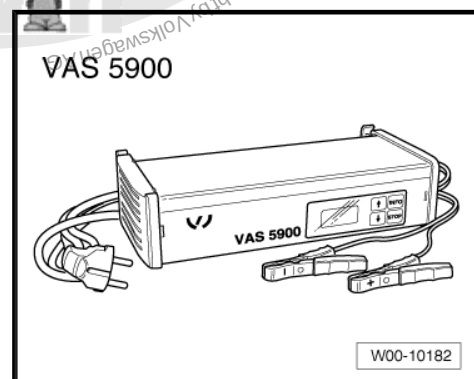
Caution

- ◆ ***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 59](#) .***
- ◆ ***Do not press **START / STOP** button when 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

- ◆ *Observe notes in chapter ➤ [page 59](#) .*
- ◆ *Totally discharged batteries in vehicles before registration must be exchanged prior to delivery. Preliminary damage cannot be excluded.*
- ◆ *The battery must have a temperature of at least 10 °C.*
- Switch off ignition and all electrical consumers.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ➤ [page 31](#) .





- Set battery to respective battery type with **INFO**.

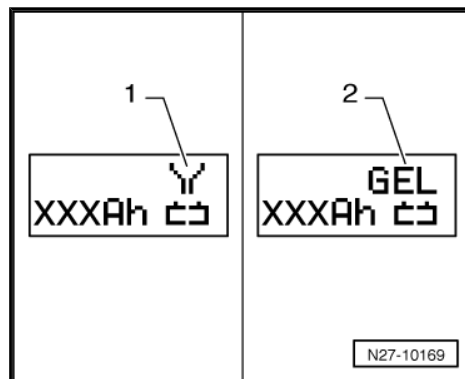
In the display, the symbol -1- for „Service charge for wet batteries“ or symbol -2- for „Service charge for gel/absorbent glass mat batteries“ will appear.

- Set battery capacity (Ah) of battery for charging using respective button „Up“ or „Down“ .
- Connect red terminal clamp „+“ 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 terminal clamp „-“ to negative terminal.
- Press **START / STOP** for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.
- Press respective button „Up“ or „Down“ to set respective 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 the selected battery voltage with **START / STOP**.

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

- Check polarity of charger unit cables.
- Confirm polarity of charger unit cables with **START / STOP**.

Charger will start charging sequence for totally discharged battery.

Ending battery charging sequence:

- Press **START / STOP**.
- Disconnect black terminal clamp „-“ of charger from negative terminal.
- Disconnect red terminal clamp „+“ of charger from positive terminal on battery.
- Pull charger plug out of battery 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! Observe warning notices and safety regulations ⇒ page 2!



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 terminal clamps are seated securely.***
- ◆ ***Do not press **START / STOP** button when charger unit cables are connected incorrectly. The charger unit may be damaged.***

- Remove battery.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ⇒ page 31 .



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 terminal clamp „+“ to positive terminal of vehicle.



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 terminal clamp „+“ to negative terminal of vehicle.
- Press **[START / STOP]** for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.
- Press respective button „Up“  or „Down“  to set respective 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 the selected battery voltage with **[START / STOP]**.

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

- Check polarity of charger unit cables.
- Confirm polarity of charger unit cables with **[START / STOP]**.

The battery charger starts with support mode.

End battery support mode:

- Press **[START / STOP]**.
- Disconnect black terminal clamp „-“ of charger unit from negative terminal of vehicle.
- Disconnect red terminal clamp „+“ of charger unit from positive terminal of vehicle.
- Pull charger plug out of battery charger.

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



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 manufacture's maintenance instructions!*



WARNING

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



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

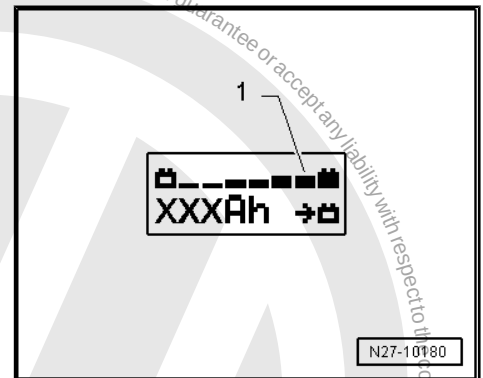
Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

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

- Proceed as for charging battery ➔ [page 31](#) .

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



3.3 Battery charger -VAS 5903-



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#) !



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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- .

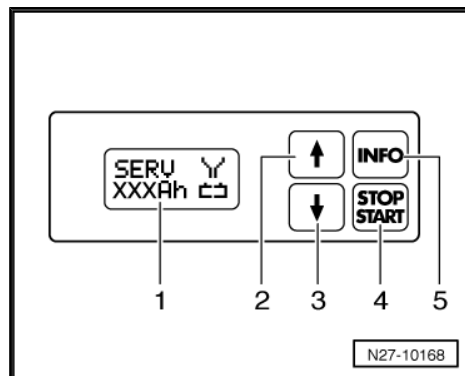


3.3.1 Description of battery charger -VAS 5903-

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! Observe warning notices and safety regulations ➔ page 2!

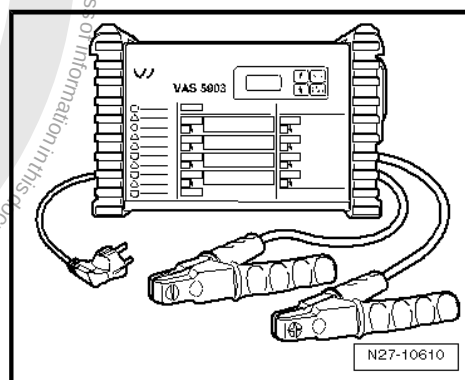


WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!
Danger of explosion when checking and charging or slave/jump 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.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ➔ page 42 .



- Set battery to respective operating mode with **INFO**.

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

- Set battery capacity (Ah) of battery for charging using respective button „Up“ or „Down“ .
- Connect red terminal clamp „+“ to positive terminal on battery.



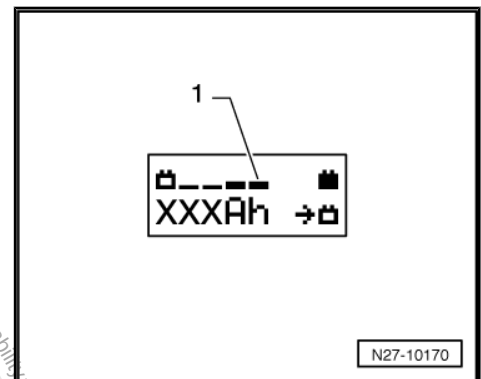
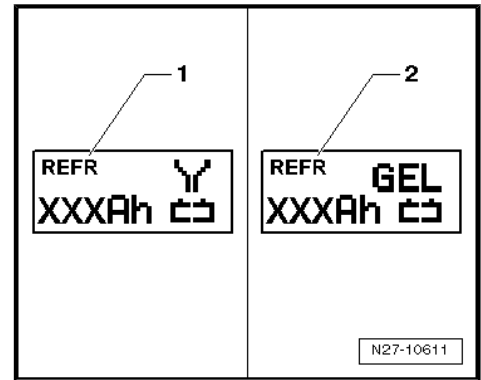
Note

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 terminal clamp „-“ to negative terminal.

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.



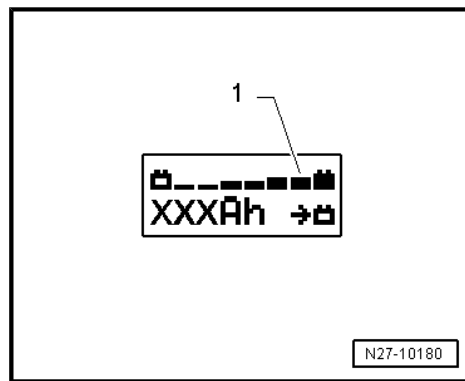


At a charge condition of 100 % all bars appear in display.



Note

- ◆ In the battery type „standard charge“ the parallel use 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:
 - Press respective 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.
 - Press respective 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 terminal clamp „-“ of charger from negative terminal.
- Disconnect red terminal clamp „+“ of charger from positive terminal on battery.
- Pull charger plug out of battery charger.

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



WARNING

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



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 there is a requirement to use „refresh charge“ mode 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:

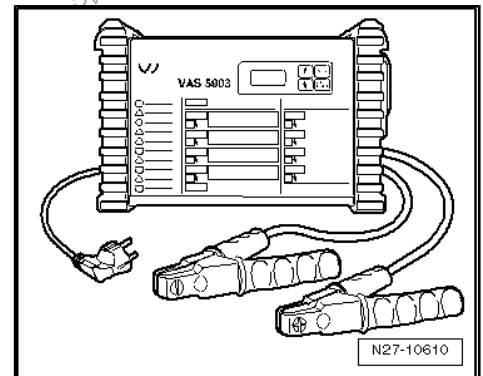
- ◆ **Wet batteries, where distilled water can be replenished.**

Do not use operating mode „refresh charge“ with 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.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ➔ [page 42](#) .



- 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 for charging using respective button „Up“  or „Down“ .
- Connect red terminal clamp „+“ 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 terminal clamp „-“ to negative terminal.

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 % of the battery voltage, the battery charger 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:

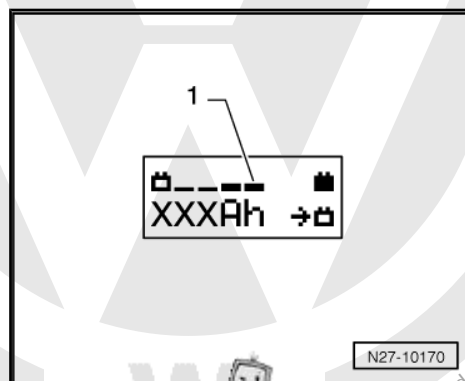
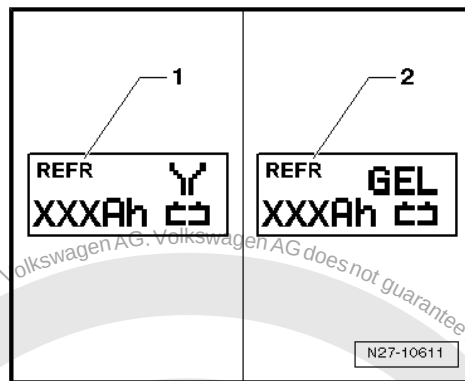
- 1 - Displayed battery voltage is not as per nominal voltage:
 - Press respective button „Up“  or „Down“  until charging sequence starts.
- 2 - Displayed battery voltage is not as per nominal voltage – charging sequence already started:
 - Press **START / STOP** twice.
 - Press respective button „Up“  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 terminal clamp „-“ of charger from negative terminal.
- Disconnect red terminal clamp „+“ of charger from positive terminal on battery.
- Pull charger plug out of battery charger.





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



WARNING

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



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.



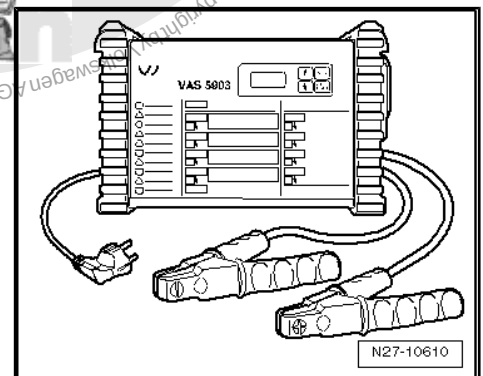
Caution

- ◆ ***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 59 .***
- ◆ ***Do not press START / STOP button when 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

- ◆ *Observe notes in chapter ➤ [page 59](#).*
- ◆ *Totally discharged batteries in vehicles before registration must be exchanged prior to delivery. Preliminary damage cannot be excluded.*
- ◆ *The battery must have a temperature of at least 10 °C.*
- Switch off ignition and all electrical consumers.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ➤ [page 42](#).





- Set battery to respective operating mode with **INFO**.

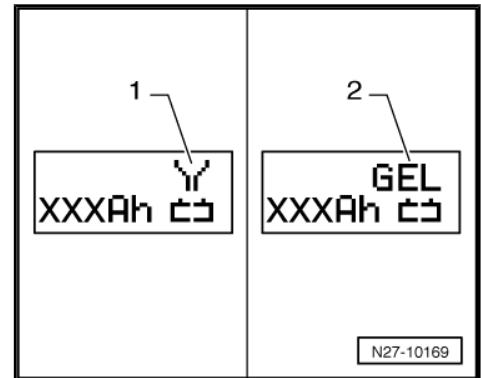
In the display, the symbol -1- for „Service charge for wet batteries“ or symbol -2- for „Service charge for gel/absorbent glass mat batteries“ will appear.

- Set battery capacity (Ah) of battery for charging using respective button „Up“ **↑** or „Down“ **↓**.
- Connect red terminal clamp „+“ 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 terminal clamp „-“ to negative terminal.
- Press **START / STOP** for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.
- Press respective button „Up“ **↑** or „Down“ **↓** to set respective 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 the selected battery voltage with **START / STOP**.
- Then follows the enquiry for "is charger cable terminal polarity correct".
- Check polarity of charger unit cables.
 - Confirm polarity of charger unit cables with **START / STOP**.

Charger will start charging sequence for totally discharged battery.

Ending battery charging sequence:

- Press **START / STOP**.
- Disconnect black terminal clamp „-“ of charger from negative terminal.
- Disconnect red terminal clamp „+“ of charger from positive terminal on battery.
- Pull charger plug out of battery 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! Observe warning notices and safety regulations ⇒ [page 2](#)!



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 terminal clamps are seated securely.***
- ◆ ***Do not press **START / STOP** button when charger unit cables are connected incorrectly. The charger unit may be damaged.***

- Remove battery.
- Connect charger plug to battery charger. The last selected operating mode will appear on display ⇒ [page 31](#) .



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 terminal clamp „+“ to positive terminal of vehicle.



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 terminal clamp „+“ to negative terminal of vehicle.
- Press **START / STOP** for approx. 5 seconds. The menu „charging totally discharged batteries/support mode“ will be activated.
- Press respective button „Up“  or „Down“  to set respective 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 the selected battery voltage with **START / STOP**.

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

- Check polarity of charger unit cables.
- Confirm polarity of charger unit cables with **START / STOP**.

The battery charger starts with support mode.

End battery support mode:

- Press **START / STOP**.
- Disconnect black terminal clamp „-“ of charger unit from negative terminal of vehicle.
- Disconnect red terminal clamp „+“ of charger unit from positive terminal of vehicle.
- Pull charger plug out of battery charger.

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



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 manufacture's maintenance instructions!*



WARNING

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



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

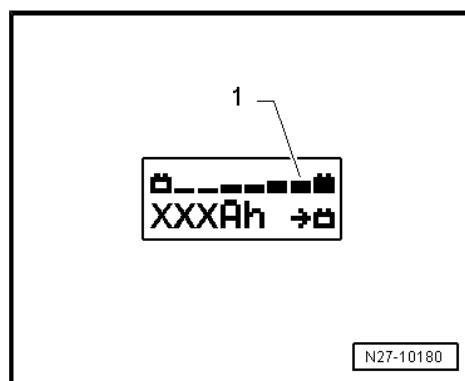
Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

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

- Proceed as for charging battery ➔ [page 42](#) .

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





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!

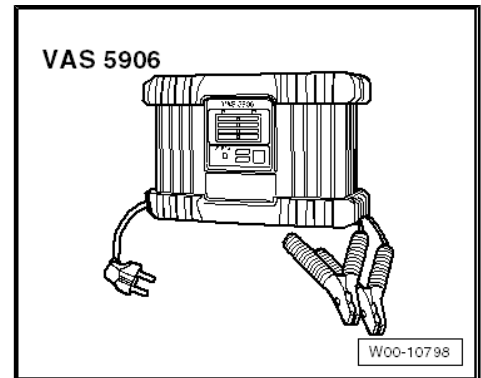


WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump 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 where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

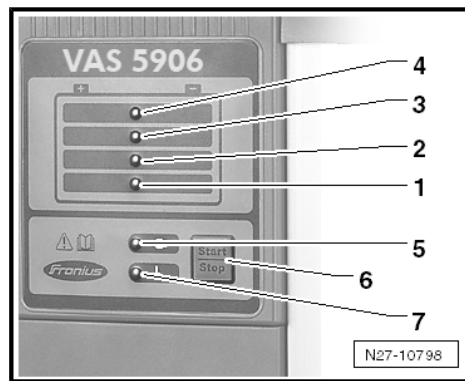
Danger of explosion when checking and charging or slave/jump starting

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 Midtronics -INC 940- battery charger only for USA/Canada

Warning and safety regulations ➔ [page 2](#)

General description ➔ [page 55](#)

Charge battery ➔ [page 56](#) .

Dealing with problems with Midtronics -INC 940- battery tester
➔ [page 58](#)

3.5.1 General description of Midtronics -INC 940- battery tester

Batteries in VW vehicles are only allowed to be charged with battery chargers approved by VW. In the USA/Canada, it is permitted for the Midtronics -INC 940- battery charger to be used.

Midtronics -INC 940- battery charger combines battery charging with a charge condition checks and a battery test.

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

Always comply with the safety regulations, the regulations for setting up the battery charger, the display menu/display buttons, LEDs and the operating procedures described in the ➔ operating manual INC 940 .

Read through ➔ operating manual INC 940 carefully.

Refer to ➔ Self-study programme No. ; Vehicle batteries for more information.



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#) !

No naked flames, sparking or smoking in the vicinity of batteries.

Battery charger must be switched off before cables are connected or disconnected.

Do not remove cell plugs during charging.

Overcharging sulphated batteries can lead to explosions.

Do not store precision tools in rooms where batteries are charged, because corrosion can ensue due to chemical reactions.



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.



3.5.2 Charging battery

Prerequisites:



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.

INC 940 initial setup performed (dealership number, date/time) ⇒ operating manual INC 940 .

- Check general information ⇒ [page 55](#) .
- Open bonnet or cover for other installation location of battery.
- Perform visual check of battery ⇒ [page 6](#) .
- Determine whether battery type is „Standard“ (wet battery) or „AGM“ (absorbent glass mat battery).
- Close all vehicle doors.



Note

- ♦ Battery temperature must be at least 10 °C.
- ♦ For additional information, refer to the ⇒ operating manual INC 940 .

Perform charging procedure:

- Switch off all electrical consumers.
- Switch off ignition and remove ignition key.
- Connect red terminal clamp „+“ of charger unit 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 terminal clamp „-“ of battery charger to negative terminal.
- Connect Midtronics -INC 940- battery charger to an earthed socket.
- Set „ON/OFF“ switch of Midtronics -INC 940- battery charger to „ON“.
- Select „Automatic“ or „Manual“ charging mode.
- Select test „In vehicle“ or „Outside vehicle“.
- Select battery type „Standard “ or „AGM“ (absorbent glass mat).



- Select test type „Warranty“ or „Miscellaneous“. Note additional details (depending on type of test).



Note

- ◆ For additional information, refer to the ⇒ operating manual INC 940 .
- ◆ If necessary, make a note of menu items required for „Warranty“ test type ⇒ Warranty service circular .

Midtronics -INC 940- battery charger tests battery and starts charging procedure. Display then shows one of three results, as well as approximate charging time.

Result:	Measures:
Battery OK	Battery can be returned to operation.
Charging required	◆ Test found low charge level. ◆ Charging starts and approximate charging duration is displayed. ◆ Achieved cold-start performance and remaining charging time are displayed, and are updated regularly.
Renew battery.	Battery defective. Charging procedure is interrupted. Renew battery.



Note

In case Midtronics -INC 940- shows fault messages or text displays other than those listed above, please refer to ⇒ [page 58](#) .



WARNING

Stop charging if battery is liberating a lot of gas. Press „Stop“ button on front.

When charging and testing procedure has finished, Midtronics -INC 940- battery charger displays „Battery good“ or „Renew battery“ and total charging time.

There are three possible messages depending on individual circumstance (printout for warranty, repair job, evaluation and filing)

- ◆ Generate test code (only possible after automatic charging and test).
- ◆ Print last test result (for warranty).
- ◆ Display last test results.



Note

For additional information, refer to the ⇒ operating manual INC 940 .



3.5.3 Dealing with problems with Midtronics - INC 940- battery tester

Under certain circumstances, the display may show errors or messages according to status.

The most frequent display messages are listed below, together with suggested solutions.



Note

For messages not listed here, please refer to ⇒ operating manual INC 940 .

Display message	Measures
Check connection.	– Check whether terminals of battery charger are firmly connected to battery terminals. – Check battery terminals are tightened according to regulations and do not have corrosion.
Terminals connected?	Safety function of tester. – Connect terminals to battery before starting charging procedure.
System noise	– Switch off all electrical consumers. – Wait until all electrical loads monitored by onboard supply control unit have switched off. – Remove ignition key. – Disconnect any suspect electrical equipment not connected to onboard supply as standard.

Wait a few minutes and repeat charging procedure ⇒ [page 56](#) .



3.6 Solar panel -VAS 6102A-

3.6.1 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.

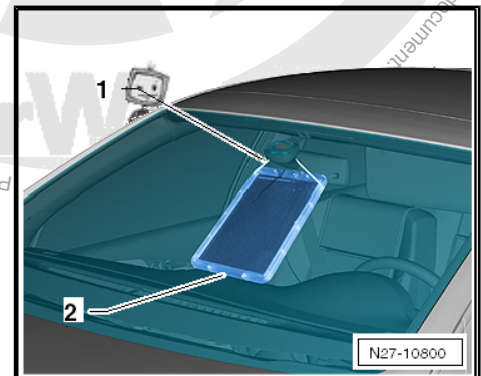
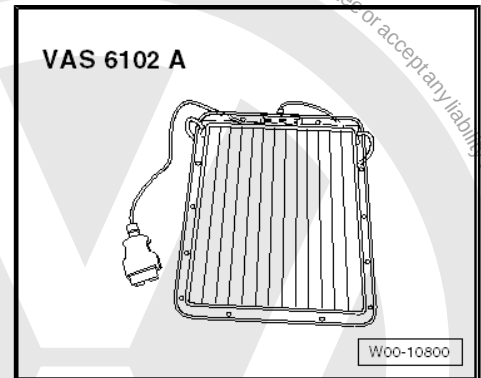
- Secure solar panel -VAS 6102A- on interior mirror -1-.
- Place underside on dash panel -2-.



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. Connection procedure is as for vehicle diagnostic tester ➔ [page 78](#)
- Check function of solar panel -VAS 6102A- . Green LED indicates function of solar panel -VAS 6102A- .



3.7 Totally discharged batteries



WARNING

Danger of injury! Observe warning notices and safety regulations ➔ [page 2](#) !

A battery is designated „totally discharged“ when the no-load voltage is less than 11.6 V.



WARNING

Batteries where the magic eye is colourless or light yellow must not be checked or charged. Do not slave/jump start the vehicle!

Danger of explosion when checking and charging or slave/jump starting

These batteries must be renewed.



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 25](#) .



4 Cruise control system (CCS)

General description:

The functions of the cruise control system are controlled by the engine control unit.

- The cruise control system can be activated/deactivated
⇒ [page 61](#) .

Fault detection and fault display

Faults on the CCS are output via the engine control unit.

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

4.1 Activating and deactivating cruise control system (CCS)

- Connect vehicle diagnostic tester ⇒ [page 78](#) .
- Select „Guided fault finding“ mode in vehicle diagnostic tester .
- Using „GoTo“ button, select „Functions/component“ and the following menu options in succession:
 - ◆ Drive
 - ◆ Engine code
 - ◆ 01 - On Board Diagnostic capable systems
 - ◆ Engine management/diesel direct injection and glow plug system
 - ◆ Functions
 - ◆ Activating and deactivating cruise control system (CCS)