

## Audi A3 1997 ➤

### Motronic injection and ignition system (4-cyl. turbo)

|           |     |  |  |  |  |  |  |  |  |
|-----------|-----|--|--|--|--|--|--|--|--|
| Engine ID | APY |  |  |  |  |  |  |  |  |
|-----------|-----|--|--|--|--|--|--|--|--|

Edition 04.1999



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

# List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

## Audi A3 1997 ➤

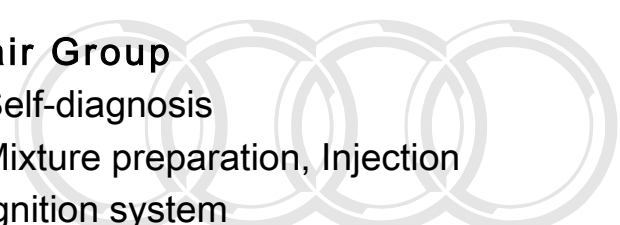
### Motronic injection and ignition system (4-cyl. turbo)

#### Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system

  
**Audi**

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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.

**All rights reserved.  
No reproduction without prior agreement from publisher.**

## Contents

|                                                                                                                               |               |
|-------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>01 - Self-diagnosis</b>                                                                                                    | <b>1</b>      |
| <b>1 Self-diagnosis of Motronic system</b>                                                                                    | <b>1</b>      |
| 1.1 Self-diagnosis of Motronic system                                                                                         | 1             |
| 1.2 Technical data for self-diagnosis                                                                                         | 1             |
| 1.3 Safety precautions                                                                                                        | 1             |
| 1.4 Connecting vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions | 1             |
| <b>2 Interrogating and erasing fault memory</b>                                                                               | <b>4</b>      |
| 2.1 Interrogating and erasing fault memory                                                                                    | 4             |
| 2.2 Fault table                                                                                                               | 5             |
| <b>3 Final control diagnosis</b>                                                                                              | <b>13</b>     |
| 3.1 Final control diagnosis                                                                                                   | 13            |
| <b>4 Basic setting</b>                                                                                                        | <b>16</b>     |
| 4.1 Basic setting                                                                                                             | 16            |
| <b>5 Coding control unit</b>                                                                                                  | <b>17</b>     |
| 5.1 Coding control unit                                                                                                       | 17            |
| 5.2 Coding table                                                                                                              | 18            |
| <b>6 Reading measured value block</b>                                                                                         | <b>18</b>     |
| 6.1 Reading measured value block                                                                                              | 18            |
| <br><b>24 - Mixture preparation, Injection</b>                                                                                | <br><b>20</b> |
| <b>1 Servicing Motronic injection system</b>                                                                                  | <b>20</b>     |
| 1.1 Servicing Motronic injection system                                                                                       | 20            |
| 1.2 Safety precautions                                                                                                        | 20            |
| 1.3 Rules for cleanliness                                                                                                     | 20            |
| 1.4 Technical data                                                                                                            | 21            |
| 1.5 Fitting locations overview                                                                                                | 22            |
| 1.6 Dismantling and assembling air cleaner                                                                                    | 30            |
| 1.7 Wiring and component check with test box V.A.G 1598/31                                                                    | 31            |
| 1.8 Renewing engine control unit                                                                                              | 33            |
| 1.9 Testing idling speed                                                                                                      | 34            |
| 1.10 Checking system pressure, fuel pressure regulator and holding pressure                                                   | 36            |
| 1.11 Testing injectors                                                                                                        | 40            |
| 1.12 Dismantling and assembling fuel rail with injectors                                                                      | 44            |
| 1.13 Removing and installing injectors                                                                                        | 48            |
| 1.14 Checking injection quantity, leak-tightness and spray pattern of injectors                                               | 50            |
| 1.15 Testing fuel pump relay -J17 and activation                                                                              | 52            |
| 1.16 Testing air mass meter -G70                                                                                              | 56            |
| 1.17 Checking intake air system for leaks (unmetered air)                                                                     | 60            |
| <b>2 Testing lambda control</b>                                                                                               | <b>62</b>     |
| 2.1 Testing lambda control                                                                                                    | 62            |
| 2.2 Operation of lambda control                                                                                               | 62            |
| 2.3 Testing lambda probe and lambda control                                                                                   | 63            |
| 2.4 Testing lambda probe heating                                                                                              | 69            |
| 2.5 Removing and installing lambda probe                                                                                      | 72            |
| <b>3 Testing secondary air system</b>                                                                                         | <b>73</b>     |
| 3.1 Testing secondary air system                                                                                              | 73            |
| 3.2 Testing secondary air inlet valve -N112                                                                                   | 77            |
| 3.3 Testing secondary air pump relay -J299 and activation                                                                     | 81            |
| <b>4 Testing fuel tank breather</b>                                                                                           | <b>86</b>     |
| 4.1 Testing fuel tank breather                                                                                                | 86            |
| 4.2 Testing solenoid valve 1 for activated charcoal filter -N80                                                               | 86            |



|                             |                                                                                             |            |
|-----------------------------|---------------------------------------------------------------------------------------------|------------|
| <b>5</b>                    | <b>Testing electronic engine power control (electronic throttle)</b>                        | <b>89</b>  |
| 5.1                         | Testing electronic engine power control (electronic throttle)                               | 89         |
| 5.2                         | Operation of electronic throttle system                                                     | 89         |
| 5.3                         | Notes on EPC warning lamp (fault warning lamp for electronic throttle) in dash panel insert | 90         |
| 5.4                         | Testing electronic throttle warning lamp -K132                                              | 90         |
| 5.5                         | Testing throttle valve control part -J338                                                   | 92         |
| 5.6                         | Performing adaption of throttle valve control part                                          | 92         |
| 5.7                         | Testing angle senders for throttle valve drive                                              | 95         |
| 5.8                         | Testing accelerator position senders                                                        | 98         |
| <b>6</b>                    | <b>Vacuum system layout</b>                                                                 | <b>103</b> |
| 6.1                         | Vacuum system layout                                                                        | 103        |
| <b>7</b>                    | <b>Testing auxiliary signals</b>                                                            | <b>107</b> |
| 7.1                         | Testing auxiliary signals                                                                   | 107        |
| 7.2                         | Checking engine speed signal                                                                | 107        |
| 7.3                         | Testing fuel consumption signal for on-board computer                                       | 107        |
| 7.4                         | Testing road speed signal                                                                   | 108        |
| 7.5                         | Testing air conditioner compressor shut-off                                                 | 110        |
| 7.6                         | Testing brake light switch and brake pedal switch                                           | 112        |
| 7.7                         | Testing clutch pedal switch -F36                                                            | 116        |
| 7.8                         | Testing power steering pressure switch -F88                                                 | 119        |
| 7.9                         | Testing data exchange between Motronic system and ABS (CAN bus)                             | 122        |
| <b>28 - Ignition system</b> |                                                                                             | <b>124</b> |
| <b>1</b>                    | <b>Testing ignition system</b>                                                              | <b>124</b> |
| 1.1                         | Testing ignition system                                                                     | 124        |
| 1.2                         | General notes on ignition system                                                            | 124        |
| 1.3                         | Safety precautions                                                                          | 124        |
| 1.4                         | Technical data                                                                              | 124        |
| 1.5                         | Testing ignition coils with output stages                                                   | 125        |
| 1.6                         | Testing intake air temperature sender -G42                                                  | 129        |
| 1.7                         | Testing engine speed sender -G28                                                            | 132        |
| 1.8                         | Testing coolant temperature sender -G62                                                     | 134        |
| 1.9                         | Testing voltage supply for control unit                                                     | 137        |
| 1.10                        | Testing knock sensor control limit                                                          | 138        |
| 1.11                        | Testing knock sensors                                                                       | 139        |
| 1.12                        | Testing Hall sender -G163                                                                   | 141        |

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

# 01 - Self-diagnosis

## 1 - Self-diagnosis of Motronic system

### 1.1 - Self-diagnosis of Motronic system

### 1.2 - Technical data for self-diagnosis

#### Equipment

- ◆ The data transfer between the control unit and vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) is carried out in "Rapid data transfer" mode.
- ◆ The fault memory is equipped with a non-volatile memory and therefore does not depend on the power supply.
- ◆ Faults relating to the electronic throttle are also indicated by the EPC warning lamp in the dash panel insert (EPC = electronic power control).

### 1.3 - Safety precautions

Note the following points if test equipment has to be used during a road test:

#### Warning

- ◆ Test equipment must always be secured on the rear seat and operated from the rear seat by a second person.
- ◆ If test equipment is operated from the front passenger seat, the occupant could be injured by the passenger's airbag in an accident.

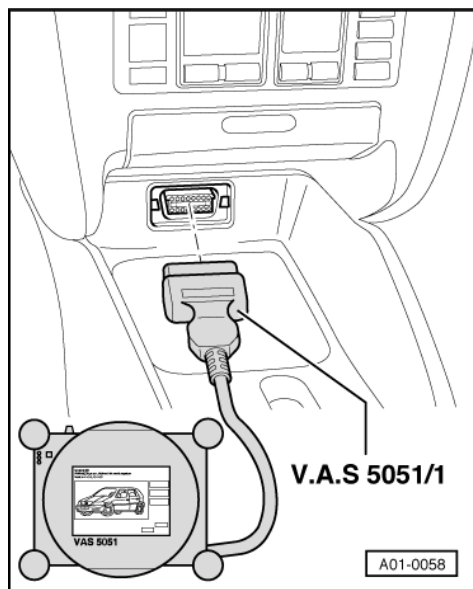
### 1.4 - Connecting vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions

**Requirements for test:** Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the written authorisation of AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Battery voltage not less than 11 V
- Earth connections on engine and gearbox OK



## Work sequence



- -> Connect up vehicle diagnostic, testing and information system VAS 5051 with diagnostic cable VAS 5051/1. Alternatively, connect fault reader V.A.G 1551 using diagnostic cable V.A.G 1551/3A.

Observe safety precautions => Page 1 .

### Note:

*The following description only covers the procedure for performing self-diagnosis with fault reader V.A.G 1551.*

*If using vehicle diagnostic, testing and information system VAS 5051, follow the operating instructions supplied with the equipment.*

-> Indicated in display

V.A.G - SELF DIAGNOSIS      HELP  
1 - Rapid data transfer 1)  
2 - Flash code output 1)

1) appears alternately

### Note:

*If the display remains blank:*

=> Fault reader operating instructions

Depending on the function required, see table of selectable functions => Page 4 .

- Switch on ignition.

or

- Start the engine.
- Switch on fault reader printer with the print key. The warning lamp in key must light up.
- Press key 1 for "Rapid data transfer".

-> When this display appears:

Rapid data transfer      HELP  
Enter address word XX

**Note:**

Address word 00 is used to start the automatic test sequence (i.e. fault memory interrogation for all vehicle systems with self-diagnosis capability in "Rapid data transfer" mode).

- Press keys 0 and 1 for address word "Engine electronics" and confirm entry with Q key.

-> The display on fault reader V.A.G 1551 will show the control unit identification, as in this example.

|              |           |        |   |
|--------------|-----------|--------|---|
| 8N0906018    | 1.8l      | R4/5VT | G |
| 0003         |           |        |   |
| Coding 05610 | WSC 12345 |        |   |

**Note:**

The control unit identification can be printed out by pressing the PRINT key on fault reader V.A.G 1551.

**Control unit identification (example)**

|                 |                                                                          |
|-----------------|--------------------------------------------------------------------------|
| - 8N0906018     | Part No.; for allocation:<br>=> Parts list                               |
| - 1.8 ltr.      | Engine capacity                                                          |
| - R4/5VT        | In-line engine, 4 cylinders,<br>5 valves per cylinder, turbo             |
| - "G"           | With cruise control (G)                                                  |
| - or no display | or without cruise control                                                |
| - 0003          | Status of data (software version) in<br>control unit                     |
| - Coding 05610  | Control unit coding                                                      |
| - WSC 12345     | Workshop Code of V.A.G 1551 which<br>was used to perform the last coding |

- Press =>key.

-> Indicated on display (function selection):

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

**Notes:**

- ♦ By entering "01" ("Interrogate control unit version") and confirming with the Q key, the control unit identification can be displayed again.

|                              |      |
|------------------------------|------|
| Rapid data transfer          | HELP |
| Control unit does not answer |      |

-> If this display appears:

- Perform fault-finding procedure as described in "Fault-finding programme: diagnostic wiring".

=> Current flow diagrams, Electrical fault-finding and Fitting locations

|                               |      |
|-------------------------------|------|
| Rapid data transfer           | HELP |
| K wire not switching to earth |      |

|                                  |      |
|----------------------------------|------|
| Rapid data transfer              | HELP |
| K wire not switching to positive |      |

|                                 |      |
|---------------------------------|------|
| Rapid data transfer             | HELP |
| Fault in communication build-up |      |



## Selectable functions

| Vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 |                                  | Ignition on, engine not running | Engine idling | Vehicle being driven | Page |
|----------------------------------------------------------------------------------------|----------------------------------|---------------------------------|---------------|----------------------|------|
| <b>Address words</b>                                                                   |                                  |                                 |               |                      |      |
| 01                                                                                     | Engine electronics               | Yes                             | Yes           | Yes                  | 1    |
| 00                                                                                     | Automatic test sequence          | Yes                             | Yes           | Yes                  | 3    |
| <b>Functions</b>                                                                       |                                  |                                 |               |                      |      |
| 01                                                                                     | Interrogate control unit version | Yes                             | Yes           | Yes                  | 3    |
| 02                                                                                     | Interrogate fault memory         | No                              | Yes           | Yes                  | 4    |
| 03                                                                                     | Final control diagnosis          | Yes                             | No            | No                   | 13   |
| 04                                                                                     | Basic setting                    | Yes                             | Yes           | Yes                  | 16   |
| 05                                                                                     | Erase fault memory               | Yes                             | Yes           | Yes                  | 4    |
| 06                                                                                     | End output                       | Yes                             | Yes           | Yes                  | 5    |
| 07                                                                                     | Code control unit                | Yes                             | No            | No                   | 17   |
| 08                                                                                     | Read measured value block        | Yes                             | Yes           | Yes                  | 18   |

## 2 - Interrogating and erasing fault memory

### 2.1 - Interrogating and erasing fault memory

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1 ).  
When doing this the engine must be running at idling speed.

**Note:**

*If the engine does not start, turn the engine over for at least 5 seconds using the starter. After doing this, do not switch off the ignition.*

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Press keys 0 and 2 for the function "Interrogate fault memory" and confirm entry with Q key.

-> Indicated on display:

No fault recognised

- Press =>key.

or

-> Indicated on display:

X faults recognised

If the printer on the fault reader is switched on the stored faults will be displayed and printed out in sequence.

- Locate and eliminate faults printed out as per fault table  
=> Page 5 .
- Press =>key.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Press keys 0 and 5 for the function "Erase fault memory" and confirm entry with Q key.

**Notes:**

-> Indicated on display:

Attention!  
Fault memory is not interrogated

*This means that the proper sequence of steps was not followed.*

- Interrogate fault memory.

*In the following cases the fault memory is not erased:*

- ◆ If the ignition was switched off after interrogating the fault memory
- ◆ If an existing static fault was not rectified

-> Indicated on display:

Rapid data transfer  
Fault memory is erased!

- Press =>key.
- After completing repair work, interrogate the fault memory again.

**Note:**

*This has the effect of erasing any faults that may have been stored while carrying out repairs (e.g. as a result of unplugging connectors).*

**End output**

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Press keys 0 and 6 for the function "End output" and confirm entry with Q key.

-> Indicated on display:

Rapid data transfer      HELP  
Insert address word XX

- Switch off ignition and unplug the diagnostic connector.

## 2.2 - Fault table

**Notes:**

- ◆ If faults occur in the sensors and components being monitored, they will be stored in the fault memory together with an indication of the type of fault.
- ◆ Faults relating to the electronic throttle are also indicated by the EPC warning lamp in the dash panel insert (EPC = Electronic Power Control); for notes on electronic throttle system => Page 89 .
- ◆ The fault table is arranged according to the 5-digit fault codes in the left-hand column.
- ◆ If a fault is stored in the fault memory and then does not occur again during the next 40 engine warm-up phases, the fault code will be automatically erased.
- ◆ Sporadically occurring faults (temporary faults) will be indicated on the V.A.G 1551 display as "SP". The word "sporadic" means "intermittent" or "occurring at irregular intervals".



- Components that are indicated as being faulty by the V.A.G 1551/VAS 5051 should not be renewed immediately. Always start by checking the wiring, connectors and earth connections for the component using the current flow diagram. This is particularly important in the case of sporadic faults (indicated by the letters "SP" on the fault reader display).
- If the connector for the engine control unit is unplugged or if the battery is disconnected, all the learned values stored in the control unit will be erased, although the contents of the fault memory will remain intact. The next time the engine is started the idling may be rough at first, in which case it should be left to idle for a few minutes until the learning process has been completed.

| Fault code |       | Readout on fault reader display                                          | Fault rectification                                                                                                                        |
|------------|-------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                          |                                                                                                                                            |
| P0101      | 16485 | Air mass meter -G70<br>Implausible signal                                | Test air mass meter => Page 56                                                                                                             |
| P0102      | 16486 | Air mass meter -G70<br>Signal too small                                  |                                                                                                                                            |
| P0103      | 16487 | Air mass meter -G70<br>Signal too large                                  |                                                                                                                                            |
| P0106      | 16490 | Intake manif. press./air press. =><br>-G71/-F96 1)<br>Implausible signal | => 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure sender -G31 |
| P0112      | 16496 | Intake air temp. sender -G42<br>Signal too small                         | - Test intake air temperature sender<br>=> Page 129                                                                                        |
| P0113      | 16497 | Intake air temp. sender -G42<br>Signal too large                         |                                                                                                                                            |

1) The intake manifold pressure is measured by charge pressure sender -G31 (not by -G71 as indicated on the display). The air pressure is measured by altitude sender -F96 (in the engine control unit).

| Fault code |       | Readout on fault reader display                        | Fault rectification                              |
|------------|-------|--------------------------------------------------------|--------------------------------------------------|
| SAE        | V.A.G |                                                        |                                                  |
| P0116      | 16500 | Coolant temp. sender -G62<br>Implausible signal        | - Test coolant temperature sender<br>=> Page 134 |
| P0117      | 16501 | Coolant temp. sender -G62<br>Signal too small          |                                                  |
| P0118      | 16502 | Coolant temp. sender -G62<br>Signal too large          |                                                  |
| P0130      | 16514 | Bank 1, Probe 1<br>Electrical fault in current circuit | - Test lambda control => Page 62                 |
| P0131      | 16515 | Bank 1, Probe 1<br>Voltage too low                     |                                                  |
| P0132      | 16516 | Bank 1, Probe 1<br>Voltage too high                    |                                                  |
| P0133      | 16517 | Bank 1, Probe 1<br>Signal too slow                     |                                                  |
| P0134      | 16518 | Bank 1, Probe 1<br>No activity                         |                                                  |

| Fault code |       | Readout on fault reader display                   | Fault rectification                                                                                                                        |
|------------|-------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                   |                                                                                                                                            |
| P0236      | 16620 | Charge pressure sender -G31<br>Implausible signal | => 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure sender -G31 |
| P0237      | 16621 | Charge pressure sender -G31<br>Signal too small   |                                                                                                                                            |



| Fault code |       | Readout on fault reader display                 | Fault rectification                             |
|------------|-------|-------------------------------------------------|-------------------------------------------------|
| P0238      | 16622 | Charge pressure sender -G31<br>Signal too large |                                                 |
| P0321      | 16705 | Engine speed sender -G28<br>Implausible signal  | - Test engine speed sender<br>=>Page <b>132</b> |
| P0322      | 16706 | Engine speed sender -G28<br>No signal           |                                                 |

| Fault code |       | Readout on fault reader display                | Fault rectification                            |
|------------|-------|------------------------------------------------|------------------------------------------------|
| SAE        | V.A.G |                                                |                                                |
| P0327      | 16711 | Knock sensor 1 -G61<br>Signal too small        | - Test knock sensor => Page <b>139</b>         |
| P0328      | 16712 | Knock sensor 1 -G61<br>Signal too large        |                                                |
| P0332      | 16716 | Knock sensor 2 -G66<br>Signal too small        |                                                |
| P0333      | 16717 | Knock sensor 2 -G66<br>Signal too large        |                                                |
| P0411      | 16795 | Secondary air system<br>Through-flow defective | - Check secondary air system => Page <b>74</b> |
| P0501      | 16885 | Vehicle speed signal<br>Implausible signal     | - Test vehicle speed signal=> Page <b>108</b>  |

| Fault code |       | Readout on fault reader display                | Fault rectification                                                 |
|------------|-------|------------------------------------------------|---------------------------------------------------------------------|
| SAE        | V.A.G |                                                |                                                                     |
| P0560      | 16944 | Voltage supply<br>Implausible signal           | - Test voltage supply for control unit => Page <b>137</b>           |
| P0562      | 16946 | Voltage supply<br>Voltage too low              |                                                                     |
| P0563      | 16947 | Voltage supply<br>Voltage too high             |                                                                     |
| P0571      | 16955 | Brake light switch -F 1)<br>Implausible signal | - Test brake light switch and brake pedal switch => Page <b>112</b> |
| P0601      | 16985 | Control unit defective                         | - Renew engine control unit => Page <b>33</b>                       |
| P0604      | 16988 | Control unit defective                         |                                                                     |
| P0605      | 16989 | Control unit defective                         |                                                                     |
| P0606      | 16990 | Control unit defective                         |                                                                     |

1) The system monitors both brake light switch -F and brake pedal switch -F47.

| Fault code |       | Readout on fault reader display                                | Fault rectification                                                                                                   |
|------------|-------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                |                                                                                                                       |
| P1102      | 17510 | Bank 1 - Probe 1, Heating element circuit<br>Short to Positive | - Test lambda probe heating => Page <b>69</b>                                                                         |
| P1111      | 17519 | Lambda control, Bank1<br>System too lean                       | - Test lambda control => Page <b>62</b>                                                                               |
| P1112      | 17520 | Lambda control, Bank1<br>System too rich                       |                                                                                                                       |
| P1113      | 17521 | Bank 1 - Probe 1<br>Internal resistance too great              | - Test signal wires for contact resistance => Page <b>68</b> . If there is no contact resistance, renew lambda probe. |



|       |       |                                                             |                                           |
|-------|-------|-------------------------------------------------------------|-------------------------------------------|
| P1115 | 17523 | Bank 1 - Probe 1, Heating element circuit<br>Short to Earth | - Test lambda probe heating<br>=> Page 69 |
| P1116 | 17524 | Bank 1 - Probe 1, Heating element circuit<br>Open circuit   |                                           |

| Fault code |       | Readout on fault reader display                     | Fault rectification                                                                                                  |
|------------|-------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                     |                                                                                                                      |
| P1127      | 17535 | Bank 1, Mixture adaption (mult.)<br>System too rich | - Take car for test drive (fuel in oil)<br>Check fuel system pressure => Page 36<br>- Test air mass meter => Page 40 |
| P1128      | 17536 | Bank 1, Mixture adaption (mult.)<br>System too lean |                                                                                                                      |
| P1136      | 17544 | Bank 1, Mixture adaption (add.)<br>System too lean  | - Take car for test drive (fuel in oil)<br>- Test fuel system pressure => Page 56                                    |
| P1137      | 17545 | Bank 1, Mixture adaption (add.)<br>System too rich  |                                                                                                                      |

**Note:**

*mult. = multiplicative, i.e. the fault occurs across the whole range of engine speeds and engine loads.*

*add. = additive, i.e. the fault only occurs at idling speed.*

| Fault code |       | Readout on fault reader display                                     | Fault rectification                                                                            |
|------------|-------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                     |                                                                                                |
| P1149      | 17557 | Lambda control, Bank 1<br>Implausible control value                 | - Test lambda control => Page 62<br>- Test angle sender for throttle valve drive<br>=> Page 95 |
| P1171      | 17579 | Angle sens. 2 for throt. valve drive -G188<br>Implausible signal 1) |                                                                                                |
| P1172      | 17580 | Angle sens. 2 for throt. valve drive -G188<br>Signal too small 1)   |                                                                                                |
| P1173      | 17581 | Angle sens. 2 for throt. valve drive -G188<br>Signal too large 1)   |                                                                                                |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display           | Fault rectification        |
|------------|-------|-------------------------------------------|----------------------------|
| SAE        | V.A.G |                                           |                            |
| P1213      | 17621 | Injector Cyl. 1 -N30<br>Short to Positive | - Test injectors =>Page 40 |
| P1214      | 17622 | Injector Cyl. 2 -N31<br>Short to Positive |                            |
| P1215      | 17623 | Injector Cyl. 3 -N32<br>Short to Positive |                            |
| P1216      | 17624 | Injector Cyl. 4 -N33<br>Short to Positive |                            |
| P1225      | 17633 | Injector Cyl. 1 -N30<br>Short to Earth    |                            |
| P1226      | 17634 | Injector Cyl. 2 -N31<br>Short to Earth    |                            |
| P1227      | 17635 | Injector Cyl. 3 -N32<br>Short to Earth    |                            |

Protected by copyright. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without prior written permission from Audi AG. Audi AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by Audi AG.

| Fault code |       | Readout on fault reader display        | Fault rectification |
|------------|-------|----------------------------------------|---------------------|
| P1228      | 17636 | Injector Cyl. 4 -N33<br>Short to Earth |                     |

| Fault code |       | Readout on fault reader display                               | Fault rectification                                                                                                                                                                                                                                       |
|------------|-------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                               |                                                                                                                                                                                                                                                           |
| P1237      | 17645 | Injector Cyl. 1 -N30<br>Open circuit                          | - Test injectors =>Page 40                                                                                                                                                                                                                                |
| P1238      | 17646 | Injector Cyl. 2 -N31<br>Open circuit                          |                                                                                                                                                                                                                                                           |
| P1239      | 17647 | Injector Cyl. 3 -N32<br>Open circuit                          |                                                                                                                                                                                                                                                           |
| P1240      | 17648 | Injector Cyl. 4 -N33<br>Open circuit                          |                                                                                                                                                                                                                                                           |
| P1287      | 17695 | Air recirc. valve for turbocharger -N249<br>Open circuit      | => 4 cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 |
| P1288      | 17696 | Air recirc. valve for turbocharger -N249<br>Short to Positive |                                                                                                                                                                                                                                                           |
| P1289      | 17697 | Air recirc. valve for turbocharger -N249<br>Short to Earth    |                                                                                                                                                                                                                                                           |

| Fault code |       | Readout on fault reader display                          | Fault rectification                  |
|------------|-------|----------------------------------------------------------|--------------------------------------|
| SAE        | V.A.G |                                                          |                                      |
| P1325      | 17733 | Knock control Cyl. 1<br>Control limit reached            | - Test knock control => Page 138     |
| P1326      | 17734 | Knock control Cyl. 2<br>Control limit reached            |                                      |
| P1327      | 17735 | Knock control Cyl. 3<br>Control limit reached            |                                      |
| P1328      | 17736 | Knock control Cyl. 4<br>Control limit reached            |                                      |
| P1335      | 17743 | Engine torque monitoring 2<br>Control limit surpassed 1) | - Check hose connections => Page 129 |
| P1336      | 17744 | Engine torque monitoring<br>Control limit surpassed      | - Test air mass meter => Page 134    |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display                                           | Fault rectification                               |
|------------|-------|---------------------------------------------------------------------------|---------------------------------------------------|
| SAE        | V.A.G |                                                                           |                                                   |
| P1337      | 17745 | Bank 1, Camshaft pos. sensor => -G163<br>Short to Earth                   | - Test Hall sender => Page 141                    |
| P1338      | 17746 | Bank 1, Camshaft pos. sensor => -G163<br>Open circuit / Short to Positive |                                                   |
| P1355      | 17763 | Ignition activation Cyl. 1<br>Open circuit                                | - Test activation of output stages<br>=> Page 127 |



| Fault code |       | Readout on fault reader display                  | Fault rectification |
|------------|-------|--------------------------------------------------|---------------------|
| P1356      | 17764 | Ignition activation, Cyl. 1<br>Short to Positive |                     |
| P1357      | 17765 | Ignition activation, Cyl. 1<br>Short to Earth    |                     |
| P1358      | 17766 | Ignition activation, Cyl. 2<br>Open circuit      |                     |
| P1359      | 17767 | Ignition activation, Cyl. 2<br>Short to Positive |                     |

| Fault code |       | Readout on fault reader display                  | Fault rectification                               |
|------------|-------|--------------------------------------------------|---------------------------------------------------|
| SAE        | V.A.G |                                                  |                                                   |
| P1360      | 17768 | Ignition activation, Cyl. 2<br>Short to Earth    | - Test activation of output stages<br>=> Page 127 |
| P1361      | 17769 | Ignition activation, Cyl. 3<br>Open circuit      |                                                   |
| P1362      | 17770 | Ignition activation, Cyl. 3<br>Short to Positive |                                                   |
| P1363      | 17771 | Ignition activation, Cyl. 3<br>Short to Earth    |                                                   |
| P1364      | 17772 | Ignition activation, Cyl. 4<br>Open circuit      |                                                   |
| P1365      | 17773 | Ignition activation, Cyl. 4<br>Short to Positive |                                                   |
| P1366      | 17774 | Ignition activation, Cyl. 4<br>Short to Earth    |                                                   |

| Fault code |       | Readout on fault reader display                      | Fault rectification                    |
|------------|-------|------------------------------------------------------|----------------------------------------|
| SAE        | V.A.G |                                                      |                                        |
| P1386      | 17794 | Control unit defective                               | - Renew engine control unit => Page 33 |
| P1387      | 17795 | Control unit defective                               |                                        |
| P1388      | 17796 | Control unit defective 1)                            |                                        |
| P1410      | 17818 | Tank breather valve -N80<br>Short to Positive        | - Test ACF solenoid valve 1 => Page 86 |
| P1421      | 17829 | Secondary air inlet valve -N112<br>Short to Earth    | - Test secondary air system=>Page 74   |
| P1422      | 17830 | Secondary air inlet valve -N112<br>Short to Positive |                                        |
| P1425      | 17833 | Tank breather valve -N80<br>Short to Earth           | - Test ACF solenoid valve 1 => Page 86 |
| P1426      | 17834 | Tank breather valve -N80<br>Open circuit             |                                        |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display                    | Fault rectification                  |
|------------|-------|----------------------------------------------------|--------------------------------------|
| SAE        | V.A.G |                                                    |                                      |
| P1432      | 17840 | Secondary air inlet valve -N112<br>Open circuit    | - Test secondary air system=>Page 74 |
| P1433      | 17841 | Relay for secondary air pump -J299<br>Open circuit |                                      |

|       |       |                                                             |                                   |
|-------|-------|-------------------------------------------------------------|-----------------------------------|
| P1434 | 17842 | Relay for secondary air pump -J299<br>Short to positive     | - Test fuel pump relay => Page 52 |
| P1435 | 17843 | Relay for secondary air pump -J299<br>Short to earth        |                                   |
| P1500 | 17908 | Fuel pump relay -J17<br>Electrical fault in current circuit |                                   |
| P1502 | 17910 | Fuel pump relay -J17<br>Short to positive                   |                                   |

| Fault code |       | Readout on fault reader display                                   | Fault rectification                                        |
|------------|-------|-------------------------------------------------------------------|------------------------------------------------------------|
| SAE        | V.A.G |                                                                   |                                                            |
| P1539      | 17947 | Clutch pedal switch -F36<br>Implausible signal                    | - Test clutch pedal switch<br>=> Page 116                  |
| P1542      | 17950 | Angle sender for throt. val. drive -G187<br>Implausible signal 1) | - Test angle sender for throttle valve drive<br>=> Page 95 |
| P1543      | 17951 | Angle sender for throt. val. drive -G187<br>Signal too low 1)     |                                                            |
| P1544      | 17952 | Angle sender for throt. val. drive -G187<br>Signal too high 1)    |                                                            |
| P1545      | 17953 | Throttle valve control<br>Faulty 1)                               | - Test throttle valve control part<br>=> Page 92           |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display                                   | Fault rectification                                                                                                                                                                                                                                       |
|------------|-------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                   |                                                                                                                                                                                                                                                           |
| P1546      | 17954 | Charge press. control solenoid<br>valve -N75<br>Short to Positive | => 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 |
| P1547      | 17955 | Charge press. control solenoid<br>valve -N75<br>Short to Earth    |                                                                                                                                                                                                                                                           |
| P1548      | 17956 | Charge press. control solenoid<br>valve -N75<br>Open circuit      |                                                                                                                                                                                                                                                           |
| P1555      | 17963 | Maximum charge pressure surpassed                                 |                                                                                                                                                                                                                                                           |
| P1556      | 17964 | Charge pressure control<br>Regulating limit not reached           |                                                                                                                                                                                                                                                           |
| P1557      | 17965 | Charge pressure control<br>Regulating limit surpassed             |                                                                                                                                                                                                                                                           |
| P1559      | 17967 | Throttle valve control part -J338<br>Fault in basic setting 1)    | - Perform adaption => Page 92                                                                                                                                                                                                                             |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display | Fault rectification         |
|------------|-------|---------------------------------|-----------------------------|
| SAE        | V.A.G |                                 |                             |
| P1560      | 17968 | Maximum engine revs surpassed   | - Rectify mechanical faults |



|       |       |                                                                   |                                                                                                                                             |
|-------|-------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| P1564 | 17972 | Throttle valve control part -J338<br>Low voltage at base setting  | - Charge battery and repeat basic setting                                                                                                   |
| P1565 | 17973 | Throttle valve control part -J338<br>Lower stop is not reached 1) | - Test throttle valve control part<br>=> Page 92                                                                                            |
| P1568 | 17976 | Throttle valve control part -J338<br>Mechanical fault 1)          |                                                                                                                                             |
| P1569 | 17977 | CCS switch -E45<br>Implausible signal                             | => Electrical system; Repair group 01; Self-diagnosis of cruise control system (CCS)                                                        |
| P1570 | 17978 | Engine control unit blocked                                       | - Perform adaption of electronic immobilizer to engine control unit<br>=> Electrical system; Repair group 01; Self-diagnosis of immobilizer |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display                           | Fault rectification                                                                        |
|------------|-------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                           |                                                                                            |
| P1579      | 17987 | Throttle valve control part -J338<br>Adaption not started | - Perform adaption of throttle valve control part; observe test requirements<br>=> Page 92 |
| P1602      | 18010 | Voltage supply Kl. 30<br>Voltage too low                  | - Test voltage supply from terminal 30 to control unit => Page 137                         |
| P1603      | 18011 | Control unit defective                                    | - Renew engine control unit => Page 33                                                     |
| P1604      | 18012 | Control unit defective 1)                                 |                                                                                            |
| P1612      | 18020 | Engine control unit wrongly coded 2)                      | - Code engine control unit => Page 17                                                      |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

2) Not with engine control unit No. 8N0 906 018.

| Fault code |       | Readout on fault reader display                                     | Fault rectification                             |
|------------|-------|---------------------------------------------------------------------|-------------------------------------------------|
| SAE        | V.A.G |                                                                     |                                                 |
| P1630      | 18038 | Accelerator position sender -G79<br>Signal too low 1)               | - Test accelerator position sender<br>=>Page 98 |
| P1631      | 18039 | Accelerator position sender -G79<br>Signal too high 1)              |                                                 |
| P1633      | 18041 | Accelerator position sender 2 -G185<br>Signal too low 1)            |                                                 |
| P1634      | 18042 | Accelerator position sender 2 -G185<br>Signal too high 1)           |                                                 |
| P1639      | 18047 | Accelerator position sender 1/2 -G79/-G185<br>Implausible signal 1) |                                                 |
| P1640      | 18048 | Control unit defective                                              | - Renew engine control unit => Page 33          |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90 .

| Fault code |       | Readout on fault reader display | Fault rectification |
|------------|-------|---------------------------------|---------------------|
| SAE        | V.A.G |                                 |                     |

|       |       |                                                                                         |                                                                          |
|-------|-------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| P1645 | 18053 | Drive train data bus<br>No message from 4WD elec.                                       | - Test data exchange between Motronic and ABS (CAN data bus) => Page 122 |
| P1648 | 18056 | Drive train data bus<br>Defective                                                       |                                                                          |
| P1649 | 18057 | Drive train data bus<br>No message from ABS CU                                          |                                                                          |
| P1676 | 18084 | Electr. throttle control fault lamp -<br>K132<br>Electrical fault in current circuit 1) | - Test EPC warning lamp => Page 90                                       |
| P1677 | 18085 | Electr. throttle control fault lamp -<br>K132<br>Short to Positive 1)                   |                                                                          |
| P1853 | 18261 | Drive train data bus<br>Implausible message from ABS<br>CU                              | - Test data exchange between Motronic and ABS (CAN data bus) => Page 122 |

1) If this fault occurs the engine control unit activates the EPC warning lamp in the dash panel insert.

Notes on EPC warning lamp =>Page 90.

**Note:**

*Electronic throttle control fault lamp -K132 (designation used in current flow diagrams) is also known as the EPC warning lamp (EPC = Electronic Power Control).*

## 3 - Final control diagnosis

### 3.1 - Final control diagnosis

**Notes:**

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the content of this publication.

- ◆ The final control diagnosis can only be performed with the ignition switched on and the engine not running.
- ◆ The electric fuel pump runs continuously throughout the final control diagnosis.
- ◆ During the final control diagnosis, each control element is activated for about 1 minute unless the test programme is deliberately advanced to the next control element by pressing the ➡ key.
- ◆ The control elements can be tested either by listening or by touching.
- ◆ The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.
- ◆ If the final control diagnosis is to be repeated, the engine must be started. The engine control unit needs to detect an engine speed of more than 300 rpm.

The final control diagnosis activates the following components in the stated sequence:

| Activation sequence                              |
|--------------------------------------------------|
| 1 ACF solenoid valve 1 (-N80)                    |
| 2 Secondary air inlet valve -N112                |
| 3 Secondary air pump relay -J299                 |
| 4 Charge pressure control valve -N75             |
| 5 Air recirculation valve for turbocharger -N249 |

**Requirements for test:**

- Fuses for engine electronics OK.
- Fuel pump relay OK.

**Test sequence**

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)



When doing this the ignition must be switched on.

-> Indicated on display:

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

- Enter "03" to select the function "Final control diagnosis".

-> Indicated on display:

|                            |   |
|----------------------------|---|
| Rapid data transfer        | Q |
| 03-Final control diagnosis |   |

### Activating solenoid valve for activated charcoal filter

#### (fuel tank breather valve)

- Confirm input with Q key.

#### **Note:**

*The fuel pump relay should pick up and the fuel pump should run. There will be a clearly audible fuel flow at the fuel pressure regulator. If the fuel pump does not run, test activation*

=>Page **54**.

-> Indicated on display:

(Appears on V.A.G 1551 as "Tank breather valve -N80")

|                         |
|-------------------------|
| Final control diagnosis |
| ACF solenoid 1 -N80     |

This valve will be actuated (i.e. will click) for about 1 minute, or until the ➔ key is pressed to advance the programme to the next control element.

If the valve is not actuated (does not click):

- Test solenoid valve 1 for activated charcoal filter -N80  
=> Page **86**.

### Activating secondary air inlet valve

- Press ➔key.

-> Indicated on display:

|                                 |
|---------------------------------|
| Final control diagnosis         |
| Secondary air inlet valve -N112 |

This valve will be actuated (i.e. will click) for about 1 minute, or until the ➔ key is pressed to advance the programme to the next control element.

If the valve is not actuated (does not click):

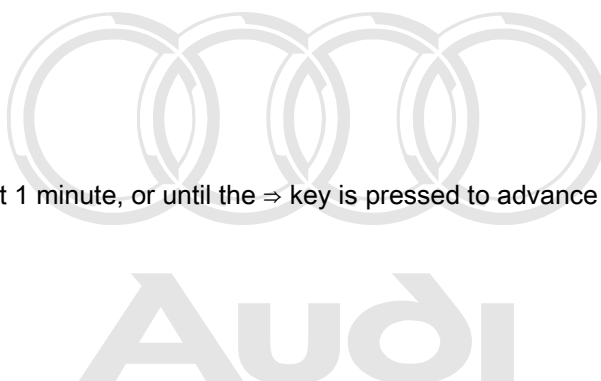
- Test secondary air inlet valve -N112  
=> Page **77**.

### Activating relay for secondary air pump

- Press ➔key.

-> Indicated on display:

|                                |
|--------------------------------|
| Final control diagnosis        |
| Secondary air pump relay -J299 |



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

The secondary air pump relay -J299 switches the secondary air pump motor -V101 on and off continuously for about 1 minute, or until the → key is pressed to advance the programme to the next control element.

If the secondary air pump motor -V101 does not run at intervals:

- Test secondary air pump relay -J299  
=> Page 81.

#### Activating charge pressure control valve -N75

- Press →key.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

-> Indicated on display:

Final control diagnosis  
Boost pressure control solenoid -N75

This valve will be actuated (i.e. will click) for about 1 minute, or until the → key is pressed to advance the programme to the next control element.

If the valve is not actuated (does not click):

=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing charge pressure control valve -N75 Charge air system with turbocharger Testing charge pressure control valve -N75

#### Activating air recirculation valve for turbocharger

- Press →key.

-> Indicated on display:

Final control diagnosis  
Air recirculation valve for turbocharger  
-N249

This valve will be actuated (i.e. will click) for about 1 minute, or until the → key is pressed to terminate the final control diagnosis.

If the valve is not actuated (does not click):

=> 4-cylinder engine (5-valve turbo), Mechanics; Repair group 21; Charge air system with turbocharger; Testing air recirculation valve for turbocharger -N249 Charge air system with turbocharger Testing air recirculation valve for turbocharger -N249

- Press →key.

-> Indicated on display:

Final control diagnosis  
END

- Press →key.

-> Indicated on display (function selection):

Rapid data transfer      HELP  
Select function XX

#### Note:

If the final control diagnosis needs to be repeated, first start the engine, then switch the ignition off and on again.



## 4 - Basic setting

### 4.1 - Basic setting

With the ignition on and engine not running, the following operation can be performed in the "Basic setting" mode (function 04):

- ♦ Adaption of throttle valve control part to engine control unit  
=>Page 92

With the engine running, the following operations can be performed in the basic setting mode:

- ♦ Learning process for lambda control => Page 65
- ♦ Fault-finding by deliberate activation and deactivation of lambda control=> Page 63

#### *Requirements for operations performed with the engine running:*

- No faults stored in fault memory
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the express written permission of AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

#### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)
- When doing this the engine must be idling.
- Interrogate fault memory =>Page 4 . The fault memory must be clear. If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Leave engine idling.

-> Indicated on display:

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

|                                |   |
|--------------------------------|---|
| Basic setting                  | Q |
| Enter display group number XXX |   |

- Enter the required Display Group number.

#### Example:

- Enter "000" to select Display Group number 000 and confirm entry with Q key.

#### **Note:**

*When the display group is selected the ACF valve is closed and the air conditioner compressor is switched off.*

-> Indicated on display:

|                 |   |    |   |   |   |   |   |
|-----------------|---|----|---|---|---|---|---|
| Basic setting 0 |   |    |   |   |   |   | Q |
| 1               | 2 | 3  | 4 | 5 | 6 | 7 |   |
| 8               | 9 | 10 |   |   |   |   |   |

#### **Notes:**

- ♦ In Display Group 00 the measured values are shown in decimal form.
- ♦ If the printer is switched on, the current display can be printed out.

- ◆ Other display groups can be selected as follows:

| Display group | V.A.G 1551  | VAS 5051   |
|---------------|-------------|------------|
| Higher        | Press key 3 | Press skey |
| Lower         | Press key 1 | Press tkey |

- Allow engine to idle for a few minutes (coolant temperature at least 80 °C).
- If all the display zones show the specified values, press the ➡ key.

-> Indicated on display (function selection):

Rapid data transfer      HELP  
Select function XX

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

| Display Group 000 (decimal readouts)                  |   |   |   |   |   |   |   |   |    |                                                      |
|-------------------------------------------------------|---|---|---|---|---|---|---|---|----|------------------------------------------------------|
| ▪ Engine idling (coolant temperature not below 80 °C) |   |   |   |   |   |   |   |   |    |                                                      |
| 1                                                     | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Display zones                                        |
|                                                       |   |   |   |   |   |   |   |   |    | Learned value for mixture formation at part throttle |
|                                                       |   |   |   |   |   |   |   |   |    | Learned value for mixture formation at idling speed  |
|                                                       |   |   |   |   |   |   |   |   |    | Control value for mixture formation                  |
|                                                       |   |   |   |   |   |   |   |   |    | Learned value for torque loss at idling speed        |
|                                                       |   |   |   |   |   |   |   |   |    | Torque at idling speed                               |
|                                                       |   |   |   |   |   |   |   |   |    | Throttle valve angle                                 |
|                                                       |   |   |   |   |   |   |   |   |    | Voltage of on-board electrical system                |
|                                                       |   |   |   |   |   |   |   |   |    | Engine speed (idling speed) 1)                       |
|                                                       |   |   |   |   |   |   |   |   |    | Engine load (without electrical consumers)           |
|                                                       |   |   |   |   |   |   |   |   |    | Coolant temperature (requirement for basic setting)  |
|                                                       |   |   |   |   |   |   |   |   |    | Specification                                        |
|                                                       |   |   |   |   |   |   |   |   |    | Corresponds to                                       |
|                                                       |   |   |   |   |   |   |   |   |    | 103...153                                            |
|                                                       |   |   |   |   |   |   |   |   |    | -10...10%                                            |
|                                                       |   |   |   |   |   |   |   |   |    | 78...178                                             |
|                                                       |   |   |   |   |   |   |   |   |    | -10...10 %                                           |
|                                                       |   |   |   |   |   |   |   |   |    | 115...140                                            |
|                                                       |   |   |   |   |   |   |   |   |    | -10...10 %                                           |
|                                                       |   |   |   |   |   |   |   |   |    | 113...141                                            |
|                                                       |   |   |   |   |   |   |   |   |    | -3...2.6 %                                           |
|                                                       |   |   |   |   |   |   |   |   |    | 109...163                                            |
|                                                       |   |   |   |   |   |   |   |   |    | -3.9...7.0 %                                         |
|                                                       |   |   |   |   |   |   |   |   |    | 1...7                                                |
|                                                       |   |   |   |   |   |   |   |   |    | 0.4...2.75 %                                         |
|                                                       |   |   |   |   |   |   |   |   |    | 142...206                                            |
|                                                       |   |   |   |   |   |   |   |   |    | 10...14.5 V                                          |
|                                                       |   |   |   |   |   |   |   |   |    | 80...92                                              |
|                                                       |   |   |   |   |   |   |   |   |    | 800...920 rpm                                        |
|                                                       |   |   |   |   |   |   |   |   |    | 21...39                                              |
|                                                       |   |   |   |   |   |   |   |   |    | 15...30 %                                            |
|                                                       |   |   |   |   |   |   |   |   |    | 185...205                                            |
|                                                       |   |   |   |   |   |   |   |   |    | 85...105 °C                                          |

- 1) Up-to-date specifications:

=> Exhaust emissions test binder

## 5 - Coding control unit

### 5.1 - Coding control unit

If the appropriate code for the vehicle is not displayed or if the control unit has been renewed, the control unit must be coded as follows.

**Note:**

*The control unit version with Part No. 8N0 906 018 is programmed with fixed code "05610" and cannot be re-coded.*

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)
- When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "07" for the function "Code control unit" and confirm entry with Q key.

-> Indicated on display:



Code control unit Q  
Enter code number XXXXX (0-32000)

- Enter control unit coding as specified in coding table => Page 18 .

#### Meaning of coding:

|    |                                     |
|----|-------------------------------------|
| XX | Country / emissions                 |
| X  | Drive layout / additional functions |
| X  | Gearbox                             |
| X  | Model                               |

#### Example of coding

|       |                                                                                                                                   |
|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| 05610 | MVEG II + D3 (exhaust emissions standard),<br>four-wheel drive without traction control (ASR),<br>6-speed manual gearbox, Audi A3 |
|-------|-----------------------------------------------------------------------------------------------------------------------------------|

- Confirm input with Q key.

-> The display on fault reader V.A.G 1551 will show the control unit identification, as in this example.

8N0906018 1.8l R4/5VT G  
0003 □  
Coding 05610 WSC 12345

#### Note:

-> Indicated on display:

Function is unknown or  
cannot be carried out at the moment

The code number that was entered was not valid.

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer  
Select function XX

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

## 5.2 - Coding table

|                            |    |                                                               |
|----------------------------|----|---------------------------------------------------------------|
| Country/emissions          | 05 | Engines with secondary air system (MVEG II + D3)              |
| Drive/additional functions | 6  | Four-wheel drive without traction control (ASR), CAN data bus |
| Gearbox                    | 1  | 6-speed manual gearbox                                        |
| Model                      | 0  | Audi A3                                                       |

## 6 - Reading measured value block

### 6.1 - Reading measured value block

#### Requirements for test:

- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off

- Steering in straight-ahead position

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)  
 When doing this the engine must be idling.

-> Indicated on display:

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

|                                |   |
|--------------------------------|---|
| Read measured value block      | Q |
| Enter display group number XXX |   |

- Enter the required Display Group number (3 figures) and confirm entry with Q key.

### Note:

*The choice of display group number depends on which functions and components are to be tested.*

-> Indicated on display for Display Group 000:

|                           |   |
|---------------------------|---|
| Read measured value block | 0 |
| 1 2 3 4 5 6               |   |
| 7 8 9 10                  |   |

-> Indicated on display (example) for Display Group 001:

|                           |   |
|---------------------------|---|
| Read measured value block | 1 |
| 1 2 3 4                   |   |

### Notes:

- ♦ If the printer is switched on, the current display can be printed out.
- ♦ Other display groups can be selected as follows:

| Display group | V.A.G 1551  | VAS 5051   |
|---------------|-------------|------------|
| Higher        | Press key 3 | Press skey |
| Lower         | Press key 1 | Press tkey |



## 24 - Mixture preparation, Injection

### 1 - Servicing Motronic injection system

#### 1.1 - Servicing Motronic injection system

#### 1.2 - Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ In order to run the engine at starting speed without actually starting it (for example, to test compression), unplug the connectors on the ignition coils and also the connectors on the injectors.
- ♦ During some of the tests the control unit may identify and record faults. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ♦ Always switch off the ignition before cleaning the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

#### Warning

Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

Note the following points if test equipment has to be used during a road test:

#### Warning

- ♦ **Test equipment must always be secured on the rear seat and operated from the rear seat by a second person.**
- ♦ **If test equipment is operated from the front passenger seat, the occupant could be injured by the passenger's airbag in an accident.**

#### 1.3 - Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following 6 rules for ensuring maximum cleanliness:

- ♦ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ♦ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ♦ Carefully cover or seal opened components if the repair cannot be completed immediately.
- ♦ Only install clean components:  
Only unpack replacement parts immediately prior to installation.  
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ♦ When the system is open:  
Do not work with compressed air if this can be avoided.  
Do not move vehicle unless absolutely necessary.
- ♦ Electrical connectors:  
Protect against dirt and moisture when disconnected.

Make sure they are dry before re-connecting.

1.4 - Technical data

|                                                                           |                               |                                         |
|---------------------------------------------------------------------------|-------------------------------|-----------------------------------------|
| Engine code letters                                                       |                               | APY (1.8 ltr. / 5V / 154 kW engine)     |
| Idling speed<br>Not adjustable - controlled by idling speed stabilisation |                               | 800 ... 920 rpm 1)                      |
| Engine speed limitation<br>by switching off the injectors                 |                               | 6800 rpm                                |
| Fuel pressure at idling speed                                             | Vacuum hose connected         | approx. 2.5 bar                         |
|                                                                           | Vacuum hose disconnected      | approx. 3.0 bar                         |
| Holding pressure after 10 minutes                                         |                               | at least 1.5 bar                        |
| Injectors                                                                 | Spray pattern                 | Two-hole nozzle (same on all injectors) |
|                                                                           | Injection qty. (30 sec.)      | 179 ±14 ml                              |
|                                                                           | Resistance (room temperature) | 12 ... 13 ω                             |

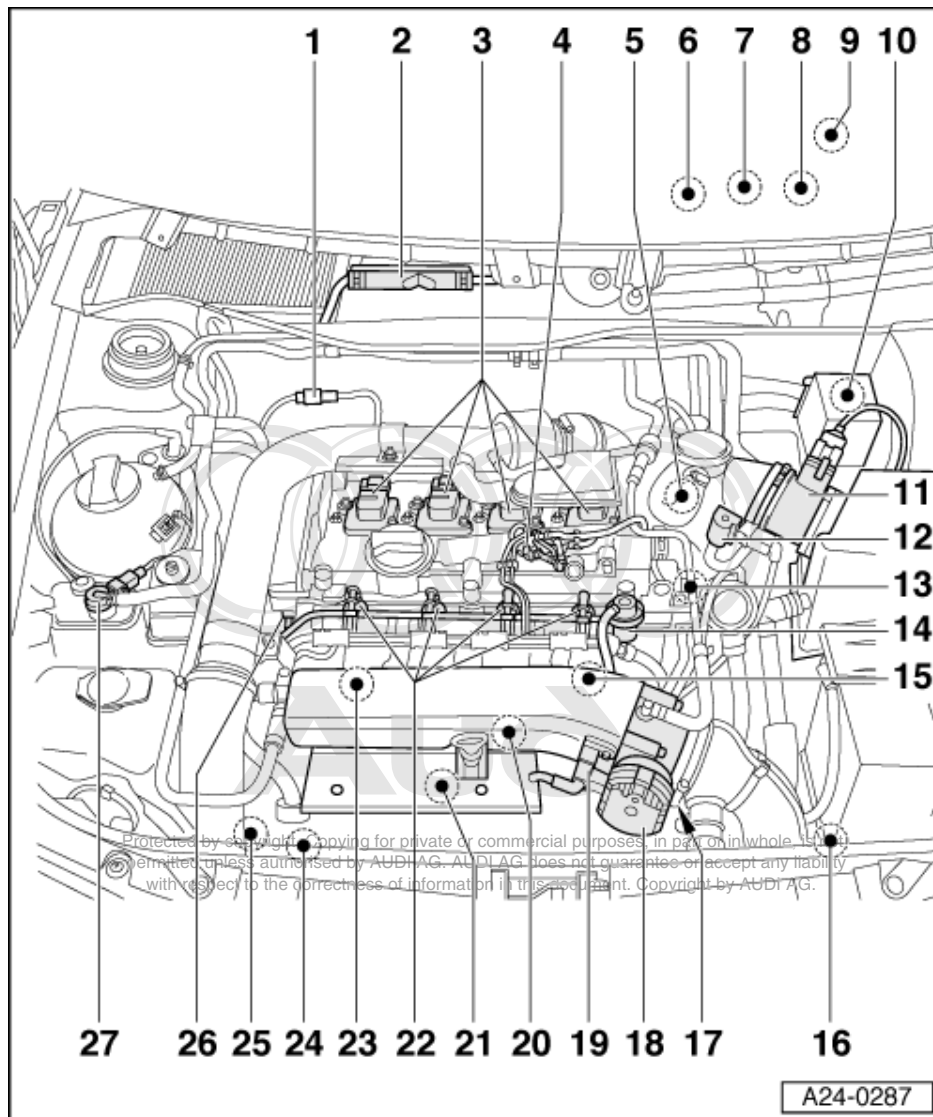
1) Idling speed with air conditioner on: 820 ... 940 rpm



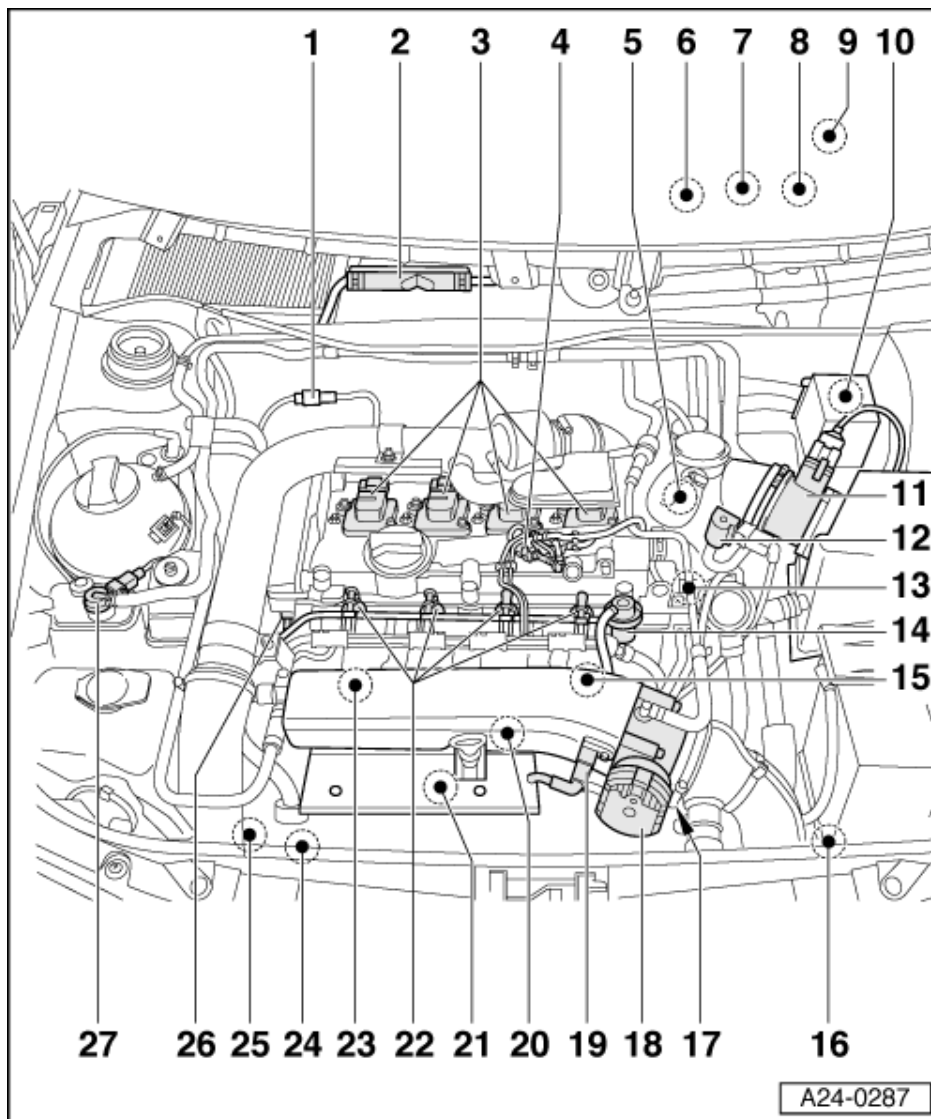
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 1.5 - Fitting locations overview



- 1 4-pin connector
  - ♦ For lambda probe 1 -G39 and lambda probe heating -Z19
  - ♦ Fitting location=>Fig. 28
- 2 Engine control unit -J220
- 3 Ignition coils -N, -N128, -N158, -N163
- 4 Air recirculation valve for turbocharger -N249
  - ♦ Fitting location => Fig. 27



**5 Combination valve for secondary air system**

- ♦ Testing, removing and installing

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 26; Secondary air system; Removing and installing parts of secondary air system Secondary air system Removing and installing parts of secondary air system

**6 Accelerator position sender -G79 and accelerator position sender 2 -G185**

- ♦ Fitting location  
=> Fig. 27

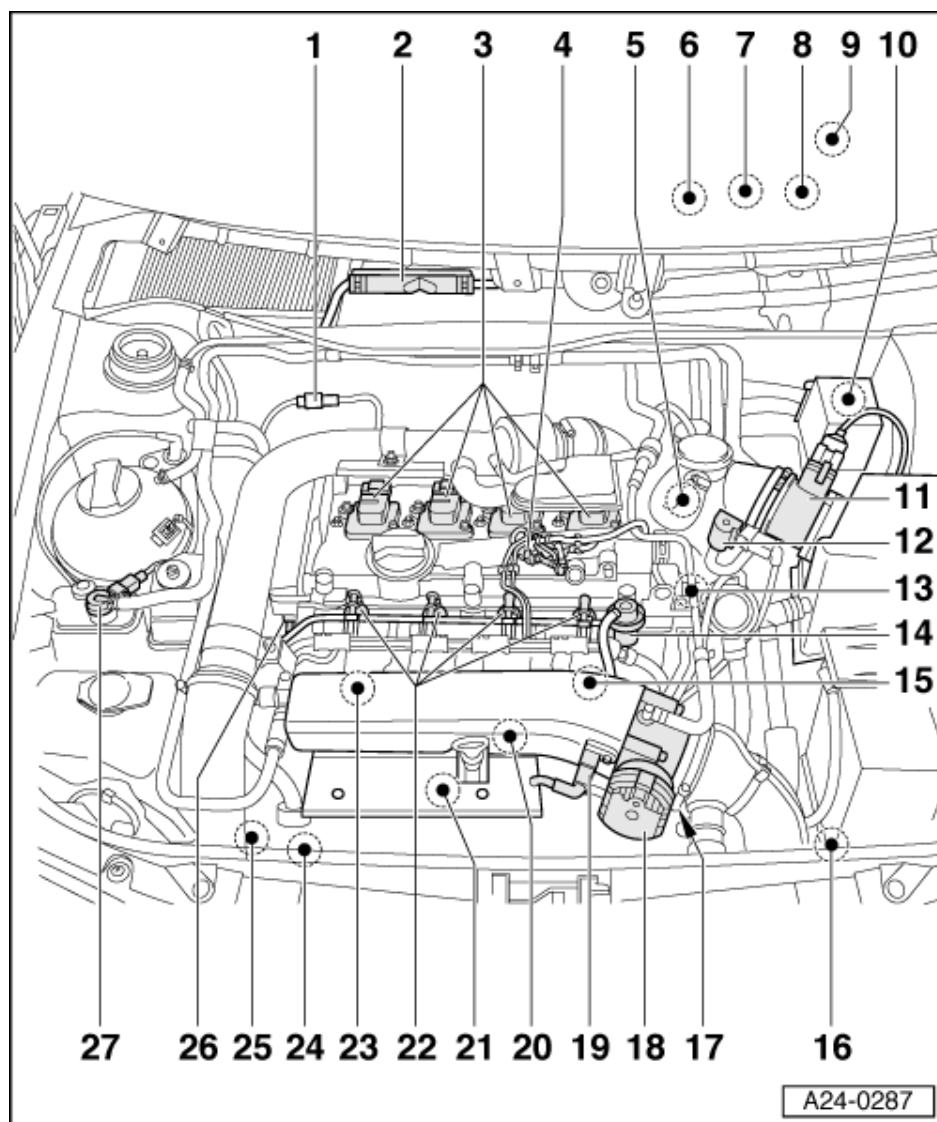
**7 Brake light switch -F and brake pedal switch -F47**

- ♦ Fitting location  
=> Fig. 28

**8 Clutch pedal switch -F36**

- ♦ Fitting location  
=> Fig. 29

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



**9 Electronic throttle control warning lamp -K132**

- ◆ EPC warning lamp
- ◆ Fitting location  
=> Fig. 28

**10 Secondary air pump relay -J299**

- ◆ Below cover on left side of bulkhead

**11 Air mass meter -G70**

- ◆ Checking =>Page 81

**12 Solenoid valve for charge pressure control -N75**

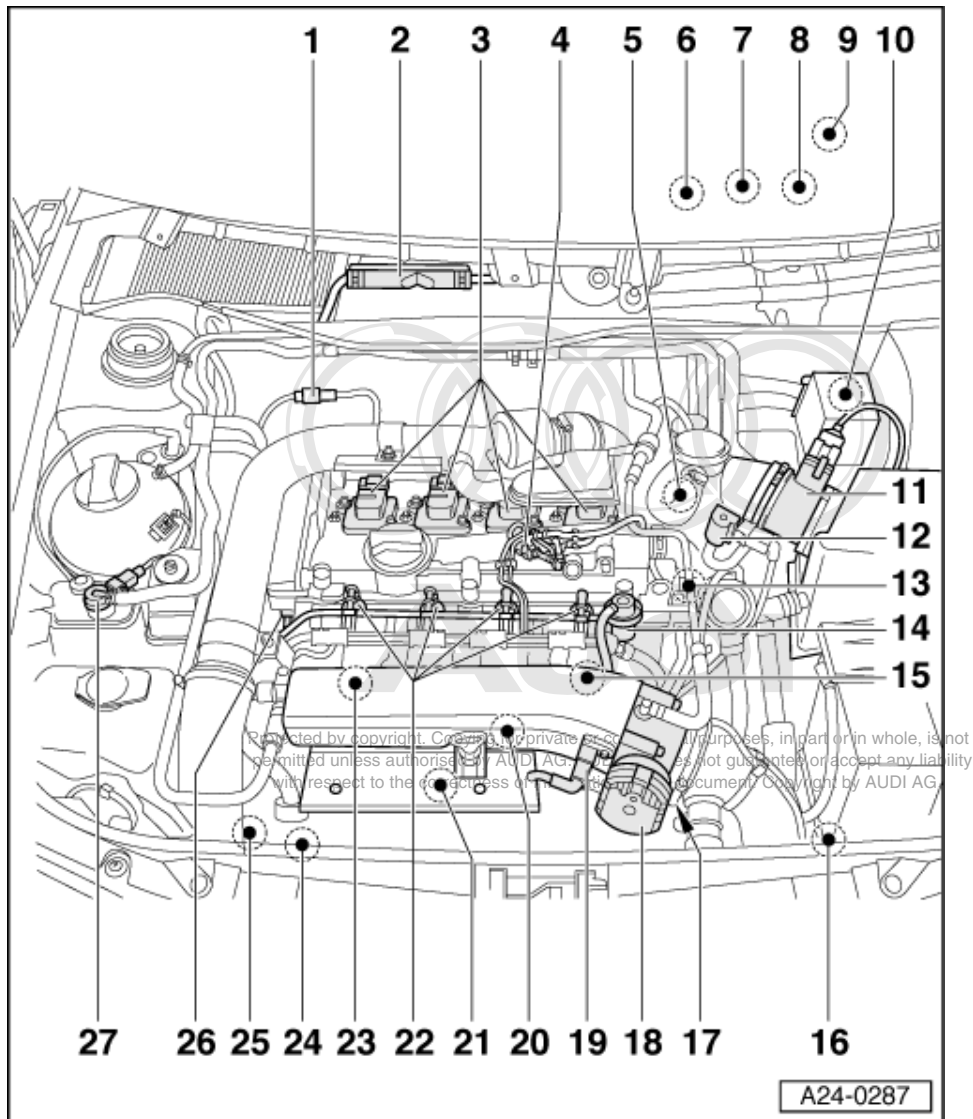
**13 Coolant temperature sender -G62**

**14 Fuel pressure regulator**

**15 Knock sensor 2 -G66**



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



16 Charge pressure sender -G31

17 Engine speed sender -G28

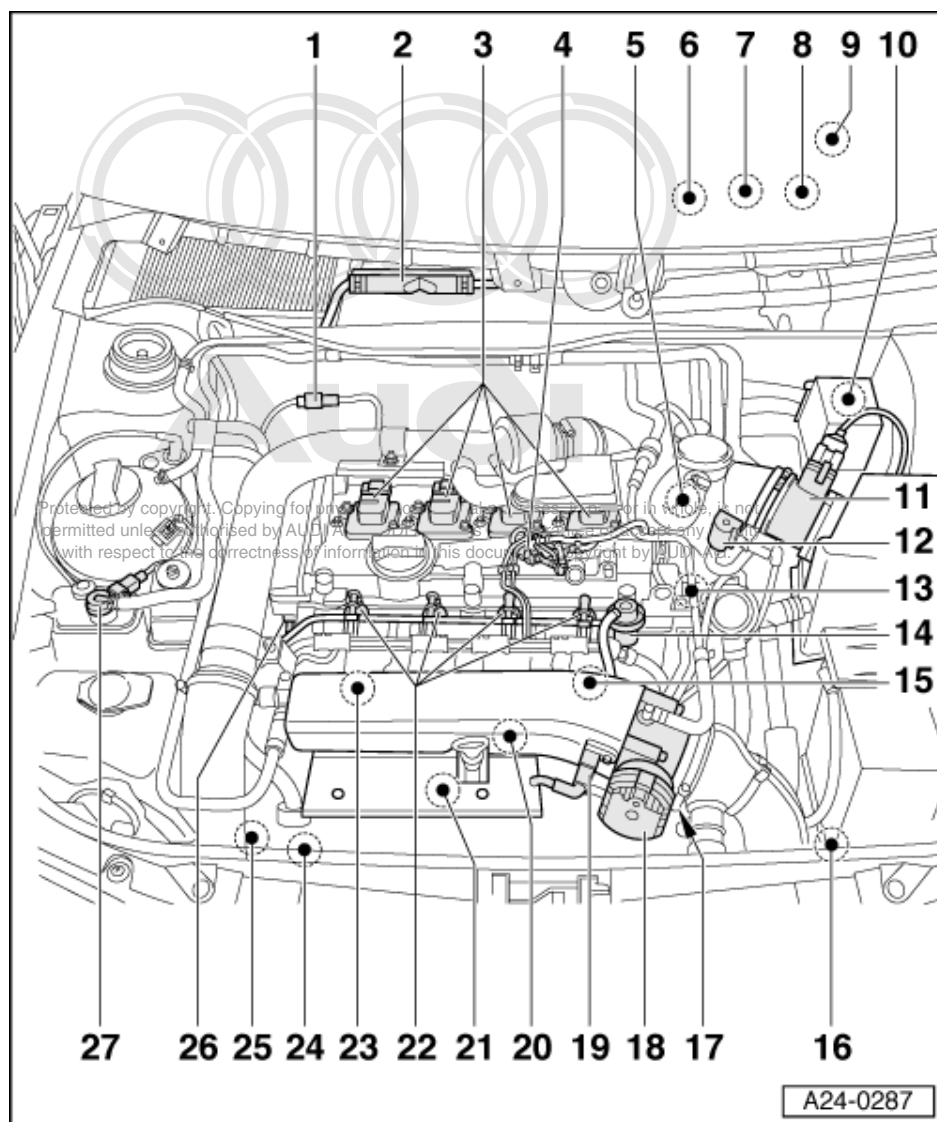
18 Throttle valve control part -J338

- ♦ With throttle valve drive -G186, angle sender for throttle valve drive -G187 and angle sender 2 for throttle valve drive -G188

19 Intake air temperature sender -G42

20 3 pin connector

- ♦ Qty. 3
- ♦ Fitting location  
=> Fig. 29
- ♦ For knock sensor 1 -G61
- ♦ For engine speed sender -G28
- ♦ For knock sensor 2 -G66



**21 Secondary air inlet valve**  
-N112

- ♦ Testing =>Page **77**

**22 Injector -N30...-N33**

**23 Knock sensor 1 -G61**

**24 Secondary air pump motor -V101**

- ♦ Checking:

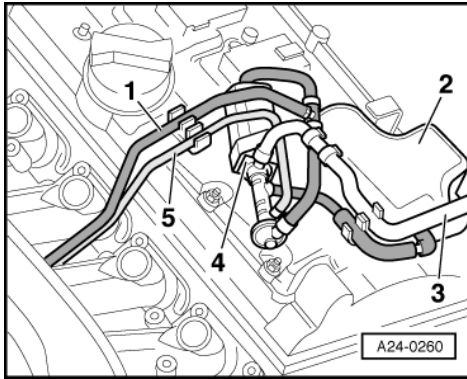
=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair group 26; Secondary air system; Removing and installing parts of secondary air system Secondary air system Removing and installing parts of secondary air system

**25 Power steering pressure switch -F88**

- ♦ Fitting location  
=> Fig. **30**

**26 Hall sender -G163**

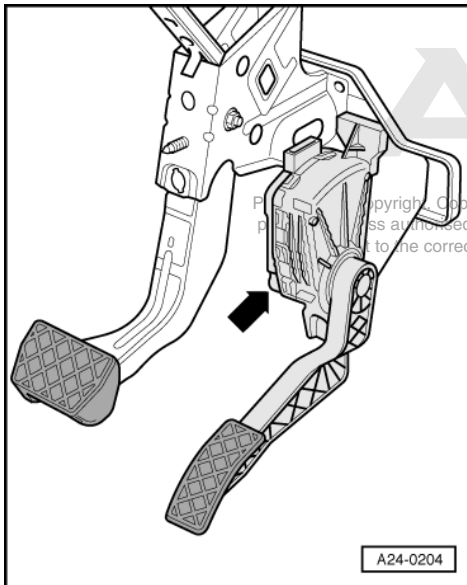
**27 Activated charcoal filter solenoid valve 1 -N80**



-> Fig.1 Fitting location of air recirculation valve for turbocharger -N249

♦ Fitting location: on cylinder head cover

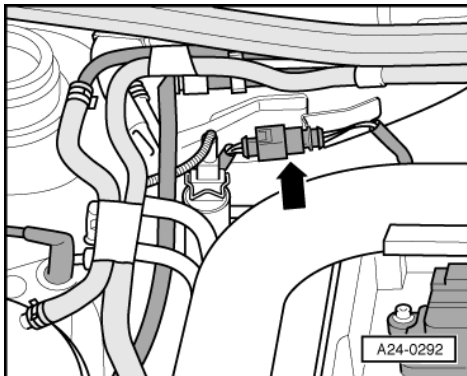
- 1 - To secondary air inlet valve -N112
- 2 - Vacuum reservoir
- 3 - To mechanical air recirculation valve
- 4 - Air recirculation valve for turbocharger -N249
- 5 - To connection on intake manifold



-> Fig.2 Fitting location of accelerator position senders -G79 and -G185

**Note:**

*Illustration shows arrangement on LHD vehicles*

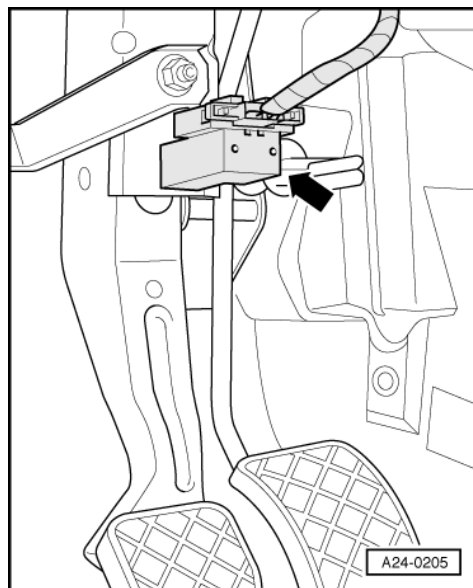




-> Fig.3 Fitting location of 4-pin connector for lambda probe 1 -G39 and lambda probe heating -Z19

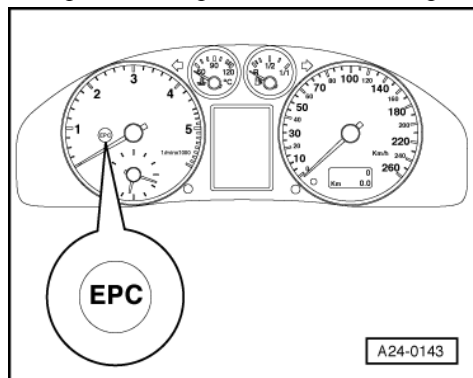
**Note:**

*A heat shield sleeve must be fitted over the plug connector -arrow-.*

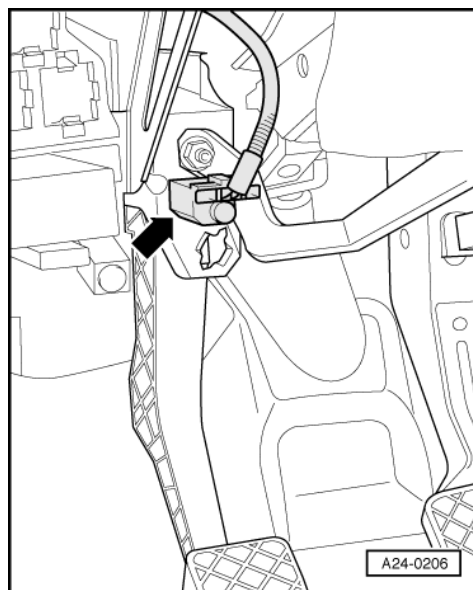


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

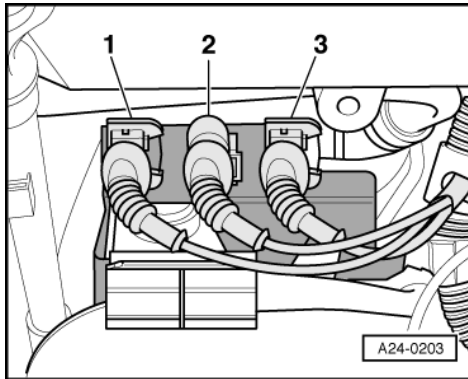
-> Fig.4 Fitting location of brake light switch -F and brake pedal switch -F47



-> Fig.5 Fitting location of electronic throttle control warning lamp -K132

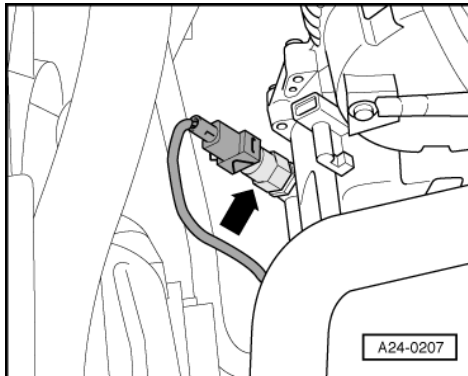


-> Fig.6 Fitting location of clutch pedal switch -F36



-> Fig.7 Fitting locations of 3-pin connectors

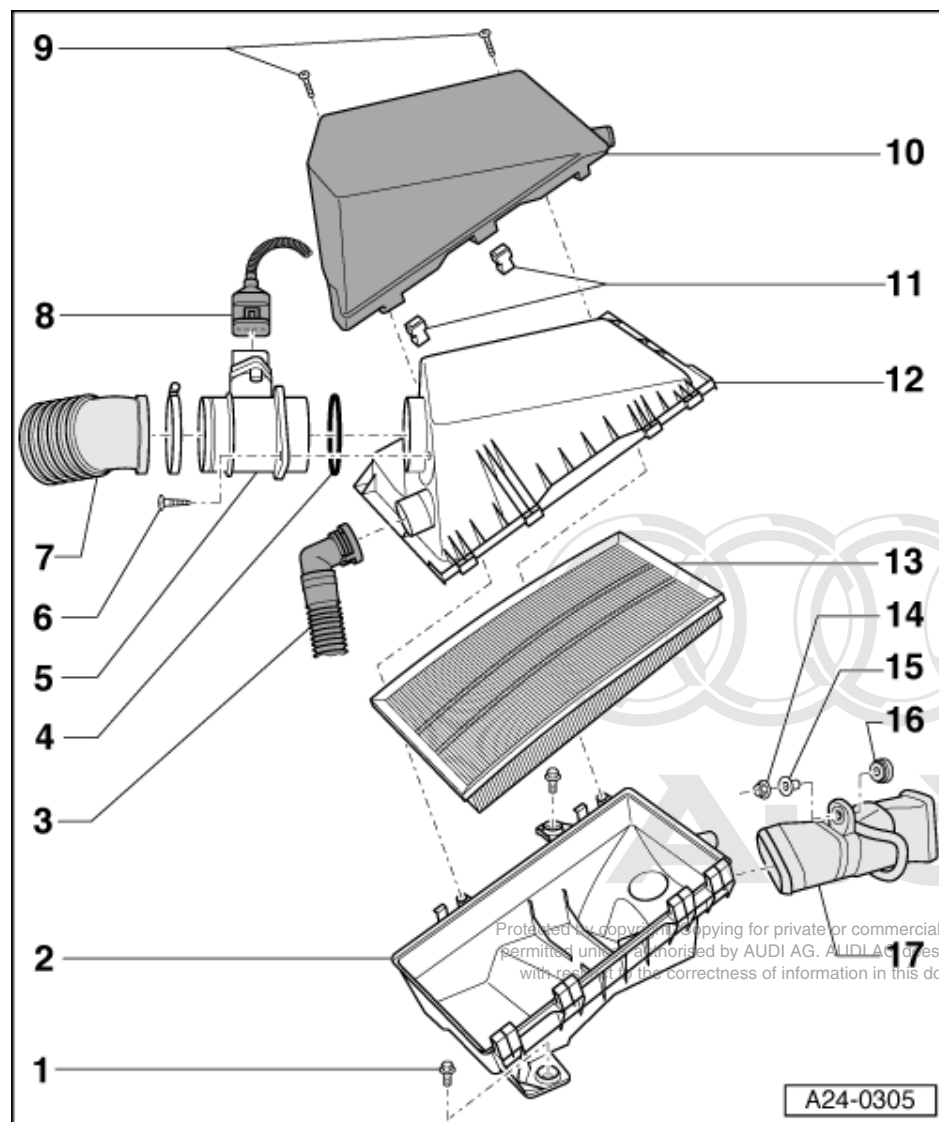
- 1 - For knock sensor 1 -G61
- 2 - For engine speed sender -G28
- 3 - For knock sensor 2 -G66



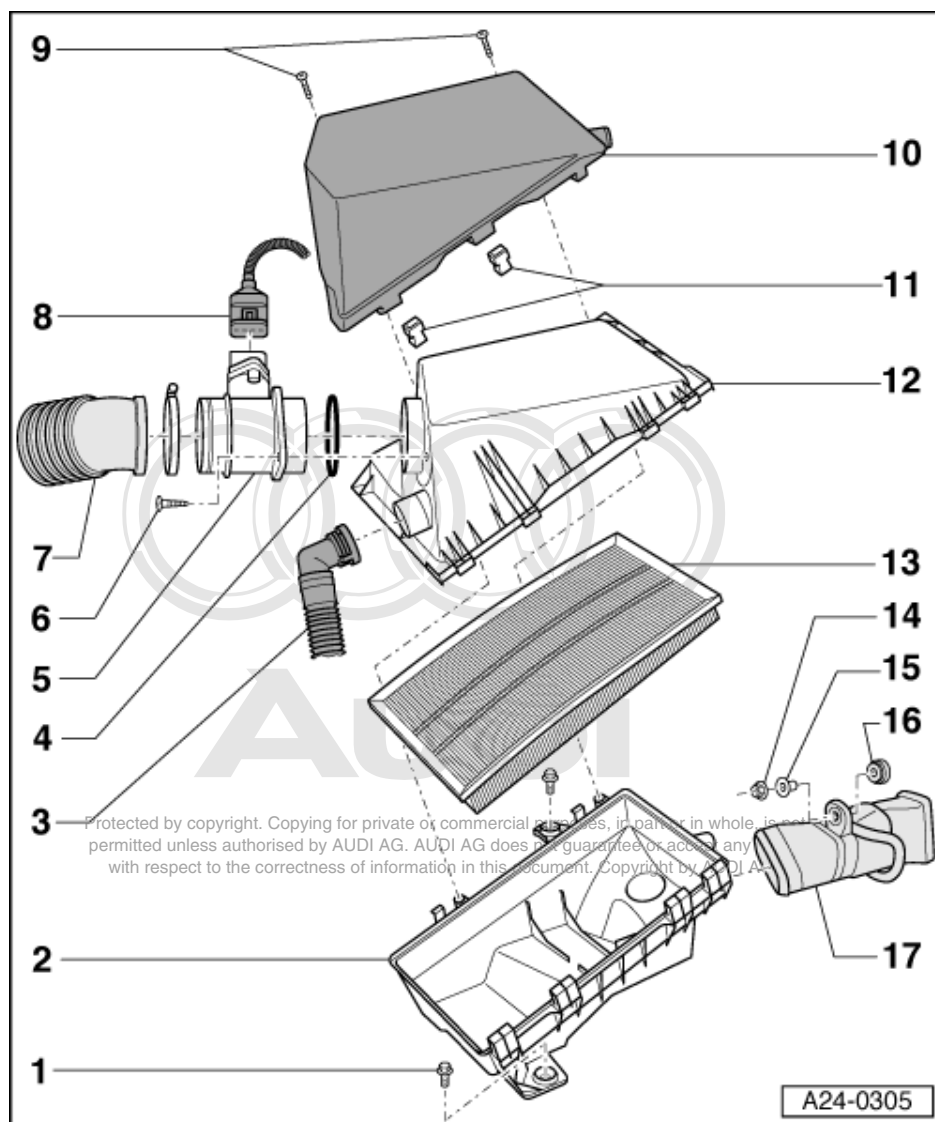
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

-> Fig.8 Fitting location of power steering pressure switch -F88

## 1.6 - Dismantling and assembling air cleaner



- 1 Hexagon bolt - 10 Nm
- 2 Air cleaner lower part
- 3 Hose
  - ♦ To secondary air pump
- 4 Seal
- 5 Air mass meter -G70
- 6 Cross-head screw
- 7 Air ducting
- 8 5 pin connector
- 9 Cross-head screw



- 10 Cover
- 11 Retaining clip
- 12 Air cleaner upper part
- 13 Filter element
- 14 Nut - 10 Nm
- 15 Bush
- 16 Rubber grommet
- 17 Air intake connection

## 1.7 - Wiring and component check with test box V.A.G 1598/31

### Notes:

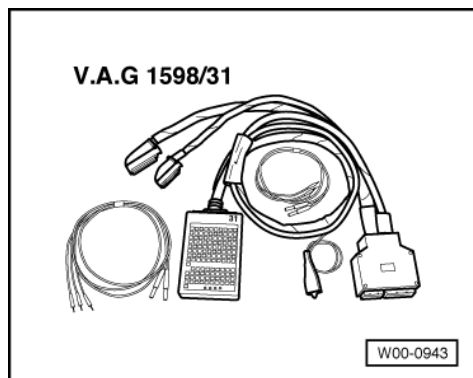
- ◆ Test box V.A.G 1598/31 is designed so that it can be connected to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ◆ This has the advantage of enabling the engine management system to remain fully operational even with the test box connected (for example, when testing signals while the engine is running).
- ◆ The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.



- ♦ Always use adapter set V.A.G 1594A to connect test equipment (e.g. voltage tester V.A.G 1527B, hand-held multimeter V.A.G 1526A etc.).

**Warning!**

To prevent damage to the electronic components, switch to the respective measuring range before connecting test leads and observe test requirements

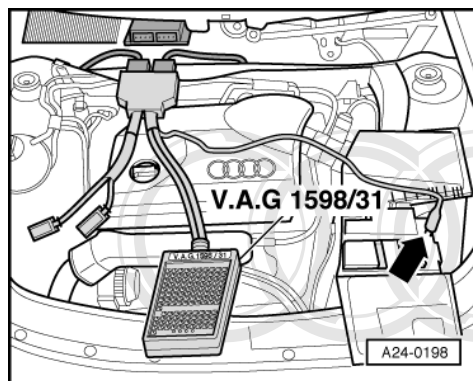


**Special tools and workshop equipment required**

- ♦ V.A.G 1598/31

**Work sequence**

- Switch off ignition.
- Unbolt windscreen wiper arms.
- Remove plenum chamber cover and rest it against the windscreen.
- Release catches and unplug control unit connectors.



- -> Connect test box V.A.G 1598/31 to wiring harness connector. Also connect earth clamp on test box - arrow- to battery negative terminal. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in the repair instructions.

**Note:** Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG

*After re-connecting the engine control unit, perform adaption of engine control unit to throttle valve control part*

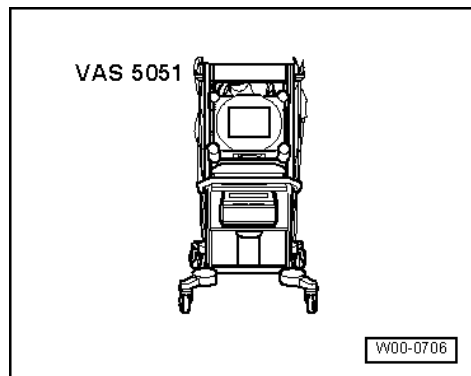
=>Page 92.

## 1.8 - Renewing engine control unit

### Note:

When the engine control unit is disconnected the learned values are erased but the contents of the fault memory remain intact.

### Special tools and workshop equipment required



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

### Removing

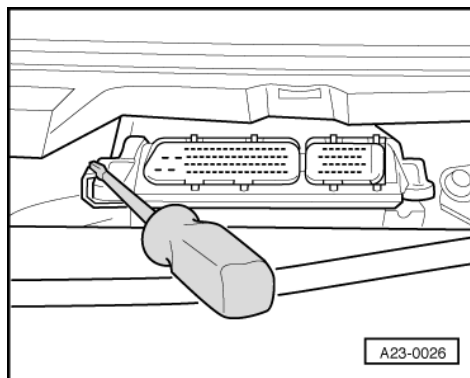
- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering address word "01" => Page 1; when doing this the ignition must be on

-> The display on fault reader V.A.G 1551 will show the control unit identification, as in this example.

8N0906018 1.8l R4/5VT G  
0003  
Coding 05610 WSC 12345

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Always start by calling up and printing out the control unit identification => Page 3.
- Check the coding against the list of coding variants => Page 18.
- Switch off ignition.
- Unbolt windscreen wiper arms.
- Remove plenum chamber cover and rest it against the windscreen.
- Release catches and unplug control unit connectors.



- -> Press back retainer on bracket using a screwdriver, then pull engine control unit towards the front of the vehicle to remove.



## Installing

Installation is carried out in the reverse order, when doing this note the following:

- Bend back retainer on bracket.

### **Note:**

*During the initial learning phase of the basic setting operation for the engine the idling may be slightly rough and the engine may pull a little unevenly.*

### **Important note:**

*After installing the new engine control unit the following operations must be performed:*

- Interrogate and if necessary erase the fault memory => Page 4 .
- Perform adaption of throttle valve control part -J338 => Page 92 .
- Check the notes on coding new engine control units => Page 17 .
- On vehicles with cruise control (identifiable by controls on steering column), activate the cruise control via the engine control unit.

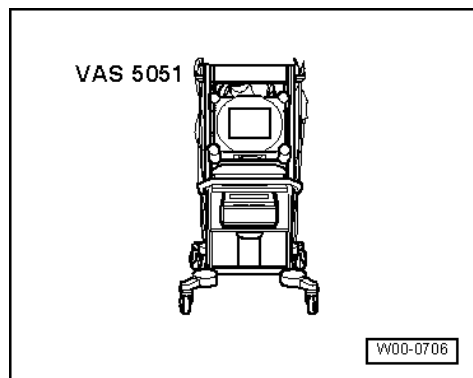
=> Electrical system; Repair group 01; Self-diagnosis of cruise control system (CCS); Testing cruise control system (CCS) Self-diagnosis of cruise control system (CCS) Testing cruise control system (CCS)

- Perform adaption of immobilizer to engine control unit.

=> Electrical System; Repair Group 01; Self-diagnosis of electronic immobilizer; Adaptation procedure when engine control unit is replaced Self-diagnosis of electronic immobilizer Adaptation procedure when engine control unit is replaced

## 1.9 - Testing idling speed

### Special tools and workshop equipment required



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ Fault reader V.A.G 1551 with V.A.G 1551/3 A

### **Requirements for test:**

- Exhaust system free of leaks
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- No pressure gauge connected

**Notes:**

- ♦ The idling speed cannot be adjusted.
- ♦ The idling speed is tested during the basic setting of the engine.
- ♦ During the basic setting of the engine, the solenoid valve for the activated charcoal filter (ACF valve -N80) is closed and the air conditioner compressor is automatically switched off.

**Test sequence**

- Interrogate fault memory =>Page 4 . The fault memory must be clear. If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Run the engine at idling speed.

**Warning!**  
The electric radiator fan should not be running.

-> Indicated on display:

Rapid data transfer                      HELP  
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting                      Q  
Enter display group number XXX

- Enter "056" for Display Group 056 and confirm entry with Q key.

-> Indicated on display:

Basic setting                      56  
1                      2                      3                      4

- Check whether the engine speed shown in display zone 1 (actual engine speed) is within the specified tolerance range.

|                                                                                                         | Display zones                                        |                          |                                      |                                    |
|---------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------|--------------------------------------|------------------------------------|
|                                                                                                         | 1                                                    | 2                        | 3                                    | 4                                  |
| <b>Display Group 056: Idling speed stabilisation with engine idling at normal operating temperature</b> |                                                      |                          |                                      |                                    |
| <b>Display</b>                                                                                          | xxx rpm                                              | xxx rpm                  | x.x %                                | X X X X X                          |
| <b>Indicates</b>                                                                                        | Engine speed (actual)                                | Engine speed (specified) | Idling speed control - torque change | Operating status                   |
| <b>Specification</b>                                                                                    | 800...920 rpm                                        | 860 rpm                  | x.x %                                | 0 0 0 0 0                          |
| <b>Note</b>                                                                                             | If readout does not match specification<br>=>Page 36 |                          |                                      | Relevance of figures<br>=> Page 36 |

**Notes:**

- ♦ The value shown in display zone 1 is the actual engine speed.
- ♦ The value shown in display zone 2 (specified engine speed) is a theoretical value calculated by the engine control unit.
- ♦ When the engine is idling the engine control unit tries constantly to adjust the actual engine speed so that it matches the specified value.
- ♦ This means that the actual engine speed when idling should always be approximately the same as the specified engine speed.



- ♦ Display zones 3 and 4 provide additional information which is not relevant when checking the idling speed.

If the specification is attained:

- Press =>key.

-> Indicated on display (function selection):

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

If the specification is not attained:

- Interrogate fault memory again =>Page 4 .

If the idling speed is too high or too low and there are no faults recorded in the fault memory, carry out the following tests (marked with dots):

- Test for unmetered air in the intake system =>Page 60 .
- Test throttle valve control part  
=>Page 92 .
- Solenoid valve for activated charcoal filter constantly open  
Test =>Page 86 .
- Perform adaption of throttle valve control part =>Page 92 .

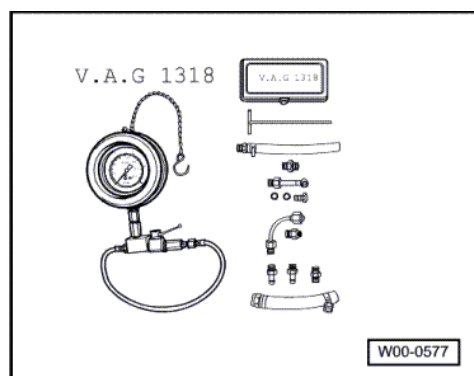
#### Relevance of figures in 5-digit readout for Display Group 056

| x | x | x | x | x | Display zone 4                                                                                                                                                                                                  |
|---|---|---|---|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |   |   |   | 0 | Air conditioner compressor<br>0 = air conditioner compressor off<br>1 = air conditioner compressor on                                                                                                           |
|   |   |   | 0 |   | Display always reads "0"                                                                                                                                                                                        |
|   |   | 0 |   |   | Air conditioner requirement - maximum warm or cold air output                                                                                                                                                   |
|   | 0 |   |   |   | Display always reads "0"                                                                                                                                                                                        |
| 0 |   |   |   |   | Power steering pressure<br>0 = no signal from pressure switch for power assisted steering<br>1 = signal from pressure switch for power assisted steering (steering wheel on full lock, rapid steering movement) |

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

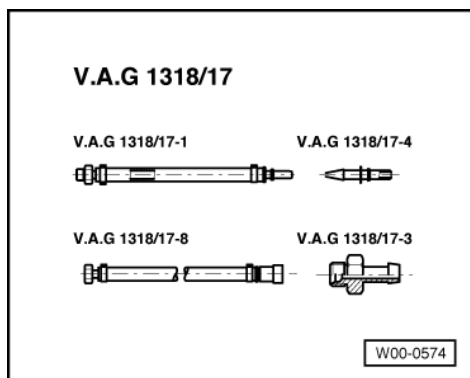
## 1.10 - Checking system pressure, fuel pressure regulator and holding pressure

### Special tools and workshop equipment required



- ♦ V.A.G 1318

♦ V.A.G 1318/7



♦ V.A.G 1318/17 (2x)

**Note:**

*The fuel pressure regulator regulates the fuel pressure according to the intake manifold pressure. This ensures that the drop in pressure at the injectors remains the same throughout all engine speed and engine load ranges.*

**Requirements for test:**

- Fuel pump relay OK. Testing => Page 52 .
- Fuel pump OK. Testing:

=> Fuel supply, Petrol engines; Repair group 20; Fuel supply, Four-wheel drive; Electrical test of fuel pump  
 Fuel supply, Four-wheel drive Electrical test of fuel pump

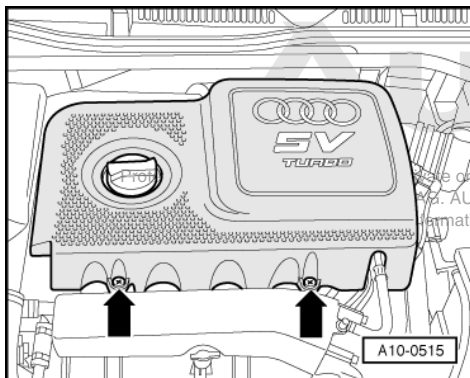
- Fuel filter OK
- Battery voltage not less than 11 V

**Warning**

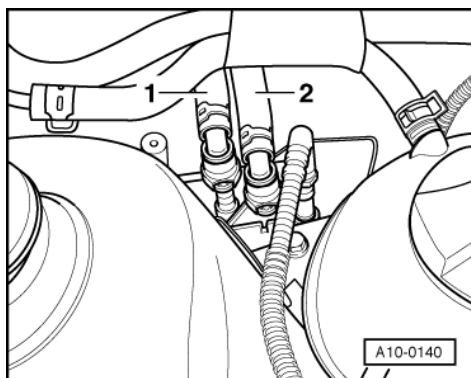
Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

**Testing system pressure**

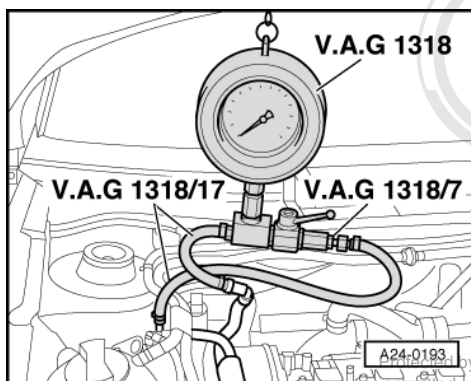
- Briefly open fuel tank filler cap (to release pressure).



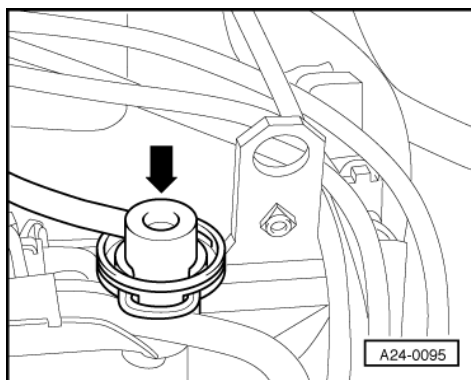
- -> Remove engine cover panel -arrows-



- -> Release retainer catch and disconnect fuel supply hose -1- (with white marking) from fuel supply pipe.



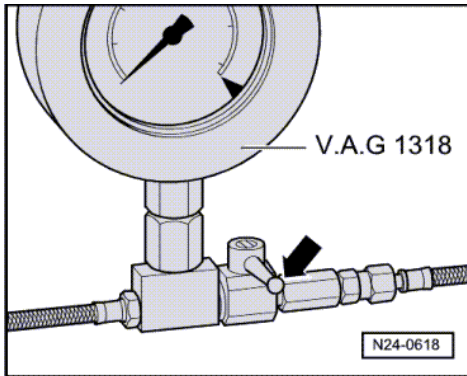
- -> Connect pressure gauge V.A.G 1318 to fuel supply pipe using adapters 1318/7 and 1318/17 (x 2).
- Open cut-off valve on pressure gauge (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Measure fuel pressure.
  - Specification: approx. 2.5 bar



- -> Disconnect vacuum hose from fuel pressure regulator -arrow-.
- The fuel pressure should rise to approx. 3.0 bar.
- Switch off ignition.
- Check leak-tightness and holding pressure by watching the drop in pressure on the pressure gauge.
  - After 10 minutes there should still be a pressure of at least 1.5 bar.

If the holding pressure drops below 1.5 bar:

- Start the engine and run at idling speed.



- -> Allow pressure to build up, then switch off ignition and at the same time close cut-off valve on pressure gauge V.A.G 1318 (valve handle at right angles to direction of flow -arrow-).
- Observe pressure drop on gauge.

If the pressure does not drop:

- Check fuel pump non-return valve.

If the pressure drops again:

- Open cut-off valve on pressure gauge V.A.G 1318 (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Allow the pressure to build up, then switch off the ignition. At the same time pinch the return hose (with blue marking) firmly together.

If the pressure does not drop:

- Renew fuel pressure regulator.

If the pressure drops again:

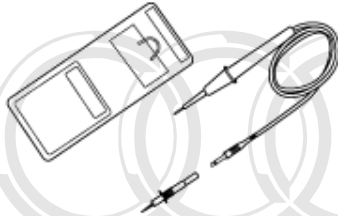
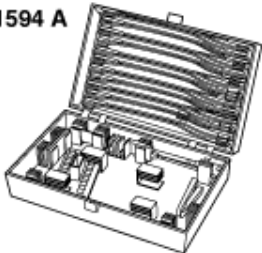
- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability
- Check pipe connections, O-rings on fuel manifold and injectors for leaks.
  - Check pressure gauge for leaks.

**Note:**

*Before removing the pressure gauge, release the fuel pressure by opening the cut-off valve. When doing this hold a container over the connection.*



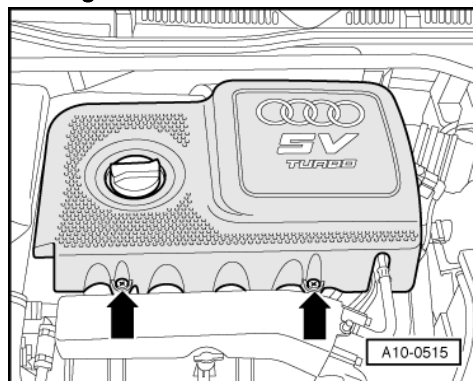
## 1.11 - Testing injectors

|                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br> | <b>V.A.G 1527 B</b><br>                                                                                                                                                                                                                                                                                                      |
| <b>V.A.G 1594 A</b><br> | <b>V.A.G 1598/31</b><br><br><small>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</small> |
|                                                                                                          | <b>G24-0022</b>                                                                                                                                                                                                                                                                                                                                                                                               |

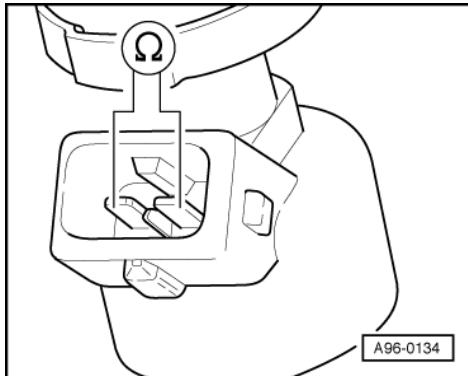
### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

### Testing internal resistance



- -> Remove engine cover panel -arrows-.
- Unplug connector from injector to be tested.



- -> Connect multimeter to valve (resistance measurement range)
- Specification: 12 ... 13  $\omega$  (at room temperature)

If the specification is not attained:

- Renew injector => Page 48 .

If the specification is attained:

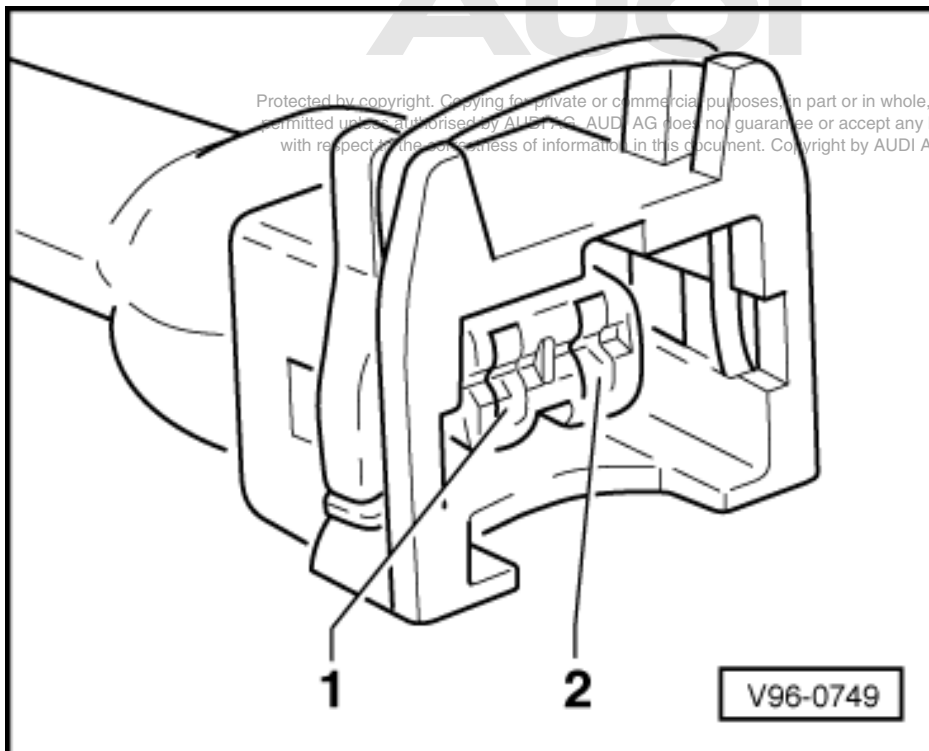
#### Checking voltage supply

##### *Requirements for test:*

- Fuel pump relay OK. Testing => Page 52 .
- Fuse for injectors OK.

=> Current flow diagrams, Electrical fault finding and Fitting locations

- Unplug connector from injector to be tested.





- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Engine earth    |

- Operate the starter briefly. (The engine can be allowed to start.)
  - The LED should light up.

If the LED does not light up:

- Test for open circuit in wiring between contact 1 and fuse for injectors.

=> Current flow diagrams, Electrical fault finding and Fitting locations

- Rectify any open circuits.

If the LED lights up:

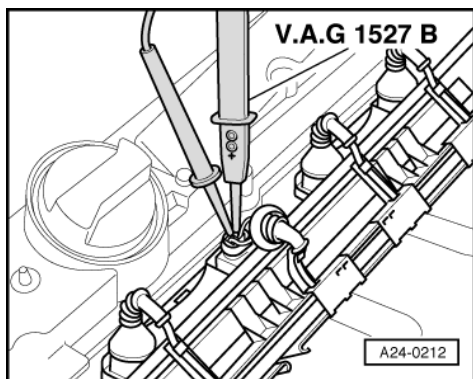
- Test activation of injectors.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

### Checking activation

#### *Test requirement:*

- Internal resistance of injector OK.
- Slide back rubber sleeve on connector for injector but do not unplug the connector.



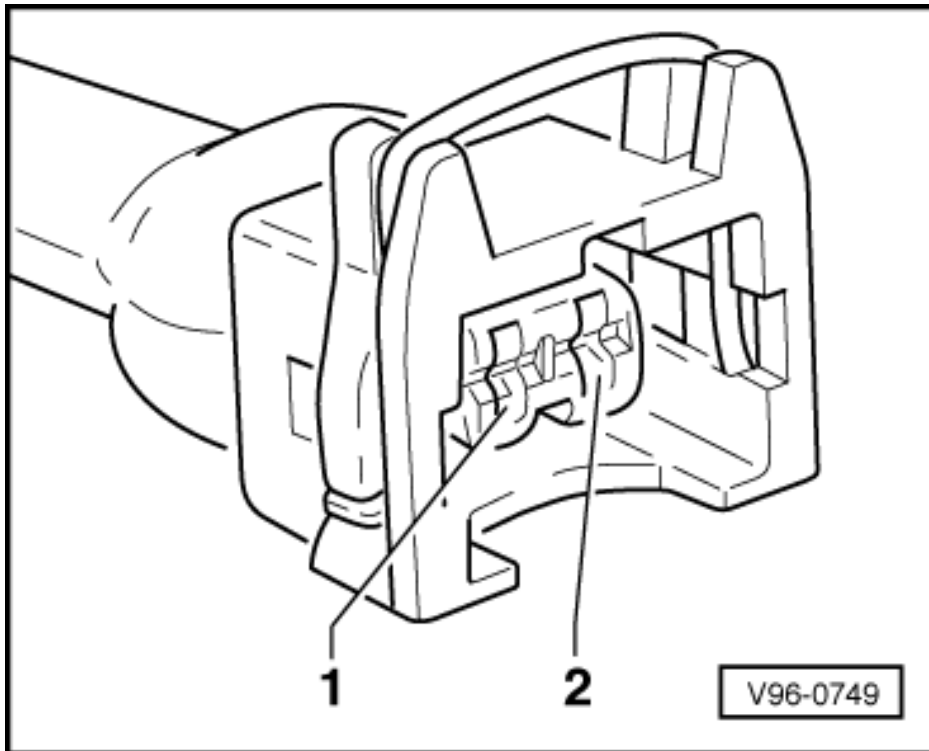
- -> Connect voltage tester V.A.G 1527 B between contact 2 (signal) and contact 1 (positive).
- Operate the starter briefly. (The engine can be allowed to start.)
  - The LED should flash.

#### *Note:*

*The LEDs on voltage testers with a low current draw continue to glow faintly between impulses from the engine control unit (rather than going out completely) and become much brighter when receiving an impulse.*

If the LED does not flash:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Cylinder | Connector for injector Contact | Test box V.A.G 1598/31 Socket |
|----------|--------------------------------|-------------------------------|
| 1        | 2                              | 96                            |
| 2        | 2                              | 89                            |
| 3        | 2                              | 97                            |
| 4        | 2                              | 88                            |

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

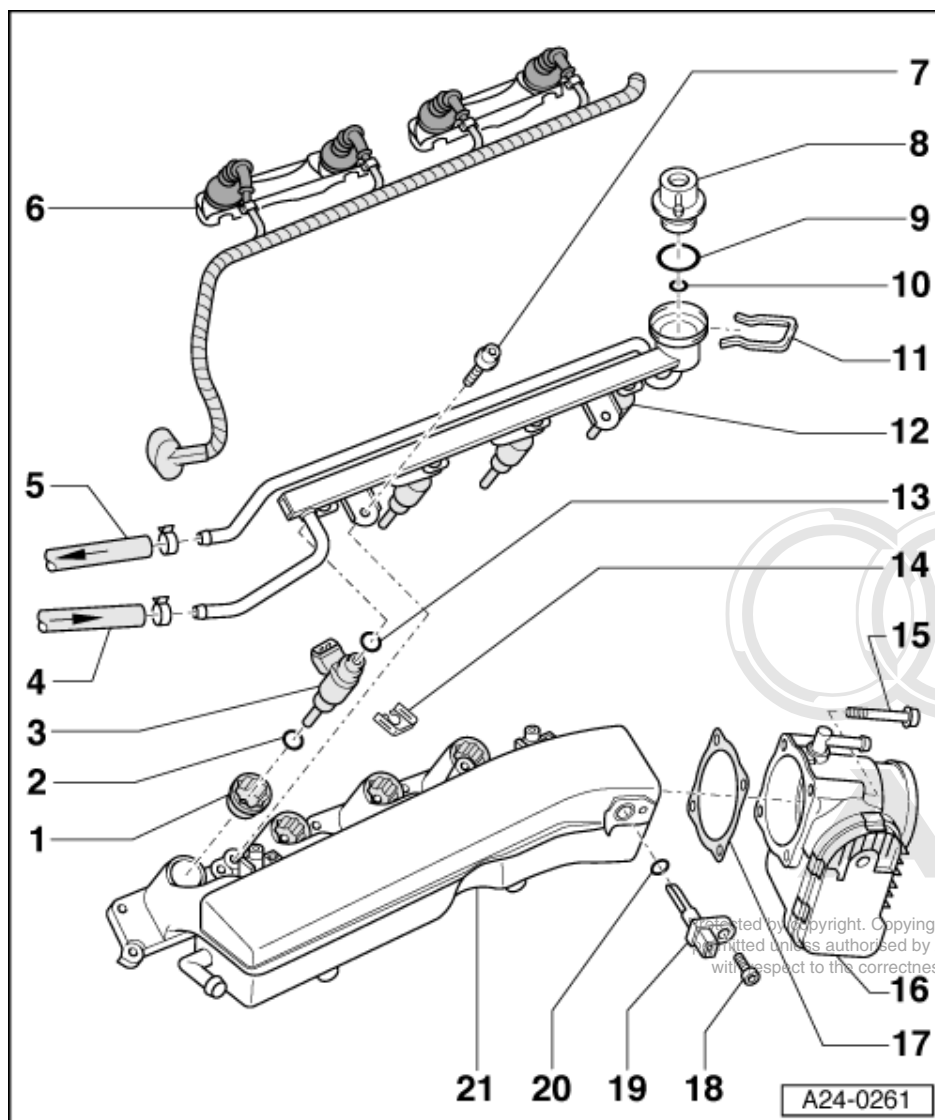
- Fit a new engine control unit => Page 33 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 1.12 - Dismantling and assembling fuel rail with injectors



### 1 Insert for injector - 3 Nm

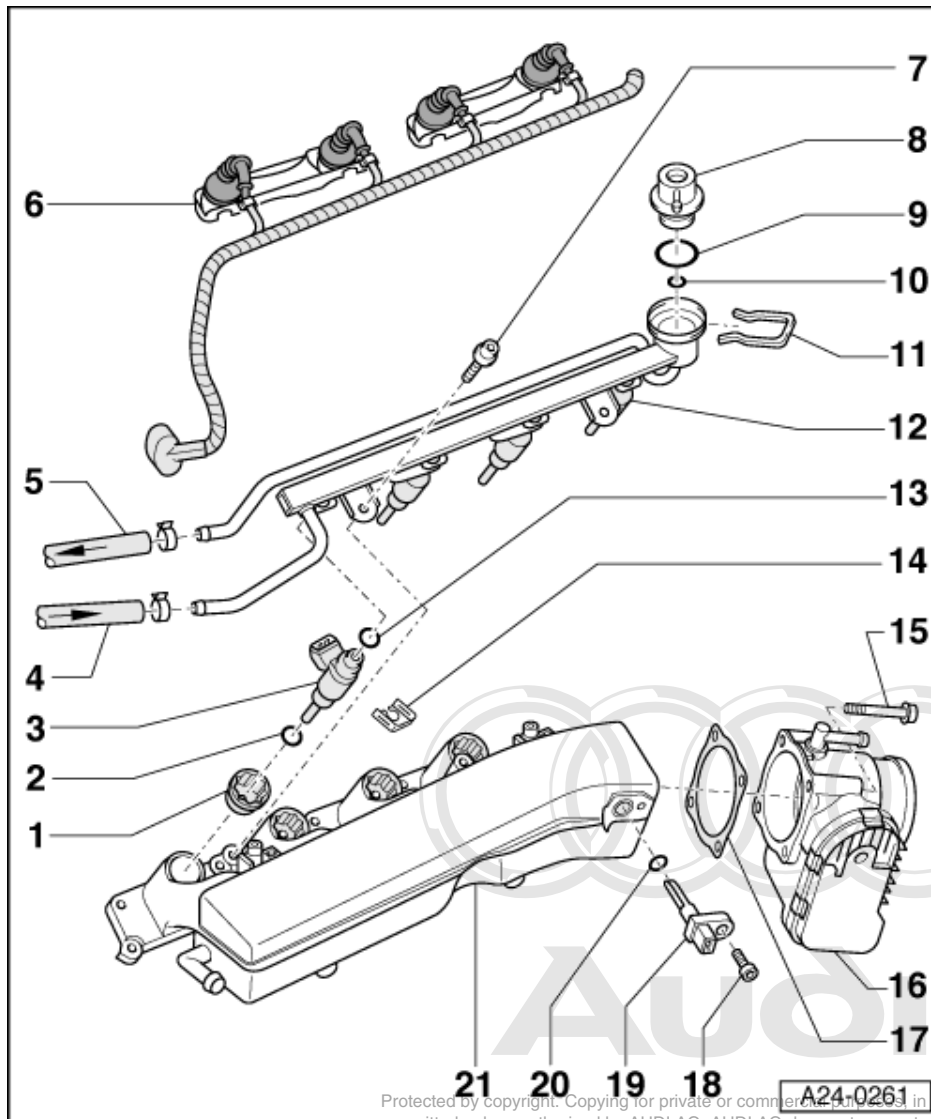
- ♦ Install with locking fluid D 000 600 A2

### 2 O ring

- ♦ Removing and installing  
=> Page 48
- ♦ Renew
- ♦ Lubricate with clean engine oil

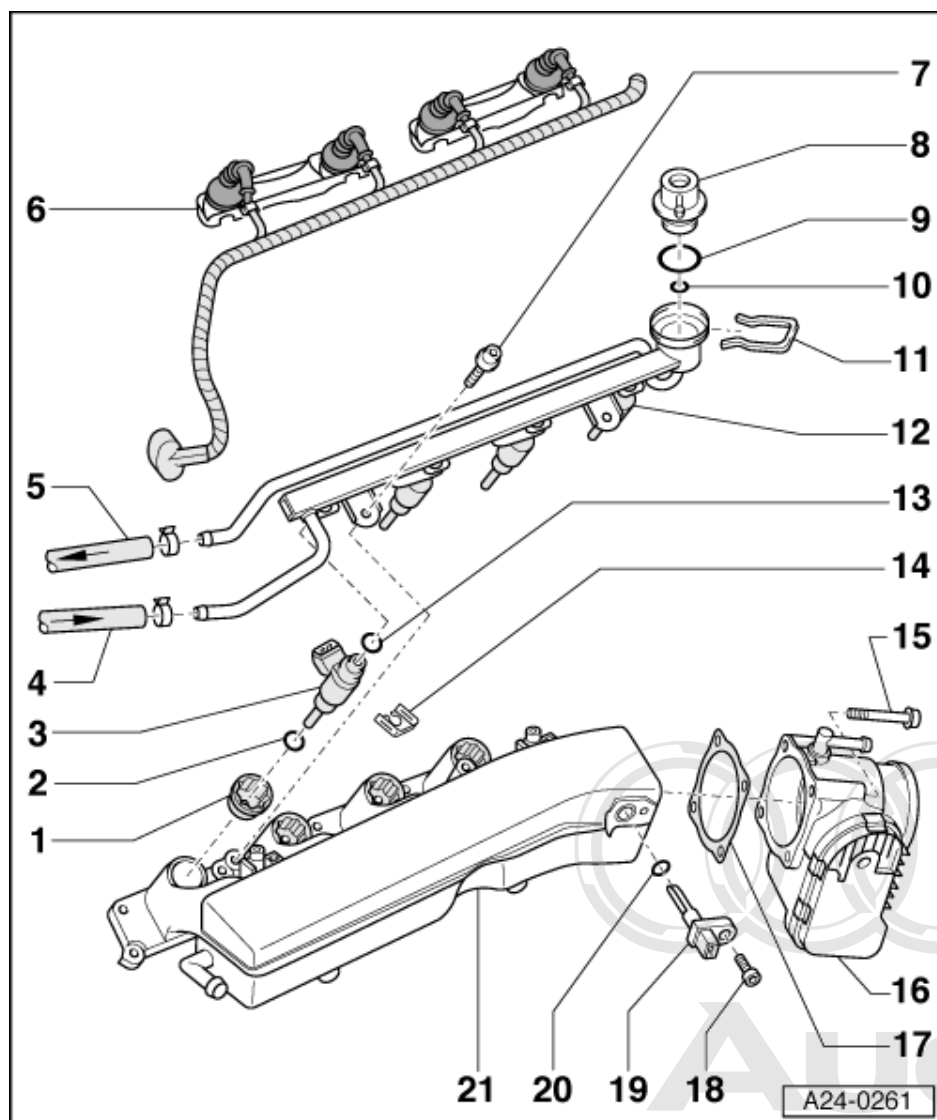
### 3 Injector -N30...-N33

- ♦ Removing and installing  
=> Page 48



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorized by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- 4 Supply hose
- 5 Return hose
- 6 Connector
  - ♦ For injectors
  - ♦ Qty. 4
- 7 Hexagon socket head bolt  
- 10Nm
- 8 Fuel pressure regulator
- 9 O ring
  - ♦ Renew
- 10 O ring
  - ♦ Renew
- 11 Retaining clip
- 12 Fuel rail



### 13 O ring

- ◆ Removing and installing  
=> Page 48
- ◆ Renew
- ◆ Lubricate with clean engine oil

### 14 Retaining clip

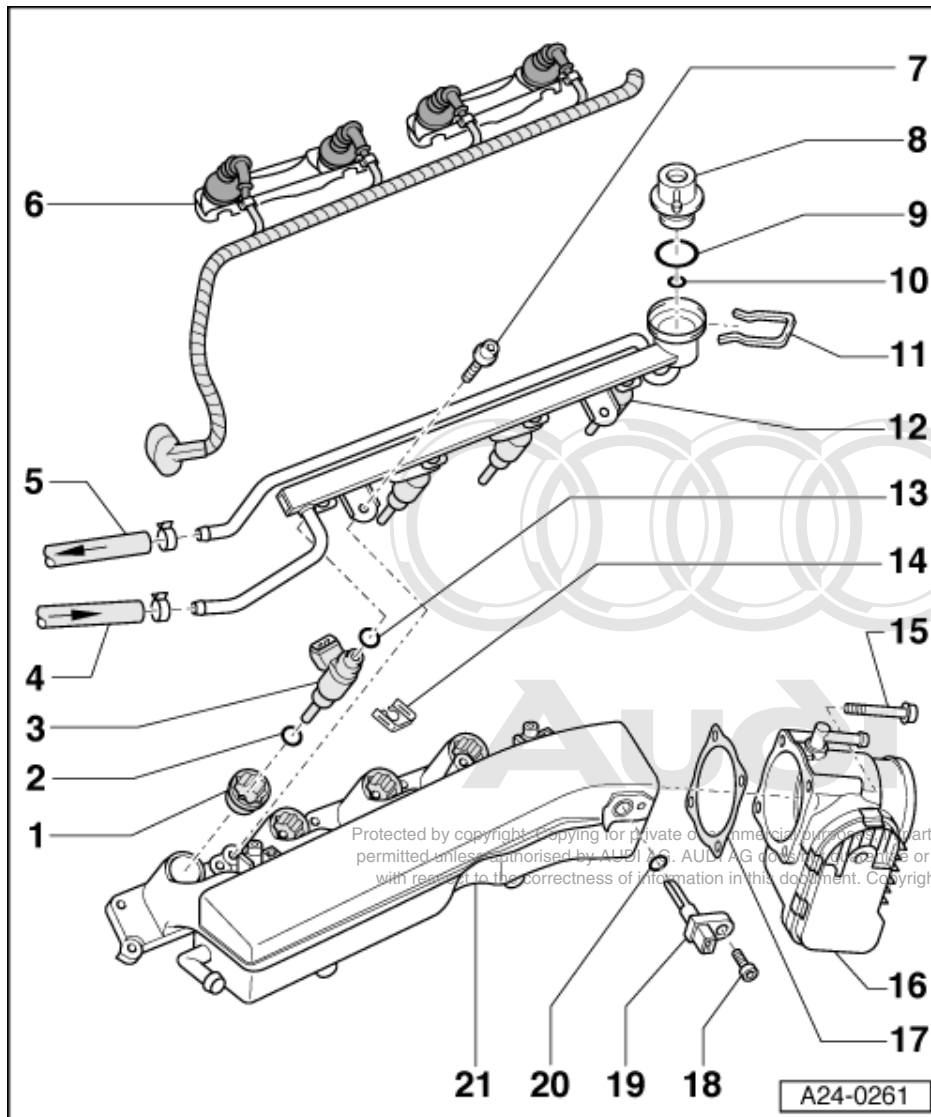
- ◆ Ensure clip is seated correctly on injector and fuel rail

### 15 10 Nm

### 16 Throttle valve control part -J338

- ◆ With throttle valve drive -G186, angle sender for throttle valve drive -G187 and angle sender 2 for throttle valve drive -G188

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

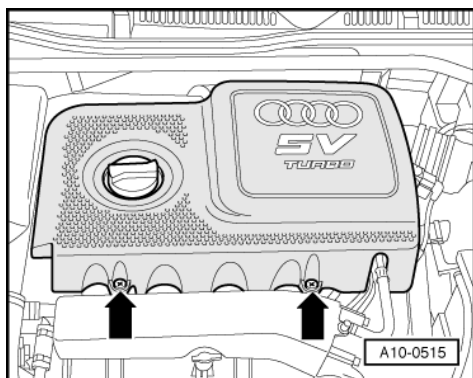


- 17 Gasket  
 ♦ Renew  
 18 10 Nm  
 19 Intake air temperature sender -G42  
 20 O ring  
 ♦ Renew  
 21 Intake manifold

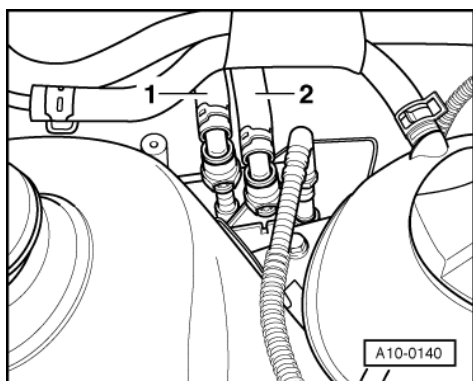


## 1.13 - Removing and installing injectors

### Removing



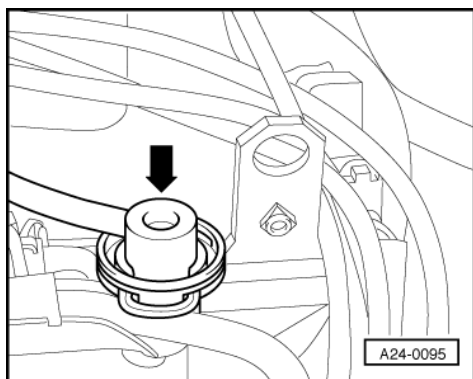
- -> Remove engine cover panel -arrows-.
- Disconnect wiring and unplug connectors for the following components:
  - Intake air temperature sender -G42
  - Hall sender -G163
  - Throttle valve control part -J338



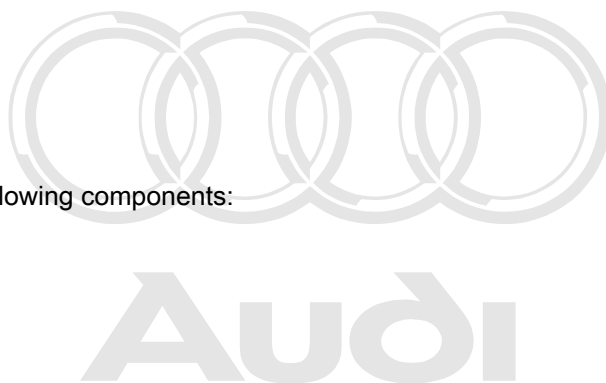
- -> Press release tabs and pull fuel supply line -1- and fuel return line -2- off connections.

### Warning

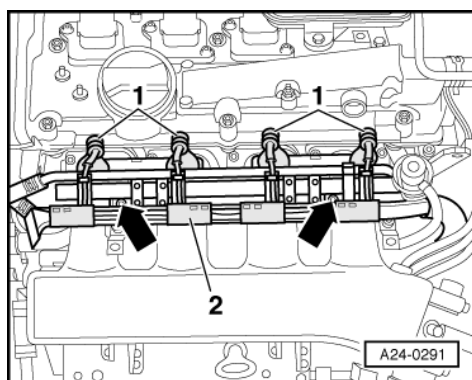
Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.



- -> Disconnect vacuum hose from fuel pressure regulator -arrow-.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- -> Unplug connectors -1-.
- Disengage wiring duct -2-.
- Remove the 2 hexagon socket head bolts -arrows- securing the fuel rail.
- Pull fuel rail together with injectors off intake manifold (pull off evenly from the top) and place it on a clean cloth in the engine compartment.
- Take off retaining clip and remove injector.

**Note:**

*To install a new fuel rail, first disconnect the fuel hoses.*

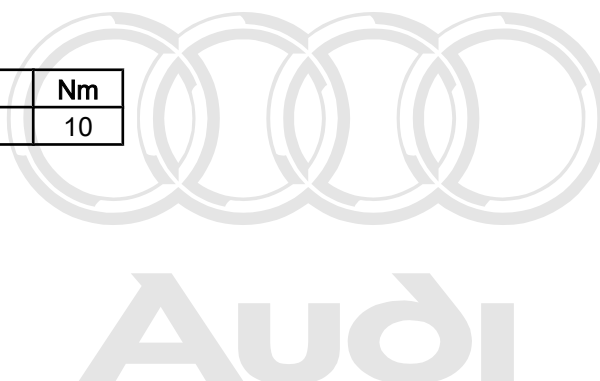
**Installing**

Installation is carried out in the reverse order. When doing this, note the following:

- Renew the O-rings at all opened connections. (When renewing the front O-ring, make sure not to remove the plastic cap from the injector head. The O-ring must be pulled off over the plastic cap.)
- Moisten the O-rings with clean engine oil.
- Make sure that the injectors are installed in the correct positions.
- Check to make sure that the retaining clips are properly seated.
- Position fuel rail together with injectors (properly secured) against intake manifold and press into place evenly all round.

**Tightening torque**

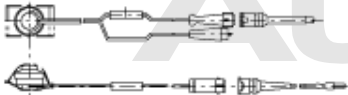
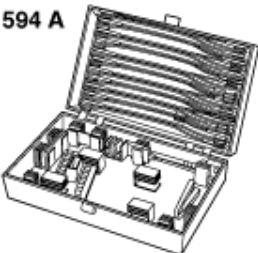
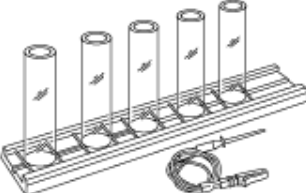
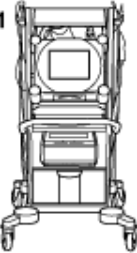
| Component                    | Nm |
|------------------------------|----|
| Fuel rail to intake manifold | 10 |



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 1.14 - Checking injection quantity, leak-tightness and spray pattern of injectors

|                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>V.A.G 1348/3-2</b></p>  | <p><b>V.A.G 1348/3A</b></p>  <p>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</p> |
| <p><b>V.A.G 1594 A</b></p>    | <p><b>V.A.G 1602</b></p>                                                                                                                                                                                                                                                                                              |
| <p><b>VAS 5051</b></p>      | <p>G24-0001</p>                                                                                                                                                                                                                                                                                                                                                                                        |

### Special tools and workshop equipment required

- ♦ V.A.G 1348/3-2
- ♦ V.A.G 1348/3A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1602
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

### Test requirement:

- Fuel pressure OK. Testing => Page 36 .

### Test sequence

- Remove fuel rail (together with injectors) from intake manifold => Page 48 . Do not disconnect the fuel hoses.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.

=> Page 31 .

- Bridge contacts 1 and 65 on the test box using test leads from adapter set V.A.G 1594 A. (This creates an earth connection to one side of the fuel pump relay coil.)

### Testing for leaks

- Switch on ignition.

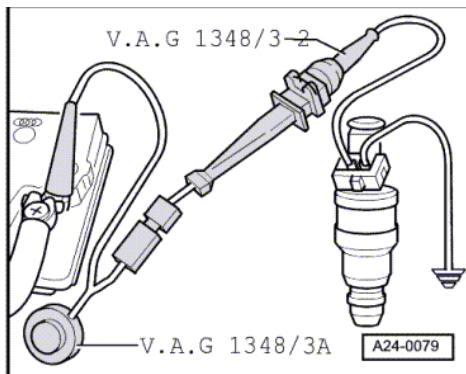
#### **Note:**

*Once the ignition has been switched on the fuel pump runs continuously, even if the engine is not running. This is because when the ignition is switched on the fuel pump relay receives a positive voltage supply via the central electrics. The negative voltage supply for the fuel pump relay comes via the cable bridge on the test box.*

- Check injectors for leaks (visual check). When the fuel pump is running, only 1 or 2 drops should escape per minute from each injector.
- If the fuel loss is greater, switch off the fuel pump (i.e. switch off the ignition) and renew the faulty injector => Page 48 .

### Checking injection quantity

- Place the injector which is to be tested into a measuring glass from injection quantity tester V.A.G 1602.



- -> Connect one of the injector contacts to engine earth using test lead and crocodile clamp from V.A.G 1594 A.
- Connect second injector contact to positive using remote control V.A.G 1348/3 A, adapter cable V.A.G 1348/3-2 and auxiliary cable.
- Switch on ignition.
  - The fuel pump should run.
- Activate remote control V.A.G 1348/3A for 30 seconds.
- Carry out measurement on all injectors.
- Once all four injectors have been actuated, place measuring glasses on a level surface.
  - Specification for each injector:  $179 \pm 14$  ml
- If the measured value for one or more of the injectors is outside the tolerance range, switch off the fuel pump (by disconnecting the cable bridge) and replace the defective injector => Page 48 .

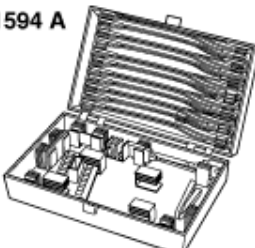
#### **Note:**

*When checking the injection quantity, also check the spray pattern. The spray pattern should be the same for all the injectors.*

- Install injectors together with fuel rail => Page 49 .



## 1.15 - Testing fuel pump relay -J17 and activation

|                                                                                                           |                                                                                                          |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br>  | <b>V.A.G 1594 A</b><br> |
| <b>V.A.G 1598/31</b><br> |                                                                                                          |
|                                                                                                           | <b>G24-0020</b>                                                                                          |

### Special tools and workshop equipment required

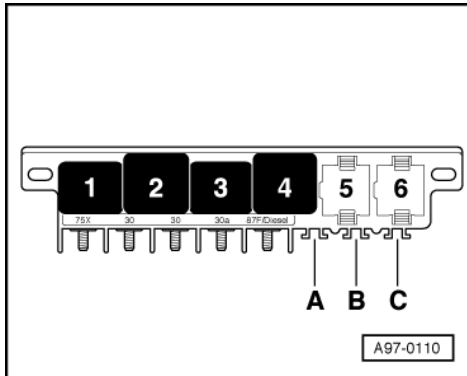
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

The fuel pump and some of the injection system components receive their voltage supply via fuel pump relay -J17.

Fuel pump relay -J17 will only close if the engine is turning over. In other words, the relay is only earthed (via the engine control unit) when the engine control unit is receiving engine revolution impulses.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

**Note:**



-> The fuel pump relay is located in the micro central electrics on the left of the driver's footwell, relay position 4.

**Test requirement:**

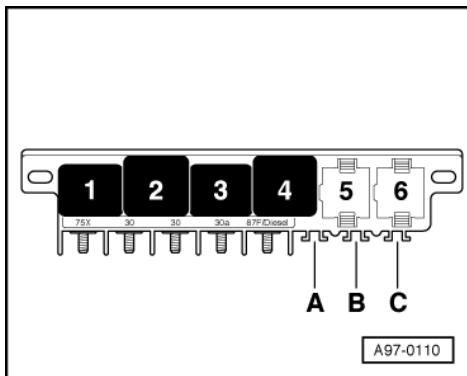
- Battery voltage not less than 11 V

**Testing operation of fuel pump relay**

- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)  
When doing this the ignition must be switched on.
- Start final control diagnosis (=> Page 13 ) and activate ACF solenoid valve 1 (-N80).



- -> The fuel pump relay should pick up and the fuel pump should run. (Relay is located in relay position 4 in micro central electrics on left of driver's footwell).

If the relay does not pick up:

- Test activation of fuel pump relay.

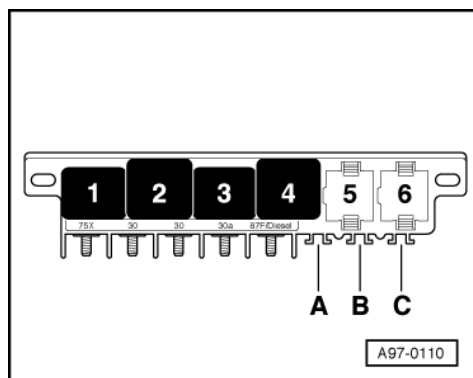
If the fuel pump does not run:

- Test voltage supply to fuel pump and other components (via fuel pump relay) => Page 55

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability

### Testing activation of fuel pump relay

- Switch off ignition.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .
- Connect sockets 2 and 65 on test box to each other using auxiliary cable from V.A.G 1594 A.
- Switch ignition on.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

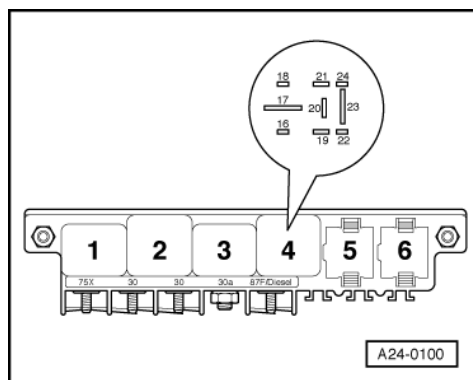
- -> The fuel pump relay should pick up. (Relay is located in relay position 4 in microcentral electrics on left of driver's footwell).

If the relay picks up now but not during the final control diagnosis:

- Fit a new engine control unit => Page 33 .

If the relay does not pick up:

- Switch off ignition.
- Disconnect fuel pump relay.



- -> Connect multimeter (voltage measurement range) between earth and contact 19 on relay panel.
- Switch ignition on.
  - Specification: approx. battery voltage

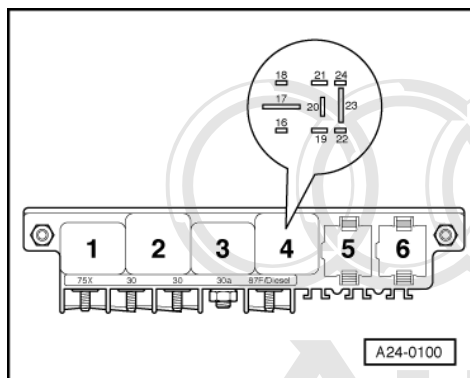
If the specification is not obtained:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations

If the specification is obtained:

- Switch off ignition.



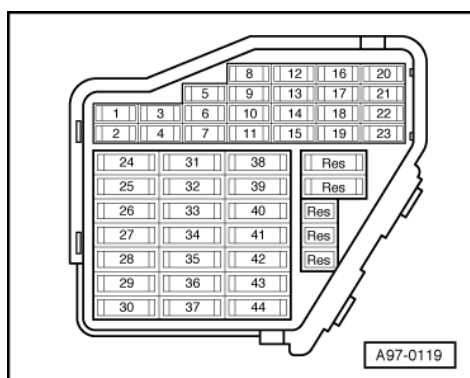
- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Micro central electrics on left of driver's footwell, relay position 4 Contact | Test box V.A.G 1598/31 Socket |
|--------------------------------------------------------------------------------|-------------------------------|
| 16                                                                             | 65                            |

- Rectify any open/short circuit as necessary.

If no fault is found:

- Fit a new fuel pump relay -J17.



- Reconnect the engine control unit.

### Testing voltage supply to fuel pump and other components

- -> Remove fuse Nos. S228, S232, S234 and S243 (sockets 28, 32, 34 and 43) from fuse holder.
- Start final control diagnosis (=> Page 13) and activate ACF solenoid valve 1 (-N80).
- For each of the following fuse positions in the fuse holder, connect the multimeter (voltage measurement range) between earth and one of the fuse contacts:

| Fuse | Specification (for one contact) |
|------|---------------------------------|
| S228 | Approx. battery voltage         |
| S232 | Approx. battery voltage         |
| S234 | Approx. battery voltage         |
| S243 | Approx. battery voltage         |

If the specifications are not obtained:

- Repeat the test on the other fuse contact.



If the specifications are again not attained:

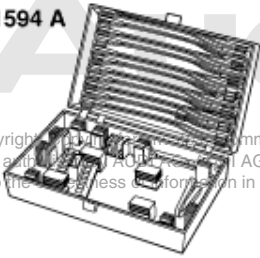
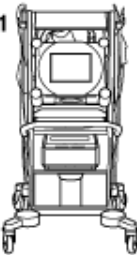
- Check wiring

=> Current flow diagrams, Electrical fault finding and Fitting locations

If no fault is found:

- Fit a new fuel pump relay -J17.
- Refit fuses.

## 1.16 - Testing air mass meter -G70

|                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>V.A.G 1526 A</b></p>     | <p><b>V.A.G 1594 A</b></p>  <p>Protected by copyright. All rights reserved. No part of this publication, in part or in whole, is not permitted unless authorized by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of the information in this document. Copyright by AUDI AG.</p> |
| <p><b>V.A.G 1598/31</b></p>  | <p><b>VAS 5051</b></p>                                                                                                                                                                                                                                                                                                       |
|                                                                                                                 | <div>G24-0021</div>                                                                                                                                                                                                                                                                                                                                                                                             |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

#### Requirements for test:

- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan and secondary air pump must not run during the test)
- Air conditioner switched off
- Fuse for air mass meter OK

=> Current flow diagrams, Electrical fault finding and Fitting locations

#### Testing operation

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)
- When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer      HELP  
 Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

#### Note:

*During the basic setting the activated charcoal filter solenoid valve (ACF valve -N80) is closed and the air conditioner compressor is switched off.*

-> Indicated on display:

Introduction of basic setting      Q  
 Enter display group number XXX

- Enter "002" to select Display Group 002 and confirm entry with Q key.

-> Indicated on display:

Basic setting 2  
     1      2      3      4

- Check display values for engine load

|                                                                                                       | Display zones                        |            |                                                                                  |                                                                                  |
|-------------------------------------------------------------------------------------------------------|--------------------------------------|------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|                                                                                                       | 1                                    | 2          | 3                                                                                | 4                                                                                |
| <b>Display Group 002: Intake air mass at idling speed with engine at normal operating temperature</b> |                                      |            |                                                                                  |                                                                                  |
| <b>Display</b>                                                                                        | xxx rpm                              | xx.x %     | x.x ms                                                                           | xxx.x g/s                                                                        |
| <b>Indicates</b>                                                                                      | Engine speed<br>(in steps of 40 rpm) | Load       | Average injection period                                                         | Air mass                                                                         |
| <b>Range</b>                                                                                          | 0...6800 rpm                         | 10...190 % | 1.0...21.0 ms                                                                    | 2.0...190.0 g/s                                                                  |
| <b>Specification</b>                                                                                  | 800...920 rpm                        | 10....25 % | 1.0....4.0 ms                                                                    | 2.0....4.5 g/s                                                                   |
| <b>Note</b>                                                                                           | ---                                  | ---        | If readout does not match specification, see table for display zone 3 => Page 58 | If readout does not match specification, see table for display zone 4 => Page 58 |

If the specification is obtained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer      HELP  
 Select function XX



## Reading Display Group 002

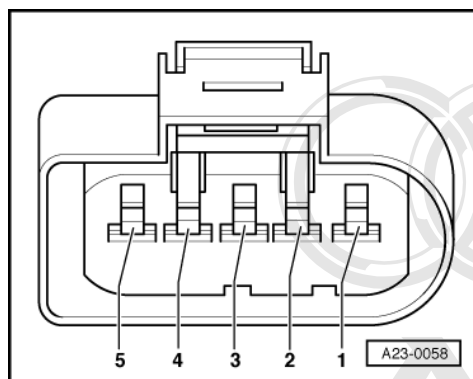
| Display zone 3   | Possible cause of fault                                  | Fault remedy                                                   |
|------------------|----------------------------------------------------------|----------------------------------------------------------------|
| Less than 1.0 ms | - Lower values can only occur when vehicle is on overrun |                                                                |
| More than 4.0 ms | - Load on engine due to ancillaries                      | - Eliminate load (air conditioner, power steering, alternator) |
|                  | - Rough idling (engine not running on all cylinders)     | - Test spark plugs<br>Test injectors => Page 40                |
|                  | - Throttle valve control part -J338 defective            | - Test throttle valve control part<br>=> Page 92               |

## Reading Display Group 002

| Display zone 4    | Possible cause of fault                                                                                                                                        | Fault remedy                                                   |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Less than 2.0 g/s | - Large quantity of unmetered air (air leak) between intake manifold and air mass meter<br>- Voltage supply to air mass meter or wiring to engine control unit | - Check intake system for leaks (unmetered air) => Page 58     |
| More than 4.5 g/s | - Load on engine due to ancillaries                                                                                                                            | - Eliminate load (air conditioner, power steering, alternator) |
|                   | - Voltage supply to air mass meter or wiring to engine control unit                                                                                            | - Test voltage supply and wiring<br>=> Page 58                 |

## Testing power supply to air mass meter

- Unplug connector from air mass meter.



- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 2                 | Engine earth    |

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the information in this document. Copyright by AUDI AG.

- Operate starter briefly.
- Specification: approx. battery voltage

**Note:**

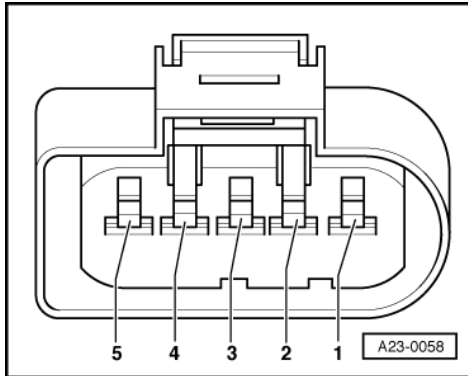
*The air mass meter receives its voltage supply via the fuel pump relay.*

If the specification is not attained:

- Test for open circuit or short to earth in wiring between fuel pump relay and contact 2 on connector via fuse.

=> Current flow diagrams, Electrical fault finding and Fitting locations

- Rectify short circuit or open circuit if necessary.



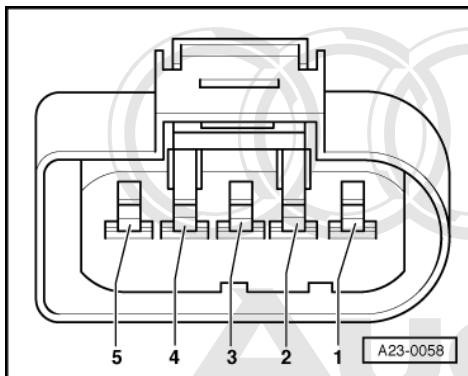
- -> Connect hand-held multimeter (voltage measurement range) between contacts 2 and 3 of connector.
- Operate starter briefly.
  - Specification: approx. battery voltage

**Note:**

*Contact 3 on the connector is for the earth connection from the engine control unit.*

If the specification is not attained:

- Test the wiring => Page 60 .



- -> Connect hand-held multimeter (voltage measurement range) between contacts 3 and 4 of connector.
- Switch ignition on.
  - Specification: approx. 5 V

Proprietary copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without permission by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

If the specification is not attained:

- Test the wiring => Page 60 .

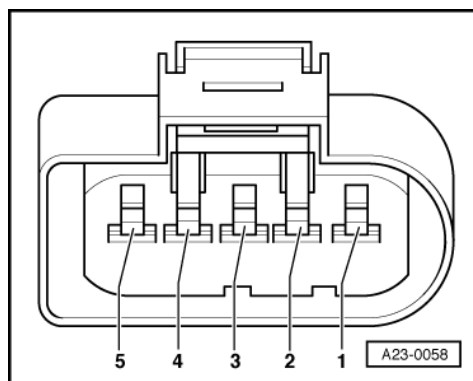


## Testing wiring for air mass meter

### *Note:*

*The wiring test also tests the signal wire.*

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 3                 | 27                            |
| 4                 | 53                            |
| 5                 | 29                            |

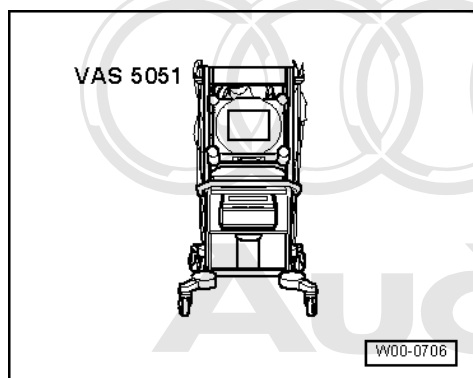
- Rectify short circuit or open circuit if necessary.
- Test all wires for short circuits with each other.

If the wiring is OK:

- Fit a new air mass meter -G70.

## 1.17 - Checking intake air system for leaks (unmetered air)

### Special tools and workshop equipment required



- ♦ VAS 5051 with VAS 5051/1
- Every other copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

or

- ♦ V.A.G 1551 and V.A.G 1551/3 A
- ♦ Engine leak detector spray G 001 800 A1

#### Notes:

- ♦ The vacuum in the intake system will cause the leak detector spray to be drawn in with the outside air. The leak detector spray reduces the ignitability of the mixture. This leads to a drop in engine speed and to a significant increase of the CO content.
- ♦ Observe the safety precautions listed on the container.

#### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)
- When doing this the engine must be idling.

-> Indicated on display:

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

|                                |   |
|--------------------------------|---|
| Read measured value block      | Q |
| Enter display group number XXX |   |

- Enter "001" to select Display Group 001 and confirm entry with Q key.

-> Indicated on display:

(1...4 = Display zones)

|                           |   |
|---------------------------|---|
| Read measured value block | 1 |
| 1      2      3      4    |   |

- Note engine speed in display zone 1.
- Systematically spray parts of the intake system with engine leak detector spray.

If the engine speed does not change:

- Press the =>key.

-> Indicated on display (function selection):

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

If the engine speed drops:

- Press the =>key.
- Enter "06" to select the function "End output" and confirm entry with Q key.
- Switch off ignition.
- Check sprayed areas of intake system for leaks and rectify if necessary.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 2 - Testing lambda control

### 2.1 - Testing lambda control

### 2.2 - Operation of lambda control

#### **Notes:**

*The lambda probe compares the oxygen content in the air with the residual oxygen content in the exhaust gas and sends a voltage signal to the control unit.*

*The voltage signal for "Mixture too rich" (low residual oxygen) is between about 0.7 and 1.1 V (based on reference earth).*

*The voltage signal for "Mixture too lean" (high residual oxygen) is between about 0.0 and +0.3 V.*

*The transition from "rich" to "lean" is accompanied by a voltage jump from between 0.7 and 1.0 V to between 0.0 and +0.3 V, and vice versa ( $\lambda = 1.0$ ).*

*Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of  $\lambda = 1.0$ . The system fluctuates continuously between "slightly too lean" and "slightly too rich".*

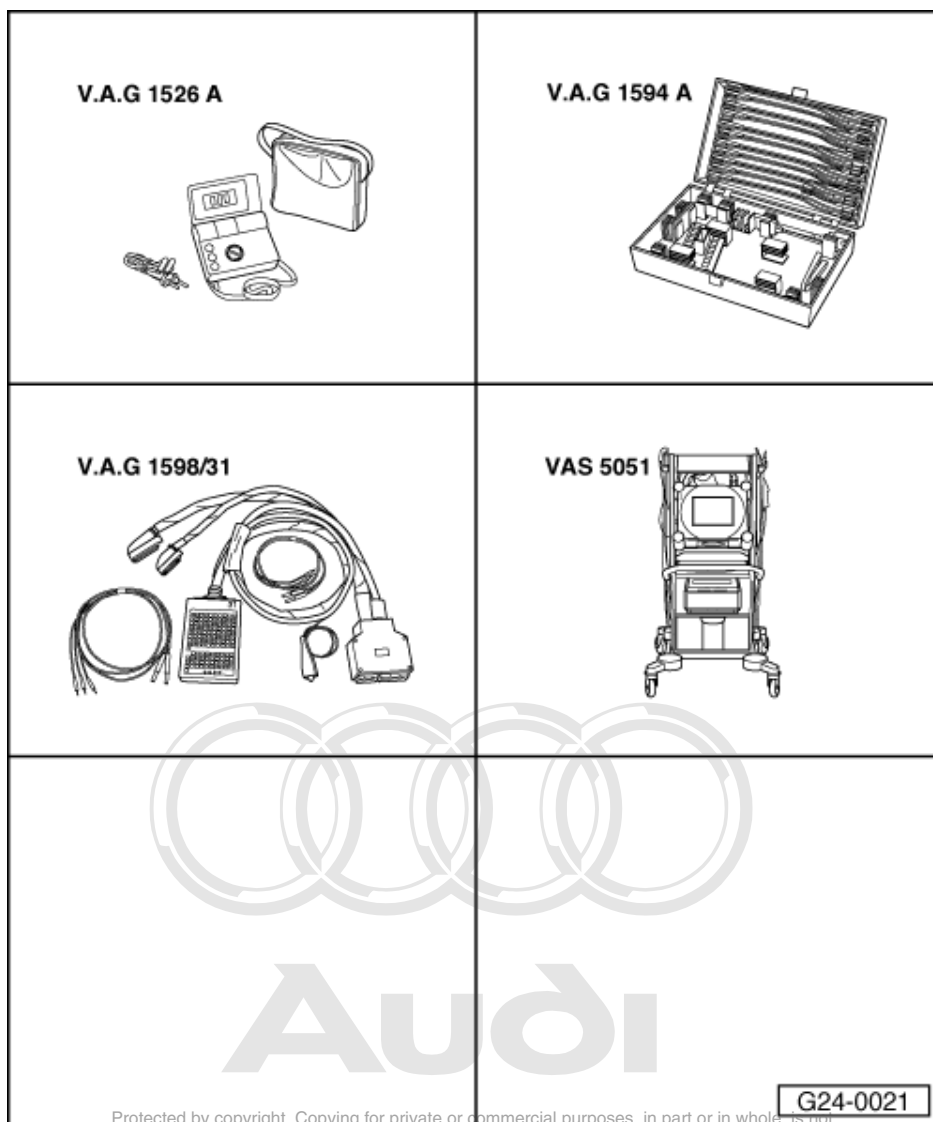
*If the voltage does not change or only changes slowly the following faults are possible:*

- ♦ Slots or holes in probe head are blocked.
- ♦ Lambda probe has been subjected to excessive thermal stress.
- ♦ Contact resistance in signal wire or earth wire.
- ♦ Lambda probe too cold; lambda probe heating not working.
- ♦ Lambda probe damaged by contact spray or similar product. (The contact spray is drawn into the probe via the fine cavities in the electrical wiring as a result of temperature fluctuations and capillary effect.)
- ♦ Lambda probe damaged by silicone vapours. (The engine draws in traces of any silicone-based sealants that may have been used. The silicone does not burn and damages the lambda probe.)



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

## 2.3 - Testing lambda probe and lambda control



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

### Notes:

- ◆ For the purposes of fault-finding it is possible to switch off the lambda control by selecting Display Group 099 in "Basic setting" mode and to switch it on again by selecting Display Group 099 in "Read measured value block" mode.
- ◆ After selecting Display Group 099 (either in "Basic setting" mode or in "Read measured value block" mode) it is possible to switch back and forth between function 04 ("Basic setting") and function 08 ("Read measured value block") by pressing keys 4 and 8 on fault reader V.A.G 1551.
- ◆ When exiting the "Basic setting" mode (function 04) the lambda control is automatically switched on again.



- ♦ The 4-pin connector for lambda probe 1 -G39 and lambda probe heating -Z19 is located on the right side of the bulkhead => -Item **22** .

**Requirements for test:**

- Take the car for a test drive and do not erase the fault memory.
- Coolant temperature at least 80 °C

**Testing operation**

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page **1** .)  
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

**Note:**

*During the basic setting the activated charcoal filter solenoid valve (ACF valve -N80) is closed and the air conditioner compressor is switched off.*

-> Indicated on display:

Introduction of basic setting      Q  
Enter display group number XXX

- Enter "030" to select Display Group 030 and confirm entry with Q key.

-> Indicated on display:

Basic setting 30  
1      2      3      4

- Check lambda probe status in display zone 1.

**Note:**

*The "lambda probe status" display indicates the status of the lambda control and lambda probes.*

|                                               | Display zones                                               |   |   |   |
|-----------------------------------------------|-------------------------------------------------------------|---|---|---|
|                                               | 1                                                           | 2 | 3 | 4 |
| <b>Display Group 030: Lambda probe status</b> |                                                             |   |   |   |
| Display                                       | X X X                                                       |   |   |   |
| Indicates                                     | Lambda probe status Bank 1                                  |   |   |   |
| Range                                         | 0 = off<br>1 = on                                           |   |   |   |
| Specification                                 | 1 1 1                                                       |   |   |   |
| Note                                          | If readout does not match specification => Page <b>65</b> . |   |   |   |

**Relevance of 3-figure display in Display Group 030**

| X | X | X | Display zone 1         |
|---|---|---|------------------------|
|   |   | 1 | Lambda control active  |
|   | 1 |   | Lambda probe condition |

|   |  |                                |
|---|--|--------------------------------|
| 1 |  | Status of lambda probe heating |
|---|--|--------------------------------|

### Testing lambda probe learned values and lambda control

- Press C key.
- Enter "032" to select Display Group 032 and confirm entry with Q key.

-> Indicated on display:

|                  |
|------------------|
| Basic setting 32 |
| 1 2 3 4          |

- Check readouts for lambda control in display zones 1 and 2.

|                                          | Display zones                                           |                                                                |   |   |
|------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------|---|---|
|                                          | 1                                                       | 2                                                              | 3 | 4 |
| Display Group 032: Lambda learned values |                                                         |                                                                |   |   |
| Display                                  | xx.x %                                                  | xx.x %                                                         |   |   |
| Indicates                                | Lambda learned value, Bank 1 at idling speed (additive) | Lambda learned value, Bank 1 at part throttle (multiplicative) |   |   |
| Range                                    | -25.0...25.0 %                                          | -25.0...25.0 %                                                 |   |   |
| Specification                            | -10.0...10.0 % (slight fluctuation possible)            | -10.0...10.0 % (slight fluctuation possible)                   |   |   |
| Note                                     | If the specification is not attained =>Page 66          |                                                                |   |   |

- Press C key.
- Enter "033" to select Display Group 033 and confirm entry with Q key.

-> Indicated on display:

|                  |
|------------------|
| Basic setting 33 |
| 1 2 3 4          |

- Check readouts for lambda control in display zones 1 and 2.

|                                   | Display zones                                                          |                                                                                 |   |   |
|-----------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------|---|---|
|                                   | 1                                                                      | 2                                                                               | 3 | 4 |
| Display Group 033: Lambda control |                                                                        |                                                                                 |   |   |
| Display                           | xx.x %                                                                 | x.xxx V                                                                         |   |   |
| Indicates                         | Lambda control Bank 1                                                  | Lambda probe voltage Bank 1                                                     |   |   |
| Range                             | -25.0...25.0 %                                                         | 0.000...1.000 V                                                                 |   |   |
| Specification                     | Between -10.0 and 10.0 % the readout should fluctuate by at least 2 %  | Between 0.000 and 1.000 V the voltage should fluctuate by about 0.3 V           |   |   |
| Note                              | If readout does not match specification<br>=>Further notes,<br>Page 65 | If readout does not match specification<br>=>Reading Display Group 033, Page 66 |   |   |

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

### Further notes

If the readout in display zone 1 does not match the specification, or if the readout does not fluctuate by at least 2 %:

- Take car for a test drive to free lambda probe of any deposits, then repeat the test.



If the readout in display zone 1 still does not match the specification even after the test drive, or if the readout still does not fluctuate by at least 2 %:

- Test the basic voltage => Page 67 .
- Test the lambda probe heating=> Page 69 .

### Reading Display Group 032

| Display zone 1 / 2                              | Possible cause of fault                                                              | Fault remedy                                                              |
|-------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Lambda learned values between -10.0 and -25.0 % | - Air leak in intake system (pressure side between turbocharger and intake manifold) | - Check intake system for leaks and eliminate unmetered air<br>=> Page 60 |
|                                                 | - Oil dilution                                                                       | - Change oil or drive car at moderate to high speeds on out-of-town roads |
|                                                 | - High oil consumption                                                               |                                                                           |
|                                                 | - Air mass meter defective                                                           | - Test air mass meter<br>=> Page 56                                       |
|                                                 | - Solenoid valve for activated charcoal filter sticking in open position             | - Test solenoid valve for activated charcoal filter => Page 86            |
|                                                 | - Fuel pressure too high                                                             | - Test fuel pressure regulator<br>=> Page 36                              |
|                                                 | - Injector leaking                                                                   | - Test injectors => Page 40                                               |
|                                                 | - Lambda probe heating defective<br>- Lambda probe dirty                             | - Test lambda probe heating<br>=> Page 69                                 |

### Reading Display Group 032

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

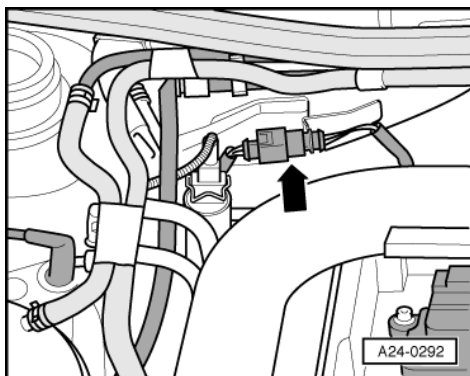
| Display zone 1 / 2                            | Possible cause of fault                                 | Fault remedy                                                              |
|-----------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------|
| Lambda learned values between 10.0 and 25.0 % | - Unmetered air in intake tract                         | - Check intake system for leaks and eliminate unmetered air<br>=> Page 60 |
|                                               | - Fuel pressure too low                                 | - Test fuel pressure regulator<br>=> Page 36                              |
|                                               | - Lambda probe heating defective                        | - Test lambda probe heating<br>=> Page 69                                 |
|                                               | - Injector not opening or only opening partially        | - Test injectors => Page 40                                               |
|                                               | - Solenoid valve for activated charcoal filter sticking | - Test solenoid valve for activated charcoal filter => Page 86            |

### Reading Display Group 033

| Display zone 2             | Possible cause of fault                                             | Fault remedy                          |
|----------------------------|---------------------------------------------------------------------|---------------------------------------|
| Approx. 0.450 V (constant) | - Open circuit in wire 4 between lambda probe and control unit      | - Test basic voltage => Page 67       |
|                            | - Open circuit in wire 3 between lambda probe and control unit      |                                       |
| Approx. 0.200 V (constant) | - Lambda probe defective                                            | - Renew lambda probe                  |
| More than 1.100 V          | - Short to positive in wire 4 between lambda probe and control unit | - Test lambda probe wiring => Page 68 |

| Display zone 2    | Possible cause of fault                                          | Fault remedy |
|-------------------|------------------------------------------------------------------|--------------|
| Less than 0.150 V | - Short to earth in wire 4 between lambda probe and control unit |              |

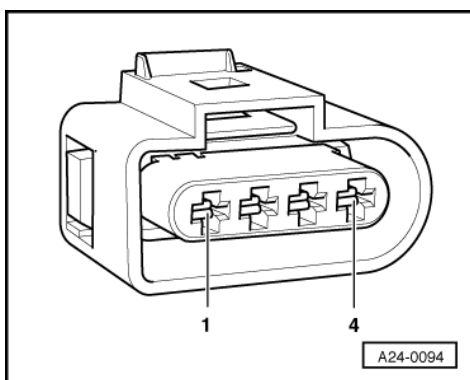
### Testing basic voltage



- -> Unplug 4-pin connector -arrow- for lambda probe.

### Note:

*Re-fit the heat shield sleeve on the connector after completing the test.*



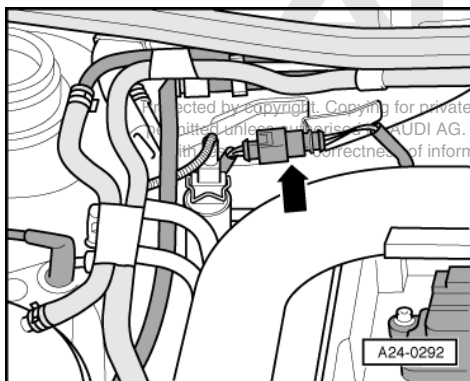
- -> Connect multimeter (voltage measurement range) between contacts 3 and 4.
- Switch ignition on.
  - Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the specification is not obtained:

- Test lambda probe wiring.

If the specification is obtained:

- Renew the lambda probe.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorized by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG.



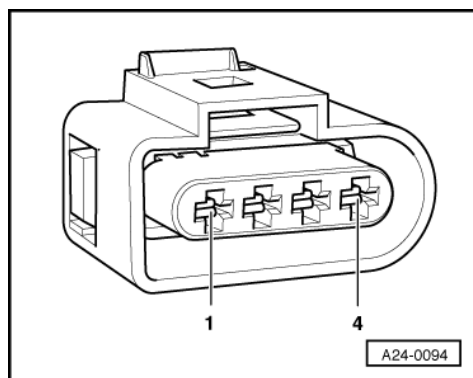
### Testing lambda probe wiring

- -> Unplug 4-pin connector -arrow- for lambda probe.

#### **Note:**

*Re-fit the heat shield sleeve on the connector after completing the test.*

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page **31** .



- -> Test the following wiring connections for open circuits:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 3                 | 51                            |
| 4                 | 70                            |

- Rectify any open circuits.
- Test for short circuits between the wires.

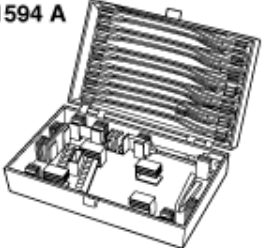
If the wiring is OK:

- Fit a new engine control unit => Page **33** .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

## 2.4 - Testing lambda probe heating

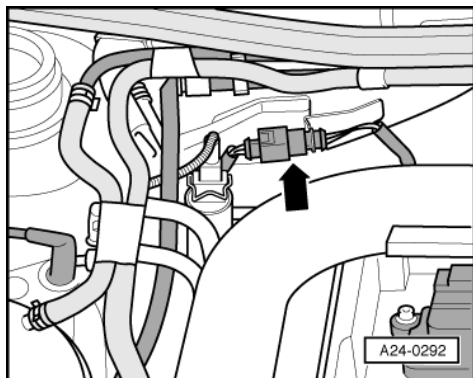
|                                                                                                                                                                                                                                                                                                                                     |                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <p><b>V.A.G 1526 A</b></p>                                                                                                                                                                                                                         | <p><b>V.A.G 1594 A</b></p>  |
| <p><b>V.A.G 1598/31</b></p>                                                                                                                                                                                                                        |                                                                                                               |
| <p>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</p> <p style="text-align: right;">G24-0020</p> |                                                                                                               |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

### *Requirements for test:*

- Coolant temperature at least 80 °C



- Fuse for lambda probe heating OK

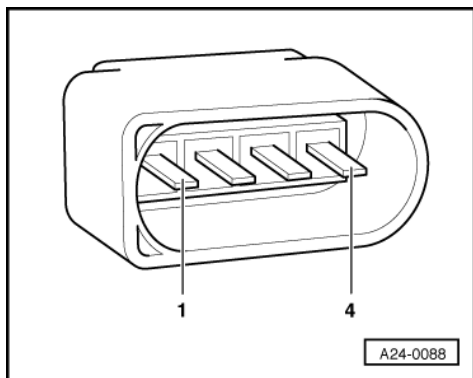
=> Current flow diagrams, Electrical fault finding and Fitting locations

### Test sequence

- -> Unplug 4-pin connector -arrow- for lambda probe.

### Note:

*Re-fit the heat shield sleeve on the connector after completing the test.*



- -> Connect multimeter (resistance measurement range) between contacts 1 and 2.
- Specification: 1 ... 5  $\Omega$  (at room temperature)

### Note:

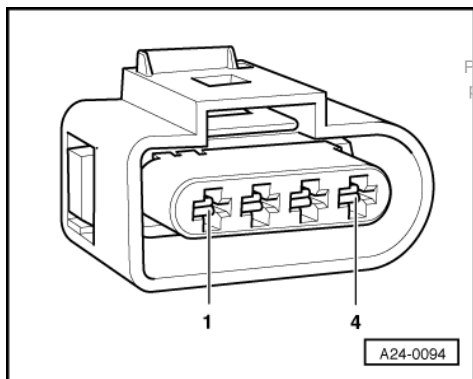
*The resistance will increase sharply at higher temperatures.*

If the specification is not attained:

- Renew the lambda probe.

If the specification is obtained:

### Testing voltage supply for lambda probe heating



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> Connect multimeter (voltage measurement range) between contacts 1 (positive) and 2 (earth).
- Start the engine.
  - Specification: approx. battery voltage (may fluctuate)

**Notes:**

- ◆ At certain points during operation, the engine control unit intervenes by constantly connecting and disconnecting the earth connection for lambda probe heating. For this reason the voltage displayed on the tester may fluctuate.
- ◆ If required, observe Display Group 041 in the "Read measured value block" function to find out when the engine control unit is switching the lambda probe heating on and off.

If no voltage is present:

- Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1 (positive)      | Vehicle earth   |

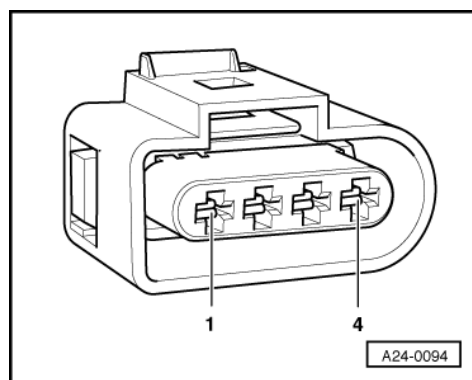
- Operate starter briefly.
  - Specification: approx. battery voltage

If there is still no voltage reading:

- Test for open circuits and short circuits in wiring between fuel pump relay and contact 1 on lambda probe connector (on wiring harness) via fuse.

=> Current flow diagrams, Electrical fault finding and Fitting locations

If the voltage supply is OK:



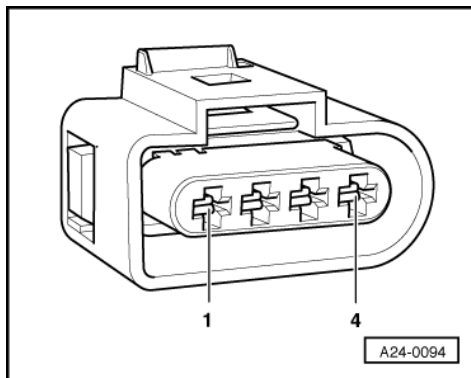
- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact                                     | Measure against  |
|-------------------------------------------------------|------------------|
| 2 (switched earth connection for engine control unit) | Battery positive |

- Start the engine.
  - Specification: approx. battery voltage (may fluctuate)
- Switch off ignition.

If no voltage is present:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 31 .



- -> Test for open circuits in the following wiring connection:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 2                 | 5                             |

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

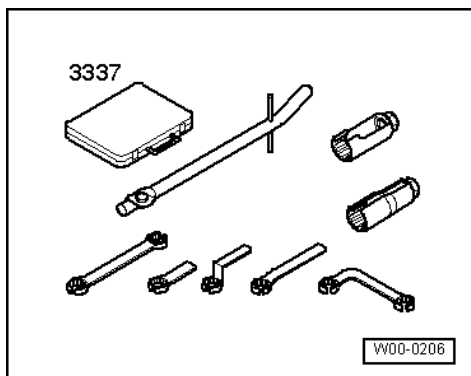
- Rectify any open circuits.

If the wiring connection is O.K. but the lambda probe heating still has no earth connection:

- Fit a new engine control unit => Page 33 .

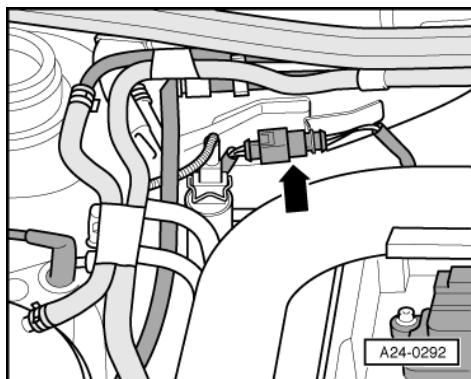
## 2.5 - Removing and installing lambda probe

### Special tools and workshop equipment required



- ♦ Ring spanner set 3337
- ♦ High-temperature paste G 052 112 A3

### Removing



- -> Unplug 4-pin connector -arrow- for lambda probe.
- Unscrew lambda probe using special tool 3337.

### Installing

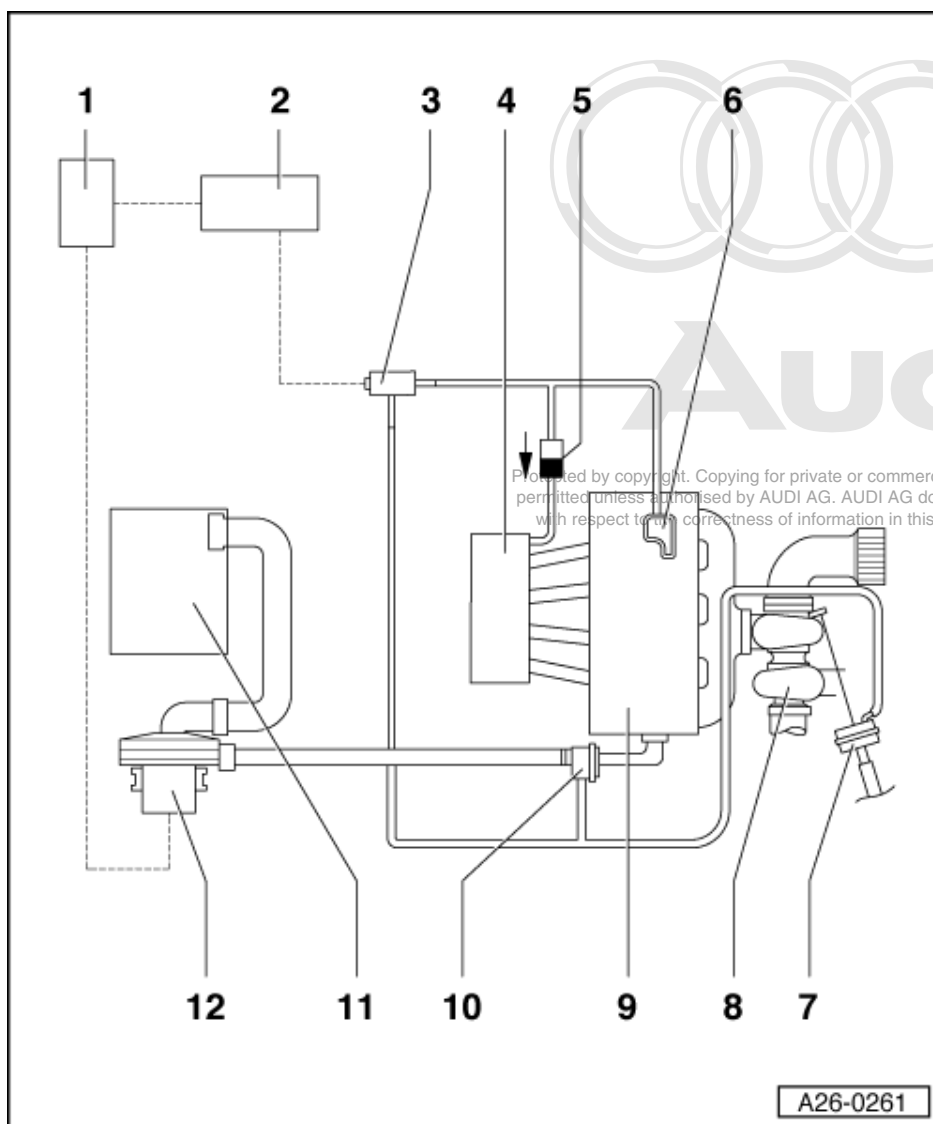
When installing, note the following points:

#### Notes:

- ◆ The screw thread on the lambda probe is coated with a special paste. This paste must not be allowed to penetrate the openings on the probe.
- ◆ Tightening torque: 55 Nm.
- ◆ When installing, always make sure that the lambda probe connector is secured in the retainer on the bulk-head.
- ◆ A heat shield sleeve must be fitted on the connector.

## 3 - Testing secondary air system

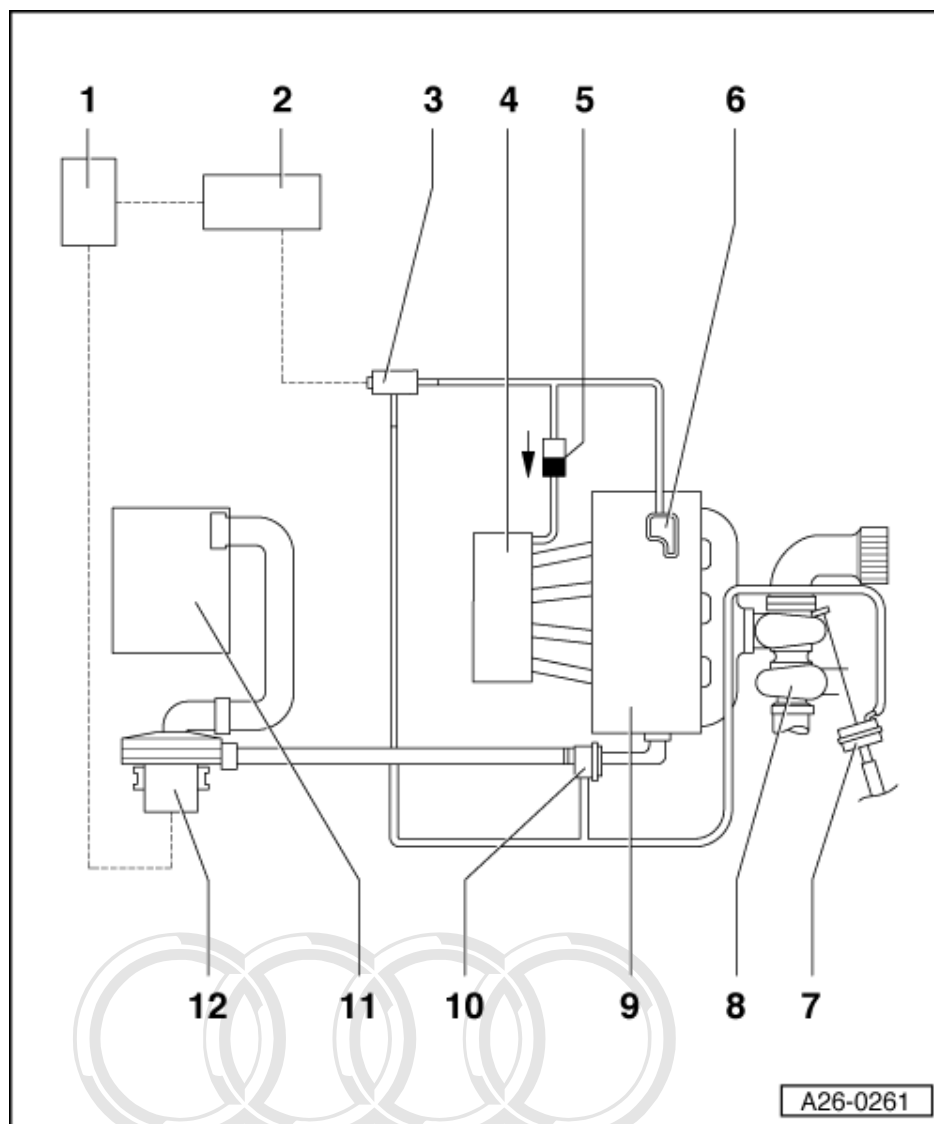
### 3.1 - Testing secondary air system



The secondary air system is designed to enable the catalytic converter to heat up and reach its operating temperature more quickly after a cold start.

### Principle of operation

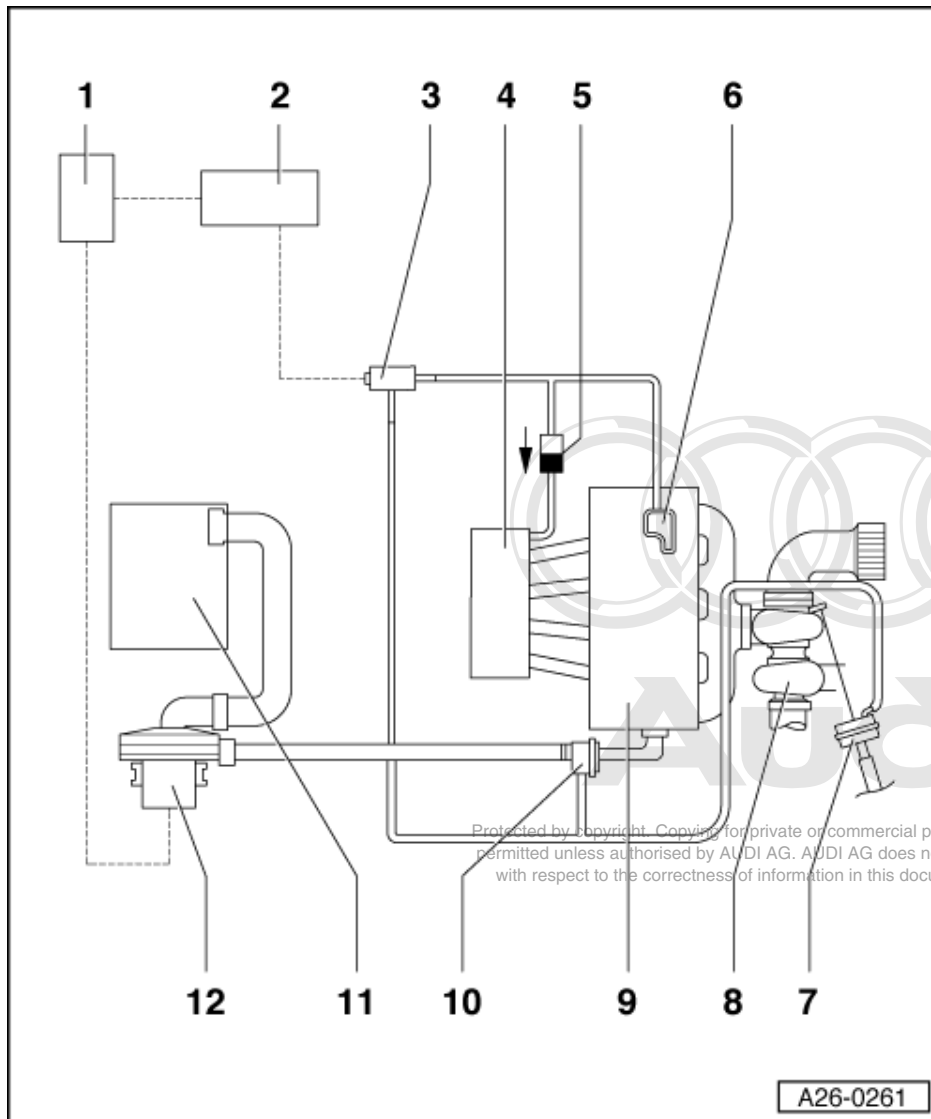
Due to the extra mixture enrichment during the cold-start phase, an increased amount of unburnt hydrocarbons is carried in the exhaust gas. The secondary air system improves the afterburning (oxidation) process in the catalytic converter, and in this way reduces toxic emissions. The heat generated by oxidation accelerates the "light off" of the catalytic converter and significantly improves exhaust gas quality during warm-up.



### Function

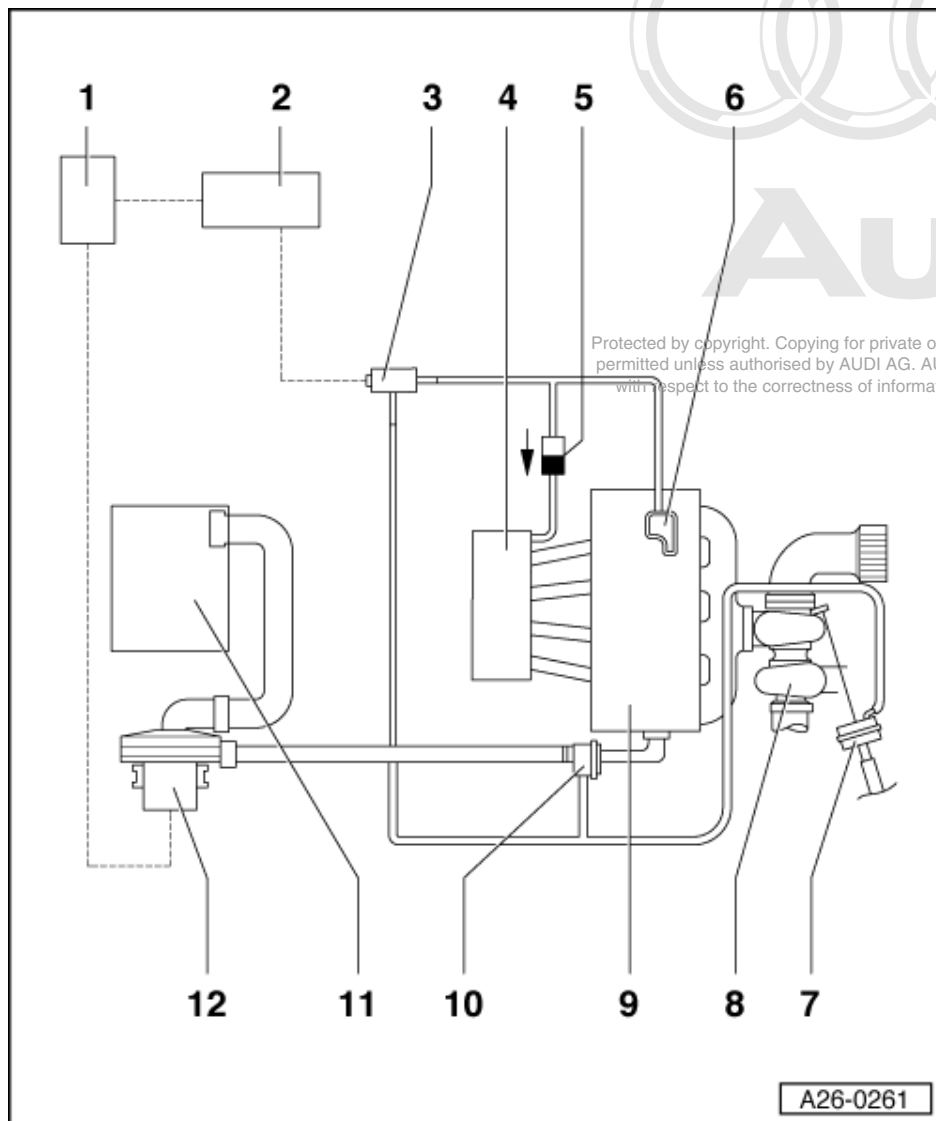
- ◆ After a cold start engine control unit -2- activates secondary air pump -12- via secondary air pump relay -1-, and air is fed to combination valve -10- (mechanical secondary air valve).
- ◆ At the same time, the system activates secondary air inlet valve -3-, which supplies vacuum to combination valve -10- and to pressure unit -7- for charge air control. In this way, the combination valve opens a passage for the secondary air system to supply air to the exhaust ports in the cylinder head.

Permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- ♦ To avoid generating unnecessary heat, the secondary air is channelled past turbocharger -8-. This is achieved by means of the pressure unit for charge air control, which opens the charge air control valve. To perform this function, the pressure unit is designed as a two-way pneumatic unit with an additional vacuum connection on the "pull-in" side.

- 1 Secondary air pump relay -J299
- 2 Engine control unit -J220
- 3 Secondary air inlet valve -N112
- 4 Intake manifold



**5 Non-return valve**

- ♦ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

**6 Vacuum reservoir**

**7 Vacuum unit for charge pressure control**

**8 Turbocharger**

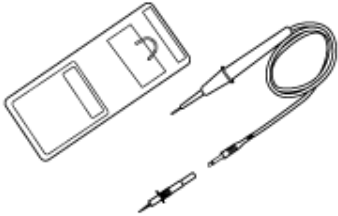
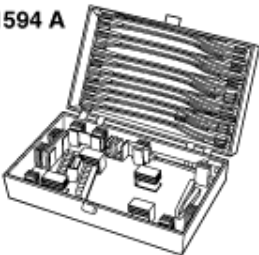
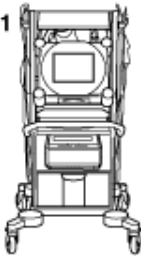
**9 Cylinder head**

**10 Combination valve for secondary air system**

**11 Air cleaner**

**12 Secondary air pump motor -V101**

### 3.2 - Testing secondary air inlet valve -N112

|                                                                                                              |                                                                                                                |
|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <p><b>V.A.G 1526 A</b></p>  | <p><b>V.A.G 1527 B</b></p>   |
| <p><b>V.A.G 1594 A</b></p>  | <p><b>V.A.G 1598/31</b></p>  |
| <p><b>VAS 5051</b></p>    | <p style="text-align: right; border: 1px solid black; padding: 2px;">G24-0023</p>                              |

#### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Fitting location => Fitting locations overview, Page **22**

#### **Test requirement:**

- Final control diagnosis has been performed

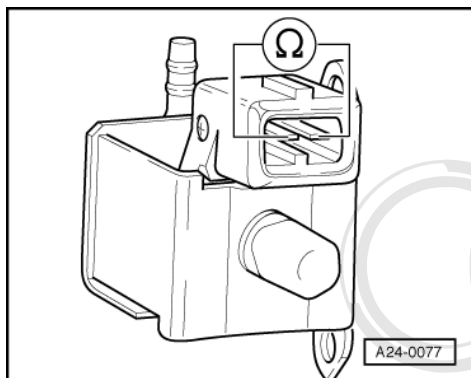
#### **Testing internal resistance**

- Unbolt bracket for secondary air inlet valve from intake manifold.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions in this document. Copyright by AUDI AG.



- Unplug connector from secondary air inlet valve -N112

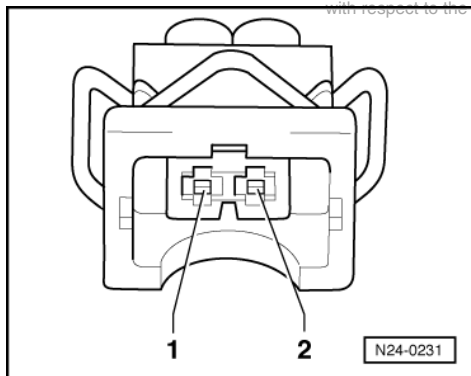


- -> Connect multimeter to valve (resistance measurement range)
- Specification: 25 ... 35  $\omega$
- If the reading does not match the specification, renew secondary air inlet valve -N112.

### Checking voltage supply

- Unplug connector from secondary air inlet valve -N112

Information: This document is not to be used for commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

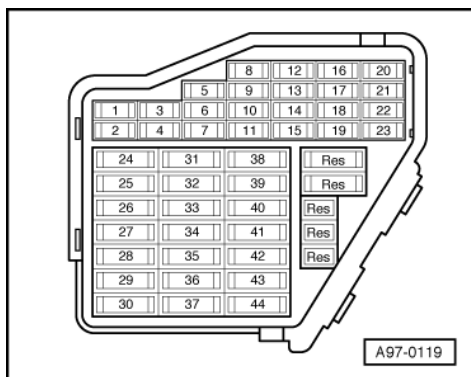


- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Engine earth    |

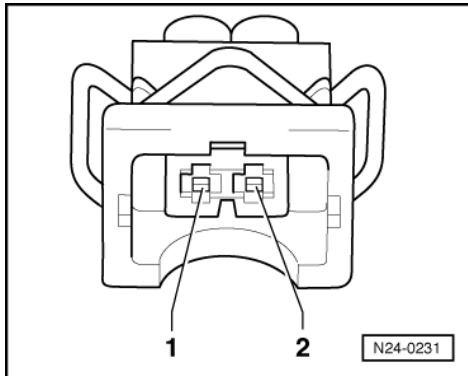
- Operate the starter briefly. (The engine can be allowed to start.)
- The LED should light up.

If the LED does not light up:



- Carry out the following tests (marked with dots):

- -> Check fuse S243 (fuse position 43 in fuse holder).

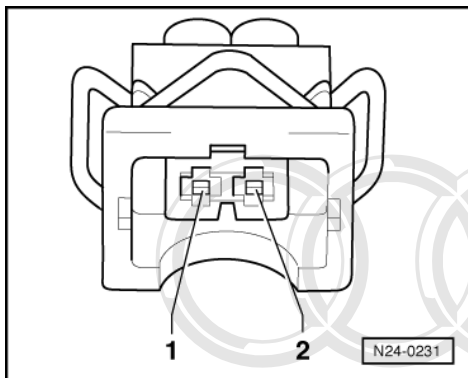


- -> Test for open circuit in wiring from connector contact 1 to fuel pump relay via fuse S243 (fuse position 43 in fuse holder):

=> Current flow diagrams, Electrical fault finding and Fitting locations

- Test fuel pump relay => Page 52 .

### Testing activation



- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against  |
|-------------------|------------------|
| 2                 | Battery positive |

- Start final control diagnosis and select secondary air inlet valve -N112.  
=> Page 13

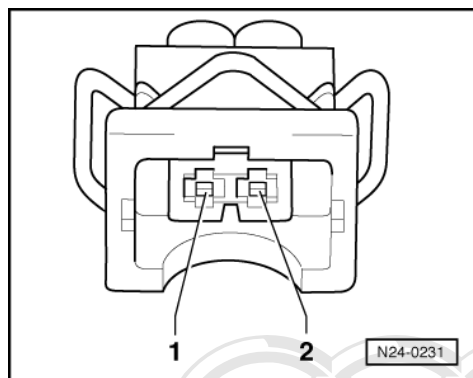
-> Indicated on display:

Final control diagnosis  
Secondary air inlet valve -N112

- The LED should flash.

If the LED lamp does not flash or lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 2                    | 9                                |

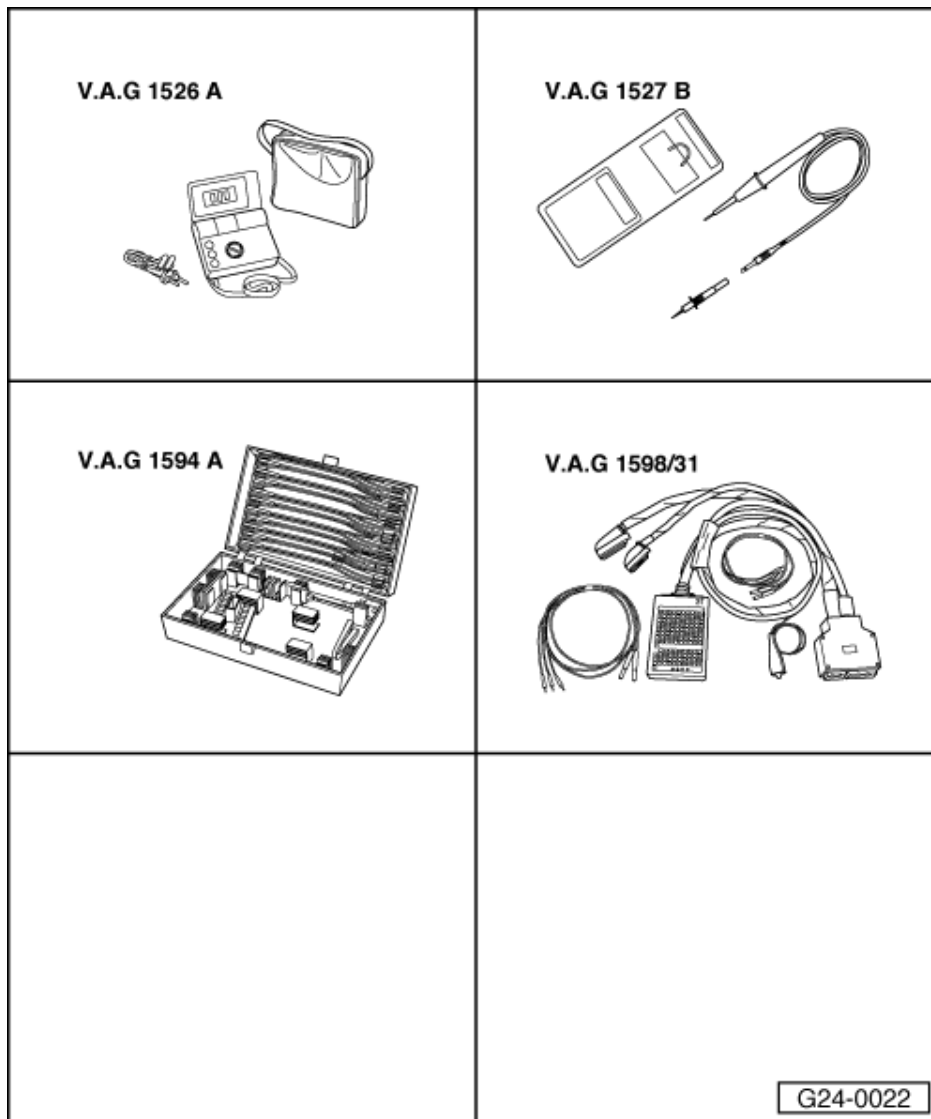
- Rectify any open/short circuit as necessary.

If the wiring is OK:

- Fit a new engine control unit => Page **33** .

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

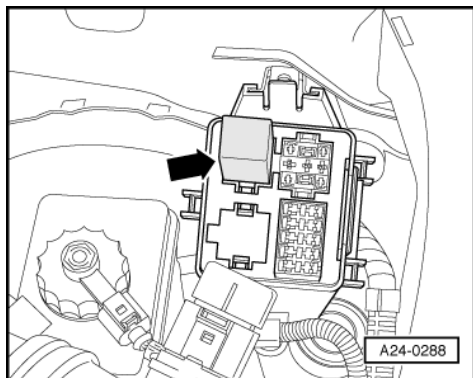
### 3.3 - Testing secondary air pump relay -J299 and activation



#### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
  - ◆ V.A.G 1527 B
  - ◆ V.A.G 1594 A
  - ◆ V.A.G 1598/31
- Start final control diagnosis and select secondary air pump relay -J299  
=> Page **13** .

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- -> Secondary air pump relay -arrow- should pick up and secondary air pump motor-V101 should run. (The relay is located under a cover on the left of the bulkhead).

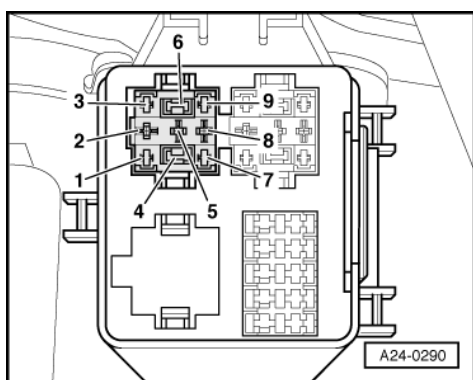
A - If the relay does not pick up:

- Test voltage supply of secondary air pump relay => Page 82 .
- Test activation of secondary air pump relay => Page 84 .

B - If the relay picks up but the secondary air pump motor does not run:

- Test voltage supply of secondary air pump motor => Page 85 .

#### Testing voltage supply of secondary air pump relay



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

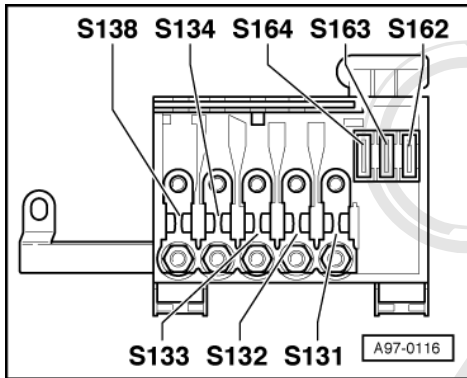
- Disconnect secondary air pump relay.
- -> Connect multimeter (voltage measurement range) as follows:

| Relay carrier below cover on left side of bulkhead<br>Contact | Measure against |
|---------------------------------------------------------------|-----------------|
| 2                                                             | Engine earth    |

- Specification: approx. battery voltage

If the specification is not obtained:

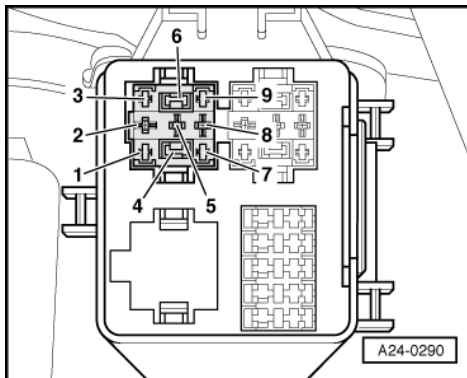
- Carry out the following tests (marked with dots):



- > Check fuse S131 (50 A) in main fuse box on battery.
- Test for open circuit in wiring from battery + (terminal 30) via fuse S131 to secondary air pump relay -J299 (below cover on left side of bulkhead).

Copyright by Audi AG. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

=> Current flow diagrams, Electrical fault finding and Fitting locations



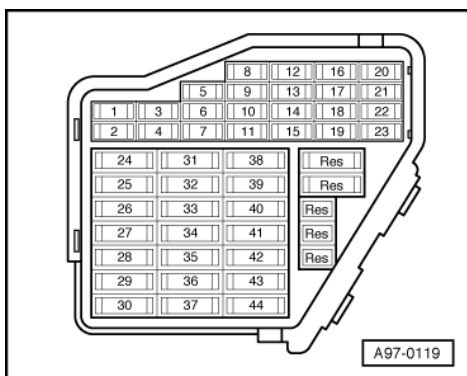
- > Connect multimeter (voltage measurement range) as follows:

| Relay carrier below cover on left side of bulkhead<br>Contact | Measure against |
|---------------------------------------------------------------|-----------------|
| 6                                                             | Engine earth    |

- Operate the starter briefly. (The engine can be allowed to start.)
  - Specification: approx. battery voltage

If the specification is not obtained:

- Carry out the following tests (marked with dots):



- > Check fuse S243 (fuse position 43 in fuse holder).

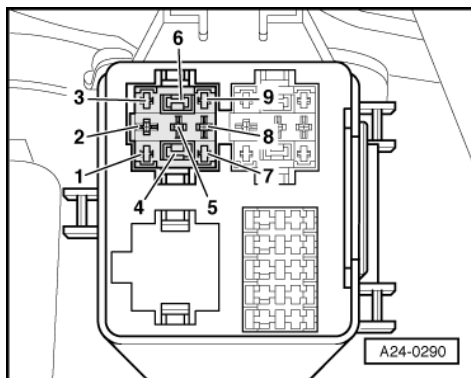


- Test for open circuit in wiring from secondary air pump relay -J299 (below cover on left side of bulkhead) to fuel pump relay via fuse S243 (fuse position 43 in fuse holder):

=> Current flow diagrams, Electrical fault finding and Fitting locations

### Testing activation of secondary air pump relay

- Switch off ignition.
- Disconnect secondary air pump relay.



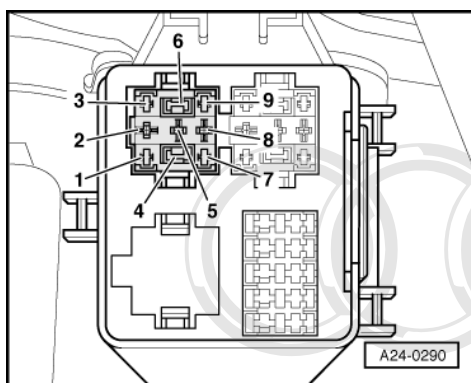
- -> Connect voltage tester V.A.G 1527 B as follows:

| Relay carrier below cover on left side of bulkhead<br>Contact | Measure against  |
|---------------------------------------------------------------|------------------|
| 4                                                             | Battery positive |

- Start final control diagnosis and select secondary air pump relay -J299  
=> Page 13 .
  - The LED should flash.

If the LED does not flash:

- Switch off ignition.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Relay carrier below cover on left side of bulkhead<br>Contact | Test box V.A.G 1598/31<br>Socket |
|---------------------------------------------------------------|----------------------------------|
| 4                                                             | 66                               |

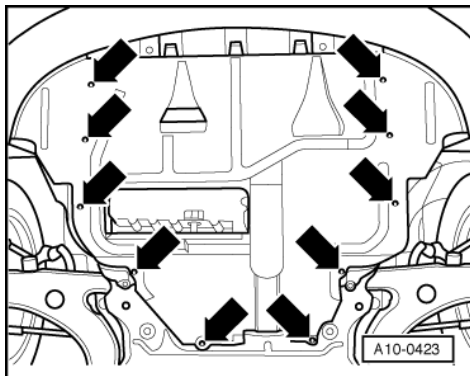
Protected by copyright. Copying for private commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Rectify any open/short circuit as necessary.

If no fault is found:

- Fit a new secondary air pump relay -J299.

#### Testing voltage supply to secondary air pump motor



- -> Remove centre section of noise insulation -arrows-.
- Unplug connector from secondary air pump motor -V101.
- Connect voltage tester V.A.G 1527 B to contacts 1 and 2 of the connector.
- Start final control diagnosis and select secondary air pump relay -J299  
=> Page 13.
- The LED should flash.

If the LED does not flash:

- Carry out the following tests (marked with dots):
- Test for open circuit in wiring from connector on secondary air pump motor -V101 to secondary air pump relay -J299 (in relay carrier below cover on left side of bulkhead):

=> Current flow diagrams, Electrical fault finding and Fitting locations

- Test for open circuit in wiring from connector on secondary air pump motor -V101 to earth point in engine compartment (left side):

=> Current flow diagrams, Electrical fault finding and Fitting locations

If no fault is found:

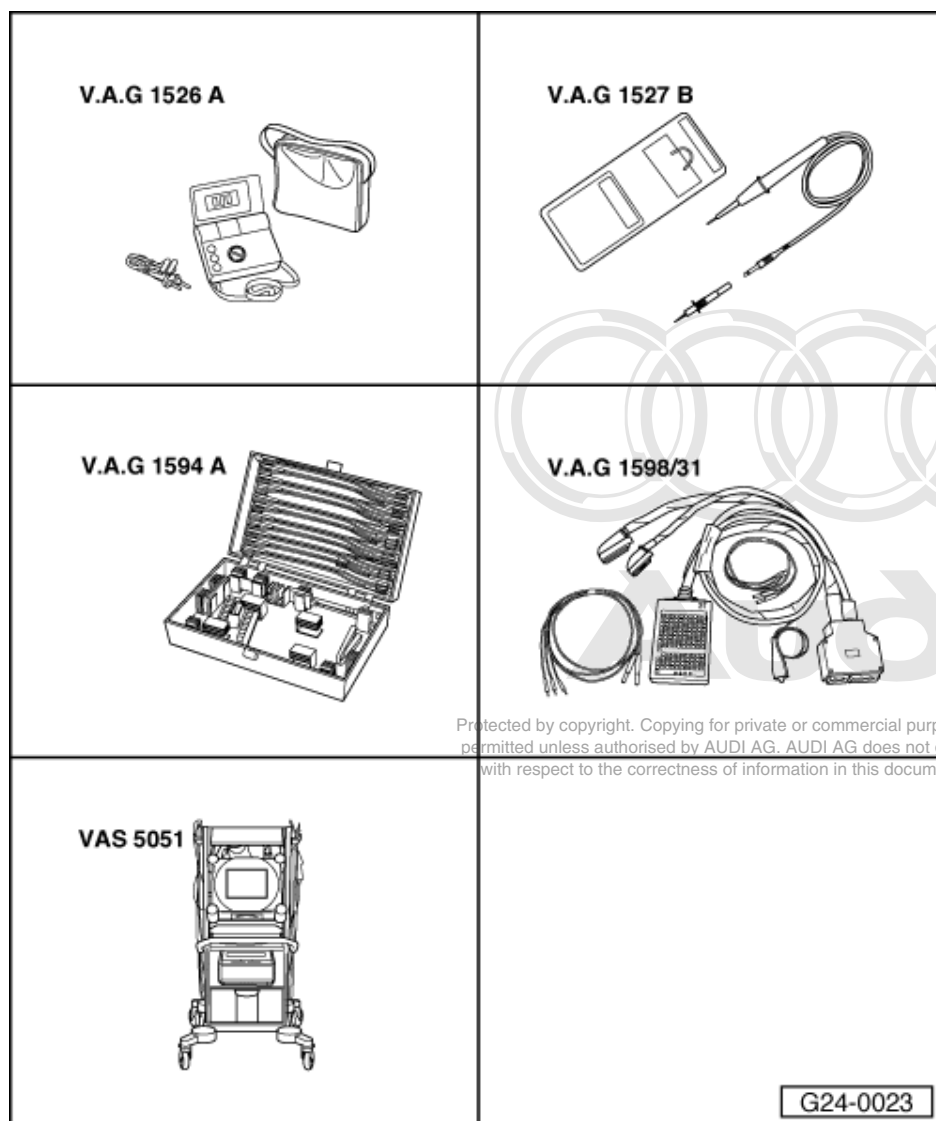
- Renew secondary air pump motor -V101.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 4 - Testing fuel tank breather

### 4.1 - Testing fuel tank breather



### 4.2 - Testing solenoid valve 1 for activated charcoal filter -N80

#### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

**Note:**

*In this context, solenoid valve 1 for activated charcoal filter is also designated as fuel tank breather valve, or ACF valve.*

**Testing for leaks**

ACF solenoid valve -N80 remains closed when it is not receiving any current.

- Disconnect hoses from ACF valve but leave the electrical connector plugged in.
- Connect an auxiliary hose to one of the connections on the ACF valve.
- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1).
- When doing this the ignition must be switched on.
- Start final control diagnosis and select solenoid valve for activated charcoal filter -N80 =>Page 13 .

-> Indicated on display:

Final control diagnosis  
ACF solenoid 1 -N80

The valve should click...

...and should open and close (test by blowing into auxiliary hose).

If valve does not click:

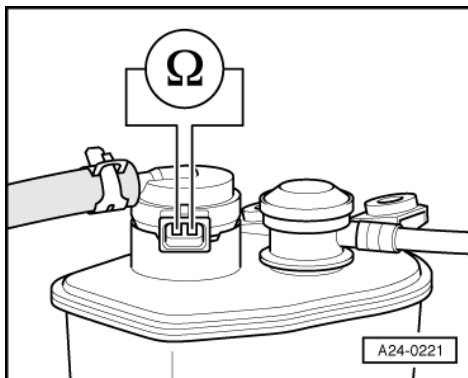
- Test internal resistance of ACF valve.

If the valve does not open and close properly:

- Renew activated charcoal filter system solenoid valve -N80.

**Testing internal resistance**

- Unplug connector on ACF valve.



- -> Connect multimeter to valve (resistance measurement range)
- Specification: 22 ... 30 Ω

If the specification is not attained:

- Renew activated charcoal filter system solenoid valve -N80.

If the specification is attained:

- Test voltage supply => Page 88 .



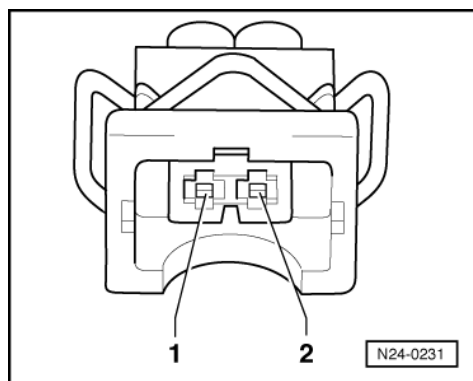
## Testing voltage supply

### **Note:**

The ACF valve receives its voltage supply via the fuel pump relay.

### **Test requirement:**

- Fuse for ACF valve OK
- Unplug connector on ACF valve.



- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Engine earth    |

- Operate starter briefly.
  - The LED should light up.

If the LED does not light up:

- Test for open circuit in wiring from contact 1 to fuel pump relay via fuse.

=> Current flow diagrams, Electrical fault finding and Fitting locations

- Rectify any open circuits.

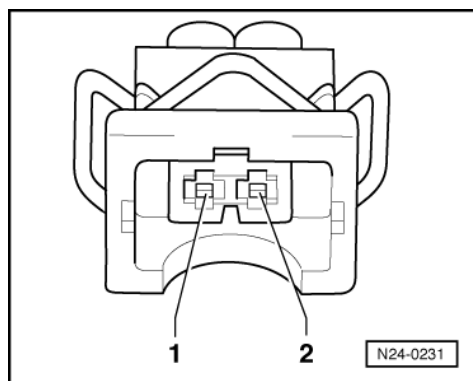
If the wiring is OK:

- Test fuel pump relay => Page 52 .

If the LED lights up:

- Test activation.

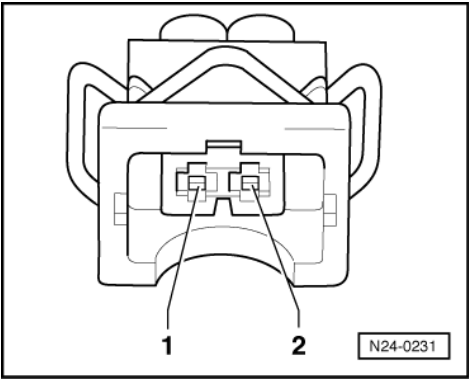
## Checking activation



- -> Connect voltage tester V.A.G 1527 B to contact 1 (positive) and contact 2 of the connector.
- Start final control diagnosis and select solenoid valve for activated charcoal filter -N80 =>Page 13 .
  - The LED should flash.

If the LED lamp does not flash or lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 2                    | 64                               |

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

- Fit a new engine control unit => Page 33 .

## 5 - Testing electronic engine power control (electronic throttle)

### 5.1 - Testing electronic engine power control (electronic throttle)

#### 5.2 - Operation of electronic throttle system

With the electronic throttle the throttle valve is not operated by a cable connected to the accelerator pedal. There is no mechanical link between the accelerator and the throttle valve.

The throttle valve is actuated by a servomotor (throttle valve positioner) in the throttle valve control part over the full range of engine speeds and load conditions.

The throttle valve positioner actuates the throttle valve according to the commands it receives from the engine control unit.

The position of the accelerator pedal is communicated to the engine control unit by two accelerator position senders (variable resistors, both fitted in a single housing). The senders are connected to the accelerator pedal.

The accelerator position (as determined by the driver) is one of the main input values for the engine control unit.

When the ignition is on and the engine is not running, the engine control unit operates the throttle valve positioner in exact accordance with the signals from the accelerator position senders. For example, when the accelerator



is pressed down half way, the throttle valve positioner opens the throttle valve by an equivalent amount, i.e. about half way.

When the engine is running (i.e. under load) the engine control unit can open and close the throttle valve freely (i.e. independently of the signals being sent by the accelerator position sender).

For example, the throttle valve might already be fully open even though the accelerator is only pressed down half way. This has the advantage of preventing throttling losses at the throttle valve.

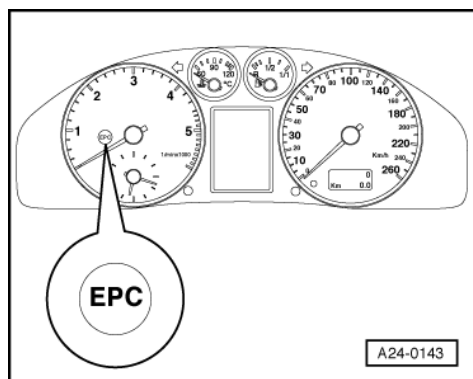
Under certain engine load conditions there is also a significant reduction in harmful emissions and noticeably improved fuel consumption.

The engine control unit can provide the optimum combination of throttle valve opening and charge pressure in order to create the required torque.

The electronic throttle is not simply a combination of two or three components, but rather a complete system comprising all the elements that together determine the position of the throttle valve and also control and monitor it. For example, the accelerator position sender, throttle valve control part, EPC warning lamp, engine control unit etc.

### 5.3 - Notes on EPC warning lamp (fault warning lamp for electronic throttle) in dash panel insert

"EPC" stands for Electronic Power Control and refers to the electronic throttle control system.



-> Fitting location of EPC warning lamp

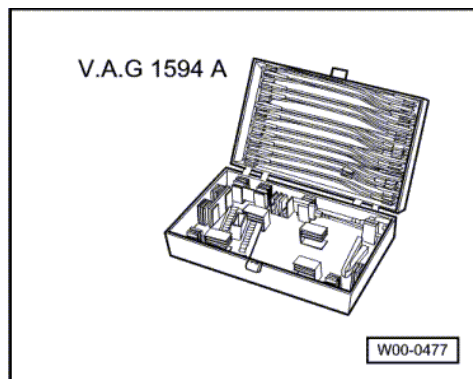
When the ignition is switched on the engine control unit tests all the components whose functions relate to the electronic throttle system.

During the test sequence the engine control unit activates the EPC warning lamp for about 1 second. If a fault is detected during this test phase the warning lamp will remain lit.

If a fault is detected in the electronic throttle system while the engine is running, the engine control unit will activate the EPC warning lamp (see Fault Table for list of possible faults). At the same time a fault code is stored in the fault memory of the engine control unit.

### 5.4 - Testing electronic throttle warning lamp -K132

**Note:**

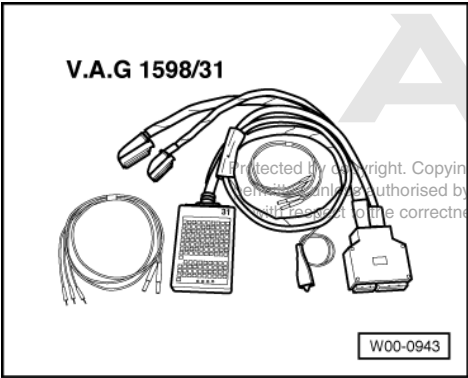


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Electronic throttle warning lamp -K132 is also known as the EPC warning lamp (EPC = electronic power control).

**Special tools and workshop equipment required**

- ♦ V.A.G 1594 A



- ♦ V.A.G 1598/31

**Testing operation of warning lamp**

- Switch on ignition.
  - If the fault memory has not registered any faults relating to the electronic throttle, the EPC warning lamp should light up for about 3 seconds.

**A - Electronic throttle warning lamp -K132**

**does not light up**

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .
- Bridge contacts 1 and 48 on the test box.
- Switch on ignition.
  - The warning lamp should light up.

If the warning lamp does not light up:

- Switch off ignition.
- Remove dash panel insert, then test bulb and voltage supply.

=> Electrical system; Repair group 90; Dash panel insert; Removing and installing dash panel insert Dash panel insert Removing and installing dash panel insert

If no fault is found:

- Test for open circuit and short to positive in the following wiring connection:

| Test box<br>V.A.G 1598/31<br>Socket | Dash panel insert<br>Contact                                                                |
|-------------------------------------|---------------------------------------------------------------------------------------------|
| 48                                  | => Current flow diagrams,<br>=> Electrical fault-finding<br>=> and Fitting locations binder |

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:



- Fit a new engine control unit => Page **33** .

## **B - Electronic throttle warning lamp -K132**

**lights up continuously**

- Interrogate fault memory of engine control unit.

If no faults are stored:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page **31** .
- Test for short to earth in the following wiring connection:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

| <b>Test box<br/>V.A.G 1598/31<br/>Socket</b> | <b>Dash panel insert<br/>Contact</b>                                                        |
|----------------------------------------------|---------------------------------------------------------------------------------------------|
| 48                                           | => Current flow diagrams,<br>=> Electrical fault-finding<br>=> and Fitting locations binder |

- Rectify any short circuits.

If the wiring is OK:

- Fit a new engine control unit => Page **33** .

## **5.5 - Testing throttle valve control part -J338**

The housing for the throttle valve control part contains the following components:

- ♦ Throttle valve drive -G186.  
(This is an electric motor that is operated by the engine control unit. The motor has to overcome spring pressure in order to open the throttle valve.)
- ♦ Angle sender 1 for throttle valve drive -G187
- ♦ Angle sender 2 for throttle valve drive -G188

### **Notes:**

- ♦ The housing for the throttle valve control part must not be opened.
- ♦ The angle senders are potentiometers with variable resistance. They inform the engine control unit of the position of the throttle valve and are completely independent of each other.
- ♦ It is not possible to adjust the potentiometers mechanically. Adjustments can be made using vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 (in basic setting mode, function 04).

## **5.6 - Performing adaption of throttle valve control part**

The adaption process enables the engine control unit to learn the different positions of the throttle valve with the ignition switched on and the engine not running. These positions are stored in the control unit. The feedback signal indicating the position of the throttle valve comes from the two angle senders for throttle valve drive.

If the throttle valve control part -J338 or the engine control unit is removed and refitted or replaced, or if the power supply to the engine control unit is interrupted, the adaption process must be performed.

The learning process (adaption process) is carried out:

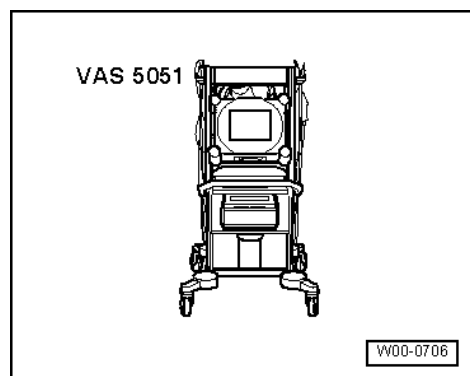
- ♦ Automatically - if the ignition is switched on for at least 10 seconds without operating the starter or depressing the accelerator, and if the engine control unit registers a "learning requirement". (In this case, however, there is no way of knowing whether the adaption process was successful or not.) The engine control unit will register a learning requirement if the previously stored voltage readings from the angle senders do not correspond (within a certain tolerance range) to the new voltage readings.
- ♦ By selecting "Basic setting" (function 04), Display Group 060 with the ignition switched on.

**Note:**

*The engine will not start while the automatic adaption process is being performed.*

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the express written permission of AUDI AG. AUDI AG does not assume any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

**Special tools and workshop equipment required**



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

**Requirements:**

- No faults stored in fault memory.  
Interrogating fault memory => Page 4 .
- Engine not running; ignition switched on.
- Accelerator not depressed.
- Coolant temperature 10 ... 95 °C.
- Intake air temperature 10 ... 90 °C.
- Voltage supply to engine control unit more than 11 V.  
Testing=>Page 137 .

**Work sequence**

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)  
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Basic setting      Q  
Enter display group number XXX



- Enter "060" for Display Group 060 and confirm entry with Q key.

When the Q key is pressed the current supply to the throttle valve positioner will be disconnected.

In this condition the throttle valve is pulled into an "emergency running" or default position by a spring in the throttle valve control part. The values supplied by the two angle senders for this position are stored in the engine control unit.

The throttle valve is then opened by a predetermined amount. As soon as it reaches this position the current supply to the throttle valve positioner is again disconnected. The spring should then close the throttle valve mechanically to the previously learned default position within a specified period of time (spring test).

The throttle valve positioner then closes the throttle valve and the values supplied by the angle senders in the throttle valve control part are stored in the engine control unit.

If the engine control unit disconnects the current supply to the throttle valve positioner while the vehicle is being driven, the result will be an increase in idling speed with fluctuating engine rpm (hunting) and very slow throttle response.

-> Indicated on display:

System in basic setting 60  
1 2 3 4

- Check display values for throttle valve control part (display zones 3 and 4).

| Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. Audi AG does not warrant or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG. |                                       |                                       |                                                                                                                       |                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                 | 1                                     | 2                                     | 3                                                                                                                     | 4                                                            |
| <b>Display zones</b>                                                                                                                                                                                                                                                            |                                       |                                       |                                                                                                                       |                                                              |
| <b>Display Group 060: Adaption of throttle valve control part</b>                                                                                                                                                                                                               |                                       |                                       |                                                                                                                       |                                                              |
| <b>Display</b>                                                                                                                                                                                                                                                                  | xx %                                  | xx %                                  | ---                                                                                                                   | ---                                                          |
| <b>Indicates</b>                                                                                                                                                                                                                                                                | Throttle valve angle (angle sender 1) | Throttle valve angle (angle sender 2) | <b>Learning stage counter</b>                                                                                         | <b>Adaption status</b>                                       |
| <b>Range</b>                                                                                                                                                                                                                                                                    | 0 ... 100 %                           | 0 ... 100 %                           | 0 to 8                                                                                                                | ADP. runs<br>ADP. O.K.<br>ADP. ERROR                         |
| <b>Specification</b>                                                                                                                                                                                                                                                            | 12...88 % 1)                          | 87...11 % 1)                          | 8                                                                                                                     | ADP O.K.                                                     |
| <b>Note</b>                                                                                                                                                                                                                                                                     |                                       |                                       | During the adaption process the learning stage counter should count from 0 to 8. (Some of the figures may be skipped) | If readout does not match specification, see note => Page 94 |

1) Tolerance:±2%

**Note:**

The abbreviation "ADP" in display zone 4 stands for "Adaption".

**Note:**

If the adaption process is interrupted by the control unit, the cause could be one of the following:

- ♦ The throttle valve is unable to close completely (e.g. because of dirt).
- ♦ Battery voltage too low.
- ♦ Throttle valve control part or wiring is defective.
- ♦ The engine was started or the accelerator depressed during the adaption process.
- ♦ Distortion of throttle valve housing (check bolts).

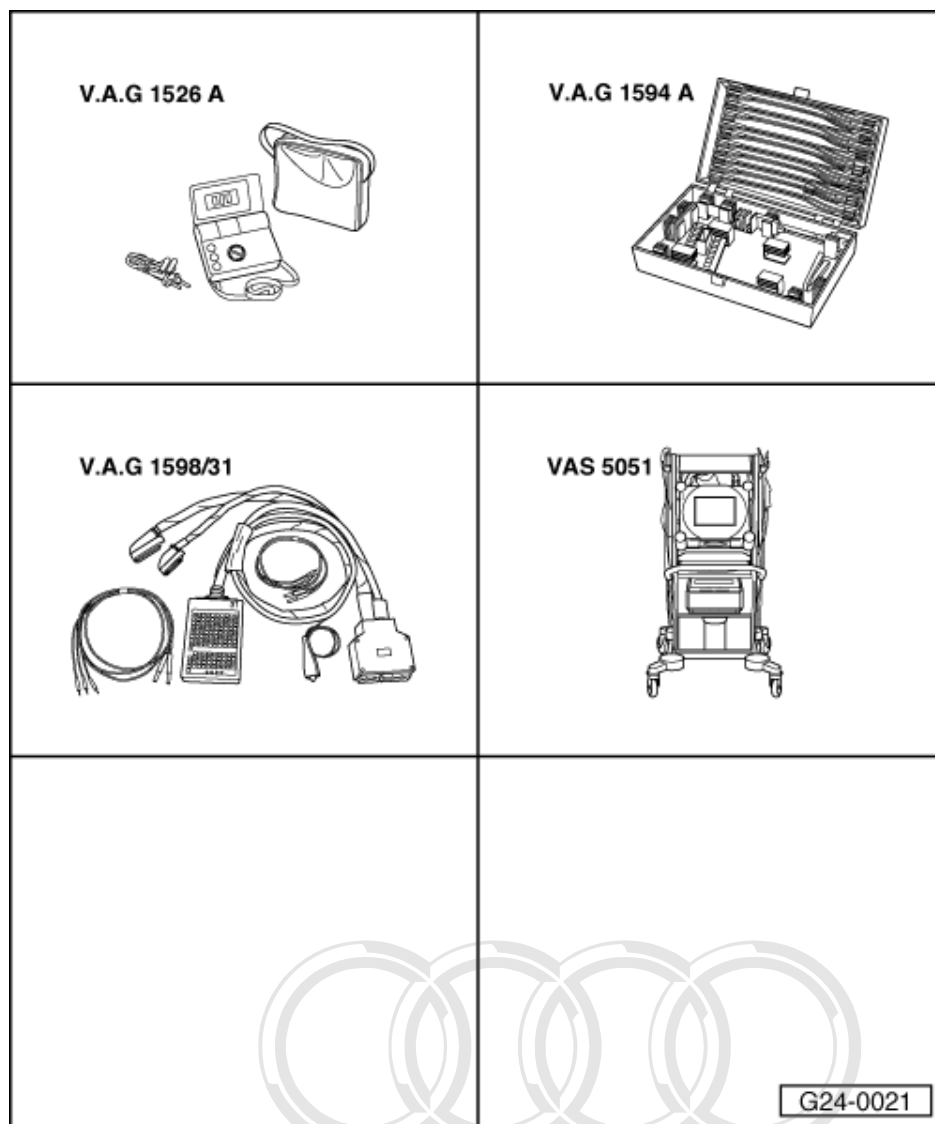
*When the adaption process is interrupted the message "Function is unknown or cannot be carried out at the moment" will appear on the fault reader display. The adaption process will start again automatically the next time the ignition is switched on (for several seconds).*

- End the engine basic setting by pressing the⇒ key.

-> Indicated on display (function selection):

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

## 5.7 - Testing angle senders for throttle valve drive



### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

or

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- ♦ V.A.G 1551 with V.A.G 1551/3 A

The angle senders for throttle valve drive (-G187 and -G188) inform the engine control unit of the position of the throttle valve. Both angle senders are located in the throttle valve control part.

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)

When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block      Q  
Enter display group number XXX

- Enter "062" for Display Group 062 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 62  
1      2      3      4

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Check display values for electronic throttle potentiometer voltages.

|                                                               | Display zones                            |                                          |                                |                                  |
|---------------------------------------------------------------|------------------------------------------|------------------------------------------|--------------------------------|----------------------------------|
|                                                               | 1                                        | 2                                        | 3                              | 4                                |
| Display Group 062: Electronic throttle potentiometer voltages |                                          |                                          |                                |                                  |
| Display                                                       | xx %                                     | xx %                                     | xx %                           | xx %                             |
| Indicates                                                     | Throttle valve angle<br>(angle sender 1) | Throttle valve angle<br>(angle sender 2) | Accelerator position<br>sender | Accelerator position<br>sender 2 |
| Range                                                         | 0 ... 100 %                              | 0 ... 100 %                              | 0 ... 100 %                    | 0 ... 100 %                      |
| Specification                                                 | 3...93 %                                 | 97...3 %                                 | 12...97 %                      | 4...49 %                         |

### Note:

The engine control unit converts the voltage readings from the angle senders into percentages of 5 V and displays them as percentages. (A supply voltage of 5 V is equivalent to 100%.)

- Observe display zones 1 and 2.
- Slowly depress accelerator to full throttle position.

The percentage value in display zone 1 should rise steadily between 3 and 93 % but without covering the full range of values.

The percentage value in display zone 2 should fall steadily between 97 and 3 % but without covering the full range of values.

### Notes:

- ♦ The reason why the value in display zone 1 rises and the value in display zone 2 falls is because the potentiometers (angle senders) in the throttle valve control part work in opposite directions.
- ♦ The percentage value for the first potentiometer increases as the voltage rises towards 5 V because the voltage at this potentiometer increases as the throttle valve opens.

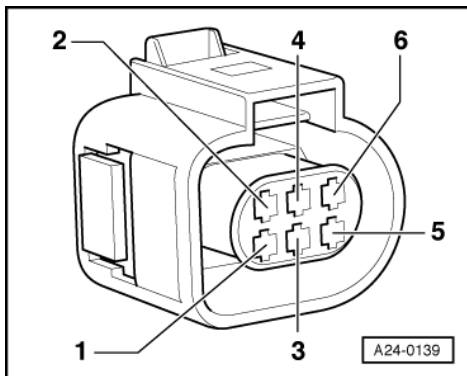
- ♦ The percentage value for the second potentiometer decreases as the voltage drops away from 5 V and towards 0 V because the voltage at this potentiometer decreases as the throttle valve opens.

If the display values do not appear as described:

- Test voltage supply and wiring to throttle valve control part =>Page 97 . Pay particular attention to the connectors, which may have corroded or become detached.
- Test accelerator position senders  
=>Page 98 .

#### Testing voltage supply to throttle valve control part

- Unplug connector from throttle valve control part.
- Switch ignition on.



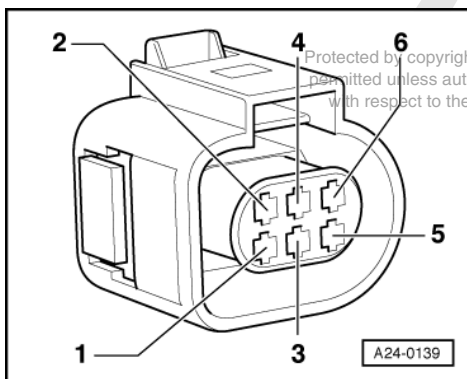
- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Specification |
|-------------------|---------------|
| 2 + earth         | approx. 5 V   |
| 2 + 6             | approx. 5 V   |

If the specifications are not obtained:

- Test wiring between engine control unit and throttle valve control part => Page 97 .

#### Testing wiring



- -> Unplug connector from throttle valve control part.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .
- Test for open circuit and short to earth or positive in the following wiring connections:



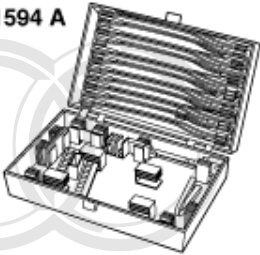
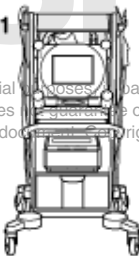
| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 1                    | 92                               |
| 2                    | 83                               |
| 3                    | 117                              |
| 4                    | 84                               |
| 5                    | 118                              |
| 6                    | 91                               |

- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Fit a new throttle valve control part.

## 5.8 - Testing accelerator position senders

|                                                                                                             |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br>   | <b>V.A.G 1594 A</b><br> |
| <b>V.A.G 1598/31</b><br> | <b>VAS 5051</b><br>    |
|                                                                                                             | <div>G24-0021</div>                                                                                       |

**Special tools and workshop equipment required**

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Accelerator position senders -G79 and -G185 are located on the accelerator pedal. Both senders inform the engine control unit of the driver's throttle requirement (pedal position), but each functions completely independently of the other (redundancy principle). Both senders are located in a single housing.

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)
- When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block      Q  
Enter display group number XXX

- Enter "062" for Display Group 062 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 62  
1      2      3      4

- Check display values for electronic throttle potentiometer voltages

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the prior written consent of AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

|                                                                      | Display zones                            |                                          |                                |                                  |
|----------------------------------------------------------------------|------------------------------------------|------------------------------------------|--------------------------------|----------------------------------|
|                                                                      | 1                                        | 2                                        | 3                              | 4                                |
| <b>Display Group 062: Electronic throttle potentiometer voltages</b> |                                          |                                          |                                |                                  |
| <b>Display</b>                                                       | xx %                                     | xx %                                     | xx %                           | xx %                             |
| <b>Indicates</b>                                                     | Throttle valve angle<br>(angle sender 1) | Throttle valve angle<br>(angle sender 2) | Accelerator position<br>sender | Accelerator position<br>sender 2 |
| <b>Range</b>                                                         | 0 ... 100 %                              | 0 ... 100 %                              | 0 ... 100 %                    | 0 ... 100 %                      |
| <b>Specification</b>                                                 | 3...93 %                                 | 97...3 %                                 | 12...97 %                      | 4...49 %                         |

### Note:

*The engine control unit converts the voltage readings from the angle senders into percentages of 5 V and displays them as percentages. (A supply voltage of 5 V is equivalent to 100%).*

- Observe display zones 3 and 4.
- Slowly depress accelerator to full throttle position.

The percentage value in display zone 3 should rise steadily between 12 and 97 % but without covering the full range of values.

The percentage value in display zone 4 should also rise steadily but without covering the full range of values (in this case 4...49 %).



**Note:**

The value shown in display zone 3 should always be about twice as high as the value shown in display zone 4.

If the display values do not appear as described:

- Test voltage supply and wiring to accelerator position senders  
=>Page 100 .
- Adjust accelerator position senders (right-hand drive vehicles only).

=> Fuel supply system, Petrol engines; Repair group 20; Servicing accelerator linkage - Vehicles with electronic throttle; Right-hand drive vehicles Servicing accelerator linkage - Vehicles with electronic throttle Right-hand drive vehicles

**Testing voltage supply to accelerator position senders**

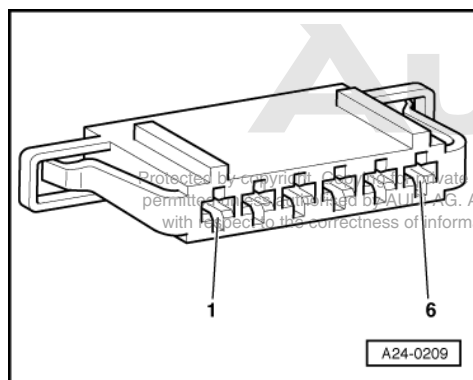
- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment

- Unplug connector for accelerator position sender.

**Left-hand drive vehicles**

- Switch ignition on.

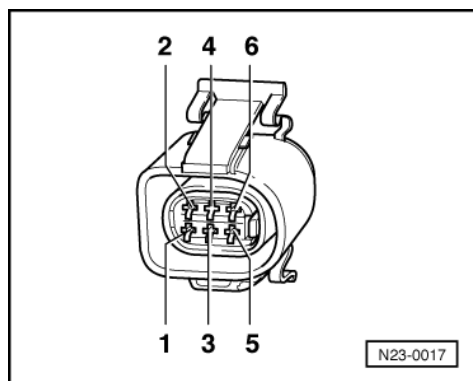


- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Specification |
|-------------------|---------------|
| 1 + earth         | approx. 5 V   |
| 1 + 5             | approx. 5 V   |
| 2 + earth         | approx. 5 V   |
| 2 + 3             | approx. 5 V   |

**Right-hand drive vehicles**

- Switch ignition on.



- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Specification |
|-------------------|---------------|
| 2 + earth         | approx. 5 V   |
| 2 + 3             | approx. 5 V   |
| 5 + earth         | approx. 5 V   |
| 5 + 4             | approx. 5 V   |

#### All models

If the specifications are obtained:

- Test the signal wires.

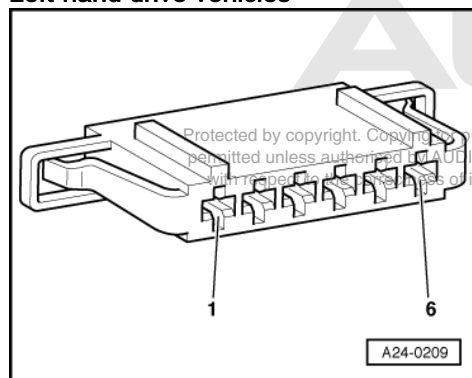
If the specifications are not obtained:

- Test wiring between engine control unit and accelerator position senders.

#### Testing wiring

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .

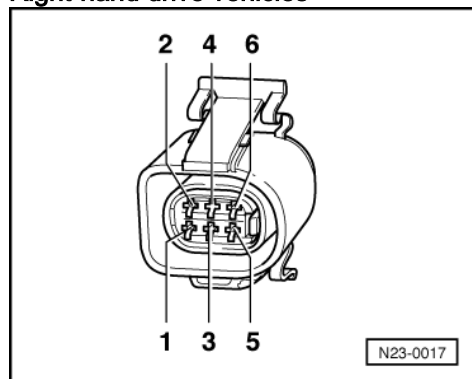
#### Left-hand drive vehicles



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 1                 | 72                            |
| 2                 | 73                            |
| 3                 | 36                            |
| 4                 | 35                            |
| 5                 | 33                            |
| 6                 | 34                            |

#### Right-hand drive vehicles





- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 1                    | 35                               |
| 2                    | 73                               |
| 3                    | 36                               |
| 4                    | 33                               |
| 5                    | 72                               |
| 6                    | 34                               |

#### All models

- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Renew accelerator position senders.

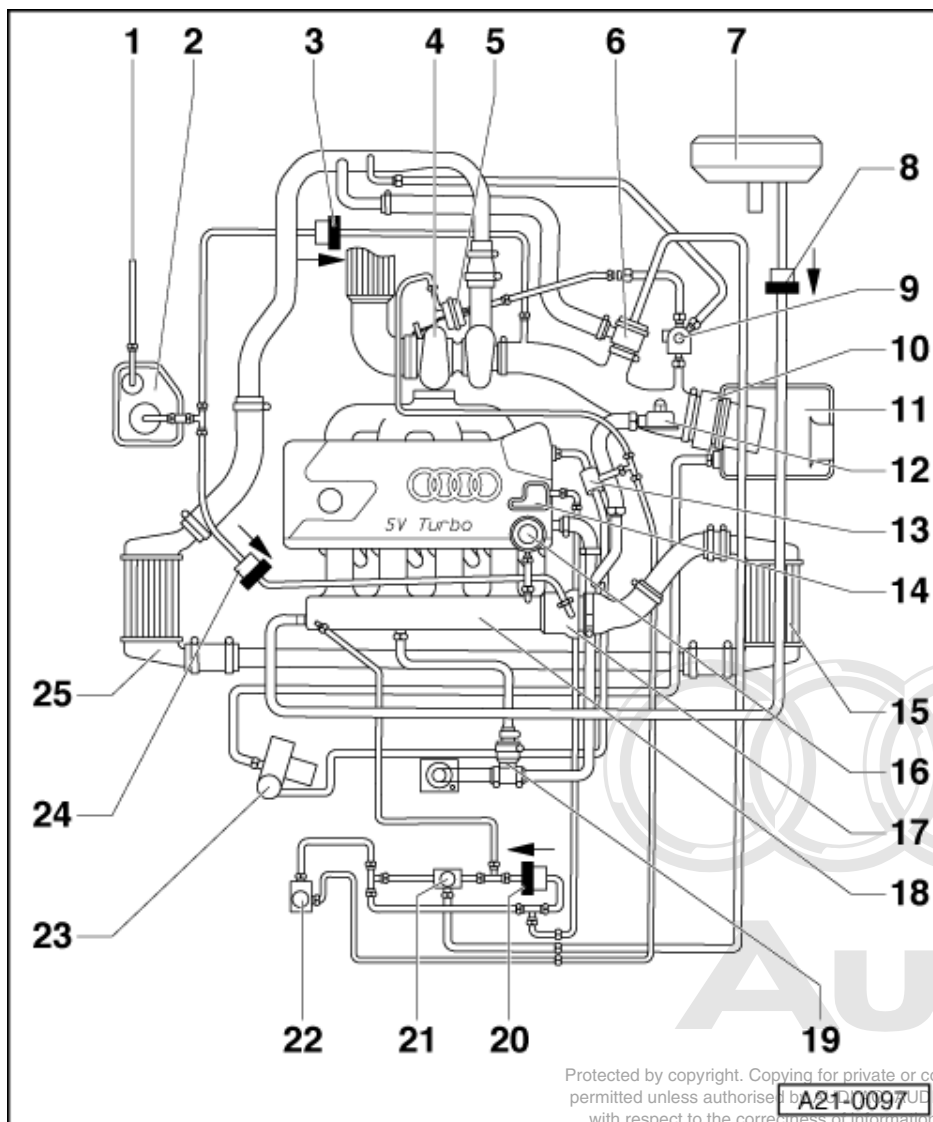
=> Fuel supply system, Petrol engines; Repair group 20; Servicing accelerator linkage - Vehicles with electronic throttle; Right-hand drive vehicles Servicing accelerator linkage - Vehicles with electronic throttle Right-hand drive vehicles



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

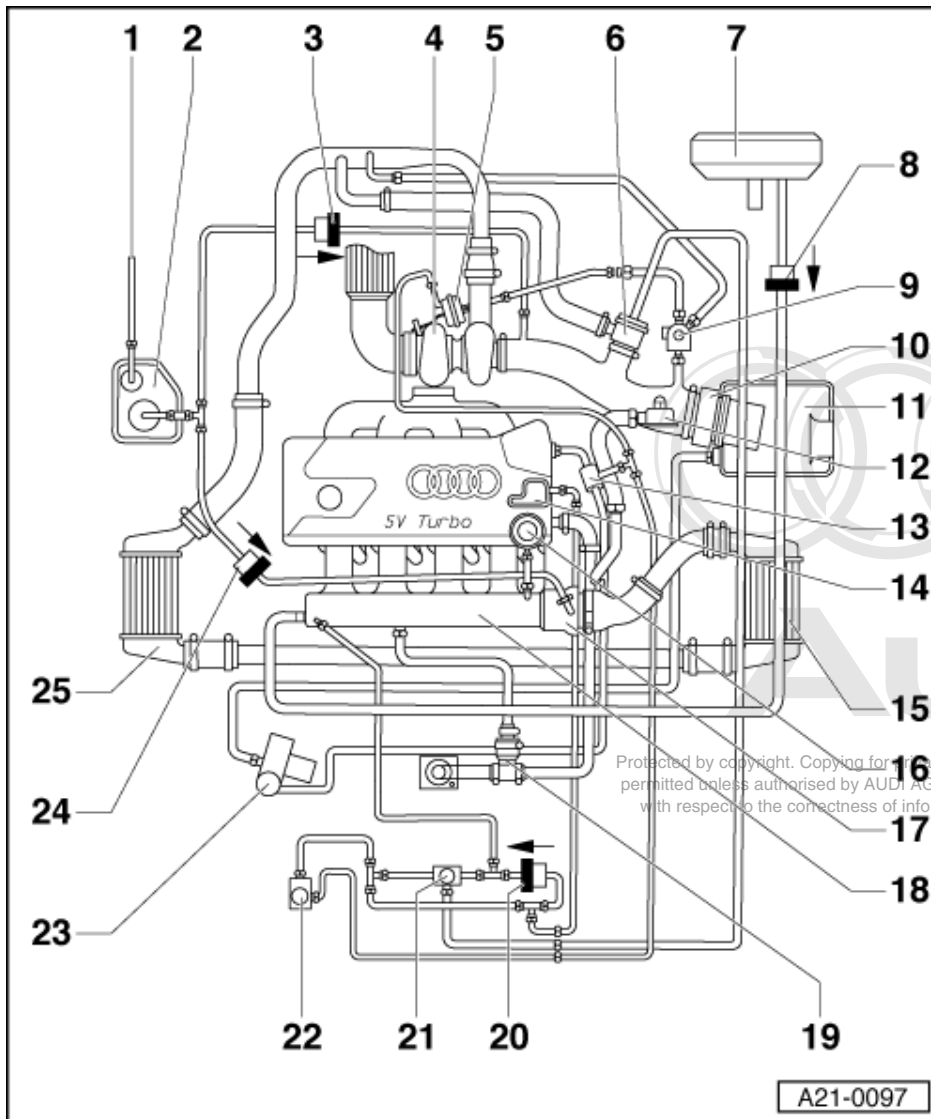
## 6 - Vacuum system layout

### 6.1 - Vacuum system layout



#### Schematic diagram

- 1 From fuel tank
- 2 Activated charcoal filter
  - ♦ With ACF solenoid valve 1 -N80
- 3 Non-return valve for ACF
  - ♦ Between activated charcoal filter and intake pipe upstream of turbocharger
  - ♦ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow
- 4 Turbocharger
- 5 Vacuum/pressure unit for charge pressure control



**6 Mechanical air recirculation valve**

**7 Brake servo**

**8 Non-return valve**

♦ Between brake servo and intake manifold

♦ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

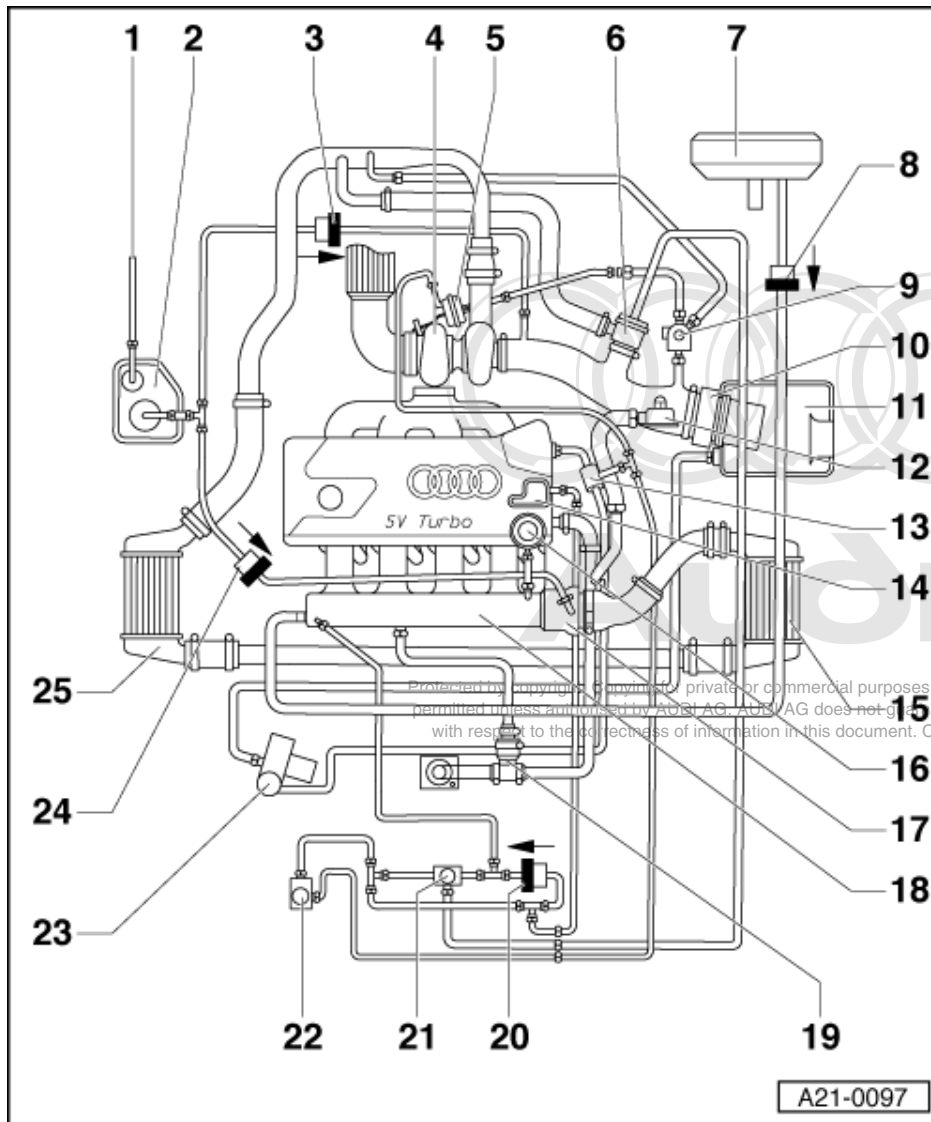
**9 Solenoid valve for charge pressure control -N75**

**10 Air mass meter -G70**

**11 Air cleaner**

**12 Crankcase breather pressure regulating valve**

**13 Combination valve for secondary air system**



**14 Vacuum reservoir**

- ♦ Bolted to cylinder head cover

**15 Charge air cooler**

- ♦ With charge pressure sender -G31

**16 Fuel pressure regulator**

**17 Throttle valve control part -J338**

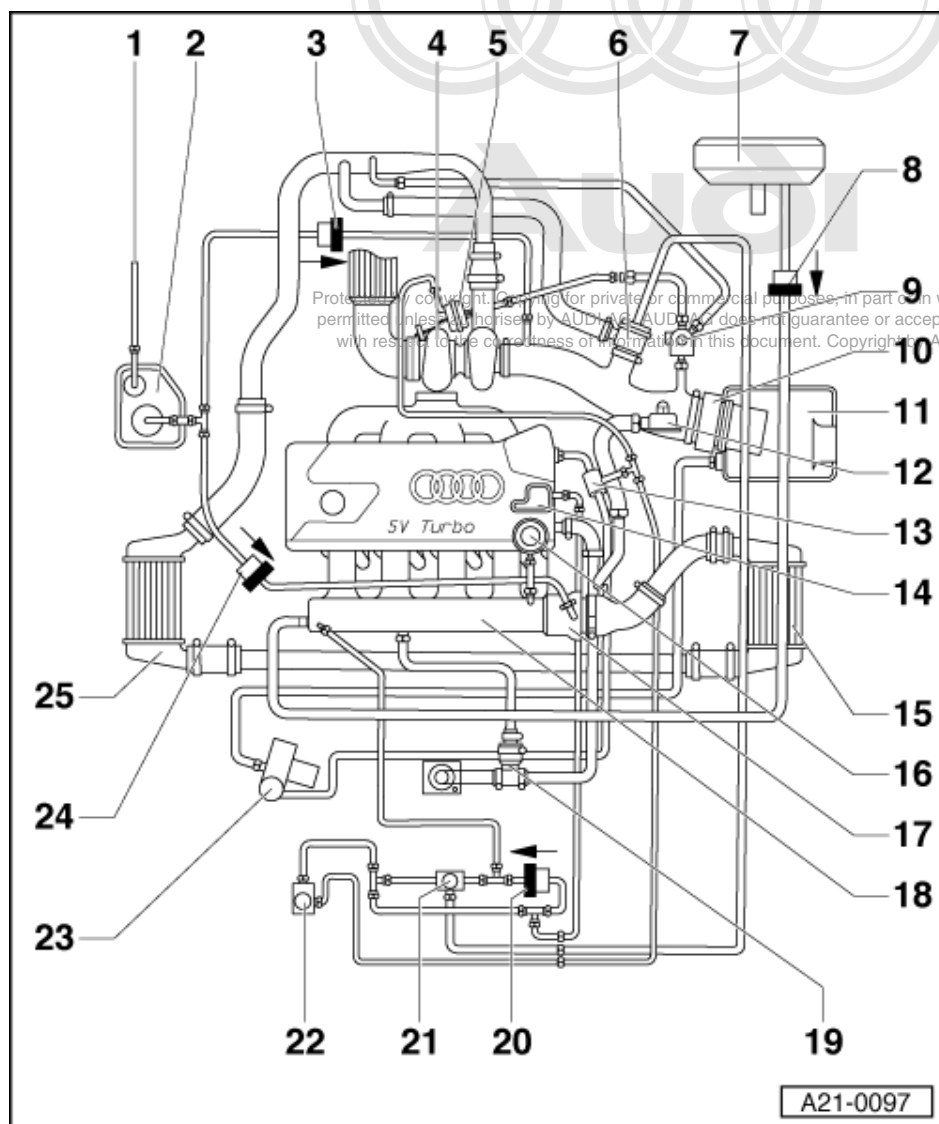
**18 Intake manifold**

- ♦ With intake air temperature sender -G42

**19 Crankcase breather**

**20 Non-return valve**

- ♦ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow


**21 Air recirculation valve for turbocharger -N249**

- ◆ Fitting location  
=> Fig. 107

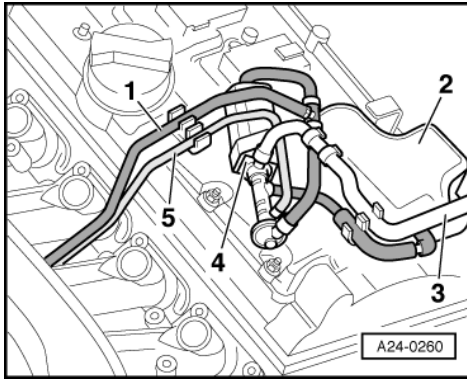
**22 Secondary air inlet valve -N112**

- ◆ Fitting location: below bracket on intake manifold

**23 Secondary air pump motor -V101**
**24 Non-return valve**

- ◆ Between activated charcoal filter and intake manifold
- ◆ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

**25 Charge air cooler**



-> Fig.1 Fitting location of air recirculation valve for turbocharger -N249

- ◆ Fitting location: on cylinder head cover

- 1 - To secondary air inlet valve -N112
- 2 - Vacuum reservoir
- 3 - To mechanical air recirculation valve
- 4 - Air recirculation valve for turbocharger -N249
- 5 - To connection on intake manifold

## 7 - Testing auxiliary signals

### 7.1 - Testing auxiliary signals

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

### 7.2 - Checking engine speed signal

#### *Notes:*

- ◆ The signal generated by engine speed sender -G28 is processed by the engine control unit and transmitted via contact 37 (on the engine control unit) to various electronic systems, e.g. the air conditioner control unit and ABS/EDL control unit. These systems monitor the engine speed signal and the wiring.
- ◆ Testing engine speed signal:

=> Current flow diagrams, Electrical fault finding and Fitting locations

### 7.3 - Testing fuel consumption signal for on-board computer

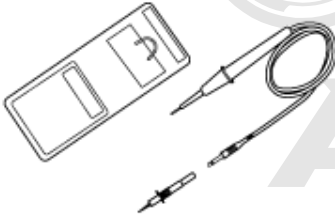
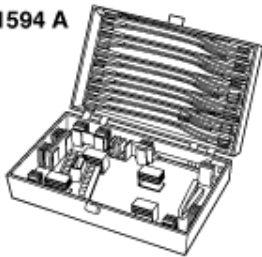
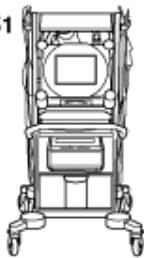
#### *Notes:*

- ◆ The fuel consumption is calculated by the engine control unit on the basis of the injection period, and the signal is transmitted to the on-board computer via contact 81 on the engine control unit.
- ◆ Testing fuel consumption signal

=> Electrical system; Repair group 90; Dash panel insert; Testing fuel consumption signal Dash panel insert  
Testing fuel consumption signal



## 7.4 - Testing road speed signal

|                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br> | <b>V.A.G 1527 B</b><br><br><small>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</small> |
| <b>V.A.G 1594 A</b><br> | <b>V.A.G 1598/31</b><br>                                                                                                                                                                                                                                                                                                    |
| <b>VAS 5051</b><br>   | <div>G24-0023</div>                                                                                                                                                                                                                                                                                                                                                                                          |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

### Notes:

- ♦ The road speed signal is generated by the road speed sender -G68 (on the gearbox) and is processed in the dash panel insert.
- ♦ The processed signal goes to contact 54 on the engine control unit and is used for idling speed stabilisation and for the damping of load change jolts when changing gear.

### Test requirement:

- Speedometer (including display) must be functioning properly.

### Fault-finding:

=> Electrical system; Repair group 90; Dash panel insert; Testing road speed signal Dash panel insert Testing road speed signal

## Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1.)  
When doing this the engine must be idling.

Warning:

To avoid accident risks when road testing the vehicle with test equipment, always observe the relevant safety precautions =>

-> Indicated on display:

|                     |      |
|---------------------|------|
| Rapid data transfer | HELP |
| Select function XX  |      |

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

|                     |        |     |
|---------------------|--------|-----|
| Read measured value | block  | Q   |
| Enter display group | number | XXX |

- Enter "005" for Display Group 005 and confirm entry with Q key.

-> Indicated on display:

|                             |   |   |   |
|-----------------------------|---|---|---|
| Read measured value block 5 |   |   |   |
| 1                           | 2 | 3 | 4 |

- Take vehicle for a test drive and check whether the road speed appears in display zone 3.
- If the road speed does not appear, raise the vehicle (preferably using a lifting platform) until the front left wheel is clear of the ground.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .
- Connect voltage tester V.A.G 1527 B to sockets 3 (positive) and 54 (road speed signal) on test box V.A.G 1598/31.
- Switch on the ignition and turn the front left wheel by hand.
  - The LED should flash very briefly.

If the LED does not flash:

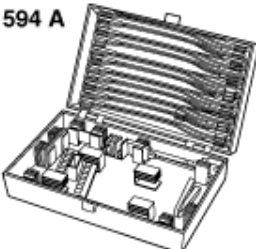
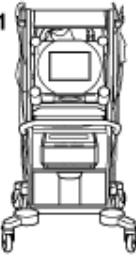
- Test for open circuit and short to positive or earth in the following wiring connection:

|                                     |                                                                                             |
|-------------------------------------|---------------------------------------------------------------------------------------------|
| Test box<br>V.A.G 1598/31<br>Socket | Dash panel insert<br>Contact                                                                |
| 54                                  | => Current flow diagrams,<br>=> Electrical fault-finding<br>=> and Fitting locations binder |

- Rectify short circuit or open circuit if necessary.



## 7.5 - Testing air conditioner compressor shut-off

|                                                                                                           |                                                                                                          |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br>  | <b>V.A.G 1594 A</b><br> |
| <b>V.A.G 1598/31</b><br> | <b>VAS 5051</b><br>     |
|                                                                                                           | <b>G24-0021</b>                                                                                          |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

### Notes:

- ♦ The air conditioner compressor signal informs the engine control unit that the compressor will be switched on in 140 ms.
- ♦ The engine control unit can send a signal via the same wire to shut off the air conditioner compressor.
- ♦ The engine control unit will shut off the air conditioner compressor in the following circumstances:
  - Under heavy acceleration (full throttle in 1st gear)
  - In emergency running mode (back-up)
  - When the "Basic setting" function is started (function 04)

### Requirements for test:

- Air conditioner okay
- No faults stored in fault memory of engine control unit
- Vehicle at room temperature (above +15 °C)

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1.)  
When doing this the engine must be idling

-> Indicated on display:

Rapid data transfer  
Select function XX

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block Q  
Enter display group number XXX

- Enter "050" for Display Group 050 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 50  
1 2 3 4

- Switch off air conditioner.
  - Specification for display zone 4: "Compr.OFF"
- Switch on air conditioner by pressing "AUTO" key and select maximum warm or cold air setting. The compressor should run.
  - Specification for display zone 4: "Compr. ON"
- Floor and release the accelerator quickly (short blip).
  - Specification for display zone 4: The display should change from "Compr.ON" to "Compr.OFF" for a few seconds (air conditioner compressor shut-off during acceleration).

If the readout in display zone 4 is not as described:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31.
- Test for open circuit and short to positive or earth in the following wiring connection:

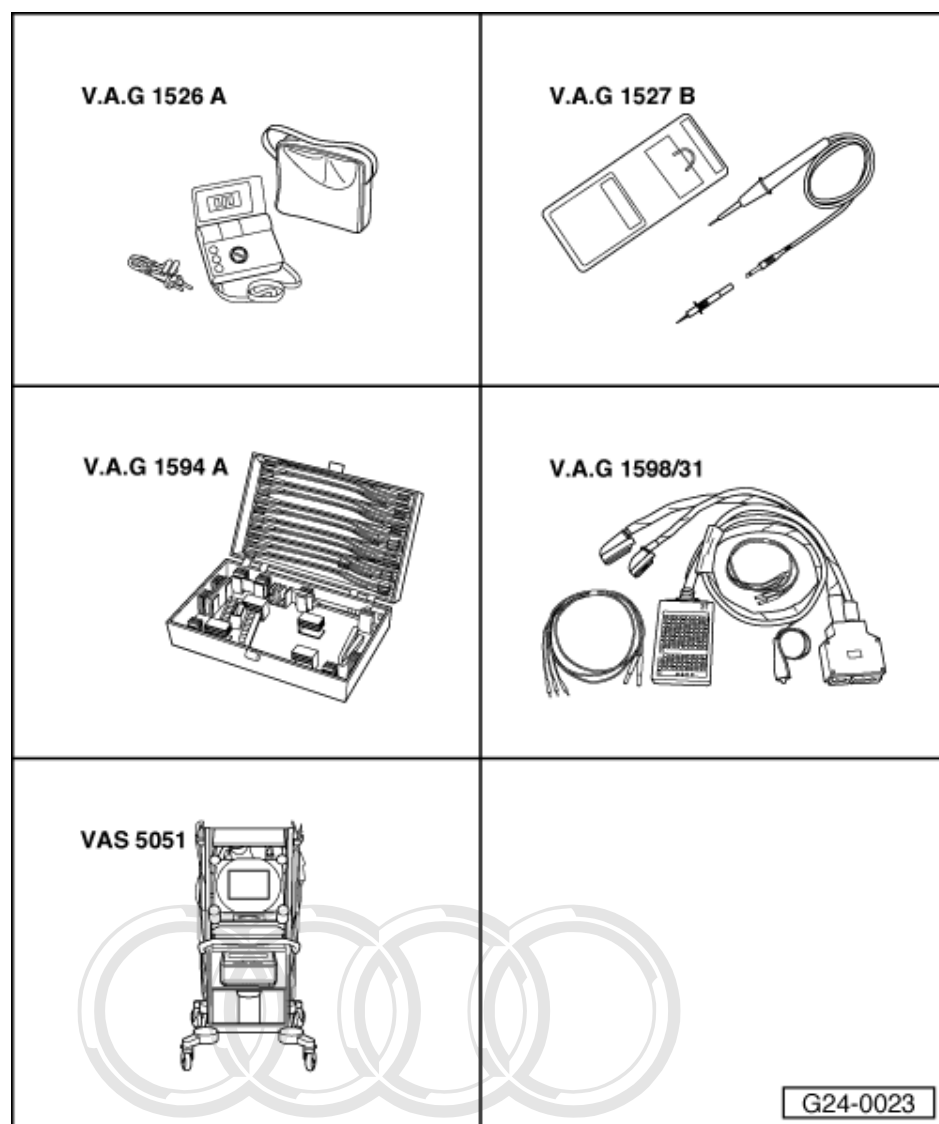
| Test box<br>V.A.G 1598/31<br>Socket | AC operating and<br>display unit -E87<br>Contact                                            |
|-------------------------------------|---------------------------------------------------------------------------------------------|
| 41                                  | => Current flow diagrams,<br>=> Electrical fault-finding<br>=> and Fitting locations binder |

- Rectify short circuit or open circuit if necessary.
- If there are no faults in the wiring, test operation of air conditioner.

=> Air conditioner; Repair Group 01; Self-diagnosis for air conditioner Self-diagnosis for air conditioner



## 7.6 - Testing brake light switch and brake pedal switch



### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
  - ♦ V.A.G 1527 B
  - ♦ V.A.G 1594 A
  - ♦ V.A.G 1598/31
  - ♦ VAS 5051 with VAS 5051/1
- Copying for private or commercial purposes, in part or in whole, is not permitted without the written permission of AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

### Note:

*For safety reasons, the signal from the accelerator position sender (potentiometer) instructing the engine control unit to open the throttle valve is suppressed whenever the brake is operated. The engine control unit therefore needs the brake light signal and also the brake pedal signal.*

*If the brake is operated while the accelerator is held down at a constant position, the engine is immediately governed down to idling speed. A defective switch can cause the engine to be throttled back when this is not desired.*

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)  
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block      Q  
Enter display group number XXX

- Enter "066" for Display Group 066 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 66  
1      2      3      4

- Check display value for brake light switch / brake pedal switch (display zone 2).

|                                                          | Display zones     |                                                                    |                      |                  |
|----------------------------------------------------------|-------------------|--------------------------------------------------------------------|----------------------|------------------|
|                                                          | 1                 | 2                                                                  | 3                    | 4                |
| <b>Display Group 066: Signals to engine control unit</b> |                   |                                                                    |                      |                  |
| <b>Display</b>                                           | xxx km/h          | XXXX                                                               | xxx km/h             | XXXX             |
| <b>Indicates</b>                                         | Actual road speed | Switch positions                                                   | Specified road speed | Switch positions |
| <b>Range</b>                                             |                   | XX00<br>XX11                                                       |                      |                  |
| <b>Specification</b>                                     |                   | XX00<br>(brake pedal<br>not depressed)                             |                      |                  |
|                                                          |                   | XX11<br>(brake pedal<br>depressed)                                 |                      |                  |
| <b>Note</b>                                              |                   | X = irrelevant<br>The switching points do not coincide<br>exactly. |                      |                  |

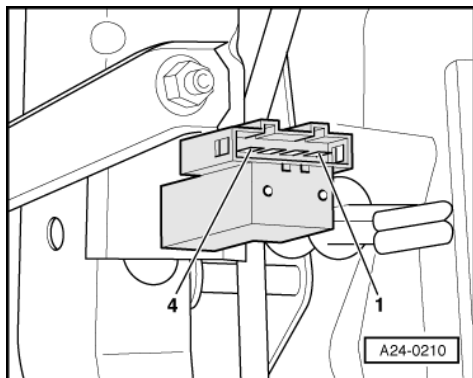
If the display values do not appear as described:

### Testing switches

- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment

- Unplug connector from brake light switch / brake pedal switch.



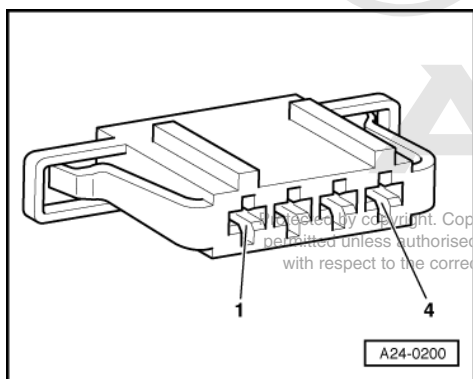
- -> Connect multimeter (resistance measurement range) between contacts 1 and 4.
  - Specification:  $\infty \omega$  (no continuity)
- Depress the brake pedal.
  - Specification: approx.  $0 \omega$
- Connect multimeter (resistance measurement range) between contacts 2 and 3.
  - Specification: approx.  $0 \omega$
- Depress the brake pedal.
  - Specification:  $\infty \omega$  (no continuity)

If the specifications are not obtained:

- Renew brake light switch / brake pedal switch.

If the specifications are obtained:

#### Checking voltage supply



- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Body earth      |

- The LED should light up.

| Connector Contact | Measure against |
|-------------------|-----------------|
| 2                 | Body earth      |

- Switch on ignition.
  - The LED should light up.

If the LED does not light up:

- Test for open circuit or short to earth in wiring from contact 1 and/or contact 2 of connector

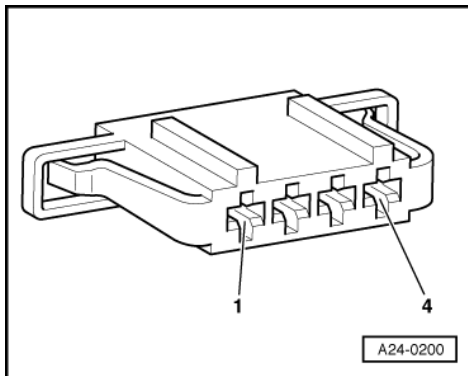
=> Current flow diagrams, Electrical fault finding and Fitting locations

- Rectify short circuit or open circuit if necessary.

If the LED lights up:

### Checking activation

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page **31** .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 3                 | 55                            |
| 4                 | 56                            |

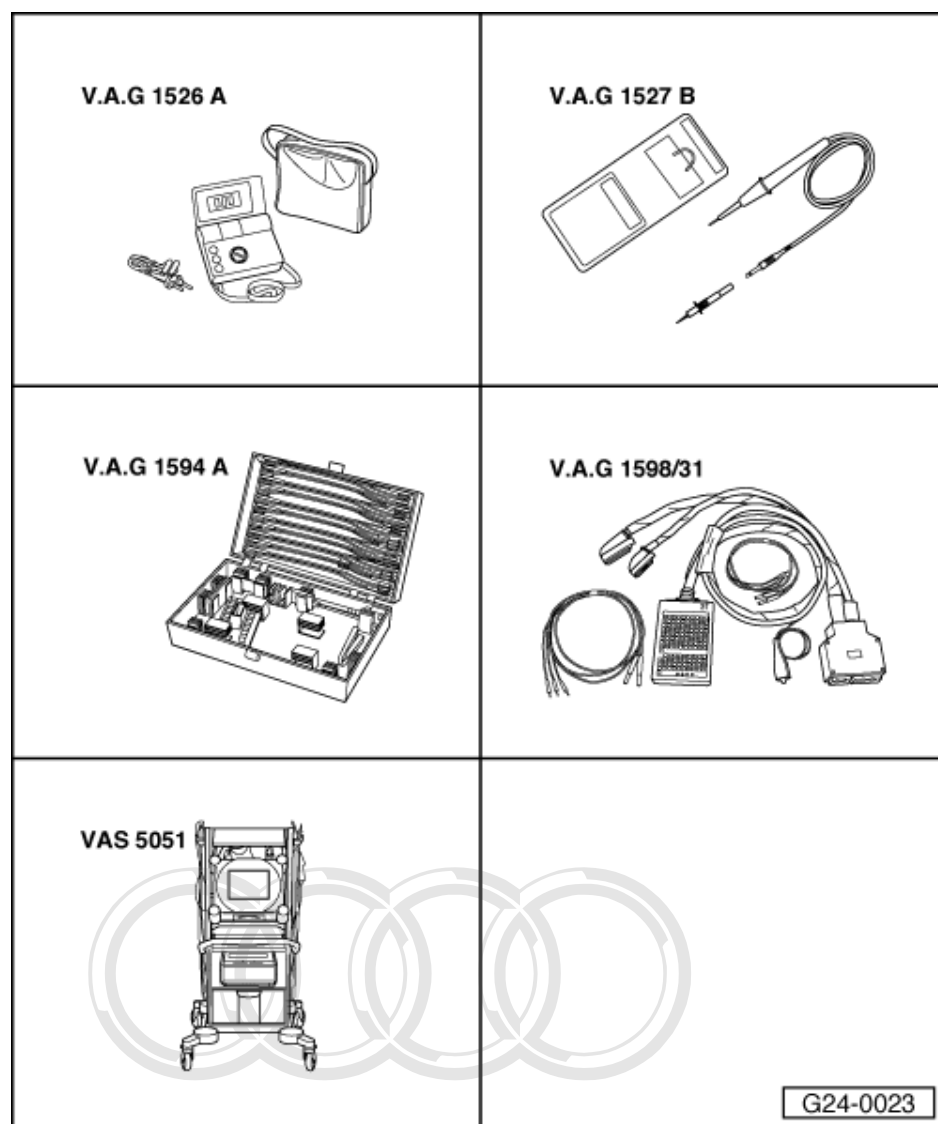
- Rectify short circuit or open circuit if necessary.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 7.7 - Testing clutch pedal switch -F36



### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

### Note:

*This signal is used to avoid over-revving and load change jolts when disengaging the clutch. It is also needed for the cruise control system.*

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" ( => Page 1 .)

When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block      Q  
Enter display group number XXX

- Enter "066" for Display Group 066 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 66  
1      2      3      4

- Check display value for clutch pedal switch (display zone 2).

|                                                          | Display zones     |                                         |                      |                  |
|----------------------------------------------------------|-------------------|-----------------------------------------|----------------------|------------------|
|                                                          | 1                 | 2                                       | 3                    | 4                |
| <b>Display Group 066: Signals to engine control unit</b> |                   |                                         |                      |                  |
| <b>Display</b>                                           | xxx km/h          | XXXX                                    | xxx km/h             | XXXX             |
| <b>Indicates</b>                                         | Actual road speed | Switch positions                        | Specified road speed | Switch positions |
| <b>Range</b>                                             |                   | X0XX<br>X1XX                            |                      |                  |
| <b>Specification</b>                                     |                   | X0XX<br>(clutch pedal<br>not depressed) |                      |                  |
|                                                          |                   | X1XX<br>(clutch pedal<br>depressed)     |                      |                  |
| <b>Note</b>                                              |                   | X = irrelevant                          |                      |                  |

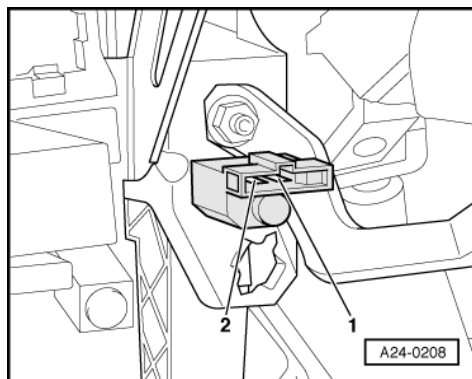
If the display values do not appear as described:

#### Testing switch

- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers and trim parts; Removing and installing driver's storage compartment Storage compartments, covers and trim parts Removing and installing driver's storage compartment

- Unplug connector from clutch pedal switch.





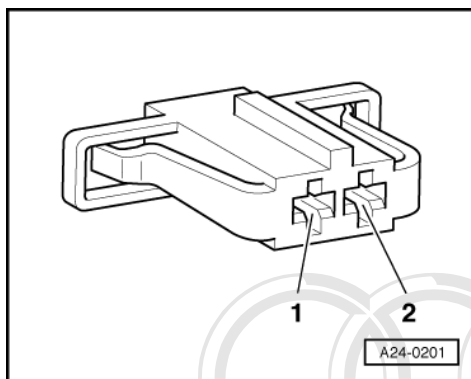
- -> Connect multimeter (resistance measurement range) between contacts 1 and 2.
  - Specification: approx. 0  $\omega$
- Depress the clutch pedal.
  - Specification:  $\infty \omega$  (no continuity)

If the specification is not attained:

- Renew clutch pedal switch.

If the specification is attained:

#### Testing voltage supply



- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Body earth      |

- Switch on ignition.
  - The LED should light up.

If the LED does not light up:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the content of this document. Information is subject to change without notice. Copyright 1999 Audi AG.

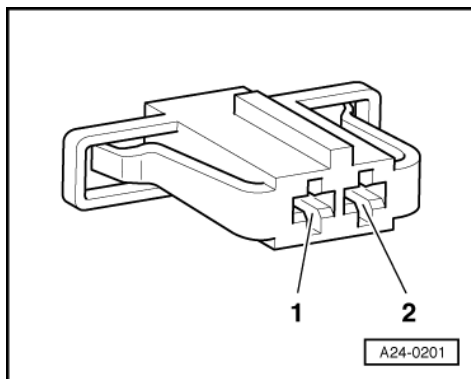
- Test for open circuit or short to earth in wiring between fuel pump relay and contact 1 on connector via fuse.

=> Current flow diagrams, Electrical fault finding and Fitting locations

If the LED lights up:

#### Checking activation

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .

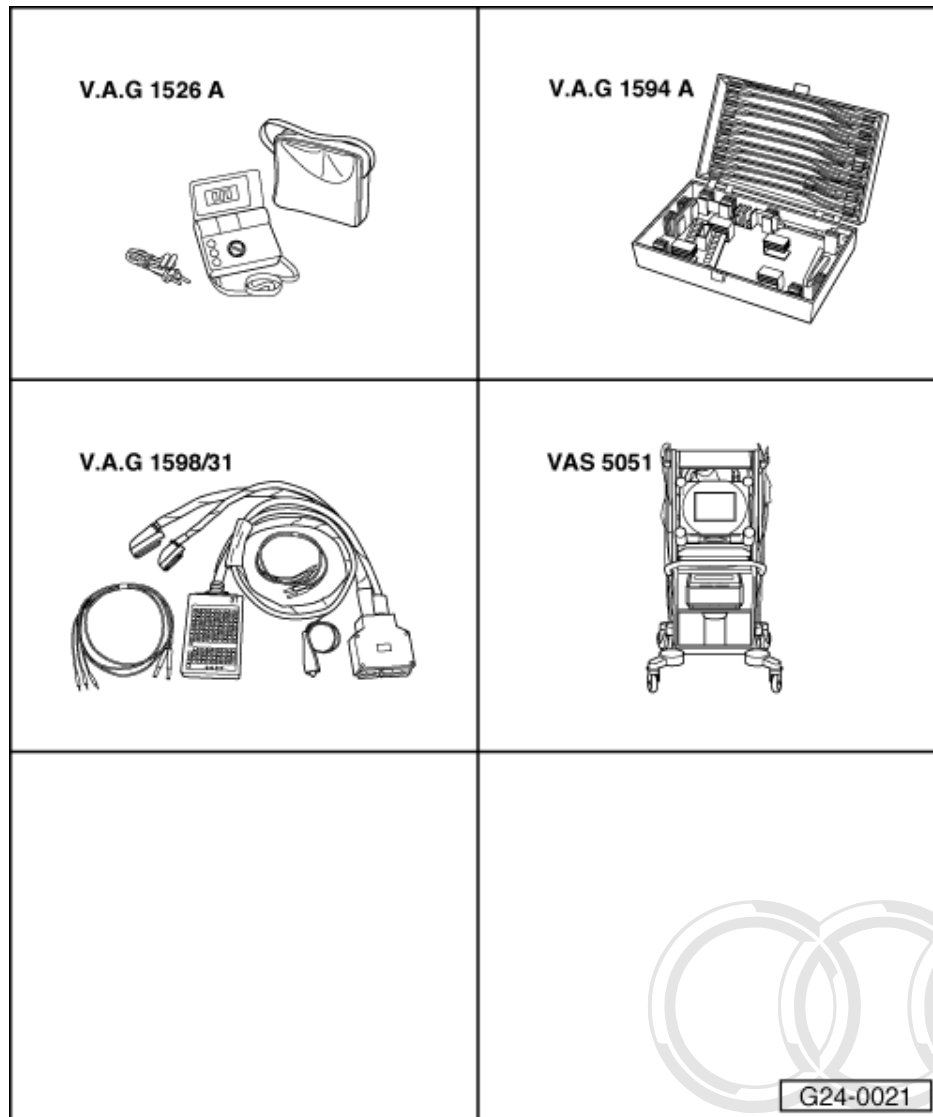


- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 2                    | 39                               |

- Rectify short circuit or open circuit if necessary.

## 7.8 - Testing power steering pressure switch -F88



### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



The function of the power steering pressure switch is to stabilise the idling speed when the steering wheel is on full lock (left or right).

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 1.)  
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block  
Enter display group number xxx

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Enter "056" for Display Group 056 and confirm entry with Q key.

-> Indicated on display:

Read measured value block      56  
1      2      3      4

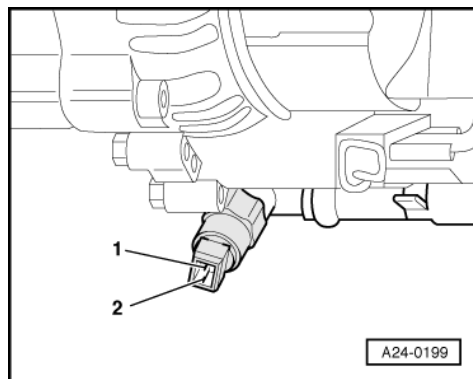
- Check display value for power steering pressure switch (display zone 4).

|                                                                                                  | Display zones       |                        |                                       |                                                                                |
|--------------------------------------------------------------------------------------------------|---------------------|------------------------|---------------------------------------|--------------------------------------------------------------------------------|
|                                                                                                  | 1                   | 2                      | 3                                     | 4                                                                              |
| Display Group 056: Idling speed stabilisation with engine idling at normal operating temperature |                     |                        |                                       |                                                                                |
| Display                                                                                          | xxx rpm             | xxx rpm                | x.x %                                 | X X X X X                                                                      |
| Indicates                                                                                        | Actual engine speed | Specified engine speed | Idling speed control<br>Torque change | Operating status                                                               |
| Range                                                                                            |                     |                        |                                       | 0XXXX<br>1XXXX                                                                 |
| Specification                                                                                    |                     |                        |                                       | 0XXXX<br>(steering wheel in straighta-<br>head position or slightly<br>turned) |
|                                                                                                  |                     |                        |                                       | 1XXXX<br>(steering wheel<br>at full lock, or turned rapidly)                   |
| Note                                                                                             |                     |                        |                                       | X = irrelevant                                                                 |

If the display values do not appear as described:

### Testing switch

- Unplug connector from power steering pressure switch -F88 on power steering pump.



- -> Connect multimeter to switch (resistance measurement range).
- Start the engine.
  - Specification:  $\infty \omega$  (no continuity)
- Turn steering wheel to full lock (left and right).
  - Specification: approx.  $0 \omega$

If the display does not change:

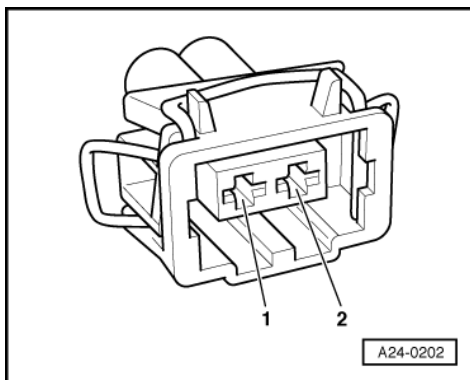
- Renew power steering pressure switch -F88.

If the display changes:

- Test the wiring => Page 121 .

### Testing wiring

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 1                 | 49                            |
| 2                 | 50                            |

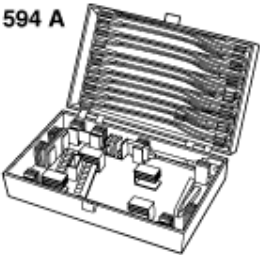
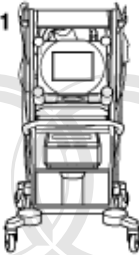
- Rectify short circuit or open circuit if necessary.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 7.9 - Testing data exchange between Motronic system and ABS (CAN bus)

|                                                                                                           |                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br>  | <b>V.A.G 1594 A</b><br>                                                                                                                                                                                                        |
| <b>V.A.G 1598/31</b><br> | <b>VAS 5051</b><br>                                                                                                                                                                                                            |
|                                                                                                           | <p>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</p> <p><b>G24-0021</b></p> |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

- Interrogate fault memory of ABS control unit.

If a fault relating to the CAN bus appears on the display:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .
- Test for open circuit and short to positive or earth in the following wiring connections:

| Test box<br>V.A.G 1598/31<br>Socket | ABS control unit<br>-J104<br>Contact                                                        |
|-------------------------------------|---------------------------------------------------------------------------------------------|
| 58<br>60                            | => Current flow diagrams,<br>=> Electrical fault-finding<br>=> and Fitting locations binder |

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

- Try renewing first the ABS control unit, then the engine control unit.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 28 - Ignition system

### 1 - Testing ignition system

#### 1.1 - Testing ignition system

#### 1.2 - General notes on ignition system

- ♦ The engine control unit is equipped with self diagnosis.
- ♦ For trouble-free operation of the electrical components a voltage of at least 11.5 V is necessary.
- ♦ During some of the tests it is possible that the control unit will detect and record a fault. The fault memory must therefore be interrogated and if necessary erased when all tests and repair work have been completed.
- ♦ After completing fault finding, repairs or component tests, it is possible that the engine will start, run for a short period and then cut out. If this happens it may be that the immobilizer is blocking the engine control unit. In such cases the fault memory must be interrogated and if necessary the control unit must be adapted.

#### 1.3 - Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, note the following points:

- ♦ Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- ♦ The ignition must be switched off before disconnecting or connecting ignition system wiring and high-voltage cables for test instruments.
- ♦ In order to run the engine at starting speed without actually starting it (for example, to test compression), unplug the connectors on the ignition coils and also the connectors on the injectors. After completing the work, interrogate and erase the fault memory.
- ♦ The ignition must always be switched off when cleaning the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

#### 1.4 - Technical data

| Engine code letters                                                                       | APY                                                                                                                                                     |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Idling speed<br>Not adjustable - controlled by the idling speed stabilisation             | 800...920 rpm                                                                                                                                           |
| Engine speed limiter<br>- shuts off injectors                                             | approx. 6800 rpm                                                                                                                                        |
| Ignition timing is determined by the control unit.<br>Ignition timing cannot be adjusted. |                                                                                                                                                         |
| Ignition system                                                                           | Individual coil system with 4 ignition coils (each with an integrated output stage) connected directly to the spark plugs via the spark plug connectors |
| Spark plugs 2)                                                                            | Tightening torque: 30 Nm                                                                                                                                |

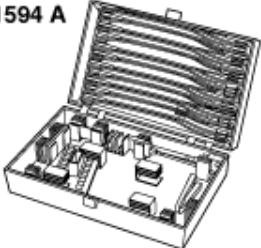
|                     |         |
|---------------------|---------|
| Engine code letters | APY     |
| Firing order        | 1-3-4-2 |

1) Idling speed with air conditioner on: 820 ... 940 rpm

2) Current specifications:

=> Exhaust emission test binder

## 1.5 - Testing ignition coils with output stages

|                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>V.A.G 1526 A</b></p>    | <p><b>V.A.G 1527 B</b></p>  <p>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorized by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</p> |
| <p><b>V.A.G 1594 A</b></p>  | <p><b>V.A.G 1598/31</b></p>                                                                                                                                                                                                                                                                                        |
|                                                                                                                | <p style="text-align: right;">G24-0022</p>                                                                                                                                                                                                                                                                                                                                                             |

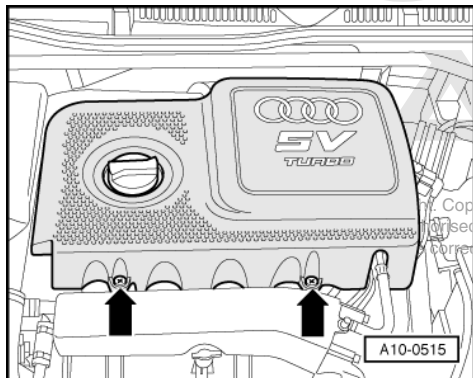
### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31



**Note:**

*Each ignition coil is combined with its output stage as a single component.*



Copying for private or commercial purposes, in part or in whole, is not permitted by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG.

- -> Remove engine cover panel -arrows-.

The procedure for identifying an inoperative or misfiring cylinder is as follows:

- Unplug the connectors from the injectors in turn with the engine running, and observe how the engine runs.
- or
- Compare the spark plugs of all cylinders with each other and check for soot on the electrodes.

When the defective cylinder has been identified:

- Swap spark plug of defective cylinder with one from another cylinder.

If the fault moves with the spark plug:

- Renew spark plug.

If the fault remains in the same cylinder:

- Swap ignition coil of defective cylinder with one from another cylinder.

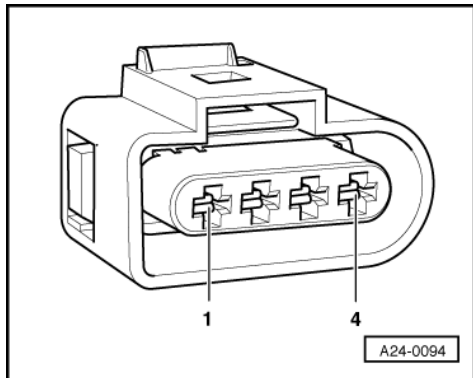
If the fault moves with the ignition coil:

- Renew ignition coil.

If the fault remains in the same cylinder:

**Testing earth connections**

- Unplug 4-pin connector from ignition coil.



- -> Connect voltage tester V.A.G 1527 B as follows:

| Connector Contact | Measure against  |
|-------------------|------------------|
| 2                 | Battery positive |
| 4                 | Battery positive |

- The LED should light up.

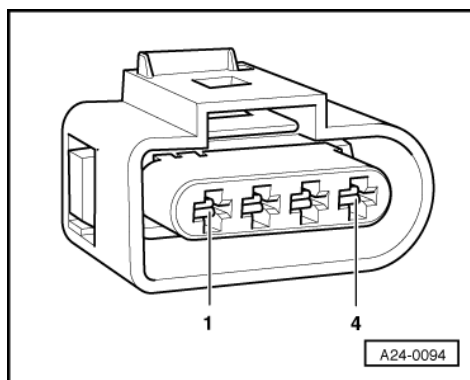
If the LED does not light up:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations

If the LED lights up:

#### Checking voltage supply



- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Engine earth    |

- Switch on ignition.
- Specification: approx. battery voltage

If the specification is not obtained:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations

If the specification is still not attained:

- Test activation of output stage => Page 127 .

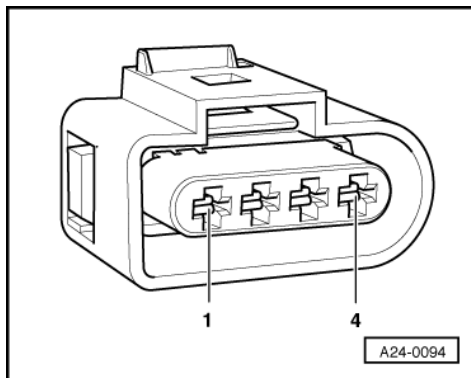
**Testing activation of output stages** Partial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Unplug the connectors from all four injectors.

#### Note:

*It is important to ensure that no fuel is injected during the test as this would damage the catalytic converter. The connectors on the injectors must therefore be unplugged.*

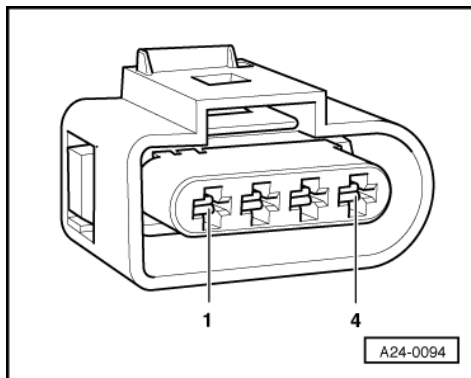
- Unplug 4-pin connector from ignition coil.



- -> Connect voltage tester V.A.G 1527 B to contacts 2 and 3 of the connector.
- Operate starter briefly.
  - The LED should flash briefly.

If the specifications are not obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 3 (cylinder 1)    | 102                           |
| 3 (cylinder 2)    | 95                            |
| 3 (cylinder 3)    | 103                           |
| 3 (cylinder 4)    | 94                            |

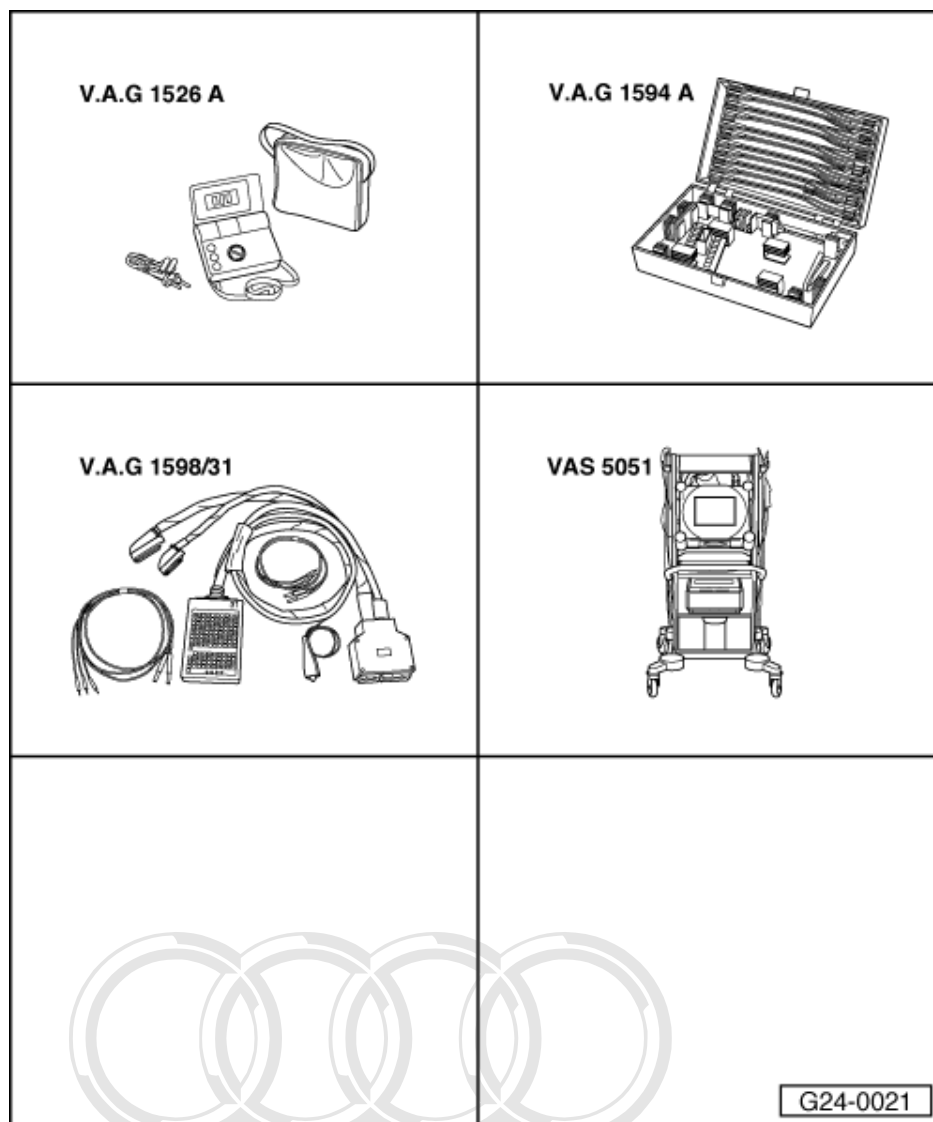
- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Renew ignition coil with output stage (combined as a single component)

This document is not to be used for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

## 1.6 - Testing intake air temperature sender -G42



### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Fitting location => Fitting locations overview, Page **22**

### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page **1**.)  
When doing this the ignition must be switched on.

-> Indicated on display:



Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block      Q  
Enter display group number XXX

- Enter "004" to select Display Group 004 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 4  
1      2      3      4

- Check display value for intake air temperature sender(display zone 4):

|                                                              | Display zones                                        |                 |                     |                        |
|--------------------------------------------------------------|------------------------------------------------------|-----------------|---------------------|------------------------|
|                                                              | 1                                                    | 2               | 3                   | 4                      |
| Display Group 004: Intake air temperature with engine idling |                                                      |                 |                     |                        |
| Display                                                      | xxxx rpm                                             | xx.x V          | xxx.x °C            | xxx.x °C               |
| Indicates                                                    | Engine speed                                         | Battery voltage | Coolant temperature | Intake air temperature |
| Range                                                        | 0 ... 6800 rpm                                       | 10.0 ... 15.0 V | -48.0 ... 143.0 °C  | -48.0 ... 143.0 °C     |
| Specification                                                | Between ambient temperature and 120 °C <sup>1)</sup> |                 |                     |                        |

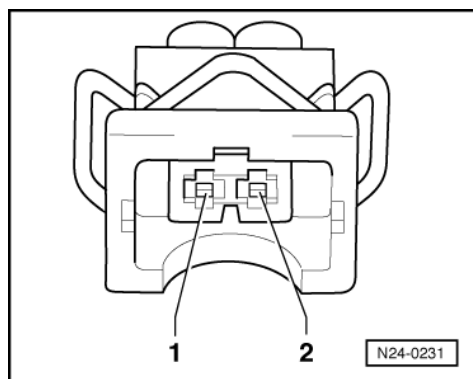
- 1) Possible readouts:

When the vehicle is being driven this figure may be up to 24 °C higher than ambient temperature.

When the vehicle is standing, temperatures up to 120 °C are possible due to heat radiated from the engine.

### Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

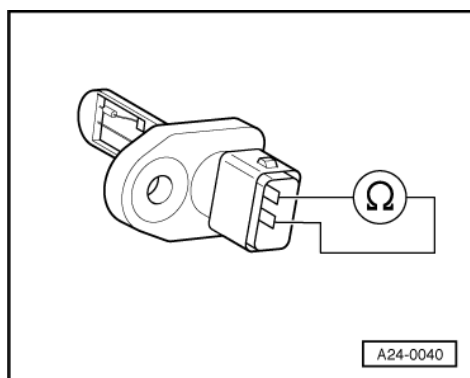
| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 1                    | 85                               |

| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 2                    | 108                              |

- Test for short circuits between the two wires.
- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

#### Testing sender



- -> Connect multimeter (resistance measurement range) to sender.

#### Specifications:

| Temperature (°C) | Resistance (kΩ) |
|------------------|-----------------|
| -20              | approx. 13.8    |
| 0                | approx. 5.5     |
| 20               | approx. 2.4     |
| 40               | approx. 1.1     |
| 60               | approx. 0.6     |

#### Example:

*If the air temperature is between 0 °C and 20 °C, the resistance should be between 5.5 kΩ and 2.4 kΩ.*

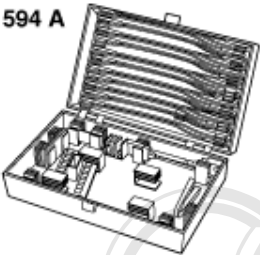
If the specification is not attained:

- Fit a new intake air temperature sender.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



## 1.7 - Testing engine speed sender -G28

|                                                                                                           |                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br>  | <b>V.A.G 1594 A</b><br>                                                                                                                                                                                 |
| <b>V.A.G 1598/31</b><br> | <p>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</p> |
|                                                                                                           | <div>G24-0020</div>                                                                                                                                                                                                                                                                      |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

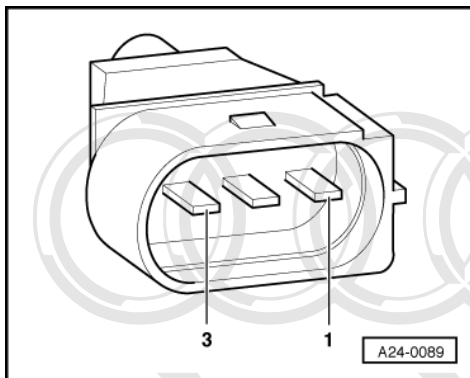
Fitting location => Fitting locations overview, Page **22**

### **Note:**

*The engine speed sender is a combined speed sender and reference mark sender. Without a signal from the -G28 the engine cannot be started. If the signal from the -G28 fails while the engine is running, the engine will cut out immediately.*

### Test sequence

- Before carrying out the test, make sure that the sender is correctly installed and firmly seated.
- Unplug connector for engine speed sender (grey connector).



- -> Connect multimeter (resistance measurement range) between contacts 2 and 3.
- Specification: 730 ... 1000  $\omega$

**Note:**

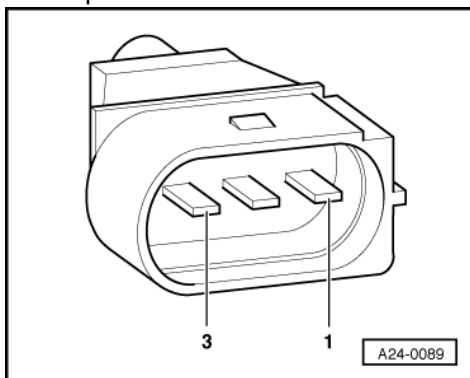
*The resistance value for the engine speed sender is based on a temperature of 20 °C. As the temperature rises, the resistance value increases.*

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the written consent of Audi AG. Audi AG does not guarantee or accept any liability for the content of this document. Copyright by AUDI AG.

If the specification is not attained:

- Fit a new engine speed sender.

If the specification is attained:



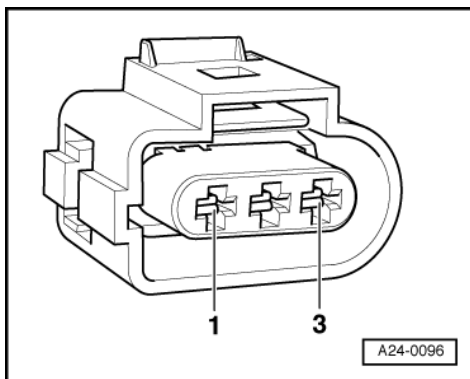
- -> Connect multimeter (resistance test range) to contacts 2 and 1 (screening) and to contacts 3 and 1 (screening).
- Specification:  $\infty \omega$  (no continuity)

If the specification is not attained:

- Fit a new engine speed sender.

If the specification is attained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page **31** .





- -> Test for open circuit and short to positive or earth in the following wiring connections:

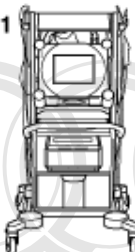
| Connector<br>Contact | Test box V.A.G 1598/31<br>Socket |
|----------------------|----------------------------------|
| 1 (screening)        | 108                              |
| 2 (earth)            | 90                               |
| 3 (signal)           | 82                               |

- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Fit a new engine control unit => Page **33** .

## 1.8 - Testing coolant temperature sender -G62

|                                                                                                                                                                                                                                                                                                                             |                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1526 A</b><br>                                                                                                                                                                                                                   | <b>V.A.G 1594 A</b><br> |
| <b>V.A.G 1598/31</b><br>                                                                                                                                                                                                                 | <b>VAS 5051</b><br>    |
| <p>Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.</p> <p><b>Audi</b></p> <p>G24-0021</p> |                                                                                                           |

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Fitting location => Fitting locations overview, Page **22**

#### Test requirement:

- Engine cold

#### Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page **1** .); when doing this, the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer      HELP  
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block      Q  
Enter display group number XXX

- Enter "004" to select Display Group 004 and confirm entry with Q key.

-> Indicated on display:

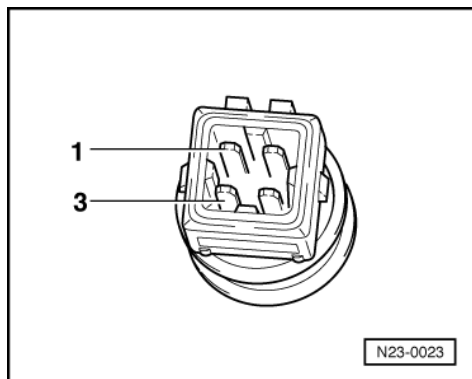
Read measured value block 4  
1      2      3      4

- Check display in display zone 3.

|                                                                  | Display zones  |                 |                                  |                                        |
|------------------------------------------------------------------|----------------|-----------------|----------------------------------|----------------------------------------|
|                                                                  | 1              | 2               | 3                                | 4                                      |
| <b>Display Group 004: Coolant temperature with engine idling</b> |                |                 |                                  |                                        |
| <b>Display</b>                                                   | xxxx rpm       | xx.x V          | xxx.x °C                         | xxx.x °C                               |
| <b>Indicates</b>                                                 | Engine speed   | Battery voltage | Coolant temperature              | Intake air temperature                 |
| <b>Range</b>                                                     | 0 ... 6800 rpm | 10.0 ... 15.0 V | -48.0 ... 143.0 °C               | -48.0 ... 143.0 °C                     |
| <b>Specification</b>                                             | xxxx rpm       | 12.0...15.0 V   | Temperature should rise steadily | Between ambient temperature and 120 °C |

If display zone 3 shows an implausible value:

- Unplug connector on coolant temperature sender.

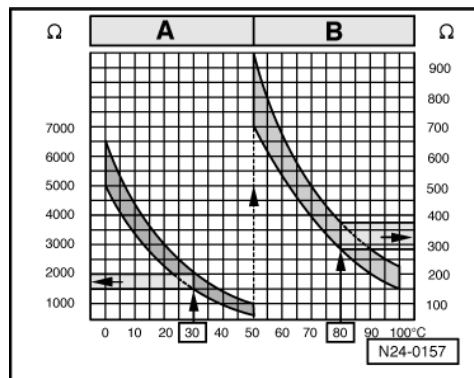


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- -> Connect multimeter (resistance measurement range) between contacts 1 and 3 on the sender.

Scale A shows resistance values for temperature range 0...50 °C and scale B the values for temperature range 50...100 °C.



-> Examples:

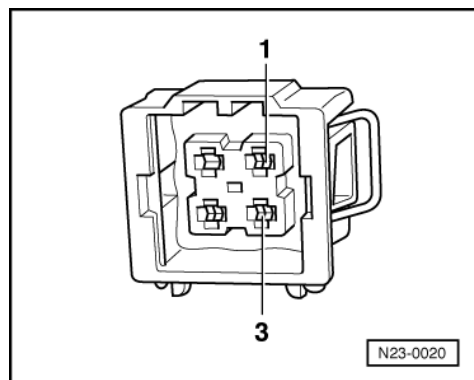
- ♦ 30 °C corresponds to a resistance from 1500...2000  $\omega$
- ♦ 80 °C corresponds to a resistance from 275...375  $\omega$

If the specification is not attained:

- Fit a new coolant temperature sender.

If the specification is attained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> Test for open circuit and short to positive or earth in the following wiring connections:

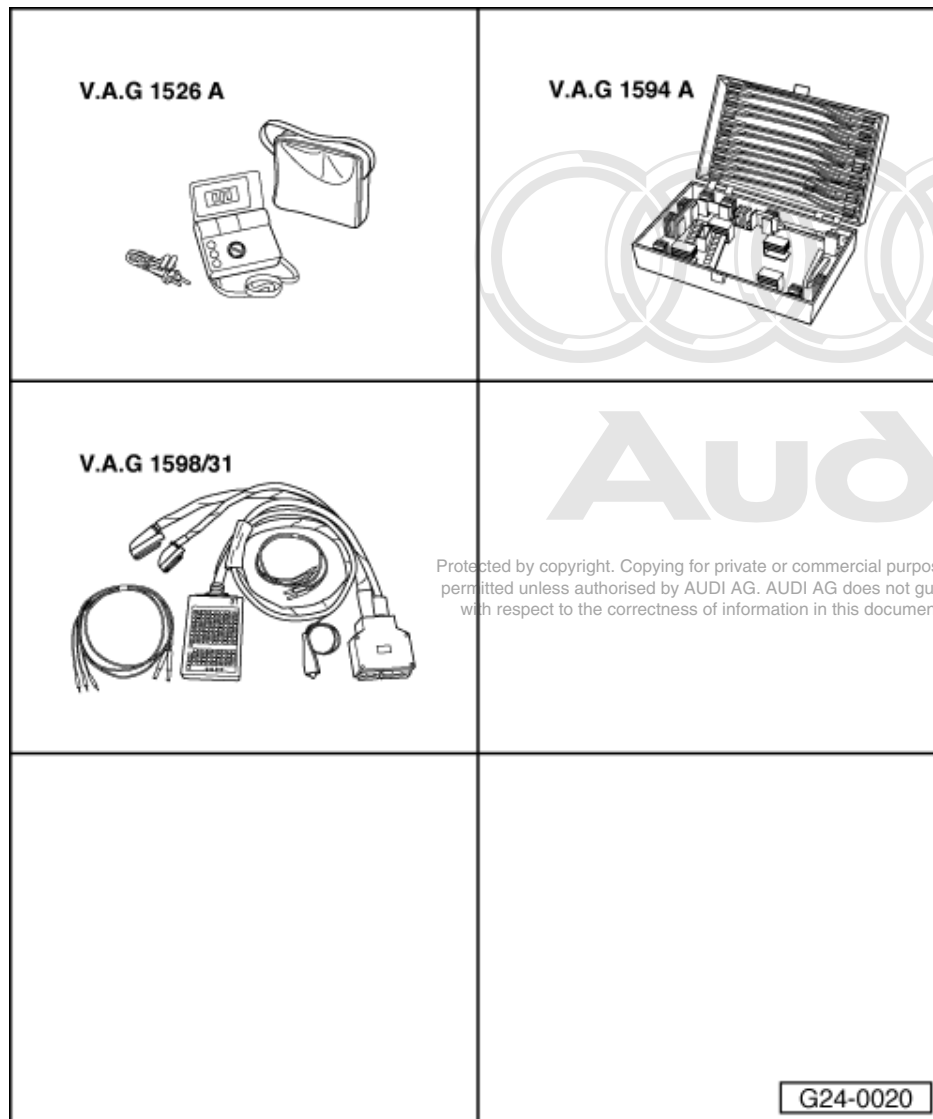
| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 1                 | 108                           |
| 3 (signal)        | 93                            |

- Test for short circuits between the two wires.
- Rectify any open/short circuit as necessary.

If no wiring fault is detected:

- Fit a new engine control unit => Page 33 .

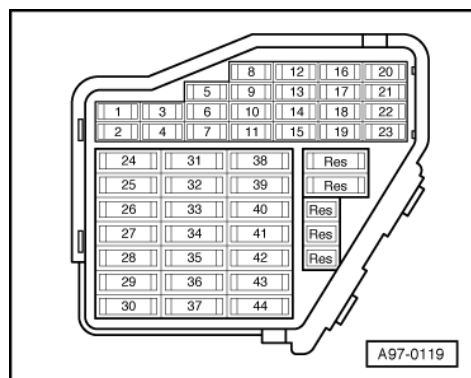
## 1.9 - Testing voltage supply for control unit



### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31

### Requirements for test:





- -> Fuse Nos. S10 and S229 for engine control unit OK (fuse positions 10 and 29)
- Battery voltage not less than 11 V
- Alternator OK

### Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .

### Notes:

- ♦ The positive voltage supply for the engine control unit comes via contact 3 (terminal 15) and contact 62 (terminal 30).
- ♦ The earth connection for the engine control unit is via contacts 1 and 2.
- Connect multimeter (voltage measurement range) as follows:

| Test box V.A.G 1598/31<br>Socket | Measure against  |
|----------------------------------|------------------|
| 1                                | Battery positive |
| 2                                | Battery positive |
| 62                               | Engine earth     |

- Specification: approx. battery voltage
- Connect multimeter (voltage measurement range) as follows:

| Test box V.A.G 1598/31<br>Socket | Measure against |
|----------------------------------|-----------------|
| 3                                | Engine earth    |

- Switch ignition on.
- Specification: approx. battery voltage

If a specification is not met:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations

## 1.10 - Testing knock sensor control limit

If the fault message "Knock sensor - control limit reached" is recorded in the fault memory the following tests must be carried out:

|                                                                       | Possible cause of fault                   | Fault remedy                                         |
|-----------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------|
| Fault message relating to all cylinders<br>or<br>cylinders 1/2 or 3/4 | - Poor fuel quality                       | - Change to higher quality fuel<br>=> Owner's Manual |
|                                                                       | - Wrong tightening torque on knock sensor | - Loosen knock sensor, then tighten to 20 Nm         |
|                                                                       | - Knock sensor defective                  | - Test knock sensor => Page 139                      |
|                                                                       | - Corrosion on connector                  | - Check connectors                                   |
|                                                                       | - Loose components on engine              | - Secure loose components                            |
| Fault message relating to one cylinder                                | - Mechanical engine fault                 | - Test compression pressure                          |

|  | Possible cause of fault      | Fault remedy              |
|--|------------------------------|---------------------------|
|  | - Loose components on engine | - Secure loose components |

## 1.11 - Testing knock sensors

|                                                                                                                |                                                                                                               |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <p><b>V.A.G 1526 A</b></p>    | <p><b>V.A.G 1594 A</b></p>  |
| <p><b>V.A.G 1598/31</b></p>  |                                                                                                               |
|                                                                                                                |                                                                                                               |

G24-0020

### Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

Fitting location => Fitting locations overview, Page 22

### Notes:

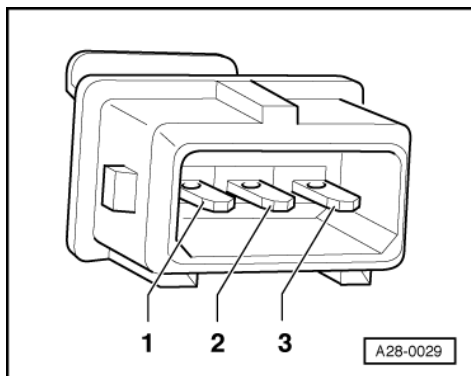
- ♦ It is not possible to carry out an electrical test of the knock sensors themselves (-G61 and -G66).
- ♦ Always use gold-plated contacts when repairing the knock sensor connectors.
- ♦ To ensure that the knock sensors function properly it is important to keep exactly to the specified tightening torque of 20 Nm.



- ♦ Check for corrosion in connection between knock sensor and wiring harness.

### Testing knock sensors

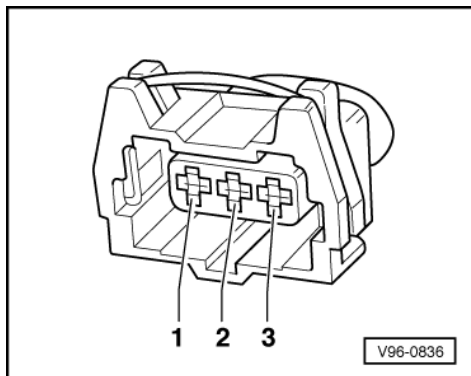
- Unplug the connector for the relevant knock sensor in the engine compartment.



- -> Test for short circuits between all three contacts in the knock sensor connector (contacts 1+2, 1+3 and 2+3).
  - Specification:  $\infty \omega$  (no continuity) - there must be no connection between any of the contacts.
- If there is a connection between the contacts, fit a new knock sensor.
- If there is no short circuit, test wiring for knock sensors.

### Testing wiring between knock sensors and engine control unit

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .
- Test for open circuit and short to positive or earth in the following wiring connections:

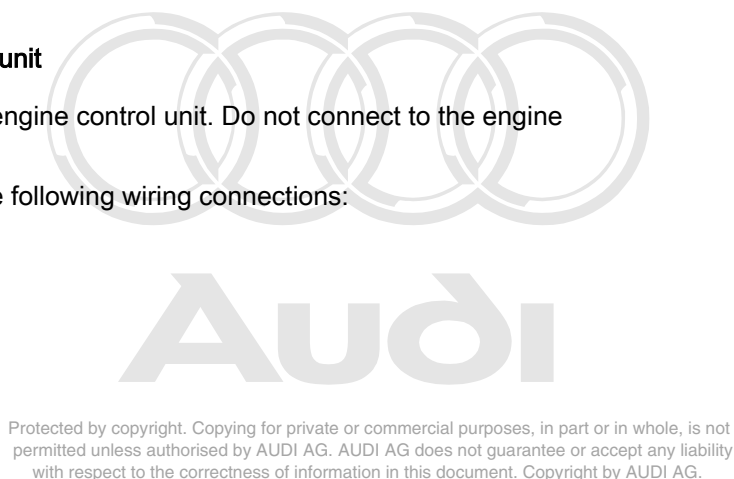


- -> Knock sensor 1 -G61 (cylinders 1/2)

| Connector for -G61<br>Contact | Test box V.A.G 1598/31<br>Socket |
|-------------------------------|----------------------------------|
| 1 (signal)                    | 106                              |
| 2 (earth)                     | 99                               |
| 3 (screening)                 | 108                              |

- Knock sensor 2 -G66 (cylinders 3/4)

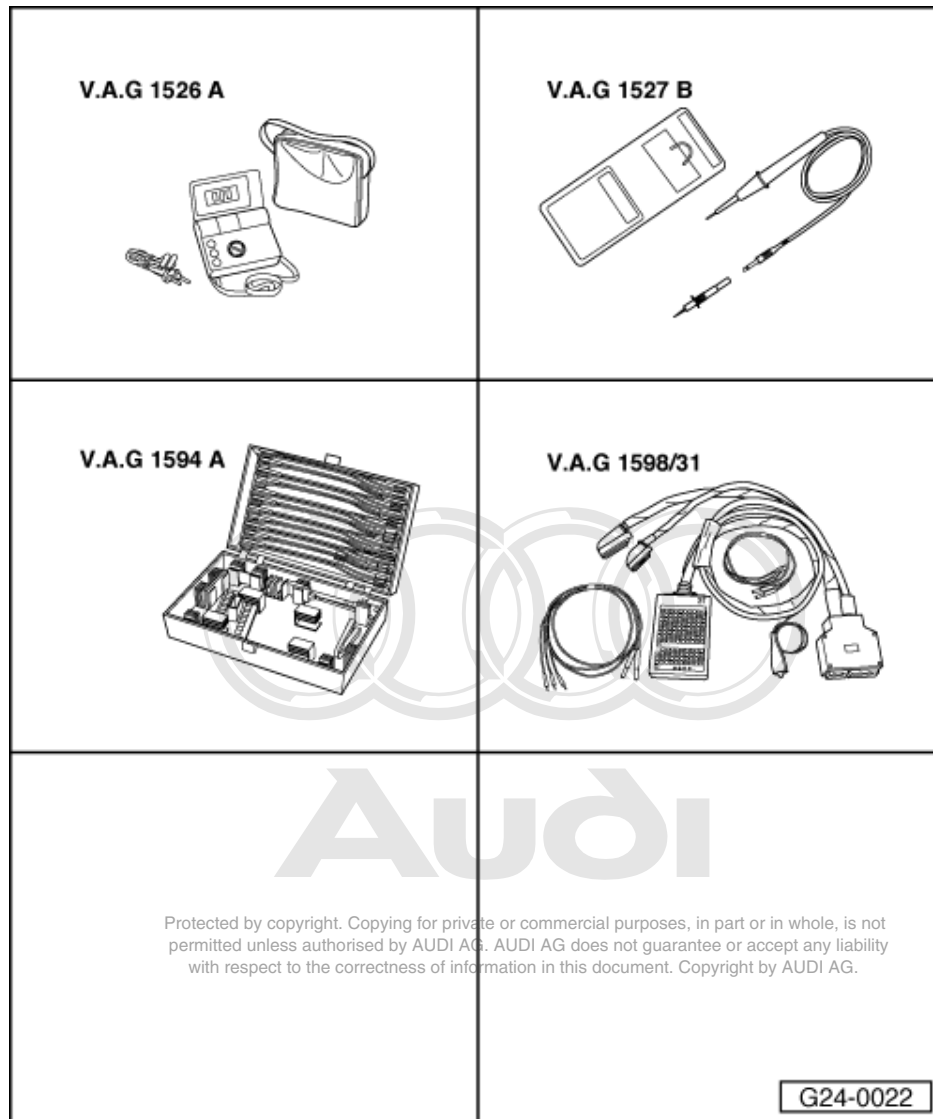
| Connector for -G66<br>Contact | Test box V.A.G 1598/31<br>Socket |
|-------------------------------|----------------------------------|
| 1 (signal)                    | 107                              |
| 2 (earth)                     | 99                               |



|                                       |                                          |
|---------------------------------------|------------------------------------------|
| <b>Connector for -G66<br/>Contact</b> | <b>Test box V.A.G 1598/31<br/>Socket</b> |
| 3 (screening)                         | 108                                      |

- Rectify any open/short circuit as necessary.

## 1.12 - Testing Hall sender -G163



### Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31

Fitting location => Fitting locations overview, Page **22**

The Hall sender indicates the ignition position for Cylinder 1.



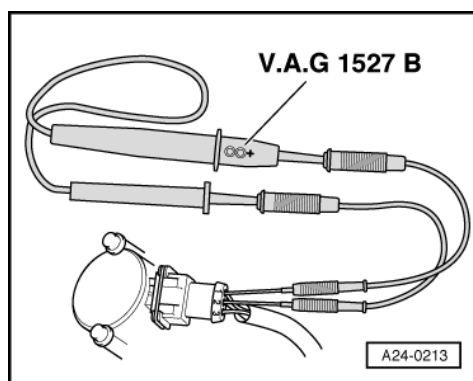
If the Hall sender fails to function, the knock control is switched off and the ignition timing is retarded slightly because the signals can no longer be assigned to the cylinders.

Even without a signal from the Hall sender the engine will continue to run and can also be re-started.

- ♦ When a fault is detected the engine control unit produces one spark per crankshaft revolution for each cylinder.
- ♦ The fact that the injection system is one revolution out of phase does not have any noticeable effect on the fuel injection. If this happens, the fuel is injected upstream of the closed inlet valve instead of while the inlet valve is open. This has only a minor influence on the quality of the air/fuel mixture.

### Checking activation

- Slacken mountings of air intake pipe.
- Slide back rubber sleeve (if fitted) on connector for Hall sender but leave connector plugged in.



- -> Connect voltage tester V.A.G 1527 B between contact 2 (Hall sender signal) and contact 1 (positive).

### Note:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions in this document. Copyright by AUDI AG.

*The connector contacts are numbered on the back of the connector.*

- Operate starter for a few seconds.
  - The LED should flash briefly on alternate engine revolutions (i.e. once every two revolutions).

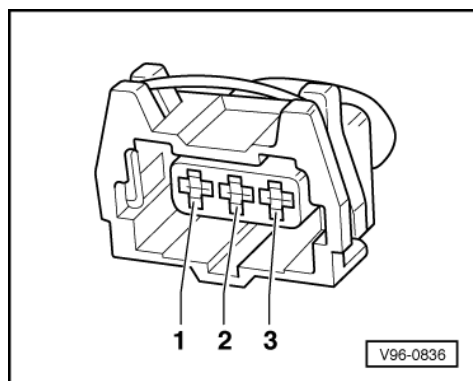
### Note:

*The LEDs on voltage testers with a low current draw continue to glow faintly between impulses from the engine control unit (rather than going out completely) and become much brighter when receiving an impulse.*

If the LED does not flash:

### Checking voltage supply

- Unplug connector from Hall sender.



- -> Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 1                 | Engine earth    |

- Switch on ignition.
  - Specification: approx. 5 V

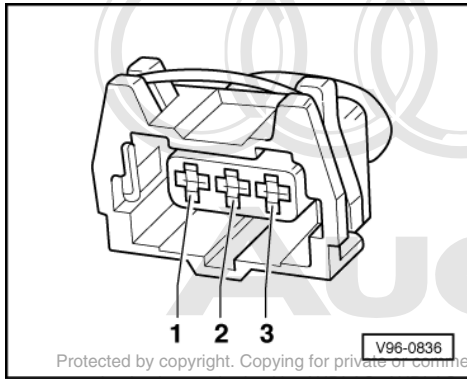
#### Testing signal wire

- Connect multimeter (voltage measurement range) as follows:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 2                 | Engine earth    |

- Switch on ignition.
  - Specification: approx. battery voltage

#### Testing earth wire



- -> Test for open circuit and short to positive in the following wiring connection:

| Connector Contact | Measure against |
|-------------------|-----------------|
| 3                 | Engine earth    |

- Rectify any open/short circuit as necessary.

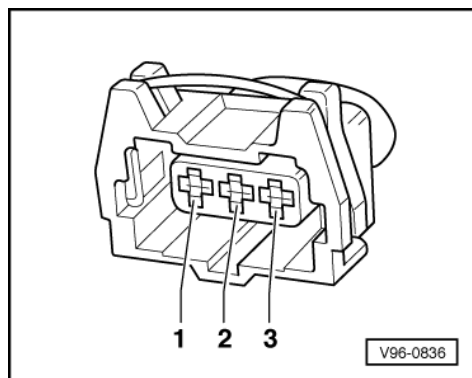
If all the readouts match the specifications but the LED does not flash (measurement taken between contacts 1 and 2 without unplugging connector and while operating starter):

- Renew the Hall sender.

If the specifications are not obtained:

#### Testing wiring between Hall sender and engine control unit

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.  
=> Page 31 .



- -> Test for open circuit and short to positive or earth in the following wiring connections:

| Connector Contact | Test box V.A.G 1598/31 Socket |
|-------------------|-------------------------------|
| 1 (positive)      | 98                            |
| 2 (signal)        | 86                            |
| 3 (earth)         | 108                           |

- Rectify any open/short circuit as necessary.
- If all the test results so far have been OK but a fault relating to the camshaft sensor (Hall sender) is displayed again after erasing the fault memory as a test measure, the cause may be as follows:
  - Rotor ring on Hall sender out of position
- Unbolt Hall sender, then check to ensure that the rotor ring is correctly aligned on the camshaft. If incorrectly installed, the catch will be pressed flat when the securing screw is tightened.
- If the rotor ring is correctly aligned, check the position of the camshaft in relation to the crankshaft.

=> 4-Cylinder engine (5-valve turbo), Mechanics; Repair Group 15; Cylinder head, valve gear; Removing and installing camshafts Cylinder head, valve gear Removing and installing camshafts



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.