

## Workshop Manual Audi A3 1997 ➤

**Motronic injection and ignition system (4-cylinder turbo)**

Engine ID

ARY

AUM

AUQ

ARX

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## List of Workshop Manual Repair Groups

### Repair Group

01 - Self-diagnosis

24 - Mixture preparation - injection

28 - Ignition system



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

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## 01 – Self-diagnosis

### 1 Self-diagnosis of Motronic system

#### 1.1 Technical data of self-diagnosis

- ◆ The fault memory is a non-volatile memory and therefore does not depend on the power supply.
- ◆ Faults specific to the “electronic throttle” are additionally indicated by the electronic power control fault lamp (“EPC warning lamp”) in the dash panel insert.
- ◆ If the engine control unit detects faults which result in deterioration of emission levels, these are indicated by activation of the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83- , refer to ⇒ [page 50](#) .
- ◆ The readiness code must always be regenerated after erasing the fault memory ⇒ [page 22](#) .

#### 1.2 Safety precautions

Note the following if testers and measuring instruments have to be used during a test drive:



##### WARNING

- ◆ *Always attach the testers and measuring instruments to the rear seat and have them operated from there by a second person.*
- ◆ *If testers and measuring instruments were to be operated from the front passenger's seat, the person sitting there could be injured by triggering of the front passenger's air-bag in an accident.*

Note the following to avoid possible injury and/or the destruction of electrical and electronic components:

- ◆ Always switch off ignition before disconnecting and connecting measuring equipment and testers.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

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## 2 Fault table



### Note

- ◆ If faults occur in the monitored sensors or components, these are stored in the fault memory together with an indication of the type of fault.
- ◆ Faults specific to the "electronic throttle" are additionally indicated by the electronic power control fault lamp ("EPC warning lamp") in the dash panel insert; for notes on the electronic throttle system, refer to [⇒ page 89](#).
- ◆ Faults which cause a deterioration in emission levels are indicated by an exhaust emissions warning lamp in the dash panel insert. For notes on the exhaust emissions warning lamp, refer to [⇒ page 50](#).
- ◆ The fault table is arranged according to the 5-digit fault codes in the left-hand column.
- ◆ If a stored fault does not re-occur within the next 40 warm-up phases, the fault code is erased automatically.
- ◆ Sporadic faults (temporary faults) are indicated on the display ⇒ Vehicle diagnosis, testing and information system VAS 5051 by "SP". The word "sporadic" means "intermittent" or "occurring at irregular intervals".
- ◆ The components shown to be defective by the ⇒ Vehicle diagnosis, testing and information system VAS 5051 should not be replaced immediately. Start by using the current flow diagram to check the wiring and connectors to these components. Also test the earth connections using the current flow diagram. This is particularly important in the case of "sporadic" faults, marked SP.
- ◆ All values learnt by the engine control unit will be erased when the engine control unit connector is pulled off or the battery is disconnected. The contents of the fault memory will remain intact. Rough idling may be encountered for a brief period if the engine is then started. In this case, allow the engine to run at idle for several minutes until the adaption process has been completed.
- ◆ If the fault memory has been erased, the readiness code must be generated again [⇒ page 22](#).

### 2.1 Fault tables for faults 16395 / P0011 to 17624 / P1216

| Fault code |       | Fault message                                                           | Remedy                                                                                                                                                       |
|------------|-------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                         |                                                                                                                                                              |
| P0011      | 16395 | Bank 1 camshaft retardation<br>Specification not attained <sup>1)</sup> | 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 15 Checking variable valve timing<br><br>Check the air mass meter -G70-<br><a href="#">⇒ page 66</a> |
| P0012      | 16396 | Bank 1 camshaft advance<br>Specification not attained <sup>1)</sup>     |                                                                                                                                                              |
| P0101      | 16485 | Air mass meter -G70-<br>Implausible signal <sup>1)</sup>                |                                                                                                                                                              |
| P0102      | 16486 | Air mass meter -G70-<br>Signal too low <sup>1)</sup>                    |                                                                                                                                                              |
| P0103      | 16487 | Air mass meter -G70-<br>Signal too high <sup>1)</sup>                   |                                                                                                                                                              |

1) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

| Fault code |       | Fault message                                                                          | Remedy                                                                            |
|------------|-------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                        |                                                                                   |
| P0106      | 16490 | Intake manifold pressure/air pressure ⇒ -G71/-F96- Implausible signal <sup>2) 3)</sup> | 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 21 Checking turbo-charger |
| P0112      | 16496 | Intake air temperature sender -G42- Signal too low <sup>2)</sup>                       |                                                                                   |
| P0113      | 16497 | Intake air temperature sender -G42- Signal too high <sup>2)</sup>                      | – Check the intake air temperature sender -G42- <a href="#">⇒ page 125</a>        |
| P0116      | 16500 | Coolant temperature sender -G62- Implausible signal <sup>2)</sup>                      |                                                                                   |
| P0117      | 16501 | Coolant temperature sender -G62- Signal too low <sup>2)</sup>                          |                                                                                   |
| P0118      | 16502 | Coolant temperature sender -G62- Signal too high <sup>2)</sup>                         |                                                                                   |

2) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

3) The intake manifold pressure is determined by the charge air pressure sender -G31- (instead of the intake manifold pressure sender -G71- displayed); the atmospheric pressure is determined by the altitude sender -F96- (in the engine control unit).

| Fault code |       | Fault message                                                   | Remedy                                                                                                    |
|------------|-------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                 |                                                                                                           |
| P0130      | 16514 | Bank 1, probe 1<br>Electrical fault in circuit <sup>4)</sup>    | – Check the lambda probe and lambda control upstream of the catalytic converter <a href="#">⇒ page 69</a> |
| P0131      | 16515 | Bank 1, probe 1<br>Voltage too low <sup>4)</sup>                |                                                                                                           |
| P0132      | 16516 | Bank 1, probe 1<br>Voltage too high <sup>4)</sup>               |                                                                                                           |
| P0133      | 16517 | Bank 1, probe 1<br>Signal too slow <sup>4)</sup>                |                                                                                                           |
| P0134      | 16518 | Bank 1, probe 1<br>No activity <sup>4)</sup>                    |                                                                                                           |
| P0135      | 16519 | Bank1, probe1<br>Heating circuit electrical fault <sup>4)</sup> |                                                                                                           |

4) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

| Fault code |       | Fault message                                                | Remedy                                                                                                      |
|------------|-------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                              |                                                                                                             |
| P0136      | 16520 | Bank 1, probe 2<br>Electrical fault in circuit <sup>5)</sup> | – Check the lambda probe and lambda control downstream of the catalytic converter <a href="#">⇒ page 78</a> |
| P0137      | 16521 | Bank 1, probe 2<br>Voltage too low <sup>5)</sup>             |                                                                                                             |



| Fault code |       | Fault message                                                        | Remedy                                                                                                    |
|------------|-------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| P0138      | 16522 | Bank 1, probe 2<br>Voltage too high <sup>5)</sup>                    | . 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 21 Checking charge air system with turbocharger |
| P0139      | 16523 | Bank 1, probe 2<br>Signal too slow <sup>5)</sup>                     |                                                                                                           |
| P0140      | 16524 | Bank 1, probe 2<br>No activity <sup>5)</sup>                         |                                                                                                           |
| P0236      | 16620 | Charge air pressure sender -G31-<br>Implausible signal <sup>5)</sup> |                                                                                                           |
| P0237      | 16621 | Charge air pressure sender -G31-<br>Signal too low <sup>5)</sup>     |                                                                                                           |
| P0238      | 16622 | Charge air pressure sender -G31-<br>Signal too high <sup>5)</sup>    |                                                                                                           |

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5) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

| Fault code |       | Fault message                                                 | Remedy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------|-------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P0300      | 16684 | Misfiring detected <sup>6)</sup>                              | <ul style="list-style-type: none"> <li>– Check the fuel pressure ⇒ <a href="#">page 52</a></li> <li>– Check the injectors ⇒ <a href="#">page 55</a></li> <li>– Check the spark plugs, ignition cables and connectors</li> <li>– Check the ignition coils with output stages ⇒ <a href="#">page 118</a></li> <li>– Check misfiring detection ⇒ <a href="#">page 140</a></li> <li>– Put fuel in fuel tank</li> <li>– Check the engine speed sender -G28- ⇒ <a href="#">page 128</a></li> </ul> |
| P0301      | 16685 | Cyl. 1 misfiring detected <sup>6)</sup>                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P0302      | 16686 | Cyl. 2 misfiring detected <sup>6)</sup>                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P0303      | 16687 | Cyl. 3 misfiring detected <sup>6)</sup>                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P0304      | 16688 | Cyl. 4 misfiring detected <sup>6)</sup>                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P0321      | 16705 | Engine speed sender -G28-<br>Implausible signal <sup>6)</sup> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P0322      | 16706 | Engine speed sender -G28-<br>No signal <sup>6) 7)</sup>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

6) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

7) This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert. For notes on the EPC warning lamp, refer to ⇒ [page 89](#).

| Fault code |       | Fault message                                                                    | Remedy                                                      |
|------------|-------|----------------------------------------------------------------------------------|-------------------------------------------------------------|
| SAE        | V.A.G |                                                                                  |                                                             |
| P0327      | 16711 | Knock sensor 1 -G61-<br>Signal too low <sup>8)</sup>                             | – Check the knock sensors ⇒ <a href="#">page 135</a>        |
| P0328      | 16712 | Knock sensor 1 -G61-<br>Signal too high <sup>8)</sup>                            |                                                             |
| P0332      | 16716 | Knock sensor 2 -G66-<br>Signal too low <sup>8)</sup>                             |                                                             |
| P0333      | 16717 | Knock sensor 2 -G66-<br>Signal too high <sup>8)</sup>                            |                                                             |
| P0341      | 16725 | Camshaft position sensor ⇒ Hall sender -G40-<br>Implausible signal <sup>8)</sup> | – Check the Hall sender -G40-<br>⇒ <a href="#">page 137</a> |

| Fault code |       | Fault message                                                             | Remedy |
|------------|-------|---------------------------------------------------------------------------|--------|
| P0342      | 16726 | Camshaft position sensor ⇒ Hall sender -G40-Signal too low <sup>8)</sup>  |        |
| P0343      | 16727 | Camshaft position sensor ⇒ Hall sender -G40-Signal too high <sup>8)</sup> |        |

8) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

| Fault code |       | Fault message                                               | Remedy                                                                                                                                                |
|------------|-------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                             |                                                                                                                                                       |
| P0411      | 16795 | Secondary air system<br>Flow not OK <sup>9)</sup>           | Checking ⇒ Rep. Gr. 26<br>– Check the tubing (secondary air inlet valve); check the intake system for leaks (unmetered air) <a href="#">⇒ page 69</a> |
| P0420      | 16804 | Bank1, catalyst system<br>Poor efficiency <sup>9)</sup>     | – Generate readiness code <a href="#">⇒ page 22</a> . If the same fault is displayed again, replace the catalytic converter. ⇒ Rep. Gr. 26            |
| P0422      | 16806 | Bank1, main catalyst<br>Poor efficiency                     |                                                                                                                                                       |
| P0441      | 16825 | Fuel tank breather system<br>Flow rate not OK <sup>9)</sup> | – Check the activated charcoal filter system solenoid valve 1 <a href="#">⇒ page 86</a>                                                               |

9) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

| Fault code |       | Fault message                                                      | Remedy                                                                                     |
|------------|-------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                    |                                                                                            |
| P0501      | 16885 | Vehicle speed signal<br>Implausible signal <sup>10)</sup>          | – Check the vehicle speed signal <a href="#">⇒ page 107</a>                                |
| P0506      | 16890 | Idling speed control<br>Specified speed not reached <sup>10)</sup> | – Check the throttle valve module <a href="#">⇒ page 90</a>                                |
| P0507      | 16891 | Idling speed control<br>Specified speed exceeded                   |                                                                                            |
| P0560      | 16944 | Voltage supply<br>Implausible signal                               | – Check the control unit power supply <a href="#">⇒ page 132</a>                           |
| P0562      | 16946 | Voltage supply<br>Voltage too low                                  |                                                                                            |
| P0563      | 16947 | Voltage supply<br>Voltage too high                                 |                                                                                            |
| P0571      | 16955 | Brake light switch -F <sup>11)</sup><br>Implausible signal         | – Check the brake light switch -F- and brake pedal switch -F47- <a href="#">⇒ page 102</a> |

10) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).  
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11) In addition to the brake light switch -F-, the brake pedal switch -F47- is also monitored.

| Fault code |       | Fault message | Remedy |
|------------|-------|---------------|--------|
| SAE        | V.A.G |               |        |



| Fault code |       | Fault message                                                                   | Remedy                                                                      |
|------------|-------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| P0601      | 16985 | Control unit defective <sup>12)</sup>                                           | – Replace the engine control unit<br>⇒ <a href="#">page 45</a>              |
| P0604      | 16988 | Control unit defective <sup>12)</sup>                                           |                                                                             |
| P0605      | 16989 | Control unit defective <sup>12)</sup>                                           |                                                                             |
| P0606      | 16990 | Control unit defective                                                          |                                                                             |
| P0685      | 17069 | Main relay ⇒ -J271-<br>Open circuit <sup>12)</sup>                              | – Check Motronic current supply relay -<br>J271- ⇒ <a href="#">page 122</a> |
| P0686      | 17070 | Main relay ⇒ -J271-<br>Short to earth <sup>12)</sup>                            |                                                                             |
| P0687      | 17071 | Main relay ⇒ -J271-<br>Short to positive <sup>12)</sup>                         |                                                                             |
| P0688      | 17072 | Main relay, load circuit ⇒ -J271-<br>Open circuit <sup>12)</sup> <sup>13)</sup> |                                                                             |

12) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

13) This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert. For notes on the EPC warning lamp, refer to ⇒ [page 89](#).

| Fault code |       | Fault message                                                         | Remedy                                                                                                                                                  |
|------------|-------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                       |                                                                                                                                                         |
| P1102      | 17510 | Bank 1, probe 1, heating circuit<br>Short to positive <sup>14)</sup>  | – Check the lambda probe heating up-<br>stream of the catalytic converter<br>⇒ <a href="#">page 76</a>                                                  |
| P1103      | 17511 | Bank 1, probe 1, heating circuit<br>Insufficient power <sup>14)</sup> |                                                                                                                                                         |
| P1105      | 17513 | Bank 1, probe 2, heating circuit<br>Short to positive <sup>14)</sup>  | – Check the lambda probe heating<br>downstream of the catalytic converter<br>⇒ <a href="#">page 82</a>                                                  |
| P1111      | 17519 | Lambda control, bank1<br>System too lean                              | – Check lambda control upstream of the<br>catalytic converter ⇒ <a href="#">page 69</a>                                                                 |
| P1112      | 17520 | Lambda control, bank1<br>System too rich                              |                                                                                                                                                         |
| P1113      | 17521 | Bank 1, probe 1<br>Internal resistance too high                       | – Start by checking for contact resist-<br>ance in signal wires ⇒ <a href="#">page 74</a> ; if<br>there is no contact resistance: renew<br>Lambda probe |
| P1114      | 17522 | Bank 1, probe 2<br>Internal resistance too high <sup>14)</sup>        | – Start by checking for contact resist-<br>ance in signal wires ⇒ <a href="#">page 82</a> ; if<br>there is no contact resistance: renew<br>Lambda probe |

14) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

| Fault code |       | Fault message                                                     | Remedy                                                                                                 |
|------------|-------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                   |                                                                                                        |
| P1115      | 17523 | Bank 1, probe 1, heating circuit<br>Short to earth <sup>15)</sup> | – Check the lambda probe heating up-<br>stream of the catalytic converter<br>⇒ <a href="#">page 76</a> |
| P1116      | 17524 | Bank 1, probe 1, heating circuit<br>Open circuit <sup>15)</sup>   |                                                                                                        |

| Fault code |       | Fault message                                                     | Remedy                                                                                              |
|------------|-------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| P1117      | 17525 | Bank 1, probe 2, heating circuit<br>Short to earth <sup>15)</sup> | – Check the lambda probe heating downstream of the catalytic converter<br>⇒ <a href="#">page 82</a> |
| P1118      | 17526 | Bank 1, probe 2, heating circuit<br>Open circuit <sup>15)</sup>   |                                                                                                     |

15) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

| Fault code |       | Fault message                                       | Remedy                                                                                                                                                                                                                                             |
|------------|-------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                     |                                                                                                                                                                                                                                                    |
| P1127      | 17535 | Bank1, mixture adaption (mult.)<br>System too rich  | – Perform a test drive (fuel in oil)<br>– Check the fuel system pressure<br>⇒ <a href="#">page 52</a><br>– Check the air mass meter<br>⇒ <a href="#">page 66</a><br>– Check the intake system for leaks (un-metered air) ⇒ <a href="#">page 69</a> |
| P1128      | 17536 | Bank 1, mixture adaption (mult.)<br>System too lean | – Check the lambda probe upstream of the catalytic converter ⇒ <a href="#">page 69</a><br>– Check the lambda probe downstream of the catalytic converter ⇒ <a href="#">page 78</a><br>– Check the injectors ⇒ <a href="#">page 55</a>              |



#### Note

*mult. = multiplicative indicates that the fault takes effect over the entire engine speed and load range.*

| Fault code |       | Fault message                                      | Remedy                                                                                                                                                                                                                                             |
|------------|-------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                    |                                                                                                                                                                                                                                                    |
| P1136      | 17544 | Bank 1, mixture adaption (add.)<br>System too lean | – Perform a test drive (fuel in oil)<br>– Check the fuel system pressure<br>⇒ <a href="#">page 52</a><br>– Check the air mass meter<br>⇒ <a href="#">page 66</a><br>– Check the intake system for leaks (un-metered air) ⇒ <a href="#">page 69</a> |
| P1137      | 17545 | Bank 1, mixture adaption (add.)<br>System too rich | – Check the lambda probe downstream of the catalytic converter<br>– Check the activated charcoal filter system solenoid valve 1 ⇒ <a href="#">page 86</a>                                                                                          |
| P1143      | 17551 | Load detection<br>Limit exceeded <sup>16)</sup>    | – Check the air mass meter<br>⇒ <a href="#">page 66</a><br>– Check the throttle valve module<br>⇒ <a href="#">page 90</a>                                                                                                                          |

16) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).



# Note

add. = additive indicates that the fault only takes effect at idle.

| Fault code |       | Fault message                                                                                               | Remedy                                                                                                                                                                                                                                                                                           |
|------------|-------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                                             |                                                                                                                                                                                                                                                                                                  |
| P1149      | 17557 | Lambda control, bank1<br>Implausible control value                                                          | <ul style="list-style-type: none"> <li>Check Lambda probe learnt values and Lambda control function <a href="#">⇒ page 71</a></li> <li>Check the fuel system pressure <a href="#">⇒ page 52</a></li> <li>Check the intake system for leaks (un-metered air) <a href="#">⇒ page 69</a></li> </ul> |
| P1171      | 17579 | Throttle valve drive angle sender 2 (electric power control) -G188-<br>Implausible signal <sup>17) 3)</sup> | <ul style="list-style-type: none"> <li>Check the throttle valve drive angle sender <a href="#">⇒ page 90</a></li> </ul>                                                                                                                                                                          |
| P1172      | 17580 | Throttle valve drive angle sender 2 (electric power control) -G188-<br>Signal too low <sup>17) 3)</sup>     |                                                                                                                                                                                                                                                                                                  |
| P1173      | 17581 | Throttle valve drive angle sender 2 (electric power control) -G188-<br>Signal too high <sup>17) 3)</sup>    |                                                                                                                                                                                                                                                                                                  |

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17) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#). This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert.

| Fault code |       | Fault message                                                                       | Remedy                                                                                                                                                                                                                                        |
|------------|-------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                     |                                                                                                                                                                                                                                               |
| P1176      | 17584 | Bank 1, lambda correction downstream of CAT<br>Control limit reached <sup>18)</sup> | <ul style="list-style-type: none"> <li>Check for ageing of the lambda probe upstream of the catalytic converter</li> <li>Check the lambda probe and lambda control downstream of the catalytic converter <a href="#">⇒ page 80</a></li> </ul> |
| P1198      | 17606 | Bank 1, probe 2, heating circuit<br>Electrical fault                                | <ul style="list-style-type: none"> <li>Check the lambda probe heating downstream of the catalytic converter <a href="#">⇒ page 82</a></li> </ul>                                                                                              |
| P1213      | 17621 | Injector, cyl. 1 -N30-<br>Short to positive <sup>18)</sup>                          | <ul style="list-style-type: none"> <li>Check the injectors <a href="#">⇒ page 55</a></li> </ul>                                                                                                                                               |
| P1214      | 17622 | Injector, cyl. 2 -N31-<br>Short to positive <sup>18)</sup>                          |                                                                                                                                                                                                                                               |
| P1215      | 17623 | Injector, cyl. 3 -N32-<br>Short to positive <sup>18)</sup>                          |                                                                                                                                                                                                                                               |
| P1216      | 17624 | Injector, cyl. 4 -N33-<br>Short to positive <sup>18)</sup>                          |                                                                                                                                                                                                                                               |

18) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions

warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83- , refer to [⇒ page 50](#) .

## 2.2 Fault tables for faults 17633 / P1225 to 19534 / P3078

| Fault code |       | Fault message                                           | Remedy                                          |
|------------|-------|---------------------------------------------------------|-------------------------------------------------|
| SAE        | V.A.G |                                                         |                                                 |
| P1225      | 17633 | Injector, cyl. 1 -N30-<br>Short to earth <sup>19)</sup> | – Check the injectors <a href="#">⇒ page 55</a> |
| P1226      | 17634 | Injector, cyl. 2 -N31-<br>Short to earth <sup>19)</sup> |                                                 |
| P1227      | 17635 | Injector, cyl. 3 -N32-<br>Short to earth <sup>19)</sup> |                                                 |
| P1228      | 17636 | Injector, cyl. 4 -N33-<br>Short to earth <sup>19)</sup> |                                                 |

19) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83- , refer to [⇒ page 50](#) .

| Fault code |       | Fault message                                         | Remedy                                                                                                                   |
|------------|-------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                       |                                                                                                                          |
| P1237      | 17645 | Injector, cyl. 1 -N30-<br>Open circuit <sup>20)</sup> | – Check the injectors <a href="#">⇒ page 55</a>                                                                          |
| P1238      | 17646 | Injector, cyl. 2 -N31-<br>Open circuit <sup>20)</sup> |                                                                                                                          |
| P1239      | 17647 | Injector, cyl. 3 -N32-<br>Open circuit <sup>20)</sup> |                                                                                                                          |
| P1240      | 17648 | Injector, cyl. 4 -N33-<br>Open circuit <sup>20)</sup> |                                                                                                                          |
| P1250      | 17658 | Fuel level too low                                    | – Resultant faults ⇒ Note<br>– Fill fuel tank and erase fault memory<br>– Interrogate the dash panel insert fault memory |

20) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83- , refer to [⇒ page 50](#) .



### Note

*The fault "fuel level too low" is set in conjunction with misfiring or faults relating to lambda control if there is or has been insufficient fuel in the tank; the fault remains static in the fault memory and is not set to sporadic even if the vehicle has been re-fuelled for example in the meantime.*

| Fault code |       | Fault message                                                            | Remedy                                                        |
|------------|-------|--------------------------------------------------------------------------|---------------------------------------------------------------|
| SAE        | V.A.G |                                                                          |                                                               |
| P1287      | 17695 | Turbocharger divert air valve -N249-<br>Open circuit <sup>21)</sup>      | Check the turbocharger divert air valve - N249- ⇒ Rep. Gr. 21 |
| P1288      | 17696 | Turbocharger divert air valve -N249-<br>Short to positive <sup>21)</sup> |                                                               |



| Fault code |       | Fault message                                                         | Remedy                                                                                                                                                                               |
|------------|-------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1289      | 17697 | Turbocharger divert air valve -N249-<br>Short to earth <sup>21)</sup> |                                                                                                                                                                                      |
| P1296      | 17704 | Fault in cooling system                                               | <ul style="list-style-type: none"> <li>– Check coolant temperature sender - G62- ⇒ <a href="#">page 130</a></li> <li>– Check thermostat ⇒ Rep. Gr. 19</li> </ul>                     |
| P1297      | 17705 | Turbocharger/throttle valve connection<br>Drop in pressure            | <ul style="list-style-type: none"> <li>– Check for contamination of the throttle valve ⇒ <a href="#">page 93</a></li> <li>– Checking charge air system with turbocharger:</li> </ul> |

21) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83- , refer to ⇒ [page 50](#) .

| Fault code |       | Fault message                                                          | Remedy                                                                                                                                                                                                                                                                                                                                                             |
|------------|-------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                        |                                                                                                                                                                                                                                                                                                                                                                    |
| P1325      | 17733 | Knock control, cyl. 1<br>Control limit reached                         | <ul style="list-style-type: none"> <li>– Check knock control ⇒ <a href="#">page 134</a></li> </ul>                                                                                                                                                                                                                                                                 |
| 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 exceeded <sup>22)</sup> 3) | <ul style="list-style-type: none"> <li>– Major leak; check the intake system for leaks (unmetered air) ⇒ <a href="#">page 69</a></li> <li>– Check the intake air temperature sender ⇒ <a href="#">page 125</a></li> <li>– Check the air mass meter ⇒ <a href="#">page 66</a></li> <li>– Check the coolant temperature sender ⇒ <a href="#">page 130</a></li> </ul> |
| P1336      | 17744 | Engine torque monitoring<br>Control limit exceeded                     |                                                                                                                                                                                                                                                                                                                                                                    |

22) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83- , refer to ⇒ [page 50](#) . This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert.

| Fault code |       | Fault message                                                              | Remedy                                                                                                                                                                                                                                                                                              |
|------------|-------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                            |                                                                                                                                                                                                                                                                                                     |
| P1340      | 17748 | Camshaft/crankshaft position sensor<br>Incorrect assignment <sup>23)</sup> | <ul style="list-style-type: none"> <li>– Unscrew the Hall sender and check for proper installation of the rotor ring at the camshaft (if incorrectly installed, the retainer tab will be squashed on tightening the bolt).</li> <li>– Additionally check the valve timing. ⇒ Rep. Gr. 13</li> </ul> |
| P1355      | 17763 | Ignition circuit cylinder 1<br>Open circuit <sup>23)</sup>                 | <ul style="list-style-type: none"> <li>– Check the ignition coils with output stages ⇒ <a href="#">page 118</a></li> </ul>                                                                                                                                                                          |
| P1356      | 17764 | Ignition circuit cylinder 1<br>Short to positive <sup>23)</sup>            |                                                                                                                                                                                                                                                                                                     |

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| Fault code |       | Fault message                                                | Remedy |
|------------|-------|--------------------------------------------------------------|--------|
| P1357      | 17765 | Ignition circuit cylinder 1<br>Short to earth <sup>23)</sup> |        |
| P1358      | 17766 | Ignition circuit cylinder 2<br>Open circuit <sup>23)</sup>   |        |

23) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

| Fault code |       | Fault message                                                   | Remedy                                                                   |
|------------|-------|-----------------------------------------------------------------|--------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                 |                                                                          |
| P1359      | 17767 | Ignition circuit cylinder 2<br>Short to positive <sup>24)</sup> | – Check the ignition coils with output stages <a href="#">⇒ page 118</a> |
| P1360      | 17768 | Ignition circuit cylinder 2<br>Short to earth <sup>24)</sup>    |                                                                          |
| P1361      | 17769 | Ignition circuit cylinder 3<br>Open circuit <sup>24)</sup>      |                                                                          |
| P1362      | 17770 | Ignition circuit cylinder 3<br>Short to positive <sup>24)</sup> |                                                                          |
| P1363      | 17771 | Ignition circuit cylinder 3<br>Short to earth <sup>24)</sup>    |                                                                          |
| P1364      | 17772 | Ignition circuit cylinder 4<br>Open circuit <sup>24)</sup>      |                                                                          |
| P1365      | 17773 | Ignition circuit cylinder 4<br>Short to positive <sup>24)</sup> |                                                                          |
| P1366      | 17774 | Ignition circuit cylinder 4<br>Short to earth <sup>24)</sup>    |                                                                          |

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24) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

| Fault code |       | Fault message                                                                               | Remedy                                                                                  |
|------------|-------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                             |                                                                                         |
| P1386      | 17794 | Control unit defective <sup>25)</sup>                                                       | – Replace the engine control unit<br><a href="#">⇒ page 45</a>                          |
| P1387      | 17795 | Control unit defective <sup>25)</sup>                                                       |                                                                                         |
| P1388      | 17796 | Control unit defective <sup>25)</sup> 3)                                                    |                                                                                         |
| P1410      | 17818 | Activated charcoal filter system solenoid valve 1 -N80-<br>Short to positive <sup>25)</sup> | – Check the activated charcoal filter system solenoid valve 1 <a href="#">⇒ page 86</a> |
| P1421      | 17829 | Secondary air inlet valve -N112-<br>Short to earth <sup>25)</sup>                           | Check the secondary air inlet valve -N112-<br><a href="#">⇒ Rep. Gr. 26</a>             |
| P1422      | 17830 | Secondary air inlet valve -N112-<br>Short to positive <sup>25)</sup>                        |                                                                                         |

25) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#). This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert.

| Fault code |       | Fault message | Remedy |
|------------|-------|---------------|--------|
| SAE        | V.A.G |               |        |



| Fault code |       | Fault message                                                  | Remedy                                                             |
|------------|-------|----------------------------------------------------------------|--------------------------------------------------------------------|
| P1424      | 17832 | Bank 1, secondary air system<br>Leak detected <sup>1)</sup>    | – Check hoses and components of secondary air system ⇒ Rep. Gr. 26 |
| P1425      | 17833 | Fuel tank breather valve -N80-<br>Short to earth <sup>1)</sup> |                                                                    |
| P1426      | 17834 | Fuel tank breather valve -N80-<br>Open circuit <sup>1)</sup>   |                                                                    |
| P1427      | 17835 | Actuation of vacuum pump for brakes<br>Short to positive       | For checking, refer to Running gear ⇒ Rep. Gr. 47                  |
| P1428      | 17836 | Actuation of vacuum pump for brakes<br>Short to earth          |                                                                    |
| P1429      | 17837 | Actuation of vacuum pump for brakes<br>Open circuit            |                                                                    |

| Fault code |       | Fault message                                                       | Remedy                                   |
|------------|-------|---------------------------------------------------------------------|------------------------------------------|
| SAE        | V.A.G |                                                                     |                                          |
| P1432      | 17840 | Secondary air inlet valve -N112-<br>Open circuit <sup>26)</sup>     | Check secondary air system ⇒ Rep. Gr. 26 |
| P1433      | 17841 | Secondary air pump relay -J299-<br>Open circuit <sup>26)</sup>      |                                          |
| P1434      | 17842 | Secondary air pump relay -J299-<br>Short to positive <sup>26)</sup> |                                          |
| P1435      | 17843 | Secondary air pump relay -J299-<br>Short to earth <sup>26)</sup>    |                                          |

26) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

| Fault code |       | Fault message                                                    | Remedy                                                         |
|------------|-------|------------------------------------------------------------------|----------------------------------------------------------------|
| SAE        | V.A.G |                                                                  |                                                                |
| P1501      | 17909 | Fuel pump relay -J17-<br>Short to earth <sup>27)</sup>           | – Check the fuel pump relay -J17-<br>⇒ <a href="#">page 62</a> |
| P1502      | 17910 | Fuel pump relay -J17-<br>Short to positive <sup>27)</sup>        |                                                                |
| P1519      | 17927 | Bank 1, variable valve timing<br>Malfunction <sup>27)</sup>      | Check the variable valve timing ⇒ Rep. Gr. 15                  |
| P1523      | 17931 | Crash signal from airbag CU<br>Implausible signal <sup>28)</sup> | Interrogate the airbag system fault memory                     |
| P1529      | 17937 | Variable valve timing<br>Short to positive <sup>27)</sup>        | Check the variable valve timing ⇒ Rep. Gr. 15                  |
| P1530      | 17938 | Variable valve timing<br>Short to earth <sup>27)</sup>           |                                                                |
| P1531      | 17939 | Variable valve timing<br>Open circuit <sup>27)</sup>             |                                                                |

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27) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to ⇒ [page 50](#).

28) This fault is stored in the event of a corresponding signal from the airbag control unit.

| Fault code |       | Fault message                                                                                                  | Remedy                                                                                                           |
|------------|-------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                                                |                                                                                                                  |
| P1539      | 17947 | Clutch pedal switch -F36-<br>Implausible signal <sup>29)</sup>                                                 | – Check the clutch pedal switch -F36-<br>⇒ <a href="#">page 104</a>                                              |
| P1541      | 17908 | Fuel pump relay -J17-<br>Open circuit <sup>29)</sup>                                                           | – Check the fuel pump relay -J17-<br>⇒ <a href="#">page 62</a>                                                   |
| P1542      | 17950 | Throttle valve drive angle sender 1 (electric<br>power control) -G187-<br>Implausible signal <sup>29)</sup> 3) | – Check the throttle valve drive angle<br>sender 1 (electric power control) -<br>G187- ⇒ <a href="#">page 96</a> |
| P1543      | 17951 | Throttle valve drive angle sender 1 (electric<br>power control) -G187-<br>Signal too low <sup>29)</sup> 3)     |                                                                                                                  |
| P1544      | 17952 | Throttle valve drive angle sender 1 (electric<br>power control) -G187-<br>Signal too high <sup>29)</sup> 3)    |                                                                                                                  |
| P1545      | 17953 | Throttle valve control<br>Malfunction <sup>29)</sup> 3)                                                        | – Check the throttle valve module<br>⇒ <a href="#">page 90</a>                                                   |

29) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#). This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert.

| Fault code |       | Fault message                                                     | Remedy                                                                    |
|------------|-------|-------------------------------------------------------------------|---------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                   |                                                                           |
| P1546      | 17954 | Charge pressure control solenoid valve -N75-<br>Short to positive | Check the charge pressure control sole-<br>noid valve -N75- ⇒ Rep. Gr. 21 |
| P1547      | 17955 | Charge pressure control solenoid valve -N75-<br>Short to earth    |                                                                           |
| P1548      | 17956 | Charge pressure control solenoid valve -N75-<br>Open circuit      |                                                                           |
| P1550      | 17958 | Charge pressure<br>Control difference                             |                                                                           |
| P1555      | 17963 | Maximum charge pressure exceeded                                  |                                                                           |
| P1556      | 17964 | Charge pressure control<br>Control limit not reached              |                                                                           |
| P1557      | 17965 | Charge pressure control<br>Control limit exceeded                 |                                                                           |

| Fault code |       | Fault message                                                                                             | Remedy                                                                |
|------------|-------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                                           |                                                                       |
| P1558      | 17966 | Throttle valve drive (electric power control) -<br>G186-<br>Electrical fault in circuit <sup>30)</sup> 3) | – Check the throttle valve module -J338-<br>⇒ <a href="#">page 90</a> |
| P1559      | 17967 | Throttle valve module -J338-<br>Fault in basic setting <sup>30)</sup>                                     | – Perform adaption ⇒ <a href="#">page 91</a>                          |
| P1560      | 17968 | Maximum engine speed<br>Exceeded                                                                          | – Repair mechanical damage                                            |
| P1564      | 17972 | Throttle valve module -J338-<br>Undervoltage in basic setting                                             | – Charge battery and repeat basic set-<br>ting                        |
| P1565      | 17973 | Throttle valve module -J338-<br>Lower stop not reached <sup>30)</sup> 3)                                  | – Check the throttle valve module<br>⇒ <a href="#">page 90</a>        |



| Fault code |       | Fault message                                                      | Remedy |
|------------|-------|--------------------------------------------------------------------|--------|
| P1568      | 17976 | Throttle valve module -J338-<br>Mechanical fault <sup>30)</sup> 3) |        |

30) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#). This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert.

| Fault code |       | Fault message                                            | Remedy                                                                                                  |
|------------|-------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                          |                                                                                                         |
| P1569      | 17977 | Cruise control system switch -E45-<br>Implausible signal | Interrogate the cruise control system fault memory                                                      |
| P1570      | 17978 | Engine control unit<br>Blocked                           | – Match the electronic immobilizer to the engine control unit                                           |
| P1579      | 17987 | Throttle valve module -J338-<br>Adaption not started     | – Observing the requirements, implement adaption of the throttle valve module <a href="#">⇒ page 91</a> |
| P1602      | 18010 | Voltage supply term. 30<br>Voltage too low               | – Check the control unit power supply <a href="#">⇒ page 132</a>                                        |

| Fault code |       | Fault message                                                    | Remedy                                                                                                                                                                               |
|------------|-------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                  |                                                                                                                                                                                      |
| P1603      | 18011 | Control unit defective <sup>31)</sup>                            | – Replace the engine control unit <a href="#">⇒ page 45</a>                                                                                                                          |
| P1604      | 18012 | Control unit defective <sup>31)</sup> 3)                         |                                                                                                                                                                                      |
| P1609      | 18017 | Crash deactivation triggered<br>(Crash triggered) <sup>31)</sup> | Interrogate the airbag system fault memory<br>– On completion of airbag system final control diagnosis, the engine control unit fault memory must be erased <a href="#">⇒ page 2</a> |

31) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#). This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert. This fault is stored in the event of a corresponding signal from the airbag control unit (also during airbag system final control diagnosis).

| Fault code |       | Fault message                                                      | Remedy                                                                                                                                                                      |
|------------|-------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                    |                                                                                                                                                                             |
| P1610      | 18018 | Control unit defective                                             | – Replace the engine control unit <a href="#">⇒ page 45</a>                                                                                                                 |
| P1612      | 18020 | Engine control unit wrongly coded <sup>32)</sup>                   | – Code engine control unit <a href="#">⇒ page 19</a>                                                                                                                        |
| P1624      | 18032 | Request for fault lamp ON active <sup>33)</sup>                    | – Emission-specific fault in gearbox control unit<br>– Read out the gearbox control unit fault memory. <a href="#">⇒ Automatic gearbox 01M, self-diagnosis; Rep. Gr. 01</a> |
| P1626      | 18034 | Drive system data bus<br>No message from gearbox CU <sup>32)</sup> | – Check data exchange between the engine control unit and other control units with CAN capability <a href="#">⇒ page 111</a>                                                |

32) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

33) The gearbox control unit has detected a fault with a detrimental effect on exhaust emissions. The gearbox control unit transmits the fault message to the engine control unit, which in turn activates the exhaust emissions warning lamp -K83-. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#). At the same time, the message P1624 in the engine control unit indicates that the fault lamp of the exhaust emissions warning lamp -K83- has been activated as a result of a gearbox problem, as opposed to an engine problem.

| Fault code |       | Fault message                                                                  | Remedy                                                              |
|------------|-------|--------------------------------------------------------------------------------|---------------------------------------------------------------------|
| SAE        | V.A.G |                                                                                |                                                                     |
| P1630      | 18038 | Accelerator position sender -G79-<br>Signal too low <sup>34)</sup> 3)          | – Check accelerator position sender -G79- <a href="#">⇒ page 98</a> |
| P1631      | 18039 | Accelerator position sender -G79-<br>Signal too high <sup>34)</sup> 3)         |                                                                     |
| P1633      | 18041 | Accelerator position sender 2 -G185-<br>Signal too low <sup>34)</sup> 3)       |                                                                     |
| P1634      | 18042 | Accelerator position sender 2 -G185-<br>Signal too high <sup>34)</sup> 3)      |                                                                     |
| P1639      | 18047 | Accelerator pedal sender 1/2 -G79+G185<br>Implausible signal <sup>34)</sup> 3) |                                                                     |

34) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp, refer to [⇒ page 50](#). This fault causes the engine control unit to activate the EPC warning lamp in the dash panel insert.

| Fault code |       | Fault message                                                      | Remedy                                                                                                                       |
|------------|-------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| SAE        | V.A.G |                                                                    |                                                                                                                              |
| P1640      | 18048 | Control unit defective <sup>35)</sup>                              | – Replace the engine control unit<br><a href="#">⇒ page 45</a>                                                               |
| P1648      | 18056 | Drive system data bus<br>Defective <sup>35)</sup>                  |                                                                                                                              |
| P1649      | 18057 | Drive system data bus<br>No message from ABS control unit          | – Check data exchange between the engine control unit and other control units with CAN capability <a href="#">⇒ page 111</a> |
| P1650      | 18058 | Drive system data bus<br>No message from dash panel insert         |                                                                                                                              |
| P1654      | 18062 | Please read out the dash panel insert fault memory                 |                                                                                                                              |
| P1682      | 18090 | Drive system data bus<br>Implausible message from ABS control unit | – Check data exchange between the engine control unit and other control units with CAN capability <a href="#">⇒ page 111</a> |
| P1853      | 18261 | Drive system data bus<br>Implausible message from ABS control unit |                                                                                                                              |
| P3078      | 19534 | Throttle valve module<br>Inadequate air throughput at idle         | – Clean the throttle valve module<br><a href="#">⇒ page 93</a>                                                               |

35) If this fault occurs within three consecutive driving cycles (engine operation for at least 5 seconds), the engine control unit activates the exhaust emissions warning lamp -K83- in the dash panel insert. For notes on the exhaust emissions warning lamp -K83-, refer to [⇒ page 50](#).

## 2.3 Final control diagnosis



### Note

- ◆ *Final control diagnosis can only be performed when engine is not running and ignition is switched on.*
- ◆ *The electric fuel pump runs continuously throughout the final control diagnosis.*
- ◆ *During final control diagnosis, the individual control elements (except for injectors) are actuated for roughly 1 minute unless the next control element is selected beforehand by pressing the  key.*
- ◆ *The control elements can be checked either by listening for audible clicks, etc. or by touching the component.*
- ◆ *The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.*
- ◆ *Before restarting the final control diagnosis the engine must be started and the ignition must be switched off and on again.*

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

| Activation sequence |                                                  |
|---------------------|--------------------------------------------------|
| 1                   | Activated charcoal filter solenoid valve 1 -N80- |
| 2                   | Secondary air inlet valve -N112-                 |
| 3                   | Secondary air pump relay -J299-                  |
| 4                   | Charge pressure control solenoid valve -N75-     |
| 5                   | Variable valve timing                            |
| 6                   | Turbocharger divert air valve -N249-             |
| 7                   | Injector, cylinder 1 -N30-                       |
| 8                   | Injector, cylinder 3 -N32-                       |
| 9                   | Injector, cylinder 4 -N33-                       |
| 10                  | Injector, cylinder 2 -N31-                       |
| 11                  | Vacuum pump for brakes <sup>36)</sup>            |

36) Vehicles with automatic gearbox only



### Note

*Engine electronics fuses OK ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine control unit. The ignition must be switched on when doing so.
- Select final control diagnosis.



### Note

*The fuel pump relay should be energised and the fuel pump should run. The fuel flow at the fuel pressure regulator should be distinctly audible. If the fuel pump does not run, check activation.*

- ◆ The 1st control element is the activated charcoal filter system solenoid valve 1 -N80-

The activated charcoal filter system solenoid valve 1 -N80- is actuated (clicks) for roughly 1 minute unless the next control element is selected beforehand by pressing the → key.

If the activated charcoal filter system solenoid valve 1 -N80- is not actuated (does not click):

- Check the activated charcoal filter system solenoid valve 1 -N80- ➔ [page 86](#) .

- ◆ The 2nd control element is the secondary air inlet valve -N112-

The secondary air inlet valve -N112- is actuated (clicks) for roughly 1 minute unless the next control element is selected beforehand by pressing the → key.

If the secondary air inlet valve -N112- is not actuated (does not click):

- Check the secondary air inlet valve -N112- ➔ Rep. Gr. 26 .

- ◆ The 3rd control element is the secondary air pump relay -J299-

The secondary air pump relay -J299- (in the 3-position relay carrier in the plenum chamber electronics box on the left, position 2) switches the secondary air pump motor -V101- on and off intermittently for roughly 1 minute unless the next control element is selected beforehand by pressing the → key.

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If the secondary air pump motor -V101- does not operate intermittently:

- Check the secondary air pump relay -J299- ➔ Rep. Gr. 26 .

- ◆ The 4th control element is the charge pressure control solenoid valve -N75-

This charge pressure control solenoid valve -N75- is actuated (clicks) for roughly 1 minute unless the next control element is selected beforehand by pressing the → key.

If the charge pressure control solenoid valve -N75- is not actuated (does not click):

- Check the charge pressure control solenoid valve -N75- ➔ Rep. Gr. 21 ; .

- ◆ The 5th control element is the camshaft adjustment valve

This valve is actuated (clicks) for roughly 1 minute unless the next control element is selected beforehand by pressing the → key.

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

- Check the camshaft adjustment valve ➔ Rep. Gr. 15 .

- ◆ The 6th control element is the turbocharger divert air valve -N249-

This valve is actuated (clicks) for roughly 1 minute unless the next control element is selected beforehand by pressing the → key.

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

- Check the turbocharger divert air valve -N249- ➔ Rep. Gr. 21 .

- ◆ The 7th, 8th, 9th and 10th control elements are the injectors

- All the injectors are to be checked consecutively in this manner.

If one of the injectors is not actuated (does not click):

- Check the injectors ⇒ [page 55](#) .

**Note**

*The following control element is only fitted on vehicles with automatic gearbox.*

- ◆ The 11th control element is the vacuum pump for brakes

The brake servo vacuum pump at the bulkhead on the right must start up intermittently for roughly 1 minute unless final control diagnosis is terminated beforehand by pressing the → key.

If the brake servo vacuum pump does not operate intermittently:

- Check brake servo vacuum pump: Running gear ⇒ Rep. Gr. 47

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*Before repeating final control diagnosis, the engine must be started and the ignition switched off and on again.*

## 2.4 Basic setting

**The following operation can be implemented with the basic setting function "Function 04" with the engine stopped and the ignition switched on:**

- ◆ Adaption of throttle valve module to engine control unit ⇒ Display group 060 ( ⇒ [page 91](#) )
- ◆ Vehicles with automatic gearbox: Adaption of kickdown function of accelerator position sender to engine control unit ⇒ Display group 063

**The following operation can be implemented with the basic setting function with the engine running:**

- ◆ Lambda control adaption ⇒ [page 71](#)

**Note**

- ◆ *No faults stored in fault memory.*
- ◆ *Coolant temperature at least 80 °C.*
- ◆ *Electrical equipment switched off (radiator fan must not run during the test).*
- ◆ *Air conditioner switched off.*
- ◆ *Vehicles with automatic gearbox: selector lever in position P or N*

### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine control unit. The ignition must be switched on when doing so.

Or, depending on desired operation:

- Start engine.
- Select basic setting.
- Enter the desired display group number.

### Example:

- Enter “000” for “Display group number 000” and confirm with the  key.



### Note

After selecting the display group number, the ACF valve is closed and the air conditioner compressor switched off.

| Display group 000 (decimal readouts)                  |   |   |   |   |   |   |   |   |    |                                                              |
|-------------------------------------------------------|---|---|---|---|---|---|---|---|----|--------------------------------------------------------------|
| • Engine idling (coolant temperature at least 80 ° C) |   |   |   |   |   |   |   |   |    |                                                              |
| 1                                                     | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ▼ Display zones                                              |
|                                                       |   |   |   |   |   |   |   |   | 0  | Learnt value for mixture formation at part throttle          |
|                                                       |   |   |   |   |   |   |   |   |    | 103...153                                                    |
|                                                       |   |   |   |   |   |   |   |   |    | Learnt value for mixture formation at idling speed           |
|                                                       |   |   |   |   |   |   |   |   |    | 78...178                                                     |
|                                                       |   |   |   |   |   |   |   |   |    | Control value for mixture formation                          |
|                                                       |   |   |   |   |   |   |   |   |    | 115...141                                                    |
|                                                       |   |   |   |   |   |   |   |   |    | Learnt values for torque loss at idling speed                |
|                                                       |   |   |   |   |   |   |   |   |    | 113...143                                                    |
|                                                       |   |   |   |   |   |   |   |   |    | Torque at idling speed                                       |
|                                                       |   |   |   |   |   |   |   |   |    | 106...189                                                    |
|                                                       |   |   |   |   |   |   |   |   |    | Throttle valve angle                                         |
|                                                       |   |   |   |   |   |   |   |   |    | 1...10                                                       |
|                                                       |   |   |   |   |   |   |   |   |    | Voltage of on-board electrical system                        |
|                                                       |   |   |   |   |   |   |   |   |    | 142...206                                                    |
|                                                       |   |   |   |   |   |   |   |   |    | Engine speed (idling speed)                                  |
|                                                       |   |   |   |   |   |   |   |   |    | 70...84                                                      |
|                                                       |   |   |   |   |   |   |   |   |    | 64...76                                                      |
|                                                       |   |   |   |   |   |   |   |   |    | • Front-wheel drive and four-wheel drive with manual gearbox |
|                                                       |   |   |   |   |   |   |   |   |    | 700...840 rpm                                                |
|                                                       |   |   |   |   |   |   |   |   |    | • Front-wheel drive with automatic gearbox                   |
|                                                       |   |   |   |   |   |   |   |   |    | 640...760 rpm                                                |
|                                                       |   |   |   |   |   |   |   |   |    | Engine load (without electrical consumers)                   |
|                                                       |   |   |   |   |   |   |   |   |    | 14...39                                                      |
|                                                       |   |   |   |   |   |   |   |   |    | 10...30%                                                     |
|                                                       |   |   |   |   |   |   |   |   |    | Coolant temperature (requirement for basic setting)          |
|                                                       |   |   |   |   |   |   |   |   |    | 180...210                                                    |
|                                                       |   |   |   |   |   |   |   |   |    | 80...110 °C                                                  |

## 2.5 Encoding control unit

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine control unit. The ignition must be switched on when doing so.
- Select the function “Code control unit” and confirm.
- Enter the control unit code in line with the encoding table [⇒ page 19](#).

### Meaning of coding

|    |   |                            |
|----|---|----------------------------|
| XX |   | Country/emissions          |
|    | X | Drive/additional functions |
|    | X | Gearbox                    |
|    | X | Vehicle model              |

| Example of coding |                                                                                          |
|-------------------|------------------------------------------------------------------------------------------|
| 11500             | EU4 (emission standard), front-wheel drive with TCS/ESP, 5-speed manual gearbox, Audi A3 |

### 2.5.1 Coding table

|                   |    |                         |
|-------------------|----|-------------------------|
| Country/emissions | 05 | EU3 (emission standard) |
|-------------------|----|-------------------------|



|                            |        |                                                                                                         |
|----------------------------|--------|---------------------------------------------------------------------------------------------------------|
|                            | 1<br>0 | EU3 (emission standard); code 10 must be set for EU3 vehicles following engine control unit replacement |
|                            | 1<br>1 | EU4 (emission standard)                                                                                 |
| Drive/additional functions | 0      | Front-wheel drive without traction control system / ESP                                                 |
|                            | 2      | Four-wheel drive without traction control system                                                        |
|                            | 5      | Front-wheel drive with traction control system / ESP                                                    |
|                            | 7      | Four-wheel drive with Electronic Stability Program                                                      |
| Gearbox                    | 0      | 5-speed manual gearbox                                                                                  |
|                            | 1      | 6-speed manual gearbox                                                                                  |
|                            | 3      | Automatic gearbox (4-speed)                                                                             |
|                            | 5      | Automatic gearbox (5-speed)                                                                             |
| Vehicle model              | 0      | Audi A3                                                                                                 |

**Note**

All exchange engine control units are pre-encoded to 11500 (EU4 emission standard); for EU3 vehicles the engine control unit must be correspondingly re-encoded to 10xx0 (in line with encoding table).

## 2.6 Reading measured value block

**Note**

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

**Test sequence**

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine control unit. The engine must be idling when doing so.
- Select measured value block.
- Enter the desired display group number.

**Example:**

- Enter "000" for "Display group number 000" and confirm with the key.

## 2.7 Readiness code

The readiness code appears as an 8-position display in measured value block 086, display zone 1. Each of the 8 positions is assigned to a particular emission-specific system.

In the event of a test series which has to be implemented in full, the self-diagnosis checks the operation of each of these systems and sets the corresponding position in the 8-position display from "1" to "0" following successful completion of the test.

If the readiness code was generated following successful completion of a test series, it will be "0 0 0 0 0 0 0 0" (measured value block 086, display zone 1).



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If an individual test is implemented in full but is "not OK", an entry is made in the fault memory. Interrogate fault memory ⇒ [page 2](#).

The readiness code is reset to "0 1 1 0 1 1 0 1" if:

- ◆ The fault memory has been erased,
- ◆ The power supply to the engine control unit has been interrupted (e.g. connector unplugged, battery disconnected)
- ◆ A new engine control unit is installed

In this case, the readiness code must be generated again  
⇒ [page 22](#).



#### Note

*The emission-specific tests are implemented by the control unit whilst driving in various load situations and the readiness code is automatically generated. In such cases, however, there is no provision for performing a final check; in other words there is no visible confirmation that the vehicle is in perfect working order when handed over to the customer.*

## 2.7.1 Reading out readiness code

### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function "Read measured value block" and confirm.
- Select "Display group number 086" and confirm.
- Check the readiness code in display zone 1
- ◆ Specification: 0 0 0 0 0 0 0 0

|                                   | Display zones                                            |                                    |                                    |   |
|-----------------------------------|----------------------------------------------------------|------------------------------------|------------------------------------|---|
|                                   | 1                                                        | 2                                  | 3                                  | 4 |
| Display group 086: Readiness code |                                                          |                                    |                                    |   |
| Readout                           | 0 0 0 0 0 0 0 0                                          | X X X X X X X X                    | X X X X X X X X                    |   |
| Display shows                     | Ready bits<br>Tests completed                            | Individual tests performed         | Individual tests performed         |   |
| Operating range                   | 1 = Not completed<br>0 = Completed                       | 1 = Not completed<br>0 = Completed | 1 = Not completed<br>0 = Completed |   |
| Specification                     | 0 0 0 0 0 0 0 0                                          | X X X X X X X X                    | X X X X X X X X                    |   |
| Note                              | Significance of readiness code ⇒ <a href="#">page 21</a> |                                    |                                    |   |



#### Note

*Display zone 1 is of primary importance. This display indicates which system has been checked by the self-diagnosis since the fault memory was last erased or since installation of a new control unit. After erasing the fault memory, all values which can be checked are set to "1". On successful completion of a test, the values are set to "0".*

X X X X X X X X Notes on display group 086, display zone 1

|                                                                                         |
|-----------------------------------------------------------------------------------------|
| Catalytic converter diagnosis                                                           |
| ◆ Readout 0 = Test performed                                                            |
| ◆ Display 1 = Test not performed (readiness code generation ⇒ <a href="#">page 22</a> ) |
| Display always 0                                                                        |
| Activated charcoal filter system                                                        |
| ◆ Readout 0 = Test performed                                                            |
| ◆ Display 1 = Test not performed (readiness code generation ⇒ <a href="#">page 22</a> ) |
| Secondary air system                                                                    |
| ◆ Readout 0 = Test performed                                                            |
| ◆ Display 1 = Test not performed (readiness code generation ⇒ <a href="#">page 22</a> ) |
| Display always 0                                                                        |
| Lambda probes                                                                           |
| ◆ Readout 0 = Test performed                                                            |
| ◆ Display 1 = Test not performed (readiness code generation ⇒ <a href="#">page 22</a> ) |
| Lambda probe heating                                                                    |
| ◆ Readout 0 = Test performed                                                            |
| ◆ Display 1 = Test not performed (readiness code generation ⇒ <a href="#">page 22</a> ) |
| Display always 0                                                                        |



### Note

*The readiness code is only generated if all display positions in zone 1 are set to "0"*

If the reading matches the specification "0 0 0 0 0 0 0" in display zone 1:

- Press the  key.
- Interrogate the fault memory as a check ⇒ [page 2](#) (there should not be any faults stored).

If specification is not obtained:

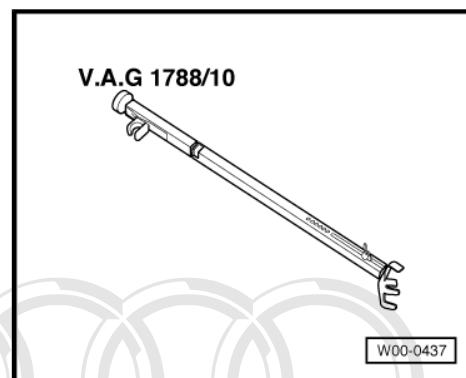
- Generate readiness code ⇒ [page 22](#) .

## 2.7.2 Generating readiness code

Special tools and workshop equipment required

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- ◆ Engine speed adjuster -V.A.G 1788/10-



 **Note**

- ◆ *Vehicle is stationary.*
- ◆ *Vehicles with automatic gearbox: selector lever in position P or N*
- ◆ *Electrical equipment switched off (radiator fan must not run during the test).*
- ◆ *Air conditioner switched off.*
- ◆ *Coolant temperature at least 80 °C ⇒ Display group 004, display zone 3. Important: Warm up engine if possible by means of a test drive.*

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 **Note**

*If, within a given step, "OK" is immediately displayed as test result following selection of a display group, the test has already been implemented and it is possible to proceed with the next step.*

### Work step 1: Interrogating fault memory

 **Note**

*Engine stopped, ignition switched on*

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit.
- Select the function "Interrogate fault memory".

The display will show the number of faults stored in the memory or "No fault detected!".

If a fault has been stored:

- Eliminate fault, erase fault memory. Perform test drive and interrogate fault memory again as a check.

If there are no faults stored:

- Press the  key.

## Work step 2: Erasing fault memory



### Note

*Engine stopped, ignition switched on*

- Select the function “Erase fault memory”.



### Note

*The readiness code is reset on erasing the fault memory and must therefore be generated again.*

- Press the  key.

## Work step 3: Adapting throttle valve module to engine control unit



### Note

*Engine stopped, ignition switched on*

- Select the function “Start basic setting”.
- Select “Display group number 060” and confirm.
- Check the specifications in display zones 3 and 4:

|                                                      | Display zones                         |                                       |                                                                                                   |                                                                              |
|------------------------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|                                                      | 1                                     | 2                                     | 3                                                                                                 | 4                                                                            |
| Display group 060: Adaption of throttle valve module |                                       |                                       |                                                                                                   |                                                                              |
| Readout                                              | xx %                                  | xx %                                  | x                                                                                                 | ---                                                                          |
| Display shows                                        | Throttle valve angle (angle sender 1) | Throttle valve angle (angle sender 2) | Adaption step counter                                                                             | Adaption status                                                              |
| Operating range                                      |                                       |                                       | 0...8                                                                                             | ADP in progress<br>ADP OK<br>ERROR                                           |
| Specification                                        | 3...93 %                              | 97...3 %                              | 8                                                                                                 | ADP OK                                                                       |
| Note                                                 |                                       |                                       | Following adaption, the adaption step counter reaches the number 8 (numbers may also be skipped). | If “ERROR” is displayed: Interrogate fault memory <a href="#">⇒ page 2</a> . |

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### Note

*During adaption, different numbers representing the respective adaption status are displayed in zone 3. The crucial factor is not the behaviour of the adaption step counter (display zone 3) during adaption, but rather that the specification “ADP OK” is displayed in zone 4 after adaption.*

If the reading matches the specification “ADP OK”:

- Press the  key.

## Work step 4: Adapting kickdown function <sup>37)</sup>

37) Vehicles with automatic gearbox only



### Note

*Engine stopped, ignition switched on*

- Select “Display group number 063”.



### Note

*You will then be given the prompt “Operate kickdown”.*

- Fully depress accelerator pedal beyond kickdown point and keep it pressed.



### Note

*During kick-down point adaption the display on -V.A.G 1551- shows “Kick-down ADP. running”. Following successful kick-down point adaption, the display on -V.A.G 1551- will show “Kick-down ADP. OK”.*

- Check the readout in display zone 4:

|                                               | Display zones                                                                                                                                                                                                                                                                     |                                                     |          |                                                                               |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------|-------------------------------------------------------------------------------|
|                                               | 1                                                                                                                                                                                                                                                                                 | 2                                                   | 3        | 4                                                                             |
| Display group 063: Adapting kickdown function | 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. |                                                     |          |                                                                               |
| Readout                                       | xx %                                                                                                                                                                                                                                                                              | xx %                                                | Kickdown | ---                                                                           |
| Display shows                                 | Accelerator position sender 1                                                                                                                                                                                                                                                     | Learnt kickdown value/accelerator position sender 1 | Kickdown | Adaption status                                                               |
| Range                                         |                                                                                                                                                                                                                                                                                   |                                                     | Kickdown | depress<br>ADP. running<br>ADP. OK<br>ERROR                                   |
| Specification                                 | 79...94 %                                                                                                                                                                                                                                                                         | 79...94 %                                           | Kickdown | ADP. O.K.                                                                     |
| Note                                          |                                                                                                                                                                                                                                                                                   |                                                     |          | If display shows “ERROR”: Interrogate fault memory ⇒ <a href="#">page 2</a> . |



### Note

*“ERROR” may be displayed for example if the accelerator pedal is not floored immediately after the tester prompt or if the accelerator pedal is released whilst the adaption process is still running and has not yet been completed. In both cases, exit from “Basic setting” mode and repeat the adaption process.*

If the reading matches the specification “ADP OK”:

- Press the  key.

## Work step 5: Checking operating status of Lambda control

- Start engine (on vehicles with manual gearbox: press clutch pedal)



### Note

After starting the engine it may be necessary to re-select the engine control unit with "address word" 01 and to start the "Basic setting" function with "04".

- Fit engine speed adjuster -V.A.G 1788/10- on accelerator pedal and increase engine speed to 2000 rpm.



### Note

Engine running at 2000 rpm

- Select "Display group number 030".
- Check the lambda probe status in display zones 1 and 2.

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### Note

It may take several minutes to obtain the result of diagnosis.

|                                        | Display zones                       |                                     |   |   |
|----------------------------------------|-------------------------------------|-------------------------------------|---|---|
|                                        | 1                                   | 2                                   | 3 | 4 |
| Display group 030: Lambda probe status |                                     |                                     |   |   |
| Readout                                | X X X                               | X X X                               |   |   |
| Display shows                          | Lambda probe status bank 1, probe 1 | Lambda probe status bank 1, probe 2 |   |   |
| Operating range                        | 0 = off<br>1 = on                   | 0 = off<br>1 = on                   |   |   |
| Specification                          | 1 1 1                               | 1 1 0                               |   |   |

| Significance of 3-position displays in display group 030 |   |   |                                                            |
|----------------------------------------------------------|---|---|------------------------------------------------------------|
| X                                                        | X | X | Display zones 1 and 2                                      |
|                                                          |   | X | Lambda control: 0 = not active; 1 = active                 |
|                                                          | X |   | Lambda probe condition: 0 = not active; 1 = active         |
| X                                                        |   |   | Lambda probe heating condition: 0 = not active; 1 = active |



### Note

- ◆ The first position of the 3-position display (heating) fluctuates between 0 and 1 at certain operating points.
- ◆ Lambda control of the lambda probe downstream of the catalytic converter (bank 1, probe 2) is not active without engine load, that is, the 3rd position of the 3-position display is 0.

- Do not continue with testing until the displays have reached “111” in display zone 1 and “110” in display zone 2 at least once.

#### Work step 6: Diagnosis of ageing of Lambda probe before catalytic converter

##### Note

*Engine still running at 2000 rpm.*

- Select “Display group number 034”.
- Check the specification in display zone 4:

##### Note

*It may take several minutes to obtain the result of diagnosis.*

|                                                                                            | Display zones |                         |                |                                                                                         |
|--------------------------------------------------------------------------------------------|---------------|-------------------------|----------------|-----------------------------------------------------------------------------------------|
|                                                                                            | 1             | 2                       | 3              | 4                                                                                       |
| Display group 034: Diagnosis of ageing of Lambda probe before catalytic converter (bank 1) |               |                         |                |                                                                                         |
| Readout                                                                                    | xxxx rpm      | xxx °C                  | x.x            | ---                                                                                     |
| Display shows                                                                              | Engine speed  | Exhaust gas temperature | Dynamic factor | Diagnosis status                                                                        |
| Operating range                                                                            |               |                         |                | Test OFF<br>Test ON<br>B1-S1 OK<br>B1-S1 n.OK                                           |
| Specification                                                                              | 2000 rpm      | Greater than 350 °C     | 0.5...2.5      | B1 - S1 OK                                                                              |
| Note                                                                                       |               |                         |                | If display shows "B1 - S1 n.OK": interrogate fault memory<br>⇒ <a href="#">page 2</a> . |

If the reading matches the specification "B1 - S1 OK":

- Press the  key.

#### Work step 7: Diagnosis of condition of Lambda probe after catalytic converter

##### Note

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*Engine still running at 2000 rpm.*

- Select “Display group number 036”.
- Check the specification in display zone 2:

|                                                                                 | Display zones                           |                  |   |   |
|---------------------------------------------------------------------------------|-----------------------------------------|------------------|---|---|
|                                                                                 | 1                                       | 2                | 3 | 4 |
| Display group 036: Condition of Lambda probe after catalytic converter (bank 1) |                                         |                  |   |   |
| Readout                                                                         | x.xxx V                                 | ---              |   |   |
| Display shows                                                                   | Lambda probe voltage<br>bank 1, probe 2 | Diagnosis status |   |   |



| Display zones   |                 |                                                                                       |  |  |
|-----------------|-----------------|---------------------------------------------------------------------------------------|--|--|
| Operating range |                 | Test OFF<br>Test ON<br>B1 - S2 OK<br>B1 - S2 n.OK                                     |  |  |
| Specification   | 0.100...0.950 V | B1 - S2 OK                                                                            |  |  |
| Note            |                 | If display shows "B1 - S2 n.OK": interrogate fault memory<br>⇒ <a href="#">page 2</a> |  |  |

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If the reading matches the specification "B1 - S2 OK":

- Press the key.

#### Work step 8: Diagnosis of Lambda control system



#### Note

Engine still running at 2000 rpm.

- Select "Display group number 037".
- Check the specification in display zone 4:

| Display zones                                                  |           |                                      |                                                                     |                                                                                    |
|----------------------------------------------------------------|-----------|--------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                                                                | 1         | 2                                    | 3                                                                   | 4                                                                                  |
| Display group 037: Diagnosis of Lambda control system (bank 1) |           |                                      |                                                                     |                                                                                    |
| Readout                                                        | xxx %     | x.xxx V                              | x.xx                                                                | ---                                                                                |
| Display shows                                                  | Load      | Lambda probe voltage bank 1, probe 2 | Lambda correction value between bank 1, probe 1 and bank 1, probe 2 | Diagnosis status                                                                   |
| Operating range                                                |           |                                      |                                                                     | Test OFF<br>Test ON<br>Syst. OK<br>Syst. n.OK                                      |
| Specification                                                  | 13...40 % | 0.100...0.950 V                      | Less than 0.02                                                      | Syst. OK                                                                           |
| Note                                                           |           |                                      |                                                                     | If display shows "Syst. n.OK": interrogate fault memory ⇒ <a href="#">page 2</a> . |

If the reading matches the specification "Syst. OK":

- Press the key.

#### Work step 9: Diagnosis of ageing of Lambda probe after catalytic converter



#### Note

Engine still running at 2000 rpm.

- Select "Display group number 043".
- Check the specification in display zone 4:

|                                                                                           | Display zones |                         |                                      |                                                                                         |
|-------------------------------------------------------------------------------------------|---------------|-------------------------|--------------------------------------|-----------------------------------------------------------------------------------------|
|                                                                                           | 1             | 2                       | 3                                    | 4                                                                                       |
| Display group 043: Diagnosis of ageing of Lambda probe after catalytic converter (bank 1) |               |                         |                                      |                                                                                         |
| Readout                                                                                   | xxxx rpm      | xxx °C                  | x.xxx V                              | ---                                                                                     |
| Display shows                                                                             | Engine speed  | Exhaust gas temperature | Lambda probe voltage bank 1, probe 2 | Diagnosis status                                                                        |
| Operating range                                                                           |               |                         |                                      | Test OFF<br>Test ON<br>B1 - S2 OK<br>B1 - S2 n.OK                                       |
| Specification                                                                             | 2000 rpm      | Greater than 350 °C     | 0.100...0.950 V                      | B1 - S2 OK                                                                              |
| Note                                                                                      |               |                         |                                      | If display shows "B1 - S2 n.OK": interrogate fault memory<br>⇒ <a href="#">page 2</a> . |

If the reading matches the specification "B1 - S2 OK":

- Press the  key.

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#### Work step 10: Diagnosis of catalytic converter



#### Note

*Engine still running at 2000 rpm.*

- Select "Display group number 046".
- Check the specifications in display zones 2 and 4:



#### Note

*The test duration for catalytic converter diagnosis is approximately 60 seconds.*

|                                                              | Display zones |                                                                                                                                         |                               |                                                                                                                                                |
|--------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | 1             | 2                                                                                                                                       | 3                             | 4                                                                                                                                              |
| Display group 046: Diagnosis of catalytic converter (bank 1) |               |                                                                                                                                         |                               |                                                                                                                                                |
| Readout                                                      | xxxx rpm      | xxx °C                                                                                                                                  | x.xx                          | ---                                                                                                                                            |
| Display shows                                                | Engine speed  | Exhaust gas temperature                                                                                                                 | Measured value CAT conversion | Diagnosis status                                                                                                                               |
| Operating range                                              |               |                                                                                                                                         | 0...8                         | Test OFF<br>Test ON<br>CAT B1 OK<br>CAT B1 n.OK                                                                                                |
| Specification                                                | 2000 rpm      | Greater than 440 °C                                                                                                                     | Greater than 1.0              | Cat B1 OK                                                                                                                                      |
| Note                                                         |               | The test is not started if the exhaust gas temperature is not within the specified range. Increase or reduce engine speed if necessary. |                               | If display shows "Cat B1 n.OK": interrogate fault memory<br>⇒ <a href="#">page 2</a> . If no fault has been stored, renew catalytic converter. |



If reading matches specification "CAT B1 OK":

- Press the  key.

### Work step 11: Diagnosis of fuel tank breather valve

- Remove the speed setting tool -V.A.G 1788/10- and leave the engine idling.



#### Note

*Engine idling.*

- Select "Display group number 070".
- Check the specification in display zone 4:



#### Note

*If the test is not started or if the display switches from "Test ON" to "Test OFF", give a brief burst of throttle and the test will be repeated.*

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|                                                          | Display zones                                 |                                       |   |                                                                                                                                                                                 |
|----------------------------------------------------------|-----------------------------------------------|---------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                          | 1                                             | 2                                     | 3 | 4                                                                                                                                                                               |
| Display group 070: Diagnosis of fuel tank breather valve |                                               |                                       |   |                                                                                                                                                                                 |
| Readout                                                  | xx %                                          | xx %                                  |   | ---                                                                                                                                                                             |
| Display shows                                            | Degree of opening of fuel tank breather valve | Lambda control diagnosis value        |   | Diagnosis status                                                                                                                                                                |
| Operating range                                          |                                               |                                       |   | Test OFF<br>Test ON<br>TBV OK<br>TBV n.OK<br>Abort                                                                                                                              |
| Specification                                            | 0...99 %                                      | Less than -7 %<br>or greater than 7 % |   | TBV OK                                                                                                                                                                          |
| Note                                                     |                                               |                                       |   | If display shows "TBV n.OK": interrogate fault memory ⇒ <a href="#">page 2</a> .<br>Check the activated charcoal filter system solenoid valve 1 -N80- ⇒ <a href="#">page 86</a> |

If specified value "TBV. OK" is attained:

- Press the  key.

### Work step 12: Diagnosis of secondary air system



#### Note

*Engine idling.*

 **Note**

*The secondary air pump operates for several seconds during secondary air system diagnosis.*

- Select “Display group number 077”.
- Abruptly floor the accelerator pedal and release it again (brief burst of throttle of at least 2500 rpm).
- Check the specification in display zone 4:

 **Note**

*The secondary air system test duration is approximately 60 seconds.*

|                                                               | Display zones                                                |           |                                                |                                                                                    |
|---------------------------------------------------------------|--------------------------------------------------------------|-----------|------------------------------------------------|------------------------------------------------------------------------------------|
|                                                               | 1                                                            | 2         | 3                                              | 4                                                                                  |
| Display group 077: Diagnosis of secondary air system (bank 1) |                                                              |           |                                                |                                                                                    |
| Readout                                                       | xxxx rpm                                                     | xx.x g/s  | xx %                                           | ---                                                                                |
| Display shows                                                 | Engine speed                                                 | Air mass  | Relative air mass bank 1, secondary air system | Diagnosis status                                                                   |
| Operating range                                               |                                                              |           |                                                | Test OFF<br>Test ON<br>Syst. OK<br>Syst. n.OK<br>Abort                             |
| Specification                                                 | 700...840 rpm <sup>38)</sup><br>640...760 rpm <sup>39)</sup> | 2...5 g/s | Greater than -20 %                             | Syst. OK                                                                           |
| Note                                                          |                                                              |           |                                                | If display shows “Syst. n.OK”: interrogate fault memory ➔ <a href="#">page 2</a> . |

38) Manual gearbox, front and four-wheel drive

39) Automatic gearbox, front-wheel drive

If the reading matches the specification “Syst. OK”:

- Press the  key.

**Work step 13: Reading out readiness code**

- Read out the readiness code again ➔ [page 21](#).

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## 24 – Mixture preparation - injection

### 1 Servicing Motronic injection system

#### 1.1 Safety precautions

Note the following if testers and measuring instruments have to be used during a test drive:



#### WARNING

- ◆ *Test equipment must always be secured on the rear seat and operated from that position by a second person.*
- ◆ *If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, the person sitting in this seat could be seriously injured when the airbag is triggered.*

Note the following to avoid possible injury and/or the destruction of electrical and electronic components:

- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ *If the engine is to be operated at cranking speed without it starting (e.g. compression test), unplug the connectors from the ignition coils and injectors.*
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The fault memory should therefore be interrogated and (if necessary) erased after completing all tests and performing any repair work. The readiness code must be generated after erasing the fault memory ⇒ [page 22](#).
- ◆ 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

*The fuel system is pressurised. Wrap a cloth around the connection before opening the system. Then dissipate pressure by carefully unfastening the connection.*

#### 1.2 Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following "6 rules":

- ◆ Thoroughly clean all unions and surrounding areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts

that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).

- ◆ When the system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.
- ◆ Unplugged electrical connectors must be kept clean and dry. Make sure connections are dry when attaching.

### 1.3 Technical data

| Engine code letters                                                               |                                  | ARX, AUM (1.8 l / 5V / 110 kW engine)<br>ARY, AUQ (1.8 l / 5V / 132 kW engine)                                                     |
|-----------------------------------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Idling speed<br>Speed cannot be adjusted, regulated by idling speed stabilisation |                                  | 700 ... 840 rpm (manual gearbox, front-wheel drive and four-wheel drive)<br>640 ... 760 rpm (automatic gearbox, front-wheel drive) |
| Engine speed limitation by way of injector deactivation                           |                                  | approx. 6800 rpm                                                                                                                   |
| Fuel pressure at idle                                                             | Vacuum hose connected            | approx. 2.5 bar                                                                                                                    |
|                                                                                   | Vacuum hose disconnected         | approx. 3.0 bar                                                                                                                    |
| Residual pressure after 10 min                                                    |                                  | min. 1.5 bar                                                                                                                       |
| Injectors                                                                         | Spray pattern                    | Two-hole injector / same for all injectors                                                                                         |
|                                                                                   | Injection quantity (30 seconds)  | 145 ± 12 ml                                                                                                                        |
|                                                                                   | Resistance (ambient temperature) | 12 ... 13 Ω                                                                                                                        |

### 1.4 Overview of fitting locations



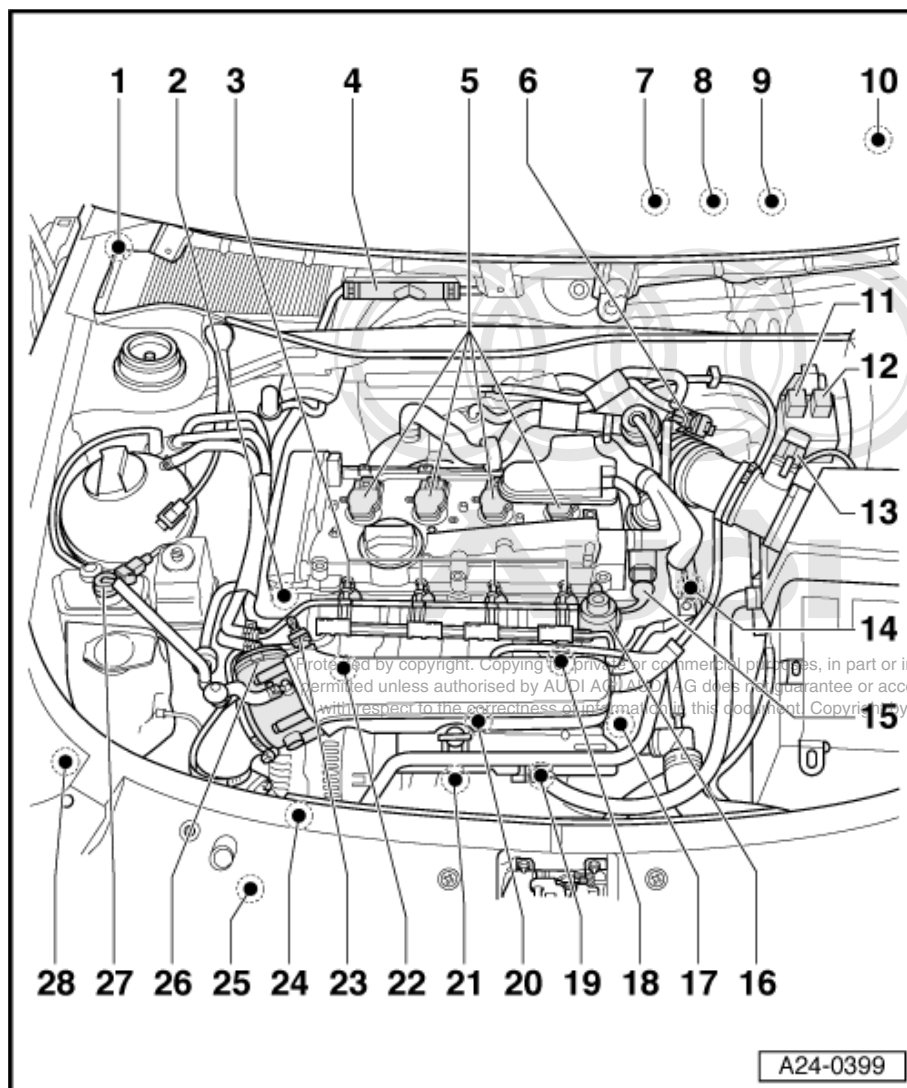
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# 1 - Lambda probe -G39- with Lambda probe heater -Z19-

- ❑ For fitting locations of Lambda probes and protective cover for connectors, refer to  
⇒ [page 37](#) ,  
⇒ [page 37](#)
- ❑ For marking of connectors for Lambda probes, refer to ⇒ [page 37](#) ,  
⇒ [page 37](#)
- ❑ Checking Lambda probe and lambda control upstream of catalytic converter ⇒ [page 69](#)
- ❑ Checking for ageing of Lambda probe upstream of catalytic converter ⇒ [page 74](#)
- ❑ Checking heating for Lambda probe upstream of catalytic converter ⇒ [page 76](#)
- ❑ Removing and installing  
⇒ [page 85](#)

# 1 - Lambda probe, after cata- lytic converter -G130- with Lambda probe heater 1, after catalytic converter -Z29-

- ❑ For fitting locations of Lambda probes and protective cover for connectors, refer to  
⇒ [page 37](#)
- ❑ For marking of connec-



- tors for Lambda probes,  
refer to [⇒ page 37](#) , [⇒ page 37](#)
- ☐ Checking Lambda probe and lambda control downstream of catalytic converter [⇒ page 78](#)
  - ☐ Checking heating for Lambda probe downstream of catalytic converter [⇒ page 82](#)
  - ☐ Removing and installing [⇒ page 85](#)
- 2 - Hall sender -G40-**
- ☐ Checking [⇒ page 137](#)
- 3 - Injector, cylinder 1 -N30- ... injector, cylinder 4 -N33-**
- ☐ Checking [⇒ page 55](#)
  - ☐ Removing and installing [⇒ page 59](#)
- 4 - Motronic control unit -J220-**
- ☐ Checking voltage supply of engine control unit [⇒ page 132](#)
  - ☐ Replacing [⇒ page 45](#)
- 5 - Ignition coil 1 with output stage -N- , ignition coil 2 -N128- , ignition coil 3 -N158- , ignition coil 4 -N163-**
- ☐ Checking [⇒ page 118](#)
- 6 - Solenoid valve for charge pressure control -N75-**
- ☐ Checking: 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 21
- 7 - Accelerator pedal position sender -G79- and accelerator pedal position sender 2 -G185-**
- ☐ Fitting location [⇒ page 37](#)
  - ☐ Checking [⇒ page 98](#)
  - ☐ Kick-down function adaption for vehicles with automatic gearbox [⇒ page 100](#)
- 8 - Brake light switch -F- and brake pedal switch -F47-**
- ☐ Fitting location [⇒ page 38](#) , [⇒ page 38](#)
- 9 - Clutch pedal switch -F36-**
- ☐ Fitting location [⇒ page 38](#) , [⇒ page 38](#)
- 10 - Instrument cluster**
- ☐ With electronic power control fault lamp -K132- ("EPC" warning lamp) Notes on EPC warning lamp [⇒ page 89](#)
  - ☐ With exhaust emissions warning lamp -K83- . Notes on exhaust emissions warning lamp [⇒ page 50](#)
- 11 - Motronic current supply relay -J271-**
- ☐ Fitting location [⇒ page 39](#) , [⇒ page 39](#)
  - ☐ Checking [⇒ page 122](#)
- 12 - Secondary air pump relay -J299-**
- ☐ Fitting location [⇒ page 39](#) , [⇒ page 39](#)
  - ☐ Checking: ⇒ 4-cylinder engine (5-valve turbo), mechanics; Rep. Gr. 26; Checking secondary air system
- 13 - Air mass meter -G70-**
- ☐ Checking [⇒ page 66](#)
- 14 - Coolant temperature sender -G62-**
- ☐ Checking [⇒ page 130](#)
  - ☐ If necessary release pressure in cooling system before removing
- 15 - Inlet camshaft timing adjustment valve 1 -N205- 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 15**
- 16 - Fuel pressure regulator**
- ☐ Checking [⇒ page 52](#)
- 17 - Engine speed sender -G28-**
- ☐ Checking [⇒ page 128](#)
- 18 - Knock sensor 2 -G66-**

## 19 - Turbocharger air recirculation valve -N249-

- ☐ Fitting location ⇒ [page 36](#) , ⇒ [page 36](#)
- ☐ Checking: 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 21

## 20 - 3-pin connector

- ☐ 3 x
- ☐ Fitting location ⇒ [page 37](#) , ⇒ [page 37](#)
- ☐ For knock sensor 1 -G61-
- ☐ For engine speed sender -G28-
- ☐ For knock sensor 2 -G66-

## 21 - Secondary air inlet valve -N112-

- ☐ Fitting location ⇒ [page 36](#) , ⇒ [page 36](#)
- ☐ Checking: 4-cylinder engine (5-valve turbo) ⇒ Rep. Gr. 26

## 22 - Knock sensor 1 -G61-

## 23 - Intake air temperature sender -G42-

- ☐ Checking ⇒ [page 125](#)

## 24 - Secondary air pump motor -V101-

- ☐ Checking: 4-cylinder engine (5-valve) ⇒ Rep. Gr. 26

## 25 - Power steering pressure switch -F88-

- ☐ Fitting location ⇒ [page 38](#) , ⇒ [page 38](#)

## 26 - Throttle valve module -J338-

- ☐ With throttle valve drive (electric power control) -G186-, throttle valve drive angle sender 1 (electric power control) -G187- and throttle valve drive angle sender 2 (electric power control) -G188-
- ☐ Checking ⇒ [page 90](#)
- ☐ Perform adaption after renewal ⇒ [page 91](#)

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

- ☐ Checking ⇒ [page 86](#)

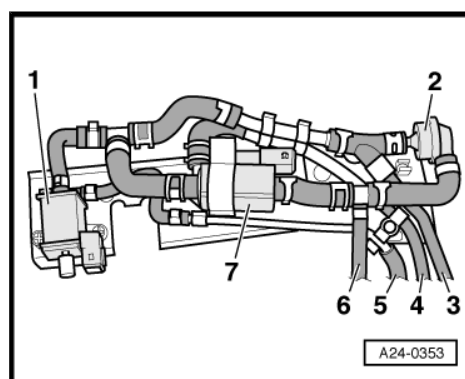
## 28 - Charge air pressure sender -G31-

- ☐ Screwed into top of charge air cooler
- ☐ Checking: 4-cylinder engine (5-valve turbo), mechanics ⇒ Rep. Gr. 21

## Fitting location of turbocharger divert air valve -N249- and secondary air inlet valve -N112-

- ◆ Fitting location: below front bracket on intake manifold

- 1 - Secondary air inlet valve -N112-
- 2 - Non-return valve
- 3 - To vacuum reservoir
- 4 - To mechanical air recirculation valve
- 5 - To secondary air system combination valve
- 6 - To connection on intake manifold
- 7 - Turbocharger divert air valve -N249-

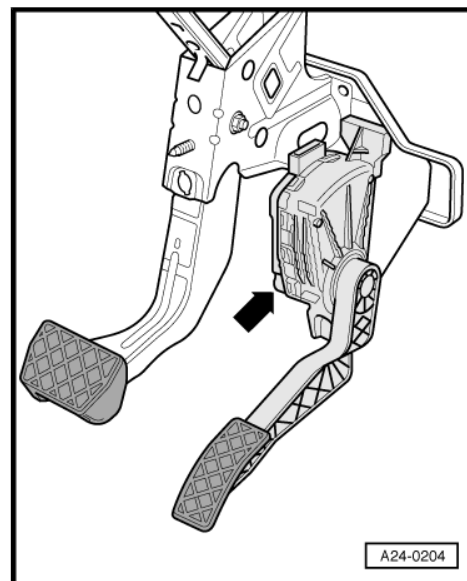


## Fitting location of accelerator pedal position sender -G79- and accelerator pedal position sender 2 -G185-



Note

Diagram shows set-up on left-hand drive vehicles.



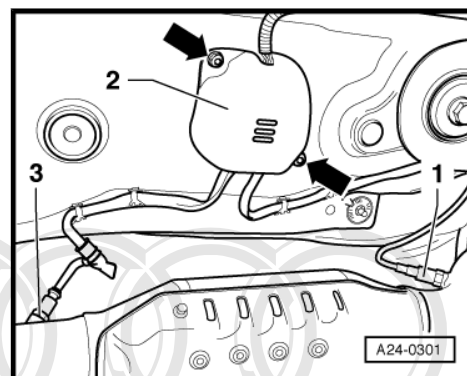
## Fitting location of Lambda probes and protective cover for connectors

1 - Lambda probe -G39- and Lambda probe heater -Z19-

2 - Protective cover for connectors

3 - Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

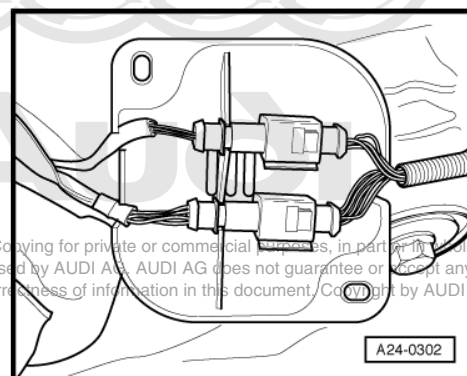
The connectors for the Lambda probes and Lambda probe heating are accessible on the floor of the vehicle (right-side) after unscrewing the protective cover -arrows-.



## Identification of connectors

Black connector For Lambda probe -G39- and Lambda probe heater -Z19-

Brown connector For Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



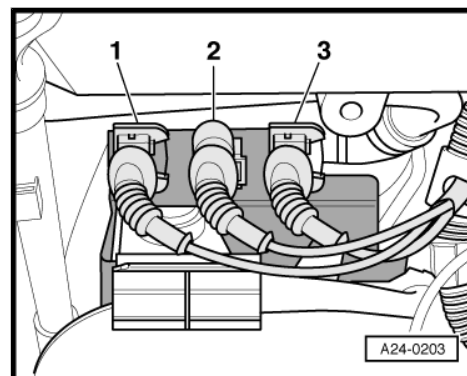
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## Fitting location of 3-pin connectors

1 - For knock sensor 1 -G61-

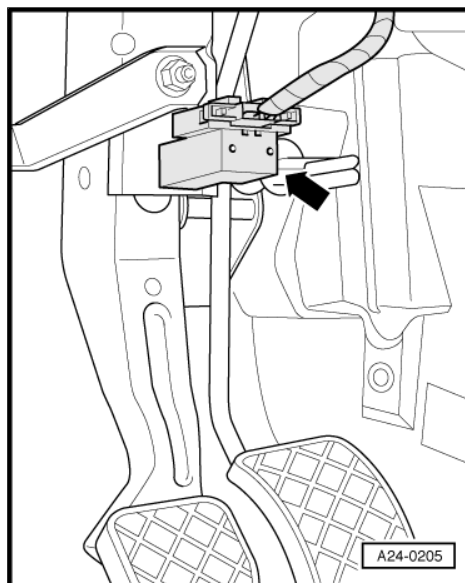
2 - For engine speed sender -G28-

3 - For knock sensor 2 -G66-

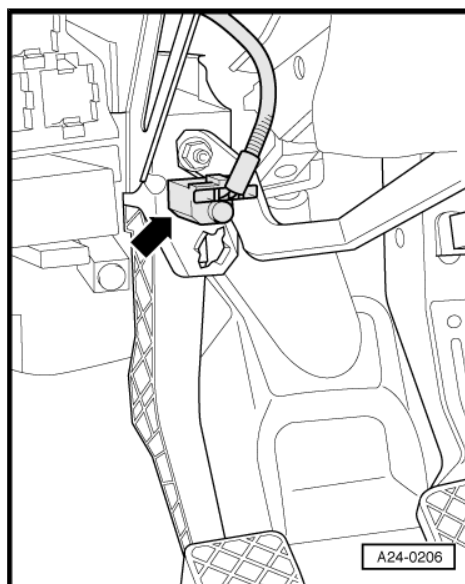




**Fitting location of brake light switch -F- and brake pedal switch -F47-**

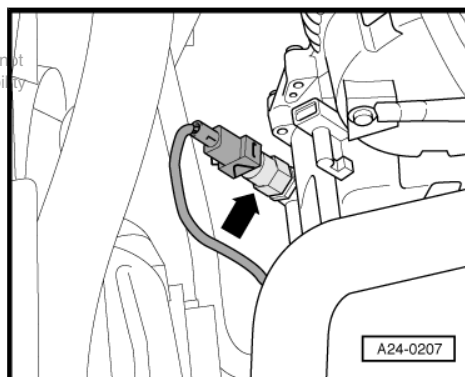


**Fitting location of clutch pedal switch -F36-**



**Fitting location of power assisted steering pressure switch -F88-**

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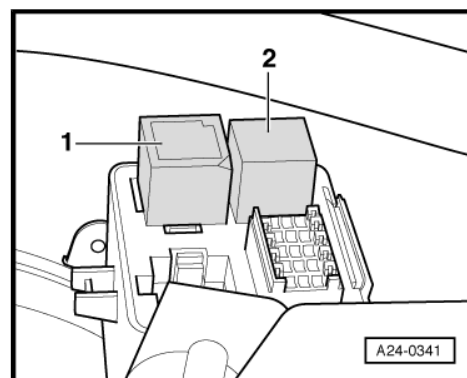


### Fitting location of Motronic current supply relay -J271- and secondary air pump relay -J299-

◆ Beneath cover on left at bulkhead

1 - Motronic current supply relay -J271-

2 - Secondary air pump relay -J299-



## 1.5 Air cleaner - exploded view

1 - Hexagon bolt

□ 10 Nm

2 - Air cleaner housing (bottom section)

□ Remove grit, dirt and leaves from the bottom part of the air cleaner housing

3 - Hose

□ To secondary air pump

4 - Seal

5 - Air mass meter -G70-

6 - Cross-head bolt

7 - Air duct

8 - 5-pin connector

9 - Cross-head bolt

10 - Cover

11 - Retaining clip

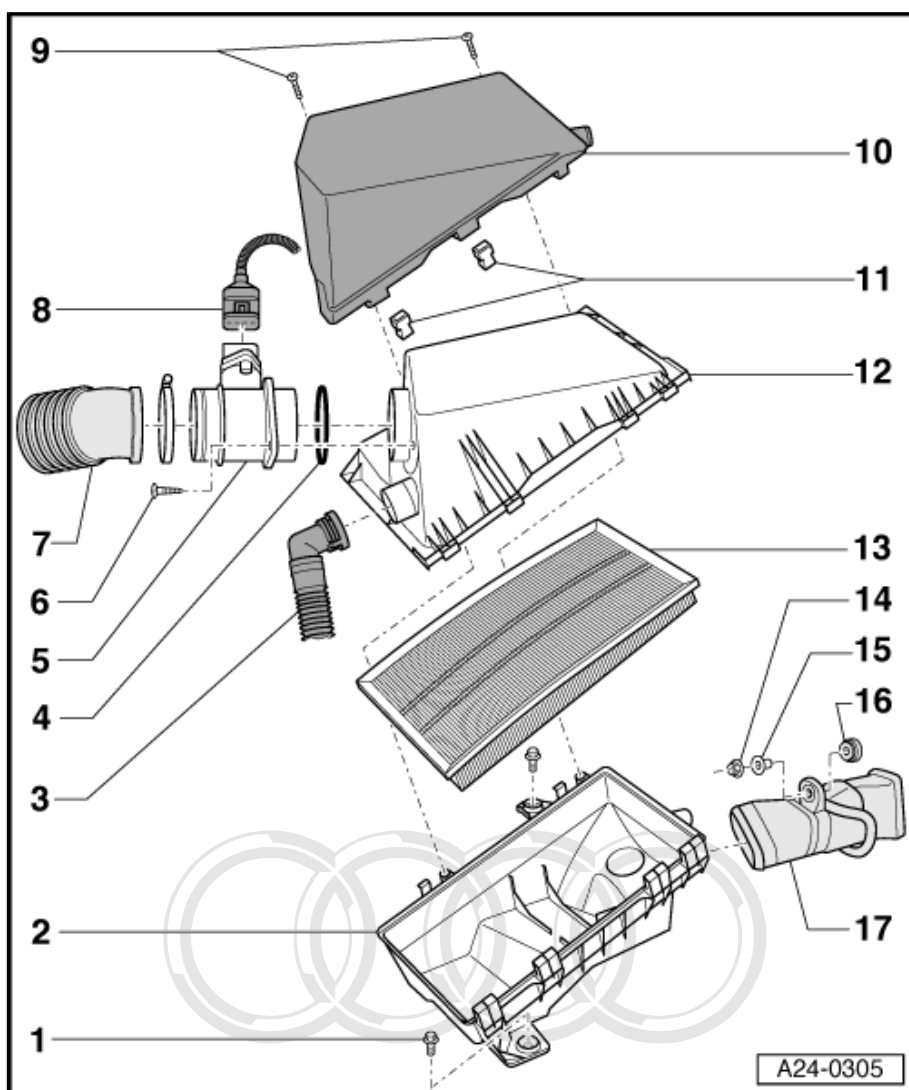
12 - Air cleaner housing (top section)

□ Remove grit, dirt and leaves from the top part of the air cleaner housing

13 - Air filter element

□ Always use a genuine air filter element

□ Heed replacement intervals ⇒ Maintenance ;



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Booklet 806

- ☐ Removing and installing ⇒ [page 40](#)

#### 14 - Nut

- ☐ 10 Nm

#### 15 - Bush

#### 16 - Rubber grommet

#### 17 - Air intake connection

- ☐ Remove dirt and leaves from the air intake connections

## 1.6 Removing and installing air filter element

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### Removing



#### Note

*Make sure no dirt gets into the air cleaner housing when removing air filter element.*

- Detach air intake hose at air cleaner housing.
- Detach electrical connector at air mass meter -G70- .
- Unscrew bolts from air cleaner housing and detach top section of air cleaner housing.
- Pull out air filter element.
- Cover the open air cleaner housing with a clean cloth.

### Installing

To ensure the proper function of the air mass meter -G70- it is important to observe the following notes and instructions.



#### Note

- ◆ *If the air cleaner element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Use a silicone-free lubricant when installing the intake hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ⇒ Parts catalogue*
- It is essential to clean any dirt and leaves out of water drain hose in air cleaner (bottom section).
- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt in air duct leading to air filter element.
- When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).

- Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element. Note position of sealing lip on air filter element (to prevent air leaks).
- Then screw top section of air cleaner back onto bottom section.
- Ensure secure fit of intake hose at air mass meter -G70- .
- The remaining installation steps are carried out in the reverse sequence.

## 1.7 Checking wiring and components with test box -V.A.G 1598/31-

### 1.7.1 The following procedure applies to engine control units which are not bolted to a protective housing by way of a locking element

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#### Note

- ◆ *The test box -V.A.G 1598/31- is designed such that it can be simultaneously connected to both the wiring harness to the engine control unit and to the engine control unit itself.*
- ◆ *This has the advantage that the electronic engine management system remains fully functional with the test box connected (e.g. for measurement of signals with engine running).*
- ◆ *Whether or not the engine control unit is additionally to be connected to the test box is described in the relevant test procedures.*
- ◆ *Use is always to be made for connecting measuring instruments (e.g. voltage tester -V.A.G 1527B- , portable multimeter -V.A.G 1526C- ) of the adapter set -V.A.G 1594C- .*

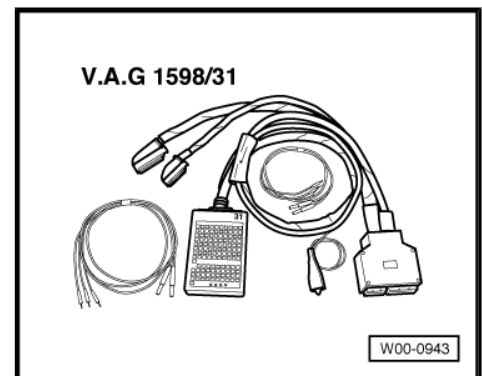


#### WARNING

***To avoid damaging electronic components, select the appropriate measuring range before connecting the test leads and heed the test conditions.***

#### Special tools and workshop equipment required

- ◆ -V.A.G 1598/31-



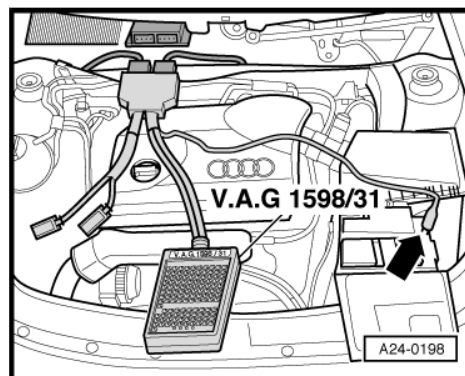
- Switch off ignition.

- Remove the engine control unit ⇒ [page 45](#) .
- Connect the test box -V.A.G 1598/31- to the wiring harness connectors. Connect the earth clip at the test box (not visible in illustration) to earth. Whether or not the engine control unit is additionally to be connected to the test box is described in the relevant test procedures.
- Perform testing as described in the appropriate repair procedures.



#### Note

- ◆ The following operations must be performed after re-connecting the engine control unit:
- ◆ Adaption of throttle valve module -J338- ⇒ [page 91](#)
- ◆ Kick-down function adaption for vehicles with automatic gear-box ⇒ [page 100](#)
- ◆ Interrogation and (if applicable) erasing of fault memory ⇒ [page 2](#)
- ◆ If the fault memory has been erased, the readiness code must be generated again ⇒ [page 22](#) .



## 1.7.2 Procedure for engine control units bolted to a protective housing



#### Note

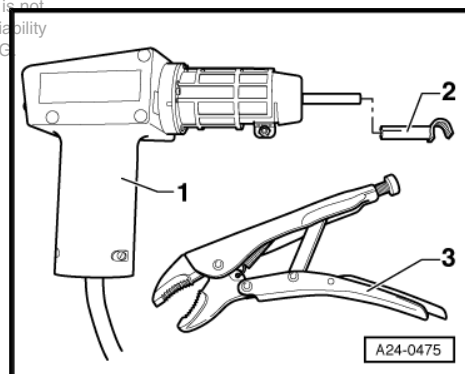
- ◆ The test box -V.A.G 1598/31- is designed such that it can be simultaneously connected to both the wiring harness to the engine control unit and to the engine control unit itself.
- ◆ This has the advantage that the electronic engine management system remains fully functional with the test box connected (e.g. for measurement of signals with engine running).
- ◆ Whether or not the engine control unit is additionally to be connected to the test box is described in the relevant test procedures.
- ◆ Use is always to be made for connecting measuring instruments (e.g. voltage tester -V.A.G 1527B-, portable multimeter -V.A.G 1526C-) of the adapter set -V.A.G 1594C- .

### Special tools and workshop equipment required

- ◆ Hot air blower -1- (from wiring harness repair set -VAS 1978A- )

- ◆ Commercially available vice-grip pliers

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- Switch off ignition.
- Unscrew the wiper arms.
- Detach the plenum chamber cover and set it down towards the windscreen.

**Note**

Item -1- in the illustration shows the engine control unit with protective housing.



To make the connectors at the engine control unit less accessible, the engine control unit -1- is bolted to a protective housing -4- by means of a locking element -2- and shear bolts -3-.

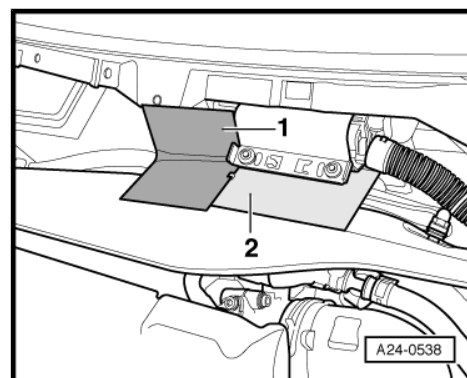
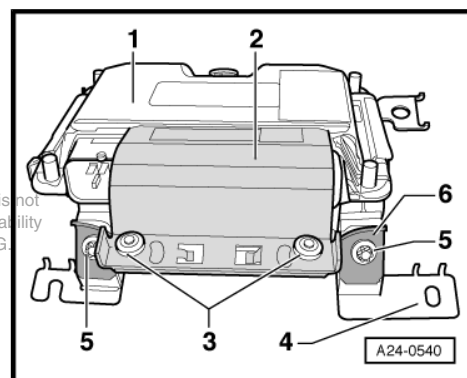
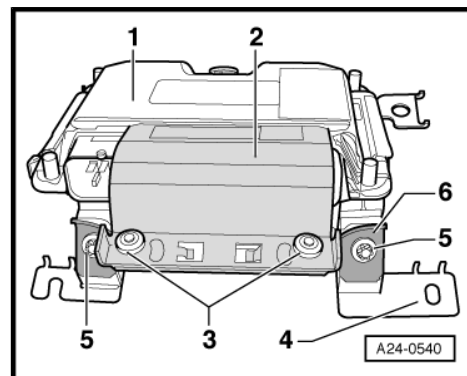
To make it even more difficult to screw out the shear bolts, the threads are coated with locking fluid.

The locking element -2- must be separated from the protective housing to enable the connectors to be unplugged from the engine control unit (e.g. when connecting the test box). This procedure is described in the following.

**WARNING**

**Exact compliance with the following operations is essential so as not to damage (scorch) wiring, connectors, insulation and control units. Heed the operating instructions for the hot air blower.**

So as to avoid damaging wires and connectors, fit plates to provide a screen (items -1- and -2-). This is designed to stop the connector housing and wiring harness becoming hot.



- Select the settings on the hot air blower as shown in the illustration, i.e. set the temperature potentiometer -2- to maximum heat output and the two-stage air flow switch -3- to position 3.



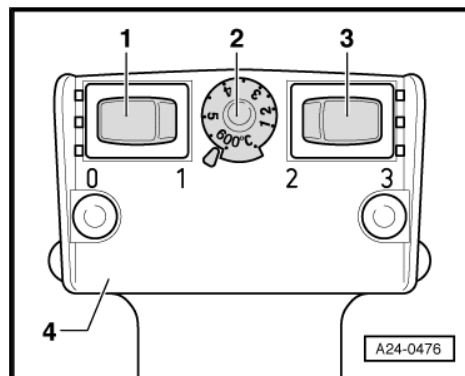
### Note

Then heat the bolt of the locking element with the hot air blower. This step reduces the inhibiting action of the locking fluid on the shear bolt threads, making these easier to unscrew.



### WARNING

The shear bolts and parts of the metal housing also become very hot when heating the thread of the locking element. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.



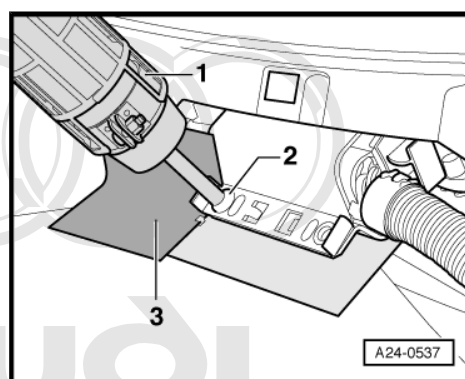
- Direct nozzle -1- of hot air blower at bolt -2- of locking mechanism.



### Note

Particular care is to be taken in this case as the control unit connectors are in the immediate vicinity.

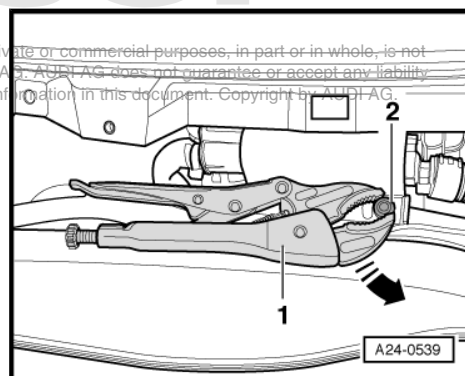
- Switch on the hot air blower and heat the thread for about 20 to 25 seconds.



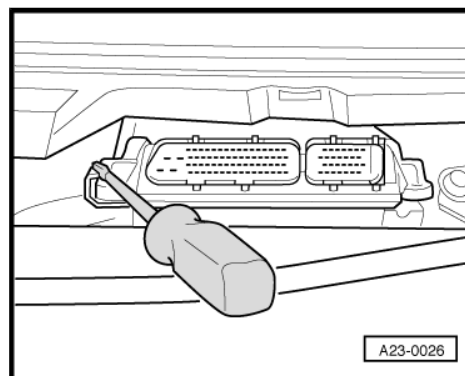
- Then grasp the head of the bolt -2- with the vice-grip pliers -1- and unscrew the shear bolt in arrow direction.
- To enhance anti-theft protection, the locking element is mounted such that it is not possible to give the vice-grip pliers a full turn.

The procedure for the second shear bolt is exactly the same. Particular care is to be taken in this case as the control unit connectors are in the immediate vicinity.

- After taking out the second bolt, the locking element for the connectors can be removed.



- Use a screwdriver to press aside the retainer tab of the mount and pull out the engine control unit to the front.
- Release the connector catches and unplug the control unit connectors.

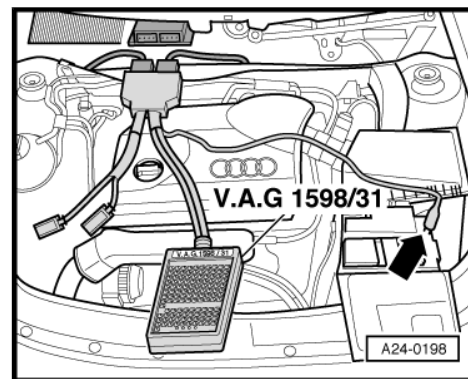


- Connect the test box -V.A.G 1598/31- to the wiring harness connectors. Connect the earth clip at the test box (not visible in illustration) to earth. Whether or not the engine control unit is additionally to be connected to the test box is described in the relevant test procedures.
- Perform testing as described in the appropriate repair procedures.

Perform the following operations after re-connecting the engine control unit:

Install accordingly in the reverse order of removal. The protective housing (locking element) is to be re-attached to the engine control unit. Use is to be made of new shear bolts.

- Bend back the retainer tab of the mount.



#### Note

- ◆ The following operations must be performed after re-connecting the engine control unit:
- ◆ Adaption of throttle valve module -J338-
- ◆ Kick-down function adaption for vehicles with automatic gear-box
- ◆ Interrogation and (if applicable) erasing of fault memory.

#### Procedure following interruption of voltage supply



#### Note

- ◆ The following operations must be performed after re-connecting the voltage supply:
- ◆ Adaption of throttle valve module -J338- ⇒ [page 91](#)
- ◆ Kick-down function adaption for vehicles with automatic gear-box ⇒ [page 100](#)
- ◆ Interrogation and (if applicable) erasing of fault memory ⇒ [page 2](#)



#### Note

*Slightly rough idling and slight bucking whilst driving may be encountered in the initial adaption phase.*

## 1.8 Removing and installing engine control unit with and without protective housing

### 1.8.1 Replacement procedure for engine control unit without protective housing

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select vehicle system "01 - Engine electronics". The ignition must be switched on when doing so.

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The vehicle diagnostic and service information system -VAS 5052- displays the control unit identification and the code -2-.

- Always start by displaying and printing out the control unit identification.
- Switch off ignition.
- Unscrew the wiper arms.
- Detach the plenum chamber cover and set it down towards the windscreen.



### Note

*Always switch off the ignition before unplugging or plugging in the control unit connectors.*

- Release the connector catches and unplug the control unit connectors.
- Use a screwdriver to press aside the retainer tab of the mount and pull out the engine control unit to the front.

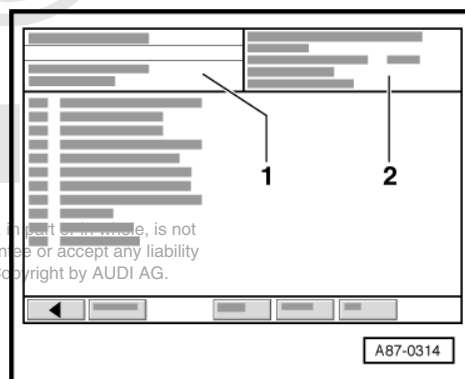
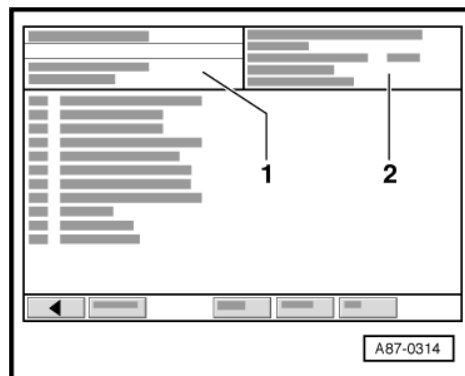
### Installing

Install in reverse order, paying attention to the following:

- Bend back the retainer tab of the mount.

**The following operations must be performed after connecting the new engine control unit:**

- Code engine control unit ⇒ [page 19](#) .
- Perform adaption of throttle valve module -J338- ⇒ [page 91](#) .
- Perform adaption of kick-down function for vehicles with automatic gearbox ⇒ [page 100](#) .
- The immobilizer must be enabled using vehicle diagnostic and service information system -VAS 5052- .
- In “Guided Fault Finding” mode, “Select type” menu, select the option “Remaining vehicles for online immobiliser interface” and follow the instructions in Guided Fault Finding.



## 1.8.2 Procedure for replacement of engine control units bolted to a protective housing (locking element)

### Removing

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select vehicle system “01 - Engine electronics”. The ignition must be switched on when doing so.

The vehicle diagnostic and service information system -VAS 5052- displays the control unit identification and the code -2-.

- Always start by displaying and printing out the control unit identification.
- Switch off ignition.
- Unscrew the wiper arms.
- Detach the plenum chamber cover and set it down towards the windscreen.



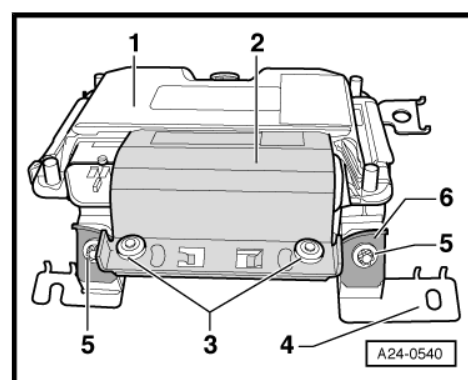
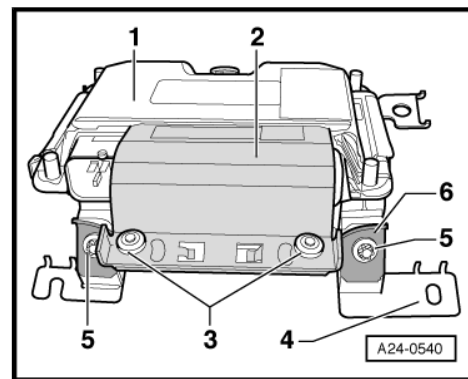
#### Note

Item -1- in the illustration shows the engine control unit with protective housing.

To make the connectors at the engine control unit less accessible, the engine control unit -1- is bolted to a protective housing -4- by means of a locking element -2- and shear bolts -3-.

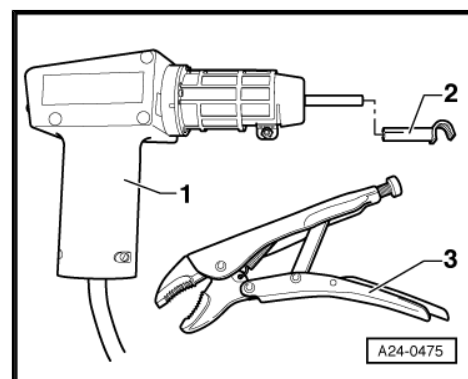
To make it even more difficult to screw out the shear bolts, the threads are coated with locking fluid.

The locking element -2- must be separated from the protective housing to enable the connectors to be unplugged from the engine control unit (e.g. when connecting the test box or replacing the engine control unit). This procedure is described in the following.



#### Special tools and workshop equipment required

- ◆ Hot air blower -1- (from wiring harness repair set -VAS 1978A- )



- ◆ Commercially available vice-grip pliers

#### Procedure:

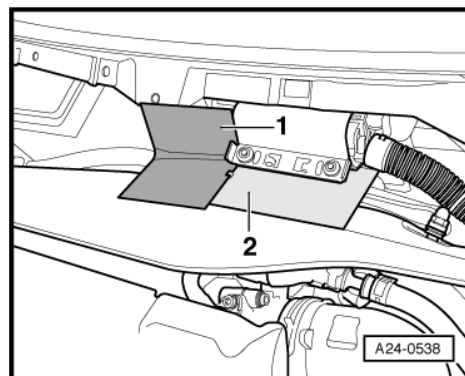


#### WARNING

**Exact compliance with the following operations is essential so as not to damage (scorch) wiring, connectors, insulation and control units. Heed the operating instructions for the hot air blower.**

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So as to avoid damaging wires and connectors, fit plates to provide a screen (items -1- and -2-). This is designed to stop the connector housing and wiring harness becoming hot.

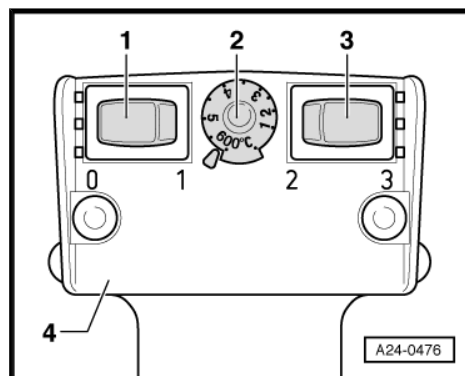


- Select the settings on the hot air blower as shown in the illustration, i.e. set the temperature potentiometer -2- to maximum heat output and the two-stage air flow switch -3- to position 3.



### Note

*Then heat the bolt of the locking element with the hot air blower. This step reduces the inhibiting action of the locking fluid on the shear bolt threads, making these easier to unscrew.*



### WARNING

*The shear bolts and parts of the metal housing also become very hot when heating the thread of the locking element. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.*

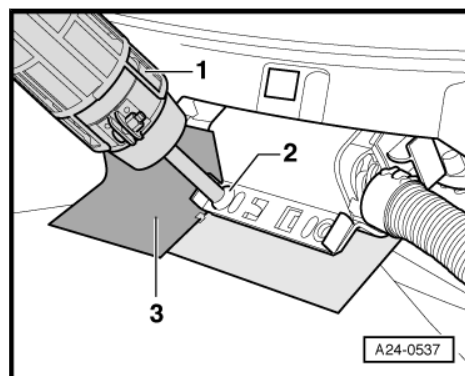
- Move the nozzle -1- of the hot air blower towards the bolt -2- of the locking element.



### Note

*Particular care is to be taken in this case as the control unit connectors are in the immediate vicinity.*

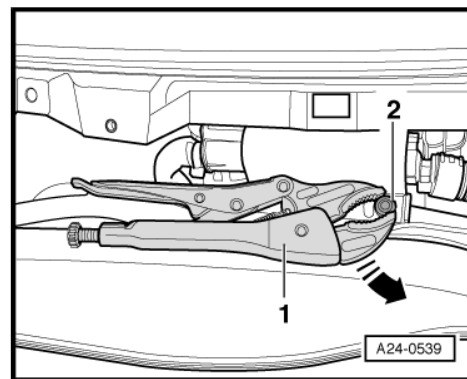
- Switch on the hot air blower and heat the thread for about 20 to 25 seconds.



- Then grasp the head of the bolt -2- with the vice-grip pliers -1- and unscrew the shear bolt in arrow direction.
- For greater protection, the locking element is mounted such that it is not possible to give the vice-grip pliers a full turn.

The procedure for the second shear bolt is exactly the same. Particular care is to be taken in this case as the control unit connectors are in the immediate vicinity.

- Once the second bolt has been taken out, the windscreen wiper system must be removed. ⇒ Electrical system; Rep. Gr. 92; Windscreen wiper system; Removing and installing windscreen wiper system



#### WARNING

*The control unit is not to be pulled over the locking element -6- as this could strain and damage the control unit.*

- Then pull out the engine control unit with the retainer.

Following removal, the locking element is to be unscrewed from the retainer. The control unit is not to be pulled out until the locking element has been removed.

To make it more difficult to pull out the engine control unit -1-, the locking element -2- is bolted onto the protective housing with the shear bolts -3-.

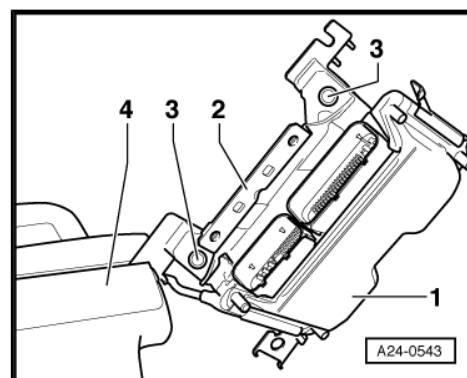
To make it even more difficult to screw out the shear bolts, the threads are coated with locking fluid.

- Clamp the control unit in a vice

#### Installing

Installation is performed accordingly in the reverse sequence.

- The protective housing must always be re-attached to the engine control unit.
- Remove remnants of locking fluid from the tapped holes for the shear bolts. This can be done by using a thread tap.
- Always use new shear bolts.
- Bend back the retainer tab of the mount.



**The following operations must be performed after connecting the new engine control unit:**

- Code engine control unit ⇒ [page 19](#) .
- Perform adaption of throttle valve module -J338- ⇒ [page 91](#) .
- Perform adaption of kick-down function for vehicles with automatic gearbox ⇒ [page 100](#) .
- The immobilizer must be enabled using vehicle diagnostic and service information system -VAS 5052-
- In "Guided Fault Finding" mode, "Select type" menu, select the option "Remaining vehicles for online immobiliser interface" and follow the instructions in Guided Fault Finding.

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## 1.9 Exhaust emissions warning lamp -K83- in dash panel insert

If the engine control unit detects faults which result in deterioration of emission levels, these are indicated by activation of the exhaust emissions warning lamp -K83- .

The engine control unit activates the exhaust emissions warning lamp -K83- after switching on the ignition. Shortly after starting the engine, the exhaust emissions warning lamp -K83- goes out if no faults leading to a deterioration in emission levels have been detected by the engine control unit and actuation of the lamp by the engine control unit is OK.

If faults leading to a deterioration in emission levels are detected during engine operation, the engine control unit activates the exhaust emissions warning lamp (such faults are indicated in the fault table). At the same time an entry is made in the engine control unit fault memory.

The exhaust emissions warning lamp -K83- may flash or be permanently lit. The fault memory is always to be interrogated

⇒ [page 2](#) .

### If lamp stays lit:

A fault has occurred causing deterioration of emission levels. Interrogate the fault memory for the Motronic control unit/automatic gearbox (if fitted).

If engine running problems are encountered or a customer complaint has been received and the exhaust emissions warning lamp -K83- does not light, the fault memory must be interrogated. Faults may also have been stored which do not immediately activate the exhaust emissions warning lamp -K83- , but only do so if the fault is detected again after re-starting the engine.

### If lamp flashes:

A fault has occurred which, under these driving conditions, will cause damage to the catalytic converter (e.g. misfiring). In this case the vehicle may only be driven with reduced power.

## 1.10 Checking exhaust emissions warning lamp -K83-

### Checking operation of warning lamp

- Switch on ignition.
- ◆ The self-diagnosis fault lamp ( exhaust emissions warning lamp -K83- ) must light
- Start engine.
- ◆ Shortly after starting the engine, the exhaust emissions warning lamp -K83- goes out if there are no emission-specific faults stored in the fault memory.



### Note

*The activation signal for the fault lamp is transmitted by the engine control unit to the dash panel insert by means of the CAN bus. Check data exchange between the engine control unit and other control units with CAN capability ⇒ [page 111](#) .*

## 1.11 Checking idling speed

### Special tools and workshop equipment required

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◆ Vehicle diagnosis and service information system -VAS 5052-



**Note**

- ◆ No leaks in exhaust system.
- ◆ Coolant temperature at least 80 °C.
- ◆ Electrical equipment switched off (radiator fan must not run during the test).
- ◆ Air conditioner switched off.
- ◆ No pressure gauge connected.
- ◆ Vehicles with automatic gearbox: selector lever in position P or N



**Note**

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

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**Test sequence**

- Interrogate the fault memory ⇒ [page 2](#) . There must not be any faults stored. If necessary, eliminate faults, erase fault memory, switch off and re-start engine, perform test drive and interrogate fault memory again as a check.
- Leave engine idling.



**WARNING**

*The electric radiator fan should not be running.*

- Select the function "Start basic setting" and confirm.
- Select "Display group number 056".
- Check whether the engine speed in display zone 1 (actual engine speed) is within the permissible tolerance range.

|                                                                                    | Display zones                                                                |                                                  |                                    |                                                           |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------|-----------------------------------------------------------|
|                                                                                    | 1                                                                            | 2                                                | 3                                  | 4                                                         |
| Display group 056: Idling speed stabilisation when idling at operating temperature |                                                                              |                                                  |                                    |                                                           |
| Display                                                                            | xxx rpm                                                                      | xxx rpm                                          | x.x %                              | X X X X X                                                 |
| Display                                                                            | Actual engine speed                                                          | Specified engine speed                           | Idling speed control torque change | Operating statuses                                        |
| Specification                                                                      | 700...840 rpm <sup>40)</sup><br>640...760 rpm <sup>41)</sup>                 | 770 rpm <sup>40)</sup><br>700 rpm <sup>41)</sup> | x.x %                              | 0 0 0 0 0                                                 |
| Note                                                                               | If the reading does not match the specification<br>⇒ <a href="#">page 52</a> |                                                  |                                    | Explanatory notes on numbers<br>⇒ <a href="#">page 52</a> |

40) Manual gearbox, front and four-wheel drive

41) Automatic gearbox, front-wheel drive



### Note

- ◆ *The engine speed in display zone 1 is the actual engine speed.*
- ◆ *The engine speed in display zone 2 (specified engine speed) is a theoretical speed 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 are provided for information purposes but have no relevance as regards checking of the idling speed.*

If the reading matches the specification:

- Press the  key.

If the reading does not match the specification:

- Interrogate the fault memory again ⇒ [page 2](#) .
- If the fault memory has been erased, the readiness code must be generated again ⇒ [page 22](#) .

### 1.11.1 Perform the following checks marked with a dot if the idling speed is too high or too low and there are no faults stored in the fault memory:

- Check for air leaks in the intake system ⇒ [page 69](#) .
- Check the throttle valve module ⇒ [page 90](#) .
- Activated charcoal filter system solenoid valve permanently open; checking ⇒ [page 86](#) .
- Perform adaption of throttle valve module ⇒ [page 91](#) .

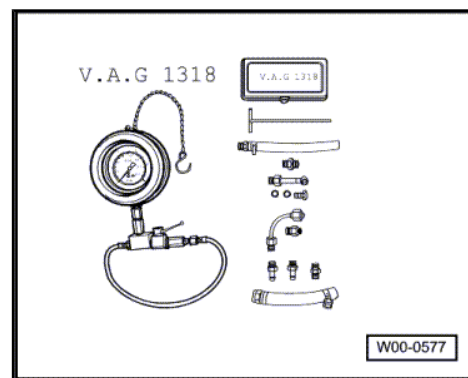
### 1.11.2 Explanatory notes on 5-position display in display group 056

| x | x | x | x | x | Display zone 4                                                                                                                              |
|---|---|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------|
|   |   |   |   | 0 | Air conditioner compressor: 0 = compressor off; 1 = compressor on                                                                           |
|   |   |   | 0 |   | Manual gearbox: Display always reads 0<br>Gear position of automatic gearbox: 0 = selector lever in P or N; 1 = selector lever in 1/2/3/D/R |
|   |   | 0 |   |   | Display always 0                                                                                                                            |
|   | 0 |   |   |   | Display always 0                                                                                                                            |
| 0 |   |   |   |   | Display always 0                                                                                                                            |

### 1.12 Checking system pressure, fuel pressure regulator and residual pressure

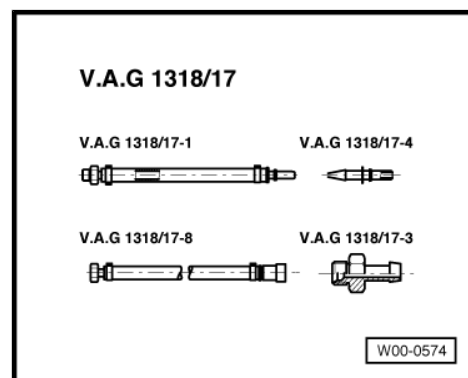
Special tools and workshop equipment required

◆ K-Jetronic pressure tester -V.A.G 1318-



◆ -V.A.G 1318/7-

◆ -V.A.G 1318/17- (2x)



Note

*Fuel pressure is controlled by the fuel pressure regulator according to the intake manifold pressure. As a result, the pressure drop at the injectors remains constant at all engine speeds and throttle openings.*



Note

- ◆ Fuel pump relay OK; checking ⇒ [page 62](#)
- ◆ Fuel pump OK; checking: ⇒ Fuel supply system, petrol engines; Repair group 20.
- ◆ Fuel filter OK
- ◆ Battery voltage min. 12.7 V
- ◆ Vehicles with automatic gearbox: selector lever in position P or N

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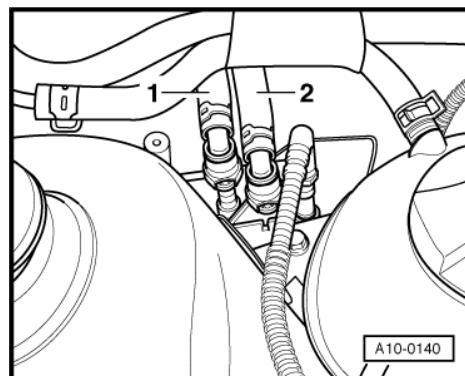
WARNING

*The fuel system is pressurised. Before opening the system, wrap a cloth around the connection. Then dissipate pressure by carefully unfastening the connection.*

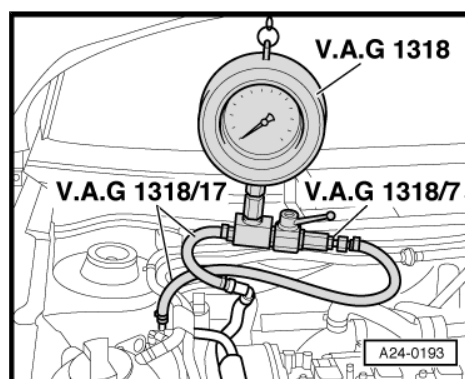
Checking system pressure

- Briefly open the tank cap to reduce pressure.

- Detach the fuel supply hose -1- (with white mark) from the supply pipe.



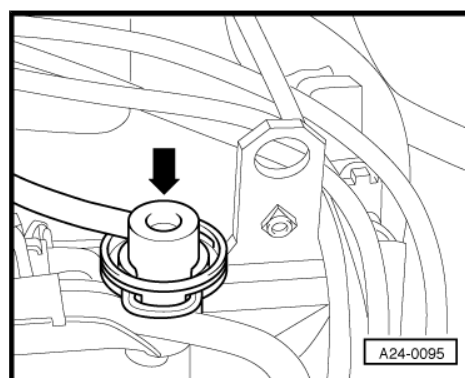
- Connect the K-Jetronic pressure gauge -V.A.G 1318- with adapters 1318/7 and 1318/17 (2x) to the supply pipe.
- Open the cut-off valve of the K-Jetronic pressure gauge - V.A.G 1318-. The lever points in the direction of flow.
- Start the engine and let it idle.
- Measure the fuel pressure.
- ◆ Specification: approx. 2.5 bar



- Disconnect the vacuum hose at the fuel pressure regulator.
- ◆ The fuel pressure must increase to approx. 3.0 bar.
- Switch off ignition.
- Check for leaks and check the residual pressure by observing the drop in pressure on the pressure gauge.
- ◆ After 10 minutes, the pressure level must still be at least 1.5 bar.

If the residual pressure drops below 1.5 bar:

- Start the engine and let it idle.



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- Allow pressure to build up, then switch off ignition. At the same time, close the cut-off valve of the K-Jetronic pressure gauge -V.A.G 1318- (lever at right angles to direction of flow -arrow-).

- Observe pressure drop on pressure gauge.

If the pressure now does not drop:

- Check fuel pump non-return valve.

If the pressure drops again:

- Open the cut-off valve of the K-Jetronic pressure gauge - V.A.G 1318- (lever in direction of flow).

- Start the engine and let it idle.

- Allow pressure to build up, then switch off ignition. At the same time tightly clamp-off the return hose (with blue marking)

If the pressure now does not drop:

- Renew the fuel pressure regulator.

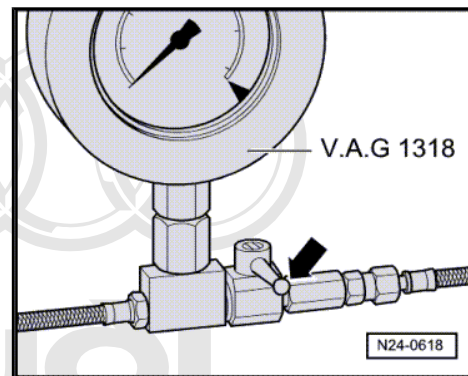
If the pressure drops again:

- Check pipe connections, O-rings on fuel rail and injectors for leaks.
- Check K-Jetronic pressure tester -V.A.G 1318- for leaks.



#### Note

*Before detaching the pressure gauge, dissipate the fuel pressure by opening the cut-off valve. When doing so, hold a vessel in front of the connection.*

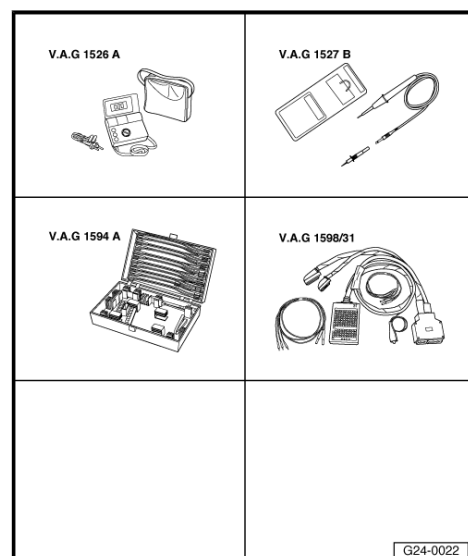


## 1.13 Checking injectors

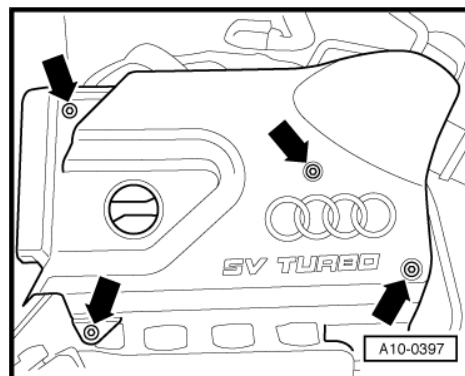
### Checking internal resistance

#### Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Voltage tester -V.A.G 1527B-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-



- Remove the engine cover -arrows-.
- Unplug the connector at the injector to be checked.



- Connect the multimeter (resistance measuring range) to the injector.

◆ Specification: 12 ...13  $\Omega$  (at ambient temperature)

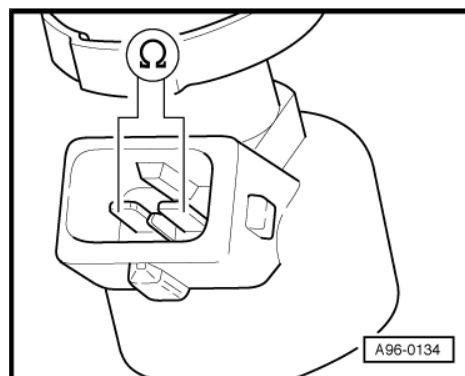
If the reading does not match the specification:

- Replace the injector.

If the reading matches the specification:

- Check voltage supply.

#### Checking voltage supply



#### Note

- ◆ *Fuse for injectors OK  $\Rightarrow$  Current flow diagrams, Electrical fault finding and Fitting locations*
- ◆ *Fuel pump relay OK; checking  $\Rightarrow$  [page 62](#)*

- Unplug the connector at the injector to be checked.
- Connect up the voltage tester -V.A.G 1527B- as follows:

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

- Switch on ignition.

- ◆ The LED must light

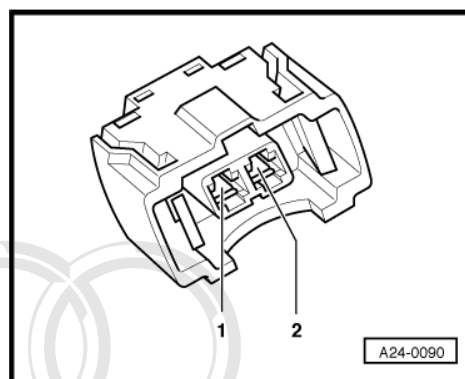
If the LED does not light:

- Check for open circuit in wiring between contact 1 and fuse for injectors:
- Eliminate open circuit in wiring if necessary.

If the LED lights:

- Check actuation of the injectors.

#### Checking activation



#### Note

*Internal resistance of injector OK*

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- Push back the rubber grommet of the injector connector but leave the connector plugged in.

- Connect up the voltage tester -V.A.G 1527B- between contacts 2 (signal) and 1 (positive).
- Briefly operate the starter (engine may also start).
- ◆ The LED must flash



#### Note

*Voltage testers with a low current draw do not go out completely between activation signals from engine control unit, but continue to glow slightly and become slightly brighter on activation.*

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If the LED does not flash:

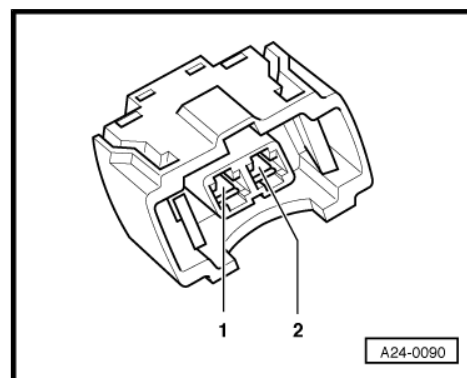
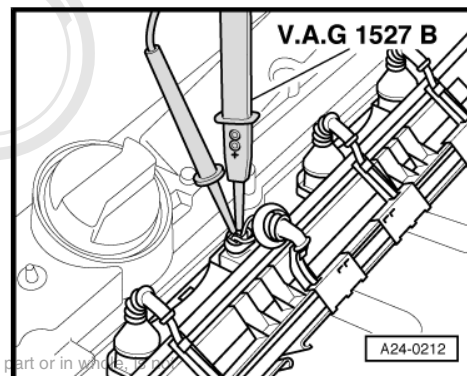
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#).
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.

If the wiring is OK:

- Replace the engine control unit ⇒ [page 45](#).



## 1.14 Dismantling and assembling fuel rail with injectors - exploded view

**1 - Injector insert**

- ☐ 3 Nm
- ☐ Apply locking fluid "D 000 600 A2" when fitting

**2 - O-ring**

- ☐ Removing and installing ⇒ [page 59](#)
- ☐ Replace
- ☐ Moisten with fresh engine oil

**3 - Injectors -N30- ... -N33-**

- ☐ Removing and installing ⇒ [page 59](#)

**4 - Supply hose**
**5 - Return hose**
**6 - Fuel rail**
**7 - Hexagon socket head bolt**

- ☐ 10 Nm

**8 - Connector**

- ☐ For injectors
- ☐ 4 x

**9 - Fuel pressure regulator**
**10 - O-ring**

- ☐ Replace

**11 - O-ring**

- ☐ Replace

**12 - Retaining clip**
**13 - O-ring**

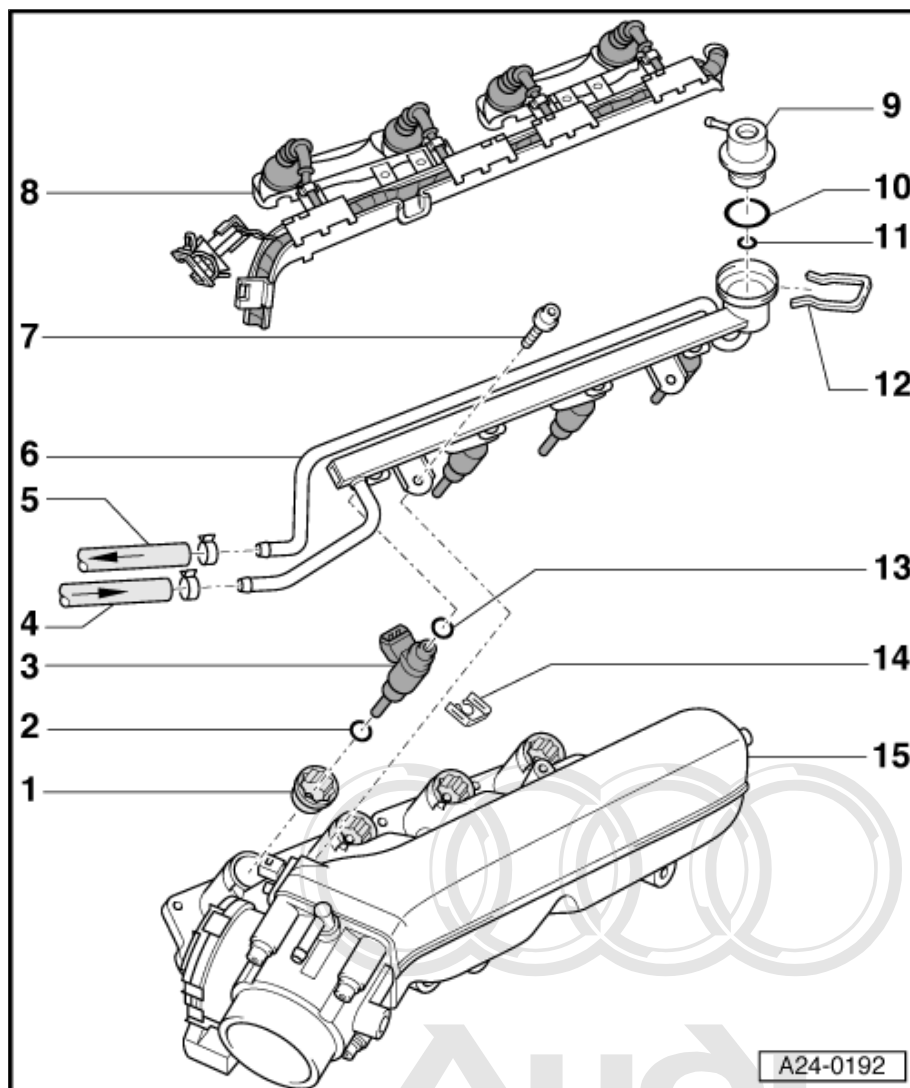
- ☐ Removing and installing ⇒ [page 59](#)
- ☐ Replace
- ☐ Moisten with fresh engine oil

**14 - Retaining clip**

- ☐ Ensure it is positioned correctly on injector and fuel rail

**15 - Intake manifold**

- ☐ With throttle valve module -J338-
- ☐ With intake air temperature sender -G42-
- ☐ Removing and installing ⇒ Rep. Gr. 15



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## 1.15 Removing and installing injectors

### Removing

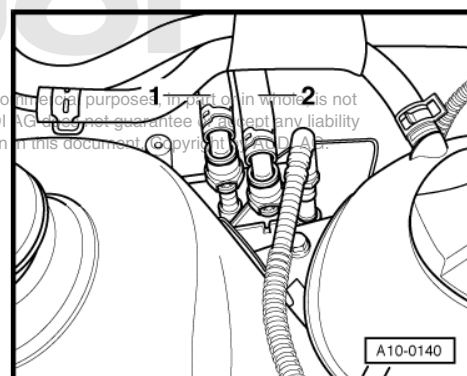
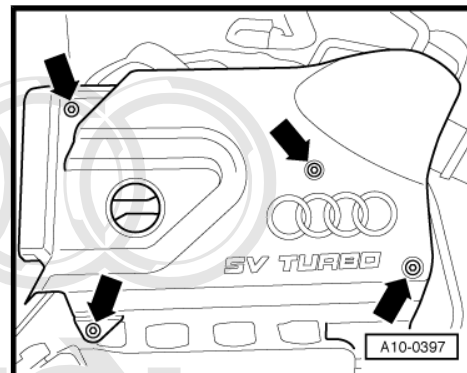
- Remove the engine cover -arrows-.
- Disconnect the wiring/unplug the connector at the:
  - Intake air temperature sender -G42-
  - Hall sender -G40-
  - Throttle valve module -J338-
- Press the release buttons at the separation point and disconnect the fuel supply pipe -1- and fuel return pipe -2-.



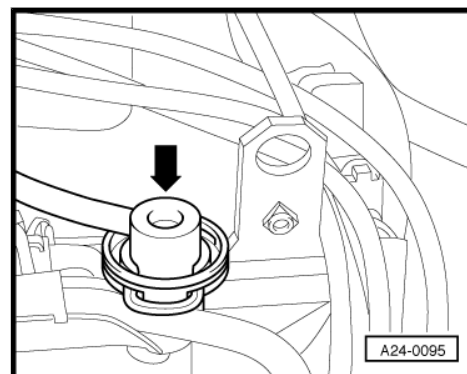
### WARNING

*The fuel system is pressurised. Before opening the system, wrap a cloth around the connection. Then dissipate pressure by carefully unfastening the connection.*

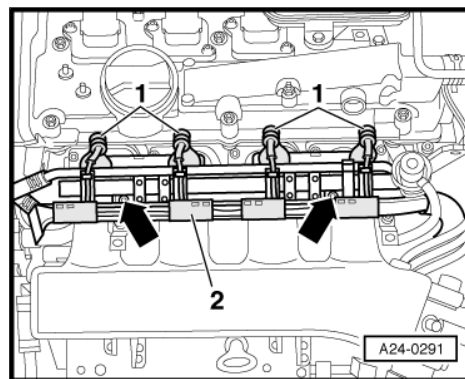
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- Disconnect vacuum hose from fuel pressure regulator -arrow-.



- Unplug the connectors -1-.
- Disengage the cable duct -2-.
- Remove the two hexagon socket head bolts -arrows- for 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.
- Pull off retaining clip and detach injector.


**Note**

*The fuel hoses must be detached before replacing fuel rail.*

**Installing**

Installation is carried out in the reverse order; note the following:

- Replace the O-rings at all the connections unfastened (when replacing the front O-ring, never pull the plastic cap off the injector head - lift the O-ring over the plastic cap).
- Moisten the O-rings with fresh engine oil.
- Make sure the injectors are correctly positioned.
- Check for firm attachment of the retaining clips.
- Position fuel rail together with injectors (properly secured) against intake manifold and press into place evenly.

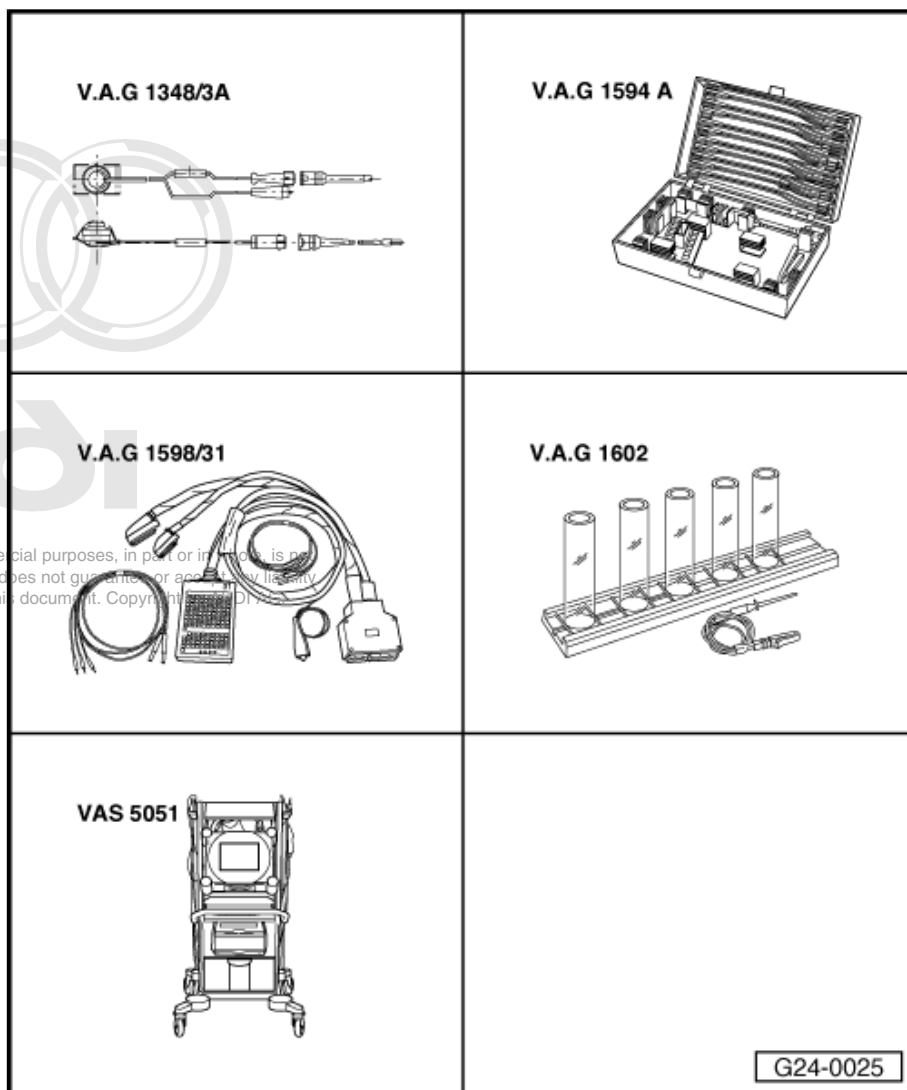
**Tightening torque**

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

## 1.16 Checking injection quantity and spray pattern of injectors; checking for leaks

**Special tools and workshop equipment required**

- ◆ -V.A.G 1348/3A-
- ◆ -V.A.G 1594 A-
- ◆ -V.A.G 1598/31-
- ◆ -V.A.G 1602-
- ◆ -VAS 5051- with -VAS 5051/1-



## Test sequence



### Note

Fuel pressure OK; checking ⇒ [page 52](#).

- Remove fuel rail (with injectors fitted) from intake manifold ⇒ [page 59](#). Fuel hoses remain connected.
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#).

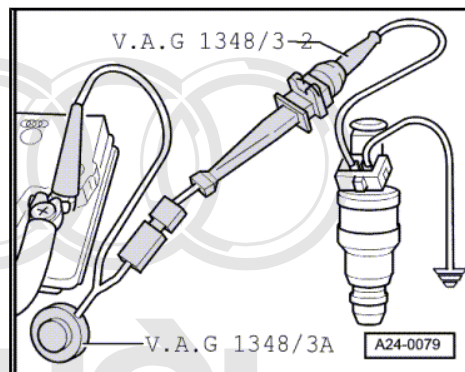
### Checking for leaks

- Use leads from the adapter set -V.A.G 1594 A- to jumper contacts 1 and 65 at the test box.
- Switch on ignition.
- ◆ The fuel pump must run.
- Check injectors for leaks (visual check). With the fuel pump running, the maximum permissible leakage rate per injector is 1...2 droplets per minute.

- In the event of greater fuel loss, shut off the fuel pump (switch off ignition) and replace the defective injector ⇒ [page 59](#) .

### Checking injection quantity

- Insert the injector to be checked in a graduated beaker of the injection quantity tester -V.A.G 1602- .
- Connect one contact of the injector with a test lead and crocodile clamp from -V.A.G 1594 A- to engine earth.
- Connect the second injector contact with remote control -V.A.G 1348/3A- , adapter lead -V.A.G 1348/3-2- and a test cable to positive.
- Use leads from the adapter set -V.A.G 1594 A- to jumper contacts 1 and 65 at the test box.
- Switch on ignition.
- ◆ The fuel pump must run.
- Operate the remote control -V.A.G 1348/3A- for 30 seconds.
- Perform measurement with all injectors.
- Once all four injectors have been actuated, place the graduated beakers on a flat surface.
- ◆ Specification for each injector:  $145 \pm 12 \text{ ml}$
- If the measured value of one or more injectors is outside the tolerance, shut off the fuel pump (switch off ignition) and replace the defective injector ⇒ [page 59](#) .
- If the measured values for all injectors are outside the tolerance, check the fuel pressure ⇒ [page 52](#) .



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### Note

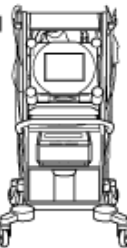
*The spray pattern is also to be checked when checking the injection quantity. It must be the same for all injectors.*

- Install injectors with fuel rail.

## 1.17 Checking fuel pump relay -J17- and activation

### Special tools and workshop equipment required

- ◆ -V.A.G 1526 A-
- ◆ -V.A.G 1594 A-
- ◆ -V.A.G 1598/31-
- ◆ Vehicle diagnosis and service information system -VAS 5052-

|                                                                                                               |                                                                                                                |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <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><b>VAS 5051</b></p>      |
|                                                                                                               | <p>G24-0021</p>                                                                                                |

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### Checking operation of fuel pump relay -J17-

Fitting location ⇒ Overview of fitting locations ⇒ [page 33](#)

The fuel pump and some of the injection system components are powered via the fuel pump relay -J17- .

The 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 speed impulses.



#### Note

*Battery voltage min. 12.7 V*

- Remove the driver's storage compartment:
- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. The ignition must be switched on when doing so.
- Initiate final control diagnosis ⇒ [page 16](#) and activate activated charcoal filter solenoid valve 1 -N80- .

- ◆ The fuel pump relay -J17- (on the central electrics on the left of the driver's footwell, position 4) must be energised and the fuel pump must run

A - If the fuel pump relay -J17- is not energised:

- Check voltage supply of fuel pump relay -J17- .
- Check activation of fuel pump relay -J17- .

B - If relay picks up but fuel pump does not run:

- Check voltage supply for fuel pump and components (by way of fuel pump relay -J17- ).

#### Checking voltage supply of fuel pump relay -J17-

- Detach the fuel pump relay -J17- .
- Connect the multimeter (voltage measuring range) to contact 17 of the relay socket and earth.

- ◆ Specification: approx. battery voltage

If specification is not obtained:

- Renew central electrics.

#### Checking actuation of fuel pump relay -J17-

- Switch off ignition.
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Switch on ignition.
- Use leads from the adapter set -V.A.G 1594 A- to jumper contacts 1 and 65 at the test box.

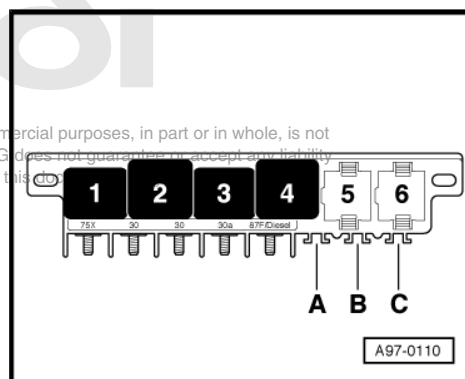
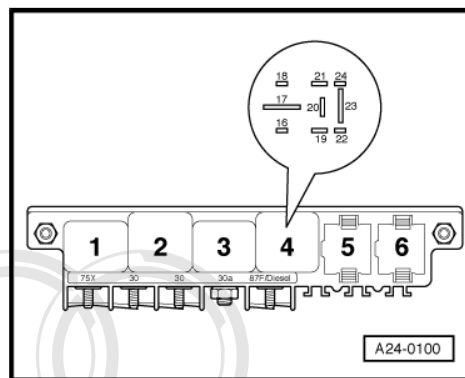
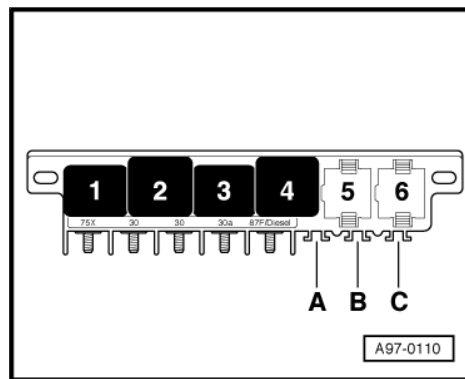
- ◆ The fuel pump relay -J17- (on the central electrics on the left of the driver's footwell, position 4) must be energised

If the fuel pump relay -J17- is now energised, but not during final control diagnosis:

- Replace the engine control unit ⇒ [page 45](#)

If the fuel pump relay -J17- is not energised:

- Switch off ignition.
- Detach the cable link.
- Detach the fuel pump relay -J17- .



- Connect up the multimeter (voltage measuring range) as follows.

| Central electrics<br>on left of driver's footwell, position 4<br>Contact | Measure to   |
|--------------------------------------------------------------------------|--------------|
| 19                                                                       | Engine earth |

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

If the reading does not match the specification

- Check the wiring ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

If the reading matches the specification:

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

| Central electrics<br>on left of driver's footwell, position 4<br>Contact | Test box -V.A.G 1598/31-<br>Socket |
|--------------------------------------------------------------------------|------------------------------------|
| 16                                                                       | 65                                 |

- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found:

- Replace the fuel pump relay -J17- .
- Reconnect the engine control unit.

#### Checking voltage supply to fuel pump and components

- Remove the fuses S228, S232, S234 and S243 (positions 28, 32, 34 and 43) in the fuse carrier.
- Initiate final control diagnosis ⇒ [page 16](#) and activate activated charcoal filter 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 at one of the contacts |
|------|--------------------------------------|
| S228 | approx. battery voltage              |
| S232 | approx. battery voltage              |
| S234 | approx. battery voltage              |
| S243 | approx. battery voltage              |

If the specifications are not obtained:

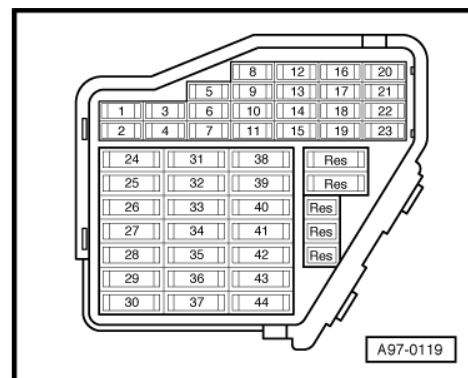
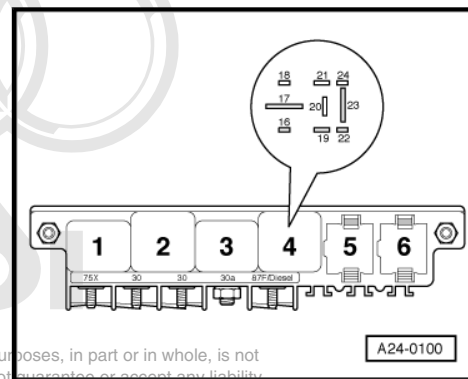
- Repeat the test on the other fuse contact.

If the specifications are again not obtained:

- Check the wiring. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

If no fault is found:

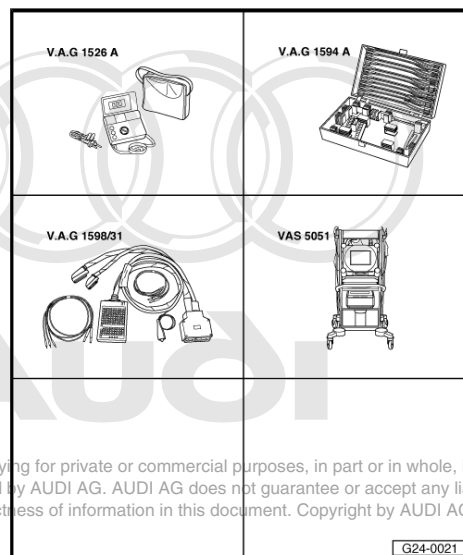
- Renew fuel pump relay -J17- .
- Refit fuses.



## 1.18 Checking air mass meter -G70-

### Special tools and workshop equipment required

- ◆ -V.A.G 1526 A-
- ◆ -V.A.G 1594 A-
- ◆ -V.A.G 1598/31-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



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G24-0021

Overview of fitting locations ⇒ [page 33](#)

### Checking operation



#### Note

- ◆ *Coolant temperature at least 80 °C*
- ◆ *Electrical equipment switched off (radiator fan must not run during the test)*
- ◆ *Air conditioner switched off*
- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Start basic setting”.
- Select “Display group number 002”.
- Check the load detection specifications.

|                                                                                                | Display zones                                                |               |                                                                           |               |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------|---------------------------------------------------------------------------|---------------|
|                                                                                                | 1                                                            | 2             | 3                                                                         | 4             |
| Display group 002: Intake air mass at idling speed with engine at normal operating temperature |                                                              |               |                                                                           |               |
| Display                                                                                        | xxx rpm                                                      | xxx %         | xx.x ms                                                                   | xxx.x g/s     |
| Display                                                                                        | Engine speed                                                 | Load          | Mean injection period                                                     | Air mass      |
| Specification                                                                                  | 700...840 rpm <sup>42)</sup><br>640...760 rpm <sup>43)</sup> | 15.0...25.0 % | 2.0...4.0 ms                                                              | 2.0...4.5 g/s |
| Note                                                                                           | ---                                                          | ---           | If specification is not obtained: evaluation<br>⇒ <a href="#">page 67</a> |               |

42) Manual gearbox, front and four-wheel drive

43) Automatic gearbox, front-wheel drive

If the reading matches the specification:

- Press the  key.

## 1.18.1 Evaluation of display group 002

| Display zone 3    | Possible cause of trouble                                                  | Remedy                                                                      |
|-------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Less than 2.0 ms  | ♦ Lower values can only occur when driving in overrun mode                 |                                                                             |
| More than 4.0 ms  | ♦ Engine loading by ancillaries                                            | – Eliminate load (air conditioner/ power steering/alternator)               |
|                   | ♦ Rough idling (engine not running on all cylinders)                       | – Check the spark plugs                                                     |
|                   | ♦ Throttle valve module -J338- defective                                   | – Check throttle valve module - J338- <a href="#">⇒ page 90</a>             |
| Display zone 4    | Possible cause of trouble                                                  | Remedy                                                                      |
| Less than 2.0 g/s | ♦ Large volume of unmetered air between intake manifold and air mass meter | – Check intake system for leaks (unmetered air) <a href="#">⇒ page 69</a> . |
|                   | ♦ Voltage supply of air mass meter/wiring to engine control unit           | – Check voltage supply and wiring <a href="#">⇒ page 67</a>                 |
| More than 4.5 g/s | ♦ Engine loading by ancillaries                                            | – Eliminate load (air conditioner/ power steering/alternator)               |
|                   | ♦ Voltage supply of air mass meter/wiring to engine control unit           | – Check voltage supply and wiring <a href="#">⇒ page 67</a>                 |

## 1.18.2 Checking voltage supply for air mass meter



Note

- ♦ Fuse for air mass meter -G70- OK [⇒ Current flow diagrams, Electrical fault finding and Fitting locations](#)
- ♦ Fuel pump relay OK; checking [⇒ page 62](#)



Note

*The air mass meter is supplied with power by the fuel pump relay.*

- Unplug the connector from the air mass meter -G70- .

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- Connect up the multimeter (voltage measuring range) as follows.

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

- Briefly operate the starter (engine may also start).
  - ◆ Specification: approx. battery voltage
- If the reading does not match the specification:
- Check for open circuit or short to earth in the wiring from contact 2 of the connector via the fuse to the fuel pump relay:
  - Eliminate open circuit in wiring/short circuit if necessary.
- Connect the portable multimeter (voltage measuring range) to contacts 2 and 3 of the connector.
  - Briefly operate the starter (engine may also start).
  - ◆ Specification: approx. battery voltage



### Note

Engine control unit earth is applied to contact 3 of the connector.

If the reading does not match the specification:

- Check wiring from air mass meter -G70- .
- Connect the portable multimeter (voltage measuring range) to contacts 3 and 4 of the connector.

- ◆ Specification: approx. 5 V

If the reading does not match the specification:

- Check wiring from air mass meter -G70- .

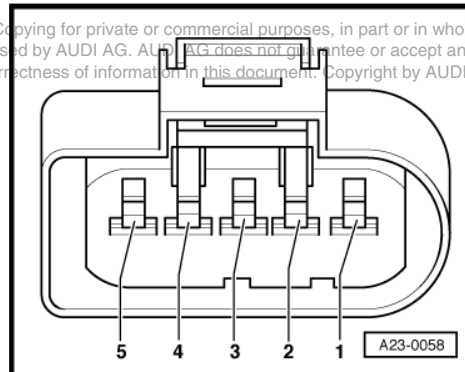
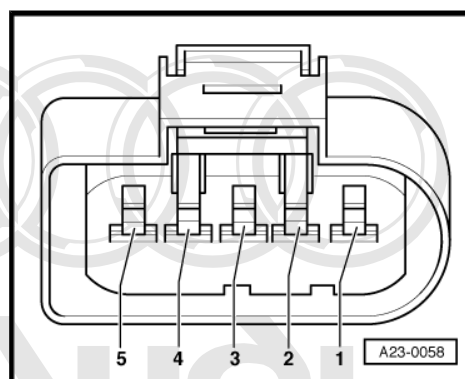
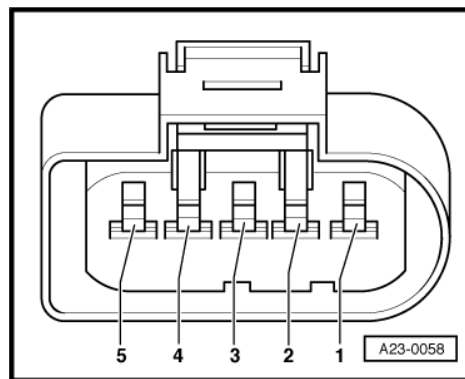
### Checking air mass meter -G70- wiring



### Note

The wiring test also includes checking of the signal wire.

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .



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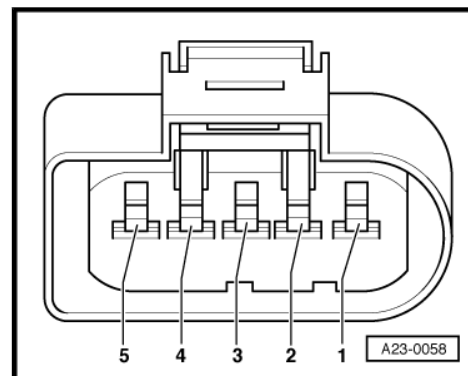
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.
- Also check all wires for mutual short circuit.

If the wiring is OK:

- Renew air mass meter -G70- .



## 1.19 Checking intake system for leaks (un-metered air)

### Special tools and workshop equipment required

- ◆
- ◆ Engine leak detector spray G 001 800 A1
- ◆ -VAS 5051-

### Test sequence



#### Note

- ◆ *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 decrease in engine speed and a considerable increase in the CO content.*

- ◆ *It is essential to comply with the safety regulations listed on the can.*

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- Connect up the vehicle diagnostic and service information system -VAS 5052- and select vehicle system "01 - Engine electronics". The engine must be idling when doing so.
- Select the "Reading measured value block" function.
- Enter "001" for "Display group number 001".
- Note down the engine speed in display zone 1.
- Systematically spray all parts of the intake system with engine leak detector spray.

If the engine speed drops:

- Check sprayed section of intake system for leaks and eliminate fault.
- Switch off ignition.

## 1.20 Checking Lambda control function

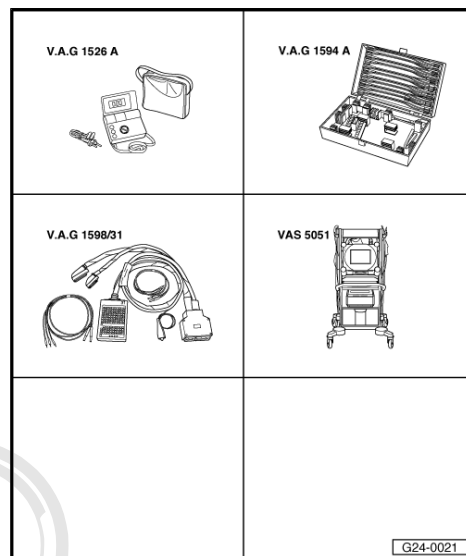
## 1.21 Checking Lambda probe and Lambda control before catalytic converter

### Special tools and workshop equipment required

- ◆ -V.A.G 1526 A-



- ◆ -V.A.G 1594 A-
- ◆ -V.A.G 1598/31-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



## Test sequence



### Note

- ◆ *No leaks in exhaust system.*
- ◆ *Coolant temperature at least 80 °C.*

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function "Start basic setting" and confirm.
- Select "Display group number 030" and confirm.
- Check the specification in display zone 1.



### Note

- ◆ *The specifications are attained more quickly if the engine speed is increased.*
- ◆ *The "Lambda probe status" indicates the status of the lambda control and the Lambda probes.*

|                                        | Display zones                       |                                     |   |   |
|----------------------------------------|-------------------------------------|-------------------------------------|---|---|
|                                        | 1                                   | 2                                   | 3 | 4 |
| Display group 030: Lambda probe status |                                     |                                     |   |   |
| Display                                | X X X                               | X X X                               |   |   |
| Display                                | Lambda probe status bank 1, probe 1 | Lambda probe status bank 1, probe 2 |   |   |
| Operating range                        | 0 = off 1 = on                      | 0 = off 1 = on                      |   |   |
| Specification                          | 1 1 1                               | 1 1 0                               |   |   |

|      | Display zones                                                                                                                                                                                                                                                   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Note | If the reading does not match the specification ⇒ <a href="#">page 73</a><br>If the reading matches the specification, but a fault has been stored in the fault memory ⇒ check Lambda probe learnt values and Lambda control function ⇒ <a href="#">page 71</a> |

| Explanatory notes on 3-position displays in display group 030 |   |   |                                                            |
|---------------------------------------------------------------|---|---|------------------------------------------------------------|
| X                                                             | X | X | Display zones 1 and 2                                      |
|                                                               |   | X | Lambda control: 0 = not active; 1 = active                 |
|                                                               | X |   | Lambda probe condition: 0 = not active; 1 = active         |
| X                                                             |   |   | Lambda probe heating condition: 0 = not active; 1 = active |

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### Note

*The first position of the 3-position display (heating) fluctuates between 0 and 1.*

- Do not continue with testing until the display in zone 1 has attained “111” at least once.

## 1.21.1 Checking Lambda probe learnt values and Lambda control function

- Select “Display group number 032” and confirm.
- Check the Lambda learnt values in display zones 1 and 2:

|                                         | Display zones                                                             |                                                                   |   |   |
|-----------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|---|---|
|                                         | 1                                                                         | 2                                                                 | 3 | 4 |
| Display group 032: Lambda learnt values |                                                                           |                                                                   |   |   |
| Display                                 | xx.x %                                                                    | xx.x %                                                            |   |   |
| Display                                 | Lambda learnt value bank 1, probe 1 at idle (additive)                    | Lambda learnt value bank 1, probe 1 at part load (multiplicative) |   |   |
| Specification                           | -6.0...6.0 %                                                              | -10.0...10.0 %                                                    |   |   |
| Note                                    | If the reading does not match the specification ⇒ <a href="#">page 72</a> |                                                                   |   |   |

- Select “Display group number 033” and confirm.
- Check 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                              |   |   |
| Display                           | Lambda control bank 1, probe 1                                       | Lambda probe voltage bank 1, probe 1 |   |   |
| Specification                     | The value must fluctuate by at least 2 % in the range -10.0...10.0 % | 0.130...3.600 V                      |   |   |

| Display zones |                                                                                  |                                                                                                                   |  |  |
|---------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--|--|
| Note          | If the reading does not match the specification<br>⇒ Refer to continuation below | If the reading does not match the specification<br>⇒ Evaluation of display group 033<br>⇒ <a href="#">page 73</a> |  |  |



### Note

The display shows the Lambda probe voltage signal conditioned and smoothed in the engine control unit. 1.5 V on the display corresponds to lambda 1.

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

- Perform a test drive to remove any residue from the Lambda probe and repeat the test.

If the reading does not match the specification in display zone 1 even after a test drive or if the value does not fluctuate by at least 2 %:

- Check the basic voltage ⇒ [page 73](#) .
- Check the Lambda probe heating upstream of the catalytic converter ⇒ [page 76](#) .
- Check for ageing of the Lambda probe upstream of the catalytic converter ⇒ [page 74](#) .

## 1.21.2 Evaluation of display group 032

| Display zone 1 / 2                         | Possible cause of trouble                                                      | Remedy                                                                                       |
|--------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Lambda learnt values below specified range | ◆ Leak in intake area (pressure side between turbocharger and intake manifold) | – Check the intake system for leaks and eliminate unmetered air<br>⇒ <a href="#">page 69</a> |
|                                            | ◆ Oil dilution                                                                 | – Change engine oil or drive car at moderate to high speeds on out-of-town roads             |
|                                            | ◆ High oil consumption                                                         |                                                                                              |
|                                            | ◆ Air mass meter defective                                                     | – Check the air mass meter<br>⇒ <a href="#">page 66</a>                                      |
|                                            | ◆ Activated charcoal filter system solenoid valve stuck open                   | – Check the activated charcoal filter system solenoid valve<br>⇒ <a href="#">page 86</a>     |
|                                            | ◆ Fuel pressure too high                                                       | – Check the fuel pressure regulator<br>⇒ <a href="#">page 52</a>                             |
|                                            | ◆ Injector not closing                                                         | – Check the injectors ⇒ <a href="#">page 55</a>                                              |
|                                            | ◆ Lambda probe heating defective<br>◆ Lambda probe defective                   | – Check the Lambda probe heating<br>⇒ <a href="#">page 82</a>                                |

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### 1.21.3 Evaluation of display group 032

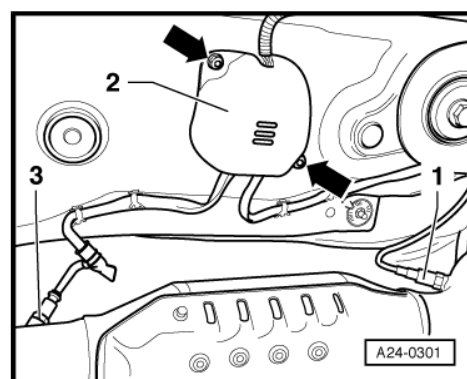
| Display zone 1 / 2                         | Possible cause of trouble                                  | Remedy                                                                                       |
|--------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Lambda learnt values above specified range | ◆ Unmetered air in intake tract                            | – Check the intake system for leaks and eliminate unmetered air<br>⇒ <a href="#">page 69</a> |
|                                            | ◆ Fuel pressure too low                                    | – Check the fuel pressure regulator<br>⇒ <a href="#">page 52</a>                             |
|                                            | ◆ Air mass meter defective                                 | – Check the air mass meter<br>⇒ <a href="#">page 66</a>                                      |
|                                            | ◆ Lambda probe heating defective                           | – Check the Lambda probe heating<br>⇒ <a href="#">page 76</a>                                |
|                                            | ◆ Lambda probe defective                                   |                                                                                              |
|                                            | ◆ Injector not opening or only opening partially           | – Check the injectors ⇒ <a href="#">page 55</a>                                              |
|                                            | ◆ Activated charcoal filter system solenoid valve sticking | – Check the activated charcoal filter system solenoid valve<br>⇒ <a href="#">page 86</a>     |

### 1.21.4 Evaluation of display group 033

| Display zone 2    | Possible cause of trouble                                                                       | Remedy                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| More than 4.800 V | ◆ Short to positive in wiring between Lambda probe and control unit<br>◆ Lambda probe defective | – Check the wiring of the Lambda probe upstream of the catalytic converter ⇒ <a href="#">page 74</a> |
| Less than 0.130 V | ◆ Short to earth in wiring between Lambda probe and control unit<br>◆ Lambda probe defective    | – Renew Lambda probe before catalytic converter                                                      |

### 1.21.5 Checking basic voltage

- Unscrew the protective cover -arrows-.
- Unplug the 6-pin connector (black) to the Lambda probe - G39- .



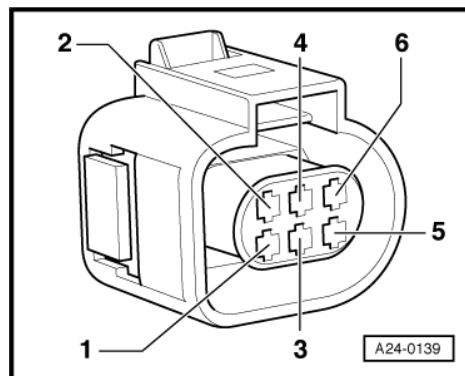
- Connect up the multimeter (voltage measuring range) between contacts 1 and 5.
- Switch on ignition.
- ◆ Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the reading does not match the specification:

- Check the Lambda probe wiring.

If the reading matches the specification:

- Replace the Lambda probe -G39- .



## 1.21.6 Checking Lambda probe wiring

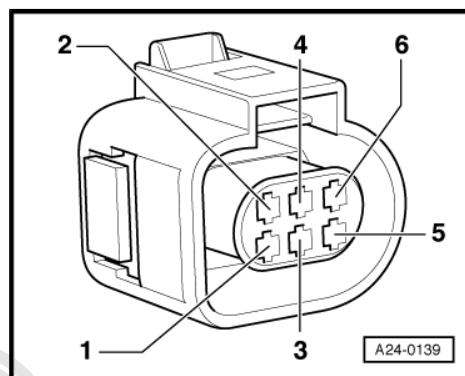
- Unplug the 6-pin connector (black) to the Lambda probe - G39- .
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Check for open circuit in the following wiring.

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1                 | 70                              |
| 2                 | 71                              |
| 5                 | 51                              |
| 6                 | 52                              |

- Eliminate open circuit in wiring if necessary. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Check the wiring for mutual short circuit.

If the wiring is OK:

- Replace the engine control unit ⇒ [page 45](#) .

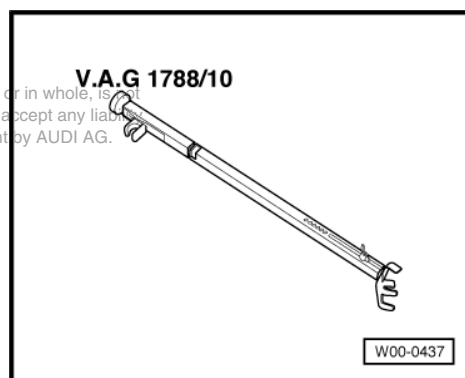


## 1.22 Checking ageing of Lambda probe before catalytic converter

Special tools and workshop equipment required

- ◆ Engine speed adjuster -V.A.G 1788/10-

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- ◆ Vehicle diagnosis and service information system -VAS 5052-

## Test sequence



### Note

*Coolant temperature at least 80 °C.*

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Start basic setting” and confirm.
- Enter “034” for “Display group number 034” and confirm.
- Use the speed setting tool -V.A.G 1788/10- to set the engine speed to 2000 rpm.
- Check the specification in display zone 4:



### Note

*This procedure may take several minutes.*

|                                                     | Display zones |                         |                |                                                   |
|-----------------------------------------------------|---------------|-------------------------|----------------|---------------------------------------------------|
|                                                     | 1             | 2                       | 3              | 4                                                 |
| Display group 034: Diagnosis of Lambda probe ageing |               |                         |                |                                                   |
| Display                                             | xxxx rpm      | xxx °C                  | x.x            | ---                                               |
| Display                                             | Engine speed  | Exhaust gas temperature | Dynamic factor | Diagnosis status                                  |
| Operating range                                     |               |                         |                | Test OFF<br>Test ON<br>B1 -S1- OK<br>B1 -S1- n.OK |
| Specification                                       | 2000 rpm      | Greater than 350 °C     | 0.5...2.5      | B1 -S1- OK                                        |
| Note                                                |               |                         |                |                                                   |

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### Note

*Value calculated from engine speed and engine load*



### Note

*The dynamic factor is an indicator for Lambda probe ageing. The lower the dynamic factor, the more advanced the ageing of the Lambda probe.*

If the reading does not match the specification in display zone 3 or 4:

- Perform a test drive to remove any residue from the Lambda probe and repeat the test.

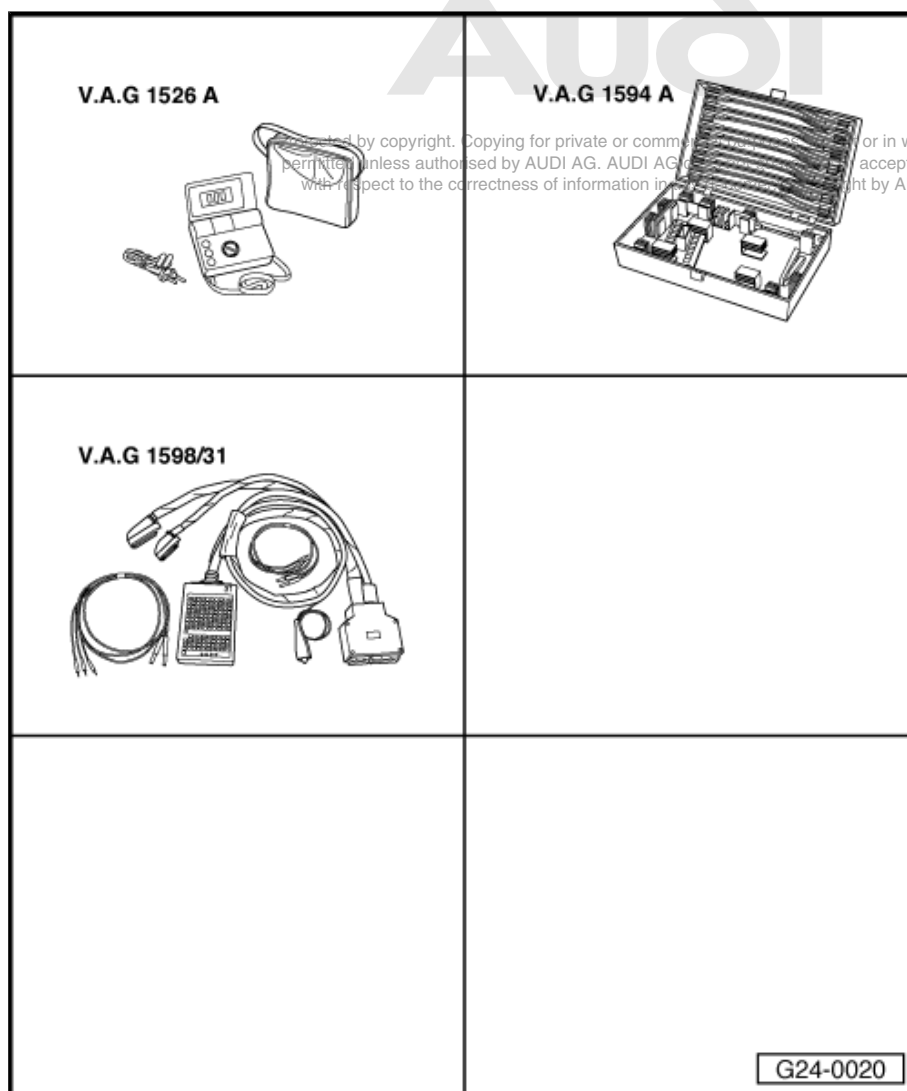
If the reading does not match the specification in display zone 3 or 4 even after a test drive:

- Replace the Lambda probe -G39- .

## 1.23 Checking Lambda probe heater -Z19- for Lambda probe -G39-

### Special tools and workshop equipment required

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



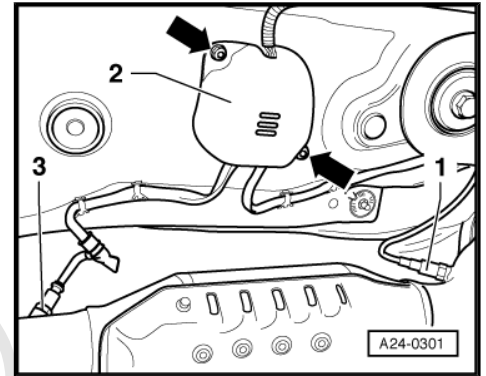
### Test sequence



#### Note

- ◆ *Coolant temperature at least 80 °C*
- ◆ *Fuse for Lambda probe heating OK ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

- Unscrew the protective cover -arrows-.
- Unplug the 6-pin connector (black) to the Lambda probe - G39- .



- Connect up the multimeter (resistance measuring range) between contacts 3 and 4.
- ◆ Specification: 2.5 ... 10  $\Omega$  (at room temperature)

If the reading does not match the specification:

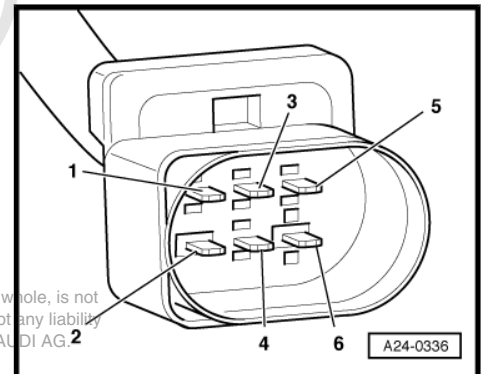
- Replace the Lambda probe -G39- .

If the reading matches the specification:

- Check voltage supply for Lambda probe heating.

#### Checking voltage supply for Lambda probe heater Z19

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- Connect up the multimeter (voltage measuring range) between contacts 3 and 4.
- Start engine.
- ◆ Specification: approx. battery voltage



#### Note

The point at which the engine control unit switches the Lambda probe heating on and off can be observed if applicable in the "Reading measured value block" function, display group number 041, display zone 2.

If there is no voltage:

- Connect up the multimeter (voltage measuring range) as follows.

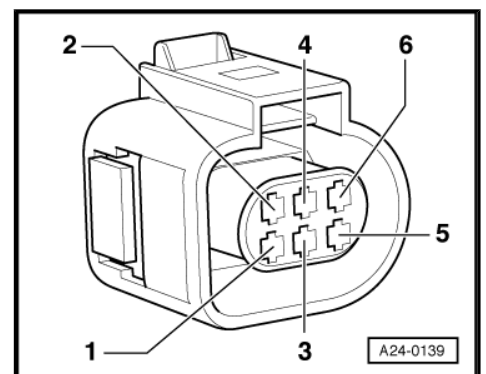
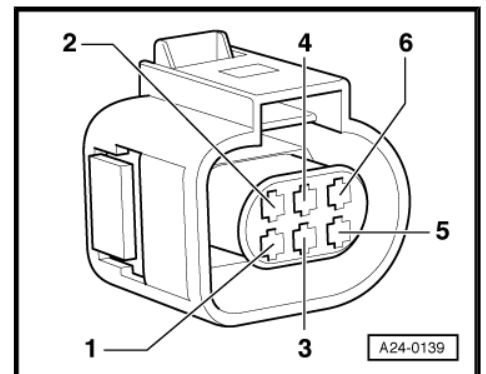
| Connector Contact | Measure to    |
|-------------------|---------------|
| 3 (positive)      | Vehicle earth |

- Briefly operate the starter.
- ◆ Specification: approx. battery voltage

If there is still no voltage:

- Check for open circuit in the wiring from contact 3 of the connector via the fuse to the fuel pump relay:

If the voltage supply is OK:



- Connect up the multimeter (voltage measuring range) as follows:

| Connector Contact                                 | Measure to       |
|---------------------------------------------------|------------------|
| 4 (engine control unit switched earth connection) | Battery positive |

- Start engine.
- ◆ Specification: approx. battery voltage



### Note

The point at which the engine control unit switches the Lambda probe heating on and off can be observed if applicable in the "Reading measured value block" function, display group number 041, display zone 2.

- Switch off ignition.

If there is no voltage:

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#).

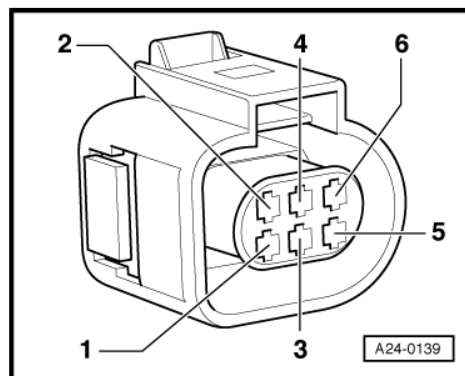
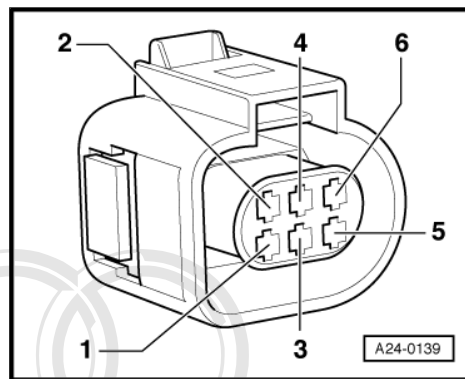
- Check for open circuit in the following wiring:

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

- Eliminate open circuit in wiring if necessary. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

If the wiring is OK but there is no earth supply for the Lambda probe heating:

- Replace the engine control unit ⇒ [page 45](#).



## 1.24 Checking Lambda probe and Lambda control after catalytic converter



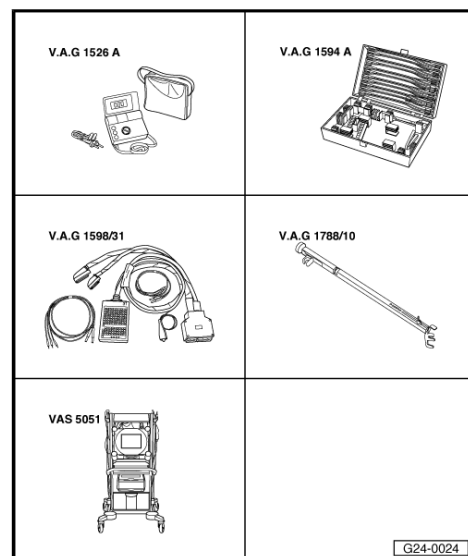
### Note

The Lambda probe upstream of the catalytic converter (bank 1, probe 1) effects regulation to  $\lambda = 1$ . There may be a shift in the control value if this Lambda probe is damaged, for example as a result of contamination or overheating. Deviations from  $\lambda = 1$  are detected by the Lambda probe downstream of the catalytic converter (bank 1, probe 2). If deviations above or below this value are detected, the probe influences control action upstream of the catalytic converter by increasing or reducing it accordingly.

### Special tools and workshop equipment required

- ◆ -V.A.G 1526 A-
- ◆ -V.A.G 1594 A-
- ◆ -V.A.G 1598/31-
- ◆ -V.A.G 1788/10-

# ◆ Vehicle diagnosis and service information system -VAS 5052-



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## 1.24.1 Test sequence

### *i* Note

- ◆ *No leaks in exhaust system.*
- ◆ *Coolant temperature at least 80 °C.*
- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Start basic setting”.
- Select “Display group number 030”.
- Check the specification in display zone 2.

### *i* Note

- ◆ *The specifications are attained more quickly if the engine speed is increased.*
- ◆ *The “Lambda probe status” indicates the status of the lambda control and the Lambda probes.*

|                                                        | Display zones                                                             |                                     |   |   |
|--------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------|---|---|
|                                                        | 1                                                                         | 2                                   | 3 | 4 |
| Display group 030: Lambda probe status at idling speed |                                                                           |                                     |   |   |
| Display                                                | X X X                                                                     | X X X                               |   |   |
| Display                                                | Lambda probe status bank 1, probe 1                                       | Lambda probe status bank 1, probe 2 |   |   |
| Operating range                                        | 0 = off<br>1 = on                                                         | 0 = off<br>1 = on                   |   |   |
| Specification                                          | 1 1 1                                                                     | 1 1 0                               |   |   |
| Note                                                   | If the reading does not match the specification ⇒ <a href="#">page 82</a> |                                     |   |   |

| Explanatory notes on 3-position displays in display group 030 |   |   |                                                            |
|---------------------------------------------------------------|---|---|------------------------------------------------------------|
| X                                                             | X | X | Display zones 1 and 2                                      |
|                                                               |   | X | Lambda control: 0 = not active; 1 = active                 |
|                                                               | X |   | Lambda probe condition: 0 = not active; 1 = active         |
| X                                                             |   |   | Lambda probe heating condition: 0 = not active; 1 = active |



### Note

- ◆ The first position of the 3-position display (heating) fluctuates between 0 and 1.
- ◆ Lambda control of the Lambda probe downstream of the catalytic converter ( -B1- -S2- ) is not active without engine load.
- Do not continue with testing until the display in zone 2 has attained “110” at least once.

## 1.24.2 Checking Lambda control after catalytic converter

- Use engine speed adjuster -V.A.G 1788/10- to set engine speed to 2000 rpm.
- Press  key.
- Select “Display group number 037”.
- Check the Lambda probe voltage in display zone 2.
- Check the lambda correction value in display zone 3 and the result of diagnosis in zone 4.

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| Display zones                                         |             |                                                                        |                                                                     |                                                                                    |
|-------------------------------------------------------|-------------|------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                                                       | 1           | 2                                                                      | 3                                                                   | 4                                                                                  |
| Display group 037: Diagnosis of Lambda control system |             |                                                                        |                                                                     |                                                                                    |
| Display                                               | xxx %       | x.xxx V                                                                | x.xx                                                                | ---                                                                                |
| Display                                               | Engine load | Lambda probe voltage bank 1, probe 2                                   | Lambda correction value between bank 1, probe 1 and bank 1, probe 2 | Diagnosis status                                                                   |
| Operating range                                       |             |                                                                        |                                                                     | Test OFF<br>Test ON<br>Syst. OK<br>Syst. n.OK                                      |
| Specification                                         | 13...40 %   | 0.100...0.950 V                                                        | Less than 0.02                                                      | Syst. OK                                                                           |
| Note                                                  |             | If specification is not obtained: evaluation ⇒ <a href="#">page 81</a> |                                                                     | If display shows “Syst. n.OK”: interrogate fault memory ⇒ <a href="#">page 2</a> . |



### Note

The Lambda probe voltage bank 1, probe 2 should remain as constant as possible. Considerable fluctuations in voltage are an indication of catalytic converter damage.

### 1.24.3 Evaluation of display group 037

| Display zone 2             | Possible cause of trouble                                                                                                                                                                | Remedy                                                                                          |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Constantly approx. 0.450 V | <ul style="list-style-type: none"> <li>♦ Open circuit in wire 4 between Lambda probe and control unit</li> <li>♦ Open circuit in wire 3 between Lambda probe and control unit</li> </ul> | – Check the basic voltage<br>⇒ <a href="#">page 81</a>                                          |
| More than 0.950 V          | ♦ Short to positive in wire 4 between Lambda probe and control unit                                                                                                                      | – Check the Lambda probe wiring downstream of the catalytic converter ⇒ <a href="#">page 82</a> |
| Less than 0.100 V          | ♦ Short to earth in wire 4 between Lambda probe and control unit                                                                                                                         |                                                                                                 |

#### Continuation

If the reading does not match the specification in display zone 3 or 4:

- Perform a test drive to remove any residue from the Lambda probe and repeat the test.

If the reading does not match the specification in display zone 3 or 4 even after a test drive:

- Replace the Lambda probe -G39- .

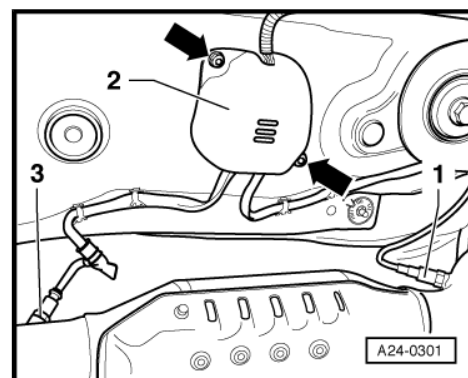


#### Note

*If the Lambda probe voltage is OK and the Lambda correction value is still greater than 0.02 even after a test drive, this is an indication of ageing of the Lambda probe before catalytic converter.*

### 1.24.4 Checking basic voltage

- Unscrew the protective cover -arrows-.
- Unplug the 4-pin connector (brown) to the Lambda probe after catalytic converter -G130- .



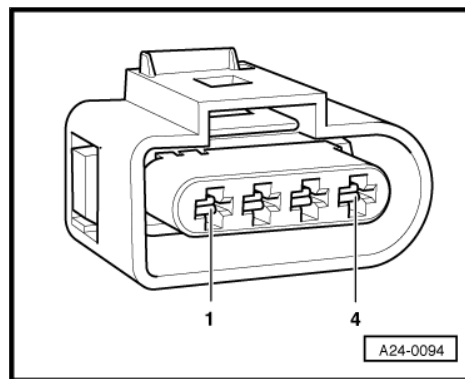
- Connect up the multimeter (voltage measuring range) between contacts 3 and 4.
- Switch on ignition.
- ◆ Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the reading does not match the specification:

- Check the Lambda probe wiring.

If the reading matches the specification:

- Replace the Lambda probe after catalytic converter -G130- .



### 1.24.5 Checking Lambda probe wiring

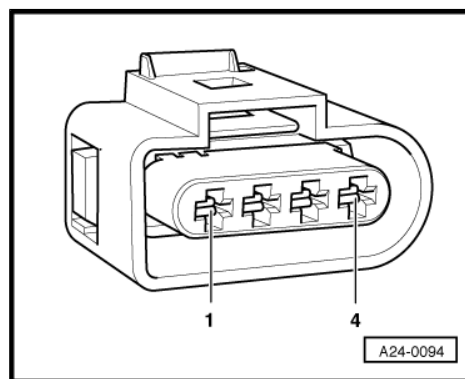
- Unplug the 4-pin connector (brown) to the Lambda probe after catalytic converter -G130- .
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Check for open circuit in the following wiring.

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 3                 | 68                              |
| 4                 | 69                              |

- Eliminate open circuit in wiring if necessary. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Check the wiring for mutual short circuit.

If the wiring is OK:

- Replace the engine control unit ⇒ [page 45](#) .



### 1.25 Checking Lambda probe 1 heater after catalytic converter -Z29- for Lambda probe after catalytic converter -G130-

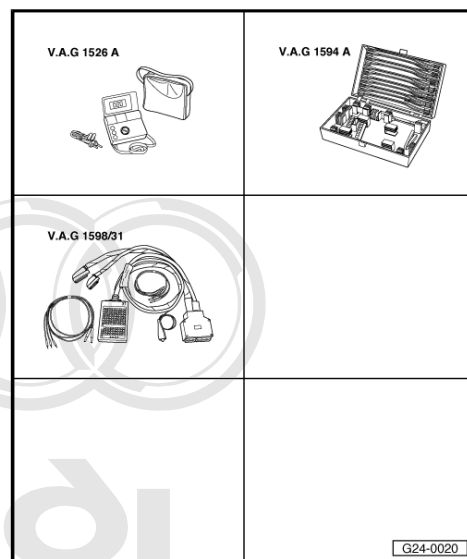
Special tools and workshop equipment required

- ◆ -V.A.G 1526 A-
- ◆ -V.A.G 1594 A-



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◆ -V.A.G 1598/31-



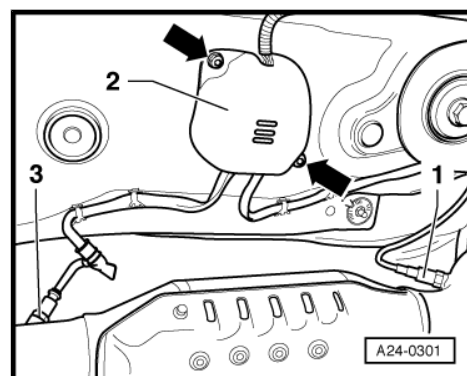
### Test sequence

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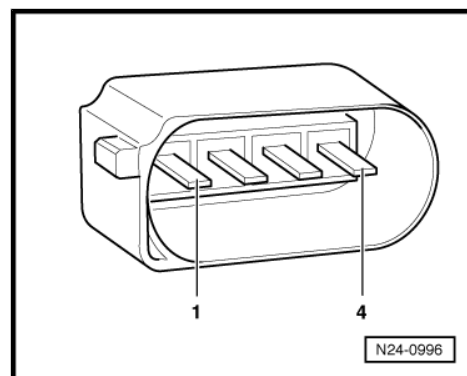
#### Note

- ◆ *Coolant temperature at least 80 °C*
- ◆ *Fuse for Lambda probe heating OK ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*
- Unscrew the protective cover -arrows-.
- Unplug the 4-pin connector (brown) to the Lambda probe after catalytic converter -G130- .



- Connect up the multimeter (resistance measuring range) between contacts 1 and 2.
- ◆ Specification: 6.4 ... 47.5  $\Omega$  (at room temperature)
- If the reading does not match the specification:
  - Replace the Lambda probe after catalytic converter -G130- .
- If the reading matches the specification:
  - Check voltage supply for Lambda probe heating.

**Checking voltage supply of Lambda probe 1 heater after catalytic converter -Z29-**



- Connect up the multimeter (voltage measuring range) between contacts 1 (positive) and 2 (earth).
- Start engine.
- ♦ Specification: approx. battery voltage



### Note

The point at which the engine control unit switches the Lambda probe heating on and off can be observed if applicable in the "Reading measured value block" function, display group number 041, display zone 4.

If there is no voltage:

- Connect up the multimeter (voltage measuring range) as follows:

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

- Briefly operate the starter.
- ♦ Specification: approx. battery voltage

If there is still no voltage:

- Check for open circuit in the wiring from contact 1 of the connector via the fuse to the fuel pump relay:

If the voltage supply is OK:

- Connect up the multimeter (voltage measuring range) as follows:

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

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

If there is no voltage:

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit [⇒ page 41](#).

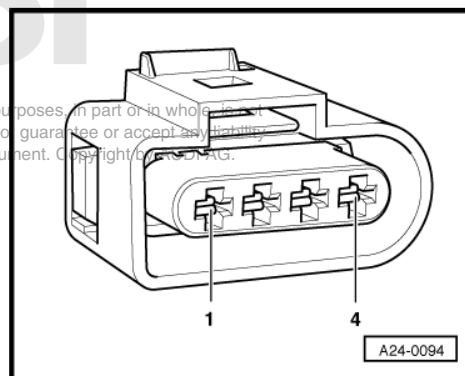
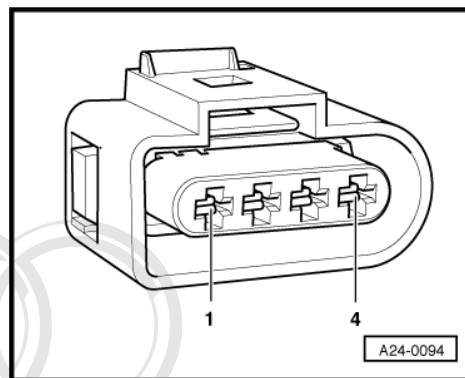
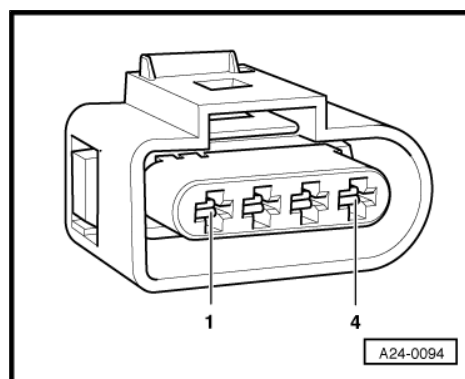
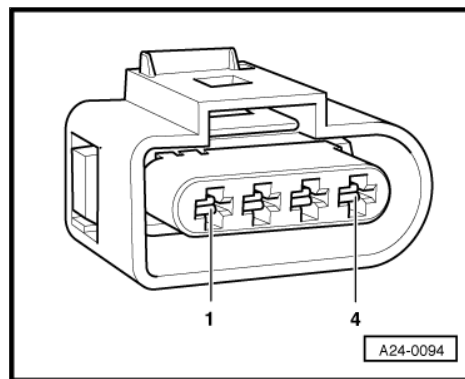
- Check for open circuit in the following wiring:

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 2                 | 63                              |

- Eliminate open circuit in wiring if necessary.

If the wiring is OK but there is no earth supply for the Lambda probe heating:

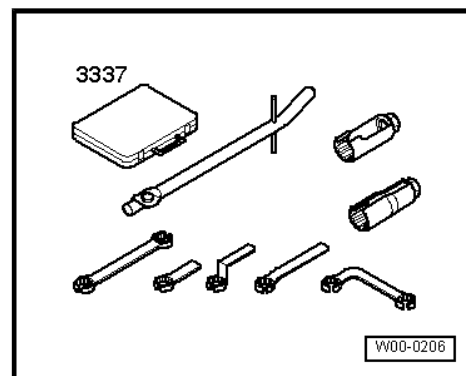
- Replace the engine control unit [⇒ page 45](#).



## 1.26 Removing and installing Lambda probe

### Special tools and workshop equipment required

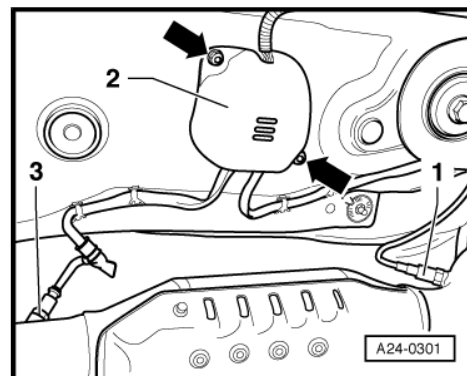
- ◆ Lambda probe open ring spanner set -3337-



- ◆ High-temperature paste

### Procedure

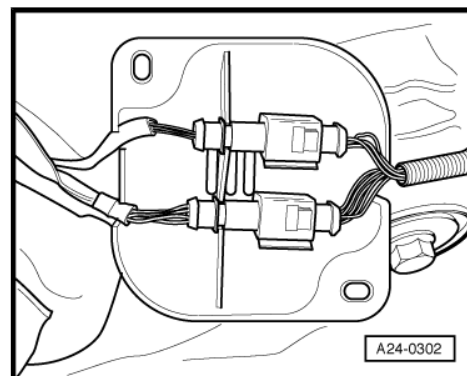
- Unscrew the protective cover -arrows-.



- Unplug the connector of the Lambda probe and lay bare the wire.

- ◆ Identification of connectors: Black for Lambda probe -G39- and Lambda probe heater -Z19- ; brown for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- .

- Use a tool from the ring spanner set for Lambda probe -3337- to screw out the Lambda probe.



Pay attention to the following on installation:



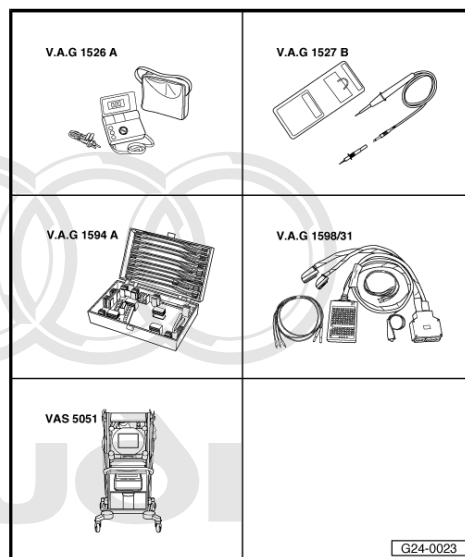
### Note

- ◆ New Lambda probes are coated with assembly paste which is not to be allowed to come into contact with the slits in the probe body.
- ◆ Only the thread of an old Lambda probe is to be coated with the high-temperature paste. This paste must not be allowed to come into contact with the slits in the probe body. High-temperature paste → Parts catalogue
- ◆ When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.
- ◆ Tightening torque: 55 Nm.

## 1.27 Checking 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-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



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### Checking for leaks

Activated charcoal filter solenoid valve 1 -N80- remains closed when it is not receiving any current.

- Detach the hoses from the activated charcoal filter system solenoid valve 1 -N80-. Leave the connector plugged in.
- Attach a test hose to one connection of the activated charcoal filter system solenoid valve 1 -N80- .
- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. The ignition must be switched on when doing so.
- Initiate final control diagnosis and activate activated charcoal filter solenoid valve 1 -N80- ⇒ [page 16](#) .
- ◆ The solenoid valve should click.
- ◆ ... and should open and close (check by blowing into the auxiliary hose).

If the solenoid valve does not click:

- Check the internal resistance of the activated charcoal filter system solenoid valve 1 -N80- .

If the activated charcoal filter system solenoid valve 1 -N80- does not open or close properly:

- Replace the activated charcoal filter system solenoid valve 1 -N80- .

### Checking internal resistance

- Unplug the connector at the activated charcoal filter system solenoid valve 1 -N80- .

- Connect the multimeter (resistance measuring range) to the activated charcoal filter system solenoid valve 1 -N80- .

◆ Specification: 22 ... 30  $\Omega$

If the reading does not match the specification.

- Replace the activated charcoal filter system solenoid valve 1 -N80- .

If the reading matches the specification:

- Check voltage supply.

#### Checking voltage supply



#### Note

- ◆ Fuse of activated charcoal filter system solenoid valve 1 -N80- OK  $\Rightarrow$  Current flow diagrams, Electrical fault finding and Fitting locations
- ◆ Fuel pump relay -J17- OK; checking  $\Rightarrow$  [page 62](#)



#### Note

The activated charcoal filter system solenoid valve 1 -N80- is supplied with power via the fuel pump relay -J17- .

- Unplug the connector at the activated charcoal filter system solenoid valve 1 -N80- .
- Connect up the voltage tester -V.A.G 1527 B- as follows:

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

- Briefly operate the starter (engine may also start).

◆ The LED must light

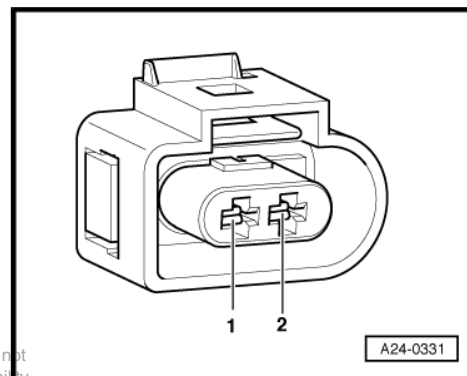
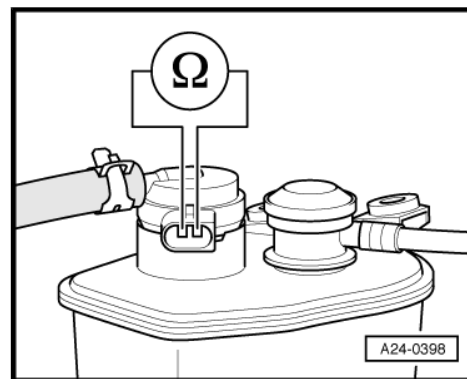
If the LED does not light:

- Check for open circuit in the wiring from contact 1 of the connector via the fuse to the fuel pump relay -J17- .
- Eliminate open circuit in wiring if necessary.

If the LED lights:

- Check actuation.

#### Checking actuation



- Connect up the voltage tester -V.A.G 1527 B- to contacts 1 (positive) and 2 of the connector.
- Initiate final control diagnosis and activate activated charcoal filter solenoid valve 1 -N80- ⇒ [page 16](#) .

◆ The LED must flash

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

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .

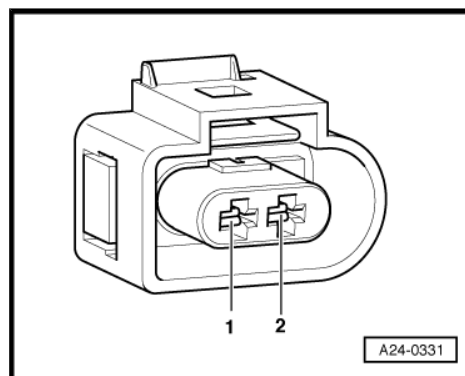
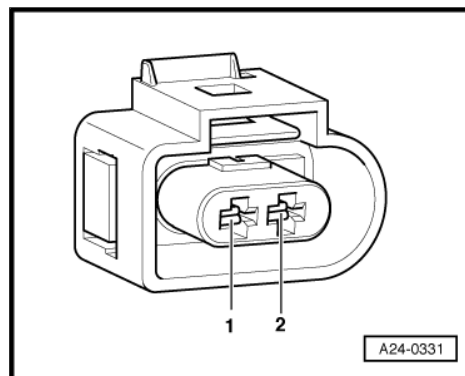
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.

If the wiring is OK:

- Replace the engine control unit ⇒ [page 45](#) .



# Audi

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## 2 Checking electronic engine power control (electronic throttle)

### 2.1 Operation of electronic throttle system

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

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) which are connected to the accelerator pedal.

The position of the accelerator pedal (driver input) is one of the principal input variables for the engine control unit.

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

The throttle valve is actuated by the throttle valve positioner in line with the specifications of 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 (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).

Thus, for example, the throttle valve may 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 improvement in emission levels and fuel consumption.

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

It would be inappropriate to think of the "electronic throttle system" as only comprising one or two components. The electronic throttle system actually contains all the components used to determine, control and monitor the position of the throttle valve, e.g. the accelerator pedal position sender, the throttle valve module, the EPC warning lamp and the engine control unit...).

### 2.2 Electronic power control fault lamp - K132- in instrument cluster



#### Note

*The electronic power control fault lamp -K132- is also referred to as the EPC warning lamp.*

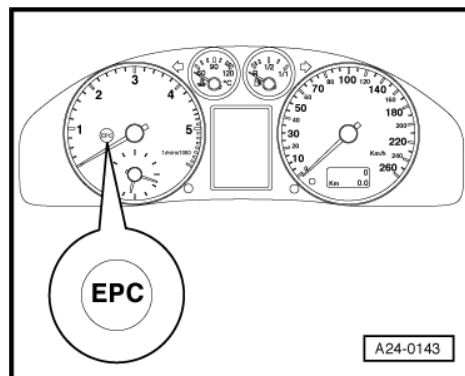
"EPC" is the abbreviation for Electronic Power Control (electronic throttle).

## Fitting location of the 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.

The engine control unit activates the EPC lamp after switching on the ignition. Shortly after starting the engine, the EPC lamp goes out if no faults in the electronic throttle system have been detected by the engine control unit and actuation of the lamp by the engine control unit is OK.

If faults in the electronic throttle system are detected during engine operation, the engine control unit activates the EPC lamp (such faults are indicated in the fault table). At the same time an entry is made in the engine control unit fault memory.



## 2.3 Checking electronic power control fault lamp -K132-

- Switch on ignition.
- ◆ The engine control unit switches on the EPC lamp.
- Start engine.
- ◆ Shortly after starting the engine, the EPC lamp goes out if no faults relating to the electronic throttle system have been stored in the fault memory.



### Note

*The activation signal for the fault lamp is transmitted by the engine control unit to the dash panel insert by means of the CAN bus. Check data exchange between the engine control unit and other control units with CAN capability ⇒ [page 111](#).*

## 2.4 Checking throttle valve module -J338-

The housing for the throttle valve module contains the following components:

- ◆ Throttle valve drive (electric power control) -G186- (this is an electric motor which is actuated by the engine control unit; it overcomes spring force to open the throttle valve).
- ◆ Throttle valve drive angle sender 1 (electric power control) - G187-
- ◆ Throttle valve drive angle sender 2 (electric power control) - G188-



### Note

- ◆ *The housing for the throttle valve module must not be opened.*
- ◆ *The angle senders take the form of potentiometers (variable resistors). They inform the engine control unit of the position of the throttle valve and are completely independent of each other.*
- ◆ *The potentiometers cannot be mechanically adjusted. The settings are made in the Basic setting mode using vehicle diagnostic and service information system -VAS 5052-.*

Perform adaption of throttle valve module ⇒ [page 91](#).

## 2.5 Performing adaption of throttle valve module

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.

Adaption must always be performed if the throttle valve module - J338 - or the engine control unit has been removed/installed or renewed, or if the voltage supply for the engine control unit has been interrupted.

Adaption is performed:

- ◆ Automatically, if the ignition is switched on for at least 10 seconds without the starter being operated or the accelerator pedal pressed and the engine control unit detects "adaption required". (In this case, however, there is no definite indication of whether the adaption process was successful or not.) The need for adaption is recognised if the stored angle sender voltage values do not coincide with the currently measured voltage values within a certain tolerance range.
- ◆ By starting basic setting (function 04), display group 060, with ignition on.



### Note

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

### Special tools and workshop equipment required

- ◆ Vehicle diagnosis and service information system -VAS 5052-

### Procedure



### Note

- ◆ No fault stored in fault memory; interrogating fault memory ⇒ [page 2](#) and ⇒ [page 2](#)
- ◆ Engine stopped, ignition switched on
- ◆ Accelerator pedal not depressed.
- ◆ Coolant temperature 10 ... 95 °C
- ◆ Intake air temperature 10 ... 90 °C
- ◆ Voltage supply to engine control unit more than 12.7 V; checking ⇒ [page 132](#).
- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function "Start basic setting".
- Select "Display group number 060".

After you press the  key, the throttle valve positioner is first disconnected from the power supply.

In this condition the throttle valve is pulled into an emergency running position by a mechanical spring which is located in the throttle valve module. The values supplied by the two angle send-



ers in this emergency running position are stored by the engine control unit.

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

The throttle valve is then closed by the throttle valve positioner; the values supplied by the angle senders in the throttle valve module are stored in the engine control unit.

De-energization of the throttle valve positioner by the engine control unit whilst driving becomes apparent in the form of a faster, uneven idling speed. The throttle response of the engine is very slow.

- Check the throttle valve module specifications in display zones 3 and 4.

|                                                      | Display zones                         |                                       |                                                                                                                                                                                                                                                                                   |                                                                               |
|------------------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                                                      | 1                                     | 2                                     | 3                                                                                                                                                                                                                                                                                 | 4                                                                             |
| Display group 060: Adaption of throttle valve module |                                       |                                       |                                                                                                                                                                                                                                                                                   |                                                                               |
| Display                                              | xx %                                  | 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                                              | Throttle valve angle (angle sender 1) | Throttle valve angle (angle sender 2) | Adaption step counter                                                                                                                                                                                                                                                             | Adaption status                                                               |
| Operating range                                      |                                       |                                       | 0...8                                                                                                                                                                                                                                                                             | ADP in progress<br>ADP OK<br>ERROR                                            |
| Specification                                        | 3...93 %                              | 97...3 %                              | 8                                                                                                                                                                                                                                                                                 | ADP OK                                                                        |
| Note                                                 |                                       |                                       | Following adaption, the adaption step counter reaches the number 8 (numbers may also be skipped).                                                                                                                                                                                 | If display shows "ERROR": Interrogate fault memory ⇒ <a href="#">page 2</a> . |

**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:
- ◆ Throttle valve cannot be completely closed (e.g. contamination)
- ◆ Battery voltage too low
- ◆ Fault in throttle valve module or wiring
- ◆ Engine started during adaption or accelerator pedal pressed
- ◆ Distortion of throttle valve housing (check bolts).
- ◆ Following termination, "Function unknown or cannot be implemented at present" appears on the tester display. The adaption process will start again automatically the next time the ignition is switched on (for several seconds).

- Exit from Basic setting function for engine.

## 2.6 Checking for contamination of throttle valve

### Note

- ◆ *Ensure that the correct type of air cleaner is fitted (genuine part) and that it is in proper condition.*
- ◆ *Intake air duct OK*
- ◆ *Fuel pressure OK*
- ◆ *Fuel tank breather function OK*
- ◆ *Injectors OK*
- ◆ *Coolant temperature > 80 °C*

Lambda probe learnt values and Lambda control function OK

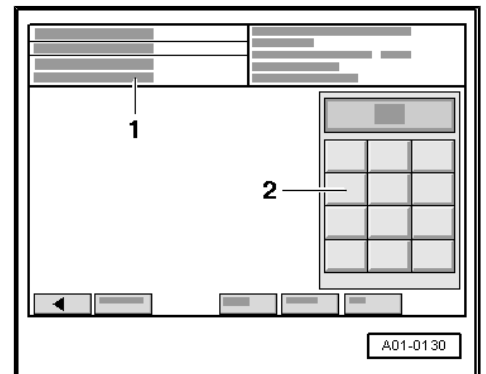
Cleaning throttle valve ⇒ [page 95](#)

### Checking Lambda probe learnt values and Lambda control function

- Connect vehicle diagnosis and service information system - VAS 5052- to engine control unit. Engine must be idling.
- Select “Basic setting”.

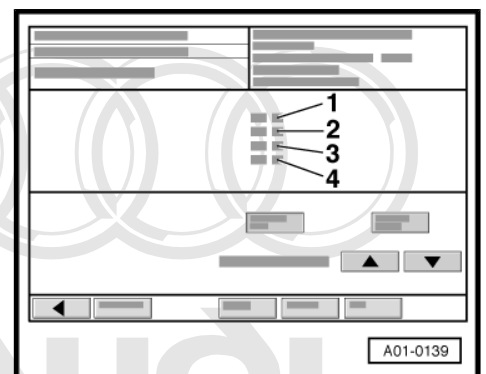
Display on tester:

- 1 - Enter display group (highest possible entry = 255)
- Use the keypad -2- to enter “032” for “Display group number 032” and confirm by touching the  key.



Display on tester:

- Check the specification in display zone -2-.



|                                         | Display zones |        |   |   |
|-----------------------------------------|---------------|--------|---|---|
|                                         | 1             | 2      | 3 | 4 |
| Display group 032: Lambda learnt values |               |        |   |   |
| Display                                 | xx.x %        | xx.x % |   |   |

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|               | Display zones                                          |                                                                   |  |  |
|---------------|--------------------------------------------------------|-------------------------------------------------------------------|--|--|
| Display       | Lambda learnt value bank 1, probe 1 at idle (additive) | Lambda learnt value bank 1, probe 1 at part load (multiplicative) |  |  |
| Specification | -9.0...9.0 %                                           | -25.0...25.0 %                                                    |  |  |

### Procedure

- Unplug the connector from the air mass meter.
- Connect up the vehicle diagnosis and service information system -VAS 5052- and select vehicle system “Engine electronics”. Engine must be idling.
- Select Basic setting.

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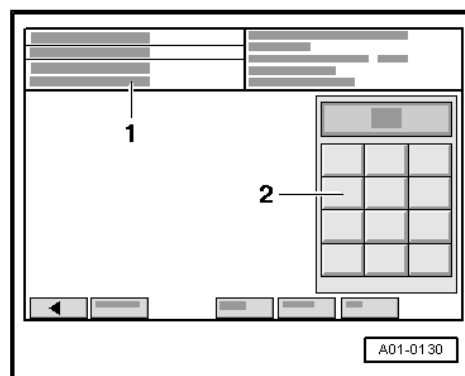


### Note

Display on tester:

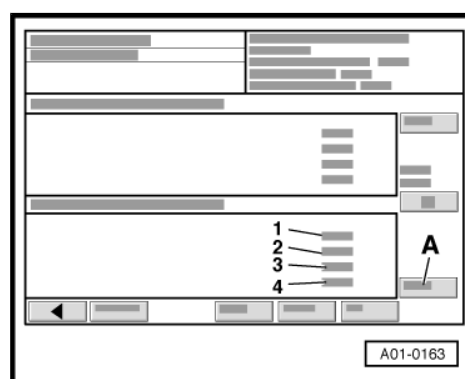
1 - Enter display group

- Enter “107” for “Display group number 107” and confirm by touching the  key.



Display on tester:

- Check the display in zone -4-.



|                                               | Display zones       |                                    |                                    |                                               |
|-----------------------------------------------|---------------------|------------------------------------|------------------------------------|-----------------------------------------------|
|                                               | 1                   | 2                                  | 3                                  | 4                                             |
| Display group 107: Lambda control, short trip |                     |                                    |                                    |                                               |
| Display                                       | xxx rpm             | x.x %                              | x.x %                              | Test ON                                       |
| Display                                       | Actual engine speed | Lambda control mean value (bank 1) | Lambda control mean value (bank 2) | Diagnosis status                              |
| Operating range                               |                     |                                    |                                    | Test OFF<br>Test ON<br>Syst. OK<br>Syst. n.OK |

|                    | Display zones |  |  |          |
|--------------------|---------------|--|--|----------|
| Specifi-<br>cation |               |  |  | Syst. OK |

If the reading matches the specification "Syst. OK" in display zone 4:

- Touch the ▾ key.
- Re-connect the air mass meter.
- For further fault-finding, perform the next step in the fault table.

If "Syst. n.OK" is displayed in zone 4:

- Touch the ▾ key.
- Use a lint-free cloth and cleaning fluid to clean the air duct in the throttle valve module.
- Perform throttle valve module adaption again [⇒ page 91](#)
- Repeat test sequence: Lambda control, short trip; Measured value block 107 in Basic setting 04
- Re-connect the air mass meter.
- Erase the fault memory [⇒ page 2](#)
- Perform a test drive. Heed the safety instructions [⇒ page 32](#)
- Fault memory interrogated [⇒ page 2](#)

## 2.7 Cleaning throttle valve module

### Special tools and workshop equipment required

- ◆ Acetone



#### Note

- ◆ *Observe all relevant safety precautions.*
- ◆ *Observe rules for cleanliness.*
- ◆ *Take care not to scratch the throttle valve housing when cleaning it.*

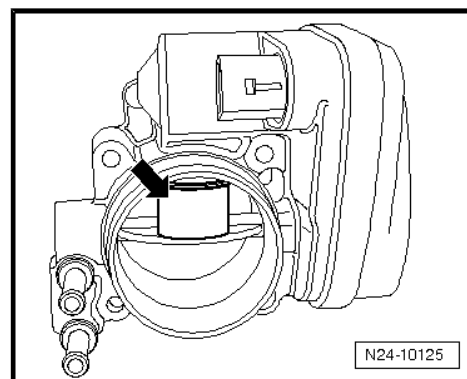
#### Procedure:

- Remove throttle valve module.
- Open throttle valve by hand and block it in the open position with a suitable object -arrow-.

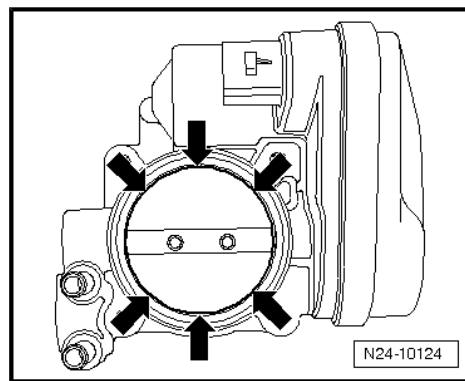


#### WARNING

**Acetone is highly flammable. Please observe all accident prevention regulations and safety precautions when handling flammable liquids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and protective clothing to avoid possible injury and skin contact.**



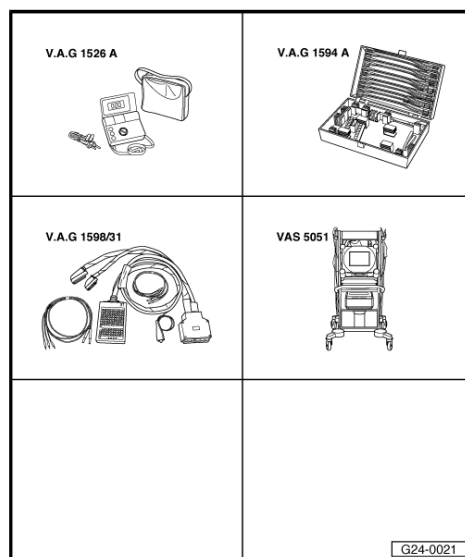
- Clean throttle valve housing, especially around the points where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to evaporate completely and re-install throttle valve module after cleaning.
- Perform adaption of engine control unit to throttle valve module ⇒ [page 91](#) .



## 2.8 Checking 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-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function "Read measured value block".
- Select "Display group number 062".
- Check the specifications for the electronic throttle potentiometer voltages in display zones 1 and 2.

|                                                                                                                                                                                                                     |                                          |                                          |                                        |                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------|----------------------------------------|----------------------------------------|
|                                                                                                                                                                                                                     | Display zones                            |                                          |                                        |                                        |
| 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. |                                          | 2                                        | 3                                      | 4                                      |
| Display group 062: Electronic throttle potentiometer voltages                                                                                                                                                       |                                          |                                          |                                        |                                        |
| Display                                                                                                                                                                                                             | xx %                                     | xx %                                     | xx %                                   | xx %                                   |
| Display                                                                                                                                                                                                             | Throttle valve angle<br>(angle sender 1) | Throttle valve angle<br>(angle sender 2) | Accelerator pedal<br>position sender 1 | Accelerator pedal<br>position sender 2 |

|                    | Display zones |          |           |          |
|--------------------|---------------|----------|-----------|----------|
| Specifi-<br>cation | 3...93 %      | 97...3 % | 12...97 % | 4...49 % |



#### Note

The engine control unit converts the voltage values of the angle senders into a percentage referenced to 5 V and displays these percentage values (5 V supply voltage corresponds to 100 %).

- Observe display zones 1 and 2.
- Slowly floor the accelerator pedal.

The percentage display in zone 1 must increase steadily. The tolerance range 3...93 % is not fully utilised in the process.

The percentage display in zone 2 must decrease steadily. The tolerance range 97...3 % is not fully utilised in the process.



#### Note

- ◆ The reason for the display in zone 1 increasing whereas the display in zone 2 decreases is the opposing action of the potentiometers (angle senders) in the throttle valve module.
- ◆ This means that the voltage tapped at one of the angle senders approaches 5 V (the further the throttle valve is opened, the higher the voltage becomes and the percentage indicated increases).
- ◆ The trend of the voltage tapped at angle sender 2 is away from 5 V and towards 0 V (the further the throttle valve is opened, the lower the voltage becomes and the percentage indicated decreases).

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If the displays are not as described:

- Check voltage supply and wiring to throttle valve module. Pay particular attention to the possibility of loose or corroded connectors.
- Check the accelerator pedal position senders ➔ [page 98](#) .

#### Checking voltage supply of throttle valve module -J338-

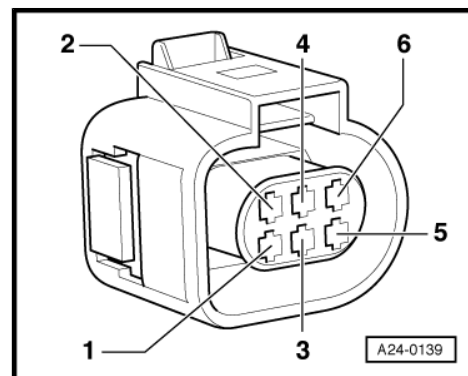
- Unplug the connector from the throttle valve module -J338- .
- Switch on ignition.
- Connect up the multimeter (voltage measuring range) as follows:

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

If the readings do not match the specifications:

- Check wiring between engine control unit and throttle valve module -J338- .

#### Checking wiring



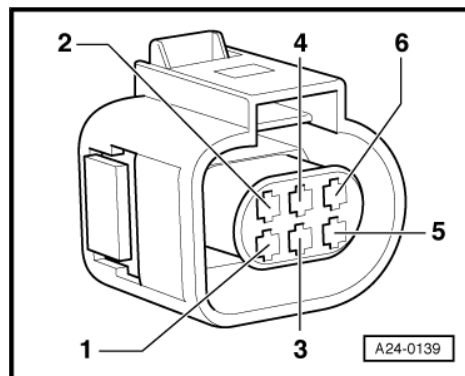
- Unplug the connector from the throttle valve module -J338- .
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit => [page 41](#) .
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found in the wiring:

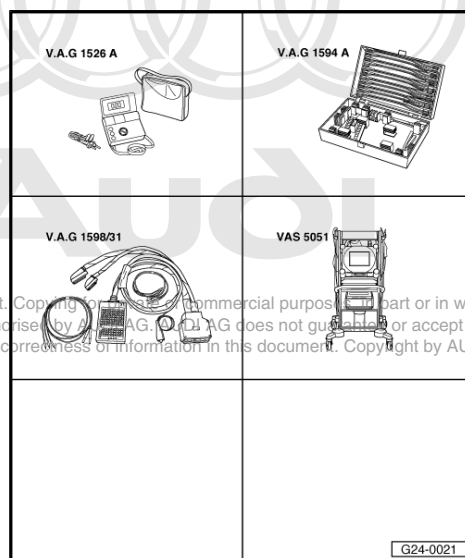
- Replace the throttle valve module -J338- .



## 2.9 Checking accelerator pedal position sender -G79-

### Special tools and workshop equipment required

- ◆ -V.A.G 1526 A-
- ◆ -V.A.G 1594 A-
- ◆ -V.A.G 1598/31-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



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### Test sequence



#### Note

Both the accelerator pedal position sender -G79- and the accelerator pedal position sender 2 -G185- are located at the accelerator pedal and provide the engine control unit with completely independent information on the driver input. Both senders are accommodated in a single housing.

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function “Read measured value block”.
- Select “Display group number 062”.
- Check the specifications for the electronic throttle potentiometer voltages in display zones 3 and 4.

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

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#### Note

*The engine control unit converts the voltage values of the angle senders into a percentage referenced to 5 V and displays these percentage values (5 V supply voltage corresponds to 100 %).*

- Observe display zones 3 and 4.
- Slowly floor the accelerator pedal.

The percentage display in zone 3 must increase steadily. The tolerance range 12...97 % is not fully utilised in the process.

The percentage display in zone 4 must also increase steadily. The tolerance range 4...49 % is not fully utilised in the process.



#### Note

*The value displayed in zone 3 must always be roughly twice that in display zone 4.*

If the displays are not as described:

- Check voltage supply and wiring of accelerator pedal senders.

#### Checking voltage supply to accelerator position senders

- Remove driver's storage compartment ⇒ Rep. Gr. 68 .
- Unplug the connector from the accelerator pedal position sender -G79- .
- Switch on ignition.

- Connect up the multimeter (voltage measuring 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   |

If the specifications are obtained:

- Check the signal wires.

If the specifications are not obtained:

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

### Checking wiring

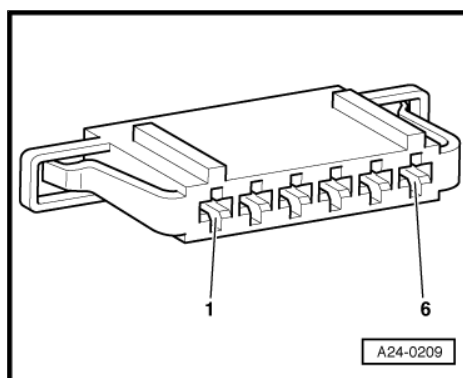
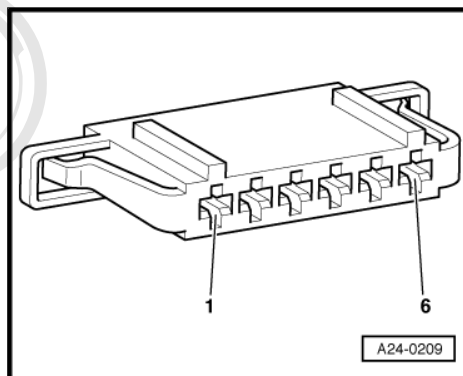
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found in the wiring:

- Renew accelerator position senders: Fuel supply system, petrol engines ⇒ Rep. Gr. 20 .



## 2.10 Adapting kickdown function

Kick-down function adaption must be performed on vehicles with automatic gearbox if the accelerator pedal position sender or engine control unit is replaced.

### Special tools and workshop equipment required

- ◆ Vehicle diagnosis and service information system -VAS 5052-

### Procedure



#### Note

- ◆ No fault stored in fault memory; interrogating fault memory ⇒ [page 2](#) and ⇒ [page 2](#)
- ◆ Engine stopped, ignition switched on

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function “Start basic setting”.
- Select “Display group number 063”.

**Note**

*You will then be given the prompt “Operate kickdown”.*

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- Fully depress accelerator pedal beyond kickdown point and keep it pressed.

**Note**

*During kick-down point adaption the display on the tester shows “Kick-down ADP. running”. Following successful kick-down point adaption, the display on the tester will show “Kick-down ADP. OK”.*

- Check the readout in display zone 4:

|                                               | Display zones                 |                                                     |          |                                                                               |
|-----------------------------------------------|-------------------------------|-----------------------------------------------------|----------|-------------------------------------------------------------------------------|
|                                               | 1                             | 2                                                   | 3        | 4                                                                             |
| Display group 063: Adapting kickdown function |                               |                                                     |          |                                                                               |
| Readout                                       | xx %                          | xx %                                                | Kickdown | ---                                                                           |
| Display shows                                 | Accelerator position sender 1 | Learnt kickdown value/accelerator position sender 1 | Kickdown | Adaption status                                                               |
| Range                                         |                               |                                                     | Kickdown | depress<br>ADP. running<br>ADP. OK<br>ERROR                                   |
| Specification                                 | 79...94 %                     | 79...94 %                                           | Kickdown | ADP. O.K.                                                                     |
| Note                                          |                               |                                                     |          | If display shows “ERROR”: Interrogate fault memory ⇒ <a href="#">page 2</a> . |

**Note**

- ◆ The abbreviation “ADP” in display zone 4 stands for Adaption.
- ◆ “ERROR” may be displayed for example if the accelerator pedal is not floored immediately after the tester prompt or if the accelerator pedal is released whilst the adaption process is still running and has not yet been completed. In both cases, exit from “Basic setting” mode and repeat the adaption process.

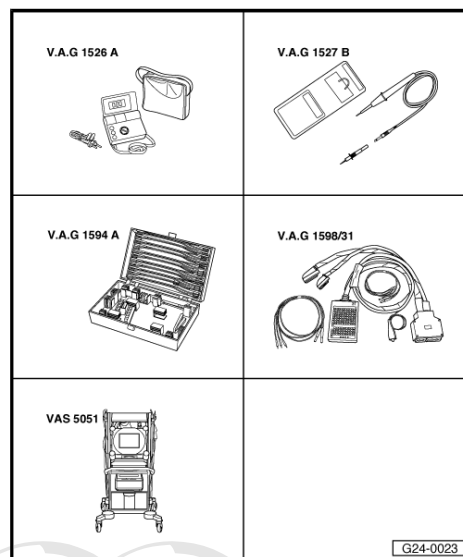
If the reading matches the specification “ADP OK”:

- Test is concluded.

## 2.11 Checking brake light switch -F- and brake pedal switch -F47-

### 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-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



### Test sequence



#### 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. To do this the control unit requires signals from the brake light switch and also the brake pedal switch. If the brake is operated while the accelerator is held constantly depressed, the engine is immediately governed down to idling speed. A defective switch can cause unwanted governing of engine speed.

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function "Read measured value block".
- Select "Display group number 066".
- Check the brake light/brake pedal switch in display zone 2.

| Display zones                                     |                      |                        |                         |                  |
|---------------------------------------------------|----------------------|------------------------|-------------------------|------------------|
|                                                   | 1                    | 2                      | 3                       | 4                |
| Display group 066: Signals to engine control unit |                      |                        |                         |                  |
| Display                                           | xxx km/h             | XXXXXXXXX              | xxx km/h                | XXXXXXXXX        |
| Display                                           | ACTUAL vehicle speed | Switch positions       | SPECIFIED vehicle speed | Switch positions |
| Operating range                                   |                      | XXXXXXX00<br>XXXXXXX11 |                         |                  |

|                    | Display zones |                                                                               |  |  |
|--------------------|---------------|-------------------------------------------------------------------------------|--|--|
| Specifi-<br>cation |               | • Pedal not pressed:<br>XXXXXX00                                              |  |  |
|                    |               | • Pedal pressed:<br>XXXXXX11                                                  |  |  |
| Note               |               | Value:<br>X = no significance.<br>The switching points<br>are slightly offset |  |  |

If display differs from specification described above: check switch

#### Checking switch

- Remove driver's storage compartment ⇒ Rep. Gr. 68 .
- Unplug the connector at the brake light/brake pedal switch.
- Connect up the multimeter (resistance measuring range) be-  
tween contacts 1 and 4.

◆ Specification:  $\infty \Omega$  (no continuity)

- Depress the brake pedal.

◆ Specification: approx.  $0 \Omega$

- Connect up the multimeter (resistance measuring range) be-  
tween contacts 2 and 3.

◆ Specification: approx.  $0 \Omega$

- Depress the brake pedal.

◆ Specification:  $\infty \Omega$  (no continuity)

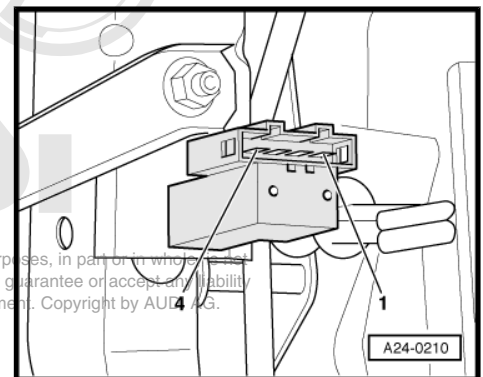
If the readings do not match the specifications:

- Replace the brake light switch/brake pedal switch.

If the specifications are obtained:

- Check voltage supply.

#### Checking voltage supply



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

| Connector<br>Contact | Measure to |
|----------------------|------------|
| 1                    | Body earth |

- ◆ The LED must light

| Connector<br>Contact | Measure to |
|----------------------|------------|
| 2                    | Body earth |

- Switch on ignition.

- ◆ The LED must light

If the LED does not light:

- Check for open circuit/short to earth in the wiring from contacts 1/2 of the connector.
- Eliminate open circuit in wiring/short circuit if necessary.

If the LED lights:

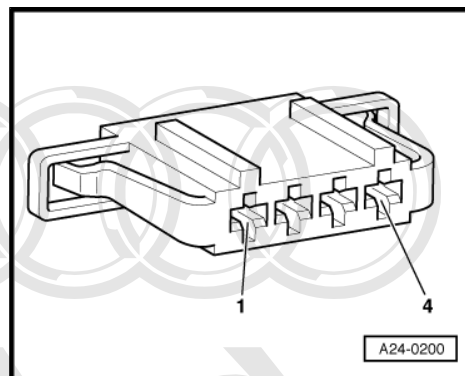
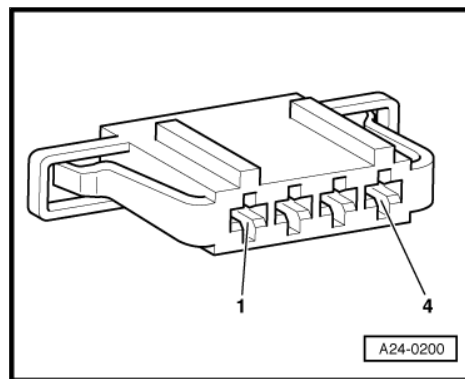
- Check actuation.

#### Checking activation

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.



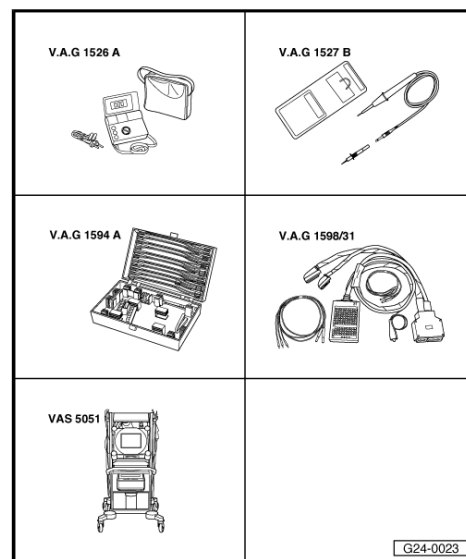
## 2.12 Checking clutch pedal switch -F36-

### 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-

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◆ Vehicle diagnosis and service information system -VAS 5052-



**Test sequence**



**Note**

*This signal prevents engine speed fluctuations and load change jolts when the clutch is disengaged. The signal is also required for the cruise control system.*

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function "Read measured value block".
- Select "Display group number 066".
- Check the accelerator pedal position sender -G79- in display zone 2.

|                                                   | Display zones        |                                  |                         |                  |
|---------------------------------------------------|----------------------|----------------------------------|-------------------------|------------------|
|                                                   | 1                    | 2                                | 3                       | 4                |
| Display group 066: Signals to engine control unit |                      |                                  |                         |                  |
| Display                                           | xxx km/h             | XXXXXXXX                         | xxx km/h                | XXXXXXXX         |
| Display                                           | ACTUAL vehicle speed | Switch positions                 | SPECIFIED vehicle speed | Switch positions |
| Operating range                                   |                      | XXXXX0XX<br>XXXXX1XX             |                         |                  |
| Specification                                     |                      | • Pedal not pressed:<br>XXXXX0XX |                         |                  |
|                                                   |                      | • Pedal pressed:<br>XXXXX1XX     |                         |                  |
| Note                                              |                      | Value:<br>X = no significance    |                         |                  |

If display differs from specification described above: check switch

**Checking switch**

- Remove driver's storage compartment ⇒ Rep. Gr. 68 .

- Unplug the connector at the accelerator pedal position sender -G79- .
- Connect up the multimeter (resistance measuring range) between contacts 1 and 2.

◆ Specification: approx. 0  $\Omega$

- Depress the clutch pedal.

◆ Specification:  $\infty \Omega$  (no continuity)

If the reading does not match the specification:

- Replace the accelerator pedal position sender -G79- .

If the reading matches the specification:

- Check voltage supply.

### Checking voltage supply

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

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

- Switch on ignition.

◆ The LED must light

If the LED does not light:

- Check for open circuit in the wiring between contact 1 of the connector and the fuse:
- Eliminate open circuit in wiring if necessary.

If the LED lights:

- Check actuation.

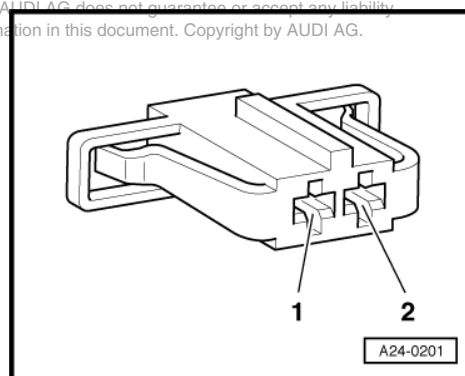
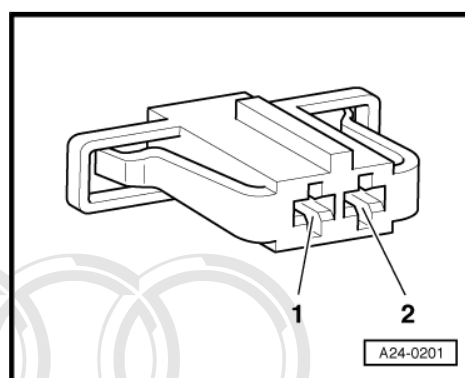
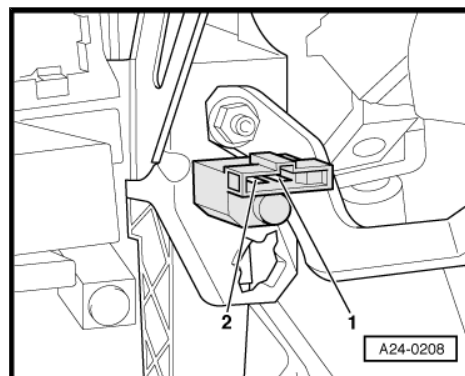
### Checking activation

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .

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

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

- Eliminate open circuit in wiring/short circuit if necessary.



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## 3 Checking auxiliary signals

### 3.1 Checking engine speed signal



#### Note

*The engine speed signal is output at contact 37 of the engine control unit. The signal is required for example for the rev counter display in the dash panel insert.*

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Check for open circuit and short to earth or positive in the following wiring:

| Test box<br>-V.A.G 1598/31-<br>Socket | Dash panel insert<br>Contact                                              |
|---------------------------------------|---------------------------------------------------------------------------|
| 37                                    | . ⇒ Current flow diagrams, Electrical fault finding and Fitting locations |

- Eliminate open circuit in wiring/short circuit if necessary.

### 3.2 Checking road speed signal



#### Note

- ♦ *The vehicle speed signal is generated by the speedometer sender -G22- (at the gearbox) and conditioned in the dash panel insert.*
- ♦ *The conditioned signal is received at contact 54 of the engine control unit and is used for idling speed stabilisation and load change jolt damping on changing gear.*



#### Note

*Speedometer function and display OK. Fault-finding: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

#### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. The engine must be idling when doing so.



#### WARNING

***To avoid the risk of accident during measurement and test drives, always heed the safety precautions ⇒ [page 32](#) .***

- Select the function "Read measured value block".
- Select "Display group number 005".
- Perform a test drive to determine whether the vehicle speed is displayed in zone 3.

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- If the vehicle speed is not displayed, raise the vehicle (on a lifting platform if possible) until the front left wheel is free to turn.
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Connect the voltage tester -V.A.G 1527 B- to sockets 3 (positive) and 54 (vehicle speed signal) of the test box - V.A.G 1598/31- .
- Switch on ignition and turn the front left wheel by hand.
- ◆ LED should flash (extremely short signal).

If the LED does not flash:

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

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

- Eliminate open circuit in wiring/short circuit if necessary.

### 3.3 Checking air conditioner compressor cut-out



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- ◆ *The air conditioner compressor signal informs the engine control unit that the compressor is to be switched on in 140 milliseconds.*
- ◆ *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:*
- ◆ *In the case of powerful acceleration (full load in 1st gear)*
- ◆ *In emergency running mode (limp-home)*
- ◆ *After starting basic setting (function 04)*



#### Note

- ◆ *Air conditioner OK*
- ◆ *No fault stored in engine control unit fault memory*
- ◆ *Vehicle at room temperature (above +15 °C).*

#### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Read measured value block”.
- Select “Display group number 050”.
- Switch off air conditioner.

- ◆ Specification for display zone 4: Compr.OFF
- Switch on the air conditioner with the “Auto” button and set the air conditioner to maximum cooling/heating output. The compressor must 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 display in zone 4 is not as described.

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.
- If there is no fault in the wiring, check operation of the air conditioner. Heating, air conditioning.

### 3.4 Checking power assisted steering pressure switch -F88-

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

#### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. **Engine must be idling**
- Select the function “Read measured value block”
- Select “Display group number 056”.
- Check the power assisted steering pressure switch in 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                                                                    |
| Display                                                                                          | Actual engine speed | Specified engine speed | Idling speed control torque change | Operating statuses                                                           |
| Operating range                                                                                  |                     |                        |                                    | 0XXXX<br>1XXXX                                                               |
| Specification                                                                                    |                     |                        |                                    | • Steering in straight ahead position or slight steering angle:<br><br>0XXXX |

| Display zones |  |  |  |                                                                                                             |
|---------------|--|--|--|-------------------------------------------------------------------------------------------------------------|
|               |  |  |  | <ul style="list-style-type: none"> <li>Full steering lock or rapid steering action:</li> </ul> <p>1XXXX</p> |
| Note          |  |  |  | Value:<br>X = no significance                                                                               |

If display differs from specification described above: check switch

#### Checking switch

- Unplug the connector at the power assisted steering pressure switch -F88- at the power steering pump.
- Connect multimeter to switch (resistance measurement range).

Start engine.

◆ Specification:  $\infty \Omega$  (no continuity)

– Turn steering wheel to full lock (left and right).

◆ Specification: approx.  $0 \Omega$

If display does not change:

– Replace the power assisted steering pressure switch -F88- .

If the display changes:

– Check the wiring.

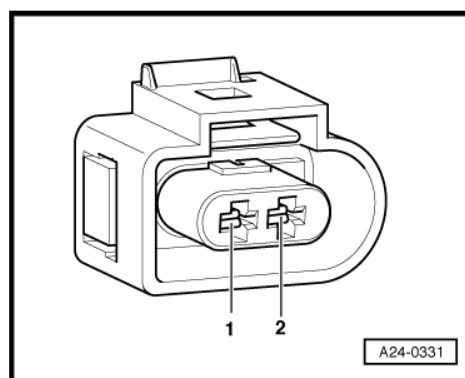
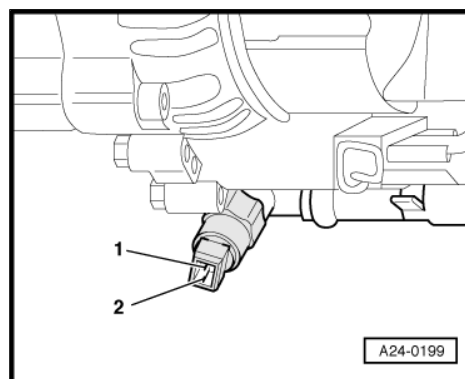
#### Checking wiring

– Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .

– Check for open circuit and short to earth or positive in the following wiring:

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

– Eliminate open circuit in wiring/short circuit if necessary.



### 3.5 Checking crash signal wire

The crash signal ("Crash deactivation triggered") is supplied to the engine control unit by the airbag control unit.

If the airbag control unit transmits the crash signal to the engine control unit (in an accident or if airbag system final control diagnosis has been performed), the engine control unit deactivates the fuel pump, i.e. the engine stops but can subsequently be re-started (e.g. to move the vehicle out of the hazard area).

– Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .

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

| Test box<br>-V.A.G 1598/31-<br>Socket | Airbag control unit -J234-<br>Contact                                      |
|---------------------------------------|----------------------------------------------------------------------------|
| 67                                    | . => Current flow diagrams, Electrical fault finding and Fitting locations |

- Eliminate open circuit in wiring/short circuit if necessary.  
=> Current flow diagrams, Electrical fault finding and Fitting locations

If no fault is found in the wiring:

- Interrogate fault memory of airbag control unit: Body, self-diagnosis => Rep. Gr. 01 .

### 3.6 Checking fuel consumption signal for on-board computer



#### Note

*The consumption signal is transmitted by the engine control unit to the instrument cluster by way of the CAN bus. Check data exchange between the engine control unit and other control units with CAN capability => [page 111](#) .*

### 3.7 Checking tank level signal wire



#### Note

- ◆ *The signal is used to determine the cause of certain faults detected (e.g. misfiring).*
- ◆ *The tank level signal is transmitted by the instrument cluster to the engine control unit via the CAN bus. Check data exchange between the engine control unit and other control units with CAN capability => [page 111](#) .*

### 3.8 Checking data exchange between the engine control unit and other control units with CAN capability



#### Note

- ◆ *Data are exchanged between the individual control units by means of a bus system.*
- ◆ *The term "CAN bus" refers to a system for transferring and distributing data.*
- ◆ *The wires between the control units on which data are transmitted are referred to as signal wires.*
- ◆ *Data are transmitted serially along these signal wires to the connected control units (e.g. engine speed, accelerator pedal position).*

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### 3.8.1 Checking bus system

If the fault table indicates that the data exchange between the engine control unit and control units with CAN capability should be tested:

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. When doing this, the ignition must be switched on.
- Select the function “Read measured value block”.



#### Note

*The measured value blocks 125 and 126 indicate the drive system data bus users.*

- Select “Display group number 125”.
- Check the displays in zones 1 to 4. **The display shows the control units capable of CAN communication with the engine control unit:**
  - ◆ No display: Control unit without CAN capability
  - ◆ Display 1: Control unit with CAN capability is data bus user
  - ◆ Display 0: Control unit with CAN capability is not data bus user
- Perform the same check for display group number 126.
- Press the  key.
- Select the function “End output”.
- Select “Automatic test sequence”.
- ◆ The fault memories of all vehicle systems with self-diagnosis capability are interrogated

If a control unit responds with its identification, the number of stored faults or “No fault detected” appears on the display.

Any stored system faults are consecutively displayed and printed out. The -V.A.G 1551- then transmits the next address word.

If a fault relating to “Drive system data bus...” or “...CAN bus” is displayed:

- Check whether the vehicle has been fitted with the correct engine control unit and other control units with CAN capability (part no. and code).

If the correct control units have been fitted:

- Check for firm attachment of the multi-pin connectors of the control units.

If the multi-pin connectors are properly attached:

- Check the CAN bus system.

### 3.8.2 Communication takes place between three or more control units by way of a “two-wire bus system”.

- Assess the faults stored in the control units.

 **Note**

*Assessment helps to localise the wiring fault.*

**Example 1:**

The faults entered in the fault memories indicate that there is no connection between control unit 1 and control units 2 and 3.

| Control unit | Faults entered in fault memory                                                                                               |
|--------------|------------------------------------------------------------------------------------------------------------------------------|
| 1            | <ul style="list-style-type: none"> <li>◆ No message from control unit 2</li> <li>◆ No message from control unit 3</li> </ul> |
| 2            | <ul style="list-style-type: none"> <li>◆ No message from control unit 1</li> </ul>                                           |
| 3            | <ul style="list-style-type: none"> <li>◆ No message from control unit 1</li> </ul>                                           |

- Switch off ignition.
- Disconnect the control units linked by the bus wires and check for open circuit in one of the bus wires. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Replace control unit 1 if no faults are found in the bus wires.

**Example 2:**

The faults entered in the fault memories indicate that there is no connection between control unit 2 and control units 1 and 3.

| Control unit | Faults entered in fault memory                                                                                               |
|--------------|------------------------------------------------------------------------------------------------------------------------------|
| 1            | <ul style="list-style-type: none"> <li>◆ No message from control unit 2</li> </ul>                                           |
| 2            | <ul style="list-style-type: none"> <li>◆ No message from control unit 1</li> <li>◆ No message from control unit 3</li> </ul> |
| 3            | <ul style="list-style-type: none"> <li>◆ No message from control unit 2</li> </ul>                                           |

- Switch off ignition.
- Disconnect the control units linked by the bus wires and check for open circuit in one of the bus wires. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Replace control unit 2 if no faults are found in the bus wires.

**Example 3:**

The faults entered in the fault memories indicate that none of the control units can transmit or receive.

| Control unit | Faults entered in fault memory                                                      |
|--------------|-------------------------------------------------------------------------------------|
| 1            | <ul style="list-style-type: none"> <li>◆ Drive system data bus defective</li> </ul> |
| 2            | <ul style="list-style-type: none"> <li>◆ Drive system data bus defective</li> </ul> |
| 3            | <ul style="list-style-type: none"> <li>◆ Drive system data bus defective</li> </ul> |

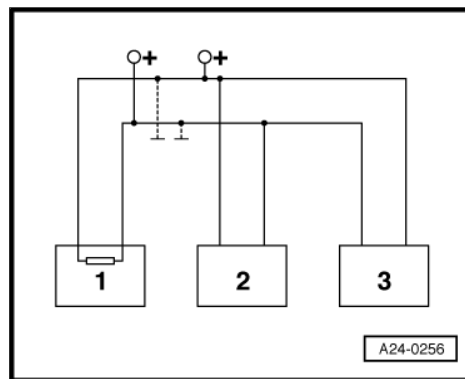
- Switch off ignition.

- Disconnect the control units linked by the bus wires and check the bus wires for short to positive and earth. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

**If the cause of the fault "Drive system data bus defective" cannot be found in the bus wires, check whether one of the control units is responsible for the fault.**

All control units using CAN bus for communication still disconnected; ignition switched off.

- Connect one of the control units.
- Connect the fault reader -V.A.G 1551- . Switch on the ignition and erase the fault memory of the control unit just connected. Terminate fault reader output with function 06 "End of output".
- Switch ignition off and on again.
- Leave ignition switched on for 10 seconds. Then use the fault reader to read out the fault memory of the control unit just connected.
- If the fault "Drive system data bus defective" is read out, replace the control unit just connected.
- If the fault "Drive system data bus defective" is not read out, connect the next control unit and repeat the procedure.



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## 4 Vacuum system layout

1 - Secondary air inlet valve - N112-

2 - Crankcase breather

3 - Secondary air pump motor -V101-

4 - Throttle valve module - J338-

5 - Non-return valves for activated charcoal filter (ACF)

- ☐ Between ACF and intake manifold
- ☐ Between ACF and intake area upstream of turbocharger
- ☐ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

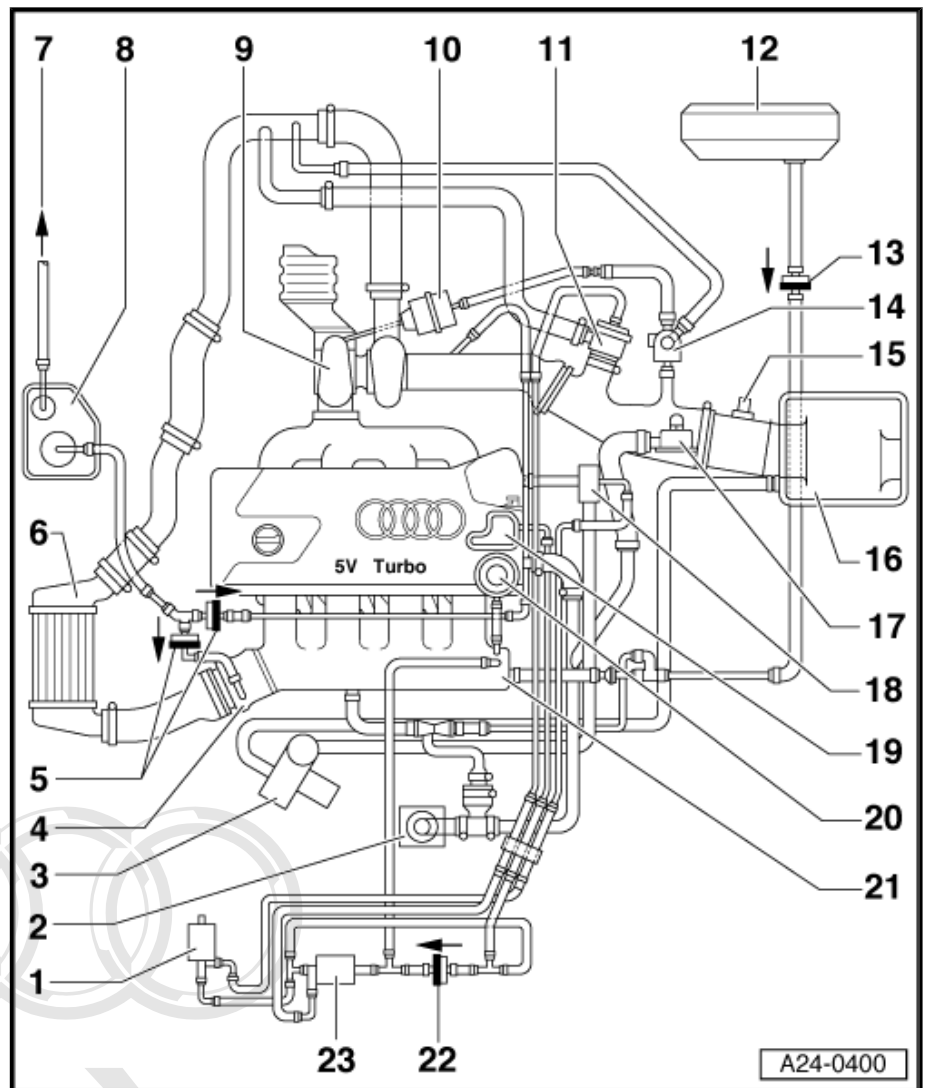
6 - Charge air cooler

- ☐ With charge air pressure sender -G31-

7 - From fuel tank

8 - Activated charcoal filter

- ☐ With activated charcoal filter system solenoid



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valve 1 -N80-

**9 - Turbocharger**

**10 - Vacuum unit for charge pressure control**

**11 - Mechanical air recirculation valve**

**12 - Brake servo**

**13 - Non-return valve**

- ☐ Between brake servo and intake manifold
- ☐ Installation position (light side/ dark side) as shown in illustration. Arrow indicates direction of flow

**14 - Charge pressure control solenoid valve -N75-**

**15 - Air mass meter -G70-**

**16 - Air cleaner**

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**17 - Pressure control valve for crankcase breather system**

**18 - Secondary air system combination valve**

**19 - Vacuum reservoir**

- ☐ Bolted to cylinder head cover

**20 - Fuel pressure regulator**

**21 - Intake manifold**

- ☐ With intake air temperature sender -G42-

**22 - Non-return valve**

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

**23 - Turbocharger divert air valve -N249-**

## 28 – Ignition system

### 1 Checking ignition system

A voltage of at least 12.5 V is required for proper operation of electrical components.



- ◆ *If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobiliser disabling the engine control unit. The fault memory must then be interrogated and, if necessary, the control unit must be adapted.*
- ◆ *Certain tests may lead to a fault being detected by the control unit and stored. The fault memory is therefore to be interrogated and if necessary erased on completion of all tests and repair work. The readiness code must be generated after erasing the fault memory ⇒ [page 22](#).*

#### 1.1 Safety precautions

**Observe the following to avoid injuries to persons and/or damage to the injection and ignition system:**

- ◆ The ignition must be switched off before disconnecting or connecting ignition system wiring, high-voltage wires and test leads.
- ◆ If the engine is to be operated at starter motor speed without it starting (e.g. compression test), unplug the connectors at the ignition coils and injectors.
- ◆ Always switch off ignition before washing engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

#### 1.2 Technical data

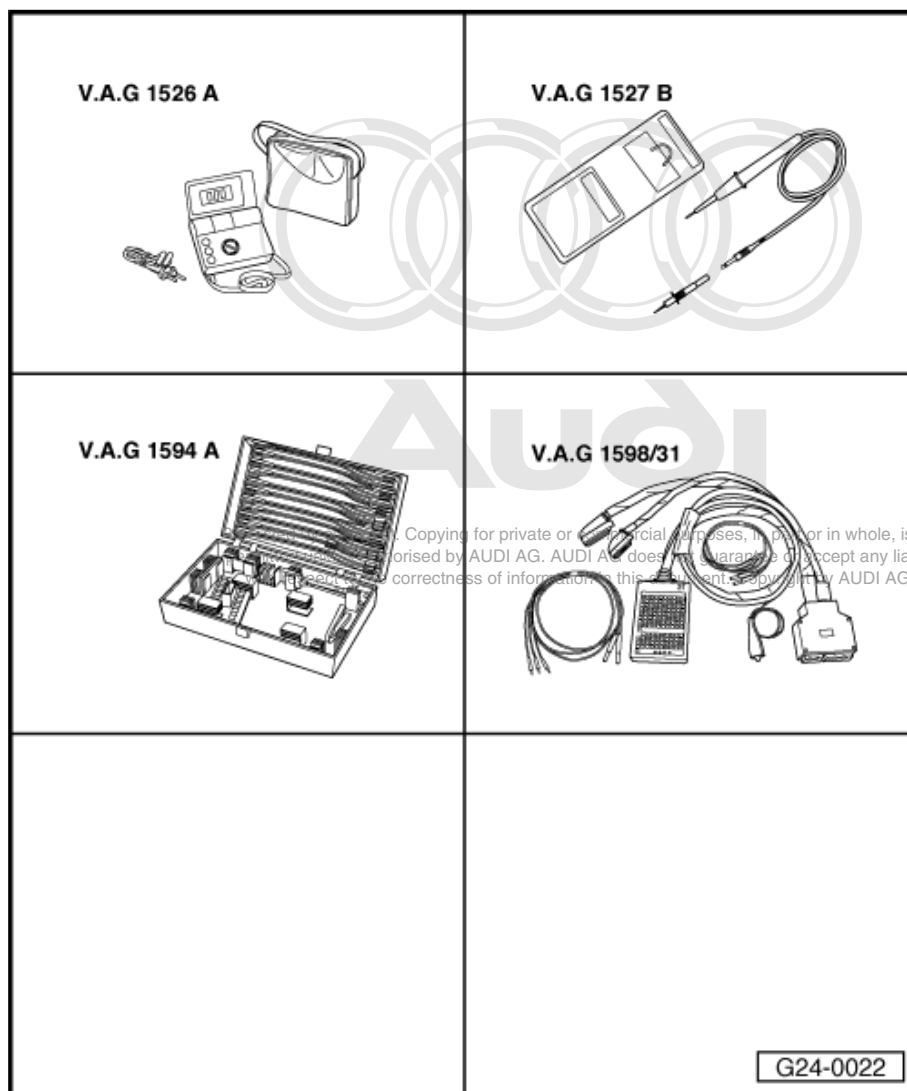
|                                                                                                   |                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engine code letters                                                                               | ARX, AUM (1.8 l / 5V / 110 kW engine)<br>ARY, AUQ (1.8 l / 5V / 132 kW engine)                                                                                   |
| Idling speed<br>Speed cannot be adjusted, regulated by idling speed stabilisation                 | 700 ... 840 rpm <sup>44)</sup> (manual gearbox, front-wheel drive and four-wheel drive)<br>640 ... 760 rpm <sup>44)</sup> (automatic gearbox, front-wheel drive) |
| Engine speed limitation<br>By way of injector deactivation                                        | approx. 6800 rpm                                                                                                                                                 |
| The ignition point is determined in the control unit<br>Ignition point adjustment is not possible |                                                                                                                                                                  |
| Ignition system                                                                                   | Multi-coil system with 4 ignition coils (output stages integrated) connected directly to the spark plugs by way of the spark plug connectors                     |
| Spark plugs <sup>44)</sup>                                                                        | Tightening torque 30 Nm                                                                                                                                          |
| Firing order                                                                                      | 1-3-4-2                                                                                                                                                          |

44) Up-to-date specifications: ⇒ Exhaust emissions test binder

## 1.3 Checking ignition coils with output stages

### Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Voltage tester -V.A.G 1527B-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-



### Test sequence



#### Note

*The ignition coil and the output stage are combined in a joint component.*

- Remove the engine cover -arrows-.

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

- Check misfiring detection ⇒ [page 140](#) and ⇒ [page 140](#) .

If misfiring has been detected:

- Continue with testing at cylinder indicated ⇒ “When defective cylinder has been identified”.

If no misfiring has been detected:

- With the engine running, consecutively unplug the connectors from the injectors and observe engine operation.

or

- Compare the spark plugs of all cylinders, paying attention to soot deposits on the electrodes.

When defective cylinder has been identified:

- Interchange the spark plug of the defective cylinder with that of a different cylinder.

If the fault now occurs at the other cylinder:

- Replace the spark plug.

If the fault remains in the same cylinder:

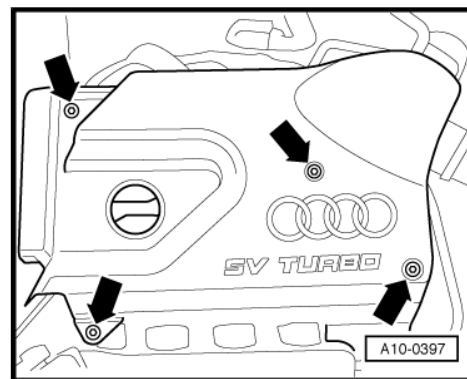
- Interchange the ignition coil of the defective cylinder with that of a different cylinder.

If the fault now occurs at the other cylinder:

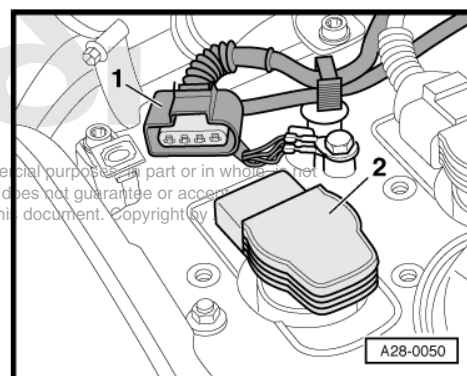
- Replace the ignition coil.

### Checking earth connections

- Unplug the 4-pin connector -1- at the ignition coil -2-.



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

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

- ◆ The LED must light

If the LED does not light:

- Check the wiring. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

If the LED lights up:

- Check voltage supply.

### Checking voltage supply of output stages



#### Note

*Engine electronics fuses OK ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

- Connect up the multimeter (voltage measuring range) as follows:

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

- Switch on ignition.

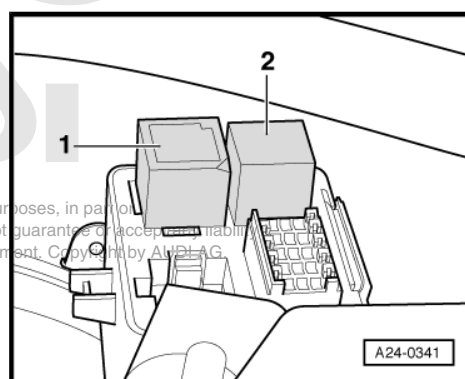
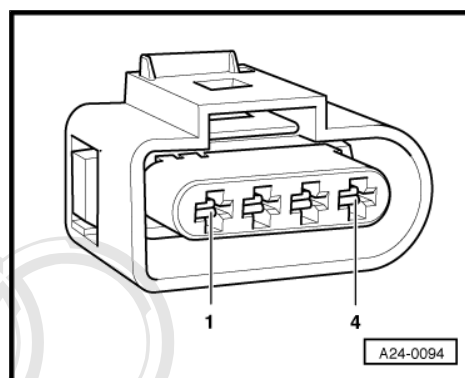
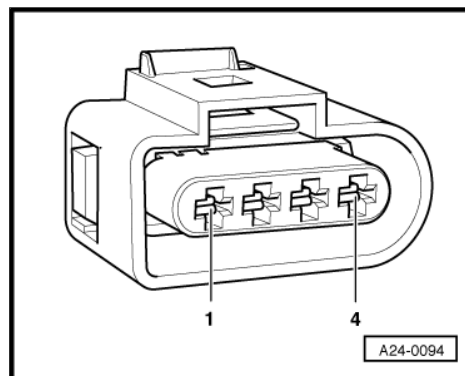
- ◆ Specification: approx. battery voltage

If the reading matches the specification:

- Check activation of output stages.

If the reading does not match the specification:

- Detach the current supply relay -1- beneath the cover on the left at the bulkhead.
- Perform the following checks marked with a dot:



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- Check the wiring from the relay carrier beneath the cover on the left at the bulkhead, contact 2 to the connector at the ignition coil, contact 1.
- Check the Motronic current supply relay -J271- → [page 122](#).

If the specification is obtained:

- Check activation.

#### Checking actuation of output stages

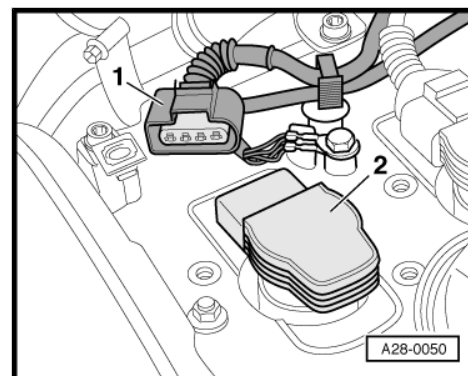
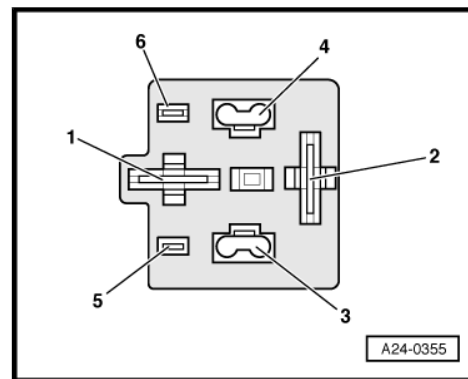
- Unplug the connectors at all injectors.



#### Note

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

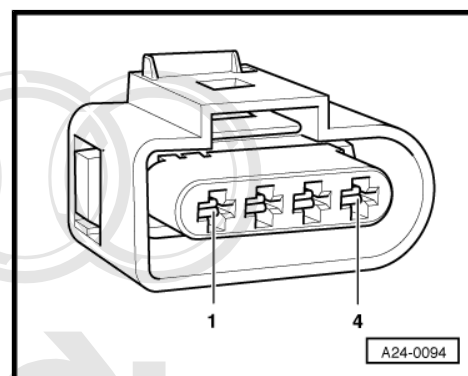
- Unplug the 4-pin connector -1- at the ignition coil -2-.



- Connect up the voltage tester -V.A.G 1527B- to contacts 2 and 3 of the connector.
- Briefly operate the starter.
- ◆ The LED should flash (short signal)

If the readings do not match the specifications:

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit → [page 41](#).



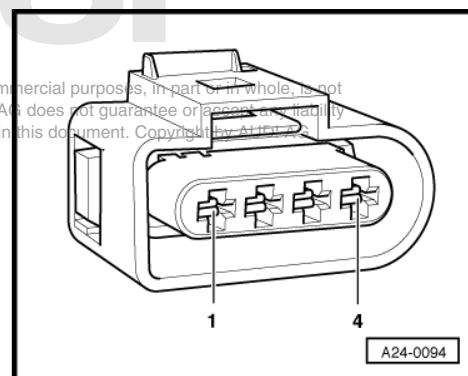
- Check for open circuit and short to earth or positive in the following wiring:

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

- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found in the wiring:

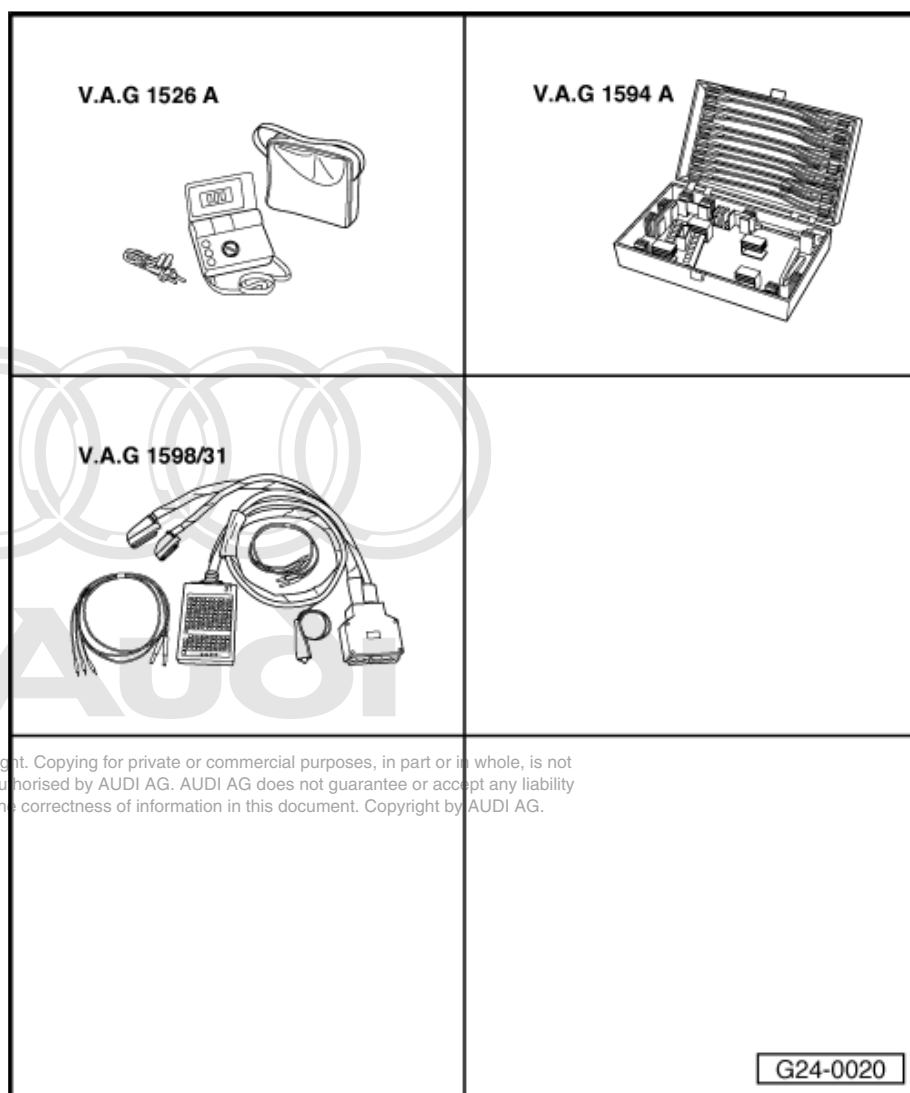
- Renew ignition coil with output stage (combined as a single component).



## 1.4 Checking Motronic current supply relay -J271-

### Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-



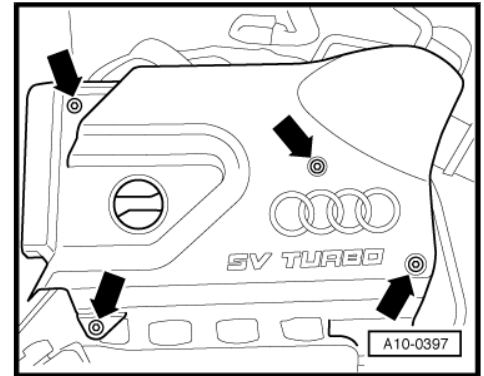
### Test sequence



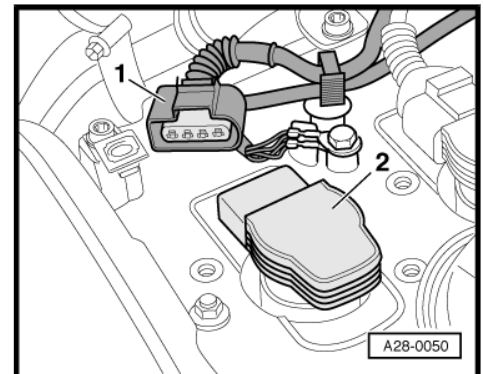
#### Note

*The Motronic current supply relay -J271- provides voltage for the ignition coils/output stages and the engine control unit at pin 121.*

- Remove the engine cover -arrows-.



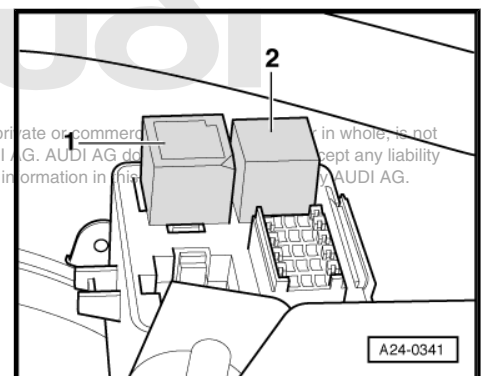
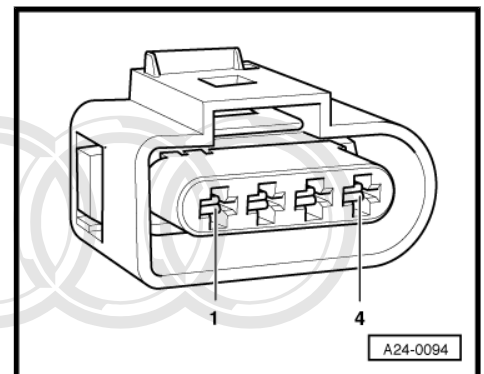
- Unplug the 4-pin connector -1- at one of the ignition coils -2-.



- Connect up the multimeter (voltage measuring range) as follows.

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

- Switch on ignition.
- ◆ Specification: approx. battery voltage
- If the reading does not match the specification:
- Switch off ignition.
- Detach the current supply relay -1- beneath the cover on the left at the bulkhead.



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- Use the current flow diagram to check for open circuit in the following connection:

| Relay carrier beneath cover on left at bulkhead Contact | Connector at ignition coils Contact |
|---------------------------------------------------------|-------------------------------------|
| 2                                                       | 1                                   |

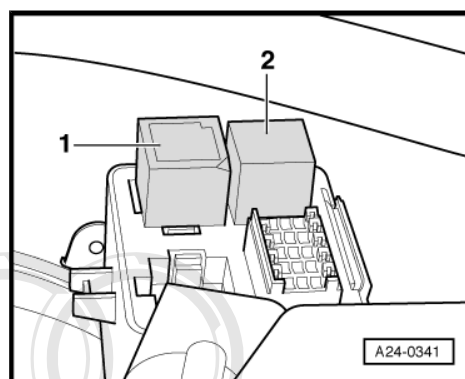
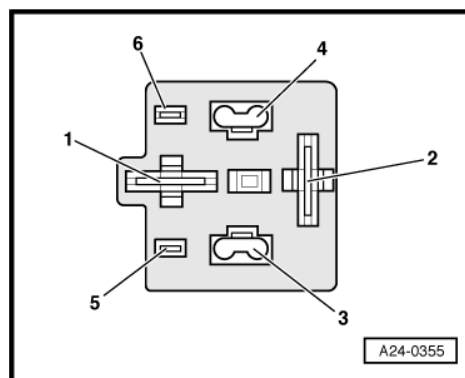
- Eliminate open circuit in wiring if necessary.

If the wiring is OK:

- Check voltage supply of Motronic current supply relay -J271- .

### Checking voltage supply

- Switch off ignition.
- Detach the current supply relay -1- beneath the cover on the left at the bulkhead.



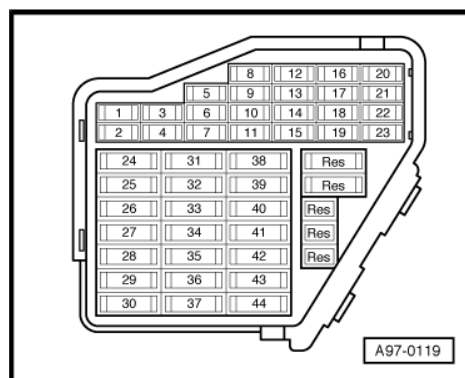
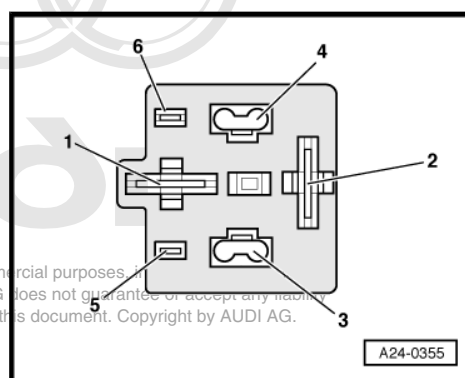
- Connect up the multimeter (voltage measuring range) as follows.

| Relay carrier beneath cover on left at bulkhead Contact | Measure to   |
|---------------------------------------------------------|--------------|
| 1                                                       | Engine earth |
| 3                                                       | Engine earth |

### ◆ Specification: approx. battery voltage

If the reading does not match the specification:

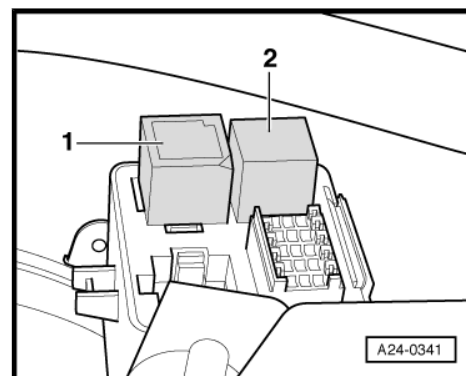
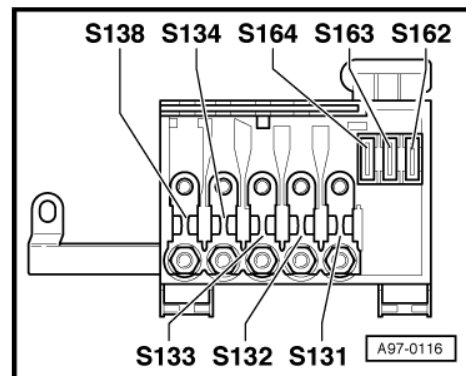
- Perform the following checks marked with a dot:



- Check fuse S10 (in fuse carrier, position 10).
- Check fuse S134 (110 A) in main fuse box/battery.
- Check for open circuit in the wiring from battery + (terminal 30) via fuse S134 and fuse 10 to the Motronic current supply relay -J271- (beneath cover on left at bulkhead). ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Check activation of Motronic current supply relay -J271- .

#### Checking activation

- Switch off ignition.
- Detach the current supply relay -1- beneath the cover on the left at the bulkhead.



- Connect up the multimeter (voltage measuring range) as follows.

| Relay carrier beneath cover on left at bulkhead<br>Contact | Measure to       |
|------------------------------------------------------------|------------------|
| 5                                                          | Battery positive |

- Switch on ignition.
  - ♦ Specification: approx. battery voltage
- If the reading does not match the specification:

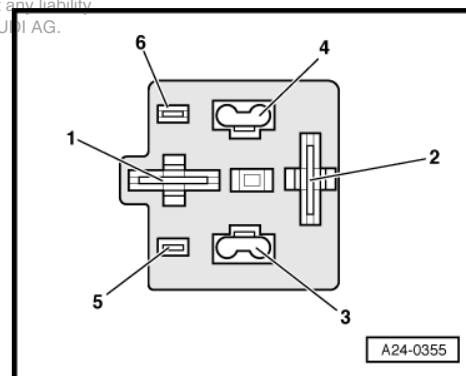
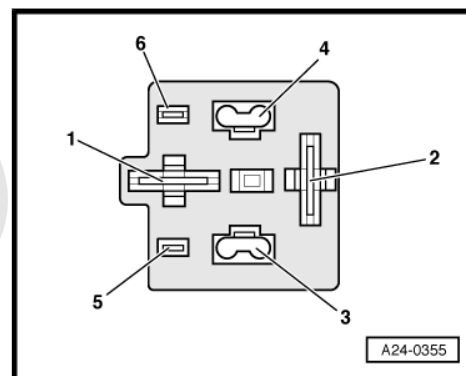
- Switch off ignition.
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .

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

| Relay carrier beneath cover on left at bulkhead<br>Contact | Test box -V.A.G 1598/31-<br>Socket |
|------------------------------------------------------------|------------------------------------|
| 5                                                          | 21                                 |

- Eliminate open circuit in wiring/short circuit if necessary.
- If no fault is found:
- Renew Motronic current supply relay -J271- .

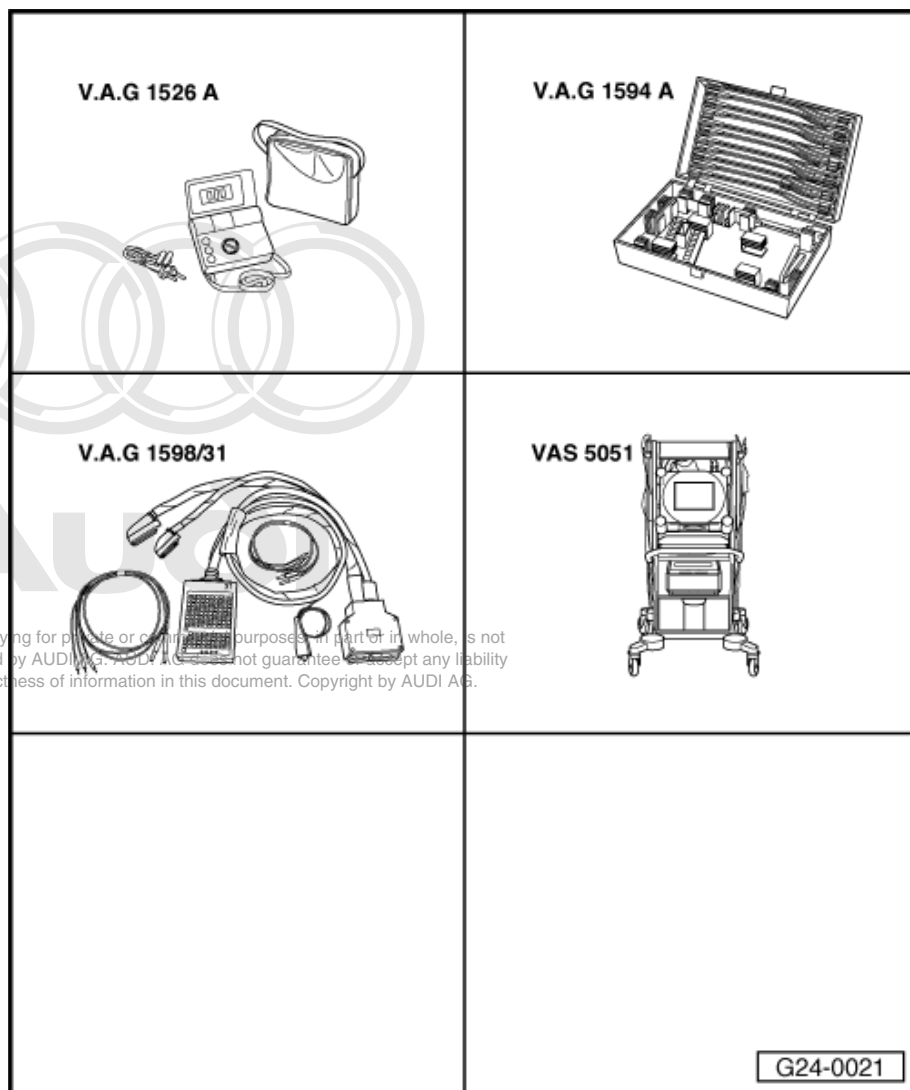


## 1.5 Checking intake air temperature sender -G42-

Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-
- ◆ Vehicle diagnosis and service information system -VAS 5052-

Fitting location ⇒ Overview of fitting locations ⇒ [page 33](#)



### Test sequence

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Read measured value block”.
- Select “Display group number 004”.
- Check the specification for the intake air temperature sender in 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 |

|                 | Display zones |                 |                     |                                                   |
|-----------------|---------------|-----------------|---------------------|---------------------------------------------------|
| Display         | Engine speed  | Battery voltage | Coolant temperature | Intake air temperature                            |
| Operating range |               |                 |                     | -48.0...143.0 °C                                  |
| Specification   | xxxx rpm      | 12.0...15.0 V   | 80.0...110.0 °C     | From ambient temperature to 110 °C <sup>45)</sup> |

45) If the temperature displayed differs considerably from the sender ambient temperature, check the sender/sender wiring for contact resistance/open circuit.

### Checking wiring

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ➔ [page 41](#) .
- Unplug the connector at the intake air temperature sender - G42- -arrow-.

### Sender with square connector:



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

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1                 | 85                              |
| 2                 | 108                             |

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### Sender with oval connector:

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

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1                 | 85                              |
| 2                 | 108                             |

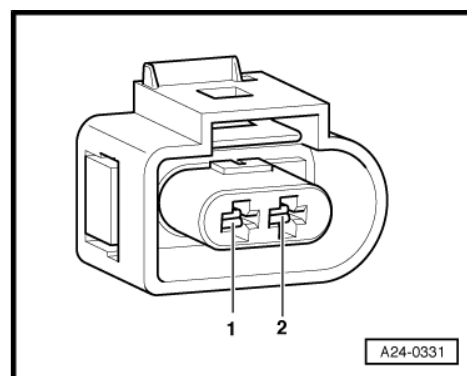
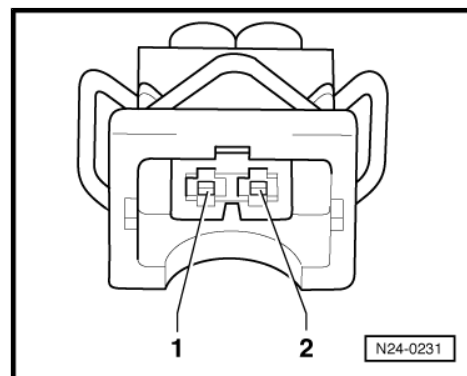
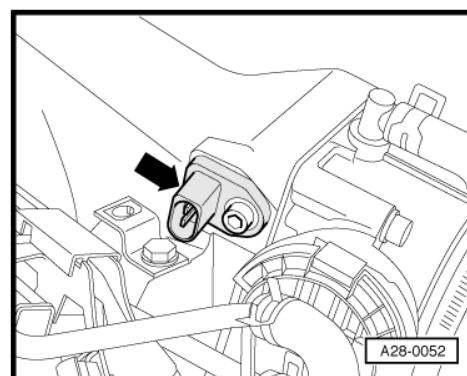
### All models:

- Check the two wires for mutual short circuit.
- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found in the wiring:

- Check intake air temperature sender -G42- .

### Checking intake air temperature sender -G42-



- Connect the multimeter (resistance measuring range) to the 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   |

If the reading does not match the specification:

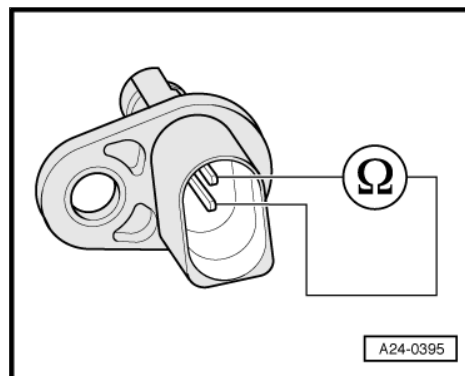
- Renew intake air temperature sender -G42- .

## 1.6 Checking engine speed sender -G28-

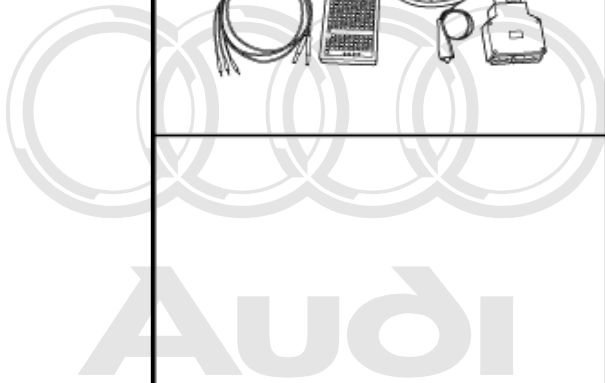
#### Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-

Fitting location ⇒ Overview of fitting locations ⇒ [page 33](#)



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|                                                                                                               |                                                                                                                |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <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><b>G24-0020</b></p>                                                                                         |

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## Test sequence

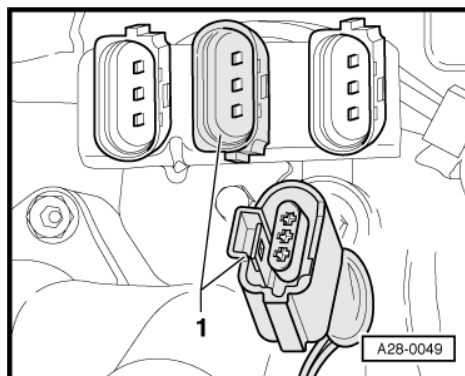


### Note

*The engine speed sender is a combined engine speed and reference mark sender. The engine cannot be started without a signal from the engine speed sender -G28-. Failure of the engine speed sender -G28- signal with the engine running causes it to cut out immediately.*

- Check proper installation and attachment of the engine speed sender -G28- before performing the test.

- Unplug connector of engine speed sender -G28- -1- (identification: grey connector).



- Connect up the multimeter (resistance measuring range) between contacts 2 and 3.

◆ Specification: 730 ...1000  $\Omega$



#### Note

*The resistance value of the engine speed sender is referenced to a temperature of 20 °C. The resistance increases with increasing temperature.*

If the reading does not match the specification:

- Replace the engine speed sender -G28- .

If the reading matches the specification:

- Connect the multimeter (resistance measurement range) to contacts 2 and 1 (screen) as well as to contacts 3 and 1 (screen).

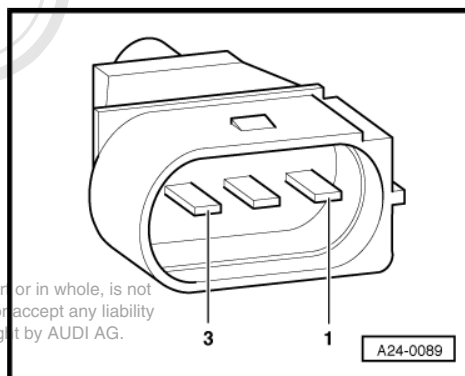
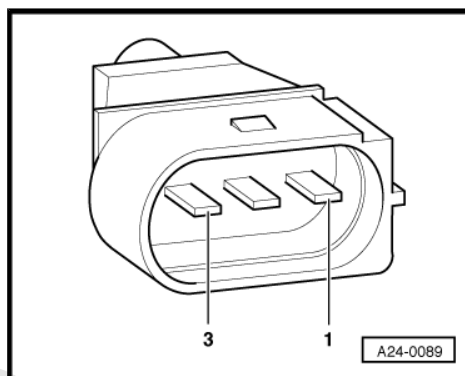
◆ Specification:  $\infty$   $\Omega$  (no continuity)

If the reading does not match the specification:

- Replace the engine speed sender -G28- .

If the reading matches the specification:

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .



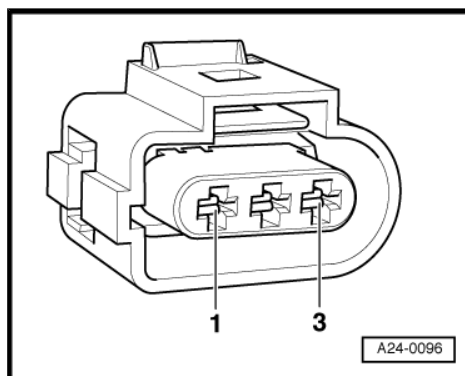
- Check for open circuit and short to earth or positive in the following wiring:

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1 (screen)        | 108                             |
| 2 (earth)         | 90                              |
| 3 (signal)        | 82                              |

- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found in the wiring:

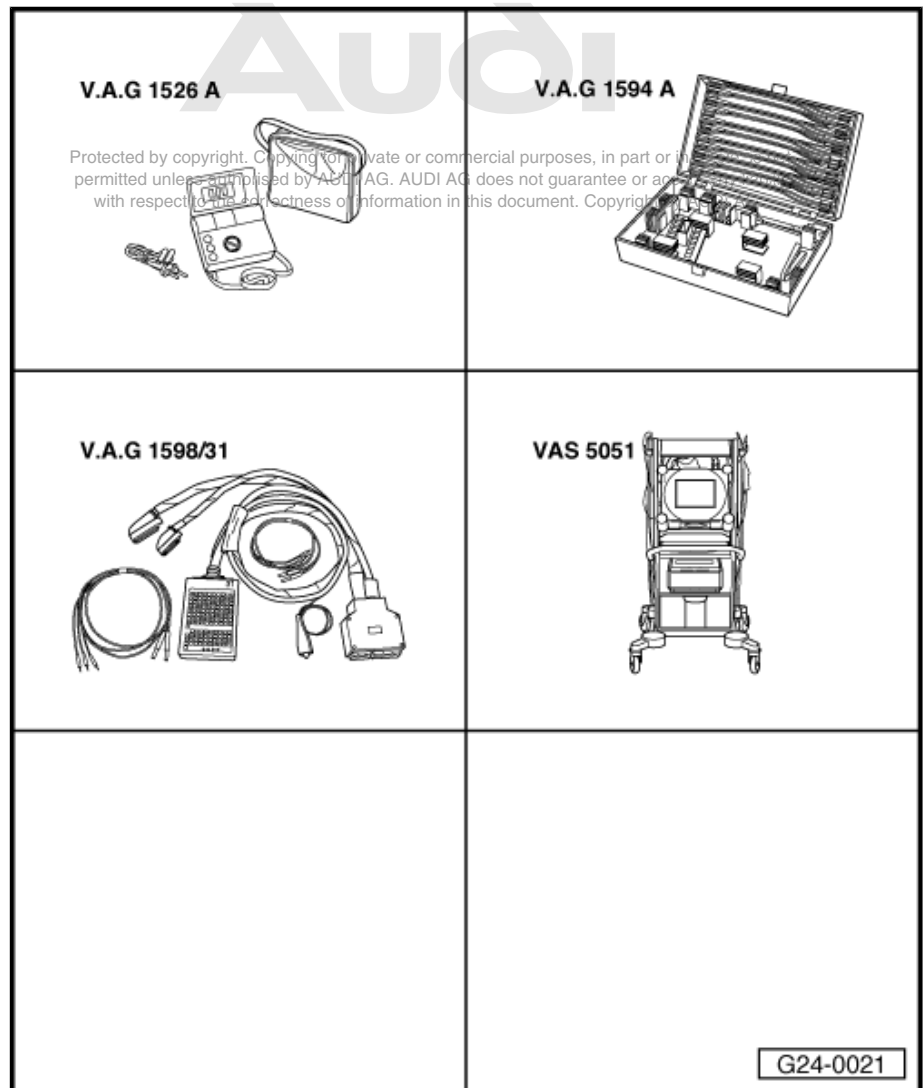
- Replace the engine control unit ⇒ [page 45](#) .



## 1.7 Checking coolant temperature sender - G62-

Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-
- ◆ Vehicle diagnosis and service information system -VAS 5052-



Overview of fitting locations ⇒ [page 33](#)

### Test sequence



#### Note

*Engine cold*

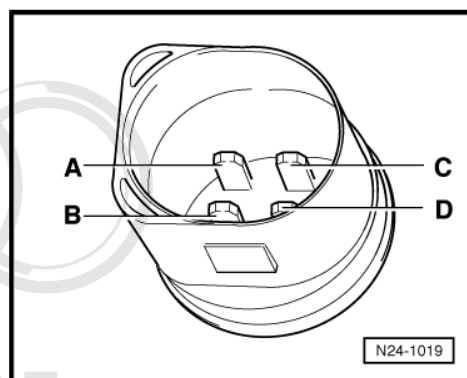
- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Read measured value block”.
- Select “Display group number 004”.
- Check the display in zone 3.

| Display zones                                             |              |                 |                                          |                                    |
|-----------------------------------------------------------|--------------|-----------------|------------------------------------------|------------------------------------|
|                                                           | 1            | 2               | 3                                        | 4                                  |
| Display Group 004: Coolant temperature with engine idling |              |                 |                                          |                                    |
| Display                                                   | xxxx rpm     | xx.x V          | xxx.x °C                                 | xxx.x °C                           |
| Display                                                   | Engine speed | Battery voltage | Coolant temperature                      | Intake air temperature             |
| Operating range                                           |              |                 | -48.0...143.0 °C                         |                                    |
| Specification                                             | xxxx rpm     | 12.0...15.0 V   | Temperature value must increase steadily | From ambient temperature to 110 °C |

If display in zone 3 is not realistic:

- Unplug the connector at the coolant temperature sender - G62- .
- Connect up the multimeter (resistance measuring range) between contacts C and D of the sender.

Area A shows the resistance values for the temperature range 0...50 °C, area B the values for the temperature range 50...100 °C.



Examples:

- ◆ 30 °C corresponds to a resistance of 1500...2000 Ω
- ◆ 80 °C corresponds to a resistance of 275...375 Ω

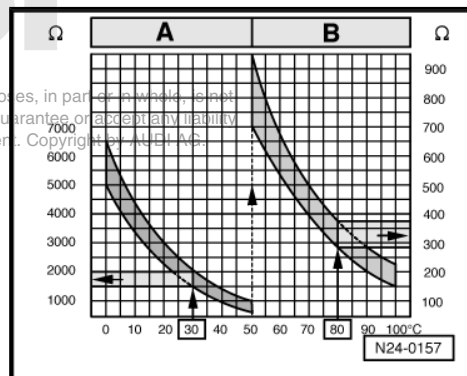
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If the reading does not match the specification:

- Replace the coolant temperature sender -G62- .

If the reading matches the specification:

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .



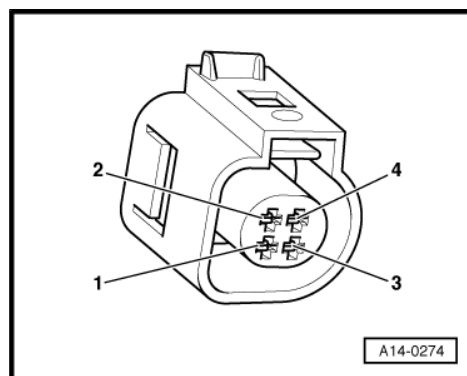
- Check for open circuit and short to earth or positive in the following wiring:

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 3                 | 108                             |
| 4 (signal)        | 93                              |

- Check the two wires for mutual short circuit.
- Eliminate open circuit in wiring/short circuit if necessary.

If no fault is found in the wiring:

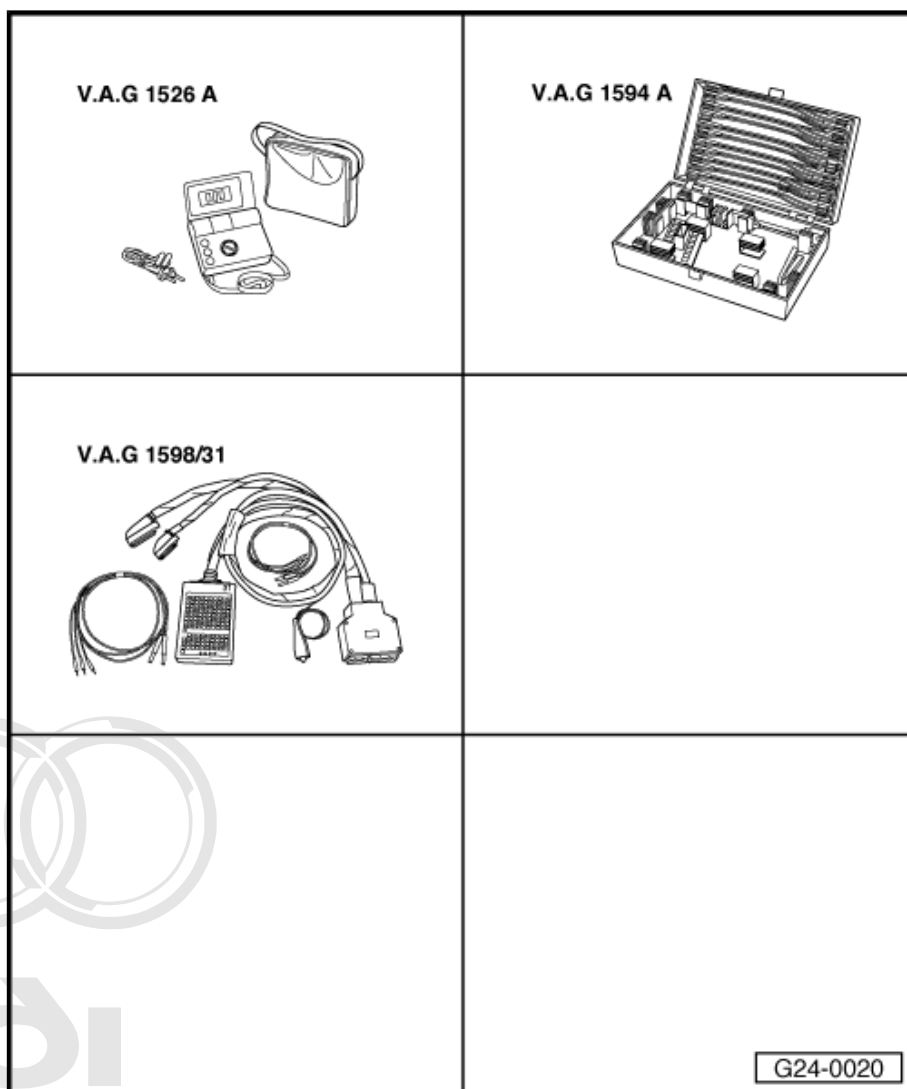
- Replace the engine control unit ⇒ [page 45](#) .



## 1.8 Checking control unit power supply

Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-



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### Test sequence



#### Note

- ◆ *Engine electronics fuses OK ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*
- ◆ *Battery voltage min. 12.7 V*
- ◆ *Alternator OK*
- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#) .
- Switch on ignition.



## Note

- ◆ *The engine control unit receives its positive power supply via contact 3 (terminal 15) and contact 62 (terminal 30).*
- ◆ *The engine control unit receives its earth supply by way of contacts 1 and 2.*
- Connect up the multimeter (voltage measuring range) as follows:

| Test box -V.A.G 1598/31-<br>Socket | Measure to       |
|------------------------------------|------------------|
| 1                                  | Battery positive |
| 2                                  | Battery positive |
| 62                                 | Engine earth     |

- ◆ Specification: approx. battery voltage
- Connect up the multimeter (voltage measuring range) as follows:

| Test box -V.A.G 1598/31-<br>Socket | Measure to   |
|------------------------------------|--------------|
| 3                                  | Engine earth |

- Switch on ignition.

- ◆ Specification: approx. battery voltage

If the specifications are not obtained:

- Check the wiring. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Connect up the multimeter (voltage measuring range) as follows:

| Test box -V.A.G 1598/31-<br>Socket | Measure to   |
|------------------------------------|--------------|
| 121 <sup>46)</sup>                 | Engine earth |

46) After switching off the ignition, the Motronic current supply relay -J271- still applies voltage to terminal 121 of the engine control unit for up to 15 minutes.

- Switch on ignition.
- ◆ Specification: approx. battery voltage
- If the reading does not match the specification:
- Check the wiring. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Check the Motronic current supply relay -J271- ⇒ [page 122](#).

## 1.9 Checking knock control limit

Perform the following checks if a fault entry relating to “Knock control limit reached” has been stored.

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Read measured value block”.
- Select “Display group number 020”.
- Check the display in all zones.

|                                                            | Display zones                                                |                                                              |                                                              |                                                              |
|------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                                                            | 1                                                            | 2                                                            | 3                                                            | 4                                                            |
| Display group 020: Ignition - knock control whilst driving |                                                              |                                                              |                                                              |                                                              |
| Display                                                    | xx.x °crank angle                                            | xx.x °crank angle                                            | xx.x °crank angle                                            | xx.x °crank angle                                            |
| Display                                                    | Ignition timing retardation, cylinder 1 due to knock control | Ignition timing retardation, cylinder 2 due to knock control | Ignition timing retardation, cylinder 3 due to knock control | Ignition timing retardation, cylinder 4 due to knock control |
| Specification                                              | 0...12 °crank angle                                          | 0...12 °crank angle                                          | 0...12 °crank angle                                          | 0...12 °crank angle                                          |
| Note                                                       | See evaluation                                               |                                                              |                                                              |                                                              |



#### Note

The numerical values displayed in zones 1 to 4 represent the actual ignition timing retardation by the knock control for the individual cylinders. The ignition timing is retarded in ° crank angle.

#### Evaluation of ignition timing retardation

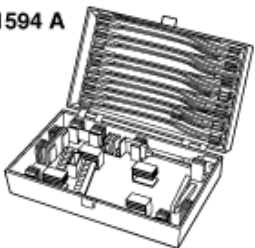
| Indicated on display                                | Possible cause of trouble            | Remedy                                                       |
|-----------------------------------------------------|--------------------------------------|--------------------------------------------------------------|
| All cylinders greater than 12 °crank angle          | ◆ Knock sensor defective             | – Check the knock sensor<br>⇒ <a href="#">page 135</a>       |
|                                                     | ◆ Connector corroded                 |                                                              |
|                                                     | ◆ Knock sensor incorrectly tightened | – Slacken knock sensors and tighten to 20 Nm                 |
|                                                     | ◆ Engine attachments loose           | – Secure the attachments                                     |
|                                                     | ◆ Poor fuel grade                    | – Change to a different fuel grade (refer to owner's manual) |
| One cylinder deviates significantly from the others | ◆ Connector corroded                 | – Check the knock sensor<br>⇒ <a href="#">page 135</a>       |
|                                                     | ◆ Mechanical engine fault            | – Check the compression:                                     |
|                                                     | ◆ Engine attachments loose           | – Secure the attachments                                     |

## 1.10 Checking knock sensors

### Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-
- ◆ 121-pin adapter cable -V.A.G 1598/31-

Fitting location ⇒ Overview of fitting locations ⇒ [page 33](#)

|                                                                                                               |                                                                                                                |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <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>G24-0020</p>                                                                                                |

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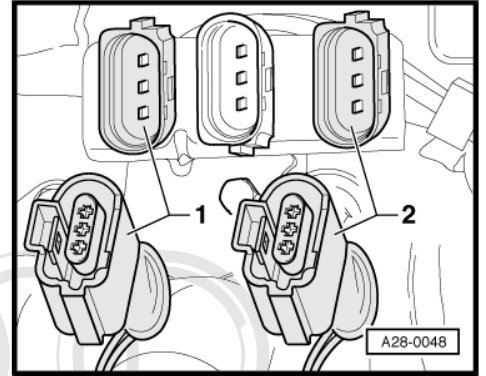
## Checking wiring of knock sensors



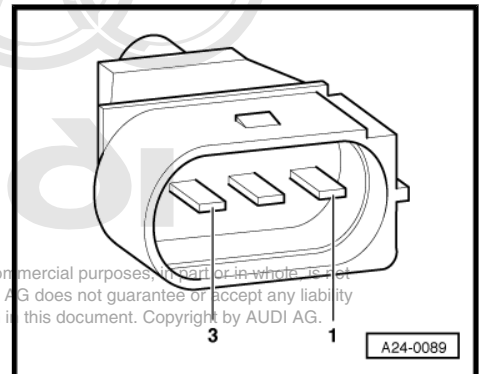
### Note

- ◆ *Electrical checking of knock sensor 1 -G61- and knock sensor 2 -G66- (i.e. the actual sensors) is not possible.*
- ◆ *Always use gold-plated contacts when repairing the knock sensor connectors.*
- ◆ *Exact compliance with the tightening torque of 20 Nm is crucial to proper operation of the knock sensors.*
- ◆ *Check for corrosion of the connector from the knock sensor to the wiring harness.*

- Unplug the connector of knock sensor 1 -G61- -1-/ knock sensor 2 -G66- -2- in the engine compartment.



- Check all three contacts at the knock sensor connector for mutual short circuit (contacts 1+2, 1+3, 2+3).
- ◆ Specification:  $\infty \Omega$  (no continuity) - there must be no connection between any of the contacts.
- If there is, replace the knock sensor.
- If no short circuit is found, check the wiring of the knock sensors.

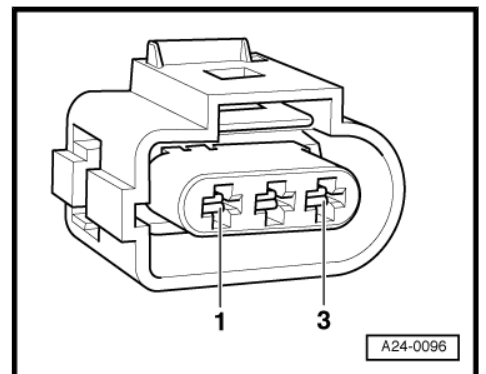


#### Checking wiring between knock sensors and engine control unit

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit [⇒ page 41](#).
- Check for open circuit and short to earth or positive in the following wiring:

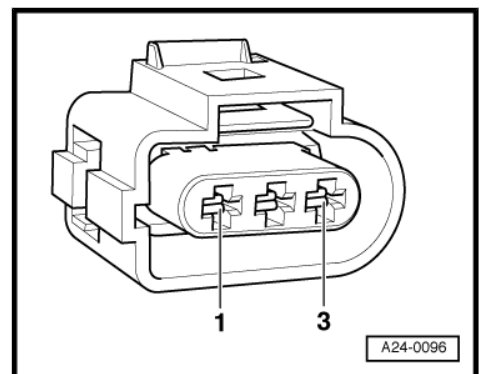
- Knock sensor 1 -G61- (cylinder 1/2)

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1 (signal)        | 106                             |
| 2 (earth)         | 99                              |
| 3 (screen)        | 108                             |



- Knock sensor 2 -G66- (cylinder 3/4)

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1 (signal)        | 107                             |
| 2 (earth)         | 99                              |
| 3 (screen)        | 108                             |



- Eliminate open circuit in wiring/short circuit if necessary.

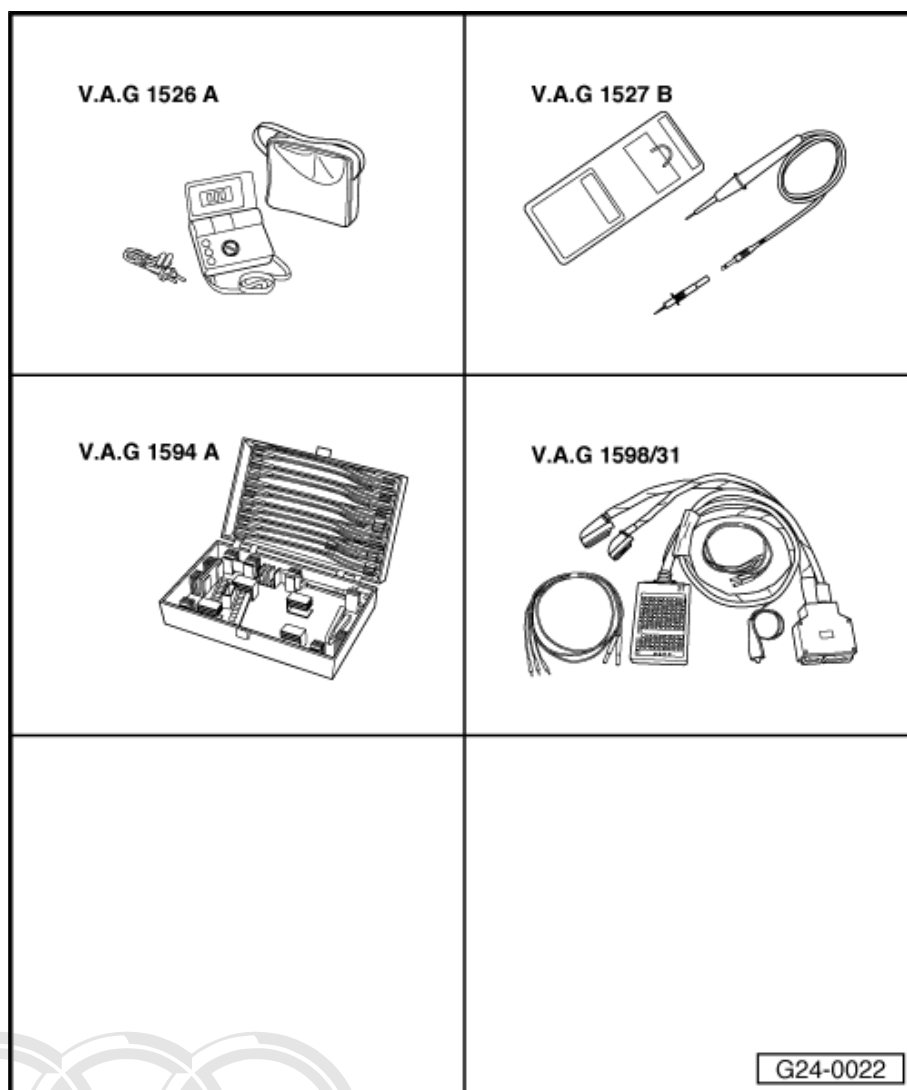
## 1.11 Checking Hall sender -G40-

### Special tools and workshop equipment required

- ◆ Portable multimeter -V.A.G 1526C-
- ◆ Adapter set -V.A.G 1594C-

- ◆ 121-pin adapter cable -V.A.G 1598/31-

Fitting location ⇒ Overview of fitting locations ⇒ [page 33](#)



## Checking activation

The Hall sender indicates the ignition position for Cylinder 1.

In the event of failure, the knock control is deactivated and the ignition timing retarded slightly as cylinder assignment is no longer possible. The charge pressure of the turbocharger is also reduced.

Even without a signal from the Hall sender the engine will continue to run and can also be re-started:

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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. Instead of taking place when the inlet valves are open, injection is "advanced" (to before the closed inlet valves). This has only a minor influence on the quality of the air/fuel mixture.
- If fitted, push back the rubber grommet of the Hall sender connector but leave the connector plugged in.

- Connect up the voltage tester -V.A.G 1527 B- between contacts 2 (Hall sender signal) and 1 (positive).

**Note**

*The connector contacts are numbered accordingly on the back of the connector.*

- Operate starter for a few seconds.
- ◆ The LED should flash.

**Note**

*Voltage testers with a low current draw do not go out completely between activation signals from engine control unit, but continue to glow slightly and become distinctly brighter on activation.*

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**If LED does not flash: check voltage supply**

**Checking voltage supply**

- Unplug the connector at the Hall sender.
- Connect up the multimeter (voltage measuring range) as follows:

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

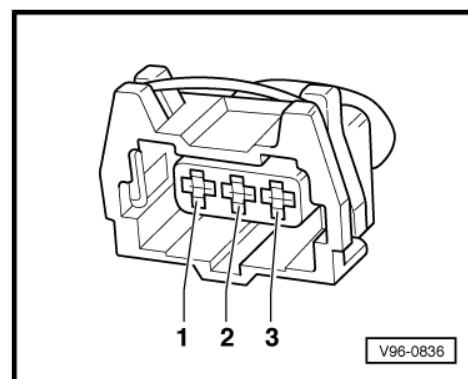
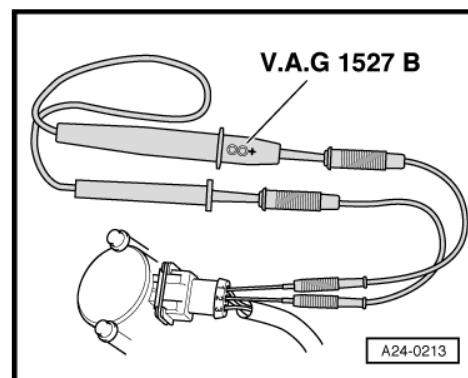
- Switch on ignition.
- ◆ Specification: approx. 5 V

**Checking signal wire**

- Connect up the multimeter (voltage measuring range) as follows:

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

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

**Checking earth wire**

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

| Connector Contact | Measure to   |
|-------------------|--------------|
| 3                 | Engine earth |

- Eliminate open circuit in wiring/short circuit if necessary.

If all the readings match the specifications and the light-emitting diode does not flash (measured between contacts 1 and 2 with starter, with connector plugged in):

- Renew Hall sender.

If readings do not match specifications, check wiring connections.

#### Checking wiring between Hall sender and engine control unit

- Connect the test box -V.A.G 1598/31- to the wiring harness to the engine control unit, but do not connect the actual engine control unit ⇒ [page 41](#).

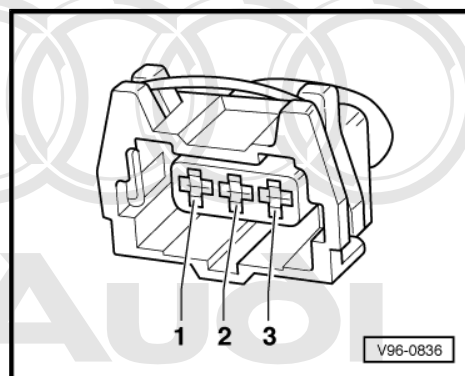
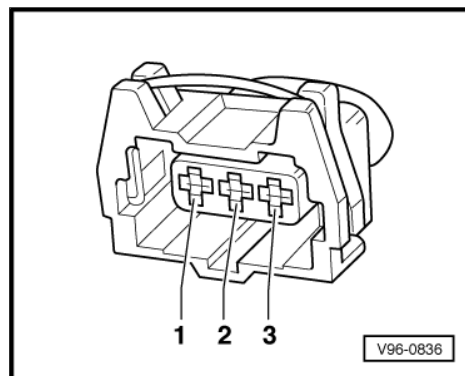
- Check for open circuit and short to earth or positive in the following wiring:

| Connector Contact | Test box -V.A.G 1598/31- Socket |
|-------------------|---------------------------------|
| 1 (positive)      | 98                              |
| 2 (signal)        | 86                              |
| 3 (earth)         | 108                             |

- Eliminate open circuit in wiring/short circuit if necessary.
- If all the test results so far have been OK but a fault related 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 position is OK, check the crankshaft/camshaft assignment. ⇒ Rep. Gr. 15



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## 1.12 Checking misfiring detection

- Connect up the vehicle diagnostic and service information system -VAS 5052- and select the engine electronics control unit. Engine must be idling.
- Select the function “Read measured value block”.
- Select “Display group number 014”.
- Check misfiring detection.

| Display zones                          |              |       |                 |                       |
|----------------------------------------|--------------|-------|-----------------|-----------------------|
|                                        | 1            | 2     | 3               | 4                     |
| Display group 014: Misfiring detection |              |       |                 |                       |
| Display                                | xxx rpm      | xxx % | xxx             | ---                   |
| Display                                | Engine speed | Load  | Total misfiring | Misfiring detection   |
| Operating range                        |              |       |                 | Activated<br>disabled |

|               | Display zones |              |                                                                                                           |                                                                                                                                    |
|---------------|---------------|--------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Specification | xxxx rpm      | 12.75...30 % | 0                                                                                                         | Activated                                                                                                                          |
| Note          |               |              | If value is above specified range: check misfiring of the individual cylinders ⇒ <a href="#">page 141</a> | Misfiring detection is disabled if misfiring is to be expected on account of the operating status (e.g. warm-up, overrun shut-off) |

### 1.12.1 Checking misfiring detection for the individual cylinders

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- Select “Display group number 015”.
  - Check misfiring detection in display zones 1 to 4:

|                                                              | Display zones                                                       |                           |                           |                       |
|--------------------------------------------------------------|---------------------------------------------------------------------|---------------------------|---------------------------|-----------------------|
|                                                              | 1                                                                   | 2                         | 3                         | 4                     |
| Display group 015: Misfiring detection, cylinders 1, 2 and 3 |                                                                     |                           |                           |                       |
| Display                                                      | xxx                                                                 | xxx                       | xxx                       | ---                   |
| Display                                                      | Misfiring rate/cylinder 1                                           | Misfiring rate/cylinder 2 | Misfiring rate/cylinder 3 | Misfiring detection   |
| Operating range                                              |                                                                     |                           |                           | Activated<br>disabled |
| Specification                                                | 0                                                                   | 0                         | 0                         | Activated             |
| Note                                                         | If specification is exceeded: evaluation ⇒ <a href="#">page 141</a> |                           |                           | ---                   |

- Select “Display group number 016”.
- Check misfiring detection in display zones 1 and 4:

|                                                    | Display zones                                                       |   |   |                       |
|----------------------------------------------------|---------------------------------------------------------------------|---|---|-----------------------|
|                                                    | 1                                                                   | 2 | 3 | 4                     |
| Display group 016: Misfiring detection, cylinder 4 |                                                                     |   |   |                       |
| Display                                            | xxx                                                                 |   |   | ---                   |
| Display                                            | Misfiring rate/cylinder 4                                           |   |   | Misfiring detection   |
| Operating range                                    |                                                                     |   |   | Activated<br>disabled |
| Specification                                      | 0                                                                   |   |   | Activated             |
| Note                                               | If specification is exceeded: evaluation ⇒ <a href="#">page 141</a> |   |   | ---                   |

### 1.12.2 Evaluation of display group 014, zone 3 and display groups 015 and 016, zones 1, 2 and 3

| Display zone 3 | Possible cause of trouble                                                                                                                                          | Remedy                                                                                                                                                                                     |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Greater than 0 | <ul style="list-style-type: none"> <li>◆ Spark plug defective</li> <li>◆ Spark plug connector defective</li> <li>◆ Ignition coil/output stage defective</li> </ul> | <ul style="list-style-type: none"> <li>– Check spark plugs and ignition cables with connectors</li> <li>– Check the ignition coils and output stages ⇒ <a href="#">page 118</a></li> </ul> |



| Display zone 3 | Possible cause of trouble | Remedy                                          |
|----------------|---------------------------|-------------------------------------------------|
|                | ◆ Injector defective      | – Check the injectors ⇒ <a href="#">page 55</a> |



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