Electronic engine power control (E-Gas), checking

E-Gas system, function

For E-Gas, the throttle valve is not operated by a cable from the accelerator pedal. There is no mechanical connection between the accelerator pedal and the throttle valve.

The position of the accelerator pedal is communicated to the Engine Control Module (ECM) via two sensors for accelerator pedal position (variable resistances; stored in one housing) that are connected with the accelerator pedal.

The accelerator pedal position (driver's intention) is a main input unit for the ECM.

Operation of the throttle valve occurs via an electric motor (throttle valve actuator) in the throttle valve control module. This is true across the entire engine speed and engine load spectrum.

The throttle valve is operated by the throttle valve actuator according to the instructions of the ECM.

With ignition switched on and engine off, the ECM activates the throttle valve actuator precisely according to the sensor for accelerator

pedal position. This means, if the accelerator pedal is depressed half way, the throttle valve actuator opens the throttle valve to the same degree; i.e. throttle valve would be opened half way.

With engine running (under load), the ECM can open or close the throttle valve independently of the sensor for accelerator pedal position.

This means, for example, that the throttle valve could be fully opened even though the accelerator pedal has only been depressed half way. This has the advantage of preventing torque losses at the throttle valve.

In addition to this, it results in significantly better values relative to emissions and consumption under certain load conditions.

The required engine torque can be achieved by the Engine Control Module (ECM) via the optimal combination of throttle valve diameter and boost pressure.

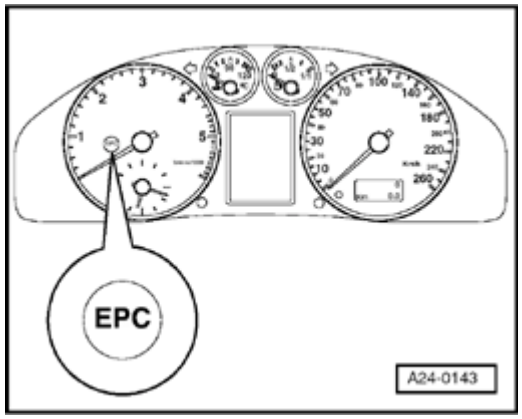
It would be incorrect to think that "E-Gas" consists of only one or two components. E-Gas is much more of a system containing all components that contribute to recognizing, controlling and monitoring the position of the throttle valve, e.g. sensor for accelerator pedal position, throttle valve control module, EPC warning lamp, Engine Control Module (ECM).

Electronic Power Control (EPC) warning lamp -K132- in instrument cluster

Note:

The Electronic Power Control (EPC) warning lamp -K132- is also called the EPC warning lamp.

"EPC" is an abbreviation and stands for Electronic Power Control (E-gas).



Installation location of EPC warning lamp

Engine Control Module (ECM) checks all components that are important for function of the E-Gas system after ignition is switched on.

The Engine Control Module (ECM) switches on the EPC warning lamp after ignition is switched on. Shortly after engine is started, the EPC warning lamp will go out. This requires, first of all, that the Engine Control Module (ECM) does not detect a malfunction in the E-gas system and, secondly, that activation of the lamp by the Engine Control Module (ECM) is OK.

If malfunctions are recognized in the E-Gas system during operation of the engine, the ECM switches on the EPC warning lamp in instrument cluster. (These malfunctions are listed in the DTC table). An entry is made in DTC memory at the same time.

Electronic Power Control (EPC) warning lamp -K132-, checking

Function test of warning lamp

- Switch ignition on.

  - ♦ Engine Control Module (ECM) switches EPC lamp on.

- Start engine.

  - ♦ Shortly after engine is started, the EPC warning lamp will go out if there are no malfunctions stored in DTC memory that relate to the E-gas system

Note:

The switch-on signal for Malfunction Indicator Lamp (MIL) is transferred from the Engine Control Module (ECM) to the instrument cluster via CAN-bus. Check data exchange between Engine Control Module (ECM) and other CAN capable control modules ⇒ *Page 24-178*

24-124

Throttle valve control module -J338-, checking

The following components are located in the housing for the throttle valve control module:

- Throttle drive (power accelerator actuation) -G186-. (This is an electric motor that is activated by the ECM. This electric motor opens the throttle valve against spring pressure.)
- Angle sensor -1- for throttle drive (power accelerator actuation) -G187-
- Angle sensor -2- for throttle drive (power accelerator actuation) -G188-

Notes:

- *The housing for the throttle valve control module must not be opened.*
- *The angle sensors are designed as potentiometers (variable resistances). They communicate the position of the throttle valve to the Engine Control Module (ECM) fully independent of each other.*
- *The potentiometers cannot be mechanically*

adjusted. Adjustments are performed in diagnostic function "04 - basic setting" using VAS5051 tester.

24-125

Throttle valve control module -J338-, adapting

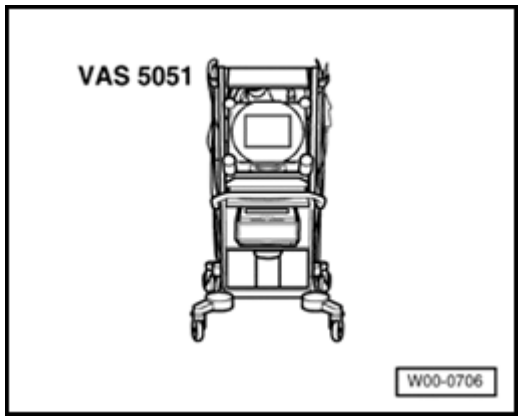
The adaptation teaches the Engine Control Module (ECM) various positions of the throttle valve when the ignition is on and the engine is stopped. These positions are stored in the control module The return communication regarding the position of the throttle valve occurs via the two angle sensors for throttle drive.

An adaptation must always be performed when the throttle valve control module -J338- or the Engine Control Module (ECM) are removed and installed (or replaced) or if voltage supply to the Engine Control Module (ECM) is interrupted.

The learning process (adaptation) occurs:

- automatically if the ignition is switched on for at least 10 seconds without operating starter and accelerator pedal and the Engine Control Module (ECM) recognizes "adaptation required". (There will be no notification of whether adaptation was successful or not however). Adaptation required is recognized if stored voltage values from the angle sensors do not match actual measured voltage values within a certain tolerance range.

- via initiation of basic setting (function 04) display group 060 with ignition on.



Note:

Engine will not start during automatic adaptation.

Special Tools and Equipment

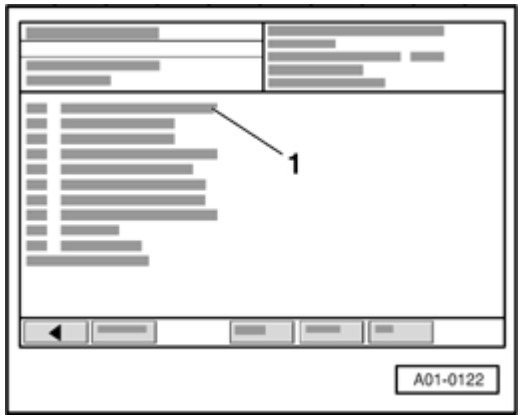
- VAS5051 with VAG5051/1

Requirements

- No DTCs in DTC memory, check DTC memory ⇒ Page 01-12 .
- Engine not running, ignition switched on.
- Accelerator pedal not depressed.
- Coolant temperature 10 to 95 °C.
- Intake air temperature 10 to 90 °C.
- Supply voltage for Engine Control Module (ECM) more than 12.7 volts; checking ⇒ Page 28-37 .

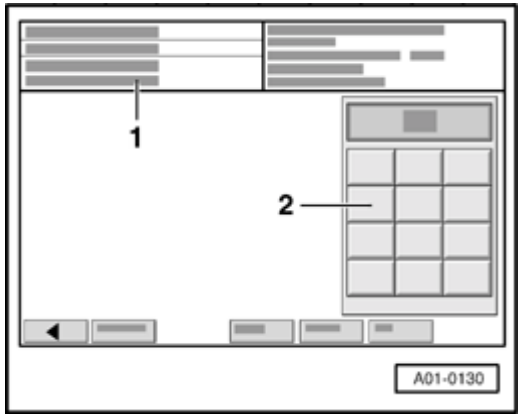
Procedure

- Connect VAS5051 tester ⇒ Page 01-7 and select vehicle system "01 - Engine electronics". Ignition must remain switched on for this.



➢ Display on VAS5051:

- In selection -1-, click on the diagnostic function "04 - Basic setting".



➢ Display on VAS5051:

1 - Enter display group Max. input value = 255

- Select function "060" in button field -2- for "display group number 060" and press Q button to confirm input.

After pressing Q-button, throttle valve actuator will be switched on without current.

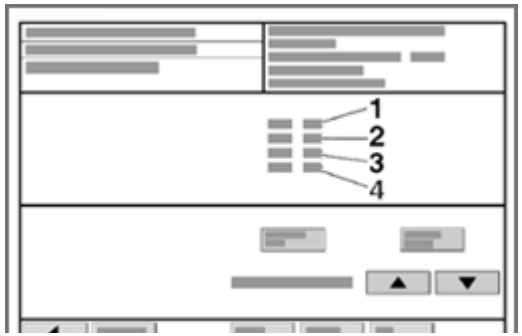
24-128

In this condition, the throttle valve will be drawn into an emergency position by a mechanical spring, which is located in the throttle valve control module. The values supplied by the two angle sensors in this emergency position are stored by the Engine Control Module (ECM).

Next, the throttle valve is opened by a certain value. If this value is reached, the throttle valve actuator is once again de-energized. Now, the mechanical spring must close the throttle valve to the previously learned emergency position within a specified time (spring test).

Then, the throttle valve is closed by the throttle valve actuator; the values supplied by the angle sensors in the throttle valve control unit are stored by the Engine Control Module (ECM).

If Engine Control Module (ECM) should de-energize throttle valve actuator during driving operation, this is expressed by an increased, surging idle speed (RPM). The engine accepts gas only after great delay.



➢ Display on VAS5051:

- Check specified values for throttle valve control module in display fields -3- and -4-.

24-129

	Display fields			
	1	2	3	4
Display group 060: Adaptation of throttle valve control module				
Display	xx %	xx %	**x**	**---**
Indicated	Throttle valve angle (angle sensor 1)	Throttle valve angle (angle sensor 2)	**Adaptation step counter**	**Adaptation condition**
Functional range			**0 to 8**	**ADP in progress** **ADP OK** **ERROR**
Specified value	3 to 93 %	97 to 3 %	**8**	**ADP OK**
Note			**After adaptation, the adaptation step counter reaches the number 8 (it is OK for numbers to be skipped).**	**If "ERROR." is displayed: Check DTC memory ⇒ Page 01-12 .** **If specified value is not obtained: ⇒Note, ⇒ Page 24-130**

Note:

The abbreviation "ADP" in display field 4 stands for "Adaptation".

24-130

Notes:

Note:

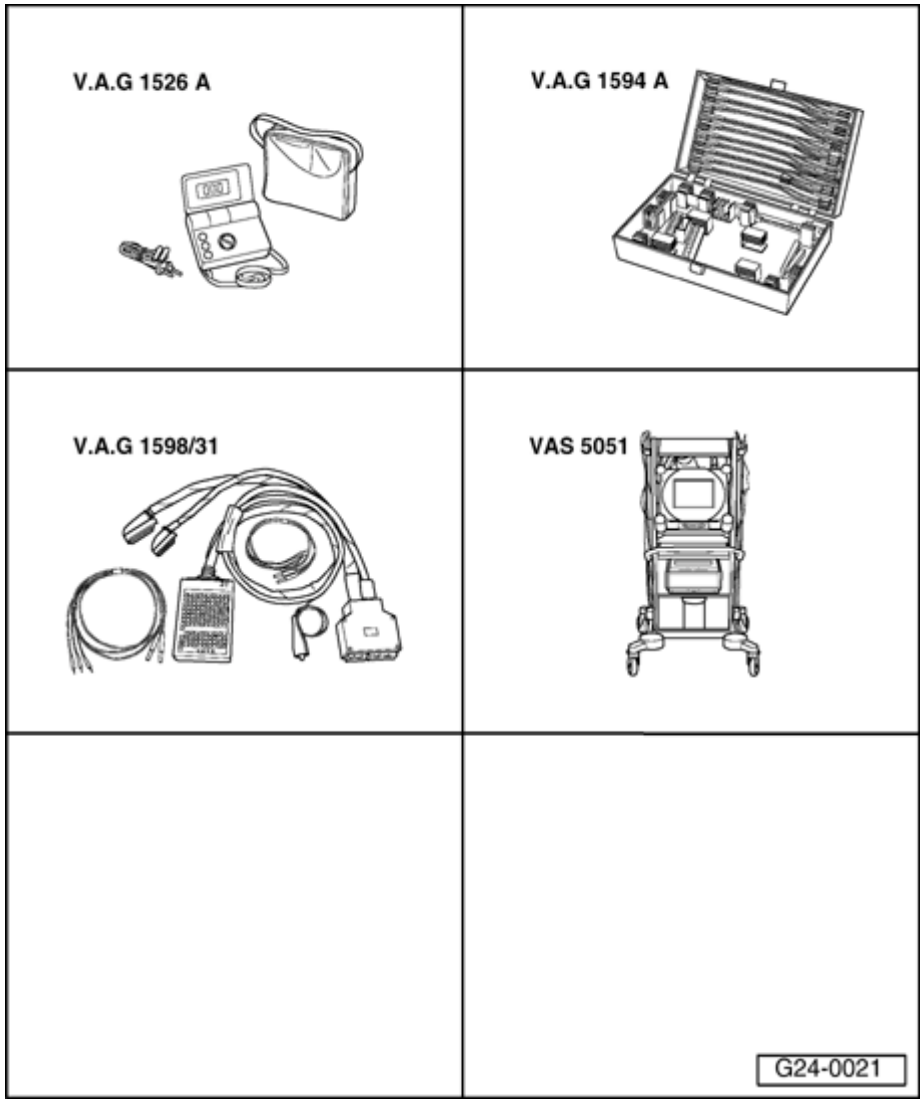
The control module can abort adaptation for the following reasons:

- *Throttle valve cannot be closed completely (e.g. contamination).*
- *Battery voltage is too low.*
- *Throttle valve control module or wire connection is faulty.*
- *Engine is started during adaptation or accelerator pedal is operated.*
- *Tension of throttle valve housing (check bolts).*

After termination, tester displays "Function is unknown or cannot be performed at the moment". The next time the ignition is switched on (several seconds), adaptation will be automatically repeated.

- End function "04 - Basic setting" by pressing ◀ button.

24-131



Angle sensor -1- for throttle drive, checking

Special Tools and Equipment

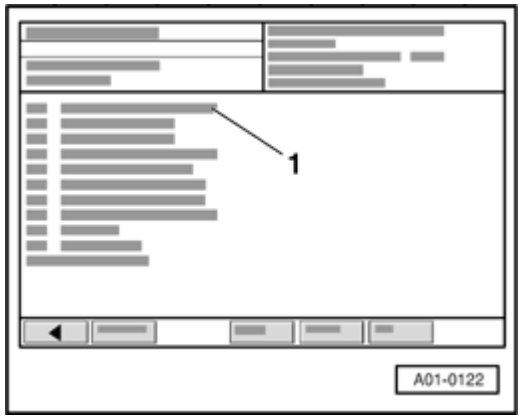
- VAG1526A
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

24-132

Angle sensor 1 for throttle drive (power accelerator actuation) -G187- and angle sensor 1 for throttle drive (power accelerator actuation) -G188- inform the Engine Control Module (ECM) about the position of the throttle valve. Both angle sensors are located in the throttle valve control module.

Test sequence

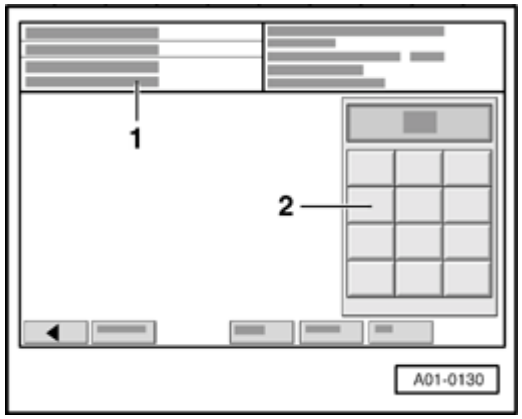
- Connect VAS5051 tester ⇒ Page 01-7 and select vehicle system "01 - Engine electronics". Ignition must remain switched on for this.



➢ Display on VAS5051:

- Select diagnostic function "08 - Read Measuring Value Block" in selection -1-.

24-133



➢ Display on VAS5051:

1 - Enter display group Max. input value = 255

- Select function "062" in button field -2- for "display group number 062" and press Q button to confirm input.

➢ Display on VAS5051:

- Check specified values for E-gas potentiometer voltages in display fields -1- and -2-.

	Display fields			
	1	2	3	4
Display group 062: E-Gas potentiometer voltages				
Display	**xx %**	**xx %**	xx %	xx %
Indicated	**Throttle valve angle (angle sensor 1)**	**Throttle valve angle (angle sensor 2)**	Sensor 1 for Pedal position	Sensor 2 for Pedal position
Specified value	**3 to 93 %**	**97 to 3 %**	12 to 97 %	4 to 49 %

Note:

Engine Control Module (ECM) calculates the voltage values of the angle sensors in percent relative to 5 volts and displays these percentage values. (5 volts supply voltage represents 100 %).

- Observe display field 1 and 2.

- Slowly depress accelerator pedal completely.

Percent indication in display field 1 must rise uniformly. In the process, the tolerance range of 3 to 93% is not completely utilized.

Percent indication in display field 2 must decrease uniformly. The tolerance range 97 to 3 % is not used completely during this.

Notes:

- *The reason why the value indicated in display field 1 climbs, while the value indicated in display field 2 decreases, has to do with the fact that the potentiometers (angle sensors) in the throttle valve control unit run in opposite directions.*

- *This means that the voltage tap of angle sensor 1 runs from 0 to 5 volts. (The more the throttle valve is opened, the larger the voltage; percent indication climbs).*

- *The voltage tap of angle sensor 2 runs from 5 to 0 volts. (The more the throttle valve is opened, the lower the voltage; the percentage decreases).*

- Press "08 - erase DTC memory" to end function ◀-button.

If indications do not resemble description:

- Check voltage supply and wire connections of throttle valve control module ⇒ Page 24-136 . Pay particular attention to harness connectors that could be loose or corroded.

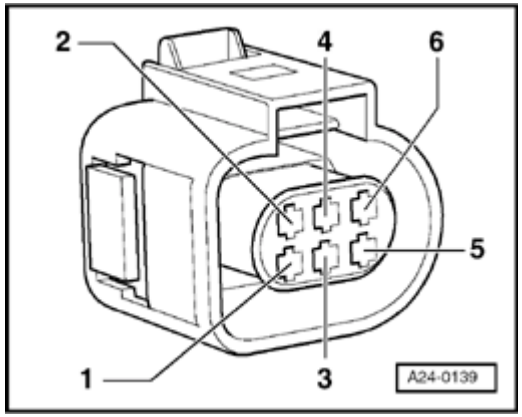
- Check accelerator pedal position sensor ⇒ Page 24-138 .

24-136

Check voltage supply throttle valve control module

- Pull connector -2- off throttle valve control module.

- Switch ignition on.

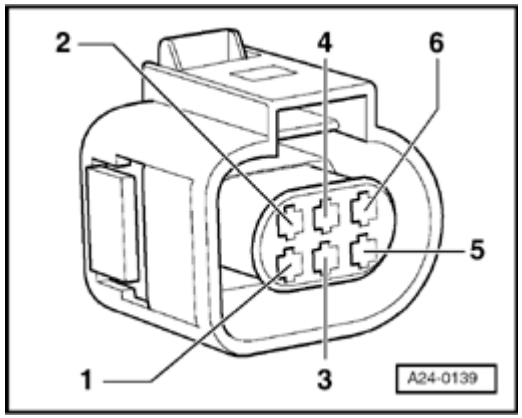


- Connect multimeter for voltage measurement as follows:

Harness connector Terminal	Specified value
2 + Ground (GND)	about 5 V
2 + 6	about 5 V

If specified values are not obtained:

- Check wire connections from Engine Control Module (ECM) to throttle valve control module ⇒ Page 24-137 .



Checking wire connections

- Pull connector -2- off throttle valve control module.
- Connect VAG1598/31 test box at wiring harness to Engine Control Module (ECM), do not connect ECM ⇒ Page 24-19 .
- Check the following wire connections for open circuit and short circuit to Ground (GND) and B+:

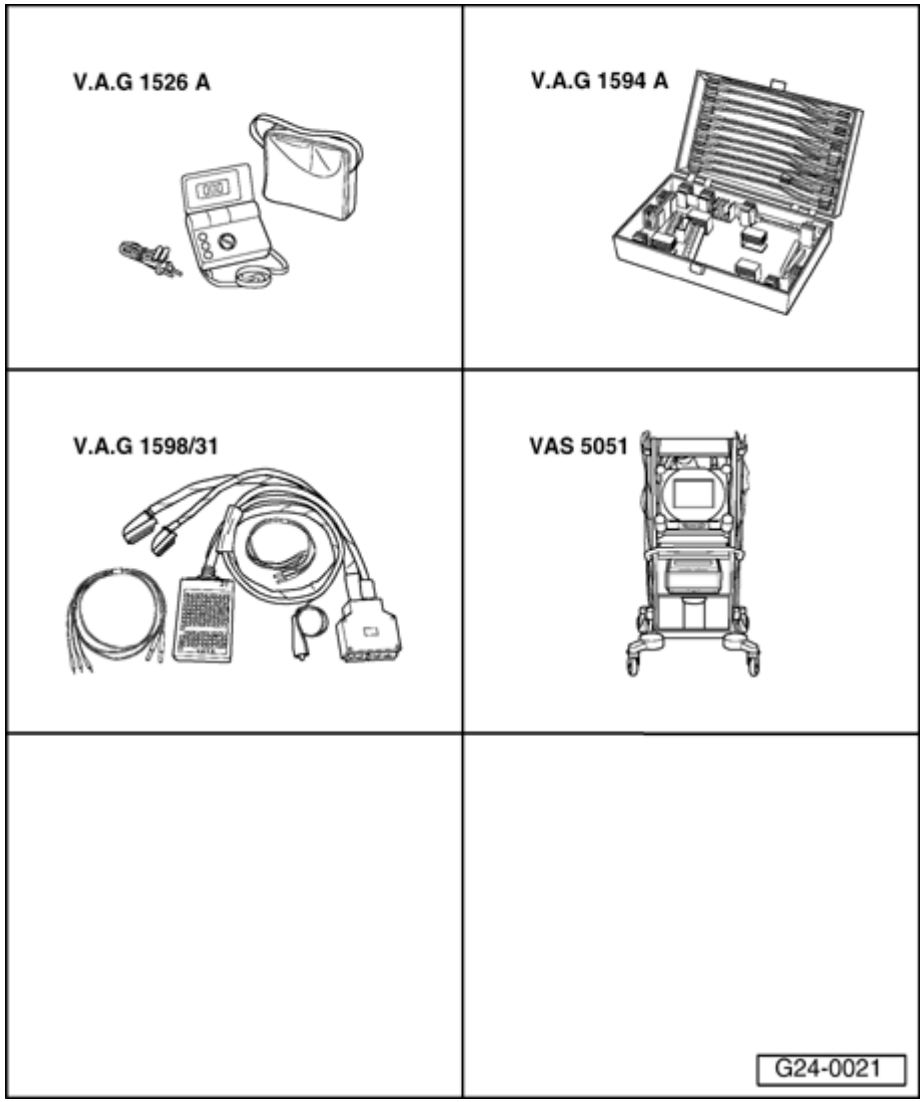
Harness connector Terminal	VAG1598/31 test box Socket
1	92
2	83
3	117
4	84
5	118
6	91

- Repair open circuit or short circuit if necessary.

If no malfunctions are found in wires:

- Replace throttle valve control module.

24-138



Throttle Position (TP) sensor, checking

Special Tools and Equipment

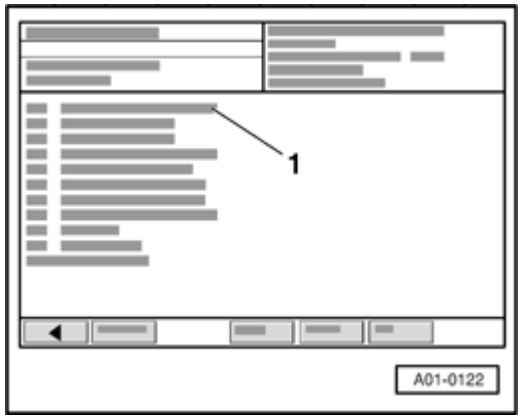
- VAG1526A
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

24-139

Both the Throttle Position (TP) sensor -G79- and the Sender -2- for accelerator pedal position -G185- are located at the accelerator pedal and communicate the driver's intentions to the ECM completely independently of each other. Both sensors are stored in one housing.

Test sequence

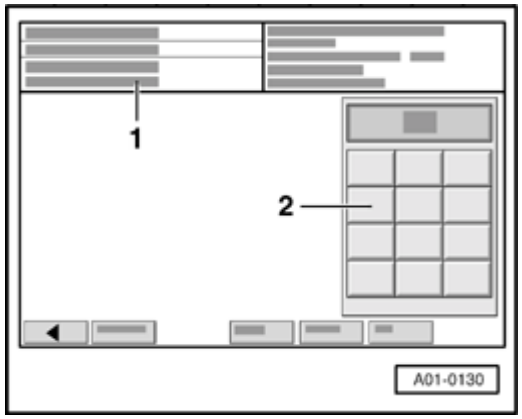
- Connect VAS5051 tester ⇒ Page 01-7 and select vehicle system "01 - Engine electronics". Ignition must remain switched on for this.



➢ Display on VAS5051:

- Select diagnostic function "08 - Read Measuring Value Block" in selection -1-.

24-140



➢ Display on VAS5051:

1 - Enter display group Max. input value = 255

- Select function "062" in button field -2- for "display group number 062" and press Q button to confirm input.

➢ Display on VAS5051:

- Check specified values for E-gas potentiometer voltages in display fields -3- and -4-.

24-141

	Display fields			
	1	2	3	4
Display group 062: E-Gas potentiometer voltages				
Display	xx %	xx %	**xx %**	**xx %**
Indicated	Throttle valve angle (angle sensor 1)	Throttle valve angle (angle sensor 2)	**Sensor 1 for Pedal position**	**Sensor 2 for Pedal position**
Specified value	3 to 93 %	97 to 3 %	**12 to 97 %**	**4 to 49 %**

Note:

Engine Control Module (ECM) calculates the voltage values of the angle sensors in percent relative to 5 volts and displays these percentage values. (5 volts supply voltage represents 100 %).

- Observe display field 3 and 4.

- Slowly depress accelerator pedal completely.

Percent indication in display field 3 must rise uniformly. The tolerance range 12 to 97% is not used completely during this.

Percent indication in display field 4 must also rise uniformly. In the process, the tolerance range of 4 to 49% is not completely utilized.

24-142

Note:

The indicated value in display field 3 must always be about twice as large as the value in display field 4.

- Press "08 - erase DTC memory" to end function ◀-button.

If indications do not resemble description:

- Check voltage supply and wire connections of sensor for accelerator pedal position ⇒ Page 24-143 .

24-143

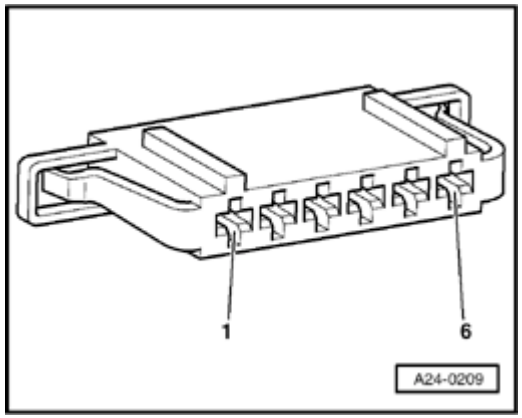
Checking voltage supply of Throttle Position (TP) sensor

- Remove driver-side storage compartment.

⇒ *Repair Manual, Body Interior, Repair Group 68; Instrument panel; Driver-side storage compartment, removing*

- Disconnect harness connector for accelerator pedal position sensor.

- Switch ignition on.



- Connect multimeter for voltage measurement as follows:

Harness connector Terminal	Specified value
1 + Ground (GND)	about 5 V
1 + 5	about 5 V
2 + Ground (GND)	about 5 V
2 + 3	about 5 V

If specified values are obtained:

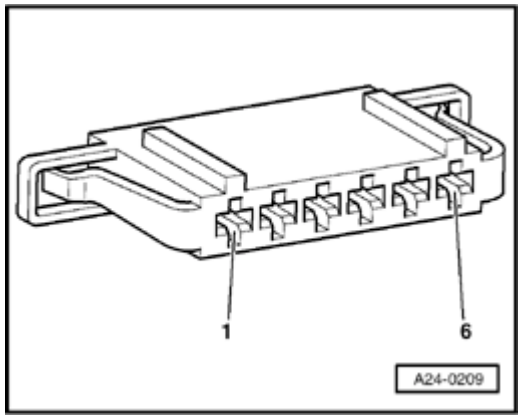
- Also check signal wires.

If specified values are not obtained:

- Check wire connections from Engine Control Module (ECM) to sensors for accelerator pedal position.

Checking wire connections

- Connect VAG1598/31 test box at wiring harness to Engine Control Module (ECM), do not connect ECM ⇒ Page 24-19 .



- Check the following wire connection for open circuit and short circuit to Ground (GND) and B+:

Harness connector Terminal	VAG1598/31 test box Socket
1	72
2	73
3	36
4	35
5	33
6	34

- Repair open circuit or short circuit if necessary.

If no malfunctions are found in wires:

- Replace accelerator pedal position sensor.

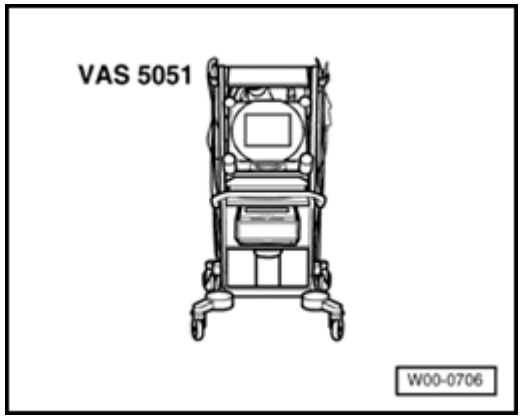
⇒ *Repair Manual, Fuel Supply System, Repair Group 20; Accelerator activation, servicing - front and all wheel drive*

24-145

Kick down function, adapting

If the sensor for accelerator pedal position or the Engine Control Module (ECM) is replaced on a vehicle with automatic transmission, the kick down function must be adapted.

Special Tools and Equipment



- VAS5051 with VAG5051/1

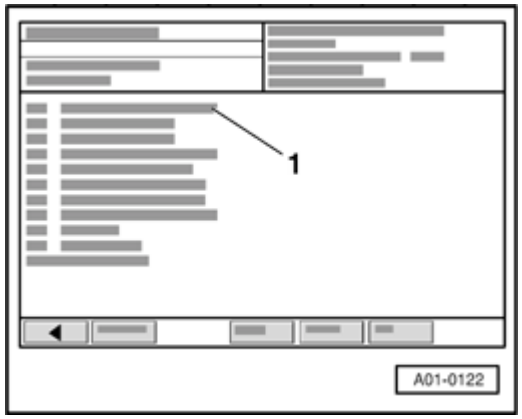
Requirements

- No DTCs in DTC memory, check DTC memory ⇒ Page 01-12 .
- Engine not running, ignition switched on.

Procedure

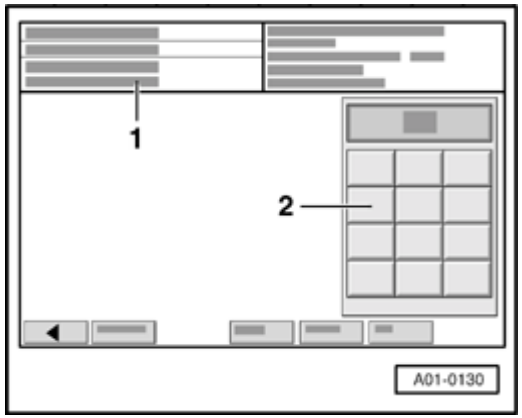
- Connect VAS5051 tester ⇒ Page 01-7 and select vehicle system "01 - Engine electronics". Ignition must remain switched on for this.

24-146



➢ Display on VAS5051:

- In selection -1-, click on the diagnostic function "04 - Basic setting".



➢ Display on VAS5051:

1 - Enter display group Max. input value = 255

- Select function "063" in button field -2- for "display group number 063" and press Q button to confirm input.

24-147

➢ Display on VAS5051:

Note:

There will be a prompt: "Operate kickdown".

- Depress accelerator pedal completely, past kick down point, and hold down.

Note:

During adaptation of the kick down point, "Kick down ADP in progress" will be indicated in display. After successful adaptation of the kick down point, "Kick down ADP OK" will be indicated on display.

- Check specified value in display field -4-.

24-148

	Display fields			
	1	2	3	4
Display group 063: Kick down function, adapting				
Display	xx %	xx %	**Kick down**	**---**
Indicated	Sensor 1 for Pedal position	learned kick down value for Throttle Position (TP) sensor	**Kick down**	**Adaptation condition**
Functional range			**Kick down**	**operate** **ADP in progress** **ADP OK** **ERROR**
Specified value	79 to 94 %	79 to 94 %	**Kick down**	**ADP OK**
Note				**If "ERROR." is displayed: Check DTC memory ⇒ Page 01-12 .**

Notes:

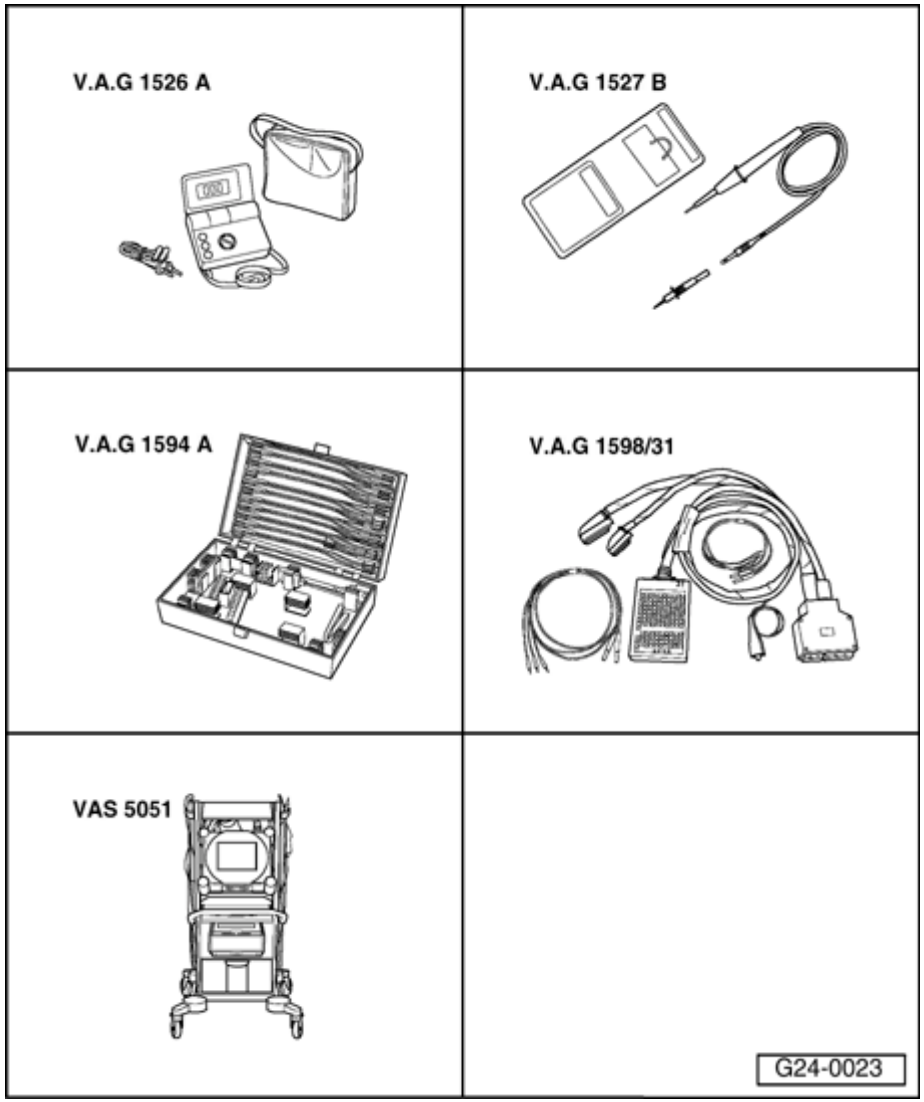
- *The abbreviation "ADP" in display field 4 stands for Adaptation.*
- *"ERROR" can be indicated, for example, if the accelerator pedal is not immediately pressed in response to a request by*

the tester or if the accelerator pedal is released while adaptation is running despite the fact that adaptation is not yet complete. In both cases, "Basic Setting" must be exited and the adaptation must be performed again ⇒ *Page 24-145* .

If specified value "ADP OK" is obtained:

- End function "04 - Basic setting" by pressing ◀ button.

24-149



Brake light switch and brake pedal switch, checking

Special Tools and Equipment

- VAG1526A
- VAG1527B
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

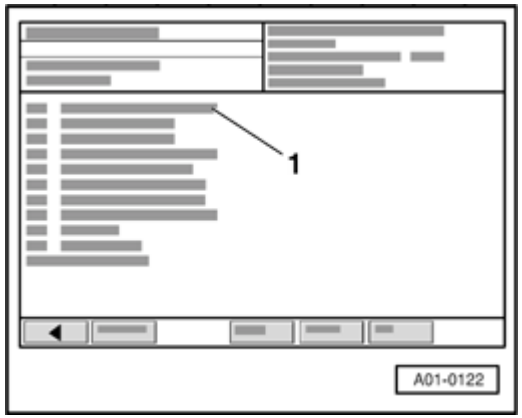
24-150

Note:

For safety reasons, the instruction from the accelerator pedal sensor (potentiometer) to the ECM to open the throttle valve is suppressed when brake is being operated. This requires the brake light switch signal and also the brake pedal switch signal in the control module. If brake pedal is operated with accelerator pedal constantly depressed, engine is immediately regulated down to idle speed. A faulty switch can lead to undesired regulation.

Test sequence

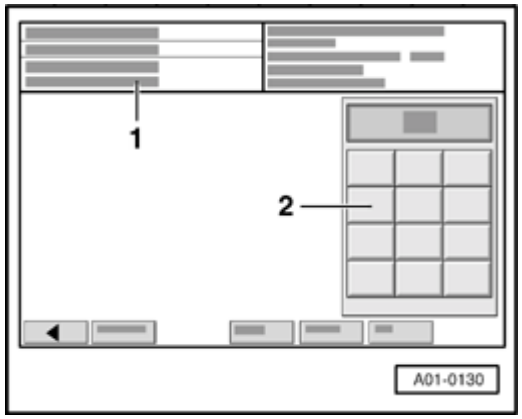
- Connect VAS5051 tester ⇒ Page 01-7 and select vehicle system "01 - Engine electronics". Ignition must remain switched on for this.



➢ Display on VAS5051:

- Select diagnostic function "08 - Read Measuring Value Block" in selection -1-.

24-151



➢ Display on VAS5051:

1 - Enter display group Max. input value = 255

- Select function "066" in button field -2- for "Display group number 066" and press Q button to confirm input.

➢ Display on VAS5051:

- Check brake light switch/brake pedal switch in display field -2-.

24-152

	Display fields			
	1	2	3	4
Display group 066: Signals to Engine Control Module (ECM)				
Display	xxx km/h	**XXXXXXXX**	xxx km/h	XXXXXXXX
Indicated	ACTUAL speed	**Switch positions**	SPECIFIED speed	Switch positions
Functional range		**XXXXXX00** **XXXXXX11**		
Specified value		• Pedal not depressed: **XXXXXX00** • Pedal depressed: **XXXXXX11**		
Note		**Value:X = no significance.** **Switch points slightly offset**		

- Press "08 - erase DTC memory" to end function
◀-button.

24-153

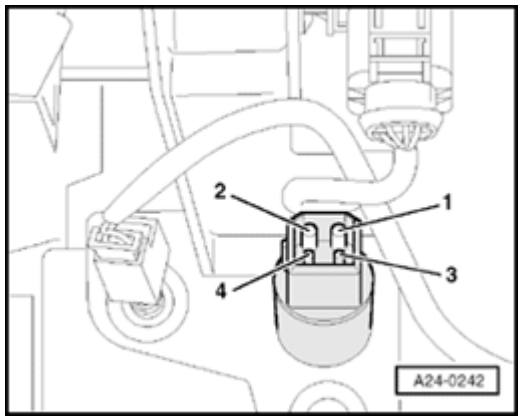
If indications do not resemble description:

Check switch

- Remove driver-side storage compartment.

⇒ *Repair Manual, Body Interior, Repair Group 68; Instrument panel; Driver-side storage compartment, removing*

- Disconnect harness connector at brake light switch and brake pedal switch.



- Connect multimeter between terminal 1 and 2 for resistance measurement.
  - Specification: ∞ Ω (no continuity)
- Depress accelerator pedal.
  - Specification: approx. 0 Ω
- Connect multimeter between terminal 3 and 4 for resistance measurement.
  - Specification: approx. 0 Ω
- Depress accelerator pedal.
  - Specification: ∞ Ω (no continuity)

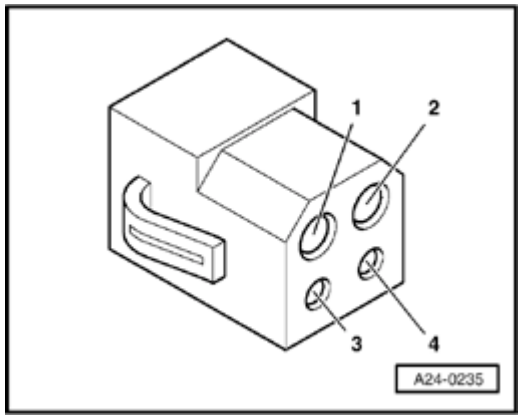
If specified values are not obtained:

- Replace brake light switch / brake pedal switch.

If specified values are obtained:

- Check voltage supply

Checking voltage supply



- Connect VAG1527B voltage tester as follows:

Harness connector Terminal	Measure to
1	Chassis Ground (GND)

♦ LED must light up.

Harness connector Terminal	Measure to
3	Chassis Ground (GND)

- Switch ignition on.

♦ LED must light up.

If LED does not light up:

- Check wire connection from terminal 1 or 3 of connector for open circuit and short circuit to Ground (GND):

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

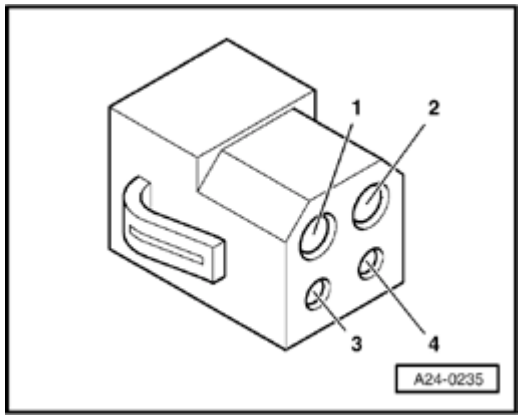
- Repair open circuit or short circuit if necessary.

If LED lights up:

- Checking activation.

Checking activation

- Connect VAG1598/31 test box at wiring harness to Engine Control Module (ECM), do not connect ECM ⇒ Page 24-19 .

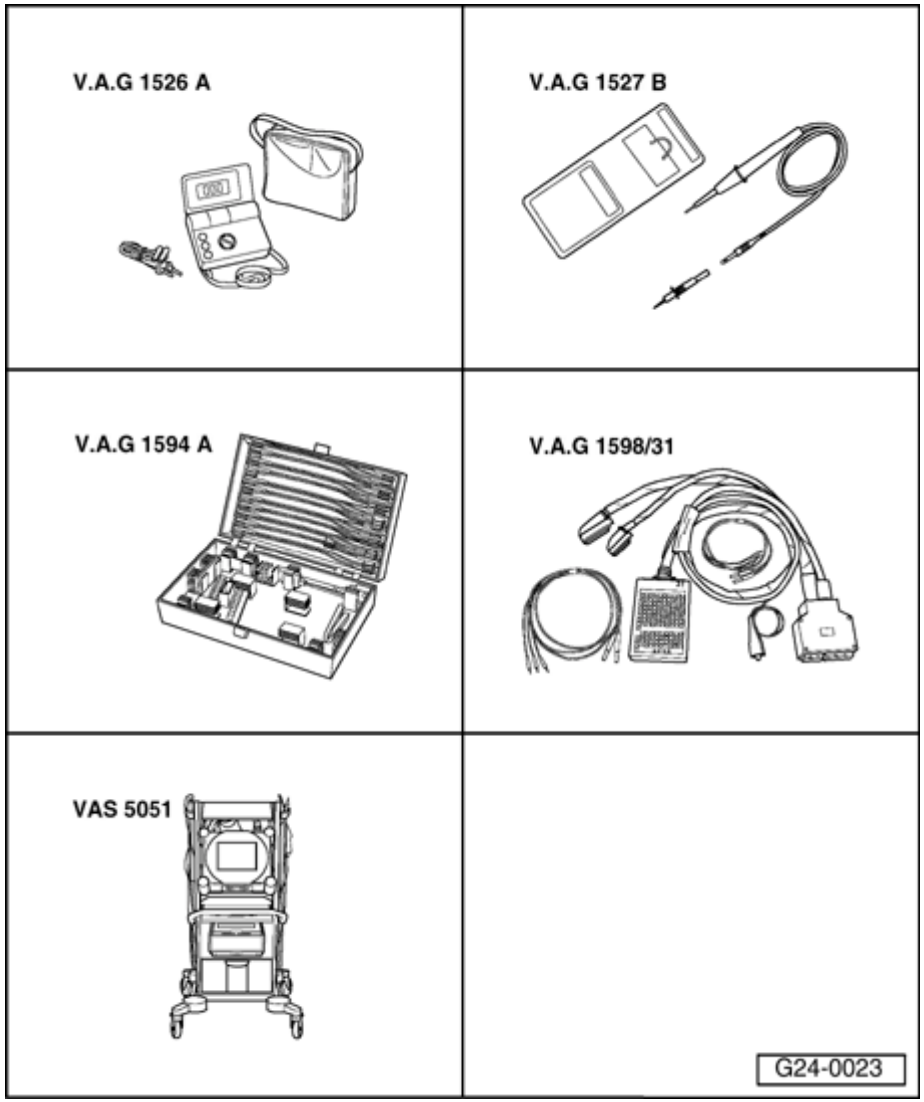


- Check the following wire connections for open circuit and short circuit to Ground (GND) and B+:

Harness connector Terminal	VAG1598/31 test box Socket
2	56
4	55

- Repair open circuit or short circuit if necessary.

24-156



Clutch vacuum vent valve switch -F36-, checking

Special Tools and Equipment

- VAG1526A
- VAG1527B
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

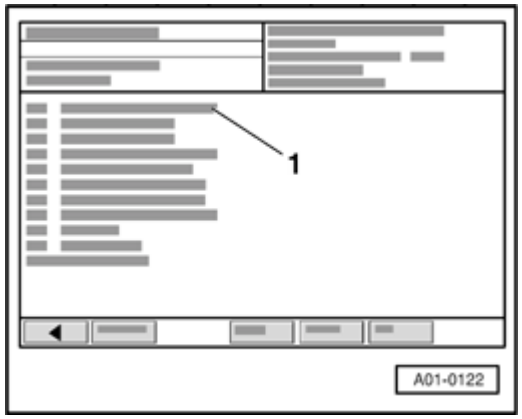
24-157

Note:

This signal helps prevent excessive RPM oscillations and tip-in shocks when clutch is disengaged and is required for the cruise control system.

Test sequence

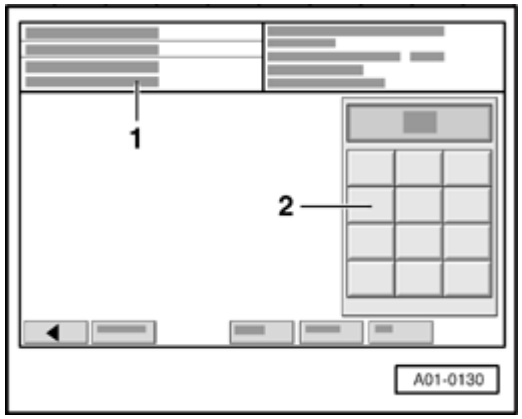
- Connect VAS5051 tester ⇒ Page 01-7 and select vehicle system "01 - Engine electronics". Ignition must remain switched on for this.



➢ Display on VAS5051:

- Select diagnostic function "08 - Read Measuring Value Block" in selection -1-.

24-158



➢ Display on VAS5051:

1 - Enter display group Max. input value = 255

- Select function "066" in button field -2- for "Display group number 066" and press Q button to confirm input.

➢ Display on VAS5051:

- Check Clutch Pedal Position (CPP) switch in display field -2.

24-159

	Display fields			
	1	2	3	4
Display group 066: Signals to Engine Control Module (ECM)				
Display	xxx km/h	**XXXXXXXX**	xxx km/h	XXXXXXXX
Indicated	ACTUAL speed	**Switch positions**	SPECIFIED speed	Switch positions
Functional range		**XXXXX0XX** **XXXXX1XX**		
Specified value		• Pedal not depressed: **XXXXX0XX** • Pedal depressed: **XXXXX1XX**		
Note		**Value:X = no significance**		

- Press "08 - erase DTC memory" to end function
◀-button.

24-160

If indications do not resemble description:

Check switch

- Remove driver-side storage compartment.

⇒ *Repair Manual, Body Interior, Repair Group 68; Instrument panel; Driver-side storage compartment, removing*

- Disconnect harness connector at Clutch Pedal Position (CPP) switch.
- Connect multimeter between terminal 1 and 2 for resistance measurement.
  - ♦ Specification: approx. 0 Ω
- Depress clutch pedal.
  - ♦ Specification: ∞ Ω (no continuity)

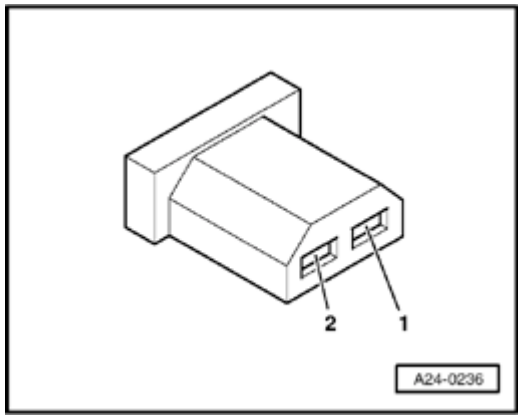
If specified value is not obtained:

- Replace Clutch Pedal Position (CPP) switch.

If specified value is obtained:

- Check voltage supply

24-161



Checking voltage supply

- Connect VAG1527B voltage tester as follows:

Harness connector Terminal	Measure to
1	Chassis Ground (GND)

- Switch ignition on.
  - ♦ LED must light up.

If LED does not light up:

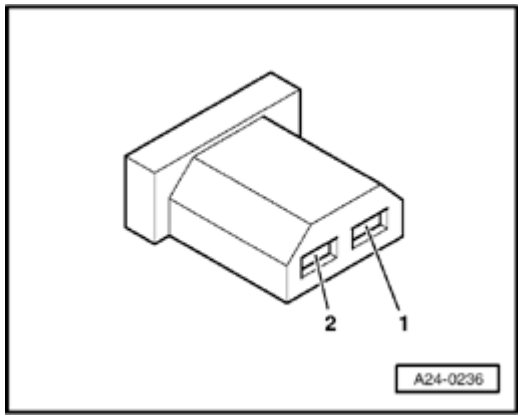
- Check wire connection from terminal 1 of connector to fuse for open circuit:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

- Repair open circuit if necessary.

If LED lights up:

- Checking activation.



Checking activation

- Connect VAG1598/31 test box at wiring harness to Engine Control Module (ECM), do not connect ECM ⇒ Page 24-19 .

- Check the following wire connection for open circuit and short circuit to Ground (GND) and B+:

Harness connector Terminal	VAG1598/31 test box Socket
2	39

- Repair open circuit or short circuit if necessary.