Electronic Engine Power Control (EPC), checking

Function of Engine Power Control (EPC)

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

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

The throttle valve positioner actuates the throttle valve according to the commands it receives from the Engine Control Module (ECM).

The position of the accelerator pedal is communicated to the Engine Control Module (ECM) by two accelerator position sensors (variable resistors, both installed in a single housing) which are connected to the accelerator pedal.

The accelerator pedal position (as determined by the driver) is one of the main input values for the Engine Control Module (ECM).

With the engine is not running and the ignition switched on, the ECM operates the throttle valve positioner in exact accordance with the signals from the accelerator position sensors. For example, when the accelerator pedal is pressed down half way, the throttle valve positioner opens the throttle valve by an equivalent amount, i.e. about half way.

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

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

24-141

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

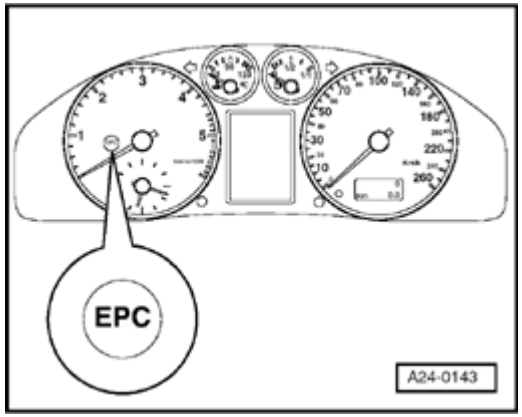
The Engine Control Module (ECM) can provide the optimum combination of throttle valve opening and charge pressure in order to create the required torque.

The electronic throttle is not simply a combination of two or three components, but rather a complete system comprising all the elements that together determine the position of the throttle valve and also control and monitor it. For example, the Accelerator Pedal Position Sensor, Throttle Valve Control Module, EPC warning lamp, Engine Control Module (ECM) etc.

24-142

Significance of electronic Engine Power Control (EPC) warning light in instrument cluster

"EPC" stands for Electronic Power Control and refers to the electronic throttle control system (Drive by wire).



Component location of EPC warning light

The Engine Control Module (ECM) checks after the ignition has been switched on all important parts of the electronic throttle control system for functionality.

After the ignition is switched on the ECM turns on the EPC warning light. Shortly after the engine has been started the EPC warning light goes out if, no malfunctions regarding the electronic throttle control system are stored in the ECM and if the activation for the EPC warning light is OK.

If a malfunction is detected in the electronic throttle system while the engine is running, the ECM will activate the EPC warning lamp. At the same time a Diagnostic Trouble Code (DTC) is stored in the DTC memory of the Engine Control Module (ECM).

Checking function of warning light

- Switch ignition on.

24-143

Specified value: The EPC warning light should light up.

If the EPC warning light does not light up:

- Check wire from Engine Control Module (ECM) to EPC warning light in instrument cluster as follows:

Cause:	Corrective action:
EPC warning light is not activated or does not light up because of an open circuit.	- Switch ignition off - Connect VAG1598/31 test box . Do not connect engine control module. - Bridge sockets 1 and 48 on test box - Switch ignition on. The EPC warning lamp should light up. If the EPC warning lamp does not light up: - Switch ignition off. - Check whether lamp is burned out and test voltage supply to lamp wiring diagram. If the warning lamp and the voltage supply are OK: - Check for open circuit or short circuit in wiring between engine control module and EPC warning lamp using wiring diagram. Determine and eliminate

	malfunction.
	If there are no malfunctions in the wiring to the EPC warning lamp:
Malfunction cause:	Engine control module (ECM) faulty ⇒Replace Engine Control Module (ECM) ⇒ Page 24-24 .

24-144

If EPC warning lamp remains lit for more than 3 seconds (i.e. continuously) when ignition is on, proceed with test as follows:

- Start engine and allow it to run at idling speed.

  Specified value: EPC warning lamp should go out.

If the EPC warning lamp does not go out:

- Check DTC memory of Engine Control Module (ECM).

If no DTCs are stored:

Cause:	Corrective action:
EPC warning light is activated via short circuit to Ground (GND).	- Switch ignition off - Connect VAG1598/31 test box . Do not connect engine control module. - Measure resistance between vehicle Ground and socket 48 on test box. Specified value: infinity (because the wire should not have any direct Ground connection) If the specification is not reached: - Determine and eliminate short circuit to Ground in wiring between engine control module and EPC warning lamp using wiring diagram.
	If there are no malfunctions in the wiring to the EPC warning lamp:

Malfunction cause:	Engine control module (ECM) faulty ⇒Replace Engine Control Module (ECM) ⇒ Page 24-24 .

24-145

Throttle Valve Control Module -J338, checking

The throttle valve control module housing contains the following components:

CAUTION!

The housing should NOT be opened.

- Throttle drive -G186 (power accelerator actuation) (This is an electric motor activated by the engine control module. The motor opens the throttle valve by applying force to overcome the spring pressure.)

- Angle sensor -1- for throttle drive (power accelerator actuation) -G187

- Angle sensor -2- for throttle drive (power accelerator actuation) -G188

Notes:

- *The angle sensors are in the form of potentiometers (variable resistors). Each sends its own separate signal to inform the engine control module of the position of the throttle valve (i.e. one of the signals is redundant).*

- *The potentiometers cannot be adjusted mechanically. Settings are made using the "Basic Setting" function (function 04) with VAG1551 scan tool or VAG1552.*

Throttle valve control module, adaptation

The adaptation process enables the Engine Control Module (ECM) 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 module. The feedback signal indicating the position of the throttle valve comes from the two angle sensors for throttle valve drive.

If the Throttle Valve Control Module -J338 or the ECM is removed and installed or replaced, or if the voltage (power) supply to the ECM is interrupted, an adaptation must be carried out.

24-147

The learning process (adaptation process) is carried out:

- By selecting "Basic Setting" (function 04), Display Group 060 with the ignition switched on.

- Automatically if the ignition is switched on for at least 6 seconds without operating the starter or depressing the accelerator, and if the Engine Control Module (ECM) registers a "learning requirement." (In this case, however, there is no way of knowing whether the adaptation process was successful or not.) The engine control module will register a learning requirement if the previously stored voltage readings from the angle sensors do not correspond (within a certain tolerance range) to the new voltage readings.

Note:

The engine will not start during automatic adaptation.

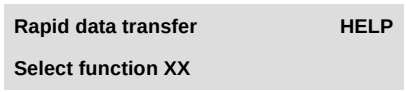
24-148

Test conditions for adaptation of throttle valve control module

- No malfunctions stored in DTC memory ⇒ Page 01-15 , check DTC memory
- Engine not running, ignition switched on
- Accelerator pedal not depressed
- Coolant temperature between 5 ° C and 100 ° C (Display group 004, display field 3)
- Intake air temperature less than 100 ° C
- Voltage supply to engine control module greater than 11Volt, Checking ⇒ Page 28-32

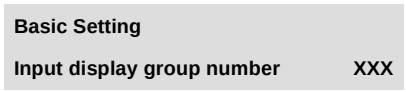
- Connect vehicle diagnostic, testing and information system VAS 5051 or VAG1551 scan tool and select engine electronics control module by entering address word "01" ⇒ Page 01-9 . When doing this the ignition must be switched on.

24-149



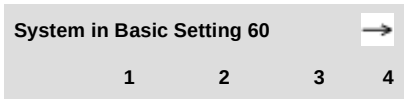
Indicated on display

- Press buttons -0- and -4- to select function "Basic Setting" and confirm entry with -Q- button.



Indicated on display

- Press buttons -0-, -6- and -0- to select "display group number 060" and confirm entry with -Q- button.



Indicated on display

- Check specification for throttle valve control module in display field 4 ⇒ Page 24-151

24-150

When the -Q- button is pressed the throttle valve positioner will be switched mechanically.

In this condition the throttle valve is pulled into an "emergency running" or default position by a mechanical spring in the throttle valve control module. The values supplied by the two angle sensors for this emergency running position are stored in the Engine Control Module (ECM).

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

The throttle valve positioner then closes the throttle valve and the values supplied by the angle sensors in the throttle valve control module are stored in the Engine Control Module (ECM).

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

24-151

- Check specification for throttle valve control module (display fields 4).

	Display fields			
	1	2	3	4
Display Group 060: Adaptation of throttle valve control module with ignition on				
Display	xx %	xx %	**---**	**---**
Indicates	Throttle valve angle (angle sensor 1)	Throttle valve angle (angle sensor 2)	**Learning stage counter**	**Adaptation status**
Work Range	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	**0 to 8**	**ADP. runs** **ADP. O.K.** **ADP. ERROR**
Specified value	3 - 20 %	80 - 97 %	**8**	**ADP. OK**
Note			**Learning stage counter must run from 0 to 8 during adaptation process (some digits may also skip).**	**If specification is not met: Notes ⇒ Page 24-152 .**

Note:

- *It is not important how the learning stage counter reacts during adaptation, rather the specification "ADP" is reached after the adaptation in display field 4.*

- *The Abbreviation "ADP" stands for adaptation.*

24-152

Note:

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

- *The throttle valve is unable to close completely (e.g. because of dirt).*
- *The harness connectors (e.g.: at throttle valve control module) are loose, not properly connected or the contacts at the connector are corroded or bent.*
- *Battery voltage too low.*
- *Throttle valve control module or wiring is faulty.*
- *The engine was started or the accelerator pedal was depressed during the adaptation process.*
- *Distortion of throttle valve housing (check bolts: 10 Nm)*

When the adaptation process is interrupted the message "Function is unknown or cannot be carried out at the moment" will appear on the fault reader display. The adaptation process will

start again automatically the next time the ignition is switched on (for several seconds).

- End engine basic setting by pressing the→ button.

- Press buttons -0- and -6- to select "End Output" function and confirm input with -Q- button.

Angle sensor -1- for throttle drive (power accelerator actuation) -G187- and angle sensor -2- for throttle drive (power accelerator actuation) -G188, checking

The angle sensor -1- for throttle drive (power accelerator actuation) -G187 and angle sensor -2- for throttle drive (power accelerator actuation) -G188 inform the engine control module of the position of the throttle valve. Both angle sensors are located in the throttle valve control module.

- Connect vehicle diagnostic, testing and information system VAS 5051 or VAG1551 scan tool and select engine electronics control module by entering address word "01" ⇒ Page 01-9 . When doing this the ignition must be switched on.

Rapid data transfer	**HELP**
Select function XX	

Indicated on display

- Press buttons -0- and -8- to select function "Read Measuring Value Block" and confirm entry with -Q- button.

Read Measuring Value Block	**Q**
Input display group number	**XXX**

Indicated on display

- Press buttons -0-, -6- and -2- to select "display group number 062" and confirm entry with -Q- button.

24-154

Note:

The engine control module converts the voltage readings from the angle sensors into percentages of 5 V and displays them as percentages. (A signal wire voltage of 5 V is equivalent to 100%.)

➢ Indicated on display

- Check specified display values for electronic throttle potentiometer voltages.

	Display fields			
	1	2	3	4
Display Group 062: Electronic throttle potentiometer voltages				
Display	**xx %**	**xx %**	xx %	xx %
Indicates	**Throttle valve angle (angle sensor 1)**	**Throttle valve angle (angle sensor 2)**	Accelerator position sensor 1	Accelerator position sensor 2
Work Range	**min.: 0 % max.: 100 %**	**min.: 0 % max.: 100 %**	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %
Specified value	**3 - 93 % (Idle value: 8 - 18%)**	**97 - 3 % (Idle value: 80 - 90%)**	12 - 97 %	4 - 49 %

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

24-155

The percentage value in display field 1 should rise steadily, but without covering the full tolerance range between 3 - 93 %.

The percentage value in display field 2 should also rise steadily but without covering the full range of values (in this case 4 - 49 %).

If the display values do not appear as described:

- Check voltage supply and wiring to accelerator position senders ⇒ Page 24-163 .

Observe harness connectors for the following: Loose connectors, not properly engaged or corroded.

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

- Check accelerator position sensors ⇒ Page 24-159 .

24-156

Notes:

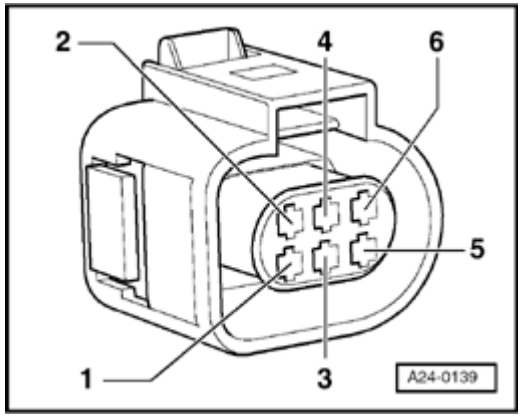
- *The reason why the value in display field 1 rises and the value in display field 2 falls is because the potentiometers (angle senders) in the throttle valve control module work in opposite directions.*
- *The percentage value for the first potentiometer increases as the voltage rises towards 5 V because the voltage at this potentiometer increases as the throttle valve opens.*
- *The percentage value for the second potentiometer decreases as the voltage drops away from 5 V and towards 0 V because the voltage at this potentiometer decreases as the throttle valve opens.*

24-157

Checking voltage supply to throttle valve control module

- Disconnect harness connector from throttle valve control module.

- Switch ignition on.



- Connect hand-held multimeter (voltage range) between the following sockets on connector:

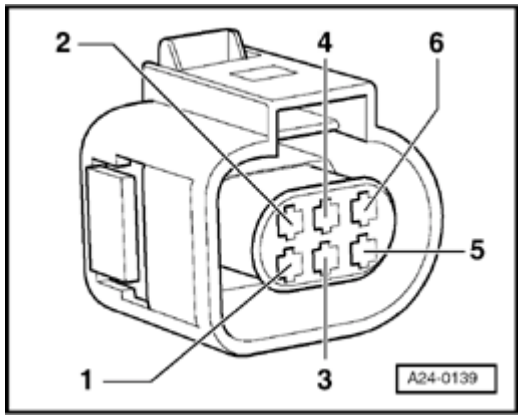
6-pin connector on wiring harness, socket	Specification
2 + Ground (GND)	approx. 5 V
2 + 6	approx. 5 V

If the specifications are not obtained, test wiring connections from engine control module to throttle valve control module ⇒ Page 24-158 .

If the readouts match the specifications, test also the signal wires and activation wires for the throttle valve positioner ⇒ Page 24-158 .

Checking wiring for voltage, signal and activation

- Connect VAG1598/31 test box to wiring harness for engine control module. Do not connect to the engine control module itself ⇒ Page 24-20 .



Test the following wiring connections for open circuits and short to B+ or Ground (GND).

6-pin connector on wiring harness, socket	VAG1598/31 test box, socket
1	92
2	83
3	117
4	84
5	118
6	91

Resistance in wiring: max. 1.5 ohm

- Repair any open/short circuit as necessary.

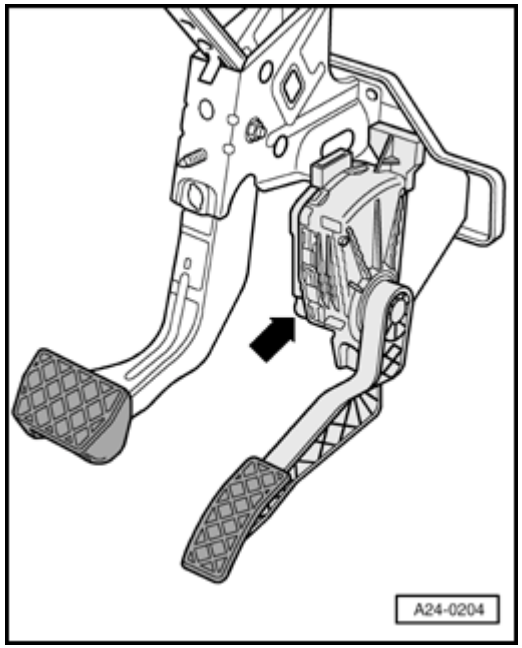
⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

If no wiring malfunction is detected:

- Replace throttle valve control module.

24-159

Throttle Position (TP) sensor -G79 and Sender -2- for accelerator pedal position -G185, checking



Component location of Throttle Position (TP) sensor -G79 and Sender -2- accelerator pedal position

The Throttle Position (TP) Sensor -G79 and Sender -2- for accelerator pedal position -G185 are located at the accelerator pedal. Both sensors inform (completely independently of the other) the engine control module of the driver's throttle requirement (pedal position). Both sensors are located in a single housing.

- Connect vehicle diagnostic, testing and information system VAS 5051 or VAG1551 scan tool and select engine electronics control module by entering address word "01" ⇒ Page 01-9 . When doing this the ignition must be switched on.

24-160

Rapid data transfer	**HELP**
Select function XX	

Indicated on display

- Press buttons -0- and -8- to select function "Read Measuring Value Block" and confirm entry with -Q- button.

Read Measuring Value Block	**Q**
Input display group number	**XXX**

Indicated on display

- Press buttons -0-, -6- and -2- to select "display group number 062" and confirm entry with -Q- button.

Read Measuring Value Block 62			→
1	**2**	**3**	**4**

Indicated on display

- Observe specification for electronic throttle potentiometer voltages.

24-161

	Display fields			
	1	2	3	4
Display Group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	**xx %**	**xx %**
Indicates	Throttle valve angle (angle sensor 1)	Throttle valve angle (angle sensor 2)	**Accelerator position sensor 1**	**Accelerator position sensor 2**
Work Range	min.: 0 % max.: 100 %	min.: 0 % max.: 100 %	**min.: 0 % max.: 100 %**	**min.: 0 % max.: 100 %**
Specified value	3 - 93 %	97 - 3 %	**12 - 97 % (Idle value: 12 - 18%)**	**4 - 49 % (Idle value: 4 - 13%)**

Note:

The engine control module converts the voltage readings from the angle sensors into percentages of 5 V and displays them as percentages. (A signal wire voltage of 5 V is equivalent to 100%.)

- Observe display fields 3 and 4.

- Slowly depress accelerator pedal to full throttle position.

The percentage value in display field 3 should rise steadily, but without covering the full tolerance range between 3 - 93 %.

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

24-162

Note:

The value shown in display field 3 should always be about the double of the value shown in display field 4.

If the display values do not appear as described:

- Check voltage supply and wiring to accelerator position sensors ⇒ Page 24-163 .

24-163

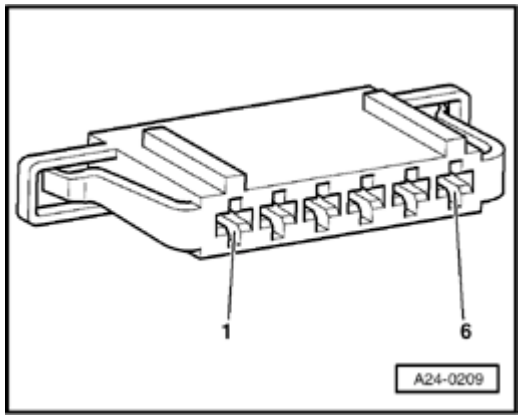
Checking voltage supply of accelerator position sensors

- Remove storage compartment on driver's side.

⇒ *Repair Manual, Body Interior, Repair Group 68*

- Disconnect harness connector for accelerator position sensor.

- Switch ignition on.



- Connect hand-held multimeter (voltage range) between the following sockets on the connector:

6-pin connector on wiring harness, socket	Specification
2 + Ground (GND)	approx. 5 V
1 + 3	approx. 5 V
5 + Ground (GND)	approx. 5 V
5 + 4	approx. 5 V

If the specifications are obtained:

- Check signal wiring ⇒ Page 24-164 .

If the specifications are not obtained:

- Check wiring between Engine Control Module (ECM) and accelerator position sensors.

Checking wiring

- Connect VAG1598/31 test box to wiring harness for engine control module. Do not connect to the engine control module itself ⇒ Page 24-20 .

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

Connector socket	VAG1598/31 test box Socket
1	72
2	73
3	36
4	35
5	33

6	34

- Repair any open/short circuit as necessary.

If no wiring malfunction is detected:

- Replace accelerator position sensors.

Note:

After replacing accelerator position sensor, on vehicles with automatic/stepless transmission carry out adaptation of Kick-Down switch ⇒ *Page 24-166* .

Kick-Down function, adaptation

On vehicles with automatic/inifinitely variable transmission, when the accelerator position sensor or the Engine Control Module (ECM) was replaced, the Kick-Down function from ECM must be adapted.

Test conditions

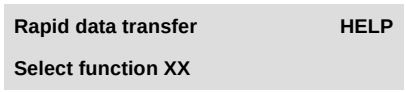
- No malfunctions stored in DTC memory ⇒ Page 01-15 , check DTC memory

- Engine not running, ignition switched on

- Connect vehicle diagnostic, testing and information system VAS 5051 or VAG1551 scan tool and select engine electronics control module by entering address word "01" ⇒ Page 01-9 .

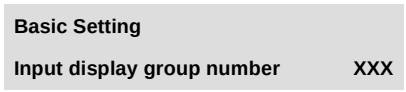
  When doing this the ignition must be switched on.

24-167



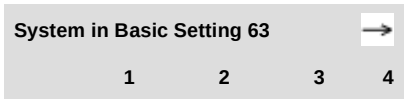
Indicated on display

- Press buttons -0- and -4- to select function "Basic Setting" and confirm entry with -Q- button.



Indicated on display

- Press buttons -0-, -6- and -3- to select "display group number 063" and confirm entry with -Q- button.



Indicated on display

Note:

You are prompt to: "Activate Kick-Down"

- Depress accelerator pedal fully pass the Kick-Down point and hold accelerator pedal at this position.

Note:

During the Kick-Down point adaptation the VAG1551 displays "Kick-Down ADP. runs". After the Kick-Down point adaptation was successfully carried out the VAG1551 displays "Kick-Down ADP. OK", now you can release the accelerator pedal.

- Check specification in display field 4.

24-168

	Display fields			
	1	2	3	4
Display Group 063: Kick-down function adaptation				
Display	xx %	xx %		**---**
Indicated	accelerator position sensor 1	accelerator position sensor 2		**Adaptation condition**
Work range	0...100 %	0...100 %	**Kick Down**	**Activate** **ADP. runs** **ADP. OK** **ADP. ERROR**
Specified value	12...97 %	4...49 %	**Kick Down**	**ADP. OK**
Note			**IF "ADP. ERROR" is displayed: Check DTC memory ⇒ Page 01-15 .**	

Note:

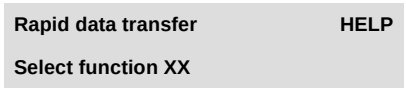
- *The Abbreviation "ADP." stands for adaptation.*
- *The "ERROR" display could appear, if the accelerator pedal was not immediately depressed after you have been prompted or the accelerator pedal was released during the adaptation although the adaptation was not completely carried out. In both cases the "Basic Setting" mode must be abandoned and the adaptation must be started again ⇒ Page 24-*

166 .

24-169

If the specification "ADP. OK" is obtained:

- Press →button.



Indicated on display (Select function)

- Press buttons -0- and -6- to select function "End Output".