


Diagnosis - Fault memory


Preceding work: Testing and adjusting engine (07-1100)

Note on fault memory

The engine control modules (ME-SFI) (N3/10) have a fault memory. A distinction is made between the recognition of faults and their storage as follows:

- Faults existing permanently
 - Loose contact faults which occurred while driving
- The fault memory is erased when the vehicle battery is disconnected.

On vehicles (except for ) , faults which no longer occur are automatically erased again after a max. of 40 warm-up phases.

On ) vehicles faults which no longer occur are automatically erased as follows:

The "CHECK ENGINE" MIL goes out after 3 trips. The fault is erased after a further 40 warm-up phases.

A warm-up phase or trip is as follows:

Warm-up phase

- Engine coolant temperature < 35°C when starting
- The coolant heats up to > 80°C

Diagnosis - Fault memory

The correction values are calculated continuously and stored permanently. Self-adaptation is carried out additively at idle and multiplicatively at part-load. The correction towards rich or lean is ± 1.0 ms (injection time) at idle and the factor 0.77-1.28 at part-load. The ME-SFI 1.0 control module adapts itself automatically after repair work.

Note on variant coding

ME-SFI 1.0 control modules have variant coding. Coding can only be carried out with the Hand-Held Tester (for automatic and manual, refer to notes on HHT "Variant coding" □ 11/5).

The following vehicle versions are to be observed for the coding:

- Vehicle model
- TWC
- Without TWC
- National version

Note on stage 2 or stage 2a drive authorization system (DAS)

- A drive authorization system (DAS) is installed on vehicles with the fuel injection and ignition system (ME-SFI). Depending on the stage of the drive authorization system the drive authorization system is activated by the RCL control module or the IR DAS control module via the CAN data bus to the engine control module (ME-SFI).

The engine control module (ME-SFI) renders the injection system inoperative after the drive authorization system is activated.

Diagnosis - Fault memory

Note on automatic recognition of the lower mechanical limit stop and the full opening of the throttle valves by the actuators

The final positions of the throttle valves are recorded by the actuator and stored in the engine control module (ME-SFI).

After the engine control module (ME-SFI) or actuator is replaced, the mechanical limit stop of the throttle valve and the wide open throttle position must be recorded and stored again.

The first time that the new engine control module (ME-SFI) is connected to terminal 30 (B+), the control module automatically carries out an adaptation of the actuator when the ignition is "ON" (lower mechanical limit stop of throttle valve).

Trip

- Time > 20 minutes after starting
 - Engine temperature > -7°C
 - Engine speed > 500 rpm
 - All functional chains have already been tested during previous trips.
- The stored **faults can only be read out with the HHT** with the ignition "ON" or with the "engine running".

The pulse readout and diagnosis via the on/off ratio display is not used any more.

Note on self-adaptation of mixture formation

On vehicles with TWC the lambda control determines the injection time so accurately that the fuel/air ratio is always around lambda 1 under all operating conditions (corresponds to 14.7 kg of air to 1 kg of fuel).

If faults occur due to:

- Air ingress
- Wear or coking of the fuel injection valves
- Wear on the engine
- Contact resistance on the mass air flow sensor
- Defective diaphragm pressure regulator
- Defective purge control valve

the ME-SFI 1.0 control module automatically corrects the mixture formation.

A stage 2 drive authorization system is installed on vehicles up to 5/96. Activation or deactivation is by means of the RCL remote control.

A stage 2a drive authorization system is installed on vehicles as of 6/96. Activation or deactivation is by means of transponder technology via the ignition key. As soon as the key is turned in the steering lock, the IR DAS control module receives a signal and enables the engine control via the CAN data bus.

Locking and unlocking the vehicle with the mechanical key has no effect on the drive authorization system. The engine control module (ME-SFI) and the RCL control module or the IR DAS control module are permanently interlocked by means of an identification code. This identification cannot be erased (refer to HHT actual values "Drive authorization system" menu item 3/7).

It is therefore not possible to replace the engine control module (ME-SFI), the RCL control module or the IR DAS control module in another vehicle on a trial basis.



If a new engine control module (ME-SFI) is installed for test purposes, a max. of 40 start-up operations only may be carried out, as after this the control modules are permanently interlocked. Before the initial start, variant coding must be carried out on the engine control module (ME-SFI) using the HHT. The identification must also be initiated and the vehicle identification number entered (refer to HHT actual values "Drive authorization system" menu item 3/7).

Conditions for the programming process:

- Selector lever in position P/N
- Vehicle stationary
- Engine not running
- Engine coolant temperature between 5°C and 100°C
- Accelerator pedal not operated

If all the conditions are met, allow the ignition to be switched on for **at least 60 seconds** and then switch the ignition off for **at least 10 seconds**.

Note:

The programmed value is only stored in the read-only memory after 10 starting cycles, provided that the voltage has not been interrupted. If for example the battery is disconnected after the 9th starting cycle, the programming process must be repeated.

Diagnosis - Fault memory

B. Working with the Hand-Held Tester

- Switch off ignition
- Disconnect connector of front axle wheel speed sensors (ESP MIL must come on)

Once the work is complete, reconnect the connector and erase fault memory with the Hand-Held Tester!

Note on actuation of the "CHECK ENGINE" MIL (only)

If there is misfiring (e.g. ignition or mixture), the "CHECK ENGINE" MIL flashes. This concerns fault codes P0300 to P0308.

The MIL comes on continuously for all other faults.

Note on sensor wheel adaptation

After replacing the engine control module (ME-SFI), sensor wheel adaptation (= programming incremental wheel) must first be carried out as follows for a rough running test:

- Engine coolant temperature approx. > 70°C
- Drive the vehicle on the road in 3rd gear or in selector lever position 3.
- Increase engine speed to approx. > 3500 rpm and then overrun phase until the engine speed is approx < 1200 rpm.

After a crankshaft speed sensor or starter ring gear is replaced or after exchanging the engine, sensor wheel adaptation must first be reset using the HHT and then the driving cycle carried out as described above.

Diagnosis - Fault memory

Notes on the HHT

● Troubleshooting with HHT

Fault memory: Select current faults

If the current status changes, e.g. due to a loose plug connection, an audible and visual signal is given so that troubleshooting can be carried out directly with the HHT.

● Loose contacts

Loose contacts are stored if they occur several times over a particular period of time. They can therefore only occur as stored faults and never as current faults.

● Specified values

All specified values relating to the actual values displayed in the HHT are given in the Diagnosis Manual Engine Volume 1 Chapter A.

● Actual engine speed value

For the engine speed, the specified idle speed value calculated by the control module appears on the left of the HHT display, and the actual speed appears on the right.

Both values should only differ slightly. The permissible tolerances have not yet been specified.

Notes on the chassis dynamometer/speedometer tester

The ESP or ASR chassis control systems must not be rendered inoperative by disconnecting the control modules, because wheel speed signals transmitted by the CAN data bus are required in the ME-SFI and ETC control modules.

In order to switch off the brake or engine control intervention of the ESP or ASR systems, the function is to be cancelled in the respective control module as follows:

A. Working without the Hand-Held Tester

- Switch off ignition
- Connect adapter to data link connector (X11/4)
- Connect socket 1 to socket 6
- Start engine (ESP MIL must come on)

● Variant coding with the HHT

- a) Before removing the engine control module (ME-SFI), read out the existing code number with the HHT (menu item 5 "Variant coding"). After the new control module has been installed, input the code number.

Note

The code number must be erased when the new control module is returned to the Central Supply Depot.

- b) If the code number **cannot** be read out, the vehicle version must be established, the corresponding code number must be obtained from the parts microfilm, Group 54 and input manually with the HHT.

● Stage 2 drive authorization system (DAS)

After the engine control module (ME-SFI) has been replaced, identification also has to be carried out after variant coding and the vehicle ident. end no. input (refer to HHT actual values "Drive authorization system", menu item 3/7).

Diagnosis - Fault memory

Notes on the HHT (continued)

● Correction program

The following corrections can be carried out with the HHT:
(refer to HHT "Correction program" menu item 6)

1. Correction of ignition for various fuels (RON)
2. Correction of fuel quantity in the event of complaint (performance map adjustment)
3. Correction of idle speed in selector lever position P/N
4. Correction of idle speed with selector lever in drive stage
5. CO setting for vehicles without TWC
6. Correction of delay time in the event of complaint
7. Make fault setting conditions less sensitive for rough running recognition

Diagnosis - Fault memory

Commercially available tools and testers, MB testers (refer to Workshop equipment manual)

Designation	e.g. company, order no.
Basic Hand-Held Tester set with: 1 Hand-Held Tester 1 Multiplexer test cable 1 Case 1 Owner's Manual	Mercedes-Benz AG 70322 Stuttgart VP/SDI 6511 00 01 00
1 Printer connecting cable	Mercedes-Benz AG 70322 Stuttgart VP/SDI 6511 0070 99

Diagnosis - Fault memory

Connecting diagram - Hand-Held Tester

Engine control module (ME-SFI)
Speed signal (DI/KSS)

Socket 4
Socket 13

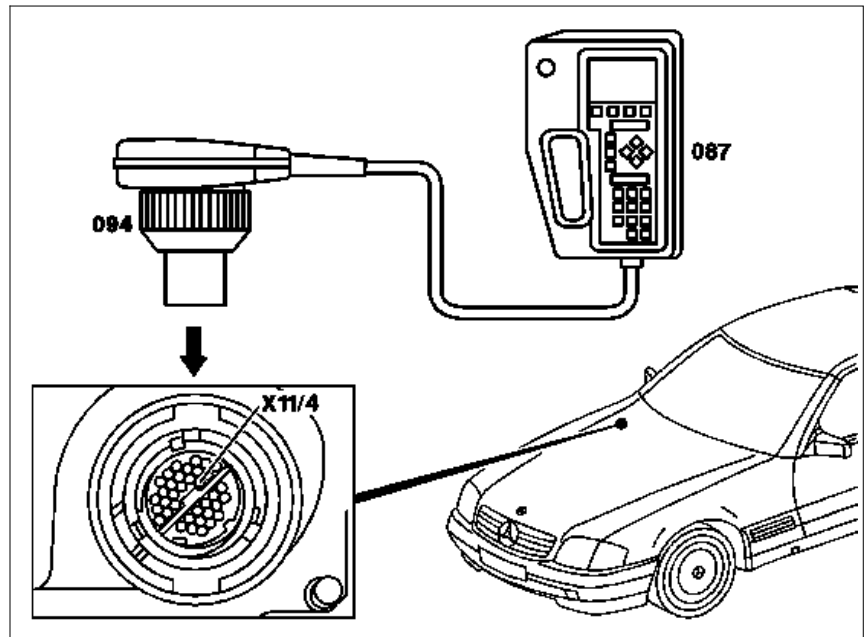


Figure 1


087 Hand-Held Tester
094 Multiplex cable
X11/4 Data link connector, 38-pin (pulse signal)

P07-6751-57

Diagnosis - Fault memory


Prerequisites for reading out the fault memory



1. Connect Hand-Held Tester to the data link connector (X11/4) in accordance with connecting diagram (refer to page 11/7).
2. Ignition: **ON**

 **It is not possible to read out the fault code with the pulse counter**

Note






■ Symbols for faults which are relevant to emissions which result in actuation of the "CHECK ENGINE" MIL on USA vehicles. This is only actuated when the tests are complete and the faults have been recognized.

 Before starting testing, observe \Rightarrow fault code description.

Fault code		Possible cause	Fault code description	Remedy/Test step ¹⁾
		No fault recognized		Carry out □23, 24, 25 or 26 completely, depending on the complaint.
P0100 ■		Hot film MAF sensor (B2/5)	□13 \geq 1	□23 \Rightarrow 4.0 - 5.0
P0105 ■	 only	Pressure sensor (B28)	□13 \geq 2	□23 \Rightarrow 6.0
P0110 ■		IAT sensor (B17)	□13 \geq 3	□23 \Rightarrow 9.0
P0115 ■		Coolant temperature sensor (B11/4)	□13 \geq 4	□23 \Rightarrow 8.0
P0120 ■		Actual value potentiometer in actuator	□13 \geq 5	□25 \Rightarrow 6.0
P0130 ■	with TWC only	Right O ₂ sensor, before TWC (G3/4)	□13 \geq 6	□23 \Rightarrow 12.0


¹⁾ Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code		Possible cause	Fault code description	Remedy/Test step ¹⁾
				
P0133 ■	with TWC only	A Right O ₂ sensor, before TWC (G3/4) ageing correction value exceeded B Right O ₂ sensor, before TWC (G3/4) ageing duration period too long	□13 \geq 7	□23 \Rightarrow 12.0
P0135 ■	with TWC only	Oxygen sensor heater of right O ₂ sensor, before TWC (G3/4)	□13 \geq 8	□23 \Rightarrow 13.0
P0136 ■	 only	Right O ₂ sensor, after TWC (G3/6)	□13 \geq 6	□23 \Rightarrow 15.0
P0141 ■	 only	Oxygen sensor heater of right O ₂ sensor, after TWC (G3/6)	□13 \geq 8	□23 \Rightarrow 16.0
P0150 ■	with TWC only	Left O ₂ sensor, before TWC (G3/3)	□13 \geq 6	□23 \Rightarrow 11.0
P0153 ■	with TWC only	A Left O ₂ sensor, before TWC (G3/3) ageing correction value exceeded B Left O ₂ sensor, before TWC (G3/3) ageing duration period too long	□13 \geq 7	□23 \Rightarrow 11.0
P0155 ■	with TWC only	Oxygen sensor heater of left O ₂ sensor, before TWC (G3/3)	□13 \geq 8	□23 \Rightarrow 13.0
P0156 ■	 only	Left O ₂ sensor, after TWC (G3/5)	□13 \geq 6	□23 \Rightarrow 14.0
P0161 ■	 only	Oxygen sensor heater of left O ₂ sensor, after TWC (G3/5)	□13 \geq 8	□23 \Rightarrow 16.0

¹⁾ Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code		Possible cause	Fault code description	Remedy/Test step ¹⁾
				
P0170 ■	with TWC only	A Self-adaptation of "part-load" mixture formation, right cylinder bank to limit value of engine control module (ME-SFI) (N3/10) B Self-adaptation of "closed throttle position" mixture formation, right cylinder bank to limit value of engine control module (ME-SFI) (N3/10)	□13 \geq 9	Air ingress, fuel injectors, diaphragm pressure regulator, engine wear
P0173 ■	with TWC only	A Self-adaptation of "part-load" mixture formation, left cylinder bank to limit value of engine control module (ME-SFI) (N3/10) B Self-adaptation of "closed throttle position" mixture formation left cylinder bank, to limit value of engine control module (ME-SFI) (N3/10)	□13 \geq 9	Air ingress, fuel injectors, diaphragm pressure regulator, engine wear
P0201 ■		Fuel injector (cylinder 1) (Y62y1)	□13 \geq 10	□23 \Rightarrow 17.0
P0202 ■		Fuel injector (cylinder 2) (Y62y2)	□13 \geq 10	□23 \Rightarrow 18.0
P0203 ■		Fuel injector (cylinder 3) (Y62y3)	□13 \geq 10	□23 \Rightarrow 19.0
P0204 ■		Fuel injector (cylinder 4) (Y62y4)	□13 \geq 10	□23 \Rightarrow 20.0
P0205 ■		Fuel injector (cylinder 5) (Y62y5)	□13 \geq 10	□23 \Rightarrow 21.0
P0206 ■		Fuel injector (cylinder 6) (Y62y6)	□13 \geq 10	□23 \Rightarrow 22.0
P0207 ■		Fuel injector (cylinder 7) (Y62y7)	□13 \geq 10	□23 \Rightarrow 23.0
P0208 ■		Fuel injector (cylinder 8) (Y62y8)	□13 \geq 10	□23 \Rightarrow 24.0

¹⁾ Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code 	Possible cause	Fault code description	Remedy/Test step ¹⁾
P0300 ■	A Misfire B Misfire "damaging to TWC"	□13 ≧11	Engine smooth running Sensor wheel adaptation Mixture adaptation Read out fault ambient data with HHT
P0301 ■	A Misfire cylinder 1 B Misfire cylinder 1 "damaging to TWC"	□13 ≧11	□24 ⇒ 22.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure
P0302 ■	A Misfire cylinder 2 B Misfire cylinder 2 "damaging to TWC"	□13 ≧11	□24 ⇒ 23.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure
P0303 ■	A Misfire cylinder 3 B Misfire cylinder 3 "damaging to TWC"	□13 ≧11	□24 ⇒ 24.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure




¹⁾ Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code 	Possible cause	Fault code description	Remedy/Test step ¹⁾
P0304 ■	A Misfire cylinder 4 B Misfire cylinder 4 "damaging to TWC"	□13 ≧11	□24 ⇒ 25.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure
P0305 ■	A Misfire cylinder 5 B Misfire cylinder 5 "damaging to TWC"	□13 ≧11	□24 ⇒ 26.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure
P0306 ■	A Misfire cylinder 6 B Misfire cylinder 6 "damaging to TWC"	□13 ≧11	□24 ⇒ 27.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure
P0307 ■	A Misfire cylinder 7 B Misfire cylinder 7 "damaging to TWC"	□13 ≧11	□24 ⇒ 28.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure
P0308 ■	A Misfire cylinder 8 B Misfire cylinder 8 "damaging to TWC"	□13 ≧11	□24 ⇒ 29.0 □24 ⇒ 30.0 □36 ⇒ 1.0-2.0 Compression pressure

¹⁾ Observe prerequisites for testing.


Diagnosis - Fault memory

Fault code 	Possible cause	Fault code description	Remedy/Test step ¹⁾
P0325 ■	Knock sensor, right	□13 ≧12	Connector cable Knock sensor
P0330 ■	Knock sensor, left	□13 ≧12	Connector cable Knock sensor
P0335 ■	Crankshaft position sensor (L5)	□13 ≧13	□24 ⇒ 12.0
P0341 ■	Camshaft Hall sensor (B6/1)	□13 ≧14	□24 ⇒ 13.0
P0410 ■	 only Secondary air injection malfunction (functional chain)	□13 ≧15	□23 ⇒ 25.0 - 26.0
P0422 ■	with TWC only Efficiency of right three-way catalytic converter insufficient	□13 ≧16	Right TWC
P0432 ■	with TWC only Efficiency of left three-way catalytic converter insufficient	□13 ≧16	Left TWC
P0440 ■	 models 140/210 and 129 as of 09/97 only Purge control system leaking (functional chain)	□13 ≧17	□23 ⇒ 31.0-33.0

P0441 ■		Purge control inoperative	□13 ≥18	□23 ⇒ 31.0-32.0
P0442 ■	(USA) models 140/210 and 129 as of 09/97 only	Purge control system leaking slightly	□13 ≥17	□23 ⇒ 33.0


1) Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code 		Possible cause	Fault code description	Remedy/Test step 1)
P0443 ■		Purge control valve (Y58/1)	□13 ≥19	□23 ⇒ 31.0
P0446 ■	(USA) models 140/210 and 129 as of 09/97 only	A Activated charcoal canister shut-off valve (functional chain) B Activated charcoal canister shut-off valve (Y58/4)	□13 ≥20	□23 ⇒ 31.0 □23 ⇒ 33.0 □23 ⇒ 35.0 □23 ⇒ 34.0
P0450 ■	(USA) models 140/210 and 129 as of 09/97 only (USA) model 129 up to 08/97 only	Fuel tank pressure sensor (B4/3) Purge monitor pressure sensor (B4/4)	□13 ≥21 □13 ≥22	□23 ⇒ 35.0 Activated charcoal canister blocked □23 ⇒ 36.0
P0455 ■	(USA) models 140/210 and 129 as of 09/97 only	Purge control system leaking badly Fuel tank pressure sensor (B4/3)	□13 ≥17 □13 ≥21	□23 ⇒ 33.0 □23 ⇒ 35.0
P0462		Fuel tank level too low		Fill up with fuel
P0500		A Vehicle speed signal, front left B Vehicle speed signal, rear left	□13 ≥23	□25 ⇒ 8.0 □25 ⇒ 9.0


1) Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code 		Possible cause	Fault code description	Remedy/Test step 1)
P0507		Idle speed control	□13 ≥24	□25 ⇒ 4.0 - 7.0
P0560		Battery voltage to engine control module (ME-SFI) (N3/10)	□13 ≥25	□23 ⇒ 1.0 - 3.0
P0565		Cruise control switch (S40)		□26 ⇒ 1.0
P0600		CAN from ESP	□13 ≥26	□23 ⇒ 37.0
P0604		A Engine control module (ME-SFI) (N3/10) B Engine control module (ME-SFI) (N3/10)		N3/10
P0605		Engine control module (ME-SFI) (N3/10)		N3/10
P0700 ■		Read out fault memory of automatic transmission control module	□13 ≥27 □13 ≥28	Test EATC, Chassis, Volume 1 - 2
P0702 ■		Read out fault memory of automatic transmission control module	□13 ≥29 □13 ≥30	Test EATC, Chassis, Volume 1 - 2
P0715 ■		Read out fault memory of automatic transmission control module	□13 ≥31	Test EATC, Chassis, Volume 1 - 2
P0720 ■		Read out fault memory of automatic transmission control module	□13 ≥32	Test EATC, Chassis, Volume 1 - 2

1) Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code 		Possible cause	Fault code description	Remedy/Test step 1)
P0730 ■		Read out fault memory of automatic transmission control module	□13 ≥33	Test EATC, Chassis, Volume 1-2
P0740 ■		Read out fault memory of automatic transmission control module	□13 ≥34	Test EATC, Chassis, Volume 1-2
P0743 ■		Read out fault memory of automatic transmission control module	□13 ≥35	Test EATC, Chassis, Volume 1-2
P0748 ■		Read out fault memory of automatic transmission control module	□13 ≥36 □13 ≥37	Test EATC, Chassis, Volume 1-2

P0753 ■		Read out fault memory of automatic transmission control module	□13≧ 38	Test EATC, Chassis, Volume 1-2
P0758 ■		Read out fault memory of automatic transmission control module	□13≧ 39	Test EATC, Chassis, Volume 1-2
P0763 ■		Read out fault memory of automatic transmission control module	□13≧ 40	Test EATC, Chassis, Volume 1-2
P0809		Angular deviation between camshafts and crankshaft		Check basic adjustment of camshafts
P1163		Oil level switch (S43)		□23 ⇒ 39.0

1) Observe prerequisites for testing.

Diagnosis - Fault memory

Fault code	Possible cause	Fault code description	Remedy/Test step 1)
P1186	Safety fuel shut-off recognized		□25 ⇒ 3.0-4.0 Throttle valve actuator difficult to move/sticks Check intake tract for residues
P1386 ■	Knock regulating in engine control module (ME-SFI) (N3/10), hardware fault	□13≧ 41	1. Increased tendency to knock due to poor fuel, coked combustion chambers or mechanical damage 2. Engine control module (ME-SFI) (N3/10)
P1420 ■	Air pump switchover valve (Y32)	□13≧ 42	□23 ⇒ 26.0

1) Observe prerequisites for testing.

3) On model 210, as of start of production up to approx. 03/96, ignore fault code, as the temperature sensors are omitted. A modified control module has been phased in as of approx. 04/96.

Diagnosis - Fault memory

Fault code	Possible cause	Fault code description	Remedy/Test step 1)
P1437 3)	Ⓝ up to 05/98 only Right exhaust gas temperature sensor (B16/5)		□23 ⇒ 44.0
P1444 3)	Ⓝ up to 05/96 only Left exhaust gas temperature sensor (B16/4)		□23 ⇒ 43.0
P1453 ■	Ⓝ and low emission D3 as of 07/97 only AIR relay module (K17)	□13≧ 42	□23 ⇒ 25.0
P1519 ■	Camshaft control, right (functional chain)	□13≧ 43	□23 ⇒ 28.0
P1522 ■	Camshaft control, left (functional chain)	□13≧ 43	□23 ⇒ 27.0
P1525 ■	Right adjustable camshaft timing solenoid (Y49/2)	□13≧ 44	□23 ⇒ 30.0
P1533 ■	Left adjustable camshaft timing solenoid (Y49/1)	□13≧ 44	□23 ⇒ 29.0
P1542	Pedal value sensor (B37)	□13≧ 45	□25 ⇒ 4.0-5.0
P1570 2)	A. Attempt at starting made with DAS locked B. CAN from DAS to engine control module (ME-SFI) (N3/10) faulty C. Engine control module (ME-SFI) and DAS control module are not compatible		Inadvertent wrong operation Testing DAS, Body, Volume 1 Testing control modules and part no.

1) Observe prerequisites for testing.

2) On model 140 Ⓝ fault code PI 570 may be displayed on vehicles built between 09/95 and 11/95 although there is no fault.

Diagnosis - Fault memory

Fault code	Possible cause	Fault code description	Remedy/Test step 1)
P1580 ■	EA/CC/ISC actuator (M16/1)	□13≧ 46	□25 ⇒ 7.0
P1584	Stop lamp switch		□26 ⇒ 2.0

P1605 ■	up to 05/96 as of 06/96	Body acceleration sensor (B24/7) Rough road recognition signal (by comparison of wheel speeds)	□13≧ 47	□23 ⇒ 42.0 Test ASR or ESP, Chassis, Volume 3
P1747 ■		CAN from ETC faulty	□13≧ 26	□23 ⇒ 37.0

- 1) Observe prerequisites for testing.
- 2) On model 140 (USA) (J) fault code P1570 may be displayed on vehicles built between 09/95 and 11/95 although there is no fault.

Fault code description

≥1		Hot film mass air flow sensor
1	OBD fault code	P0100
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of hot film mass air flow sensor signal
5	Lower limit value Upper limit value Plausibility Test duration for each limit value	approx. 0.4 V approx. 6 V The air mass may deviate from the air mass required theoretically by approx. 130% at the most (stored performance map, dependent on engine speed) < 5 s

Fault code description

≥2		Pressure sensor
1	OBD fault code	P0105
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of pressure sensor signal (intake manifold absolute pressure)
5	Lower limit value Upper limit value In overrun mode Test duration for each limit value	approx. 0.27 V approx. 4.9 V > approx. 2.5 V < 5 s

Fault code description

≥3		Intake air temperature sensor
1	OBD fault code	P0110
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of intake air temperature
5	Lower limit value Upper limit value Test duration for each limit value	> 300 k Ω (approx. - 50°C) < 150 Ω (approx. +125°C) < 1 s
6	Note	In the event of a fault the vehicle continues running with the substitute value of + 20°C. If the signal is plausible again, a changeover is made to the signal from the intake air temperature sensor.

Fault code description

≥4		ECT sensor
1	OBD fault code	P0115
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of engine coolant temperature
5	Lower limit value Upper limit value Test duration for each limit value Plausibility	> 50 k Ω (approx. - 38°C) < 50 Ω (approx.+160°C) < 1 s The temperature increase after a cold start is compared with a stored temperature model (performance map). At least 38°C must be reached after a certain time.
6	Note	In the event of a fault the vehicle continues running with a substitute value from the temperature model. If the signal is plausible again, a changeover is made to the signal from the ECT sensor.

Fault code description

≥5		Actual value potentiometer in actuator
1	OBD fault code	P0120
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of actual value potentiometer 1 or 2

5	Actual value potentiometer 1	
	Lower limit value	< 0.355 V
	Upper limit value	> 4.765 V
	Actual value potentiometer 2	
Lower limit value	< 0.295 V	
Upper limit value	> 4.63 V	

Fault code description

≥6		Oxygen sensor signal
1	OBd fault code	P0130 right before TWC P0136 right after TWC P0150 left before TWC P0156 left after TWC
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	A. Limit values of oxygen sensor signal B. Sensor status change
5	A. Limit values of oxygen sensor signal Lower limit value Upper limit value Duration of test B. Sensor status change	< - 0.15 V > 1.5 V < 5 s After approx. 220 s with the sensor heater switched on the sensor signal must not dwell in the 0.4 V - 0.6 V voltage window for more than approx. 5s
6	Test conditions	- Engine speed approx. 1000 - 2000 rpm - Load approx. 15 - 50 % - Three-way catalytic converter temperature > approx. 300°C - Lambda control enabled
7	Note	All electrical connection faults of the oxygen sensors before TWC or after TWC are recognized by means of the tests (cable open-circuit and short-circuit to ground or battery voltage).

Fault code description

≥7		A Oxygen sensor ageing correction value exceeded B Oxygen sensor ageing period too long
1	OBd fault code	P0133 right before TWC P0153 left before TWC
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	A Correction value exceeded B Period too long
5	A Limit values of correction value B Period of limit value Duration of test	approx. ±1.2 s (ATV) > approx. 5 s (average value from 15 measurements) < 80 s
6	Test conditions	- Engine speed approx. 1000 - 2000 rpm - Load approx. 15 - 50 % - Three-way catalytic converter temperature > approx. 300°C - Lambda controls enabled - No fault with three-way catalytic converter operation - No fault with oxygen sensor heater
7	Test sequence	The oxygen sensors after the TWC are required to check the three-way catalytic converter efficiency and to improve the Lambda control (two-sensor control). The Lambda mean value is formed from the oxygen sensor signals and from it a correction value is determined for the Lambda control. The ageing of the oxygen sensor before TWC is compensated for within certain limits by the correction value (value with new oxygen sensor approx. 0). If the correction value exceeds the limit value, the oxygen sensor before TWC must be replaced. The period of the sensor signal is also evaluated.
8	Note	The period of the oxygen sensor before TWC is too long: Oxygen sensor after TWC does not continue to be monitored. Correction value of oxygen sensor before TWC exceeded: Oxygen sensor after TWC continues to be monitored. If the faults for the oxygen sensor before and after TWC are recognized at the same time, usually only the oxygen sensor after TWC is defective.

Fault code description


≥8		Oxygen sensor heater
1	OBd fault code	P0135 right before TWC P0141 right after TWC P0155 left before TWC P0161 left after TWC
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Calculated resistance value of sensor heater

5	Lower limit value Upper limit value	< approx. 2.0 Ω (corresponds to approx. 6 A at 12 V) > approx. 9.2 Ω (corresponds to approx. 1.3 A at 12 V)
6	Note	The oxygen sensor heaters of the oxygen sensors before TWC or after TWC are connected in parallel
7	Test conditions	Sensor heater ON and heating-up time of approx. 220 s elapsed

Fault code description

≥9		A Self-adaptation of "part load" mixture formation to limit value of ME control module (N3/10) B Self-adaptation of "closed throttle position" mixture formation to limit value of ME control module (N3/10)
1	OBD fault code	P0170 right cylinder bank P0171 left cylinder bank
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	Fault memory is immediate Actuation of CHECK ENGINE malfunction indicator lamp after two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of self-adaptation of mixture formation
5	A Limit value of closed throttle position B Limit value of part load	approx. ± 1.0 ms (corresponds to approx. 20% of injection time at closed throttle position) 0.77 - 1.28 factor
6	Note	A journey of approx. 30 minutes is required to obtain a new value for the self-adaptation of mixture formation. The engine coolant temperature must be < 60°C when starting.

Fault code description

≥10		Fuel injection valves
1	OBD fault code	P0201 - P0208
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Current or voltage testing on respective fuel injection valve
5	Limit value of current consumption Limit value of voltage Duration of test	> 4.2 A < 2.5 V < 5 s
6	Note	The actuation of each fuel injection valve is tested for cable open-circuit and short-circuit (to ground or battery voltage). In the event of a fault the output stage stops being actuated immediately.  In the event of a short-circuit to ground the corresponding fuel injection valve is permanently open.

Fault code description

≥11		A Misfire B Misfire "harmful to TWC"
1	OBD fault code	P0300 misfire P0301 - P0308 misfire assigned to cylinder
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	A. Misfire (emission limit) Combustion misfire within 1000 engine revolutions The CHECK ENGINE malfunction indicator lamp is actuated after two consecutive journeys with fault B. Misfire "harmful to TWC" Combustion misfire within 200 engine revolutions The CHECK ENGINE malfunction indicator lamp flashes immediately in the event of combustion misfires
3	Frequency of testing	Continuous
4	Checked signal or status	Number of recognized combustion misfires (recognition by means of uneven running evaluation)
5	Limit values	A. > approx. 20 combustion misfires within 1000 engine revolutions B. > approx. 6 combustion misfires within 200 engine revolutions (dependent on performance map of engine speed and load)
6	Test conditions	- Engine speed approx. 500 - 4000 rpm - Change in load < 100% per second - Engine has been started for at least 5 s - No ESP control intervention - Sensor wheel adaptation has already taken place in overrun mode - Body acceleration sensor signal below limit value (approx. 0.5 g) - No fault in camshaft Hall-effect sensor signal - No change of gear - No inertia fuel shut-off
7	Note	If the limit value for misfire "harmful to TWC" is exceeded, the CHECK ENGINE malfunction indicator lamp flashes immediately. If too many combustion misfires occur in one cylinder, the cylinder is switched off (cylinder-selective fuel shut-off). After the affected cylinders are shut off, the CHECK ENGINE malfunction indicator lamp changes from flashing to permanent light until the next time the engine starts. If combustion misfires are recognized, the fault code P0462 is issued if the fuel tank level is too low (fuel reserve indicator lamp ON). Combustion misfires due to a shortage of fuel are recognized by means of this additional information.

Fault code description

≥12		Knock sensor
1	OBD fault code	P0325 right P0330 left
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Knock sensor signal (comparison value calculated in ME-SFI control module)
5	Lower limit value Upper limit value	approx. 0.19 V approx. 4.98 V
6	Test conditions	- Engine at operating temperature - Engine speed > 3600 rpm - Load > 40% - Knock control inactive
7	Note	In the event of a fault safety ignition retarding takes place in all cylinders

Fault code description

≥13		CKP sensor
1	OBD fault code	P0335
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	CKP sensor signal (counting the teeth on flywheel)
5	Lower limit value Upper limit value	(60 - 2 teeth) - 1 tooth (60 - 2 teeth) + 1 tooth
	Duration of test	< 5 s

Fault code description

≥14		Camshaft Hall-effect sensor
1	OBD fault code	P0341
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Camshaft Hall-effect sensor signal
5	Plausibility	No signal Number
		The signal must change from 0 - 1 and from 1 - 0 within 2 engine revolutions Max. 1 signal change per engine revolution
6	Test conditions	- Engine speed 25 - 6300 rpm - No CKP sensor fault

Fault code description

≥15		Secondary air injection (functional chain)
1	OBD fault code	P0410
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive tests with fault
3	Frequency of testing	Once per journey
4	Checked signal or status	Oxygen sensor signals before TWC
5	Limit value Duration of test	Lambda control factor approx. + 25% ("rich" stop) < 15 s
6	Test conditions	- Engine idling - Vehicle stationary - Air pump actuated at least once after engine has started - No faults with voltage supply to purge control valve, air pump switchover valve and electric air pump or air pump electromagnetic clutch - No purge control fault - No actuator fault - No combustion misfires - No fault with oxygen sensor before TWC ageing - No CAN data bus fault - Self-adaptation of mixture formation not at limit value - Air pressure above approx. 780 hPa (i.e. no test carried out above an altitude of approx. 2500 m) - Engine coolant temperature < approx. 90°C - Lambda control enabled
7	Note	If a condition changes during testing, the test is terminated and started again later
8	Test sequence	When the functional chain starts all functions for automatic mixture adaptation are blocked, the purge control valves are closed and the current Lambda control factor is recorded. This is followed by secondary air injection. The mixture must weaken. The Lambda control factor responds appropriately with an increase of approx. + 25%.

Fault code description

≥16		Three-way catalytic converter operation insufficient
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1	OBD fault code	P0422 right P0432 left
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Voltage ratio (amplitudes) of oxygen sensor signal after TWC to oxygen sensor signal before TWC
5	Limit value	Oxygen sensor signal after TWC is a maximum of 50% of oxygen sensor signal before TWC (on more than 2 of 9 measurements)
	Duration of test	approx. 210 s
6	Test conditions	<ul style="list-style-type: none"> - Engine speed approx. 900-2000 rpm - Load approx. 10% to 45% - Three-way catalytic converter temperature > approx. 350°C - Lambda control enabled and Lambda > 0.4 - No oxygen sensor fault (signal, heater, ageing) - No combustion misfires
7	Note	<p>The three-way catalytic converter is evaluated for its ability to store oxygen. Several measurements must be made in the specified engine speed and load range. The results are compared with a performance map and thus a fault is recognized if necessary.</p> <p>The amplitude of the oxygen sensor voltage after TWC must be half that of the amplitude of the oxygen sensor voltage before TWC at the most. (Note: If, for example, no monolith was installed in the three-way catalytic converter the oxygen sensor signals would be identical before and after TWC).</p> <p>If the fault codes were issued for the three-way catalytic converter and for the oxygen sensor before TWC at the same time, first replace the oxygen sensor before TWC. If after this no TWC fault is recognized, the effectiveness of the three-way catalytic converter is slightly reduced, but it must not be replaced yet.</p>

Fault code description

≥17		Purge control system (functional chain) USA models 140/210 and 129 as of 09/97 only
1	OBD fault code	P0440 leaking P0442 leaking slightly P0455 leaking badly
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Once per journey
4	Checked signal or status	Pressure values of fuel tank pressure sensor
5	Superficial leak test	Vacuum build-up of approx. 0.3 mbar per second is not reached
	Detailed leak test	Vacuum reduction with a closed system is more than approx. 15% of the vacuum reached on the superficial leak test
	Duration of test	< 30 s
6	Test conditions	<ul style="list-style-type: none"> - Engine idling - Vehicle stationary - Block time elapsed after engine has started (approx. 16 minutes) - Lambda control enabled - Secondary air injection inactive - Air pressure above approx. 780 hPa (i.e. no test carried out above an altitude of approx. 2500 m) - Slight loading of activated charcoal canister - Lambda > approx. 0.9 during the test - With fuel level in the fuel tank < 1/4 or > 3/4 only the superficial leak-test takes place - If the fuel is sloshing around in the fuel tank excessively (inadmissible sudden changes in pressure), this is recognized by the fuel tank pressure sensor (B4/3) and the test is terminated - No fault with activated charcoal canister shut-off valve - No fault with fuel tank pressure sensor
7	Note	In the event of a defective fuel tank pressure sensor the fault code P0455 is set

Fault code description

≥18		Purge control inoperative
1	OBD fault code	P0441
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Once per journey
4	Checked signal or status	Pressure gradient in the line from the activated charcoal canister to purge control valve
5	Fault	Difference in pressure fluctuations less than approx. 50 mbar
	Duration of test	< 15 s
6	Test conditions	<ul style="list-style-type: none"> - Engine idling - Load approx. 10-25% - Actuation of purge control valve with an on/off ratio between approx. 5 - 25%

Fault code description

≥19		Purge control valve
1	OBD fault code	P0443
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault

3	Frequency of testing	Once per journey
4	Checked signal or status	Voltage or current at purge control valve
5	Limit values Short-circuit to ground Short-circuit to approx. + 12 V Cable open-circuit	Voltage < 4 V Current > approx. 4.2 A No voltage (approx. 4 V - 8 V)

Fault code description

≥20		A Activated charcoal canister shut-off valve (Y58/4) USA model 140/210 and 129 as of 09/97 only B Activated charcoal canister shut-off valve output stage
1	OBD fault code	P0446
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Once per journey
4	Checked signal or status	Voltage supply at activated charcoal canister shut-off valve and fuel tank pressure
5	Limit values of voltage supply Short-circuit to ground Short-circuit to approx. + 12 V Cable open-circuit Fuel tank pressure Duration of test	Voltage < 4 V Current > approx. 4.2 A No voltage (approx. 4 V - 8 V) > approx. 3,5 mbar < 10 s
6	Note	When activated charcoal canister shut-off valve is closed, at least approx. -3.5 mbar vacuum must be recognized by the fuel tank pressure sensor

Fault code description

≥21		Fuel tank pressure sensor (USA) models 140/210 and 129 as of 09/97 only
1	OBD fault code	P0450
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Once per journey
4	Checked signal or status	Fuel tank pressure sensor (B4/3) signal
5	A. Upper limit value Lower limit value Duration of test	> approx. 4.7 V (corresponds to a pressure of approx. 35 mbar) < approx. 0.1 V (corresponds to a vacuum of approx. 60 mbar) 10 s
6	Test conditions	- Block time elapsed after engine has started (approx. 10 s)
7	Note	Fuel tank pressure sensor (B4/3) characteristics: - 50 mbar approx. 0.5 V; 0 mbar approx. 3.0 V; +30 mbar approx. 4.5 V
8	B. Lower limit value Upper limit value Duration of test	approx. 0.27 V approx. 4.9 V < 5 s

Fault code description

≥22		Purge control monitoring pressure sensor (USA) model 129 up to 08/97 only
1	OBD fault code	P0450
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Once per journey
4	Checked signal or status	Purge control monitoring pressure sensor (B4/4) signal
5	A. Upper limit value Lower limit value Duration of test	> approx. 4.7 V (corresponds to a pressure of approx. 35 mbar) < approx. 0.1 V (corresponds to a vacuum of approx. 60 mbar) 10 s
6	Test conditions	- Block time elapsed after engine has started (approx. 10 s)
7	B. Lower limit value Upper limit value Duration of test	approx. 0.27 V approx. 4.9 V < 5 s

Fault code description

≥23		A Front left speed signal B Rear left speed signal
1	OBD fault code	P0500

2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	Fault memory after two consecutive journeys with fault No actuation of CHECK ENGINE malfunction indicator lamp
3	Frequency of testing	Continuous
4	Checked signal or status	A Front left speed signal B Rear left speed signal
5	Limit value Duration of test Plausibility Duration of test	The speed signals (digital signals from the ESP control module) must be recognized as of approx. 12 km/h < 5 s The following applies as of approx. 40 km/h: front speed minus rear speed < ± 30 km/h < 30 s
6	Test conditions	- Engine speed approx. 2500-4500 rpm - Load > approx. 40% - Driving stage D
7	Note	The wheel speeds are recorded and evaluated by the ESP control module. The ME-SFI control module has a conditioned, digital speed signal. Read out the ME-SFI and ESP fault memory after fault recognition (e.g. by driving on a dynamometer).

Fault code description

≥24		Idle speed control
1	OBD fault code	P0507
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Engine speed
5	Upper limit value Lower limit value Duration of test	Specified value +300 rpm Specified value -250 rpm < 30 s If the actuation of the actuator motor in the actuator is changed by the ME-SFI control module, the new specified value must be attained within approx. 25 seconds
6	Test conditions	- Engine temperature > approx. 20°C - Air conditioning OFF - Vehicle stationary

Fault code description

≥25		Battery voltage at ME-SFI control module
1	OBD fault code	P0560
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Battery voltage
5	Lower limit value Upper limit value Duration of test	approx. 8 V approx. 17.5 V < 5 s
6	Test conditions	- Waiting time of approx. 180 s after starting elapsed

Fault code description

≥26		CAN fault
1	OBD fault code	P0600 CAN from ESP P1747 CAN from ETC
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	CAN communication
5	Note Duration of test	The exchange of data between control modules is monitored in the ME-SFI control module via the CAN controller < 15 s

Fault code description

≥27		Implausible gear or transmission slips
1	OBD fault code	P0700
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Calculated gear ratios outside tolerance

5	Permissible gear ratio Duration of test	1.986 - 2.389 1.355 - 1.455 0.970 - 1.030 0.476 - 0.536 1.726 - 2.126 < 2 s	2nd gear 3rd gear 4th gear 5th gear (calculated value) Reverse gear
6	Test conditions	<ul style="list-style-type: none"> - Engine speed > 400 rpm - Output shaft speed > 150 rpm (> approx. 20 km/h) - No shift process 	
7	Test sequence	If no shift process is in progress, the ETC control module recognizes the gear which has been shifted by the gear ratio. If the gear ratio is outside tolerance or gear recognition is implausible, the modulating pressure is adjusted to its maximum value after approx. 0.5 s. If the gear ratio remains outside tolerance or gear recognition is implausible, fault recognition takes place after approx. 1 s.	
8	Note	<p>The gear ratios are calculated from the following values: Speed signal n2, speed signal n3 and output shaft speed (determined via rear wheel speed).</p> <p>Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus.</p> <p>The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 51).</p>	

Fault code description

≥28		Command valve jams in pressure position	
1	OBD fault code	P0700	
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault	
3	Monitoring time and frequency of testing	Continuous	
4	Checked signal or status	Calculated gear ratios outside tolerance	
5	Permissible gear ratios Duration of test	1.986 - 2.389 1.355 - 1.455 0.970 - 1.030 0.476 - 0.536 1.726 - 2.126 < 2 s	2nd gear 3rd gear 4th gear 5th gear (calculated value) Reverse gear
6	Test conditions	<ul style="list-style-type: none"> - Engine speed > 400 rpm - Output shaft speed > 150 rpm (> approx. 20 km/h) 	
7	Test sequence	The shift pressure is slowly reduced after each shift process. Dragging when shift element pressure is reduced, command valve jams in pressure position. Dragging shift elements are recognized by the respective gear ratio.	
8	Note	<p>The gear ratios are calculated from the following values: Speed signal n2, speed signal n3 and output shaft speed (determined via rear wheel speed).</p> <p>Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus.</p> <p>The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 52)</p>	

Fault code description

≥29		ETC control module	
1	OBD fault code	P0702	
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault	
3	Monitoring time and frequency of testing	Continuous	
4	Checked signal or status	Fault in ETC control module <ul style="list-style-type: none"> - CAN communication - Inadmissible variant coding - Internal memory (RAM, ROM, EEPROM) 	
5	Note	<p>Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus.</p> <p>The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault codes 56, 58, 59, 62, 63, 64)</p>	

Fault code description

≥30		Supply voltage, valves	
1	OBD fault code	P0702	
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault	
3	Monitoring time and frequency of testing	Continuous	
4	Checked signal or status	Supply voltage, valves	
5	Lower limit value Upper limit value	< Battery voltage - 2 V (more than approx. 0.1 s) > Battery voltage + 2 V (more than approx. 0.1 s)	
6	Test sequence	The valves are supplied with battery voltage from the ETC control module. The difference between battery voltage and the supply voltage to the valves is monitored by the ETC control module.	

7	Note	Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 10).
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Fault code description

≥31		Supply voltage and function of speed sensors
1	OBD fault code	P0715
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	- Supply voltage, speed sensors - Speed signal n2 - Speed signal n3
5	Supply voltage, speed sensors Lower limit value Upper limit value Speed signals n2, n3 Duration of test	< approx. 4.8 V > approx. 7.2 V Signals recognized and plausible < 1 s
6	Test conditions Speed signal n2 Test conditions Speed signal n3	- Engine speed > 450 rpm - Rear right wheel speed > 250 rpm - Rear left wheel speed > 250 rpm - 3rd or 4th gear recognized - Output shaft speed > 150 rpm (> approx. 20 km/h) - No shift process
7	Test sequence	The speed signals must be recognized as of a particular engine speed and wheel speed. 3rd and 4th gear must also be shifted for the speed signal n3.
8	Note	Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault codes 11, 12, 13).

Fault code description

≥32		CAN fault recognition: Rear left and right wheel speed (from ESP) implausible or communication fault
1	OBD fault code	P0720
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status Duration of test	The ETC control module monitors the wheel speed signals from the EPS control module via the CAN data bus for plausibility < 1 s
5	Note	Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault codes 22, 23, 30).

Fault code description

≥33		Gear comparison (several times) negative
1	OBD fault code	P0730
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Comparison of recognized gear and shifted gear (calculated gear ratio) negative at least 6 times
5	Test conditions	- 2nd, 3rd, 4th or 5th gear recognized - Engine speed > 400 rpm - Output shaft speed > 150 rpm - No shift process
6	Note	The gear ratios are calculated from the following values: Speed signal n2, speed signal n3 and output shaft speed (determined via rear wheel speed). Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 55).

Fault code description

≥34		Converter lock-up clutch
1	OBD fault code	P0740
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Coefficient of friction of converter lock-up clutch

5	Test sequence	When the converter lock-up clutch is shifted the coefficient of friction is calculated by means of speed comparisons If this is outside tolerance several times, the fault is recognized.
6	Note	Faults are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 53).

Fault code description

≥35		PWM solenoid valve, converter lock-up
1	OBD fault code	P0743
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	On/off ratio, actuation of PWM solenoid valve
5	Lower limit value Upper limit value Duration of test	< 5 % > 94 % < 1 s
6	Note	Faults (cable open-circuit and short-circuit) are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 5).

Fault code description

≥36		Governing solenoid valve, modulating pressure
1	OBD fault code	P0748
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Actuation of governing solenoid valve, modulating pressure
5	Limit values Short-circuit to ground Lower limit value, voltage Upper limit value, voltage Lower limit value, current Upper limit value, current Duration of test	< 0.4 V approx. 8.5 V approx. 15 V approx. 0.300 A approx. 0.700 A < 1 s
6	Note	Faults (actuation, cable open-circuit or short-circuit, short-circuit in valve) are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 6).

Fault code description

≥37		Governing solenoid valve, shift pressure
1	OBD fault code	P0748
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Actuation of governing solenoid valve, shift pressure
5	Limit value Short-circuit to ground Lower limit value, voltage Upper limit value, voltage Lower limit value, current Upper limit value, current Duration of test	< 0,4 V approx. 8.5 V approx. 15 V approx. 0.300 A approx. 0.700 A < 1 s
6	Note	Faults (actuation, cable open-circuit or short-circuit, short-circuit in valve) are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 7).

Fault code description

≥38		Solenoid valve, 1-2/4-5 shift
1	OBD fault code	P0753
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault

3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Voltage supply
5	Limit values Lower limit value, voltage Upper limit value, voltage Duration of test	approx. 8.5 V approx. 15 V < 1 s
6	Note	Faults (actuation, cable open-circuit or short-circuit, short-circuit in valve) are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 2).

Fault code description

≥39		Solenoid valve, 2-3 shift
1	OBD fault code	P0158
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Voltage supply
5	Limit value Lower limit value, voltage Upper limit value, voltage Duration of test	approx. 8.5 V approx. 15 V < 1 s
6	Note	Faults (actuation, cable open-circuit or short-circuit, short-circuit in valve) are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 3).

Fault code description

≥40		Solenoid valve, 3-4 shift
1	OBD fault code	P0163
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Monitoring time and frequency of testing	Continuous
4	Checked signal or status	Voltage supply
5	Limit value Lower limit value, voltage Upper limit value, voltage Duration of test	approx. 8.5 V approx. 15 V < 1 s
6	Note	Faults (actuation, cable open-circuit or short-circuit, short-circuit in valve) are recognized by the ETC control module and conveyed to the ME-SFI control module via the CAN data bus. The ME-SFI control module carries out fault memory and actuation of CHECK ENGINE malfunction indicator lamp. Also read out the EATC fault memory, refer to DM Chassis (fault code 4).

Fault code description

≥41		Knock control in ME-SFI control module (N3/10) hardware fault
1	OBD fault code	P1385
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Each time the knock control is switched off
4	Checked signal or status	Internal hardware testing of knock control
5	Test conditions	- Engine at operating temperature - Load decreases (knock control is switched off)
6	Note	Fault must occur at least 10 times

Fault code description

≥42		Secondary air injection
1	OBD fault code	P1420 pump switchover valve (Y32) P1453 relay module (K17)
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	The voltage supply from the output stage of AIR relay module (K17) and AIR pump switchover valve (Y32) is evaluated via a current measurement in the respective output stage.
5	Lower limit value Upper limit value	approx. 3 V approx. 9 V
6	Test conditions	- Secondary air injection active

Fault code description

≥43		Camshaft control (functional chain)
1	OBD fault code	P1519 right cylinder bank P1522 left cylinder bank
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	Fault memory after two consecutive journeys with fault No actuation of CHECK ENGINE malfunction indicator lamp
3	Frequency of testing	Once per driving cycle
4	Checked signal or status	Intake manifold pressure sensor signal
5	Fault Duration of test	Pressure changes by less than approx. 20 mbar < 10 s
6	Test conditions	- Inertia fuel shut-off active - Engine speed approx. 1000-1500 rpm - Engine at operating temperature - No fault with voltage supply for adjustable camshaft timing solenoid
7	Note	If a condition changes during testing, the test is terminated and started again later
8	Test sequence	When the functional chain starts the instantaneous intake manifold absolute pressure is determined after approx. 1 s. The adjustable camshaft timing solenoids are then actuated for approx. 2 s and the intake manifold absolute pressure is evaluated for a further 6 s. A fault is recognized when the camshaft is adjusted from "advanced" to "retarded" and vice versa, the intake manifold absolute pressure does not change by at least approx. 20 mbar.

Fault code description

≥44		Adjustable camshaft timing solenoid
1	OBD fault code	P1525 right cylinder bank P1533 left cylinder bank
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Voltage or current at the respective adjustable camshaft timing solenoid
5	Limit values Short-circuit to ground Short-circuit to approx. 12 V Cable open-circuit	Voltage < 4 V Current > approx. 4.2 A No voltage (approx. 4 V - 8 V)
6	Test conditions	- Adjustable camshaft timing active

Fault code description

≥45		Pedal value sensor
1	OBD fault code	P1542
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Comparison of voltage signals of set value potentiometers 1 and 2
5	Difference at closed throttle position Difference at wide open throttle Plausibility Duration of test	< approx. 8 % < approx. 25 % Comparison of voltage signals of set value potentiometers 1 and 2 to air mass < 1 s
6	Note	For the comparison, multiply the voltage signal of set value potentiometer 2 by 2 because the supply voltage is only 2.5 V instead of 5.0 V. Up to approx. 10 % angle of twist at the potentiometer is defined as closed throttle position and wide open throttle from approx. 55 % angle of twist. A brief high resistance at the closed throttle position stop is permissible.

Fault code description

≥46		Actuator
1	OBD fault code	P1580
2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Voltage comparison between actual value potentiometer 1 and actual value potentiometer 2
5	Plausibility	- The difference in voltage must correspond to a maximum of 1° throttle valve angle - Comparison of throttle valve angle to air mass and pedal value sensor position

Fault code description

≥47		Body acceleration sensor (up to 06/96 only)
1	OBD fault code	P1605

2	Fault memory and actuation of CHECK ENGINE malfunction indicator lamp	After two consecutive journeys with fault
3	Frequency of testing	Continuous
4	Checked signal or status	Limit values of body acceleration sensor signal
5	Lower limit value Upper limit value Acceleration Duration of test	approx. 0.1 V approx. 4.9 V > approx. 3.4 m/s ² < 5 s
6	Test conditions	- Vehicle stationary - Block time of approx. 2 s elapsed