Diagnosis Information DME

P0010	7
P0011	8
P0016	9
P0018	10
P0020	11
P0021	12
P0026	13
P0028	15
P0030	17
P0031	18
P0032	19
P0036	20
P0037	21
P0038	22
P0040	23
P0050	25
P0051	
P0052	
P0056	28
P0057	_
P0058	_
P0071	
P0072	
P0073	-
P0074	
P0076	_
P0077	
P0078	
P0082	_
P0083	
P0084	
P0111	_
P0112	42
P0113	43
P0116	_
P0117	
P0118	_
P0127	
P0130	
P0131	_
P0132	_
P0133	
P0134	
	52

P013	*	
	7	-
	8	
	9	
	0	
	1	
	0	
	1	
	2	
	3	
	4	
	5	
	7	
	8	
P015	9	67
P016	0	68
P016	1	69
	5	
P019	6	71
P019	7	72
P019	8	73
P020	1	74
P020	2	75
P020	3	76
P020	4	77
P020	5	78
P020	6	79
P023	0	80
P026	1	81
P026	2	82
P026	4	83
P026	5	84
P026	7	85
P026	8	86
P027	0	87
P027	1	88
P027	3	89
P027	4	90
P027	6	91
P027	7	92
P030	0	93
P030	1	95
P030	2	97
P030	3	99
P030	4 1	01
P030	5 1	03
P030	61	05
P033	5 1	07
P033	61	80
P033	7 1	09
P033	81	10

D0000	444
P0339	
P0341	
P0342	
P0343	
P0344	
P0346	_
P0347	
P0348	
P0349	
P0418	_
P0420	
P0421	
P0430	
P0431	
P0440	129
P0441	
P0444	
P0445	
P0447	
P0448	
P0455	
P0456	
P0458	
P0459	
P0491	
P0492	
P0501	
P0502	146
P0503	
P0506	148
P0507	149
P050A	
P050D	
P0560	
P0562	
P0563	
P0564	
P0600	
P0606	
P0621	
P0638	
P0660	
P0661	
P0662	
P0663	
P0664	
P0665	
P0702	
P0705	
P0715	
P0730	

	4-4
P0743	
P0748	
P0753	
P0758	_
P0763	
P0778	_
P1041	_
P1042	
P1043	178
P1090	_
P1091	180
P1092	181
P1093	182
P1095	183
P1096	185
P1097	187
P1098	189
P1099	191
P1100	193
P1107	195
P1108	199
P1126	203
P1127	207
P1133	211
P1134	215
P1142	
P1143	
P1163	227
P1175	
P1265	229
P1266	230
P1350	
P1372	
P1373	_
P1480	
P1481	
P1482	
P1484	
P1485	
P1486	
P1487	
P1508	_
P1550	
P1551	
P1552	
P1553	
P1554	
P1576	
P1603	
P1608	
P1610	

D4040	050
P1613	
P1614	
P1626	
P1628	_
P1629	
P1630	
P1632	
P1634	
P1635	. 268
P1640	
P1654	. 270
P1655	. 271
P1656	. 272
P1680	. 273
P1681	. 274
P1682	. 275
P1701	. 276
P1702	. 277
P2088	. 278
P2089	. 279
P2092	. 280
P2093	. 281
P2096	. 282
P2097	. 283
P2098	. 284
P2099	
P2100	
P2101	
P2102	
P2103	
P2108	
P2119	
P2121	
P2122	_
P2123	
P2126	
P2127	
P2128	
P2176	
P2177	
P2178	
P2179	
P2180	
P2181	
P2187	
P2188	
P2189	_
P2190	
P2191	
P2191	
P2192	
	. J+ I

P2194	. 345
P2195	. 349
P2196	
P2197	
P2198	
P2228	
P2229	
P2230	
P2231	. 356
P2232	
P2234	358
P2235	359
P2243	360
P2247	. 361
P2251	362
P2254	. 363
P2257	364
P2258	
P2270	366
P2271	. 367
P2272	
P2273	. 369
P2400	. 370
P2401	. 371
P2402	. 372
P2626	. 373
P2629	. 374
P2A00	. 375
P2A03	. 376
P3081	. 377
U0073	. 378
U0103	. 380
U0129	. 382
U0140	. 383
U0155	. 385
U0404	. 386
U0418	. 387

Solenoid hydraulic valve driver, open circuit

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- Solenoid hydraulic valve faulty (open circuit)
- Open circuit in the activation line to the solenoid hydraulic valve
- Open circuit in the power supply line to the solenoid hydraulic valve
- ◆ DME control module faulty

Inlet camshaft control

i NOTE

This error is entered if the actual value varies from the target value by between 5° und 14° of the camshaft for a duration of 2 to 5 seconds.

Diagnostic conditions

- Battery voltage 10 ... 16V
- Time after engine starts > 30 seconds
- Engine and engine oil temperature -9°C ... 106°C
- Engine speed 1160 ... 6000 rpm
- No solenoid hydraulic valve final stage error
- No camshaft sensor or crankshaft sensor error

- ◆ Mechanical fault in solenoid hydraulic valve (sticks, sluggish, blocked)
- ♦ Dirt in the oil circuit
- ◆ Sealing strips on VarioCam adjuster faulty (leaky, sluggish)
- ♦ Oil pressure too low
- ♦ Mechanical fault in VarioCam adjuster

Position of crankshaft in relation to intake camshaft

i NOTE

This fault is entered if there is a permanent deviation from the nominal value of 10° camshaft angle.

Diagnostic conditions

- Battery positive voltage 10 ... 16 V
- Engine idling
- Camshaft adaptation has taken place
- No fault in camshaft sensor
- No fault in crankshaft sensor

- Camshaft sensor faulty (internal phase shift)
- ◆ Solenoid valve for camshaft adjustment soiled (does not close fully)
- ◆ Timing set incorrectly

Position of crankshaft in relation to intake camshaft

i NOTE

This fault is entered if there is a permanent deviation from the nominal value of 10° camshaft angle.

Diagnostic conditions

- Battery positive voltage 10 ... 16 V
- Engine idling
- Camshaft adaptation has taken place
- No fault in camshaft sensor
- No fault in crankshaft sensor

- Camshaft sensor faulty (internal phase shift)
- ◆ Solenoid valve for camshaft adjustment soiled (does not close fully)
- ◆ Timing set incorrectly

Position of crankshaft in relation to intake camshaft

i NOTE

This fault is entered if there is a permanent deviation from the nominal value of 10° camshaft angle.

Diagnostic conditions

- Battery positive voltage 10 ... 16 V
- Engine idling
- Camshaft adaptation has taken place
- No fault in camshaft sensor
- No fault in crankshaft sensor

- Camshaft sensor faulty (internal phase shift)
- ◆ Solenoid valve for camshaft adjustment soiled (does not close fully)
- ◆ Timing set incorrectly

Inlet camshaft control

i NOTE

This error is entered if the actual value varies from the target value by between 5° und 14° of the camshaft for a duration of 2 to 5 seconds.

Diagnostic conditions

- Battery voltage 10 ... 16V
- Time after engine starts > 30 seconds
- Engine and engine oil temperature -9°C ... 106°C
- Engine speed 1160 ... 6000 rpm
- No solenoid hydraulic valve final stage error
- No camshaft sensor or crankshaft sensor error

- ◆ Mechanical fault in solenoid hydraulic valve (sticks, sluggish, blocked)
- ♦ Dirt in the oil circuit
- ◆ Sealing strips on VarioCam adjuster faulty (leaky, sluggish)
- ♦ Oil pressure too low
- ♦ Mechanical fault in VarioCam adjuster

Valve lift control driver, below limit value

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

Possible fault causes

- Solenoid hydraulic valve faulty (short circuit to housing)
- Short circuit to ground in control line to solenoid hydraulic valve
- DME control module faulty

Valve lift control driver, above limit value

Diagnostic conditions

• Short test run with 1 full-load acceleration (solenoid hydraulic valve activation)

Possible fault causes

- Solenoid hydraulic valve faulty (short circuit of coil)
- ◆ Short circuit to B+ in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, open circuit

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- Solenoid hydraulic valve faulty (open circuit)
- Open circuit in the activation line to the solenoid hydraulic valve
- Open circuit in the power supply line to the solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, below limit value

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

Possible fault causes

- Solenoid hydraulic valve faulty (short circuit to housing)
- Short circuit to ground in control line to solenoid hydraulic valve
- DME control module faulty

Valve lift control driver, above limit value

Diagnostic conditions

• Short test run with 1 full-load acceleration (solenoid hydraulic valve activation)

Possible fault causes

- Solenoid hydraulic valve faulty (short circuit of coil)
- ◆ Short circuit to B+ in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, open circuit

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- Solenoid hydraulic valve faulty (open circuit)
- Open circuit in the activation line to the solenoid hydraulic valve
- Open circuit in the power supply line to the solenoid hydraulic valve
- ◆ DME control module faulty

Oxygen sensor heater, electric fault

Diagnostic conditions

- DME control module power supply 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- Short circuit to B+/ground/between wires or open circuit in the wiring
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater, electric fault

Diagnostic conditions

- DME control module power supply 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- Short circuit to B+/ground/between wires or open circuit in the wiring
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater, electric fault

Diagnostic conditions

- DME control module power supply 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- Short circuit to B+/ground/between wires or open circuit in the wiring
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater, open circuit

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit in the activation line to the oxygen sensor heater
- ♦ Open circuit in the power supply to the oxygen sensor heater
- ◆ Oxygen sensor faulty (oxygen sensor heater resistance too high)
- ◆ DME control module faulty

Oxygen sensor heater, below limit value

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- ♦ Short circuit to ground in control line to oxygen sensor heater
- ◆ Oxygen sensor faulty (short circuit to sensor casing)
- ◆ DME control module faulty

Oxygen sensor heater, above limit value

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Engine running

- ◆ Short circuit to B+ in control line to oxygen sensor heater
- ◆ Oxygen sensor faulty (internal short circuit)
- ◆ DME control module faulty

O2 sensors upstream interchanged

il "Interchanged oxygen sensors" means that the sensor connected to the DME control module as a sensor for bank 1 is in reality placed in the exhaust pipe of bank 2 and vice versa.

Diagnostic conditions

Oxygen sensing active

i NOTE

• In this context, please also observe the function description.

Possible fault causes

- ◆ Oxygen sensor upstream interchanged (sensor for bank 1 is in exhaust assembly of bank 2 and vice versa)
- Engine harness repaired incorrectly (cable interchanged)

Function description

O2 sensors upstream interchanged

The function detects interchanged oxygen sensors via oxygen sensing for both banks. If a fault is present, the values reaching the stop are swapped over.

Procedure of the function:

- ◆ After the oxygen sensors upstream are operational, the oxygen sensing is released. The mixture is regulated depending on the oxygen sensor values measured using the sensors for each bank.
- ♦ If the oxygen sensors upstream were interchanged, the mixture made rich would be detected on the opposite bank. The same applies to making the mixture lean.
- Since the oxygen sensors measure the mixture corrections of the

opposite bank, the oxygen sensing values reaching the stop are swapped over (i.e., the upper limit value for one bank and the lower limit value for the other bank) and remain there.

il "Interchanged oxygen sensors" means that the sensor connected to the DME control module as a sensor for bank 1 is in reality placed in the exhaust pipe of bank 2 and vice versa.

Oxygen sensor heater, electric fault

Diagnostic conditions

- DME control module power supply 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- Short circuit to B+/ground/between wires or open circuit in the wiring
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater, electric fault

Diagnostic conditions

- DME control module power supply 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- Short circuit to B+/ground/between wires or open circuit in the wiring
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater, electric fault

Diagnostic conditions

- DME control module power supply 10 V ... 16 V
- Engine running

- ◆ Corrosion in plug
- Short circuit to B+/ground/between wires or open circuit in the wiring
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater, open circuit

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit in the activation line to the oxygen sensor heater
- ♦ Open circuit in the power supply to the oxygen sensor heater
- ◆ Oxygen sensor faulty (oxygen sensor heater resistance too high)
- ◆ DME control module faulty

Oxygen sensor heater, below limit value

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Engine running

- ♦ Corrosion in plug
- ♦ Short circuit to ground in control line to oxygen sensor heater
- ◆ Oxygen sensor faulty (short circuit to sensor casing)
- ◆ DME control module faulty

Oxygen sensor heater, above limit value

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Engine running

- ◆ Short circuit to B+ in control line to oxygen sensor heater
- ◆ Oxygen sensor faulty (internal short circuit)
- ◆ DME control module faulty

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ◆ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Valve lift control driver, below limit value

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- ◆ Solenoid hydraulic valve faulty (short circuit to housing)
- ◆ Short circuit to ground in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, above limit value

Diagnostic conditions

• Short test run with 1 full-load acceleration (solenoid hydraulic valve activation)

- ◆ Solenoid hydraulic valve faulty (short circuit of coil)
- ◆ Short circuit to B+ in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, open circuit

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- ◆ Solenoid hydraulic valve faulty (open circuit)
- Open circuit in the activation line to the solenoid hydraulic valve
- Open circuit in the power supply line to the solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, below limit value

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- ◆ Solenoid hydraulic valve faulty (short circuit to housing)
- ◆ Short circuit to ground in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, above limit value

Diagnostic conditions

• Short test run with 1 full-load acceleration (solenoid hydraulic valve activation)

- Solenoid hydraulic valve faulty (short circuit of coil)
- ◆ Short circuit to B+ in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Valve lift control driver, open circuit

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- ◆ Solenoid hydraulic valve faulty (open circuit)
- Open circuit in the activation line to the solenoid hydraulic valve
- ◆ Open circuit in the power supply line to the solenoid hydraulic valve
- ◆ DME control module faulty

intake air temperature sensor – signal implausible (signal remains at fixed value)

i NOTE

If a fault is detected, a substitute value of 60 °C is used.

Diagnostic conditions

- Engine starting temperature < 81 °C
- Engine temperature > 70 °C
- Vehicle speed > 35 km/h
- Mass air flow via hot-film mass air flow meter 40 ... 300 kg/h
- No idling, no thrust shutdown
- No fault detected for ambient temperature sensor (via CAN)
- No fault detected for vehicle speed sensor

Possible fault causes

◆ Intake air temperature sensor faulty (in the hot-film mass air flow meter)

Intake air temperature sensor, below limit value

i NOTE

If a fault is detected, a substitute value of 60 °C is used.

Diagnostic conditions

- Engine running
- Time after engine starts > 25 s
- No fault detected for ambient temperature sensor (via CAN)

- ◆ Short circuit to B+ in signal wire
- open circuit in the signal leads
- Intake air temperature sensor (in the hot-film mass air flow meter) faulty
- ◆ DME control module faulty

Intake air temperature sensor, over limit value

i NOTE

If a fault is detected, a substitute value of 60 °C is used.

Diagnostic conditions

- Engine running
- Time after engine starts > 25 s

- Short circuit to ground in signal wire
- Intake air temperature sensor (in the hot-film mass air flow meter) faulty
- ◆ DME control module faulty

Coolant temperature sensor function

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit, short circuit to B+ or short circuit to ground in sensor line to coolant temperature sensor
- ♦ Open circuit in ground supply to coolant temperature sensor
- ◆ Coolant temperature sensor faulty
- ◆ Thermostat faulty (stuck open)
- ◆ Tiptronic vehicles only: coolant shutoff valve open (mechanical fault, lack of vacuum...)
- ◆ DME control module faulty

Electric coolant temperature sensor

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Short circuit to B+/ground or open circuit in the sensor line
- ♦ Open circuit in ground supply to coolant temperature sensor
- ◆ Coolant temperature sensor faulty
- ◆ DME control module faulty

Electric coolant temperature sensor

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Short circuit to B+/ground or open circuit in the sensor line
- ♦ Open circuit in ground supply to coolant temperature sensor
- ◆ Coolant temperature sensor faulty
- ◆ DME control module faulty

Intake air temperature sensor – signal implausible (too high)

i NOTE

If a fault is detected, a substitute value of 60 °C is used.

Diagnostic conditions

- Vehicle speed > 35 km/h
- Mass air flow via hot-film mass air flow meter 52 ... 300 kg/h

Possible fault causes

◆ Intake air temperature sensor faulty (in the hot-film mass air flow meter)

Oxygen sensor upstream

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor temperature < 685 °C (1,265 °F)
- Secondary air injection not active
- No other oxygen-sensor faults upstream stored

- ◆ Oxygen sensor only connected electrically (not installed in exhaust flow)
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

O2 sensor upstream, dynamic response

Diagnostic conditions

- Oxygen sensor temperature < 570 °C (1,058 °F)
- Oxygen sensing active
- Engine speed 1120 ... 4000 rpm
- Engine load 11 .. 60%
- Secondary air injection off
- No excessive loading of activated charcoal filter
- No other oxygen-sensor faults stored
- No tank leakage or tank vent fault stored

- Oxygen sensor upstream faulty (dynamically inert)
- ◆ Leak in exhaust system

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

O2 sensor heater, function

i NOTE

The function checks the sensor temperature (by measuring the internal resistance of the Nernst cell) depending on the exhaust temperature. This can be used to discover discrepancies between the set point and actual temperature of the O2 sensor, from which a faulty heating control can be deduced.

If the DME has detected a vehicle voltage > 16 V, fuel trim is also interrupted.

Diagnostic conditions

- DME control unit power supply voltage (DME) 10 V ... 16 V
- Exhaust temperature 300 °C (572 °F) ... 600 °C (1,112 °F)
- Time after engine starts > 200 s
- Intake air temperature > -7 °C (19 °F)
- No overrun
- No other driver fault of O2 sensor heater

- ♦ Vehicle voltage > 16 V
- ♦ Connector corrosion
- Contact resistance in the lines
- ♦ O2 sensor faulty
- ◆ DME control unit faulty

Oxygen sensor after catalytic converter, below limit value

Diagnostic conditions

- Exhaust temperature < 800 °C
- Oxygen sensor behind catalytic converter ready for operation
- DME control module supply voltage 10 V ... 16 V
- No other oxygen-sensor faults
- No secondary air
- No secondary air system diagnosis
- No tank ventilation
- No tank ventilation diagnosis

- ♦ Short circuit to ground in signal wire
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor after catalytic converter, over limit value

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Exhaust temperature < 800 °C

- ♦ Short circuit to B+ in signal wire
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor behind catalytic converter, dynamism

i NOTE

The catalytic converter is filled with oxygen during the thrust phase, the oxygen sensor behind the catalytic converter should recognize a lean mixture. If this is not carried out in an appropriate amount of time, the oxygen sensor is determined to be inert.

Diagnostic conditions

- Thrust phase for a minimum of 5 seconds
- Oxygen sensors behind catalytic converter ready for operation
- Basic adaptation stabilized
- No other oxygen-sensor faults

Possible fault causes

♦ Oxygen sensor faulty (dynamically inert)

Oxygen sensor behind catalytic converter, open circuit

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Time after engine starts > 200 s
- Oxygen sensor heater performance > 80% for > 60s
- Exhaust temperature 200 °C ... 800 °C

- ◆ Fault in the oxygen sensor heater, if this exists, is to be taken care of first
- ♦ Loose contact or corrosion in the connector
- ♦ Open circuit in the signal leads
- ♦ Open circuit in ground lead
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater circuit behind catalytic converter, implausible signal

i NOTE

The function checks the sensor temperature (by measuring the internal resistance of the Nernst cell) dependent on the exhaust temperature. This is used to reveal deviances between the actual and target temperatures of the oxygen sensor, which implies faulty heater adjustment.

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Exhaust temperature 250 °C ... 600 °C
- Intake air temperature > -7°C
- no other final stage oxygen sensor heater error

- ♦ plug corrosion
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor temperature < 685 °C (1,265 °F)
- Secondary air injection not active
- No other oxygen-sensor faults upstream stored

- ◆ Oxygen sensor only connected electrically (not installed in exhaust flow)
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- ◆ Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- DME control module faulty

O2 sensor upstream, dynamic response

Diagnostic conditions

- Oxygen sensor temperature < 570 °C (1,058 °F)
- Oxygen sensing active
- Engine speed 1120 ... 4000 rpm
- Engine load 11 .. 60%
- Secondary air injection off
- No excessive loading of activated charcoal filter
- No other oxygen-sensor faults stored
- No tank leakage or tank vent fault stored

- Oxygen sensor upstream faulty (dynamically inert)
- ◆ Leak in exhaust system

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

O2 sensor heater, function

i NOTE

The function checks the sensor temperature (by measuring the internal resistance of the Nernst cell) depending on the exhaust temperature. This can be used to discover discrepancies between the set point and actual temperature of the O2 sensor, from which a faulty heating control can be deduced.

If the DME has detected a vehicle voltage > 16 V, fuel trim is also interrupted.

Diagnostic conditions

- DME control unit power supply voltage (DME) 10 V ... 16 V
- Exhaust temperature 300 °C (572 °F) ... 600 °C (1,112 °F)
- Time after engine starts > 200 s
- Intake air temperature > -7 °C (19 °F)
- No overrun
- No other driver fault of O2 sensor heater

- ♦ Vehicle voltage > 16 V
- ♦ Connector corrosion
- Contact resistance in the lines
- ♦ O2 sensor faulty
- ◆ DME control unit faulty

Oxygen sensor after catalytic converter, below limit value

Diagnostic conditions

- Exhaust temperature < 800 °C
- Oxygen sensor behind catalytic converter ready for operation
- DME control module supply voltage 10 V ... 16 V
- No other oxygen-sensor faults
- No secondary air
- No secondary air system diagnosis
- No tank ventilation
- No tank ventilation diagnosis

- ♦ Short circuit to ground in signal wire
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor after catalytic converter, over limit value

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Exhaust temperature < 800 °C

- ♦ Short circuit to B+ in signal wire
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor behind catalytic converter, dynamism

i NOTE

The catalytic converter is filled with oxygen during the thrust phase, the oxygen sensor behind the catalytic converter should recognize a lean mixture. If this is not carried out in an appropriate amount of time, the oxygen sensor is determined to be inert.

Diagnostic conditions

- Thrust phase for a minimum of 5 seconds
- Oxygen sensors behind catalytic converter ready for operation
- Basic adaptation stabilized
- No other oxygen-sensor faults

Possible fault causes

♦ Oxygen sensor faulty (dynamically inert)

Oxygen sensor behind catalytic converter, open circuit

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Time after engine starts > 200 s
- Oxygen sensor heater performance > 80% for > 60s
- Exhaust temperature 200 °C ... 800 °C

- ◆ Fault in the oxygen sensor heater, if this exists, is to be taken care of first
- ♦ Loose contact or corrosion in the connector
- ♦ Open circuit in the signal leads
- ♦ Open circuit in ground lead
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor heater circuit behind catalytic converter, implausible signal

i NOTE

The function checks the sensor temperature (by measuring the internal resistance of the Nernst cell) dependent on the exhaust temperature. This is used to reveal deviances between the actual and target temperatures of the oxygen sensor, which implies faulty heater adjustment.

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Exhaust temperature 250 °C ... 600 °C
- Intake air temperature > -7°C
- no other final stage oxygen sensor heater error

- ♦ plug corrosion
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oil temperature sensor – signal remains at fixed value

Diagnostic conditions

• Engine temperature increase from 30 °C to 60 °C

Possible fault causes

• Oil temperature sensor faulty

Oil temperature sensor – signal implausible

i NOTE

This function compares the coolant temperature with the oil temperature. A fault is detected as soon the discrepancy between the two values exceeds a certian level.

Diagnostic conditions

• Engine running

- Fault in instrument cluster control module
- Oil temperature sensor faulty

Oil temperature sensor – below limit value

Diagnostic conditions

• Time after engine starts > 120 s

- Fault in instrument cluster control module
- ◆ Oil temperature sensor faulty

Oil temperature sensor – above limit value

Diagnostic conditions

• Engine running

- Fault in instrument cluster control module
- Oil temperature sensor faulty

Injection valve, open circuit

i NOTE

Open circuit leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Open circuit in the control line to the injection valve
- ♦ Open circuit in the power supply to the injection valve
- ◆ Injection valve faulty (open circuit)
- ◆ DME control module faulty

Injection valve, open circuit

i NOTE

Open circuit leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Open circuit in the control line to the injection valve
- ♦ Open circuit in the power supply to the injection valve
- ◆ Injection valve faulty (open circuit)
- ◆ DME control module faulty

Injection valve, open circuit

i NOTE

Open circuit leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Open circuit in the control line to the injection valve
- ♦ Open circuit in the power supply to the injection valve
- ◆ Injection valve faulty (open circuit)
- ◆ DME control module faulty

Injection valve, open circuit

i NOTE

Open circuit leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Open circuit in the control line to the injection valve
- ♦ Open circuit in the power supply to the injection valve
- ◆ Injection valve faulty (open circuit)
- ◆ DME control module faulty

Injection valve, open circuit

i NOTE

Open circuit leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Open circuit in the control line to the injection valve
- ♦ Open circuit in the power supply to the injection valve
- ◆ Injection valve faulty (open circuit)
- ◆ DME control module faulty

Injection valve, open circuit

i NOTE

Open circuit leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Open circuit in the control line to the injection valve
- ♦ Open circuit in the power supply to the injection valve
- ◆ Injection valve faulty (open circuit)
- ◆ DME control module faulty

Fuel pump relay, above limit value

Diagnostic conditions

- DME control module supply voltage > 7 V
- Engine running

- ◆ Short circuit to B+ of the control line (terminal 85 relay)
- ♦ Fuel pump relay faulty
- ◆ DME control module faulty

Injection valve, below limit value

i NOTE

A short circuit to ground leads to a permanently open injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to ground in control line to injection valve
- ◆ DME control module faulty

Injection valve, above limit value

i NOTE

A short circuit to B+ leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to B+ in control line to injection valve
- ◆ Injection valve faulty (short circuit)
- ◆ DME control module faulty

Injection valve, below limit value

i NOTE

A short circuit to ground leads to a permanently open injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to ground in control line to injection valve
- ◆ DME control module faulty

Injection valve, above limit value

i NOTE

A short circuit to B+ leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to B+ in control line to injection valve
- ◆ Injection valve faulty (short circuit)
- ◆ DME control module faulty

Injection valve, below limit value

i NOTE

A short circuit to ground leads to a permanently open injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to ground in control line to injection valve
- ◆ DME control module faulty

Injection valve, above limit value

i NOTE

A short circuit to B+ leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to B+ in control line to injection valve
- ◆ Injection valve faulty (short circuit)
- ◆ DME control module faulty

Injection valve, below limit value

i NOTE

A short circuit to ground leads to a permanently open injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to ground in control line to injection valve
- ◆ DME control module faulty

Injection valve, above limit value

i NOTE

A short circuit to B+ leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to B+ in control line to injection valve
- ◆ Injection valve faulty (short circuit)
- ◆ DME control module faulty

Injection valve, below limit value

i NOTE

A short circuit to ground leads to a permanently open injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to ground in control line to injection valve
- ◆ DME control module faulty

Injection valve, above limit value

i NOTE

A short circuit to B+ leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to B+ in control line to injection valve
- ◆ Injection valve faulty (short circuit)
- ◆ DME control module faulty

Injection valve, below limit value

i NOTE

A short circuit to ground leads to a permanently open injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to ground in control line to injection valve
- ◆ DME control module faulty

Injection valve, above limit value

i NOTE

A short circuit to B+ leads to a permanently closed injection valve. Therefore, misfires can be entered simultaneously.

Diagnostic conditions

- Engine start
- Supply voltage > 7 V

- ♦ Short circuit to B+ in control line to injection valve
- ◆ Injection valve faulty (short circuit)
- ◆ DME control module faulty

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - ⇒ Ignition coil faulty
 - ⇒ Spark plug faulty
 - ⇒ Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - \Rightarrow Ignition coil faulty
 - ⇒ Spark plug faulty
 - \Rightarrow Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- \Rightarrow Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - ⇒ Ignition coil faulty
 - ⇒ Spark plug faulty
 - \Rightarrow Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - ⇒ Ignition coil faulty
 - ⇒ Spark plug faulty
 - \Rightarrow Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - ⇒ Ignition coil faulty
 - ⇒ Spark plug faulty
 - ⇒ Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - ⇒ Ignition coil faulty
 - ⇒ Spark plug faulty
 - \Rightarrow Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Misfire, cylinder-selective

i NOTE 1

The fault types have special significance for misfires:

- ◆ Fault type "Implausible signal": exhaust-related fault after engine startup
- ◆ Fault type "Below limit value": exhaust-related during the journey
- ◆ Fault type "Above limit value": fault damaging to catalytic converter

i NOTE 2

- ♦ The totals error P0300 is always entered in addition to any other misfires. The misfires may have occurred in one or several cylinders.
- The misfire detection function can block the fuel injection for the remainder of the driving cycle after a permanent misfire is detected on the cylinder in question. Misfire detection remains active.

Diagnostic conditions

- Engine running
- Engine load > 4 to 25% depending on engine speed
- Intake air temperature > -30°C (-22 °F)
- No fault in crankshaft sensor
- Testing for misfires while driving: smooth road surface conditions (= no bumpy track)

- ♦ If a misfire only occurs on one cylinder:
 - ⇒ Electric fault in control line between DME and ignition coil
 - ⇒ Spark plug connector faulty
 - ⇒ Ignition coil faulty
 - ⇒ Spark plug faulty
 - \Rightarrow Secondary air

- ⇒ Mechanical or electrical fault in injection valve
- ⇒ Valve seat or valve faulty
- ⇒ Valve lift control faulty
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

♦ When misfires occur on the banks:

- ⇒ Electric fault or loose contact in the control line to solenoid valve of camshaft adjustment
- ⇒ Solenoid valve of camshaft adjustment electrically/mechanically faulty or clogged
 - ⇒ Hall sender rotor (sensor wheel) faulty/kinked
 - ⇒ Secondary air
 - ⇒ Intake camshaft adjustment too slow
 - ⇒ Intake camshaft timing incorrect
 - ⇒ Exhaust camshaft timing incorrect
 - ⇒ Fault in the valve lift control
 - ⇒ Oxygen sensor faulty (also: loose contact in wiring harness) ^
 - ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

When misfires occur on both banks:

- ⇒ Incorrect/low-grade fuel
- ⇒ Tank empty
- ⇒ An engine-block heater is used
- ⇒ Secondary air
- ⇒ Exhaust system blocked/narrowed
- ⇒ Foreign bodies in intake tract, this can lead to sporadic misfires on changing cylinders.

Crankshaft sensor, open circuit

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ open circuit or short circuit to B+/ground
- ♦ Crankshaft sensor faulty
- ◆ DME control module faulty

Crankshaft sensor, open circuit

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ open circuit or short circuit to B+/ground
- ♦ Crankshaft sensor faulty
- ◆ DME control module faulty

Crankshaft sensor, open circuit

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ open circuit or short circuit to B+/ground
- ♦ Crankshaft sensor faulty
- ◆ DME control module faulty

Crankshaft sensor, open circuit

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ open circuit or short circuit to B+/ground
- ♦ Crankshaft sensor faulty
- ◆ DME control module faulty

Crankshaft sensor, open circuit

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ open circuit or short circuit to B+/ground
- ♦ Crankshaft sensor faulty
- ◆ DME control module faulty

Camshaft sensor, implausible signal

i NOTE

When this fault is detected, the ignition angle is retarded. If both hall sensor signals are missing, the starting process will take approximately 10 s.

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ Hall sensor faulty

Camshaft sensor, lower than limit value

i NOTE

When this fault is detected, the ignition angle is retarded.
If both hall sensor signals are missing, the starting process will take approximately 10 s

Diagnostic conditions

• Engine running

Possible fault causes

♦ Short circuit to ground in signal wire

Camshaft sensor, limit value exceeded

i NOTE

When this fault is detected, the ignition angle is retarded. If both hall sensor signals are missing, the starting process will take approximately 10 s.

Diagnostic conditions

• Engine running

Possible fault causes

♦ Short circuit to B+ in signal wire

Camshaft sensor, open circuit

i NOTE

The diagnosis recognizes absence of signal. This can be caused by an electrical open circuit or by missing rotary parts (single or all) of the sensor wheel on the camshaft.

When this fault is detected, the ignition angle is retarded.

If both hall sensor signals are missing, the starting process will take approximately 10 s

Diagnostic conditions

- Engine running
- No other camshaft sensor faults

- ♦ Signal line open circuit
- ♦ Hall sensor faulty
- ◆ Rotor hall sender (sensor wheel on camshaft) faulty

Camshaft sensor, implausible signal

i NOTE

When this fault is detected, the ignition angle is retarded. If both hall sensor signals are missing, the starting process will take approximately 10 s.

Diagnostic conditions

• Engine running

- ♦ Loose contact or corrosion in the connector
- ♦ Hall sensor faulty

Camshaft sensor, lower than limit value

i NOTE

When this fault is detected, the ignition angle is retarded.
If both hall sensor signals are missing, the starting process will take approximately 10 s

Diagnostic conditions

• Engine running

Possible fault causes

♦ Short circuit to ground in signal wire

Camshaft sensor, limit value exceeded

i NOTE

When this fault is detected, the ignition angle is retarded. If both hall sensor signals are missing, the starting process will take approximately 10 s.

Diagnostic conditions

• Engine running

Possible fault causes

♦ Short circuit to B+ in signal wire

Camshaft sensor, open circuit

i NOTE

The diagnosis recognizes absence of signal. This can be caused by an electrical open circuit or by missing rotary parts (single or all) of the sensor wheel on the camshaft.

When this fault is detected, the ignition angle is retarded.

If both hall sensor signals are missing, the starting process will take approximately 10 s

Diagnostic conditions

- Engine running
- No other camshaft sensor faults

- ♦ Signal line open circuit
- ♦ Hall sensor faulty
- ◆ Rotor hall sender (sensor wheel on camshaft) faulty

Driver of secondary air pump relay

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit, short circuit to B+ or short circuit to ground of control line to secondary-air pump relay
- Open circuit in the power supply to the secondary-air pump relay
- ◆ Secondary-air pump relay faulty
- ◆ DME control module faulty

Catalytic conversion

i NOTE

The catalytic converter monitor compares the amplitude of the oxygen sensor behind the catalytic converter with the amplitude of a computed limit catalytic converter during defined air gulping and enrichment phases. The amplitudes allow conclusions to be drawn about the ability of the catalytic converter to store oxygen.

Diagnostic conditions

- Engine start temperature > -15°C (5 °F)
- Catalytic converter temperature 385 635°C (725-1175 °F)
- Loading of activated charcoal filter < 8
- Oxygen sensing in front of catalytic converter active
- Oxygen sensors behind catalytic converter ready for operation
- 50 seconds (cumulative) within following load/rpm range
- Engine speed 1280 2880 rpm
- Engine load (relative filling) 22 41%
- No fault oxygen sensors, tank vent, secondary-air pump relay, secondary-air valve relay, throttle adjusting unit, mass air flow sensor, no misfire.
- ➤ The diagnostic conditions can also be established using the PIWIS Tester via the short test "Catalytic conversion". It is not necessary to have the vehicle in motion for this.

- ♦ Oxygen sensors in front of and behind catalytic converter swapped (position in exhaust assembly)
- ♦ Valve lift error
- ◆ Aged oxygen sensor behind catalytic converter
- ◆ Catalytic converter faulty (pre-catalytic conversion rate too low)

If an aged oxygen sensor (oxygen sensor signal behind catalytic converter, dynamism) is detected together with this fault:

- ♦ remedy the fault "Oxygen sensor signal behind catalytic converter, dynamism" first,
- ♦ Then check if this fault catalytic conversion has been entered again.

⚠ IMPORTANT

If the primary catalytic converter is faulty, check the main catalytic converter for damage and also replace it if necessary.

Catalytic conversion

i NOTE

The catalytic converter monitor compares the amplitude of the oxygen sensor behind the catalytic converter with the amplitude of a computed limit catalytic converter during defined air gulping and enrichment phases. The amplitudes allow conclusions to be drawn about the ability of the catalytic converter to store oxygen.

Diagnostic conditions

- Engine start temperature > -15°C (5 °F)
- Catalytic converter temperature 385 635°C (725-1175 °F)
- Loading of activated charcoal filter < 8
- Oxygen sensing in front of catalytic converter active
- Oxygen sensors behind catalytic converter ready for operation
- 50 seconds (cumulative) within following load/rpm range
- Engine speed 1280 2880 rpm
- Engine load (relative filling) 22 41%
- No fault oxygen sensors, tank vent, secondary-air pump relay, secondary-air valve relay, throttle adjusting unit, mass air flow sensor, no misfire.
- ➤ The diagnostic conditions can also be established using the PIWIS Tester via the short test "Catalytic conversion". It is not necessary to have the vehicle in motion for this.

- ♦ Oxygen sensors in front of and behind catalytic converter swapped (position in exhaust assembly)
- ♦ Valve lift error
- ◆ Aged oxygen sensor behind catalytic converter
- ◆ Catalytic converter faulty (pre-catalytic conversion rate too low)

If an aged oxygen sensor (oxygen sensor signal behind catalytic converter, dynamism) is detected together with this fault:

- ♦ remedy the fault "Oxygen sensor signal behind catalytic converter, dynamism" first,
- ♦ Then check if this fault catalytic conversion has been entered again.

⚠ IMPORTANT

If the primary catalytic converter is faulty, check the main catalytic converter for damage and also replace it if necessary.

Catalytic conversion

i NOTE

The catalytic converter monitor compares the amplitude of the oxygen sensor behind the catalytic converter with the amplitude of a computed limit catalytic converter during defined air gulping and enrichment phases. The amplitudes allow conclusions to be drawn about the ability of the catalytic converter to store oxygen.

Diagnostic conditions

- Engine start temperature > -15°C (5 °F)
- Catalytic converter temperature 385 635°C (725-1175 °F)
- Loading of activated charcoal filter < 8
- Oxygen sensing in front of catalytic converter active
- Oxygen sensors behind catalytic converter ready for operation
- 50 seconds (cumulative) within following load/rpm range
- Engine speed 1280 2880 rpm
- Engine load (relative filling) 22 41%
- No fault oxygen sensors, tank vent, secondary-air pump relay, secondary-air valve relay, throttle adjusting unit, mass air flow sensor, no misfire.
- ➤ The diagnostic conditions can also be established using the PIWIS Tester via the short test "Catalytic conversion". It is not necessary to have the vehicle in motion for this.

- ♦ Oxygen sensors in front of and behind catalytic converter swapped (position in exhaust assembly)
- ♦ Valve lift error
- ◆ Aged oxygen sensor behind catalytic converter
- ◆ Catalytic converter faulty (pre-catalytic conversion rate too low)

If an aged oxygen sensor (oxygen sensor signal behind catalytic converter, dynamism) is detected together with this fault:

- ♦ remedy the fault "Oxygen sensor signal behind catalytic converter, dynamism" first,
- ♦ Then check if this fault catalytic conversion has been entered again.

⚠ IMPORTANT

If the primary catalytic converter is faulty, check the main catalytic converter for damage and also replace it if necessary.

Catalytic conversion

i NOTE

The catalytic converter monitor compares the amplitude of the oxygen sensor behind the catalytic converter with the amplitude of a computed limit catalytic converter during defined air gulping and enrichment phases. The amplitudes allow conclusions to be drawn about the ability of the catalytic converter to store oxygen.

Diagnostic conditions

- Engine start temperature > -15°C (5 °F)
- Catalytic converter temperature 385 635°C (725-1175 °F)
- Loading of activated charcoal filter < 8
- Oxygen sensing in front of catalytic converter active
- Oxygen sensors behind catalytic converter ready for operation
- 50 seconds (cumulative) within following load/rpm range
- Engine speed 1280 2880 rpm
- Engine load (relative filling) 22 41%
- No fault oxygen sensors, tank vent, secondary-air pump relay, secondary-air valve relay, throttle adjusting unit, mass air flow sensor, no misfire.
- ➤ The diagnostic conditions can also be established using the PIWIS Tester via the short test "Catalytic conversion". It is not necessary to have the vehicle in motion for this.

- ♦ Oxygen sensors in front of and behind catalytic converter swapped (position in exhaust assembly)
- ♦ Valve lift error
- ◆ Aged oxygen sensor behind catalytic converter
- ◆ Catalytic converter faulty (pre-catalytic conversion rate too low)

If an aged oxygen sensor (oxygen sensor signal behind catalytic converter, dynamism) is detected together with this fault:

- ♦ remedy the fault "Oxygen sensor signal behind catalytic converter, dynamism" first,
- ♦ Then check if this fault catalytic conversion has been entered again.

⚠ IMPORTANT

If the primary catalytic converter is faulty, check the main catalytic converter for damage and also replace it if necessary.

Fuel tank ventilation system above/below limit value

i NOTE

- Diagnosis of the tank vent's permeability is performed by evaluating the force alteration when the tank vent is activated. Depending on the load of the active charcoal filter, the purge air contributes more or less to the formation of the mixture.
- This test is performed independently of the output stage diagnosis.

Diagnostic conditions

- Battery positive voltage 11 ... 15.5 V
- Time after engine starts 600 s
- Engine temperature > 60 °C
- Ambient temperature > 3.8 °C

Vehicle speed = 0 km/h

- Correction factor, height > 0.730
- Active charcoal filter load > 2.0
- No faults detected for hot-film mass air flow meter, throttle valve adjusting unit, tank vent output stage, coolant temperature sensor, vehicle speed, idle speed control

- ◆ Tank vent faulty (stuck open or closed)
- Tank vent installed back to front
- Purge air line leaking
- ◆ Purge air line trapped or blocked

Fuel tank ventilation system above/below limit value

i NOTE

- Diagnosis of the tank vent's permeability is performed by evaluating the force alteration when the tank vent is activated. Depending on the load of the active charcoal filter, the purge air contributes more or less to the formation of the mixture.
- This test is performed independently of the output stage diagnosis.

Diagnostic conditions

- Battery positive voltage 11 ... 15.5 V
- Time after engine starts 600 s
- Engine temperature > 60 °C
- Ambient temperature > 3.8 °C

Vehicle speed = 0 km/h

- Correction factor, height > 0.730
- Active charcoal filter load > 2.0
- No faults detected for hot-film mass air flow meter, throttle valve adjusting unit, tank vent output stage, coolant temperature sensor, vehicle speed, idle speed control

- ◆ Tank vent faulty (stuck open or closed)
- Tank vent installed back to front
- ◆ Purge air line leaking
- ◆ Purge air line trapped or blocked

Electric tank vent

Diagnostic conditions

- Supply voltage > 7 V
- Engine running with occasional activation of tank vent

- ◆ Short circuit to B+/ground or open circuit in the control line
- Open circuit in tank vent power supply
- ◆ Tank vent faulty
- ◆ DME control module faulty

Electric tank vent

Diagnostic conditions

- Supply voltage > 7 V
- Engine running with occasional activation of tank vent

- ◆ Short circuit to B+/ground or open circuit in the control line
- Open circuit in tank vent power supply
- ◆ Tank vent faulty
- ◆ DME control module faulty

DMTL – Tank Leakage Diagnostics Module, valve driver

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground of control line for DMTL switch-over valve
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- ◆ DME control module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

◆ The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- The system is identified to by leaking if the power consumption is lower

during the actual leakage test as it was during the reference leak test.

- ♦ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module, valve driver

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground of control line for DMTL switch-over valve
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- ◆ DME control module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

◆ The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- The system is identified to by leaking if the power consumption is lower

during the actual leakage test as it was during the reference leak test.

- ♦ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

Leakage in fuel tank system

Diagnostic conditions

- Vehicle speed = 0 km/h
- Engine speed = 0 rpm
- Correction factor, height > 0.73
- Coolant temperature upon starting the engine may be no more than 6.8
 K above ambient temperature
- Coolant temperature when engine starts > 3.8 °C
- Period for which the engine needs to have been running before ignition is switched off > 20 minutes
- Ignition has been switched off for at least 10 seconds.
- Ambient temperature 4 ... 35.3 °C
- Active charcoal filter load < 3 for minor leak
- Fuel tank fuel level 10 ... 54 litres
- Battery positive voltage 11.02 ... 14.5 V
- No fuel tank filling
- No faults detected for ambient pressure sensor, coolant temperature sensor, vehicle speed sensor
- No output stage faults detected for DMTL pump motor, DMTL switchover valves and tank vent
- No fault detected for tank vent (flow)
- ► The diagnostic conditions can also be established using the PIWIS Tester via the short test "tank leakage test". After the test has begun, the ignition must be switched off.

i NOTE

◆ In this context, please also observe the function description.

- Tank cap not closed correctly, leaking or missing
- Purge air line leaking
- Tank vent leaking
- DMTL (Tank Leakage Diagnostics Module) leaking

◆ Leakage in fuel tank system

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

• The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ◆ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

Leakage in fuel tank system

Diagnostic conditions

- Vehicle speed = 0 km/h
- Engine speed = 0 rpm
- Correction factor, height > 0.73
- Coolant temperature upon starting the engine may be no more than 6.8
 K above ambient temperature
- Coolant temperature when engine starts > 3.8 °C
- Period for which the engine needs to have been running before ignition is switched off > 20 minutes
- Ignition has been switched off for at least 10 seconds.
- Ambient temperature 4 ... 35.3 °C
- Active charcoal filter load < 3 for minor leak
- Fuel tank fuel level 10 ... 54 litres
- Battery positive voltage 11.02 ... 14.5 V
- No fuel tank filling
- No faults detected for ambient pressure sensor, coolant temperature sensor, vehicle speed sensor
- No output stage faults detected for DMTL pump motor, DMTL switchover valves and tank vent
- No fault detected for tank vent (flow)
- ► The diagnostic conditions can also be established using the PIWIS Tester via the short test "tank leakage test". After the test has begun, the ignition must be switched off.

i NOTE

◆ In this context, please also observe the function description.

- Tank cap not closed correctly, leaking or missing
- Purge air line leaking
- Tank vent leaking
- DMTL (Tank Leakage Diagnostics Module) leaking

◆ Leakage in fuel tank system

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

• The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ◆ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

Electric tank vent

Diagnostic conditions

- Supply voltage > 7 V
- Engine running with occasional activation of tank vent

- ◆ Short circuit to B+/ground or open circuit in the control line
- Open circuit in tank vent power supply
- ◆ Tank vent faulty
- ◆ DME control module faulty

Electric tank vent

Diagnostic conditions

- Supply voltage > 7 V
- Engine running with occasional activation of tank vent

- ◆ Short circuit to B+/ground or open circuit in the control line
- Open circuit in tank vent power supply
- ◆ Tank vent faulty
- ◆ DME control module faulty

Secondary-air system

i NOTE

The secondary diagnosis is not carried out during secondary air injection after cold start, but at a later point in time ("intrusive check").

In this process, the secondary air pump is activated and the excess air is determined via the oxygen sensor.

The secondary air diagnostics can be activated via the short test menu on the PIWIS Tester.

Diagnostic conditions

- Secondary air system diagnosis is not yet performed in this cycle
- Correction factor, height > 0.73
- Intake air temperature 5 °C ... 60 ° C
- Engine starting temperature < 42 °C
- Engine temperature 5 °C ... 102 ° C
- Exhaust temperature < 650°C
- Mass air flow 13 kg/h ... 50 kg/h
- Oxygen sensors in front of catalytic converter ready for operation
- Idle speed
- Time after engine starts > 590 s
- No relevant faults stored

- ◆ Secondary air pump relay mechanically faulty (jams)
- ◆ Power supply for secondary air pump faulty
- ◆ Air duct cross section narrowed (pinched / blocked)
- ♦ Electric switch-over valve does not function
- ♦ Pneumatic switch-over valve does not function
- ◆ Leak in vacuum system
- ◆ Secondary air pump electrically or mechanically faulty

Secondary-air system

i NOTE

The secondary diagnosis is not carried out during secondary air injection after cold start, but at a later point in time ("intrusive check").

In this process, the secondary air pump is activated and the excess air is determined via the oxygen sensor.

The secondary air diagnostics can be activated via the short test menu on the PIWIS Tester.

Diagnostic conditions

- Secondary air system diagnosis is not yet performed in this cycle
- Correction factor, height > 0.73
- Intake air temperature 5 °C ... 60 ° C
- Engine starting temperature < 42 °C
- Engine temperature 5 °C ... 102 ° C
- Exhaust temperature < 650°C
- Mass air flow 13 kg/h ... 50 kg/h
- Oxygen sensors in front of catalytic converter ready for operation
- Idle speed
- Time after engine starts > 590 s
- No relevant faults stored

- ♦ Secondary air pump relay mechanically faulty (jams)
- ◆ Power supply for secondary air pump faulty
- ◆ Air duct cross section narrowed (pinched / blocked)
- ♦ Electric switch-over valve does not function
- ♦ Pneumatic switch-over valve does not function
- ◆ Leak in vacuum system
- ◆ Secondary air pump electrically or mechanically faulty

Vehicle speed signal

Diagnostic conditions

- Engine speed 1480 ... 2520 rpm
- Coolant temperature > 30 °C
- Thrust shutdown for at least 3 seconds

- ◆ Fault entry in PSM control module
- ◆ Wheel speed sensor faulty
- ◆ Contact resistance between wheel speed sensor and PSM control module

Vehicle speed signal

Diagnostic conditions

- Engine speed 1480 ... 2520 rpm
- Coolant temperature > 30 °C
- Thrust shutdown for at least 3 seconds

- ◆ Fault entry in PSM control module
- ◆ Wheel speed sensor faulty
- ◆ Contact resistance between wheel speed sensor and PSM control module

Vehicle speed signal

Diagnostic conditions

- Engine speed 1480 ... 2520 rpm
- Coolant temperature > 30 °C
- Thrust shutdown for at least 3 seconds

- ◆ Fault entry in PSM control module
- ◆ Wheel speed sensor faulty
- ◆ Contact resistance between wheel speed sensor and PSM control module

Idle speed control

in The fault "Idle speed control" is detected when the DME cannot set the specified idle speed for a certain amount of time.

Diagnostic conditions

• Engine idling

Possible fault causes

Fault type "Over limit value"

◆ Secondary air behind throttle valve

- ◆ Air cleaner blocked/frozen
- Air guide between air cleaner and throttle valve blocked
- ◆ Secondary unit sluggish
- ◆ Exhaust system blocked

Idle speed control

in The fault "Idle speed control" is detected when the DME cannot set the specified idle speed for a certain amount of time.

Diagnostic conditions

• Engine idling

Possible fault causes

Fault type "Over limit value"

◆ Secondary air behind throttle valve

- ◆ Air cleaner blocked/frozen
- Air guide between air cleaner and throttle valve blocked
- ◆ Secondary unit sluggish
- ◆ Exhaust system blocked

P050A

Idle speed control

in The fault "Idle speed control" is detected when the DME cannot set the specified idle speed for a certain amount of time.

Diagnostic conditions

• Engine idling

Possible fault causes

Fault type "Over limit value"

◆ Secondary air behind throttle valve

- ◆ Air cleaner blocked/frozen
- Air guide between air cleaner and throttle valve blocked
- ◆ Secondary unit sluggish
- ◆ Exhaust system blocked

P050D

Idle speed control

in The fault "Idle speed control" is detected when the DME cannot set the specified idle speed for a certain amount of time.

Diagnostic conditions

• Engine idling

Possible fault causes

Fault type "Over limit value"

◆ Secondary air behind throttle valve

- ◆ Air cleaner blocked/frozen
- Air guide between air cleaner and throttle valve blocked
- ◆ Secondary unit sluggish
- ◆ Exhaust system blocked

Power supply, implausible signal

i NOTE

The fault is detected if the measured voltage is lower than the operating voltage of the control module.

If a fault is detected, a substitute value of 14.05 V is used.

Diagnostic conditions

• Time after engine starts > 240 s

Possible fault causes

◆ DME control module faulty

Power supply, limit value exceeded or not reached

i NOTE

The fault is detected if for at least 3 s the connected voltage is:

- ♦ lower than 10 V (below lower limit value) or
- ◆ greater than 16 V (upper limit value exceeded).

If a fault is detected, a substitute value of 14.05 V is used.

Diagnostic conditions

- For fault type limit value exceeded and limit value not reached:
- Time after engine starts > 240 s
- Only for fault type limit value exceeded:
- No vehicle speed error detected
- Vehicle speed > 25 km/h (16 mph)

- ◆ DME control module supply voltage above limit value / below limit value
- ◆ DME control module faulty

Power supply, limit value exceeded or not reached

i NOTE

The fault is detected if for at least 3 s the connected voltage is:

- ♦ lower than 10 V (below lower limit value) or
- ◆ greater than 16 V (upper limit value exceeded).

If a fault is detected, a substitute value of 14.05 V is used.

Diagnostic conditions

- For fault type limit value exceeded and limit value not reached:
- Time after engine starts > 240 s
- Only for fault type limit value exceeded:
- No vehicle speed error detected
- Vehicle speed > 25 km/h (16 mph)

- ◆ DME control module supply voltage above limit value / below limit value
- ◆ DME control module faulty

Steering wheel electronics (CAN convenience) control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The steering wheel electronics control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Steering wheel electronics control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ◆ No power supply for steering wheel electronics control module
- ◆ Steering wheel electronics control module is incorrectly coded
- ◆ Short circuit or open circuit in the CAN convenience
- ◆ Steering wheel electronics control module faulty (in most cases the cause is not the steering wheel electronics control module but incorrect coding!)

Fault effects

- ◆ Communication via the CAN convenience is no longer possible.
- ♦ No other control modules are able to communicate with the steering wheel electronics control module.

Affected contacts on the steering wheel electronics control module connector Connector A:

- ◆ 1 ground supply terminal 31
- ♦ 2 power supply terminal 30
- ♦ 8 CAN convenience low
- ♦ 9 CAN convenience high
- ◆ 13 power supply terminal 15

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Control module faulty (EEPROM/ RAM/ ROM)

Diagnostic conditions

• Ignition on

Possible fault causes

♦ DME control module faulty

Battery warning light

Diagnostic conditions

- Engine running
- Normal driving for 2 minutes

- ◆ Open circuit in line between generator and DME
- Short circuit to ground in line between generator and DME
- ◆ Short circuit to B+ in line between generator and DME
- ◆ Generator faulty

Throttle valve adjusting unit faulty

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage > 10 V
- Time after ignition on > 30 s
- Engine not running
- Vehicle is stationary
- Engine temperature 5 °C ... 100 °C
- Intake air temperature > 5 °C
- Pedal value < 0.8 %

Possible fault causes

◆ Throttle valve adjusting unit faulty

Electric tuning flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to tuning flap solenoid valve
- ◆ Tuning flap solenoid valve faulty
- ◆ DME control module faulty

Electric tuning flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to tuning flap solenoid valve
- ◆ Tuning flap solenoid valve faulty
- ◆ DME control module faulty

Electric tuning flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to tuning flap solenoid valve
- ◆ Tuning flap solenoid valve faulty
- ◆ DME control module faulty

Electric distributor pipe flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ◆ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to distributor pipe flap solenoid valve
- ♦ Distributor pipe flap solenoid valve faulty
- ◆ DME control module faulty

Electric distributor pipe flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ◆ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to distributor pipe flap solenoid valve
- ♦ Distributor pipe flap solenoid valve faulty
- ◆ DME control module faulty

Electric distributor pipe flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ◆ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to distributor pipe flap solenoid valve
- ♦ Distributor pipe flap solenoid valve faulty
- ◆ DME control module faulty

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- ♦ Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- ♦ Other control modules detect these substitute values and set this fault code.

Electric air cleaner flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to air cleaner flap solenoid valve
- ♦ Air cleaner flap solenoid valve faulty
- ◆ DME control module faulty

Electric air cleaner flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to air cleaner flap solenoid valve
- ♦ Air cleaner flap solenoid valve faulty
- ◆ DME control module faulty

Electric air cleaner flap

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine running > 10 s

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to air cleaner flap solenoid valve
- ♦ Air cleaner flap solenoid valve faulty
- ◆ DME control module faulty

Hot-film mass air flow meter - above/below limit value

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground in sensor line to hot-film mass air flow meter
- Open circuit in power supply line (12V), ground supply line or sensor power supply line (5V) to the hot-film mass air flow meter
- Hot-film mass air flow meter faulty
- DME control module faulty

Function description

Diagnosis of plausibility of MAF sensor signal

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Hot-film mass air flow meter - above/below limit value

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground in sensor line to hot-film mass air flow meter
- ◆ Open circuit in power supply line (12V), ground supply line or sensor power supply line (5V) to the hot-film mass air flow meter
- Hot-film mass air flow meter faulty
- DME control module faulty

Function description

Diagnosis of plausibility of MAF sensor signal

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Hot-film mass air flow meter - above/below limit value

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground in sensor line to hot-film mass air flow meter
- Open circuit in power supply line (12V), ground supply line or sensor power supply line (5V) to the hot-film mass air flow meter
- Hot-film mass air flow meter faulty
- DME control module faulty

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Hot-film mass air flow meter - above/below limit value

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground in sensor line to hot-film mass air flow meter
- Open circuit in power supply line (12V), ground supply line or sensor power supply line (5V) to the hot-film mass air flow meter
- Hot-film mass air flow meter faulty
- DME control module faulty

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Mass air flow ahead of throttle valve implausible (too high)

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- Hot-film mass air flow meter faulty (battered)
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Mass air flow upstream of throttle valve implausible (too low)

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

- Air cleaner blocked
- ◆ Leakage between MAF sensor and throttle valve adjusting unit
- Throttle valve sluggish or heavily soiled
- MAF sensor faulty (battered)
- One or both cylinder banks remain jammed in small valve lift
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- ◆ The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Mass air flow ahead of throttle valve implausible (too high)

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- Hot-film mass air flow meter faulty (battered)
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Mass air flow upstream of throttle valve implausible (too low)

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

• In this context, please also observe the function description.

- Air cleaner blocked
- ◆ Leakage between MAF sensor and throttle valve adjusting unit
- Throttle valve sluggish or heavily soiled
- MAF sensor faulty (battered)
- One or both cylinder banks remain jammed in small valve lift
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- ◆ The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Mass air flow ahead of throttle valve implausible (too high)

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- Hot-film mass air flow meter faulty (battered)
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Mass air flow upstream of throttle valve implausible (too low)

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

- Air cleaner blocked
- ◆ Leakage between MAF sensor and throttle valve adjusting unit
- Throttle valve sluggish or heavily soiled
- MAF sensor faulty (battered)
- One or both cylinder banks remain jammed in small valve lift
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- ◆ The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Mass air flow ahead of throttle valve implausible (too high)

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- Hot-film mass air flow meter faulty (battered)
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Mass air flow upstream of throttle valve implausible (too low)

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

- Air cleaner blocked
- ◆ Leakage between MAF sensor and throttle valve adjusting unit
- Throttle valve sluggish or heavily soiled
- MAF sensor faulty (battered)
- One or both cylinder banks remain jammed in small valve lift
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- ◆ The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Mass air flow ahead of throttle valve implausible (too high)

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- Hot-film mass air flow meter faulty (battered)
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Mass air flow upstream of throttle valve implausible (too low)

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

• In this context, please also observe the function description.

- Air cleaner blocked
- ◆ Leakage between MAF sensor and throttle valve adjusting unit
- Throttle valve sluggish or heavily soiled
- MAF sensor faulty (battered)
- One or both cylinder banks remain jammed in small valve lift
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- ◆ The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Mass air flow ahead of throttle valve implausible (too high)

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- Hot-film mass air flow meter faulty (battered)
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Mass air flow upstream of throttle valve implausible (too low)

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine start
- No faults detected for throttle valve adjusting unit, ambient pressure sensor, intake temperature sensor, speed sender

i NOTE

◆ In this context, please also observe the function description.

- Air cleaner blocked
- ◆ Leakage between MAF sensor and throttle valve adjusting unit
- Throttle valve sluggish or heavily soiled
- MAF sensor faulty (battered)
- One or both cylinder banks remain jammed in small valve lift
- ◆ DME control module faulty (ambient pressure sensor at fault detection threshold)

Function description

- ◆ The measured value supplied by the MAF sensor is compared to a value from a map. This map is determined by engine speed, throttle valve position, ambient pressure and intake air temperature.
- ◆ The mass air flow upstream of the throttle valve is identified as implausible if the measured value deviates too greatly from the map.
- ♦ If the switching cups stick on a small stroke on one or both banks (e.g., oil duct blocked), the MAF sensor can also be detected as faulty. This is because the expected increase in the air-flow rate does not occur.
- ◆ The monitoring of electrical faults (open circuit, short circuit) takes place in a separate diagnosis.

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

i NOTE

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

i NOTE

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

i NOTE

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

i NOTE

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Oil pressure switch, above limit value

Diagnostic conditions

- Power supply voltage > 7 V
- Engine is not running (0 rpm) + ignition on for at least 60 s

Possible fault causes

- ♦ Short circuit to B+ or open circuit in the signal line
- ♦ Oil pressure switch faulty
- ◆ DME control module faulty

Oil pressure switch, below limit value

Diagnostic conditions

- Power supply voltage > 7 V
- Engine start-up and subsequent engine speed > 2520 rpm for at least 4 s

- ♦ There is no oil pressure
- ♦ Short circuit to B+ or ground in the signal line
- ♦ Oil pressure switch faulty
- ◆ DME control module faulty

Intake air temperature sensor – signal implausible (too low)

i NOTE

If a fault is detected, a substitute value of 60 °C is used.

Diagnostic conditions

- Previous engine switch-off temperature > 40 °C
- Engine temperature has cooled off by > 20K before restart
- Engine starting temperature -35 °C ... 70 °C
- Time after engine starts > 2 s
- No fault detected for ambient temperature sensor (via CAN)

Possible fault causes

◆ Intake air temperature sensor faulty (in the hot-film mass air flow meter)

Crash output

Diagnostic conditions:

- Ignition on
- Internal function test completed

- ♦ Short circuit to B+/ground or open circuit in the line
- ◆ DME control module faulty
- ◆ POSIP triggering unit faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Valve lift control parity check error, implausible signal

ii NOTE: EXTREMELY IMPORTANT TO OBSERVE!

- For this diagnostic, the cylinder preceding in the firing order can also be affected.
- ◆ If misfires are entered simultaneously (P0300 to P0306), these must be worked through first.
- If only valve lift errors are entered, please also check the cylinders preceding in the firing order.
- ◆ Example: If the valve lift error for cylinder 4 (bank 2) is entered, the mechanism of the valve lift switching of cylinder 2 (bank 1) is also to be checked (firing order: 1-6-2-4-3-5).
- ◆ Valve lift error detected via evaluation of rough running, similar to detecting misfiring.
- Parity check errors during valve lift control only entered together with cylinder-specific faults.

Diagnostic conditions

• Engine at idle speed and then full-load acceleration in 2nd gear

- In at least one cylinder, the valves jam on a small stroke and
- •in at least one cylinder, the valves jam on a large stroke.
- ⇒ Please read the information at the beginning of the document!

Valve lift control, above limit value

ID NOTE: EXTREMELY IMPORTANT TO OBSERVE!

- For this diagnostic, the cylinder preceding in the firing order can also be affected.
- ◆ If misfires are entered simultaneously (P0300 to P0306), these must be worked through first.
- If only valve lift errors are entered, please also check the cylinders preceding in the firing order.
- ◆ Example: If the valve lift error for cylinder 4 (bank 2) is entered, the mechanism of the valve lift switching of cylinder 2 (bank 1) is also to be checked (firing order: 1-6-2-4-3-5).
- ◆ Valve lift error detected via evaluation of rough running, similar to detecting misfiring.
- Parity check errors during valve lift control only entered together with cylinder-specific faults.

Diagnostic conditions

• Engine idling

- Valve(s) of a cylinder stay jammed in large stroke
- ◆ Valves of different cylinders stay jammed in large stroke (parity check error)
- ⇒ Please read the information at the beginning of the document!

Valve lift control, above limit value

ID NOTE: EXTREMELY IMPORTANT TO OBSERVE!

- For this diagnostic, the cylinder preceding in the firing order can also be affected.
- ◆ If misfires are entered simultaneously (P0300 to P0306), these must be worked through first.
- If only valve lift errors are entered, please also check the cylinders preceding in the firing order.
- ◆ Example: If the valve lift error for cylinder 4 (bank 2) is entered, the mechanism of the valve lift switching of cylinder 2 (bank 1) is also to be checked (firing order: 1-6-2-4-3-5).
- ◆ Valve lift error detected via evaluation of rough running, similar to detecting misfiring.
- Parity check errors during valve lift control only entered together with cylinder-specific faults.

Diagnostic conditions

• Engine idling

- Valve(s) of a cylinder stay jammed in large stroke
- ◆ Valves of different cylinders stay jammed in large stroke (parity check error)
- ⇒ Please read the information at the beginning of the document!

DMTL – Tank Leakage Diagnostics Module, heater output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for DMTL heater
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- DME control module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

◆ The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the

reference leak test if the tank system is leak-free.

- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ♦ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module, heater output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for DMTL heater
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- DME control module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

◆ The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the

reference leak test if the tank system is leak-free.

- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ♦ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module, heater output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for DMTL heater
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- DME control module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

◆ The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the

reference leak test if the tank system is leak-free.

- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ♦ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module

Diagnostic conditions

- Vehicle speed = 0 km/h
- Engine speed = 0 rpm
- Correction factor, height > 0.73
- Coolant temperature upon starting the engine may be no more than 6.8
 K above ambient temperature
- Coolant temperature when engine starts > 3.8 °C
- Period for which the engine needs to have been running before ignition is switched off > 20 minutes
- Ignition has been switched off for at least 10 seconds.
- Ambient temperature 4 ... 35.3 °C
- Active charcoal filter load < 3 for minor leak
- Fuel tank fuel level 10 ... 54 litres
- Battery positive voltage 11.02 ... 14.5 V
- No fuel tank filling
- No faults detected for ambient pressure sensor, coolant temperature sensor, vehicle speed sensor
- No output stage faults detected for DMTL pump motor, DMTL switchover valves and tank vent
- No fault detected for tank vent (flow)
- ➤ The diagnostic conditions can also be established using the PIWIS Tester via the short test "tank leakage test". After the test has begun, the ignition must be switched off.

i NOTE

• In this context, please also observe the function description.

Possible fault causes

◆ DMTL – Tank Leakage Diagnostics Module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ◆ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module

Diagnostic conditions

- Vehicle speed = 0 km/h
- Engine speed = 0 rpm
- Correction factor, height > 0.73
- Coolant temperature upon starting the engine may be no more than 6.8
 K above ambient temperature
- Coolant temperature when engine starts > 3.8 °C
- Period for which the engine needs to have been running before ignition is switched off > 20 minutes
- Ignition has been switched off for at least 10 seconds.
- Ambient temperature 4 ... 35.3 °C
- Active charcoal filter load < 3 for minor leak
- Fuel tank fuel level 10 ... 54 litres
- Battery positive voltage 11.02 ... 14.5 V
- No fuel tank filling
- No faults detected for ambient pressure sensor, coolant temperature sensor, vehicle speed sensor
- No output stage faults detected for DMTL pump motor, DMTL switchover valves and tank vent
- No fault detected for tank vent (flow)
- ► The diagnostic conditions can also be established using the PIWIS Tester via the short test "tank leakage test". After the test has begun, the ignition must be switched off.

i NOTE

• In this context, please also observe the function description.

Possible fault causes

◆ DMTL – Tank Leakage Diagnostics Module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ◆ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module

Diagnostic conditions

- Vehicle speed = 0 km/h
- Engine speed = 0 rpm
- Correction factor, height > 0.73
- Coolant temperature upon starting the engine may be no more than 6.8
 K above ambient temperature
- Coolant temperature when engine starts > 3.8 °C
- Period for which the engine needs to have been running before ignition is switched off > 20 minutes
- Ignition has been switched off for at least 10 seconds.
- Ambient temperature 4 ... 35.3 °C
- Active charcoal filter load < 3 for minor leak
- Fuel tank fuel level 10 ... 54 litres
- Battery positive voltage 11.02 ... 14.5 V
- No fuel tank filling
- No faults detected for ambient pressure sensor, coolant temperature sensor, vehicle speed sensor
- No output stage faults detected for DMTL pump motor, DMTL switchover valves and tank vent
- No fault detected for tank vent (flow)
- ► The diagnostic conditions can also be established using the PIWIS Tester via the short test "tank leakage test". After the test has begun, the ignition must be switched off.

i NOTE

• In this context, please also observe the function description.

Possible fault causes

◆ DMTL – Tank Leakage Diagnostics Module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ◆ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

DMTL – Tank Leakage Diagnostics Module

Diagnostic conditions

- Vehicle speed = 0 km/h
- Engine speed = 0 rpm
- Correction factor, height > 0.73
- Coolant temperature upon starting the engine may be no more than 6.8
 K above ambient temperature
- Coolant temperature when engine starts > 3.8 °C
- Period for which the engine needs to have been running before ignition is switched off > 20 minutes
- Ignition has been switched off for at least 10 seconds.
- Ambient temperature 4 ... 35.3 °C
- Active charcoal filter load < 3 for minor leak
- Fuel tank fuel level 10 ... 54 litres
- Battery positive voltage 11.02 ... 14.5 V
- No fuel tank filling
- No faults detected for ambient pressure sensor, coolant temperature sensor, vehicle speed sensor
- No output stage faults detected for DMTL pump motor, DMTL switchover valves and tank vent
- No fault detected for tank vent (flow)
- ► The diagnostic conditions can also be established using the PIWIS Tester via the short test "tank leakage test". After the test has begun, the ignition must be switched off.

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

◆ DMTL – Tank Leakage Diagnostics Module faulty

Function description

Tank leakage test/DMTL - Tank Leakage Diagnostics Module

i Note

The tank leakage test is performed only on USA vehicles.

Construction of the tank leakage diagnostics module:
The diagnostics module consists of an electric motor with a small air pump, switch-over valves and a reference nozzle.
In addition, the modul is heated so as to prevent the forming of condensation and ice.

Procedure of the function:

- ◆ The pump is operated via an electric motor and conveys air through the reference leak. The power consumed during this process is determined.
- ◆ The switch-over valve switches and the air current is now directed into the fuel tank. The power consumed during this process is also determined. After a waiting period dependent on the fuel tank fuel level, it must be at least as high as the power consumption was during the reference leak test if the tank system is leak-free.
- ◆ The system is identified to by leaking if the power consumption is lower during the actual leakage test as it was during the reference leak test.
- ◆ An evaluation of the power consumption levels when the pump is started and after the switch-over valve has switched serves to identify faults within the tank leakage diagnostic module (e.g. pump blocked, motor spins at idle speed, valve does not switch etc.).
- ◆ The diagnosis of heating, motor and switch-over valve is performed via the output stage of the DME control module.

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Steering wheel electronics (CAN drive) control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The steering wheel electronics control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Steering wheel electronics control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ◆ No power supply for steering wheel electronics control module
- ◆ Steering wheel electronics control module is incorrectly coded
- ♦ Short circuit or open circuit in the CAN drive
- ◆ Steering wheel electronics control module faulty (in most cases the cause is not the steering wheel electronics control module but incorrect coding!)

Fault effects

- ◆ Communication via the CAN drive is no longer possible.
- ♦ No other control modules are able to communicate with the steering wheel electronics control module.

Affected contacts on the steering wheel electronics control module connector Connector A

- ◆ 1 ground supply terminal 31
- ♦ 2 power supply terminal 30
- ♦ 8 CAN drive low
- ♦ 9 CAN drive high
- ◆ 13 power supply terminal 15

Air-conditioning system regulator, communication

i Note!

◆ Internal function test completed.

Diagnostic conditions

The air-conditioning system regulator initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Air-conditioning system regulator wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ♦ No power supply for air-conditioning system regulator
- ◆ Air-conditioning system regulator incorrectly coded
- ◆ Short circuit or open circuit in the CAN convenience
- ♦ Air-conditioning system regulator faulty (in most cases the cause is not the air-conditioning system regulator but incorrect coding!)

Fault effects

- ◆ Communication via the CAN convenience is no longer possible.
- ♦ No other control modules are able to communicate with the air-conditioning system regulator.

Affected contacts on the air-conditioning system regulator connector Connector A:

- ◆ 1 ground supply terminal 31
- ♦ 2 power supply terminal 30
- ♦ 8 CAN convenience low
- ♦ 9 CAN convenience high
- ♦ 13 power supply terminal 15

Vehicle electrical system control module, communication

i Note!

◆ Internal function test completed.

Diagnostic conditions

The vehicle electrical system control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Vehicle electrical system control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ "Ignition on"

Possible fault causes

- ◆ Power supply for the vehicle electrical system control module is incorrect
- ♦ Vehicle electrical system control module is incorrectly coded
- ◆ Short circuit or open circuit in the CAN convenience
- ♦ Vehicle electrical system control module faulty (in most cases the cause is not the vehicle electrical system control module but incorrect coding!)

Fault effects

- ◆ Communication via the CAN convenience is no longer possible.
- ♦ No other control modules are able to communicate with the vehicle electrical system control module.

Affected contacts on the vehicle electrical system control module connector Connector A:

- ♦ 27 power supply terminal 15
- ♦ 37 CAN convenience high
- ♦ 38 CAN convenience low
- ♦ 42 ground supply

Connector B:

- ♦ 3 power supply terminal 30
- ♦ 21 wake-up

Steering wheel electronics (CAN drive) control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The steering wheel electronics control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Steering wheel electronics control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ◆ No power supply for steering wheel electronics control module
- ◆ Steering wheel electronics control module is incorrectly coded
- ♦ Short circuit or open circuit in the CAN drive
- ◆ Steering wheel electronics control module faulty (in most cases the cause is not the steering wheel electronics control module but incorrect coding!)

Fault effects

- ◆ Communication via the CAN drive is no longer possible.
- ♦ No other control modules are able to communicate with the steering wheel electronics control module.

Affected contacts on the steering wheel electronics control module connector Connector A

- ◆ 1 ground supply terminal 31
- ♦ 2 power supply terminal 30
- ♦ 8 CAN drive low
- ♦ 9 CAN drive high
- ♦ 13 power supply terminal 15

POSIP triggering unit, communication

i Note!

◆ Internal function test completed.

Diagnostic conditions

The POSIP triggering unit initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. POSIP triggering unit wake-up through:

- ◆ event-induced CAN message
- ♦ key contact (terminal S)

Possible fault causes

- ♦ No power supply for POSIP triggering unit
- ◆ POSIP triggering unit incorrectly coded
- ♦ Short circuit or open circuit in the CAN drive
- ◆ POSIP triggering unit faulty (in most cases the cause is not the POSIP triggering unit but incorrect coding!)

Fault effects

- Communication via the CAN drive is no longer possible.
- ◆ No other control modules are able to communicate with the POSIP triggering unit.

Affected contacts on the POSIP triggering unit connector Connector A:

- ◆ 1 power supply terminal S
- ◆ 26 ground supply terminal 31
- ♦ 34 power supply terminal S
- ♦ 40 ground supply terminal 31
- ♦ 49 CAN convenience high
- ♦ 50 CAN convenience low

Communication, Tiptronic control unit

i NOTE

Internal function test completed!

Diagnostic conditions

The Tiptronic control unit initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Tiptronic control unit wake-up through:

- ◆ Event-induced CAN message
- "Ignition on"

Possible fault causes

- ◆ No power supply for Tiptronic control unit
- Tiptronic control unit is incorrectly coded
- Short circuit or open circuit in the CAN drive
- ◆ Tiptronic control unit faulty (in most cases the cause is not the Tiptronic control unit but incorrect coding!)
- ◆ DME control unit faulty

Fault effects

- ◆ Communication via the CAN drive is no longer possible
- ◆ No other control units are able to communicate with the Tiptronic control unit

Affected contacts on the Tiptronic control unit connector Connector B

- ◆ 29 Power supply terminal 15
- ◆ 30 Ground supply terminal 31

Connector C

- ◆ 1 CAN drive low
- ◆ 2 CAN drive high

Affected contacts on the DME control unit connector Connector B – CAN drive OUT

- ◆ 3 CAN drive low
- ♦ 4 CAN drive high

Connector D - CAN drive IN

- ◆ 36 CAN drive high
- ◆ 37 CAN drive low

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Rear control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The rear control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Rear control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ♦ No power supply for rear control module
- ◆ Rear control module is incorrectly coded
- ◆ Short circuit or open circuit in the CAN convenience
- ♦ Rear control module faulty (in most cases the cause is not the rear control module but incorrect coding!)

Fault effects

- ♦ Communication via the CAN convenience is no longer possible.
- No other control modules are able to communicate with the rear control module.

Affected contacts on the rear control module connector Connector A:

- ♦ 8 power supply terminal 15
- ◆ 23 power supply terminal 30

Connector B:

- ♦ 2 CAN convenience high
- ♦ 8 CAN convenience low
- ◆ 11 ground supply terminal 31

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Coolant switch-over valve driver, above limit value

Diagnostic conditions

- Supply voltage > 7 V
- Engine running
- Coolant change-over valve activated (ATF cooler closed)
- for **997** coolant temperature < 90 °C (194 °F) **and** ATF temperature < 83 °C (181 °F)
- for **987** coolant temperature < 80 °C (176 °F) **and** ATF temperature < 75 °C (167 °F)

- ◆ Short circuit to B+ in control line
- ◆ Coolant switch-over valve faulty
- ◆ DME control module faulty

Coolant switch-over valve driver, below limit value

Diagnostic conditions

- Supply voltage > 7 V
- Engine running
- Coolant change-over valve **not** activated (ATF cooler open)
- for **997** coolant temperature > 100 °C (212 °F) **or** ATF temperature > 90 °C (194 °F)
- for **987** coolant temperature > 90 °C (194 °F) **or** ATF temperature > 90 °C (194 °F)

- ◆ Short circuit to ground in control line
- ◆ DME control module faulty

Coolant switch-over valve driver, open circuit

Diagnostic conditions

- Supply voltage > 7 V
- Engine running
- Coolant change-over valve **not** activated (ATF cooler open)
- for **997** coolant temperature > 100 °C (212 °F) **or** ATF temperature > 90 °C (194 °F)
- for **987** coolant temperature > 90 °C (194 °F) **or** ATF temperature > 90 °C (194 °F)

- Open circuit in the control line
- ◆ Coolant switch-over valve faulty
- ◆ DME control module faulty

Electric exhaust flap

iNOTE

Only for Carrera S increased performance (X51).

Diagnostic conditions

- Power supply voltage > 7 V
- Engine running
- Switch exhaust flap on and off with button

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to exhaust flap solenoid valve
- ♦ Exhaust flap solenoid valve faulty
- ◆ DME control module faulty

Electric exhaust flap

iNOTE

Only for Carrera S increased performance (X51).

Diagnostic conditions

- Power supply voltage > 7 V
- Engine running
- Switch exhaust flap on and off with button

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to exhaust flap solenoid valve
- ♦ Exhaust flap solenoid valve faulty
- ◆ DME control module faulty

Electric exhaust flap

iNOTE

Only for Carrera S increased performance (X51).

Diagnostic conditions

- Power supply voltage > 7 V
- Engine running
- Switch exhaust flap on and off with button

- ♦ Short circuit to B+/ground or open circuit in the control line
- ♦ Open circuit of power supply to exhaust flap solenoid valve
- ♦ Exhaust flap solenoid valve faulty
- ◆ DME control module faulty

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Solenoid hydraulic valve driver, below limit value

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- ◆ Solenoid hydraulic valve faulty (short circuit to housing)
- Short circuit to ground in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Solenoid hydraulic valve driver, above limit value

Diagnostic conditions

• Short test run (solenoid hydraulic valve activation)

- Solenoid hydraulic valve faulty (short circuit of coil)
- ◆ Short circuit to B+ in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Solenoid hydraulic valve driver, below limit value

Diagnostic conditions

- Battery positive voltage 10 V ... 16 V
- Time after engine starts > 10 seconds

- ◆ Solenoid hydraulic valve faulty (short circuit to housing)
- Short circuit to ground in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Solenoid hydraulic valve driver, above limit value

Diagnostic conditions

• Short test run (solenoid hydraulic valve activation)

- Solenoid hydraulic valve faulty (short circuit of coil)
- ◆ Short circuit to B+ in control line to solenoid hydraulic valve
- ◆ DME control module faulty

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Throttle valve adjusting unit – output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for throttle valve adjusting unit positioning motor
- ◆ Power supply of positioning motor for throttle valve adjusting unit interrupted
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit – position deviation/control range

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

◆ Throttle valve adjusting unit faulty

Throttle valve adjusting unit – position deviation/control range

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

◆ Throttle valve adjusting unit faulty

Throttle valve adjusting unit – position deviation/control range

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

Possible fault causes

◆ Throttle valve adjusting unit faulty

Throttle valve adjusting unit not adapted

i NOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage > 10 V
- Time after ignition on > 30 s
- Engine not running
- Vehicle is stationary
- Engine temperature 5 °C ... 100 °C
- Intake air temperature > 5 °C
- Pedal value < 0.8 %

- ◆ There are no, or no valid, adaptation values stored in the DME control module (after replacment of throttle valve adjusting unit and/or DME) because:
- adaptation has not been performed.
- adaptation was not performed successfully.
- adaptation was canceled.
- ◆ Throttle valve adjusting unit faulty

Throttle valve adjusting unit faulty

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage > 10 V
- Time after ignition on > 30 s
- Engine not running
- Vehicle is stationary
- Engine temperature 5 °C ... 100 °C
- Intake air temperature > 5 °C
- Pedal value < 0.8 %

Possible fault causes

◆ Throttle valve adjusting unit faulty

Throttle valve adjusting unit – potentiometer

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground in the sensor line to potentiometer 1 or 2 of the throttle valve adjusting unit
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit – potentiometer

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground in the sensor line to potentiometer 1 or 2 of the throttle valve adjusting unit
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit – potentiometer

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground in the sensor line to potentiometer 1 or 2 of the throttle valve adjusting unit
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit – potentiometer

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground in the sensor line to potentiometer 1 or 2 of the throttle valve adjusting unit
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit – potentiometer

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground in the sensor line to potentiometer 1 or 2 of the throttle valve adjusting unit
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit – potentiometer

iNOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground in the sensor line to potentiometer 1 or 2 of the throttle valve adjusting unit
- ◆ Throttle valve adjusting unit faulty
- ◆ DME control module faulty

Throttle valve adjusting unit not adapted

i NOTE

When a fault is detected, the system is in stand-by operation mode in pedal sensor, i.e.:

- Maximum pedal value is limited to 30 %.
- Dynamism is limited.

Diagnostic conditions

- Supply voltage > 10 V
- Time after ignition on > 30 s
- Engine not running
- Vehicle is stationary
- Engine temperature 5 °C ... 100 °C
- Intake air temperature > 5 °C
- Pedal value < 0.8 %

- ◆ There are no, or no valid, adaptation values stored in the DME control module (after replacment of throttle valve adjusting unit and/or DME) because:
- adaptation has not been performed.
- adaptation was not performed successfully.
- adaptation was canceled.
- ◆ Throttle valve adjusting unit faulty

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Thermostat stuck open

Diagnostic conditions

- Vehicle speed > 15 km/h (9 mph)
- Engine speed 1,000 ... 5,000 rpm
- Air mass throughput under the aforementioned conditions: 3.0 kg
- Coolant temperature when engine starts < 60 °C (140 °F)
- Ambient temperature -6.8 °C (19.8 °F) ... 60 °C (140 °F)

i NOTE

◆ In this context, please also observe the function description.

Possible fault causes

- ◆ Thermostat faulty (stuck open)
- Coolant temperature sensor faulty
- ◆ Tiptronic vehicles only: coolant shutoff valve open (mechanical fault, lack of vacuum...)

Function description

i Note

◆ The diagnostic conditions can best be established on a (roller-type) dynamometer.

Start of diagnosis after engine starting under the following conditions:

- Engine not hot
- Ambient temperature in a suitable range
- Normal driving
- Adequate air mass throughput

Diagnosis procedure:

- ◆ The air throughput is used to estimate the amount of heat liberated during combustion of the fuel mixture.
- ♦ If, under the conditions described above, the coolant temperature does not reach a certain value after a certain amount of fuel mixture has passed through the engine, it is assumed that the thermostat is stuck in open position.
- ◆ Since a stuck temperature signal also produces a similar fault symptom, the fault "engine temperature sensor" might also be entered. The sensor must be checked in this case.
- ♦ In Tiptronic vehicles, an open coolant shutoff valve can also lead to this fault entry, as the engine heat is transferred to the transmission via the transmission cooling.

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- below limit value

i NOTE

• The diagnosis is intended to display a negative deviation of more than 30% (leaning) of the lambda control adaptation in the partial load range (FRAU > 0.7).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda control adaptation FRAU (lower load range)

- above limit value

• The diagnosis is intended to display a positive deviation of more than 30% (fattening) of the lambda control adaptation in the partial load range (FRAU > 1.3).

Diagnostic conditions

- Engine load 15 .. 80%
- Mass air flow via hot-film mass air flow meter 40 ... 220 kg/h
- Engine speed 1,040 ... 4760 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

Possible fault causes

- Intake system leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- ◆ Fuel pressure too low
- Fuel injector faulty (stuck)
- Fuel pump delivery too low

Lambda control adaptation RKAT (range near idle speed)

- above limit value

- The diagnosis is intended to display a positive deviation of more than 6 % (fattening) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

- Mass air flow < 32 kg/h
- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter.

Possible fault causes

- Oil filler cap leaking (secondary air)
- Intake system leaking (secondary air)
- Crankcase ventilation leaking (secondary air)
- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Leak in exhaust system
- Tank vent faulty (does not close completely)

Lambda control adaptation RKAT (range near idle speed)

- below limit value

i NOTE

- The diagnosis is intended to display a negative deviation of more than 6 % (leaning) of the lambda control adaptation in the range near idle speed.
- Opposed adaptation values in connection with misfires indicate that the timing has been changed.

Diagnostic conditions

• Mass air flow < 32 kg/h

- Engine speed < 960 rpm
- Oxygen sensing in front of catalytic converter active
- Engine temperature > 55.5 °C
- No tank ventilation
 - ⇒ USA: Time after engine starts 250 ... 350 s
 - ⇒ RoW: Time after engine starts 302 ... 402 s
- No faults detected for oxygen sensor
- No faults detected for tank vent
- No faults detected for hot-film mass air flow meter

- Incorrect main filling signal from hot-film mass air flow meter
- ◆ Fuel pressure too high
- Injection valve mechanically faulty (dripping)
- Tank vent faulty (does not close completely)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Lambda correction downstream, bank 1 – rich/lean control limit exceeded

i NOTE

- Diagnosis detects a deviation between the lambda value measured by the oxygen sensor upstream and the value measured by the oxygen sensor downstream.
- The deviation is eliminated through adaptation, a fault is only set once the adaptation limits are exceeded.
- The most common fault cause is a leakage between the two oxygen sensors, resulting in the sensor downstream measuring more residual oxygen in the exhaust than the sensor upstream.

Diagnostic conditions

- Engine running
- Oxygen sensing upstream active
- No faults detected for oxygen sensor or oxygen sensor heater up and downstream
- No fault for secondary air injection, catalytic converter or tank vent entered

- ◆ Leakage in exhaust system between the two oxygen sensors
- Oxygen sensor upstream faulty (contaminated/aged)

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Function monitoring of torque comparison

Diagnostic conditions

• Engine speed > 1120 rpm

- ♦ Hot-film mass air flow meter faulty
- ◆ DME control module faulty

Oxygen sensor upstream

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Exhaust temperature < 800 °C (1,472 °F)
- Oxygen sensor temperature > 685 °C (1,265 °F)
- Catalytic converter heating not active
- Secondary air injection not active
- No other oxygen-sensor faults upstream stored

- ◆ High resistance short circuit to B+ in signal wire
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor, implausible signal

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Oxygen sensor heater switched on at > 70 s
- Exhaust temperature 350 ... 800 °C
- No other oxygen-sensor faults stored

- ♦ High resistance short circuit to B+ in signal wire
- ♦ Heater injection
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Exhaust temperature < 800 °C (1,472 °F)
- Oxygen sensor temperature > 685 °C (1,265 °F)
- Catalytic converter heating not active
- Secondary air injection not active
- No other oxygen-sensor faults upstream stored

- ◆ High resistance short circuit to B+ in signal wire
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor, implausible signal

Diagnostic conditions

- DME control module supply voltage 10 V ... 16 V
- Oxygen sensor heater switched on at > 70 s
- Exhaust temperature 350 ... 800 °C
- No other oxygen-sensor faults stored

- ♦ High resistance short circuit to B+ in signal wire
- ♦ Heater injection
- ♦ Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Driver of secondary air pump relay

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit, short circuit to B+ or short circuit to ground of control line to secondary-air pump relay
- Open circuit in the power supply to the secondary-air pump relay
- ◆ Secondary-air pump relay faulty
- ◆ DME control module faulty

Driver of secondary air pump relay

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit, short circuit to B+ or short circuit to ground of control line to secondary-air pump relay
- Open circuit in the power supply to the secondary-air pump relay
- ◆ Secondary-air pump relay faulty
- ◆ DME control module faulty

Oxygen sensor signal behind catalytic converter, too lean

Diagnostic conditions

- Mass air flow throughput 25 kg/h ... 120 kg/h
- Oxygen sensing behind catalytic converter active
- Basic adaptation stabilized
- No secondary air system diagnosis
- No tank ventilation diagnosis
- No high loading of carbon filter
- No other oxygen-sensor faults

Possible fault causes

Oxygen sensor signal behind catalytic converter, too rich

Diagnostic conditions

- Mass air flow throughput 25 kg/h ... 120 kg/h
- Oxygen sensing behind catalytic converter active
- Basic adaptation stabilized
- No secondary air system diagnosis
- No tank ventilation diagnosis
- No high loading of carbon filter
- No other oxygen-sensor faults

Possible fault causes

Oxygen sensor signal behind catalytic converter, too lean

Diagnostic conditions

- Mass air flow throughput 25 kg/h ... 120 kg/h
- Oxygen sensing behind catalytic converter active
- Basic adaptation stabilized
- No secondary air system diagnosis
- No tank ventilation diagnosis
- No high loading of carbon filter
- No other oxygen-sensor faults

Possible fault causes

Oxygen sensor signal behind catalytic converter, too rich

Diagnostic conditions

- Mass air flow throughput 25 kg/h ... 120 kg/h
- Oxygen sensing behind catalytic converter active
- Basic adaptation stabilized
- No secondary air system diagnosis
- No tank ventilation diagnosis
- No high loading of carbon filter
- No other oxygen-sensor faults

Possible fault causes

DMTL – Tank Leakage Diagnostics Module, pump output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for DMTL pump motor
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- ◆ DME control module faulty

DMTL – Tank Leakage Diagnostics Module, pump output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for DMTL pump motor
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- ◆ DME control module faulty

DMTL – Tank Leakage Diagnostics Module, pump output stage

Diagnostic conditions

- Supply voltage 10 V ... 16 V
- Engine start

- ◆ Open circuit, short circuit to B+ or short circuit to ground of activation line for DMTL pump motor
- Open circuit in the power supply to the DMTL
- ◆ DMTL Tank Leakage Diagnostics Module faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

Oxygen sensor upstream

i NOTE

The fault "Over limit value" is detected if the oxygen sensor voltage is > 1.5 V for an uninterrupted period of more than 5 s.

Diagnostic conditions

- DME control module power supply 10.5 V ... 16 V
- Oxygen sensor heater switched on for > 70 s
- Oxygen sensing active
- Exhaust temperature 600 °C (1,112 °F)... 750 °C (1,382 °F)
- min. 3 s overrun
- No secondary air injection or diagnosis of secondary air system active
- No tank ventilation or diagnosis of tank ventilation system active
- No other oxygen-sensor faults stored

- Fault in oxygen sensor heater ⇒ If this exists, is to be taken care of first
- Loose contact or corrosion in the connector
- ◆ Short circuit to B+/ground/between wires or open circuit in the wiring
- Heater injection
- Oxygen sensor faulty
- ◆ DME control module faulty

P2A00

Fuzel trim interrupted (open loop)

i NOTE

- ♦ The DME has detected an implausible temperature range for the O2 sensor
- ♦ or a vehicle voltage > 16 V.
- ♦ Because fuel trim is interrupted when this happens, the DME stores this fault as information.
- ♦ The exact fault cause is stored as an additional P code if necessary.

Diagnostic conditions

• Engine running

- ♦ Vehicle voltage > 16 V
- ♦ Other electrical faults of the O2 sensor upstream

P2A03

Fuzel trim interrupted (open loop)

i NOTE

- ♦ The DME has detected an implausible temperature range for the O2 sensor
- ♦ or a vehicle voltage > 16 V.
- ♦ Because fuel trim is interrupted when this happens, the DME stores this fault as information.
- ♦ The exact fault cause is stored as an additional P code if necessary.

Diagnostic conditions

• Engine running

- ♦ Vehicle voltage > 16 V
- ♦ Other electrical faults of the O2 sensor upstream

Coolant temperature sensor function

Diagnostic conditions

- Power supply voltage 10 V ... 16 V
- Engine running

- ♦ Open circuit, short circuit to B+ or short circuit to ground in sensor line to coolant temperature sensor
- ♦ Open circuit in ground supply to coolant temperature sensor
- ◆ Coolant temperature sensor faulty
- ◆ Thermostat faulty (stuck open)
- ◆ Tiptronic vehicles only: coolant shutoff valve open (mechanical fault, lack of vacuum...)
- ◆ DME control module faulty

DME control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The DME control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. DME control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ♦ No power supply for DME control module
- ◆ DME control module incorrectly coded
- ♦ Short circuit or open circuit in the CAN drive
- ◆ DME control module faulty (in most cases the cause is not the DME control module but incorrect coding!)

Fault effects

- Communication via the CAN drive is no longer possible.
- ♦ No other control modules are able to communicate with the DME control module.

Affected contacts on the DME control module connector Connector A:

- ◆ 1 power supply terminal 30
- ♦ 2 power supply terminal 15
- ◆ 4 ground supply terminal 31
- ♦ 5 ground supply terminal 31
- ♦ 6 ground supply terminal 31

Connector D:

- ♦ 36 CAN drive high
- ♦ 37 CAN drive low

Communication, Tiptronic control unit

i NOTE

Internal function test completed!

Diagnostic conditions

The Tiptronic control unit initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored.

Tiptronic control unit wake-up through:

- ◆ Event-induced CAN message
- "Ignition on"

Possible fault causes

- No power supply for Tiptronic control unit
- Tiptronic control unit is incorrectly coded
- Short circuit or open circuit in the CAN drive
- ◆ Tiptronic control unit faulty (in most cases the cause is not the Tiptronic control unit but incorrect coding!)
- ◆ DME control unit faulty

Fault effects

- ◆ Communication via the CAN drive is no longer possible
- No other control units are able to communicate with the Tiptronic control unit

Affected contacts on the Tiptronic control unit connector Connector B

- ◆ 29 Power supply terminal 15
- ◆ 30 Ground supply terminal 31

Connector C

- ◆ 1 CAN drive low
- ◆ 2 CAN drive high

Affected contacts on the DME control unit connector Connector B – CAN drive OUT

- ◆ 3 CAN drive low
- ♦ 4 CAN drive high

Connector D - CAN drive IN

- ◆ 36 CAN drive high
- ◆ 37 CAN drive low

PSM control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The PSM control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. PSM control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ♦ No power supply for PSM control module
- ◆ PSM control module incorrectly coded
- ◆ Short circuit or open circuit in the CAN drive
- ◆ PSM control module faulty (in most cases the cause is not the PSM control module but incorrect coding!)

Fault effects

- ◆ Communication via the CAN drive is no longer possible.
- No other control modules are able to communicate with the PSM control module.

Affected contacts on the PSM control module connector Connector A:

- ◆ 4 ground supply terminal 31
- ♦ 14 CAN drive low
- ◆ 28 power supply terminal 15
- ♦ 35 CAN drive high

Front control module, communication

i Note!

♦ Internal function test completed.

Diagnostic conditions

The front control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Front control module wake-up through:

- ◆ event-induced CAN message
- ♦ "Ignition on"

Possible fault causes

- ♦ No power supply for front control module
- ◆ Front control module is incorrectly coded
- ◆ Short circuit or open circuit in the CAN convenience
- ◆ Front control module faulty (in most cases the cause is not the front control module but incorrect coding!)

Fault effects

- ◆ Communication via the CAN convenience is no longer possible.
- No other control modules are able to communicate with the front control module.

Affected contacts on the front control module connector Connector A:

- ◆ 1 power supply terminal 30
- ♦ 7 CAN convenience low
- ◆ 15 CAN convenience high
- ♦ 21 power supply terminal 15
- ◆ 35 power supply terminal 15 (redundant)

Connector B:

- ◆ 20 power supply terminal 15 (redundant)
- ♦ 40 ground supply terminal 31

Instrument cluster, communication

i NOTE

Internal function test completed!

Diagnostic conditions

The instrument cluster initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Instrument cluster wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ "Ignition on"

Possible fault causes

- ♦ No power supply for instrument cluster
- ♦ Instrument cluster incorrectly coded
- ◆ Short circuit or open circuit in the CAN display
- ♦ Instrument cluster faulty (in most cases the cause is not the instrument cluster but incorrect coding!)

Fault effects

- ◆ Communication via the CAN display is no longer possible.
- ♦ No other control modules are able to communicate with the instrument cluster.

Affected contacts on the instrument cluster connector Connector A:

- ◆ 1 ground supply terminal 31
- ◆ 2 power supply terminal 30
- ◆ 17 ground supply terminal 31
- ◆ 18 power supply terminal 30
- ♦ 30 wake-up
- ♦ 31 CAN display high
- ♦ 32 CAN display low

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ◆ Control module is incorrectly coded
- ♦ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

Fault effects

- ♦ The specified control module sends only substitute values via the CAN.
- Other control modules detect these substitute values and set this fault code.

Fault entry in specified control module

i Note!

◆ Internal function test completed.

Diagnostic conditions

The control module initially tests internal function sequences after wake-up. If they are OK, all diagnosable outputs are then tested and any faults are stored. Control module wake-up through:

- ◆ event-induced CAN message
- ♦ wake-up signal via wake-up line
- ♦ key contact (terminal S)
- ♦ "Ignition on"

Possible fault causes

- ♦ Control module is incorrectly coded
- ◆ Periphery connected to specified control module is incorrect
- ◆ Control module faulty (in most cases the cause is not the control module but incorrect coding!)

Fault effects

- ♦ The specified control module sends only substitute values via the CAN.
- ♦ Other control modules detect these substitute values and set this fault code.