

Reading measured value block

Reading measured value block: Display groups 000 to 010

Display zone 1 ... 5

Display group 000 (decimal readouts)												
Reading measured value block 0 ⇒										<input type="checkbox"/> Indicated on display	Specification	Corresp. to
1	2	3	4	5	6	7	8	9	10	<input type="checkbox"/> Display zones		
Display zones 6 ... 10 =>Page 01-106												
Learned value for idling stabilisation, automatic gearbox with gear engaged (0 is displayed for manual gearbox)											0...10 or 236...255	
Learned value for idling stabilisation, manual gearbox in idling position, automatic gearbox in selector lever position P or N											0...14 or 240...255	
Engine speed ▪ Valve gear "S" 1) ▪ Valve gear "M" 1)											26...30 28...32	650...750 rpm 700...800 rpm
Air mass meter output voltage ▪ Valve gear "S" 1) ▪ Valve gear "M" 1)											145...158 147...162	1.45...1.58 V 1.47...1.62 V
Coolant temperature											135...160	85...110 °C

1) Identifying characteristics of installed valve gear => Page [01-3](#).

Display zone 6 ... 10

Display group 000 (decimal readouts)												
Reading measured value block 0 ⇒										<input type="checkbox"/> Indicated on display	Specification	Corresp. to
1	2	3	4	5	6	7	8	9	10	<input type="checkbox"/> Display zones		
Learned value for throttle valve potentiometer											50...100	250...500 mV
Lambda learning demand 0 = Learning demand at idling speed and part throttle range 3 = Learning process completed at idling speed											3	
Lambda control value (mean value 128/cyl. 1...3) 0 is displayed for vehicles with no lambda probes											120...136	
Switching inputs											20	
Idling stabilisation feedback (mean value 128)											126...130	
Display zones 1 ... 5 =>Page 01-105												

Notes on Display Group 000:

- ◆ If the values displayed do not correspond to the specified values, use the following display groups 001 - 023 for fault rectification.
- ◆ Do not deal with any deviations in display zone 8 until the lambda learning process at idling speed has been completed => display zone 9.
- ◆ If values greater than 3 are displayed in display zone 9 => Display group 007 or 008.

Display Group 001; basic function

Reading measured value block 1 ... °C ... V - ... V	=>	<input type="checkbox"/> Indicated on display
Engine control unit power supply ▪ 12.0 ... 14.0 V OK		
Unallocated (only for vehicles with secondary air)		
Air mass meter output voltage ▪ Valve gear "S": 1.450 ... 1.580 V OK (for new engines, max. 1.660 V) 1) ▪ Valve gear "M": 1.470 ... 1.620 V OK (for new engines, max. 1.680 V) 1) ▪ In the event of engine speed increase, display value rises to 2.500 V, drops to 0.000 V and starts rising again.		
Coolant temperature ▪ 85 ... 110 °C OK		

1) Identifying characteristics of installed valve gear => Page [01-3](#).

Test table, Display group 001

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Less than 85 °C 1)	- Engine too cold	- Perform test drive if necessary
		- Coolant temperature sender or wiring to engine control unit	- Interrogate fault memory =>Page 28-27
	Greater than 110 °C 1)	- Radiator dirty	- Clean radiator
		- Radiator fan not working	- Check function
		- Thermostat defective	- Check coolant thermostat
		- Coolant temperature sender or wiring to engine control unit	- Interrogate fault memory =>Page 28-27

1) Vehicle at operating temperature.

Notes on display zone 1:

- ◆ The coolant temperature sender is a temperature-sensitive resistor. If the sender signal is biased, for example due to moisture in a connector (effect similar to parallel resistor), this biasing may be in a range which the fault memory is still not able to detect.
- ◆ If a fault has been stored relating to the coolant temperature sender, a coolant temperature of 20 °C is displayed in the measured value block when the engine is started. It will go up by 10°C for every minute of engine operation. The maximum substitute value is 85°C.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
	Less than 1.450 V		

2	(Valve gear "S") or less than 1.470 V (Valve gear "M")	- Large quantity of unmetered air between intake manifold and air mass meter	- Eliminate air leak
	Greater than 1.580 V (Valve gear "S") or greater than 1.620 V (Valve gear "M")	- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Notes on display zone 2:

- ◆ Only assess the tolerance range of the air mass meter output voltage in function 04 "Basic setting" at idling speed.
- ◆ The air-mass meter output voltage decreases by 0.01 V for every 500 m above sea level.
- ◆ Identifying characteristics of installed valve gear => Page [01-3](#).

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Less than 12 V	- Alternator defective, battery heavily discharged	- Check voltage, charge battery
		- High load on electrical system shortly after starting engine due to high charge current and load from ancillaries	- Increase engine speed for several minutes and switch off ancillaries
		- Contact resistance in power supply or earth connection for engine control unit	- Checking voltage supply to engine control unit => Page 28-31
		- Current drain with ignition off	- Eliminate current drain
	Greater than 14.0 V	- Voltage control on alternator defective	- Check voltage; if necessary, fit a new voltage regulator
		- Excess voltage from assisted start or high speed charger	- Interrogating fault memory =>Page 01-13

Display group 002, throttle valve potentiometer:

Reading measured value ⇒				□ Indicated on display
block 2	⇒	0		
... V	... V	... V	0	
Idling switch ▪ 0 = open ▪ 1 = closed				
Learned value for throttle valve potentiometer ▪ 0.250 ... 0.500 V OK				
Throttle valve potentiometer voltage (idling speed to part throttle range)				

▪ 0.250 ... 1.275 V OK

Throttle valve potentiometer voltage (idling speed to full throttle range)

▪ 0.250 ... 4.750 V OK

Test table, Display group 002

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Deviation from tolerance range	- Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 24-98 or => Display group 009, display zone 4
2	Outside the tolerance range	- Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 24-98 or => Display group 009, display zone 4
3	Outside the tolerance range	- Idling switch actuated or defective - Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 24-98 or => Display group 009, display zone 4
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
		- Moisture in connector of throttle valve potentiometer -G69	- Check connector
		- Earth point at intake manifold	- Check earth connection => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Notes on display zone 3:

- ◆ Idling switch must be closed for checking throttle valve potentiometer learned value => Display zone 4.
- ◆ If the displays in zones 2 and 3 agree at idling speed, the learning process is OK. The last value learned is constantly displayed if no learning process takes place.
- ◆ The throttle valve potentiometer learned value is set to 0.550 V if the control unit is de-energised.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	0 or 1	- -F60 idling switch defective - Throttle valve potentiometer -G69 defective or incorrectly set	- Interrogate fault memory =>Page 24-103
		- Throttle valve sticking - Floor mat pressing down on accelerator pedal	- => Display group 011, Display zone 4 Eliminate cause

		- Moisture in connector of throttle valve potentiometer -G69	- Check connector
		- Throttle cable setting	- Adjust throttle cable

Display Group 003; basic function

Reading measured value block 3	⇒	<input type="checkbox"/> Indicated on display
... rpm	... %	... %
		... km/h
		Road speed
		Throttle valve angle: <ul style="list-style-type: none"> ▪ Idling: 0% OK ▪ Full throttle: Greater than 95% OK
		Engine load (idling speed) <ul style="list-style-type: none"> ▪ Valve gear "S": 15.0 ... 35.0% OK 1) ▪ Valve gear "M": 15.0 ... 32.0% OK 1)
		Engine speed (idling speed) <ul style="list-style-type: none"> ▪ Valve gear "S": 650 ... 750 rpm OK 1) ▪ Valve gear "M": 700 ... 800 rpm OK 1)

1) Identifying characteristics of installed valve gear => Page [01-3](#).

Test table, Display group 003

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Greater than 750 rpm (Valve gear "S")	- Idling switch -F60 incorrectly set or defective	- Checking and adjusting idling speed switch -F60 => Page 24-103 or => Display group 004, display zone 4
	or greater than 800 rpm (Valve gear "M")	- Air intake system drawing in large quantities unmetred air	- Check air intake system for leaks
(cont.) t		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 24-52

Note on display zone 1:

Identifying characteristics of installed valve gear => Page [01-3](#).

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Less than 650 rpm (Valve gear "S")	- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 24-52
	or less than 700 rpm (Valve gear "M")	- Idling switch -F60 incorrectly set or defective	- Checking and adjusting idling speed switch -F60 => Page 24-103 or => Display group 004, display zone 4
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Note on display zone 1:

Identifying characteristics of installed valve gear => Page [01-3](#).

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Outside the tolerance range	- Poor idling (not running on all cylinders)	- Injector or spark plugs defective
		- Air mass meter -G70 defective	- Interrogate fault memory => Page 01-13 or => Display group 001, Display zone 2
		- Idling stabilisation valve -N71 defective	- Interrogate fault memory =>Page 01-13 or => Display group 018
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Note on display zone 2:

Only assess engine load tolerance range at idling speed in function 04 "Basic setting"

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Greater than 0% at idling speed	- -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 01-13 or =>Display group 002
		- Throttle cable setting	- Adjust throttle cable
		- Throttle valve sticking	- Eliminate cause
	Less than 95% at full throttle	- -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 01-13 or =>Display group 002
		- Throttle cable setting	- Adjust throttle cable
		- Throttle valve potentiometer -G69 incorrectly set	- Checking throttle valve potentiometer - G69 => Page 24-98

Notes on display zone 3:

- ◆ For checking at full throttle, switch engine off and ignition on.
- ◆ Vehicles with manual and automatic gearbox have different throttle valve units. The start of the

opening of the 2nd stage of the throttle valve unit can be measured with ignition switched on; this also checks that it has been fitted correctly. Manual gearbox 45 ... 53%; Automatic gearbox 27 ... 35%.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	No Display	- Fault in wiring between dash panel insert and engine control unit	- Checking wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
		- Open circuit or short circuit between vehicle speed sender -G22/-G68 and engine control unit	- Checking wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
		- Vehicle speed sender -G22/-G68	- Checking vehicle speed sender -G22/-G68 => Page 24-124

Note on display zone 4:

If vehicle speed is not displayed on V.A.G 1551, start by checking whether speedometer reading is OK. If not, check speedometer:

=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

Display group 004: Idling speed stabilisation:

Reading measured value block 4								□ Indicated on display	
1	4	0	0	0	1	1	0		
			X	X	X	X	X	<ul style="list-style-type: none"> ▪ Display always 0 ▪ Air conditioner compressor: 0 = off, 1 = on ▪ Idling switch: 0 = open, 1 = closed ▪ Gear recognition signal: 1 = manual gearbox or automatic gearbox in selector lever position "P" or "N" ▪ 0 = automatic gearbox in selector lever position R, D, 3, 2, 1 ▪ Gearshift signal (as of control unit no. 8A0 906 266 E): ▪ 0 = not active, 1 = active 	
Idling stabilisation learned value for automatic gearbox (AT) <ul style="list-style-type: none"> ▪ In selector lever position D, 3, 2, 1 or R +10... -20 OK ▪ Display always 0 for manual gearbox (MT) 									
Learned value for idling stabilisation <ul style="list-style-type: none"> ▪ For manual gearbox (MT) in idling position +14 ... -16 OK ▪ (new engines +20 ... -16) ▪ For automatic gearbox (AT) in selector lever position "P" or "N" +10 ... -20 OK 									

▪ (new engines +16 ... -20)

Idling control at idle

▪ 0 ± 2 OK

Notes on display zones 2 and 3:

- ◆ Only assess values in display zone 2 or 3 if idling control is within tolerance at idle (display zone 1). If idling control is not within the tolerance after 1 minute waiting time, learning does not take place in display zone 2 or 3.
- ◆ Positive learned values indicate higher learned value than in basic setting: -N71 still open.
Negative learned values indicate lower learned value than in basic setting: -N71 is still closed.

Test table, Display group 004

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Outside the tolerance range	- Fault in fault memory	- Interrogate fault memory =>Page 01-13
		- Idling switch -F60 actuated or defective	- Checking idling switch -F60 => Page 24-103 and => Display group 002, display zone 4
		- Idling stabilisation valve -N71 defective	- Checking idling stabilisation valve -N71 => Page 24-52
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
		- Throttle valve sticking - Floor mat pressing down on accelerator pedal - Unmetered air	- Eliminate cause

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Greater than +14 (MT) or Greater than +10 (AT)	- Idling stabilisation valve -N71 defective	- Checking idling stabilisation valve -N71 => Page 24-52
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
	- Suction jet pump blocked (automatic gearbox)	- Eliminate cause	
	Less than -16 (MT)	- Idling stabilisation valve -N71 defective	- Interrogate fault memory =>Page 01-13 or =>

			Display group 018
	or Less than -20 (AT)	- Large volume of unmetered air, intake manifold area, throttle valve stop not OK, leakage air at throttle valve 2nd stage	- Eliminate cause

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Outside the tolerance range	Vehicles with automatic gearbox only: - Display zone 2 outside tolerance range	- => Display zone 2
		- Display zone 2 within tolerance range - Set selector lever to D and observe idling speed for approx. 1 min; if display zone 3 remains outside tolerance range, then the gearbox will not operate smoothly	- Check gearbox
4	Not 001 1 1) or Not 001 10 2)	- Idling switch -F60 actuated or defective	- Checking and adjusting idling speed switch - F60 =>Page 24-103
		- A/C compressor switched on	- Switch off the air conditioner
		- Air conditioner requires higher cooling or heat output ("high")	- Checking air conditioner compressor shut-off =>Page 24-119
		- Gear engaged (automatic gearbox)	- Move selector lever to P or N

1) Control unit no. 8A0 906 266 C

2) As of control unit no. 8A0 906 266 E

Display group 005, lambda learned values, cylinder bank 1:

Reading measured value block 5	⇒	<input type="checkbox"/> Indicated on display
... % ... % ... % ... %		
		Lambda learned value, part throttle 3 (bank 1) ▪ -25% ... +25% OK
		Lambda learned value, part throttle 2 (bank 1) ▪ -25% ... +25% OK
		Lambda learned value, part throttle 1 (bank 1) ▪ -25% ... +25% OK
		Lambda learned value, idling speed (bank 1) ▪ -25% ... +25% OK

Notes on all display zones => Display group 006

Display group 006, lambda learned values, cylinder bank 2:

Reading measured value ⇒				□ Indicated on display
block 6
... %	... %	... %	... %	
				Lambda learned value, part throttle 3 (bank 2) ▪ -25% ... +25% OK
				Lambda learned value, part throttle 2 (bank 2) ▪ -25% ... +25% OK
				Lambda learned value, part throttle 1 (bank 2) ▪ -25% ... +25% OK
				Lambda learned value, idling speed (bank 2) ▪ -25% ... +25% OK

Notes on all display zones:

- ◆ Positive learned value (+ %) signifies:
Mixture too lean, more fuel must be injected (programmed basic injection period too short, actual injection period ... % longer, so that $\lambda = 1$ is achieved)
- ◆ Negative learned value (- %) signifies:
Mixture too rich, less fuel must be injected (programmed basic injection period too long, actual injection period ... % shorter, so that $\lambda = 1$ is achieved)

Test table: Display groups 005 and 006

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1/2/3/4	Low lambda learned values	If learned value in display zone 1 is low and the learned values in display zones 2, 3 and 4 are normal:	- Disconnect and seal off crankcase breather Problem eliminated after motorway drive or oil change
		- Oil dilution (high petrol content in oil)	
		- Injector leaking	- Check injection valves => Page 24-34
		If all 4 lambda learned values are very low:	
		- Fuel pressure too high	- Checking fuel pressure =>Page 24-29
		- Solenoid valve 1 for activated charcoal filter -N80 is constantly open	- Check -N80 => Page 24-92 or => Display group 009, display zone 3
		- Air mass meter -G70 defective	- Check -G70 => Page 24-58
(cont.) t		- Lambda probe heating defective or lambda probe dirty	- Check lambda probe => Page 24-84 or =>Display group 010, display zones 1 and 2

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1/2/3/4	High lambda learned values	If learned value in display zone 1 is high and the learned values in display zones 2, 3 and 4 are normal: - Unmetered air in intake manifold area	- Eliminate causes
		- Injector blocked	- Test injection quantity =>Page 24-40
		If all 4 lambda learned values are very high: - Air mass meter -G70 defective	- Check -G70 => Page 24-58
		- Fuel pressure too low	- Checking fuel pressure =>Page 24-29
		- Unmetered air between -G70 and throttle valve - Unmetered air at manifold gasket	- Eliminate cause
		- Lambda probe heating defective or lambda probe dirty	- Check lambda probe => Page 24-84 or =>Display group 010, display zones 1 and 2

Notes on display groups 005 and 006:

- ◆ Differences in lambda learned values (=> Display group 010, display zones 1 and 2) of more than 8% between display group 005 (bank 1) and display group 006 (bank 2) may be due to the following:
 - Defective spark plugs
 - Defective injectors (leaking, blocked)
 - Unmetered air on one side
 - Lambda probe defective or dirty
 - Mechanical base setting (valve timing) of engine not OK
- ◆ If the difference between the richest and leanest lambda learned value of a display group is 9%, any further leaning of the two learning ranges in question is stopped (=> Display group 007 or 008). The learning demand display (=> Display group 007 or 008) for these learning ranges cannot be "1".
- ◆ All values are reset to 0.0% if control unit is deenergised.

Display group 007, lambda control, cylinder bank 1:

Reading measured value block 7					⇒	<input type="checkbox"/> Indicated on display
...	X	X	X	X	XXXXXXXXX	XXXXXXXXX
%						
						Lambda learning demand display (bank 1); significance =>Page 01-131
						Lambda learning demand diagnosis (bank 1); significance =>Page 01-131
						Lambda learning range display (bank 1)
						<ul style="list-style-type: none"> ▪ Part throttle 3:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 2:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 1:0 = engine speed and load for this learning
	X					

X X X	range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Idling speed:0 = engine speed for this learning range not attained ▪ 1 = engine speed for this learning range attained
Lambda control (bank 1) ▪ 0.0 ± 6.0% OK 1)	

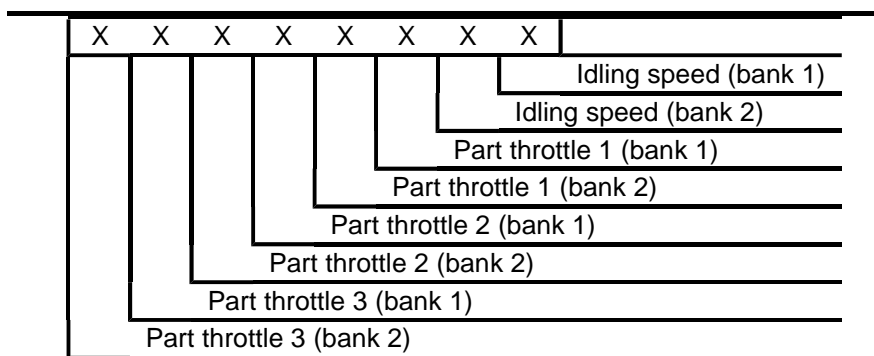
1) Only assess the lambda control tolerance range at idling speed in function 04 "Basic setting", as function 08 "Reading measured value block" also includes control of ACF influence.

Display group 008, lambda control, cylinder bank 2:

Reading measured value block 8		⇒	<input type="checkbox"/> Indicated on display
...	X X X X	XXXXXXXXX	XXXXXXXXX
%			
		Lambda learning demand display (bank 2); significance =>Page 01-131 Lambda learning demand diagnosis (bank 2); significance =>Page 01-131	
		Lambda learning range display (bank 2) ▪ Part throttle 3:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 2:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Part throttle 1:0 = engine speed and load for this learning range not attained ▪ 1 = engine speed and load for this learning range attained ▪ Idling speed:0 = engine speed for this learning range not attained ▪ 1 = engine speed for this learning range attained	
X X X X			
Lambda control (bank 2) ▪ 0.0 ± 6.0% OK 1)			

1) Only assess the lambda control tolerance range at idling speed in function 04 "Basic setting", as function 08 "Reading measured value block" also includes control of ACF influence.

Significance of 8-digit display "Lambda learning demand diagnosis or Lambda learning demand display"



Note:

- ◆ Lambda learning demand diagnosis:

0 = diagnosis not yet performed, 1 = diagnosis performed.

◆ Lambda learning demand display:

0 = Re-learning prompt, 1 = learning process completed.

Test table: Display groups 007 and 008

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Outside tolerance range	Negative display - engine too rich Effect: Lambda control leans the mixture	- Wait 30 seconds for the display to stabilise
		Positive display ("+" is not displayed) - engine too lean Effect: Lambda control enriches the mixture - Unmetered air	- Eliminate air leak
		- Injector defective	- Checking injection quantity =>Page 24-40
		- Not successfully learned	- => Display zone 4
		- Lambda learned values at stop	- Check lambda learned values => Display group 005 or 006
2	-		- => Notes
3	-		- => Notes
4	-		- => Notes

Notes on display zone 1:

- ◆ Do not assess lambda control in either function 04 "Basic setting" or function 08 "Reading measured value block" until after the learning process has been completed successfully (=> Learning demand display).
- ◆ The lambda control indicates the instantaneous control status. After the learning process has been successfully completed (=> Learning demand display), the values fluctuate by $0.0 \pm 6.0\%$. If the learning process (display zone 4) has been completed and a value around $0.0 \pm 6.0\%$ is not attained, observe display group 010, display zone 3 or 4 and check control action of both lambda probes. The display values must intermittently drop below 0.3 V and exceed 0.6 V; if not, check lambda probe heating and lambda probe.
- ◆ The lambda control stop must also be assessed only after the learning process has been completed successfully (=> Learning demand display):
for control unit no. 8A0 906 266 C: Control stop max. +29%
Control stop min. - 60%
From control unit no. 8A0 906 266 E: Control stop max. +32%
Control stop min. - 87.5%
- ◆ For values of more than $\pm 20\%$ in function 04 "Basic setting", the following faults are possible:
 - Unmetered air
 - Engine damage (oil combustion due to defective piston)

Notes on display zone 2:

- ◆ The instantaneous learning range (load status) is displayed in zone 2 (learning range display). Only idling speed and part throttle learning ranges are displayed, as learning does not take place at full throttle.
- ◆ The following procedure must be implemented to reach the corresponding learning range (load status):
 - Idling speed learning range: Allow vehicle to idle (650 ... 900 rpm).
 - Part throttle 1, 2, 3 learning range: Perform a test drive (observe safety precautions => Page [01-5](#)); for this purpose, increase engine speed to 1500 ... 3000 rpm and generate load by pressing the brake gently.

Notes on display zone 3:

- ◆ The lambda learning diagnosis shows which lambda learned value was checked in the learning process.
- ◆ On completion of diagnosis, the corresponding value is set to "1", regardless of whether the diagnosis was found to be OK or not.
- ◆ If the lambda learning demand diagnosis value in display zone 3 is set to "1", but the corresponding lambda learning demand display (display zone 4) is not set to "1", diagnosis has been performed but found not to be OK.
- ◆ The lambda learning demand diagnosis is always reset to "0" on starting with a coolant temperature of less than 40 °C.

Notes on display zone 4:

- ◆ Display zone 4 (learning demand display) shows the learning range (display zone 2) in which there is a demand for learning.
- ◆ Learning requirements:
 - No fault stored in fault memory
 - Engine speed at idle (650 ... 900 rpm or 1500 ... 3000 rpm)
 - Coolant temperature 80 ... 110 °C
 If these requirements are met, but learning still does not start immediately, briefly actuate throttle.
- ◆ Learning is prohibited:
 - With rough idling (hunting), during acceleration and at full throttle
 - If faults have been stored in the fault memory (does not apply to sporadic faults)
 - If the difference between the richest and the leanest lambda learned value of a display group is 9%. Learning in both learning ranges is discontinued in the event of a 9% difference. The learning demand display for these learning ranges cannot be "1"=> Display group 005 or 006 .
- ◆ Learning commences 20 seconds after start of function 04 "Basic setting" or, for control unit no. 8A0 906 266 C: 2 minutes after every start with a coolant temperature of less than 40 °C
From control unit no. 8A0 906 266 E: 4 minutes after every start with a coolant temperature of less than 40 °C.

Notes on display zone 4 - continued:

- ◆ The following list indicates the conditions under which the re-learn prompt (learning demand) is enforced:
 - On starting function 04 "Basic setting" with V.A.G 1551 or whenever fault memory has been erased, all learning demand displays are set to "0" in order to force a re-learn prompt for the lambda learned values after vehicle servicing.
 - A learning demand is always enforced in all learning ranges whenever the engine is started with the coolant temperature less than 40 °C.
 - All learning demand displays are set to "0" again if a major learned value deviation (between a stored learned value and a newly learned value) occurs in a learning range during the learning process.
- ◆ If learning is successful, the learning demand values of the respective learning range (display zone 2) are set to "1".
- ◆ Significance of the 8-digit learning demand display: 0 = re-learn prompt
1 = learning process completed

Display group 009, lambda control:

Reading measured value block 9 ... % ... % ... % ... %	=>	<input type="checkbox"/> Indicated on display
Throttle valve angle => Display group 003, display zone 3		
Duty cycle (actuation) of ACF solenoid valve 1 -N80 ▪ 0 ... 99% OK		
Lambda control (bank 2) => Display group 008, display zone 1		

Lambda control (bank 1) => Display group 007, display zone 1

Note on display zones 1 and 2:

Do not assess lambda control in either function 04 "Basic setting" or function 08 "Reading measured value block" until after the learning process has been completed successfully (=> Display group 007 or 008, display zone 4).

Notes on display zone 3:

- ◆ ACF solenoid valve 1 -N80 is closed during learning process.
- ◆ The influence of ACF can be assessed by comparing the display value in function 04 "Basic setting" (ACF valve closed: 99%) and function 08 "Reading measured value block" (ACF valve open: 0%).

Display group 010: Lambda control, lambda probe voltage signal:

Reading measured value block 10		⇒	□ Indicated on display
... %	... %	... V	... V
		Voltage signal: Bank 2, lambda probe 1	
		▪ Intermittently greater than 0.6 V/less than 0.3 B OK (display must fluctuate)	
		Voltage signal: Bank 1, lambda probe 1	
		▪ Intermittently greater than 0.6 V/less than 0.3 B OK (display must fluctuate)	
		Sum total of lambda control (bank 2) and instantaneous lambda learned value (bank 2)	
		▪ Difference between display values 1 and 2 less than 8% OK	
		Sum total of lambda control (bank 1) and instantaneous lambda learned value (bank 1)	
		▪ Difference between display values 1 and 2 less than 8% OK	

Test table, Display group 010

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1/2	Difference between Display zone 1 and Display zone 2 greater than 8%	- Defective spark plug	- Test spark plugs
		- Unmetered air on one side	- Eliminate cause
		- Injector leaking	- Interrogate fault memory =>Page 24-34
		- Lambda probe defective or dirty	- Interrogate fault memory =>Page 01-13 or =>display zones 3 and 4
		- Mechanical base setting (valve timing) of engine not OK	- Check valve timing

Note on display zones 1 and 2:

The sum total of lambda control and lambda learned value indicates the overall influence of the lambda control. Comparison of display zones 1 and 2 permits direct assessment of differences between banks.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
			- Check injection

3/4	Display not fluctuating (constant 0.0 ... 0.3 V or (constant 0.6 ... 0.9 V)	- Injector defective	valves => Page 24-34
		- Defective spark plug	- Test spark plugs
		- Large quantity of unmetered air	- Eliminate cause
		- Solenoid valve 1 for activated charcoal filter - N80	- Perform final control diagnosis =>Page 24-92
		- Lambda probe defective or dirty	- Interrogate fault memory =>Page 24-80
		- Lambda probe heating defective	- Checking lambda probe heating => Page 24-84
		- Fuel system pressure too high or too low	- Checking fuel pressure =>Page 24-29
		- Coolant temperature sender -G62	- Interrogating fault memory =>Page 28-27

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3/4	Constant 2.550 V	- Short to positive through: - Lambda probe - Signal wire - Engine control unit	- Check Lambda probe => Page 24-80
	Constant 0.350 ... 0.450 V	- Open circuit through: - Lambda probe - Signal wire - Engine control unit	- Check Lambda probe => Page 24-80
	Constant 0.000 V	- Short to earth through: - Lambda probe - Signal wire - Engine control unit	- Check Lambda probe => Page 24-80

Notes on display zones 3 and 4:

- ◆ The voltage signal for "Rich mixture (low level of residual oxygen)" is between about 0.6 and 1.0 V.
- ◆ The voltage signal for "Lean mixture (high level of residual oxygen)" is between about 0.0 and 0.3 V.
- ◆ During the transition from "rich" to "lean" and vice versa ($\lambda = 1.0$), there is a voltage jump from 0.6 ... 1.0 V to 0.0 ... 0.3 V or vice versa.

Notes on display zones 3 and 4 - continued:

- ◆ Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of $\lambda = 1.0$. The system fluctuates continuously between "slightly too lean" and "slightly too rich".
- ◆ The display value must intermittently drop below 0.3 V and exceed 0.6 V. Display values less than 0.45 V indicate "lean", whilst values over 0.45 V indicate "rich".

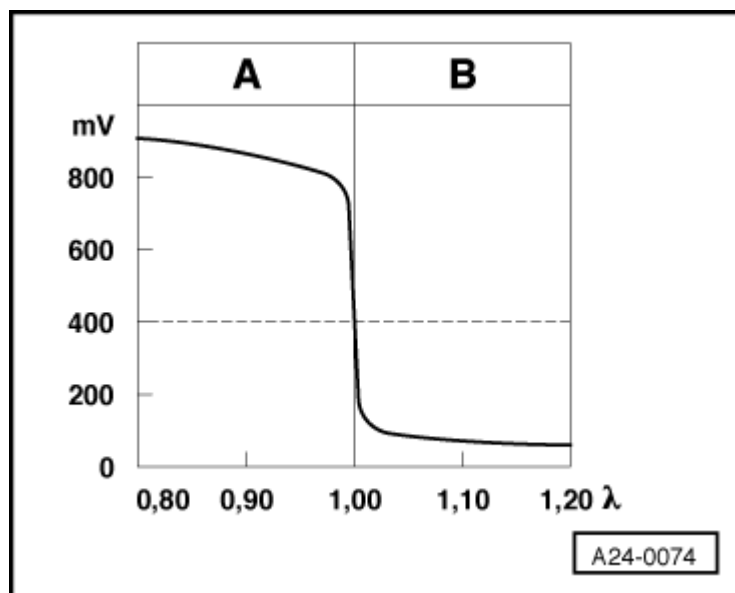
→ Lambda probe voltage U_λ in mV

A: High lambda probe voltage

- ◆ Rich mixture (excess fuel or lack of air)
- ◆ High CO value

B: Low lambda probe voltage

- ◆ Lean mixture (lack of fuel or excess air)
- ◆ Low CO value



Reading measured value block

Reading measured value block: Display groups 011 to 099

Display group 11, ignition timing:

Reading measured value block 11			⇒	<input type="checkbox"/> Indicated on display
...° BTDC	...° BTDC	± ...° crankshaft	0	
			Idling switch ▪ 0 = open ▪ 1 = closed	
			Ignition timing intervention for digital idling speed stabilisation	
			Ignition timing with knock control and digital idling-speed stabilisation (mean value of all cylinders)	
			Ignition timing without knock control and digital idling-speed stabilisation	

Notes on display zone 1:

- ◆ Ignition timing of 12° BTDC is displayed at idling speed (idling switch closed) in functions 04 "Basic setting" and 08 "Reading measured value block".
- ◆ In the event of an increase in engine speed (idle switch open) the current ignition timing without knock control and digital idling stabilisation is displayed.

Notes on display zone 2:

- ◆ Digital idling stabilisation is only active when the idling switch is closed.
- ◆ Knock control is active as of an engine load greater than 40% => Display group 013 or 014.

Notes on display zone 3:

- ◆ Digital idling stabilisation (DIS) is only active when the idling switch is closed.
- ◆ Ignition timing for DIS with idling switch open 0.0°crankshaft.
- ◆ DIS is blocked in function 04 "Basic setting", display 0.0°crankshaft
- ◆ Ignition timing intervention for DIS in function 08 "Reading measured value block" at idling speed without electrical loads 0.0 ±3.0°crankshaft

Display group 012, ignition timing:

Reading measured value block 12			⇒	<input type="checkbox"/> Indicated on display
... rpm	... %	1st map	...° crankshaft	
			Ignition timing retardation of knock control (mean value of all cylinders)	
			Ignition timing map switching ▪ 1st map = basic map (98 octane) ▪ 2nd map = map with reduced ignition timing (95 octane)	
			Engine load => Display group 003, display zone 2	
			Engine speed => Display group 003, display zone 1	

Notes on display zone 3:

- ◆ Ignition timing map switching is selected by the knock control

- ◆ The ignition timing difference between the 1st and 2nd map is approx. 3°crankshaft. The 2nd map is selected if ignition timing retardation (display zone 4) of approx. 4°crankshaft is detected.

Notes continued:

- ◆ 2nd map is selected in the event of:
 - Poor fuel grade (less than 95 RON)
 - Abnormal engine running noise (ancillaries loose)
 - Engine damage (oil combustion caused by defective piston)
- ◆ Ignition timing map switching is disabled if there is a knock sensor fault stored in the fault memory.
- ◆ For more precise assessment with 2nd map selected => Display groups 013 and 014.

Notes on display zone 4:

- ◆ Knock control is active as of an engine load greater than 40% => Display group 013 or 014.
- ◆ The ignition timing retardation values are only used when the knock control is "active".

Display group 013, Knock control:

Reading measured value block 13				⇒	<input type="checkbox"/> Indicated on display
1st map	...° cr/shaft	...° cr/shaft	...° cr/shaft		
			Ignition timing retardation by knock control, cyl. 3		
			Ignition timing retardation by knock control, cyl. 2		
			Ignition timing retardation by knock control, cyl. 1		
Ignition timing map switching => Display group 012, display zone 3					

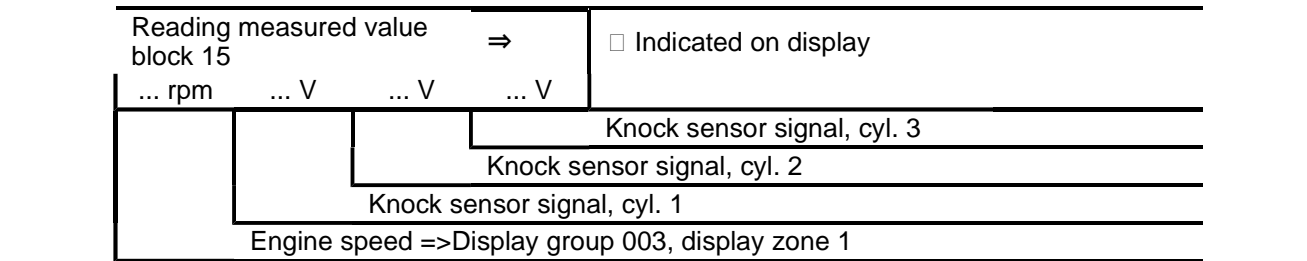
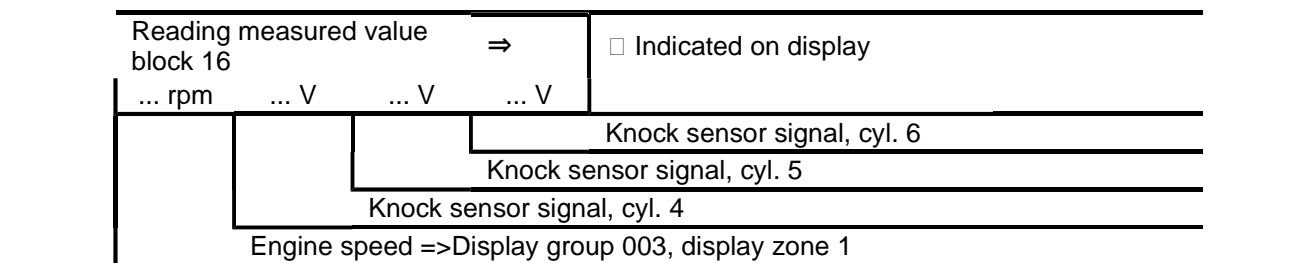
Display Group 14 - Knock control:

Reading measured value block 14				⇒	<input type="checkbox"/> Indicated on display
1st map	...° cr/shaft	...° cr/shaft	...° cr/shaft		
			Ignition timing retardation by knock control, cyl. 6		
			Ignition timing retardation by knock control, cyl. 5		
			Ignition timing retardation by knock control, cyl. 4		
Ignition timing map switching => Display group 012, display zone 3					

Notes on display groups 013 and 014:

- ◆ The knock control is active from an engine load of greater than 40%.
- ◆ At engine loads of more than 40%, the display will show the current ignition timing retardation values. At engine loads of less than 40% the display will constantly show the last values used.
- ◆ If there is audible knocking and no perceptible ignition timing retardation, increase the engine speed to above 3500 rpm for 5 seconds in order to activate the knock sensor fault detection (diagnosis) function.
- ◆ If there is a significant difference between the ignition timing retardation value for one of the cylinders and the values for the other cylinders, the following faults are possible:
 - Loose ancillaries
 - Corrosion at connector
 - Engine damage (e.g. oil combustion as a result of a defective piston/tooth broken on ring gear/defective piston pin)
- ◆ If the ignition timing retardation values for all the cylinders are high, the following faults are possible:
 - Corrosion at connector => Display groups 015 and 016
 - Tightening torque (20 Nm) not OK

- Open circuit.
- Knock sensor defective
- Loose ancillaries
- ◆ High ignition timing retardation values for all cylinders (banks 1 and 2) are caused by the use of fuel with a low octane number (less than 95 RON / USA). less than RON 91.

Display group 15, knock sensor signal:**Display group 016, knock sensor signal:****Notes on display groups 015 and 016, display zones 2, 3, and 4:**

- ◆ Differences of more than a factor of three between the min. and max. knock sensor signal in a display group may be caused by the following fault:
 - Corrosion at connector
- ◆ Signal differences of more than a factor of three between display group 015 (cylinder 1 to 3) and display group 016 (cylinder 4 to 6) may result from the following faults:
 - Corrosion at connector
 - Open circuit
 - Knock sensor defective
- ◆ If no faults are found when checking the knock sensor, wiring and connector, check the engine for loose ancillaries or engine damage => Display group 013 and 014.

Display group 017, EGR (if fitted):**Note:**

- ◆ Display 017 must only be observed for vehicles fitted with exhaust gas recirculation system (EGR).
- ◆ "0" is always displayed in zones 1, 2, and 4 if the vehicle is not fitted with EGR.
- ◆ There is no EGR on cold starting (-10 °C ... 30 °C), at idling speed and in function 04 "Basic setting".
- ◆ Display group 017 is only to be assessed in function 08 "Reading measured value block" because exhaust gas recirculation is automatically deactivated in function 04 "Basic setting".
- ◆ If diagnosis conditions are satisfied, the engine control unit always checks flow through EGR system after starting.
- ◆ Diagnosis conditions are only attained whilst driving at 80 ... 100 km/h in 4th or 5th gear. Diagnosis is active if diagnosis conditions are satisfied. The vehicle must then be driven within the constraints of the diagnostic conditions for 1 1/2 ... 5 minutes to obtain a diagnostic result.
EGR flow check diagnosis (EGR volume) is active as soon as the following conditions are satisfied:
 - Speed: Constant
 - Engine speed: 2000 ... 3000 rpm (=> Display group 003)
 - Engine load for control unit no. 8A0 906 266 C: 33 ... 60 %

From control unit no. 8A0 906 266 E: 30 ... 60 %

Reading measured value ⇒				<input type="checkbox"/> Indicated on display
block 17				
2	0	...%	... °C	
				EGR temperature
				▪ Determined by EGR temperature sensor -G98
				Engine load
				▪ 33 ... 60 % (control unit no. 8A0 906 266 C)
				▪ 30 ... 60 % (as of control unit no. 8A0 906 266 E)
				Time counter 2
				▪ Final value = 0 (control unit no. 8A0 906 266 C)
				▪ Final value = 160 (as of control unit no. 8A0 906 266 E)
				Time counter 1
				▪ Final value = 2 (control unit no. 8A0 906 266 C)
				▪ Final value = 1 (as of control unit no. 8A0 906 266 E)

Notes on display zones 1 and 2:

- ◆ Time counters are displayed in zones 1 and 2.
- ◆ Counters are incremented if diagnosis conditions are satisfied and decremented if not.
- ◆ Control unit no. 8A0 906 266 C:
Counter 1 switches from "0" to "1" as soon as counter 2 reaches "255". Counter 2 then switches to "0" and starts counting up again. Counter 1 switches from "1" to "2" as soon as counter 2 reaches "255" again.
- ◆ As of control unit no. 8A0 906 266 E:
Counter 1 switches from "0" to "1" as soon as counter 2 reaches "255". Counter 2 then switches to "0" and starts counting up again to "160".
- ◆ Diagnosis is completed as soon as both counters have reached their final value.
Diagnosis is however only found to be OK if EGR temperature in display zone 4 is greater than 65 °C at the end of diagnosis.
- ◆ Diagnosis is terminated if EGR temperature at end of diagnosis is greater than 65 °C.
- ◆ Diagnosis is terminated if EGR temperature at end of diagnosis is less than 65 °C.
- ◆ If the EGR flow check diagnosis is to be specifically repeated or repeated following a successful diagnosis, switch of the engine and re-start.

Display group 018: Idling speed stabilisation:

Reading measured value ⇒				<input type="checkbox"/> Indicated on display
block 18				
... %	... A	... %	... V	
				Engine control unit voltage supply => Display group 001, display zone 4
				Current regulation of idling stabilisation valve -N71
				Current consumption of idling stabilisation valve - N71
				Internal specified duty cycle of idling stabilisation valve -N71

Note on display zone 1:

The display shows the internal control unit computed value for the specified duty cycle without current and voltage correction.

Note on display zone 2:

The display shows the actual current consumption of the idling stabilisation valve -N71.

Notes on display zone 3:

- ◆ Positive/negative values signify increase/decrease in duty cycle to obtain specified current.
- ◆ If +60% is displayed for a lengthy period of time, this is an indication of contact resistance/ -N71 overheating; a display of -40% for a lengthy period indicates an interturn short circuit in -N71.

Display group 019, mixture preparation:

Reading measured value block 19 ⇒				<input type="checkbox"/> Indicated on display
... %	... g/s	... km/h	... ms	
				Injection period (mean value of all cylinders)
				Speed => Display group 003, display zone 4
				Intake air mass
				Engine power (internal calculated value)

Note on display zone 1:

The engine power is an internal control unit computed value calculated from the air intake under standard conditions (atmospheric pressure 1013 mbar, air temperature 20 °C).

Display group 022, traction control system:

Note:

- ◆ Display group 022 need only be observed on vehicles with traction control systems (ASR); can be seen from ASR warning lamp in dash panel insert.
- ◆ The wheel slip information for traction control (ASR) is calculated in the ABS/ASR control unit. If slip is detected, the ABS control unit requests the engine control unit to reduce torque. which is subdivided into 12 reduction stages.
- ◆ If the engine is cold (coolant temperature less than 20 °C), the reduction in engine torque is attained
 - In low reduction stages (1 ... 5) by ignition timing retardation;
 - In high reduction stages (6 ... 12) by briefly deactivating individual injectors.
- ◆ If the engine is warm (coolant temperature greater than 40 °C), the engine torque is reduced solely by way of brief deactivation of individual injectors.

Reading measured value block 22 ⇒				<input type="checkbox"/> Indicated on display
0	... ° crankschaft	... Nm	... Nm	
				Engine torque (actual torque) ▪ -68 ... 250 Nm
				Reduced engine torque (specified torque) ▪ -68 ... 250 Nm
				Ignition timing retardation as a result of traction control (cold engine only)
				Reduction stages ▪ 0 ... 12

Display Group 023 - Operating status:

	<input type="checkbox"/> Indicated on
--	---------------------------------------

Reading measured value block 23				⇒	display
X	X	X	X	X	
			X	X	Air-conditioner compressor shut-off ▪ 0 = air conditioner compressor is not shut off: ▪ 1 = air conditioner compressor is shut off by engine control unit
				X	Display always 0 Air conditioner compressor off/on ▪ 0 = air conditioner compressor off/vehicle not fitted with air conditioner ▪ 1 = A/C compressor on
	X				Gear recognition signal: ▪ 0 = selector lever set to R, D, 3, 2, or 1 (gear engaged/vehicle fitted with manual gearbox) ▪ 1 = selector lever set to "P" or "N"
		X			Gear shift signal (ignition timing retardation) ▪ 0 = ignition timing retardation not active/vehicle fitted with manual gearbox ▪ 1 = ignition timing retardation active
					Display always 0

Notes on display zone 2:

- ◆ Gear shift is not always displayed on account of brief signal.
- ◆ Checking ignition timing retardation on changing gear => Page [24-136](#)
- ◆ Checking gear signal => Page [24-131](#).

Notes on display zone 3:

- ◆ Checking air conditioner compressor shutoff =>Page [24-119](#)
- ◆ The air conditioner compressor is shut off by the engine control unit on accelerating from standstill and from low vehicle speed for approx. 12 seconds. If the accelerator pedal is released sooner, the time is reduced to min. 3 seconds. At full throttle, the air conditioner compressor is shut off by the automatic gearbox (kickdown switch)

Note on display zone 4:

If the air conditioner compressor is off => Display zone 3, display zone 4 indicates whether the compressor was shut off by the engine control unit.

Display group 099, Lambda control:

Reading measured value block 99			⇒	□ Indicated on display
...rpm	...%	... °C	λ-control ...	
				Lambda control ▪ Basic setting 04: λ-control OFF ▪ Reading measured value block 08: λ-control ON
				Coolant temperature => Display group 001, display zone 1
				Engine load => Display group 003, display zone 2
				Engine speed => Display group 003, display zone 1

Notes on display zone 4:

- ◆ For defined fault finding, the lambda control is switched off when display group 099 in function 04 "Basic setting" is selected and is switched on when this group is selected in function 08 "Reading measured value block".
- ◆ Lambda control is automatically re-activated on exit from function 04 "Basic setting".