

Motronic self-diagnosis
Read measured value block: Display Groups 7 to 24 and 35

Display Group 07: Idling speed stabilisation at idle (coolant temperature not below +80°C)

Read measured value block 7 ⇒		◀ Display	
.... g/s g/s	0.8 - 1.3	75 - 110
		Idling speed stabilisation learned value Engine code ABZ / AEW / AKG / AKJ: 75 - 100 Engine code AHC / AKH: 80 - 110	
		Control factor, current of idling speed stabilisation valve -N71	
		Inducted air mass (actual at idle)	
		Air mass (specified at idle): Engine code ABZ / AKG: 3.9 - 6.5 g/s Engine code AEW / AKJ: 3.4 - 6.5 g/s Engine code AHC / AKH: 3.9 - 7.1 g/s	

Note on Display zone 2:

The display shows the air mass measured by the air mass meter. Discrepancies between the specified air mass (Display zone 1) and the actual air mass (Display zone 2) indicate unmetered air between the air mass meter and the throttle housing or idling speed stabilisation valve. Short-term discrepancies of±0.3 g/s are insignificant.

Note on Display zone 3:

The heating up of the idling speed stabilisation valve solenoid changes the internal resistance. To achieve the opening of the idling speed stabilisation valve calculated by the control unit, the necessary current must flow. If this current is not reached because the solenoid resistance has increased due to heating, the duty factor must be altered in compensation to achieve the calculated current. When the engine is cold (room temperature), the figure is in the region of 1.0. When the solenoid is heated, the control factor increases. Values above 1.3 indicate contact resistance in the wire connection between the engine control unit and the idling speed stabilisation valve.

Note on Display zone 4:

The current for the idling speed stabilisation valve necessary for a specific air flow is calculated by the control unit. If this air flow is not reached, because the flow resistance has increased due, for example, to dirt clogging the valve, the idling speed stabilisation valve must be continually opened somewhat wider to compensate. This discrepancy is detected by the control unit and is compensated by means of an altered pilot control value (learning). Major discrepancies indicate dirt-clogging or impeded movement of the valve.

Display Group 08: Fuel consumption (idling and driving)

Read measured value block 8 ⇒				◀ Display
0 - 7000 rpm	15 - 28 %	1.4 - 2.0 l/h	0 km/h	
Vehicle speed				
Fuel consumption (at idle)				
Engine load (at idle):				
Engine code ABZ / AEW / AKG / AKJ: 15 - 28 %				
Engine code AHC / AKH: 9 - 16 %				
Actual engine speed (display in increments of 40)				

Notes on Display zone 2:

- ◆ At full throttle, values of 80 - 100 % are reached.
- ◆ The maximum engine load decreases by approximately 10 % for every 1000 m above sea level.

Notes on Display zone 3:

- ◆ Not suitable for fuel consumption measurement in litres/100 km.
- ◆ The specified display value applies only to idling (power to overcome friction losses), without load from ancillaries (air conditioner/heater, alternator, power steering pump).

Display Group 09: Torque reduction during gearshift

Read measured value block 9 ⇒				◀ Display
0 - 7000 rpm	0 - 410 Nm Nm	No. tor red. Torque red.	

				Gearshift function: Engine code ABZ up to model year 1996: Ignition timing retard in degrees (crankshaft angle) Engine code ABZ/AKG from model year 1997: No torque reduction / torque reduction Engine code AEW/AHC/AKJ/AKH: No torque reduction / torque reduction (Display on vehicles with manual gearbox: No torque reduction)
			Actual torque 0 - 400 Nm	
		Specified torque (request from automatic gearbox control unit)		
Engine speed (display in increments of 40)				

Notes on Display Group 09:

- ♦ This Display Group can be used to assess how the engine torque during gearshifting, and therefore the gearshift jolt, is reduced by retarding the ignition timing.
- ♦ The engine control unit informs the gearbox control unit of the current torque (actual torque).
- ♦ Based on this information, the gearbox control unit calculates whether a torque reduction is necessary during a gear-shift, and the amount of torque reduction required (specified torque).
- ♦ At low engine load the ignition timing is not retarded.

Display Group 10: Lambda learned values at idle and part throttle (coolant temperature not below +80°C)

Read measured value block 10				⇒	◀ Display
-14 - +9	-14 - +9	-10 - +10	-10 - +10		
%	%	%	%		
			Lambda learned value at part throttle, cyl. bank 2		
		Lambda learned value at part throttle, cyl. bank 1			
	Lambda learned value at idle, cyl. bank 2				
Lambda learned value at idle, cyl. bank 1					

Notes on Display Group 10:

- ♦ When power is disconnected from the control unit, all values are reset to 0.0 %. Basic setting.
- ♦ In case of lambda learned value differences of more than 8 % between cylinder bank 1 and bank 2, the following faults may have occurred:

- Spark plug defective
- Injector defective (leaking, clogged)
- Lambda probe defective, dirty
- Mechanical basic setting (timing) of engine not OK

Test table, Display Group 10

Display zone	Display on V.A.G 1551	Fault cause	Fault remedy
1, 2, 3, 4	Low lambda learned values	<ul style="list-style-type: none"> - Low lambda learned values at idle with normal lambda learned values at part throttle: oil thinning (high fuel content in oil) possible - Injector leaking - Display zones 1, 2, 3, 4 display too low: fuel system pressure too high - Air mass meter -G70 defective - Lambda probe heating defective or lambda probe dirty 	<ul style="list-style-type: none"> - Disappears after motorway drive or oil change - Check injectors =>Page 24-32 - Check fuel system pressure and holding pressure => Page 24-21 - Check air mass meter -G70 =>Page 24-93 - Check lambda probe and probe heater =>Page 24-46 - Check activated charcoal filter system solenoid valve -N80 => Page 24-70

Test table, Display Group 10

Display zone	Display on V.A.G 1551	Fault cause	Fault remedy

1, 2, 3, 4	High lambda learned values	<ul style="list-style-type: none"> - High lambda learned values at idle with lower lambda learned values at part throttle: unmetered air in intake manifold area possible - Injector clogged - Display zones 1, 2, 3, 4 high: air mass meter - G70 defective - Fuel system pressure too low (fuel supply) - Unmetered air between -G70 and throttle valve - Unmetered air at manifold gasket - Lambda probe heater defective or lambda probe dirty 	<ul style="list-style-type: none"> - Eliminate cause - Check injectors => Page 24-32 - Check air mass meter -G70 =>Page 24-93 - Check fuel system pressure and holding pressure => Page 24-21 - Eliminate cause - Check lambda probe and probe heater =>Page 24-46
------------	----------------------------	---	--

Display Group 11: Lambda control at idle (coolant temperature not below +80°C)

Read measured value block 11				⇒	◀ Display
-12.5 to 12.5 %	-12.5 to 12.5 %	-0.17 to +0.9 V	-0.17 to +0.9 V		
			Lambda probe voltage, cylinder bank 2		
			Lambda probe voltage, cylinder bank 1		
	Lambda control value at idle, cylinder bank 2				
Lambda control value at idle, cylinder bank 1					

Test table, Display Group 11

Display zone	Display on V.A.G 1551	Fault cause	Fault remedy
1 and 2	Outside tolerance range	<ul style="list-style-type: none"> - Negative display, engine too rich; effect: lambda control adjusts to lean - Positive display ("+" not displayed), engine too lean; effect: lambda control enriches 	- Wait approx. 30 seconds for display to stabilise

		- Unmetered air - Injector defective - Lambda learned values at control limit	- Eliminate cause - Check injector =>Page 24-25 - Read measured value block, Display Group 10 => Page 01-120
3 and 4	Below -0.17 V Above +0.9 V	- Not possible - Short circuit to positive in signal wire of lambda probe	- Check wiring connection =>Page 24-49

Display Group 12: Tank breather at idle (coolant temperature not below +80°C)

Read measured value block 12				⇒	◀ Display
0 - 65 %	-5 - +85 %	-20 - +18 %	TB active or λ adaption		
				"TB active" means the activated charcoal filter solenoid valve 1 is pulsed (6 minute cycle) "λ adaption" means the activated charcoal filter solenoid valve 1 is continuously closed (1 minute cycle)	
				Lambda correction value with tank breather active	
				Filling level of activated charcoal filter	
				Duty factor of activated charcoal filter solenoid valve 1	

Notes on Display Group 12:

- ◆ At idle the engine can only process a certain maximum fuel volume from the ACF system. For this reason the solenoid valve opening is limited to 65 % at idle. At part-load and full-load the duty factor can rise to 99 %.
- ◆ During λ adaption the lambda control "learns" the operating conditions excluding the deviation due to petrol fumes from the activated charcoal filter (ACF valve closed).

Notes on Display Group 12:

- ◆ At -5 % filling level there are no petrol fumes in the ACF.
- ◆ At +95 % filling level activated charcoal filter is full of petrol fumes.
- ◆ At +100 % filling level the ACF valve is leaky, e.g. due to foreign bodies.

Notes on Display zone 4:

- ◆ During the "TB active" phase (Display zone 4) the engine control unit calls for a specific volume of fuel from the ACF system. If, with the activated charcoal filter filled to a high level, the ACF valve is closed further to maintain the specified ACF rate (low duty factor), the reaction of the λ control is to change the correction value (Display zone 3). If this reaction is lower than expected, because in the meantime petrol fumes from the fuel tank have increased the filling level, the control unit calculates a higher filling level. If an ACF valve is defective (e.g. leaking due to foreign bodies), the reduction in the ACF rate is likewise not reached. The duty factor is reduced further until the lower control limit is reached. From this the system incorrectly calculates a filling level of 100 %.
- ◆ With 18 % fuel from the ACF system the λ control runs in the neutral range, i.e. without a correction value. When a smaller quantity of petrol fumes emerges from the ACF system, the λ control must enrich (with empty ACF: 18 %). If a very high percentage of fuel emerges from the ACF system, the λ control must adjust to lean. This adjustment to lean may be up to 20 % (Display zone 3).

Display Group 13: Engine code ABZ / AHC / AKG / AKH, knock control (driving)

Read measured value block 13				⇒	◀ Display
0 - 15° CA	0 - 15° CA	0 - 15° CA	0 - 15° CA		
			Ignition timing retarded by knock control: cylinder 4		
			Ignition timing retarded by knock control: cylinder 3		
		Ignition timing retarded by knock control: cylinder 2			
Ignition timing retarded by knock control: cylinder 1					

Display Group 14 Engine Code ABZ / AHC / AKG / AKH, knock control (driving)

Read measured value block 14				⇒	◀ Display
0 - 15°	0 - 15°	0 - 15°	0 - 15°		
CA	CA	CA	CA		
			Ignition timing retarded by knock control: cylinder 8		
			Ignition timing retarded by knock control: cylinder 7		
		Ignition timing retarded by knock control: cylinder 6			
Ignition timing retarded by knock control: cylinder 5					

Display Group 13: Engine Code AEW/AKJ, knock control (driving)

Read measured value block 13 ⇒				◀ Display
0 - 12° CA	0 - 12° CA	0 - 12° CA	0 - 12° CA	
			Ignition timing retarded by knock control: cylinder 4	
			Ignition timing retarded by knock control: cylinder 3	
			Ignition timing retarded by knock control: cylinder 2	
			Ignition timing retarded by knock control: cylinder 1	

Display Group 14 Engine Code AEW, knock control (driving)

Read measured value block 14 ⇒				◀ Display
0 - 15° CA	0 - 15° CA	0 - 15° CA	0 - 15° CA	
			Ignition timing retarded by knock control: cylinder 8	
			Ignition timing retarded by knock control: cylinder 7	
			Ignition timing retarded by knock control: cylinder 6	
			Ignition timing retarded by knock control: cylinder 5	

Notes on knock control:

- ◆ Knock control is active over the entire engine speed range above an engine load greater than 30 %. When 30 % engine load is exceeded, the current ignition timing retard values are displayed.
- ◆ If the ignition timing retard value of one cylinder differs significantly from the others, the following faults may have occurred:
 - Loose auxiliary components
 - Corrosion on connector
 - Engine damage (e.g. oil burning in case of piston damage)

- ♦ If high ignition timing retard values are indicated at all cylinders, the following faults may have occurred:
 - Knock sensor tightening torque (20 Nm) not OK
 - Open circuit in wiring
 - Knock sensor defective
 - Loose auxiliary components
 - Poor fuel quality
- ♦ Average ignition timing retard values due to fuel quality (at outside temperature 20°C, approx. 2000 rpm and full-throttle):

Engine code ABZ/AKG	Engine code AEW/AKJ	Engine code AHC/AKH
RON 98 0 - 8 °CA	RON 95 0 - 8 °CA	RON 98 0 - 8 °CA
RON 95 3 - 10.5 °CA	RON 91 4 - 12 °CA	RON 95 3 - 10.5 °CA
RON 91 6 - 15 °CA		

Display Group 15: Knock control (idling)

Read measured value block 15 ⇒				◀ Display	
0.273	0.273	0.273	0.273		
to 2.5 V	to 2.5 V	to 2.5 V	to 2.5 V		
				Knock sensor signal, cylinder 4	
				Knock sensor signal, cylinder 3	
				Knock sensor signal, cylinder 2	
				Knock sensor signal, cylinder 1	

Display Group 16 Knock control (idling)

Read measured value block 16 ⇒				◀ Display	
--------------------------------	--	--	--	-----------	--

0.273 to 2.5 V	0.273 to 2.5 V	0.273 to 2.5 V	0.273 to 2.5 V	
			Knock sensor signal, cylinder 8	
		Knock sensor signal, cylinder 7		
	Knock sensor signal, cylinder 6			
Knock sensor signal, cylinder 5				

Notes on Display Groups 15 and 16:

- ◆ At higher revs the signal voltage of the knock sensors may reach values of up to approx. 30 volts.
- ◆ In the case of a difference of more than 50 % between the values in Display Group 15 (cylinders 1 to 4) and Display Group 16 (cylinders 5 to 8), the following faults may have occurred:

- Contact resistance in wiring connections and connectors (corrosion)

- Knock sensor defective

- ◆ If no faults are detected by electrical testing of the knock sensor, the wiring and the connectors, the engine should be checked for loose auxiliary components or mechanical damage.

Display Group 17: Misfire detection (driving)

Read measured value block 17			⇒	◀ Display
0000 - 7000 rpm	10 - 100 %	0	ADP. runs ADP. OK	
			Sender wheel check (ring gear check)	
			Misfires per 200 crankshaft revolutions (all cylinders)	
	Engine load			
Engine speed (display in increments of 40)				

Note on Display zone 3:

To detect misfires at higher loads than at idle, carry out a test drive if necessary.

Note on Display zone 4:

The display "ADP. runs" (adaption running) means the sender wheel check is not yet completed. The sender wheel check can only be performed during overrun. Misfire detection is restricted while adaption is running.

Display Group 18: Misfire Detection (driving)

Read measured value block 18 ⇒				◀ Display
ADP. runs	-0.5 to	-0.5 to	-0.5 to	
ADP. OK	+0.5 ° CA	+0.5 ° CA	+0.5 ° CA	
				Correction value, ring gear segment 4
				Correction value, ring gear segment 3
				Correction value, ring gear segment 2
				Sender wheel check (ring gear check)

Note on Display Group 18:

- ◆ The misfire detection functions over the entire engine speed range above 15 % engine load.
- ◆ The display shows the number of misfires for the 200 crankshaft revolutions just completed.
- ◆ For ignition misfire detection, the system checks the acceleration of the crankshaft as each cylinder fires. The respective accelerations (change in rotation speed) of the cylinders are compared with each other. To be able to record this acceleration reliably, the toothed disk for the speed sender is checked for true running during overrun at rotation speeds of 1520 - 3520 rpm, i.e. when there is no ignition (ignition spark) and therefore no acceleration. A slight out-of-true resulting from production tolerances is stored as the initial value.

Display Group 19: Misfire detection (driving)

Read measured value block 19 ⇒				◀ Display
0	0	0	0	
				Misfires per 200 crankshaft revolutions (cylinder 4)
				Misfires per 200 crankshaft revolutions (cylinder 3)
				Misfires per 200 crankshaft revolutions (cylinder 2)
				Misfires per 200 crankshaft revolutions (cylinder 1)

Display Group 20 Misfiring Detection (driving)

Read measured value block 20 ⇒				◀ Display
0	0	0	0	
				Misfires per 200 crankshaft revolutions (cylinder 8)
				Misfires per 200 crankshaft revolutions (cylinder 7)
				Misfires per 200 crankshaft revolutions (cylinder 6)
				Misfires per 200 crankshaft revolutions (cylinder 5)

Notes on Display Group 19 and 20:

- ♦ The display shows the number of misfires of the relevant cylinder for the 200 crankshaft revolutions just completed.
- ♦ If the cylinder combinations 1-4-6-7 or 5-8-3-2 occur, this indicates a defect in the respective ignition coil power output stage.

Display Group 21 Operating status (idling and driving)

Read measured value block 21 ⇒				◀ Display
Neutral	A/C High	Compr. ON	No. tor red.	
Gear engag.	A/C Low	Compr. OFF	Torque red.	
				Torque reduction during gearshift (automatic gearbox) (Ignore display on vehicles with manual gearbox)
				AC compressor
				Air conditioning system High = high cooling/heating power Low = low cooling/heating power
				Selector lever position (Ignore display on vehicles with manual gearbox)

Display Group 22: Variable intake manifold change-over function (driving)

Read measured value block 22 ⇒				◀ Display
0000 - 7000	0 - 10	-40 - 125	IMC-V OFF	

rpm	ms	° C	IMC-V ON	
				Variable intake manifold change-over: Engine code ABZ/AEW/AKG/AKJ: Rising engine speed: intake manifold change-over at approx. 4200 rpm Falling engine speed: intake manifold change-over at approx. 4000 rpm Engine code AHC/AKH: Rising engine speed: intake manifold change-over at approx. 4500 rpm Falling engine speed: intake manifold change-over at approx. 4300 rpm
				Coolant temperature
				Engine load: (injection duration) Engine code ABZ / AEW / AKG / AKJ: 0 - 10 ms Engine code AHC / AKH: 0 - 20 ms
				Engine speed (display in increments of 40)

Display Group 23: ASR (only vehicles with traction control)

Read measured value block 23			⇒	◀ Display
0000 - 7000	0 - 410	0 - 315	TCSn. activ	
rpm	Nm	Nm	TCS active	
				Operating status of traction control (ASR)
				Actual torque (feedback from Motronic to ASR/ABS control unit)
				Specified torque (request to reduce torque from ASR/ABS control unit)
				Engine speed (display in increments of 40)

Notes on Display zone 2 and 3:

- ◆ When traction control is inactive, i.e. when the ASR is not requesting a torque reduction, Display zone 2 shows a significantly higher value than the maximum possible 315 Nm of the engine. This is a purely theoretical value (up to 410 Nm) which was only chosen to be so high as to provide a broad "safety margin" between it and the actual torque. This ensures that the request for torque reduction is detected by the engine control unit under all circumstances.
- ◆ The difference between the values in Display zones 2 and 3 (specified and actual) diminishes during the period in which the ASR is active.

Display Group 24: Operating state of rear window heater (idling)

Read measured value block 24				⇒	◀ Display
.... rpm rpm	85 - 105 °C	R.wn.h.OFF R.wn.ht.ON		
				Operating state: Rear window heater OFF Rear window heater ON	
				Coolant temperature	
				Engine speed (specified)	
				Engine speed (actual)	

Display Group 35: Air-shrouded injectors "System in Basic Setting" Function 04, only for vehicles with MVEG III:

System in basic setting 35				⇒	◀ Indicated on display
g/s	650 - 6300 rpm		AS-I OK		
				Operating state: A-IV OK A-IV not OK Test ON Test OFF	
				ignore	
				Idling speed	
				Air mass, idling speed control	