

Diagnosis

Diagnosis using the HHT

Activation applications

Activation using HHT	Possible symptoms, no DTC's stored	Examples of possible causes in system (refer to corresponding DM)
Camshaft	Rough idle, poor performance	Adjustable camshaft control
Secondary air injection pump	Excessive emissions	Secondary air injection piping, oxygen sensor, secondary air injection pump
Injection valve	Rough idle, poor performance	Injection valve, engine control module
Throttle valve	Idle speed too high, rough idle, motor hunts	Poor idle control, position sensor
Electric fuel pump	Repairs to fuel system (relieve fuel pressure)	Repairs to fuel system
Evaporative emission control system	Fuel odor	Purge valve, leak in EVAP system
Purge control valve Carbon canister	Test EVAP system, check for system integrity	
Exhaust gas recirculation	Rough idle, high fuel consumption	EGR valve, (binding)
Air/fuel mixture control	Off-idle or warm-up faults	Ignition coil, air leak, injection valve

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Activation using HHT	Possible symptoms, no DTC's stored	Examples of possible causes in system (refer to corresponding DM)
Electric cooling fan	Motor temperature too high	Cooling fan defective, engine control module, wiring
Ignition control	Rough idle, poor performance	Ignition coil, spark plugs, wiring
Switchable intake manifold	Poor performance	Switchover valve, vacuum lines, vacuum tank
Compression test	Rough idle, poor starting, poor performance	Check for mechanical faults
Supercharger	Poor performance	Supercharger, air flap/air filter motor, engine control module
Supercharger clutch	Poor performance	Supercharger, wiring, engine control module
Air intake	Poor performance	Air intake switchover valve/motor, engine control module

Activation functions

Activation using HHT	Function	
Camshaft	ON	Motor idles poorly (uneven)
Secondary air injection pump	ON	Oxygen sensor voltage goes to < 40 mV in max 60 s.
Injection valve	OFF	Idle speed drops briefly when an injector is switched off. Idle quality deteriorates.
	ON	Idle quality improves when the injector is switched on again.
Throttle valve	OPEN	Idle speed increases as throttle angle increases.
	CLOSED	Idle speed decreases as throttle angle decreases.
Electric fuel pump	OFF	OFF: Fuel pressure drops and the motor stalls.
EVAP system	ON	Purge valve ON: Purge valve cycles
Purge control valve Carbon canister	ON	Test EVAP system, for leaks, engine off.
Exhaust gas recirculation	ON	Motor runs poorly, stalls.
Air/fuel mixture control	RICH\LEAN	LEAN: Idle quality deteriorates

Activation functions

Activation using HHT	Function	
Electric cooling fan	PLUS/MINUS	Cooling fan can be regulated between 20 and 90%.
Ignition control	ON	Motor runs somewhat poorly recognizable by poor idle quality. If no change in idle quality, check ignition circuit for faults.
Switchable intake manifold	ON	ON: Operation of switchover valve is visible under motor cover.
Compression test		Test for internal cylinder damage.
Supercharger clutch	ON	Supercharger clutch engages
Air flap/air filter actuator	ON	Air flap can be heard switching.

Additional information to the actual value screens

HHT actual value screen	Possible symptoms, no DTC's stored	Possible faults in system
Testing engine at idle, emissions testing	Complaints of poor performance	Refer to corresponding DM volume
Testing engine	Test of motor functions Check idle speed control system	Refer to corresponding DM volume
Engine, cold start	Engine won't start or starts with difficulty	Refer to corresponding DM volume
Engine, warm-up	Complaints during warm-up	Refer to corresponding DM volume
Engine performance	Testing on a chassis dynamometer Poor acceleration Poor performance High fuel consumption	Refer to corresponding DM volume
Cruise control	Complaints with cruise control operation	Refer to corresponding DM volume
Drive authorization system	Engine will not start	Refer to corresponding DM volume
Cylinder balance test (smooth running function)	Engine complaints (mechanical, engine management)	Refer to corresponding DM volume
Compression testing	Engine shakes Engine starts with difficulty Blue exhaust smoke after start up Poor performance	Refer to corresponding DM volume
Tests completed	After repaired faults	Refer to corresponding DM volume

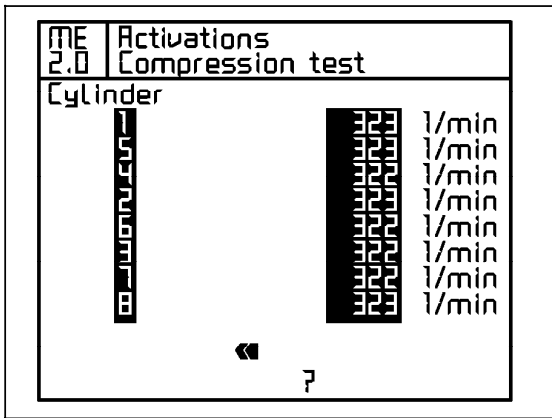
Compression Testing

Compression can be tested as an input using the HHT.

A mechanical problem may be present if the difference in engine speed is > 8 rpm for engines 104/112/113, and > 5 rpm for engine 111.

Any engine speed difference will not present itself in the same manner in all engines, so no conclusions can be drawn concerning the affected cylinder.

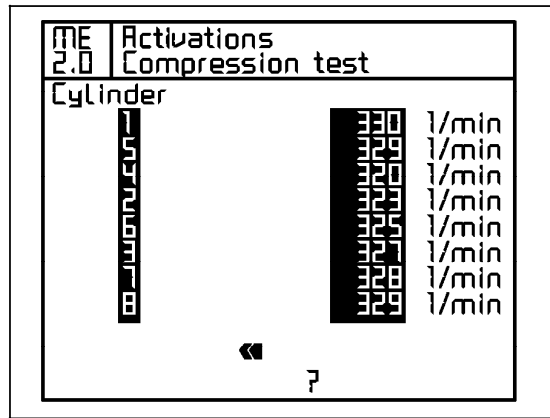
If the engine speed difference is greater than the set value, perform a compression/cylinder leakage test to determine the affected cylinder.



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Figure 1

Good compression test
Engine 113



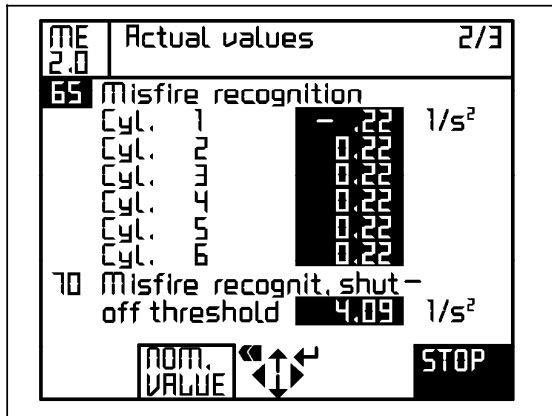
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Figure 2

Failed compression test
Engine 113
Example:
Cylinder 1 330 rpm (max. value)
Cylinder 4 320 rpm (mni. value)
Difference 10 rpm

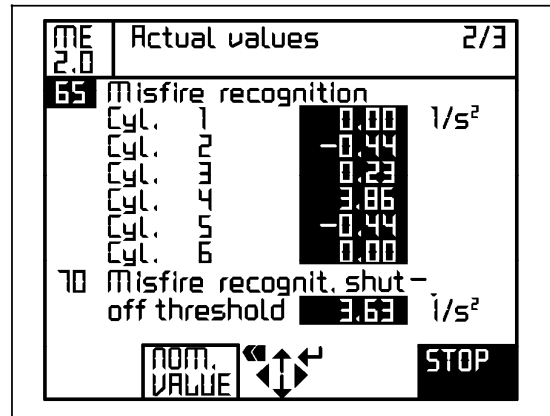
Cylinder balance test

The cylinder balance test must be performed at idle. If the misfire recognition shutoff threshold is exceeded, a fault will be stored and at the same time the fault count will increase. After repairs, clear the diagnostic memory.



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Figure 3



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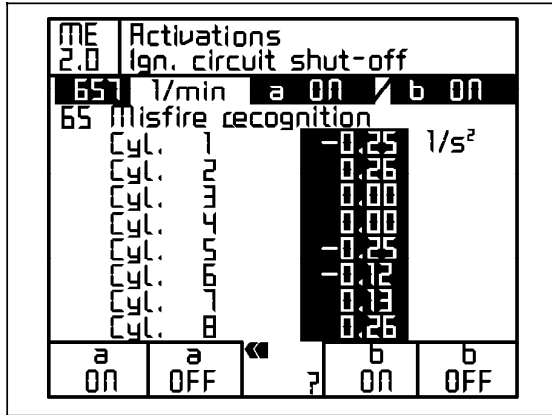
Figure 4

Good cylinder balance test
 Engine 112
 1/s²=Engine speed difference
 between cylinders

Failed cylinder balance test
 Engine 112
 Fault in cylinder 4

Ignition circuit shutoff

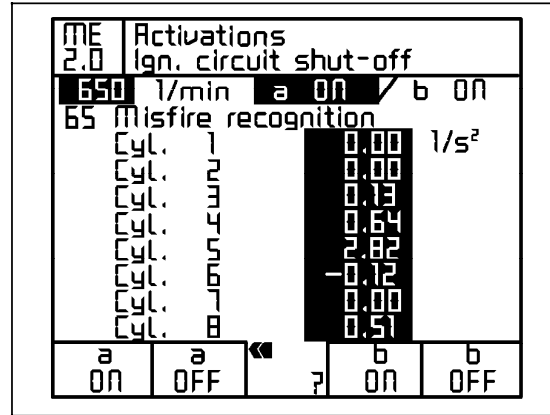
Ignition circuit shutoff can only be performed on Motor 113.



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Figure 5

Good ignition shutoff test
Engine 113



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Figure 6

Failed ignition shutoff test
Engine 113
Ignition circuit b switched off
Fault in cylinder 5, ignition circuit a