Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
Catalytic Converter Monitoring	P0420	Time for Rear O2 sensor signal to go low. Catalyst monitoring performed at idle. Wait for throttle closed period, then a number of front O2 sensor oscillations to measure average fuel trim value. Then rich fueling to purge oxygen, wait for high rear O2 sensor value to indicate purged cat - or max time, then lean fueling and measure time for rear O2 sensor signal to fall. Time measurement in phase 3 begins when front O2 sensor output goes below 450 mV and stops when rear O2 sensor output goes below 450 mV	Time for rear O2 to go low. Value corrected to standard flow and catalyst temperature.	< 1400 msec	Delta load Vehicle speed Engine speed Load MAF Min time after engine start Fuel control Catalyst temperature Throttle Nr of Front O2 oscillations for averaged integrator value. Rich fuelling time Evaporative canister purge Rear O2 sensor voltage before switch to lean Lambda integrator Brake switch status changes No DTC set, pending or confirmed Battery voltage	-2 < delta load < 2 g/s < 15,5 mph 900 +200/-100 rpm 3,5 – 9 g/s > 230 s Closed loop - then rich - then lean 450 - 700 °C, modeled Closed 2 1,5 to 10 seconds Not active Time according to value in matrix, examples: 640 mV + 5 sec. 0 ± 15% Max 3 Front O2 sensor Rear O2 sensor MAF sensor, P0101, P0102, P0103 11 to 18 V	13 - 30 sec, Once / DCY	Statistical treatment, up to 6 DCY, after limit is reached: immediate MIL illumination
Synchronization error	P0340	Rationality, Sync error, high due to soot	Ignition	Not synchronized	Engine speed Revolutions	Running >500 after start phase	600 revs Once / DCY	Two DCY
	P1340	Rationality, Sync error low	Ignition	Not synchronized	Engine speed Revolutions	Running >500 after start phase	600 revs Once / DCY	Two DCY
Misfire Detection	P0300 to P0304	Ionization detection At idle: combination of ionization and crankshaft speed evaluation	Misfire counter 1000 revs Misfire counter 200 revs	> 3% See separate map	Engine speed Load change transient MAP (for Man Transmission) Torque Fuel cut Battery voltage Enabling delay when Coolant temp is below – °C at start	> idle rpm at warm engine – 150 rpm < ± 3,0 kPa/combustion > 0 and not in disable region Not active > 10.0 V Delayed until Coolant temp > 21°C	1000 OR 200 revs Continuous	Two DCY / MIL blink
Misfire Detected With Low Fuel	P0313	Same as above	Misfire counter 200 revolutions	See separate map	Same as above Fuel level	Same as above < 8% (5 liters)	200 revolutions Continuous	MIL blink
Detect signals	P1312	Signal high during fuel cut OR at start OR compared to defined window	Detect signal	High	Engine speed Engine synchronization	Engine started During or after	125 revolutions Continuous	Two DCY
	P1341 to P1344	Combustion signal cyl 1 OR 2 OR 3 OR 4 missing	Detect signal	Low	Engine speed Engine synchronization No DTC set, pending or confirmed	Engine started During or after Powertrain relay rationality, P0685	45 revolutions Continuous	Two DCY
Ion detection system error	P1315	Ion Detect Module connector disconnected	Combustion AND ignition signals	= 0 for more than 25 revs	Engine speed Fuel cut Load	Running > 400 rpm Not active > 10 mg/combustion	25 revolutions Continuous	Two DCY
Ion detect module ignition trig input	P1350 to P1354	All or single cylinder ignition trig input to ion detect module missing	Knock signal information	= 0 at combustion stroke	Engine speed Fuel cut	Running > 400 rpm Not active	8 revolutions Continuous	Two DCY

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions		Time Required	MIL Illumin.
					Load	> 10 mg/combustion			
Knock signal	P0325	Faulty knock signal	Knock signal	No knock pulses	Accelerator pedal	Not released		8 revolutions	Two DCY
					Engine speed	Engine started		Continuous	
					Coolant temperature	> 60°°C			
Injector Circuit	P0201 to P0204	El. Check – Min, max, open circuit	Short cut OR open circuit	Short cut to ground, battery or not connected	Battery voltage	> 6.0 V		1 sec	Two DCY
					Engine speed	Engine moving OR running		Continuous	
					No DTC set, pending or confirmed	Powertrain relay rationality, P0685			
Ignition coil trigs 1, 2, 3 & 4	P2300, P2303, P2306, P2309	Control circuit range check min	Short-cut	To ground or not connected	Engine speed	Engine running		1 sec	Two DCY
					Supply voltage	> 11 V		Continuous	
	P2301, P2304, P2307, P2310	Control circuit range check max	Short-cut	To battery voltage	Engine speed	Engine running		1 sec continuous	Two DCY
					Supply voltage	> 11 V		Continuous	
EVAP Canister Vent Valve	P0498	Circuit continuity check	Short-cut	To ground or not connected	Engine speed	Running		6 sec, Continuous	Two DCY
					Battery voltage	> 11 V			
	P0499		Short-cut	To battery voltage	Purge	Not active		At engine start	
					No DTC set, pending or confirmed	Purge valve, P0441, P0444, P0445			
						Powertrain relay, P0685, P0686, P0687			
	P0446	Rationality check	Fuel tank pressure raise after EVAP leak check	Not raised 400 Pa within 8 sec	Fuel tank pressure	< -800 Pa		Once per DCY	Two DCY
					EVAP test	Not active		Leak check time + 8 sec	
					Canister Vent Valve	Not active			
					Fuel tank pressure sensor	Adaption performed			
					Diagnostic ran and passed for	Canister Vent Valve circuit, P0498, P0499			
					IAT	> +4 °C			
					No DTC set, pending or confirmed	Purge valve, P0441, P0444, P0445			
						Fuel tank pressure sensor, P0451, P0452, P0453, P1451			
						Powertrain relay, P0685, P0686, P0687			
					Purge rationality diagnostic	Not active			
EVAP leak test General conditions						Enable	Disable		
					ECT & IAT	> +4 °C	< +4 °C		
					Ambient temperature	+ 35 deg C	+ 35 deg C		
					MAF Δ	-	±90 mg/comb		
					Fuel tank pressure	< 200 Pa	< 200 Pa		
					MAP	< -15 kPa	< -15 kPa (during pull-down)		
					Max number of vapor disables in DCY	2	2		
					Ramp 0: Slosh				
					Pressure change in expected direction		> 70 Pa		
					Pressure change in opposite direction		> 70 Pa		
					Ramp 0: ECT	> 40 °C			
					Ramp 1: Slosh				
					Pressure change in expected direction		> 300 Pa		
					Pressure change in opposite direction		> 160 Pa		
					Ramp 2: Slosh				
					Pressure change in expected direction		> 111 Pa		
					Pressure change in opposite direction		> 80 Pa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions		Time Required	MIL Illumin.
					Battery voltage	10 - 16 Volts			
					Fuel cut	Not active			
					Canister vent valve rationality test	Not active			
					No DTC set, pending or confirmed	Fuel tank pressure sensor, P0451, P0452, P0453, P1451			
						Tank pressure adaption, P1452, P1453, P1492, P1493			
						Vehicle speed sensor, P0501			
						Canister Vent Valve, P0446, P0498, P0499			
						Purge valve, P0441, P0444, P0445			
						Brake light switch, P0719, P0724			
						ECT sensor, P0115, P0117, P0118, P0119			
						IAT sensor, P0111, P0112, P0113			
						ABS communication, P1625			
					Time between test attempts	30 sec			
					at Vehicle speed (hot test)	> 27,3 mph			
					System power-up	In present DCY, or no test in previous DCY			
					Purge	Not active			
					Purge ramp	Finished, not required for cold start DCY (<40°C)			
					Purge vapor HC content	Max. 50% of engine's fuel via purge			
					Fuel volume	15 to 85 %			
					Fuel level	Updated			
					Lambda control	Closed Loop			
					Catalyst diagnostic	Not active			
					AIR diagnostic	Not active			
					O2 sensor diagnostic	Not active			
						Enable	Disable		
Idle test					Vehicle speed	0	> 0	Once / DCY	
					Brake activations	Max 2	max 2	25 sec	
					Purge adaption	> -5%			
					Purge HC Δ vs. start		> 20%		
					Lambda integrator Δ vs. start		> 12,5%		
					Ambient pressure Δ	< 4kPa/3 min	> 4kPa/3 min		
					Fuel tank pressure	> -500 Pa	< -2100 Pa		
					Ramp 0 vapor generation		> 4 Pa/s		
Vehicle moving test					Vehicle speed	43,5 – 80,8 mph		Once / DCY	
					Vehicle speed Δ vs. start		< ± 5 mph	35 s	
					Brake activations	Max 1	Max 1		
					Purge adaption	> -7%			
					Purge HC Δ vs. start		> 15,5%		
					Lambda integrator Δ vs. start		> 10%		
					Ambient pressure Δ	< 4kPa/3 min	> 4kPa/3 min		
					Fuel tank pressure	> -700 Pa	< -2750 Pa		
					Ramp 0 vapor generation		> 1,1 Pa/s		
Filler cap test, big leak / high vapor generation					Vehicle speed	31,1 – 93,2 mph		Max 50 times /DCY	
					Vehicle speed Δ vs. start		> ±7,5 mph		
					Brake activations	Max 1	Max 1		
					Purge adaption	> -24%			
					Purge HC Δ vs. start		> 30%		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions		Time Required	MIL Illumin.
					Lambda integrator Δ vs. start		> 25%		
					Ambient pressure Δ	< 5kPa/3 min	> 5kPa/3 min		
					Fuel tank pressure	> -700 Pa	< -2500 Pa		
					Ramp 0 vapor generation		> 12 Pa/s		
EVAP large leak > 3 mm	P0455	Rationality check	Pressure does not reach specified level in specified time. See separate document						Two DCY
	P1455	When fuel level info is incorrect							
EVAP small leak 1 mm < X < 3 mm	P0442	Rationality check	Pressure gradient check. See separate document	Leakage factor 4					Two DCY
	P1442	When fuel level info is incorrect							
EVAP very small leak 0,5 < X < 1 mm	P0456	Rationality check	Pressure gradient check. See separate document	Average leak factor > 0 (valid values –3 to 3) 13 values in stack					Up to eight DCY
	P1456	When fuel level info is incorrect							
Fuel tank pressure sensor	P0452	Low end check	Short cut	To ground or not connected	Ignition on	>2 sec		3 sec	Two DCY
	P0453	High end check	Short cut	To battery	Engine speed	Running		Continuous	
					Battery voltage	>11,0 V			
	P0451	Rationality	Number of flank shifts (of 25 Pa)	> 15 times in 5 sec	Ignition on	>2 sec		5 sec	Two DCY
	P1451	When fuel level info is incorrect	Same as above	Same as above	Engine speed	Running		Once / DCY	
					Battery voltage	>11,0 V			
					ECT & IAT	> +4°C			
					Fuel in tank	< 85% (53 liters)			
					No DTC set, pending or confirmed	Fuel tank pressure sensor circuit, P0452, P0453			
						Canister Vent Valve, P0446, P0498, P0499			
						Purge valve, P0441, P0444, P0445			
						Tank pressure adaption, P1452, P1453, P1492, P1493			
					Fuel level	Updated			
Fuel tank pressure sensor	Pressure adaption, general conditions				BARO pressure	75 to 106 kPa			
					Vehicle speed	0			
					Engine speed	0			
					ECT	< +40°C			
					Fuel tank volume	< 80,5% (50 liter)			
					IAT	> 0°C			
					No DTC set, pending or confirmed	Fuel tank pressure sensor, P0451, P0452, P0453, P1451			
					ECU	First time after Power Up			
	P1452	Sensor Offset	Min failure	Adaption value < -750 Pa	Engine speed	Running		Ignition on + 5s	Two DCY
	P1492	Sensor offset when fuel level info is incorrect			Fuel tank pressure sensor adaption	Performed		Once / DCY	
					Fuel level	Updated			
					Battery voltage	> 11,0 V			
	P1453	Sensor Offset	Max failure	Adaption value >1000 Pa	Engine speed	Running		Ignition on + 5s	Two DCY
	P1493	Sensor offset when fuel level info is incorrect			Fuel tank pressure sensor adaption	Performed		Once / DCY	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
		is incorrect			Fuel level	Updated		
					Battery voltage	> 11,0 V		
EVAP Purge Valve	P0441	Valve leaking	Tank pressure drop when valve is commanded closed	> 30 Pa/sec	Vehicle speed	0	3 sec	Two DCY
					Fuel volume	15 - 85 %	Once / DCY	
					Engine speed	Running		
					Purge	Not active		
					IAT & ECT at engine start	+4 to +40 ℃		
					Battery voltage	11 to 16 Volts		
					MAP	< -15 kPa		
					No DTC set, pending or confirmed	Canister Vent Valve, P0446, P0498, P0499		
						ECT sensor, P0115, P0117, P0118, P0119		
						Vehicle speed sensor, P0501		
						Tank pressure adaption, P1452, P1453, P1492, P1493		
						ABS communication, P1625		
						Powertrain relay, P0685, P0686, P0687		
					Diagnostic ran and passed for	Purge Valve circuit, P0444, P0445		
					ECU	First time after Power Up		
	P0444	Circuit continuity check	Short-cut	Short cut to ground or not connected	Engine speed	Running	1 sec	Two DCY
	P0445		Short-cut	Short cut to battery voltage	Battery voltage	> 11,0 V	Continuous	
					Purge valve	Active (ECT > 40℃)		
					No DTC set, pending or confirmed	Powertrain relay, P0685, P0686, P0687		
Fuel level	P0462	Min signal	AD value	< 2000	Engine speed	Running	1 sec	No MIL, will set alternate DTC for EVAP rationalities
	P0463	Max signal	AD value	> 25000	Battery voltage	> 11,0 V		
	P0460	Rationality, no activity	Fuel level info change	< 1,6% (1 liter)	Engine speed	Running	15,5 miles	
					Battery voltage	> 11,0 V		
					No DTC set, pending or confirmed	Fuel level circuit, P0462, P0463		
					If the volume increases with more than 16% (10 liters) during DCY, refueling is assumed, and a new reference will be taken.	When volume reference > 85% (53 liters) OR < 3,2% (2 liters), driving distance for evaluation is increased to 93,2 miles.		
	P0461	Rationality, fuel consumption	Fuel level change	Fuel consumption less than 0,8% (0,5 liters). 5 checks done for fault setting. Results saved in buffer, also between DCY:s.	Reference volume updated when Vehicle speed	> 24,9 mph	5 X 21,7 miles	No MIL, will set alternate DTC for EVAP rationalities
					Evaluation distance	21,7 miles		
					Evaluation distance when fuel level >90%	43,5 miles		
					Diagnostic ran and passed for	Fuel tank level sensor, P0460, P0462, P0463		
Fuel trim, long term	P0171	System lean	Long term	<-24,6%	Engine speed	Running	1 sec	Two DCY
	P0172	System rich	Long term	>+24,6%	Lambda control	Active	Continuous	
		Fuel trim matrix with 20 load/rpm cells. Diagnostic will fail if the trim value in present cell is above threshold			Fuel trim	6 updates in actual load/rpm cell (100 msec cycle time)		
					Coolant temperature	> 71 deg C		
					Diagnostic ran and passed for	MAF, P0101, P0102, P0103		
						ECT sensor, P0115, P0117, P0118, P0119		
						Front O2 sensor, P0131, P0132, P0134		
Front O2 sensor	P0132	Range check high	Voltage	>1200 mV	Engine speed	Running	6 sec	Two DCY
					Battery voltage	11,0 < U < 18,0V	Continuous	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
					Front O2 sensor heater	Active - sensor warmed up		
					Closed-loop fueling	Active		
	P0131	Range check low	Voltage	< 100 mV in 30 sec	Engine speed	Running	30 sec	Two DCY
					Rear sensor signal	> 700 mV	Continuous	
					Front O2 sensor heater	Active - sensor warmed up		
					Battery voltage	> 11,0V		
					Lambda control	Active > 5 sec		
					Load	> 0		
					AIR	Not active		
					EVAP leak test	Not active		
					Fuel cut	Not active		
	P0134	Circuit Continuity check	Voltage	300 to 600 mV	Engine speed	Running	10 sec	Two DCY
					Battery voltage	> 11,0V	Continuous	
					Sensor heater	Active		
					Sensor heater active time from engine starting depending on IAT or ECT at start.	<-9°C for 570 sec		
						-8 to 8°C for 270 sec		
						>8°C for 80 sec		
					EVAP leak test	Not active		
					No DTC set, pending or confirmed	IAT sensor, P0111, P0112, P0113		
					Lambda control	Closed loop		
	P0133	Response rate	Signal switches OR Revolutions	< 4 in 140 revolutions > 110 for 4 switches	Engine speed	1500 – 3000 rpm	135 revolutions Once / DCY	Two DCY
					Lambda control	Closed loop		
					Battery voltage	> 11,0 V		
					Engine load	210 - 500 mg/combustion		
					Lambda Integrator	Within ±15%		
					ECT	> 70°C		
					Time from engine starting	> 180 sec		
					Purge fuel factor	> -10%		
					No DTC set, pending or confirmed	O2 Sensor Switch Point, P1131, P1132		
						MAF, P0101, P0102, P0103		
O2 Sensor Switch Point	P1131	Switch point trim value	Lean	> 11,5 revolutions	Engine speed	Running	20 / 25 revolutions	Two DCY
	P1132		Rich	> 11,5 revolutions	Coolant temp	> 70°C	Continuous	
					Delta load, positive	< 60 mg/combustion/250 msec		
					Delta load, negative	> - 15 mg/combustion/250 msec		
					Engine speed	1500 - 2800 rpm		
					Load	200 - 400 mg/combustion		
					Time after engine start	>200 s		
					Fuel control	Closed loop		
					Rear sensor voltage for trim activation	> 625 mV or < 575 mV		
					Purge adaption	> -5%		
					Stable time	25 sec		
					Additional stable time if after fuel-cut	40 sec		
					Time between adaptions	10 sec		
					No DTC set, pending or confirmed	MAF, P0101, P0102, P0103		
					Diagnostic ran and passed for	Rear O2 Sensor, P0137, P0138, P0140		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
Front O2 sensor heater	P0031	Range check min	Short cut	To ground or not connected	Engine speed	Running	6 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					O2 heater frequency	10 % < PWM < 85 %		
	P0032	Range check max	Short cut	To battery voltage	Engine speed	Running	6 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					O2 heater frequency	10 % < PWM < 85 %		
	P0030	Rationality	Heater current	< 300 mA for > 16 sec	Engine speed	Running	16 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					PWM Duty Cycle	10 to 85 %		
					No DTC set, pending or confirmed	Front O2 sensor heater circuit, P0031, P0032		
						Fuel pump relay, P0628, P0629		
Rear 02 sensor	P0137	Signal low	Voltage	< 100 mV for > 30 sec	Engine speed	Running	6 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					Rear O2 sensor heater	Active - sensor warmed up		
					Lambda closed loop	> 5 sec		
					Lambda integrator	Within -20 to +20 %		
					Load	> 210 mg		
						No EVAP leak test		
						No Fuel Cut		
					No DTC set, pending or confirmed	MAF, P0101, P0102, P0103		
	P0138	Signal high	Voltage	>1200 mV	Engine speed	Running	6 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					Rear O2 sensor heater	Active - sensor warmed up		
	P0140	Activity	Sensor voltage	>400 mV	Engine speed	Running	200 msec	Two DCY
					Fuel cut	Active for > 6,5 sec	Once/DCY	
					Battery voltage	> 11,0 V		
					Lambda control	Active for > 20 sec		
					Rear O2 sensor heater	Active - sensor warmed up		
Rear O2 sensor heater	P0037	Range check min	Short cut	To ground or not connected	Engine speed	Running	6 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					Sensor heater	Active		
					O2 heater frequency	10 % < PWM < 85 %		
	P0038	Range check max	Short cut	To battery voltage	Engine speed	Running	6 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					Sensor heater	Active		
					O2 heater frequency	10 % < PWM < 85 %		
	P0036	Rationality	Heater current	< 200 mA for > 16 sec	Engine speed	Running	16 sec	Two DCY
					Battery voltage	> 11,0 V	Continuous	
					Sensor heater	Active		
					No DTC set, pending or confirmed	Rear O2 sensor heater circuit, P0037, P0038		
						Fuel pump relay, P0628, P0629		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
MAP – Turbocharger Boost Pressure Correlation	P023D	Rationality MAP vs. Turbo boost sensors	Pressure difference	> 12 kPa for 3 readings	Engine speed Vehicle speed Ignition on No DTC set, pending or confirmed	0 0 Ignition off OR engine not moving OR no rpm for 3 sec MAP circuit, PP0107, P0108 Turbo boost pressure sensor circuit, P0237, P0238	3 readings Once / DCY	Two DCY
MAP sensor	P0106	Rationality	MAP	> 50 kPa for 400 msec	Engine speed Accelerator pedal Load No DTC set, pending or confirmed	Running > 1300 rpm Released for > 400 msec < 110 mg/combustion MAP circuit, P0107, P0108 Crankshaft position sensor, P0337, P0339	5 readings Once / DCY	Two DCY
	P0109	Rationality	MAP	<10 kPa or >140 kPa for 2,0 sec	Engine speed	Cranking	Once / DCY	Two DCY
	P0107	Range check min	Short-cut	To ground or not connected	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY
	P0108	Range check max	Short-cut	To sensor supply voltage	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY
Turbo boost pressure sensor	P0237	Range check min	Short-cut	To ground or not connected	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY
	P0238	Range check max	Short-cut	To sensor supply voltage	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY
MAF sensor	P0102	Range check, low signal	Short-cut	To ground or not connected	Engine speed No DTC set, pending or confirmed	Running OR Moving Powertrain relay, P0685, P0686, P0687	Continuous	Two DCY
	P0103	Range check, high signal	Short-cut	To sensor supply voltage	Engine speed No DTC set, pending or confirmed	Running OR Moving Powertrain relay, P0685, P0686, P0687	Continuous	Two DCY
MAF sensor, rationality	P0101	Comparison of measured MAF sensor signal with mass air flow calculated from throttle area, BARO, MAP and Turbo Boost sensors. Samples are taken in two load windows, below and above 15 g air/sec. To report fault, the average deviation in one of the windows has to be above the limit after 500 samples. To report pass, 500 samples have to be taken in both load windows with less deviation than the fault limit.	MAF deviation AND Fuel Trim OR MAF deviation AND Fuel Trim OR MAF deviation	> -24% > -20% > 24% > 20% > ±30%	Engine speed Battery Voltage Coolant Temperature Engine Speed Pressure quote, MAP vs. pressure before throttle MAP deviation between samples Calculated Mass Air Flow (from MAP) Boost by-pass status change Vehicle speed to enable test Fuel cut Ambient pressure, modeled ECT at start Diagnostic ran and passed for	Running > 11 Volts 67 - 115 ℃ 1400 – 4000 rpm 0,39 - 0,70 < ±2,5 kPa in 1500 msec > 7 g/s No change for 500 ms > 18,6 mph for 60 sec Inactive > 72 kPa > -7℃ MAP sensor, P0106, P0107, P0108 IAT sensor, P0111, P0112, P0113 Turbo boost pressure sensor, P0237, P0238, P023D	500 samples or more Continuous	Two DCY
IAT sensor	P0112	Range check min	Device driver detects min error	Circuit low	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
	P0113	Range check max	Device driver detects max error	Circuit high	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY
	P0111	Rationality, no activity	IAT sensor output change	< 1 ℃	Soak time Run time Engine Load For time ECM reset	> 600 min > 900 sec Running > 270 mg/comb 150 sec cumulative Not allowed	900 sec Once / DCY	Two DCY
ECT sensor	P0115	Rationality, No activity	Temp. change	< 2 ℃	Engine speed Load < 150 mg/combustion AND > 270 mg/combustion ECT at start Vehicle speed No DTC set, pending or confirmed	Running 180 sec 150 sec =< 71 ℃ > 0 mph ECT circuit, P0117, P0118	Load condition dependant Once / DCY	Two DCY
Thermostat / ECT rationality	P0128	Rationality	Sample period of 200 sec starts when modeled ECT reaches 80 ℃. Comparison at end of sample period: Mean value of difference between ECT reading and modeled coolant temperature	> 30 ℃ above modeled ECT OR > Calculated limit below modeled ECT	Engine speed ECT at start-up Calculated coolant temp Idle portion of DCY Fuel cut portion of DCY Ambient pressure, modeled ECT at start Time after start Diagnostic ran and passed for Vehicle speed Disables for remainder of DCY if Vehicle speed Block heater start	Running < 52 ℃ > 80 ℃ < 50 % < 50 % > 72 kPa > -7℃ < 750 sec ECT sensor, P0115, P0117, P0118, P0119 IAT sensor, P0111, P0112, P0113 > 87 mph for > 30 sec (accumulated time) Not allowed	300 to 700 sec Once / DCY	Two DCY
Low sided ECT rationality	P0126	Rationality	Sample period of 60 sec starts when modeled ECT reaches 10 ℃. Comparison at end of sample period: Mean value of ECT reading is compared with threshold	ECT < 5 ° C	Engine speed ECT at start-up IAT or ECT sensor Idle portion of DCY Fuel cut portion of DCY Ambient pressure, modeled Time after start No DTC set, pending or confirmed Diagnostic ran and passed for Disables for remainder of DCY if Vehicle speed Block heater start	Running < 0 ℃ Below -7 deg C < 50 % < 50 % > 72 kPa < 800 sec ECT sensor circuit, P0117, P0118 IAT sensor, P0112, P0113 ABS communication, P1625 Vehicle speed, P0501 ECT sensor rationality, P0115 P0119 IAT sensor rationality P0111 > 87 mph for > 30 sec (cumulative) Not allowed	150 to 300 sec Once / DCY	Two DCY
ECT sensor	P0117	Range check min	Device driver detects min error	Circuit low	Engine speed	Not moving OR running	1 sec Continuous	Two DCY

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
	P0118	Range check max	Device driver detects max error	Circuit high	Engine speed	Not moving OR running	1 sec Continuous	Two DCY
	P0119	Too quick change	Mean value in stack (of 5 values)	> 10 °C	Engine speed Comparison of each ECT reading, insert into stack when diff. from previous reading	Running > 5 °C	5 readings, time base 100 msec Continuous	Two DCY
	P0119	Too quick change	Difference between consecutive values When the threshold has been	> 60 °C	Engine speed No DTC set, pending or confirmed	Running ECT sensor circuit, P0117, P0118	Continuous	Two DCY
ECT sensor stuck above maximum enable / ECT vs. IAT comparison	P011B	Rationality	ECT vs IAT reading at engine start	ECT > 20 deg C above IAT OR IAT > 30 deg C above ECT	Engine speed Engine off time Engine run time ECT drop after 45 sec Block heater start ECM reset	Running > 600 min 45 sec < 2 deg C Not allowed Not allowed	45 sec Once / DCY	Two DCY
Turbocharger bypass valve	P0034	Control circuit Low	Device driver detects valve error	Circuit low	Engine speed Turbo bypass valve	Running Active	Continuous	Two DCY
	P0035	Control circuit High	Device driver detects valve error	Circuit high	Engine speed Turbo bypass valve	Running Active	Continuous	Two DCY
	P0033	Rationality	Mean value of 50 MAF pulsations at Accelerator released AND Mean value of 50 Turbo Boost Pressure pulsations at Accelerator released	> 1.90 mg/sec > 1.1kPa	Engine speed Turbo bypass valve Turbo boost pressure Ambient pressure model Ambient pressure, modeled ECT at start No DTC set, pending or confirmed Mean value of Throttle during pulsation period	Running < 3500 rpm Commanded Open > Ambient pressure + 35 kPa Updated > 72 kPa > -7°C MAP sensor, P0106, P0107, P0108 Powertrain relay, P0685, P0686, P0687 < 2,6 %	600 msec, > 1 time Continuous	Two DCY
Turbocharger wastegate solenoid	P0245	Control circuit Low	Device driver detects min error	Circuit low	Engine speed No DTC set, pending or confirmed	Running Powertrain relay functional test, P0685	Continuous	Two DCY
	P0246	Control circuit High	Device driver detects max error	Circuit high	Engine speed	Running	Continuous	Two DCY
	P0244	Functional test	Turbo boost pressure decrease slope AND Mean pressure diff over throttle	+ 12 to - 10 kPa/sec > 23 kPa > 30 kPa when BARO > 85 kPa	Engine speed Turbo boost pressure Ambient pressure model Ambient pressure, modeled ECT Accelerator position Max throttle change during sample period vs. start value ECT at start (out of limits) Boost adaption No DTC set, pending or confirmed	> 2200 rpm & < 5000 rpm > Ambient pressure + 39 kPa Updated > 72 kPa > 71°C 5 - 50% < 10% > -7°C Done (also in earlier DCY) Wastegate circuit, P0245, P0246	1,0 sec Continuous	Two DCY

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
					Diagnostic ran and passed for	Turbo boost pressure sensor, P0237, P0238, P023D MAP sensor, P0106, P0107, P0108		
		Functional test	Pressure difference over throttle	< -300 mg/comb	Same as above		500 msec Continuous	
Time to closed loop	P0125	Rationality	Time before entering closed loop	> 600 sec	Engine speed Start Temperature, lowest of ECT/IAT	Running < -7℃	600 sec Once / DCY	Two DCY
			Time before entering closed loop	>150 sec	Engine speed Start Temperature, lowest of ECT/IAT	Running -7℃ < T < 10℃	300 sec Once / DCY	Two DCY
			Time before entering closed loop	> 60 sec	Engine speed Start Temperature, lowest of ECT/IAT	Running >10℃	120 sec Once / DCY	Two DCY
Crankshaft position sensor	P0337	Sensor circuit low	Engine speed at cranking	< 100 rpm	Cranking defined by Battery voltage AND MAP vs. Ambient pressure diff. IF above conditions not met: THEN Close throttle MAP vs. Ambient pressure diff. AND check engine speed	Δ > 0,6 V > 2 kPa For 2 sec For 1,5 sec > 5 kPa	3,5 sec Once / DCY	Immediately
	P0339	Rationality	Lost position in same DCY	Position found then lost during 10 msec, > 7 times	Vehicle speed Engine speed Ignition	= 0 mph Cranking OR Running < 3 sec On	3 sec Continuous	Two DCY
			Lost position in same DCY	Position found then lost during 10 msec, > 3 times	Vehicle speed Brake Engine speed Ignition	> 18,6 mph Not active Running > 3 sec On	Error occurs 3 times Continuous	Two DCY
Vehicle speed	P0501	Fault reported from ABS	Wheel Angular Velocity Front Left Validity bit AND Wheel Angular Velocity Front Right Validity bit	Not received within 1 sec	Ignition Battery voltage Nodes on HS CAN No DTC set, pending or confirmed	On for > 3 sec 6.0 V to 16.0 V Not in sleep mode OR programming mode Lost communication with ABS module, P1625	1 sec, continuous	Two DCY
Brake light switch	P0719	Rationality - low	Vehicle speed	4 times decreases from 24,9 to 1,9 mph within 2 to 12	Engine speed Brake	Running Not active	Once / DCY	Two DCY
	P0724	Rationality - high	Vehicle speed	4 times increases from 1,9 to 24,9 mph within 2 to 12	Engine speed Brake	Running Active	Once / DCY	Two DCY
Accelerator position sensor 1	P2122	Range check min	Short cut	To ground OR open circuit (< 10%)	Ignition	Off OR On	100 msec	Immediately
	P2123	Range check max	Short cut	To battery (> 93%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P2121	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 10%, > 93%) Min or max fault not possible to determine	Ignition Engine speed	Off OR On Moving, not moving, running, stopping	100 msec Continuous	Immediately

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
					No DTC set, pending or confirmed	Accel. pos 1 circuit, P2122, P2123		
Accelerator position sensor 2	P2127	Range check min	Short cut	To ground OR open circuit (< 5%)	Ignition	Off OR On	100 msec	Immediately
	P2128	Range check max	Short cut	To battery (> 50%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P2126	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 5%, > 50%)	Ignition	Off OR On	100 msec	Immediately
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous	
					No DTC set, pending or confirmed	Accel. pos 2 circuit, P2127, P2128		
Accelerator position sensor 1 & 2	P2138	Rationality check, correlation fault	Difference between 1 & 2	> 5,2%	Ignition	Off OR On	200 msec	Immediately
			OR difference between adaptation values of 1 & 2	> 3,4% for 192 msec	Engine speed	Moving, not moving, running, stopping	Continuous	
Throttle position sensor 1	P0122	Range check min	Short cut	To ground OR open circuit (< 5.5%)	Ignition	Off OR On	100 msec	Immediately
	P0123	Range check max	Short cut	To battery (> 94,5%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P0121	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 5,5%, > 94.5%)	Ignition	Off OR On	100 msec	Immediately
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous	
					No DTC set, pending or confirmed	Throttle pos 1 circuit, P0122, P0123		
Throttle position sensor 2	P0222	Range check min	Short cut	To ground OR open circuit (< 5.5%)	Ignition	Off OR On	100 msec	Immediately
	P0223	Range check max	Short cut	To battery (> 94,5%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P0221	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 5,5%, > 94.5%)	Ignition	Off OR On	100 msec	Immediately
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous	
					No DTC set, pending or confirmed	Throttle pos 2 circuit, P0222, P0223		
Throttle position sensors 1 & 2	P2135	Rationality check, correlation fault	Difference between 1 & 2	> 4%	Ignition	Off OR On	200 msec	Immediately
			OR difference between adaptation values of 1 & 2	> 4% for 192 msec	Engine speed	Moving, not moving, running, stopping	Continuous	
Throttle motor	P2176	Rationality check, throttle min pos learning fault	Throttle movement	No movement after 10 alternations	Ignition	Off OR On	1,5 sec	Immediately
					Engine speed	Moving, not moving, running, stopping	Continuous	
	P0638	Rationality check, throttle position fault	Throttle movement	In wrong direction OR	Ignition	Off OR On	400 msec	Immediately
				Does not follow calculated movement test pattern OR	Engine speed	Moving, not moving, running, stopping	Continuous	
				> Calculated limit in Bowden cable mode				
	P1523	Rationality check, throttle default position fault	Throttle position	> 41% detected by Main OR	Ignition	Off OR On	1 sec	Immediately
				Not within 27% to 41% detected by MCP OR	Engine speed	Moving, not moving, running, stopping	Continuous	
			MAF Air flow	> 23 g/s	Throttle motor power	Disabled		
	P1681	Sensor switching fault	Transistor to pull one throttle sensor to ground does not toggle within OR	700 msec	Engine speed	Not moving, moving, running, stopping	700 msec	Immediately
			TPS1 is grounded like TPS2	TPS1 changes > 20% when grounding TPS2	Ignition	On	Continuous	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
			TPS2 is not grounded like it should be	TPS2 > 25%				
ECM int ROM	P0601	ROM checksum control	Checksum	Faulty for 200 msec	Ignition Engine speed	On Running, moving, not moving, stopping	200 msec Continuous	Immediately
ECM int RAM	P0604	RAM check	RAM	Faulty for 200 msec	Ignition Engine speed	On Running, moving, not moving, stopping	200 msec Continuous	Immediately
ECM int comm	P0606	Internal communication supervision	ECM CPU Internal serial communication	Faulty for 200 msec	Ignition Engine speed	On Running, moving, not moving, stopping	200 msec Continuous	Immediately
ECM CPU fault	P0607	CPU control	CPU	Faulty for 200 msec	Engine speed	Ignition off, not moving, moving, running, stopping	200 msec	Immediately
End Of Line programming fault	P0602 P0610 P0630 P0632	ECU programming supervision	CAN vehicle configuration Variant data VIN Wheel circumference	Unprogrammed Unprogrammed Unprogrammed Unprogrammed	Ignition	On	Continuous 200 msec	Two DCY
Vref 1	P0641	Voltage supply 1 out of range	Voltage supply 1	Not within 87,75 to 92,25%	Ignition Engine speed	On Running, moving, not moving, stopping	100 msec Continuous	Immediately
Vref 2	P0651	Voltage supply 2 out of range	Voltage supply 2	Not within 87,75 to 92,25%	Ignition Engine speed	On Running, moving, not moving, stopping	100 msec Continuous	Immediately
ECM int A/D	P1680	Comparison A/D conversion of Pedal Position sensor	Main processor vs. MCP A/D conversion difference of Pedal position sensor	> 3%	Ignition Engine speed	On Running, moving, not moving, stopping	200 msec Continuous	Immediately
TCM CAN data	P1623	Transmission controller data missing on CAN BUS	Message TCM general status	Not received within 1 sec	Ignition Battery voltage Communication Gear box Recover from a reset, over or under voltage condition	On (3 sec since power up) 6 – 18 V Normal Communication not disabled with diagnostic service Automatic	1 sec Continuous	Two DCY
TCS/ABS CAN data	P1625	TCS/ABS controller data missing on CAN BUS	Message ABS general status OR message response to Wheel Angular Velocity Front Right Validity bit check	Not received within 1 sec Not received within 1 sec	Ignition Battery voltage HS CAN	On for more than 3 sec 6 – 18 V All nodes not in sleep mode	3 sec Continuous	Two DCY
Fuel pump relay	P0628 P0629	Circuit continuity check	Short-cut Short-cut	To ground or not connected To battery voltage	Engine speed Battery voltage Ignition	Not moving OR Running > 11,0 V On	1 sec Continuous	Two DCY
Powertrain relay	P0686 P0687	Circuit continuity check	Short-cut Short-cut	To ground or not connected To battery voltage	Engine speed Battery voltage Ignition	Not moving OR Running > 11,0 V On	0,5 sec Continuous	Two DCY
	P0685	Functional test	Powertrain relay AND BoostControl AND PurgeValve	Activated Reports low fault Reports low fault	Engine speed	Not moving OR Running	0,5 sec Continuous	Two DCY

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.
			Injector 1	Reports low fault				
			Injector 2	Reports low fault				
			Injector 3	Reports low fault				
			Injector 4	Reports low fault				
			Combustion detect signals	0				
Idle Rpm Control	P0506		Engine idle	Nominal – 100 rpm	Vehicle speed	0	10 sec	Two DCY
			AND Load	< 225 mg/comb	Battery voltage	> 11,0 V	Continuous	
			AND Air to raise idle rpm	Reached maximum	Accelerator pedal	Released		
			AND all of the above during	10 sec	Throttle limphome, P0606, P0638, P1681, P0121, P0641, P0221, P0651, P2138	Not active		
					Ambient pressure, modeled	> 72 kPa		
	P0507		Engine idle	Nominal + 200 rpm	Vehicle speed	0	10 sec	Two DCY
			AND Air to raise idle rpm	Reached minimum	Battery voltage	> 11,0 V	Continuous	
			AND all of the above during	10 sec	Accelerator pedal	Released		
					Throttle limphome, P0606, P0638, P1681, P0121, P0641, P0221, P0651, P2138	Not active		
					Ambient pressure, modeled	> 72 kPa		
Cold start emission reduction strategy diagnostic	P1400		Timing retard or	< 5 degrees	Cold start strategy	Enabled	10 sec cumulative	Two DCY
			Idle speed increase	< 75 rpm	Load	< 380 mg/comb	Once / DCY	
					Load stable	< 10 mg/comb/100 msec change, after this 1,5 sec before		
Ignition off timer diagnostic	P2610	Verification of ignition off timer. 1. Checks that timer starts at igntion off with a test after 60 secs and 2. That it measures correctly for	Comparison of ECM clock timer with ignition off timer after 60 Comparison of monitor timer and ignition off timer. Check done att 600 secs on monitor timer	Diff more than 6 secs Diff more than 60 secs	ECM reset Ignition off time Engine	No 60 secs Has run in this driving cycle	660 secs Once / DCY	Two DCY