Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
IVVT Intake	P0011	target error	Camshaft position deviation from commanted position	> table values+ 6...7.875 or < table values - 6...7.875	[°CA]	Engine speed	> 736....1248 < 6016	[rpm]	150	[s]	every 360° CA	2 DCY
						Oil Temp.	>-10 and < 130	[°C]			continuous	
						Commanded Camshaft Position	Stabilized	[-]				
						engine	"running"					
						Ignition	"on"					
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No CRK error	P0335, P0336					
						No CAM error	P0340, P0341, P0365, P0366					
						No "one tooth off" error IVVT	P0016, P0017					
						No slow response IVVT	P000A, P000B					
						No target error IVVT	P0014					
						No SLV error IVVT	P2089, P2088, P0010, P2091, P2090, P0013					
one tooth off	P0016	reference position changed	Camshaft reference position;	> 135 < 148.875	[°CA]	Engine speed	> 672 and < 4000	[rpm]	< 2	[s]	every 360° CA	2 DCY
						Oil Temp.	> -10	[°C]			once / DCY	
						ECT	> -9.8	[°C]				
						Ignition	"on"					
						engine	"running"					
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No CRK error	P0335, P0336					
						No CAM error	P0340, P0341, P0365, P0366					
						No "one tooth off" error IVVT	P0017					
						No slow response IVVT	P000A, P000B					
						No target error IVVT	P0014					
						No SLV error IVVT	P2089, P2088, P0010, P2091, P2090, P0013					
	P000A	slow response	actual CMP - CMP at start of diagnosis	>= 4.125	[°CA]	Ignition	"on"		150	[s]	every 360° CA	2 DCY
						engine	"running"					
						Engine speed	> 736...1248 and < 6016	[rpm]			continuous	
						Oil Temp.	> -10 and < 130	[°C]				
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No CRK error	P0335, P0336					
						No CAM error	P0340, P0341, P0365, P0366					
						No "one tooth off" error IVVT	P0016, P0017					
						No slow response IVVT	P000B					
						No target error IVVT	P0011, P0014					
						No SLV error IVVT	P2089, P2088, P0010, P2091, P2090, P0013					
	P2088	The hardware is able to detect electrical failures in the IVVT solenoid valve circuit. Three symptoms can be distinguished: short circuit to battery, open circuit and short circuit to ground. Only one symptom can be active at the same time. At the time of the solenoid valve is energized, it always ensures that the duty cycle output signal is never 0 or 100 %. With calibration fulfilling proper IVVT performance, and, simultaneously, the output signal is not 0 and 100 % PWM. Not being near 0 % or 100 % is the condition for a electrical diagnosis. An eventcounter of the electrical diagnosis counts the reccurrencies of this diagnosis. It is used for activation of diagnosis during thee applyed special energization with 0% or	Short to Ground			Ignition	"on"		1,7	[s]	100 ms	2 DCY
						PWM signal	< 91.8	[%]			continuous	
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No SPI Bus conflict	P0606					
	P2089		short to battery plus			Ignition	"on"		1,7	[s]	100 ms	
						PWM signal	> 2	[%]			continuous	2 DCY
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No SPI Bus conflict	P0606					
	P0010		open circuit			Ignition	"on"		1,7	[s]	100 ms	2 DCY
						PWM signal	> 12.9 and < 91.8	[%]			continuous	
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No SPI Bus conflict	P0606					
IVVT Exhaust	P0014	target error	Camshaft position	> (Camshaft setpoint + 6...7.875) or < (Camshaft setpoint - 6...7.875)	[°CA]	Engine speed	> 736...1248 and < 6016	[rpm]	150	[s]	every 360° CA	2 DCY
						Oil Temp.	> -10 and < 130	[°C]			continuous	
						Setpoint stable						
						Ignition	"on"					
						Battery voltage	> 10 and < 16	[V]				
						Engine	running					
				disable conditions:		No active DTC´s:						
						No CRK error	P0335, P0336					
						No CAM error	P0340, P0341, P0365, P0366					
						No "one tooth off" error IVVT	P0016, P0017					
						No slow response IVVT	P000A, P000B					
						No target error IVVT	P0011					
						No SLV error IVVT	P2089, P2088, P0010, P2091, P2090, P0013					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
one tooth off	P0017	reference position changed	Camshaft reference position;	> -110.125 or < -96.25	[°CA]							2 DCY
						Engine speed	> 672 and < 4000				every 360° CA	
						Oil Temp.	> -10	[°C]	< 2	[s]	once / DCY	
						ECT	> -9.8	[°C]				
						Ignition	"on"					
						Battery voltage	> 10 and < 16	[V]				
						Engine	"running"					
				disable conditions:		No active DTC´s:						
						No CRK error	P0335, P0336					
						No CAM error	P0340, P0341, P0365, P0366					
						No "one tooth off" error IVVT	P0016					
						No slow response IVVT	P000A, P000B					
						No target error IVVT	P0011, P0014					
						No SLV error IVVT	P2089, P2088, P0010, P2091, P2090, P0013					
	P000B	slow response	actual CMP - CMP at start of diagnosis	>= 4.125	[°CA]	Ignition	"on"		150	[s]		2 DCY
						Engine	"running"					
						Engine speed	> 640...1248 and < 6016	[rpm]			every 360° CA	
						Oil Temp.	> -10 and < 130	[°C]			continuous	
						Battery voltage	> 10 and < 16	[V]				
				disable conditions:		No active DTC´s:						
						No CRK error	P0335, P0336					
						No CAM error	P0340, P0341, P0365, P0366					
						No "one tooth off" error IVVT	P0016, P0017					
						No slow response IVVT	P000A					
						No target error IVVT	P0011, P0014					
						No SLV error IVVT	P2089, P2088, P0010, P2091, P2090, P0013					
	P2090	The hardware is able to detect electrical failures in the IVVT solenoid valve circuit. Three symptoms can be distinguished: short circuit to battery, open circuit and short circuit to ground. Only one symptom can be active at the same time. At the time of the solenoid valve is energized, it always ensures that the duty cycle output signal is never 0 or 100 %. With calibration fulfilling proper IVVT performance, and, simultaneously, the output signal is not 0 and 100 % PWM. Not being near 0 % or 100 % is the condition for a electrical diagnosis. An eventcounter of the electrical diagnosis counts the reccurrencies of this diagnosis. It is used for activation of diagnosis	Short to Ground			Ignition	"on"					
						PWM signal	< 91.8	[%]	1,7	[s]	100 ms	2 DCY
						Battery voltage	> 10 and < 16	[V]			continuous	
				disable conditions:		No active DTC´s:						
						No SPI Bus conflict	P0606					
	P2091		short to battery plus			Ignition	"on"					
						PWM signal	> 2	[%]	1,7	[s]	100 ms	2 DCY
						Battery voltage	> 10 and < 16	[V]			continuous	
				disable conditions:		No active DTC´s:						
						No SPI Bus conflict	P0606					
	P0013		open circuit			Ignition	"on"					
						PWM signal	> 12.9 and < 91.8	[%]	1,7	[s]	100 ms	2 DCY
						Battery voltage	> 10 and < 16	[V]			continuous	
				disable conditions:		No active DTC´s:						
						No SPI Bus conflict	P0606					
AAT Sensor	P0073	short to battery plus	AAT raw value	> 4.976 (<-41°C)	[V]	Ignition	"on"		2000	[ms]		2 DCY
						Battery voltage	> 9	[V]			100 ms	
											continuous	
	P0072	short to ground	AAT raw value	< 0.498 (>110°C)	[V]							2 DCY
				disable conditions:		No active DTC's:						
						AAT	P009A, P0074					
	P009A	plausibility check	delta of measured AAT - modled AAT	>= 20.3	[°C]	Ignition	"on"					
						Battery voltage	>= 10	[V]			100 ms	
	P009A	plausibility check	delta of measured AAT - modled AAT	<= -20.3	[°C]	Vehicle speed	<= 100	[mph]		[s]	continuous	2 DCY
						Vehicle speed	> 21.875	[mph]				2 DCY
						Mass air flow	< 500.01	[kg/h]				
						Mass air flow	> 70.01	[kg/h]				
						Engine speed	> 928	[rpm]				
						Engine speed	< 6496	[rpm]				
						ECT	< 120	[°C]				
						ECT	> 69	[°C]				
						Intake manifold heat model	< 200	[-]	immediately			
						Elapsed time after conditions for learning	>= 15	[s]	after			
									error is			
				disable conditions:		No active DTC's:			detected			
						No Ambient pressure sensor error	P2229, P2228, P2227					
						No Mass Air Flow sesnor error	P0103, P0102					
						No IAT error	P0113, P0112, P0114, P0111					
						No VS error	P0501					
						No Camshaft error	P0340, P0341, P0365, P0366					
						No Crankshaft error	P0335, P0336					
						No ECT error	P0118, P0117, P0119, P0116,					
						No LOAD_TPS error	P0101, P1101, P0068					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No Engine off timer error No AAT error	P2610 P0073, P0072, P0074					
	P0074	oscillation check	delta of I measured AAT - AAT_MMV I of moving vehicle	> 6	[°C]	Ignition Battery voltage and Vehicle speed for Timer No active DTC's: No AAT error	"on" > 9 > 12.5 > 25.5 P0073, P0072, P009A	[V] [mph] [s]	2000	[ms]	100 ms continuous	2 DCY
	P0111	plausibility check	IAT of moving vehicle- AAT at engine start and IAT of moving vehicle - ECT at engine start	>= 20.25...95.25 >= 20.25...95.25	[°C] [°C]	Ignition Battery voltage I AAT@engine start - AAT of moving vehicle I and I IAT@engine start - IAT of moving vehicle I and ECT @engine start- ECT of moving vehicle and ECT @engine start- ECT of moving vehicle and Vehicle speed for Time length and Time after engine start and Time after engine start and Engine off timer No active DTC's: No Ambient pressure sensor error No Mass Air Flow sesnor error No IAT error No VS error No Camshaft error No Crankshaft error No ECT error No LOAD_TPS error No AAT error	"on" > 10 <=2.25 <=3 <=3.75 =>9 =>9.375 >20 =>60 <120 >460 P2229, P2228, P2227 P0103, P0102 P0113, P0112, P0114, P0111 P0501 P0340, P0341, P0365, P0366 P0335, P0336 P0118, P0117, P0119, P0116, P0101, P1101, P0068 P0073, P0072, P0074	[V] [°C] [°C] [°C] [°C] [mph] [s] [s] [s] [min]	immedeately after error is detected		100 ms once / DCY	2 DCY
Load TPS Rationality **Mass Air Flow (MAF) Sensor Performance**	P0101	deviation measured airflow to modeled airflow filtered active relative LAM correction	meassured air flow - modeled air flow and filtered active relative LAM correction Close loop active or meassured air flow - modeled air flow and filtered active relative LAM correction Close loop active	> 15 ... 50 < -11 <-15 ... -50 > 11	[%] [%] [%] [%]	Ignition Battery voltage Engine Time after engine start RPM RPM Throttle position Throttle position Pressure quotient Pressure quotient Ambient pressure System is controlled by mass air flow sensor No engine state "pull fuel cutoff" Electronic throttle control power stage is on	"on" > 10 "running" > 5 > 800 < 6496 < 4.996...10 > 84.999 > 0.3 > 0.99 > 69.999	[V] [s] [rpm] [rpm] [°] [°] [-] [-] [kPa]	1600	[ms]	20 ms continuous	2 DCY
Intake Air Flow System Performance	P1101	deviation measured airflow to modeled airflow filtered active relative LAM correction	meassured air flow - modeled air flow and Close loop not active meassured air flow - modeled air flow and Close loop not active	> 15 ... 50 < -15 ... -50	[%] [%]	Electronic throttle control power stage is on						2 DCY
Throttle Body Airflow Performance	P0068	deviation measured airflow to modeled airflow filtered active relative LAM correction	meassured air flow - modeled air flow and filtered active relative LAM correction filtered active relative LAM correction Close loop active	> 15 ... 50 > -11 < 11	[%] [%] [%]							2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
			or meassured air flow - modeled air flow and filtered active relative LAM correction filtered active relative LAM correction Close loop active	<-15 ... -50 > -11 < 11 disable conditions:	[%] [%] [%]	 No active DTC's: No Mass Air Flow error No IAT sensor error No Canister purge valve error No Ambient pressure sensor error No Throttle Position error No Supply voltage error No Camshaft error No Variable valve timing error No ECT error No variable intake manifold error	 P0103, P0102 P0113, P0112, P0114, P0111 P0459, P0458 P2229, P2228, P2227 P0123, P0122, P0223, P0222, P0121, P0221 P0643, P0642, P0653, P0652 P0340, P0341, P0365, P0366 P000A, P000B, P0016, P0017 P0118, P0117, P0119, P0116, P065E,				
Variable intake manifold	P0662 P0661	Variable intake manifold is a static driven power stage. This diagnosis detects an elctrical malfunction, short circuit battery (SCB), short circuit to ground (SCG)	Short to Battery short to ground or open circuit	 disable conditions:		Ignition Battery voltage No active DTC's: No ECU SPI error	"on" > 9 P0606	[V]	1	[s]	200 ms continuous	2 DCY 2 DCY
Variable intake manifold Rationality	P065E	plaus off	Feedback sensor and Commanded position and Commandet position stable or	< 1.001 0 > 0.4	[V] [-] [s]	Ignition Time after engine start IAT Engine speed Engine speed Switching operations in high load engine state without refill the vacuum reservoir	"on" > 3 > -9.8 > 608 < 6208 < 1...3	[s] [°C] [/rev] [/rev] [-]	1.4	[s]	100 ms continuous	2 DCY
		plaus on	Feedback sensor and Commanded position and Commandet position stable	> 3.999 1 > 0.4 disable conditions:	[V] [s]	 No active DTC's: No ECT error No Ambient pressure sensor error No IAT sensor error No Supply voltage error No VIM actuator diagnosis error	 P0118, P0117, P0119, P0116, P2229, P2228, P2227 P0113, P0112, P0114, P0111 P0643, P0642, P0653, P0652 P0662, P0661,					
MAF Sensor	P0102 P0103	short to ground or open circuit short to battery plus	mass air flow mass air flow	< 2.5 (<0.46V) >= 490 (>=4,29V) disable conditions:	[kg/h] [kg/h]	Ignition Engine Throttle position RPM Battery voltage non confirmed crank sensor fault No active DTC's: No CRK error	"on" "running" > 0.9 > 736 > 9 not present P0335, P0336	[°] [rpm] [V]	480	[ms]	10 ms continuous	2 DCY 2 DCY
AMP Sensor	P2229 P2228	short to battery plus short to ground or open circuit	signal voltage signal voltage	> 4.302 (109,4 kPa) < 2.002 (50,9 kPa) disable conditions:	[V] [V]	Ignition Battery voltage No active DTC's: No Supply voltage error No Ambient pressure sensor error	"ON" >9 P0643, P0642, P0653, P0652 P2227	[V]	2500	[ms]	10 ms continuous	2 DCY 2 DCY
	P2227	plausibility check	gradient or	> 1.003	[kPa/s]	Ignition Engine	"on" "running"		1	[s]	1 s continuous	2 DCY
			Ambient Pressure from last driving cycle- Ambient Pressure @engine start and mass air flow mmv calc. from altitude sesnor - mass air flow mmv	> 20 > 1.13	(kpa) [kg/h]	Vehicle speed Idle Mass air flow Intake manifold pressure ECT Duration in which the conditions for diag are fulfilled MAF integral out of DFCO since engine start	<=0.625 <=18 <=49.9993 >=39.75 >=13 >=0.8	[mph] [kg/h] [kPa] [°C] [s] [kg]	immediately after error is detected and the LOAD_TPS diag is finished		1 s once / DCY	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
				disable conditions:		No active DTC's: No Throttle Position error No Mass Air Flow error No Camshaft error No Crankshaft error No Variable valve timing error No ECT error No Ambient pressure sensor error No Supply voltage error No VS error	 P0123, P0122, P0223, P0222, P0121, P0221 P0103, P0102 P0340, P0341, P0365, P0366 P0335, P0336 P000A, P000B, P0016, P0017 P0118, P0117, P0119, P0116, P2229, P2228 P0643, P0642, P0653, P0652 P0501					
IAT Sensor	P0112	short to ground	IAT raw value	< 0.151 (>126°C)	[V]	Ignition Battery voltage	"on" >9	 [V]	1000	[ms]	100 ms continuous	2 DCY
	P0113	short to battery plus	IAT raw value	> 4.849 (< -50°C)	[V]							2 DCY
IAT Sensor Rationality	P0111	stuck check	deviation of IAT since engine start	< 1.5	[°C]	Ignition Battery voltage Driven distance since engine start ECT Time after engine start AAT Intake manifold heat model changes	"on" >9 >= 6.25 >= 69 >= 600 >= -8.3 >= 100	 [V] miles [°C] [s] [°C]	2000	[ms]	100 ms once / DCY	2 DCY
				disable conditions:		No active DTC's: No VS error No ECT error No IAT sensor error No LOAD_TPS error	 P0501 P0118, P0117, P0119, P0116, P0113, P0112, P0114, P0101, P1101, P0068					
IAT Sensor Intermittent / Rationality	P0114	signal intermitten	IAT difference	> 9.8	[°C]	Ignition Battery voltage	"on" >9	 [V]	2000	[ms]	100 ms continuous	2 DCY
				disable conditions:		No active DTC's: No IAT sensor error	 P0113, P0112, P0111					
ECT Sensor	P0118	short to battery plus or open circuit	ECT raw value	> 4.96 (-39.75°C)	[V]	Ignition Battery voltage IAT IAT Time after engine start	"on" >9 >=-30 or (< -30 and > 120)	 [V] [°C] [°C] [s]	1000	[ms]	100 ms continuous	2 DCY
	P0117	short to ground	ECT raw value	< 0.27 (136.50°C)	[V]				1000	[ms]	100 ms continuous	2 DCY
ECT Sensor Rationality	P0116	signal range check	ECT at engine start - IAT at engine start ECT at engine start	> table value 12...30 > table value 50.25...90	[°C] [°C]	Ignition Time after engine start Battery voltage IAT at engine start AAT at engine start IAT at engine staart - AAT at engine start Engine off timer for display Engine off timer signal	"on" >2 >10 > -9.75 and < 50.25 > -9.75 < 9.8 >= 420 plausible	 [s] [V] [°C] [°C] [°C] [min]	immediately after error is detected		100 ms once / DCY	2 DCY
				disable conditions:		No active DTC's: No ECT error No IAT error	 P0117, P0118, P0116 (stuck check) P0111, P0112, P0113, P0114					
ECT Sensor Rationality	P0116	stuck check	ECT back up value - ECT back up value at engine start ECT raw value - ECT raw value at engine start	> table value 6...39.8 > table value 2.3...19.5	[°C] [°C]	Ignition ECT @ start battery voltage	"on" <75.8 <10	 [°C] [V]	immediately after error is detected		1 s continuous	2 DCY
				disable conditions:		No active DTC's: No ECT error	 P0117, P0118, P0116 (signal range check)					
ECT Sensor Intermittant / Rationality	P0119	intermitten / noisy	ECT_LIM - ECT_MES	> 5.3	[°C]	Ignition Battery voltage	"on" >9	 [V]	1200	[ms]	100 ms continuous	2 DCY
				disable conditions:		No active DTC's: No ECT error	 P0117,P0118					
Coolant System	P0128	functional check	ECT model value	> 91.5	[°C]	Ignition ECT @ start	"on" > -9.75 and < 75	 [°C]	immediately after error is detected		1 s	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
Thermostat Monitor		See description and flow-charts for more details	ECT	< 81	[°C]	IAT @ engine start Battery voltage "Trailing throttle fuel cut off" activation time since engine start "Min. load" activation time since engine start "Max. VS" activation time since engine start Engine state "idle speed" activation time since engine start IAT deviation (decrease) after engine start Engine speed Timer ECT deviaction (decrease)	> -9.75 > 10 < = 19.9 < = 50 < = 89.8 < = 39.8 > -20.25 not (> 4800 for 8 and < -3)	[°C] [V] [%] [%] [%] [%] [°C] [rpm] [s] [°C]			once / DCY	
				disable conditions:		No active DTC's: No ECT error No MAF error No VS error No CKP error No TPS Error No IAT error	 P0116, P0117, P0118, P0119 P0103, P102 P0501 P0335, P0336 P0121,P0122, P0123, P0221, P0222, P0223 P0111, P0112, P0113, P0114					
Throttle Position TP Sensor 1	P0123	short to battery plus or open circuit	TP Volts	> 4.815 (96,4 %)	[V]	Ignition	"on"		200	[ms]	10 ms continuous	1 DCY
	P0122	short to ground	TP Volts	< 0.197 (3,94 %)	[V]							1 DCY
				disable conditions:		No active DTC's: No supply voltage error	 P0642, P0643					
	P0121	rationalty check	actual TPS 1 - calc. value	> 1	[-]	Ignition Engine No adaption is requested	"on" "running"		400	[ms]	10 ms continuous	1 DCY
				disable conditions:		No active DTC's: No supply voltage error	 P0642, P0643					
TP Sensor 2	P0223	short to battery plus	TP Volts	> 4.823 (96,5 %)	[V]	Ignition	"on"		200	[ms]	10 ms continuous	1 DCY
	P0222	short to ground or open circuit	TP Volts	< 0.19 (3,8 %)	[V]							1 DCY
				disable conditions:		No active DTC's: No supply voltage error	 P0642, P0643					
	P0221	rationalty check	actaul TPS 2 - calc. value	> 1	[-]	Ignition Engine No adaption is requested	"on" "running"		400		10 ms continuous	1 DCY
				disable conditions:		No active DTC's: No supply voltage error	 P0642, P0643					
TP Sensor Rationality	P2119	The throttle position is determined by a two-channeled sensor. Both channels deliver invers dispersing voltage signals. In order to reduce inaccuracy , the two signal voltages are referenced to their supply voltage. After initial engine start and compone spring check - lower position not reached	TPS by adaptation and Diagnosis time	>=24.997 = 0	[°]	Ignition Powerstage not disabled by processor monitoring	"on"		immediately		5 ms once / DCY	1 DCY
		spring check - upper position not reached	TPS by adaptation and Diagnosis time	>= 2.006 = 0	[°]				immediately		5 ms once / DCY	1 DCY
	P2176	Adaptation conditions exceeded	Vehicle speed or engine speed or ECT or Battery voltage or IAT	> 0 > 192 > 4.5 < 110.3 > 9 < 4.5	[mph] [rpm] [°C] [V] [°C]	Ignition Powerstage not disabled by processor monitoring	"on"		immediately		5 ms continuous	1 DCY
		Spring and limp home position violation	TPS1 or TPS2 throttle position sensor voltage differs from the stored limp home position			Ignition Powerstage not disabled by processor monitoring	"on"		> 0.6	[s]	5 ms continuous	1 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length	Frequency of Checks	MIL Illum.
					Request for TPS adaptation				
		lower mechanical stop adaptation outside range	TPS1 or TPS2 sensor voltage does not reach the minimum lower mechanical position within specified time window.				> 0.6 [s]	5 ms continuous	1 DCY
		Limp home postion adaptation violation	TPS1 or TPS2 sensor voltage does not reach the Limp home position window (at least lower postion).				> 0.6 [s]	5 ms continuous	1 DCY
Injector Control Circuits		This diagnostic detects the error via the ECM hardware (ATIC39). The diagnosis is only performed if there is no cylinder shut off and between a minimum (320 rpm) and maximum engine speed (worst case for diagnosis is a cold engine and high engine speed, then it is possible that all injectors are activated all the time without interruption). The driver ATIC39 can distinguish between three errors: Short to battery (SCB), Short to ground (SCG) and Open line (OL). SCB and real OL are detected by the driver only if the output is driven (ON-state), additionally SCG will be detected as OL also in ON-state. If the output is non-driven (OFF-state) by the driver, SCG is detected.							
Cylinder #1	P0201		open circuit		Logical variable for raw KEY_OFF Ignition	"off" "on"	3200 [ms]	200 ms continuous	2 DCY
	P0261		short to ground		Battery voltage No cyl specific fuel cut off Fuel pump is running	> 9 [V]			2 DCY
	P0262		short to battery plus		Engine Engine speed Engine speed	"running" > 320 [rpm] < 4000...6016 [rpm]			2 DCY
				disable conditions:	No active DTC's: No main relay error No fuel pump relay error	P0607 P0628, P0629			
Cylinder #2	P0202		open circuit		Logical variable for raw KEY_OFF Ignition	"off" "on"	3200 [ms]	200 ms continuous	2 DCY
	P0264		short to ground		Battery voltage No cyl specific fuel cut off Fuel pump is running	> 9 [V]			2 DCY
	P0265		short to battery plus		Engine Engine speed Engine speed	"running" > 320 < 4000...6016 [rpm]			2 DCY
				disable conditions:	No active DTC's: No main relay error No fuel pump relay error	P0607 P0628, P0629			
Cylinder #3	P0203		open circuit		Logical variable for raw KEY_OFF Ignition	"off" "on"	3200 [ms]	200 ms continuous	2 DCY
	P0267		short to ground		Battery voltage No cyl specific fuel cut off Fuel pump is running	> 9 [V]			2 DCY
	P0268		short to battery plus		Engine Engine speed Engine speed	"running" > 320 [rpm] < 4000...6016 [rpm]			2 DCY
				disable conditions:	No active DTC's: No main relay error No fuel pump relay error	P0607 P0628, P0629			
Cylinder #4	P0204		open circuit		Logical variable for raw KEY_OFF Ignition	"off" "on"	3200 [ms]	200 ms continuous	2 DCY
	P0270		short to ground		Battery voltage No cyl specific fuel cut off Fuel pump is running	> 9 [V]			2 DCY
	P0271		short to battery plus		Engine Engine speed Engine speed	"running" > 320 [rpm] < 4000...6016 [rpm]			2 DCY
				disable conditions:	No active DTC's: No main relay error No fuel pump relay error	P0607 P0628, P0629			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
Knock Control	P0325	Circuit Diagnosis The purpose of this diagnostic is to observe the analog input signal (Knock signal) from the ATM40 device to the microcontroller. The signal is checked continuously by a range check of the signal and with two algorithms, which observe the signal bandwidth. A slave and a master algorithm is used. Both algorithms have to show the same state to increment the failure counter. The absolute noise value of the ATM40 device is	noise level	< 0.1 or > 4.8	[V]	Ignition Engine Not in decel fuel cut off Not in decel mode Mass air flow Engine speed Mass air flow	"on" "running" > 220 > 2496 > 185...272	 [mg/stk] [rpm] [mg/stk]	7200	[°CA]	180°CA continuous	2 DCY
	P0326	plausibility check	master cycle counter slave cycle counter	>= >=	[seg] [seg]				7200	[°CA]	every 360° CA continuous	2 DCY
				disable conditions:		No active DTCs: No CAM error No CRK error No ECU error	 P0340, P0341, P0365, P0366 P0335, P0336 P601, P602, P604					
Crankshaft Position Sensor Diagnosis **Crankshaft sensor circuit Electrical Diagnosis**	P0335	signal missing	No signal			Ignition Engine	"on" "running		1440	[°CA]	every 360° CA continuous	1 DCY
Crankshaft Position Sensor Performance Diagnosis	P0336	plausibility check	Signal available			Ignition Engine Limp Home Not Active	"on" "running CRK error limp home not active		3600	[°CA]	every 360° CA continuous	1 DCY
		plausibility check	Signal available			Ignition Engine Limp Home Not Active	"on" "running CRK error limp home not active		2160	[°CA]	every 360° CA continuous	1 DCY
		plausibility check	Signal available			Ignition Engine	"on" "running		2520	[°CA]	every 360° CA continuous	1 DCY
		Missing tooth detection	one tooth to many or to few	<> one tooth disable conditions:		Fuel cut off Ignition Engine No active DTC's: No CPS error No Cam sensor error No IV error No IV error No Crk sensor error	active "on" "running P0453, P0458, P0443 P0016, P0340, P0341, P0365, P0366 P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204 P0335		7200	[°CA]	720 °CA multiple	1 DCY
		out of range	segment adaptation over limit	> 7.8 disable conditions:	[‰]	Ignition Engine Fuel cut off Engine speed No active DTC's: No CPS error No Cam sensor error No IV error No IV error No Crk sensor error	"on" "running active > 1216 and < 4000 P0453, P0458, P0443 P0016, P0340, P0341, P0365, P0366 P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204 P0335	 [rpm]	8640	[°CA]	720 °CA multiple	1 DCY
Intake Camshaft Position (CMP) Sensor	P0340	No Signal	No signal edge is detected for a max time between two camshaft signal edges			Ignition engine in synchronized mode	"on" active		2880	[°CA]	every 360° CA continuous	2 DCY
	P0341	plausibility check	Crankshaft tooth number when camshaft 1 interrupt occurs	< 2 and > 22	[-]							2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
			Crankshaft tooth number when camshaft 1 interrupt occurs	< 62 and > 82	[-]							
				disable conditions:		No active DTCs: No CKP error	P0335, P0336					
Exhaust Camshaft Position (CMP) Sensor	P0365	No Signal	No signal edge is detected for a max time between two camshaft signal edges			Ignition engine in synchronized mode	"on" active		2880	[°CA]	every 360° CA continuous	2 DCY
	P0366	plausibility check	Crankshaft tooth number when camshaft 2 interrupt occurs	< 40 and > 58	[-]							2 DCY
			Crankshaft tooth number when camshaft 2 interrupt occurs	disable conditions:		No active DTCs: No CKP error	P0335, P0336					
Fuel Level Sensor Diagnosis	P0461	stuck check	fuel tank level movement fuel tank level movement	< Fuel tank level initialisation+0.132 > Fuel tank level initialisation-0.132	[gal] [gal]	Ignition Vehicle speed	"on" > 12.426	[mph]	660	[s]	100 ms continuous	2 DCY
						Moving mean value Fuel cut off Part load Counter for rationality error Max. filtered VS gradient	>= 1.055736 and <= 10.428 not active active >= 110 >= 0.142899	[gal] [s] [mph]				
				disable conditions:		No active DTCs: No VS error No fuel level sensor error	P0501 P0461(gradient), P0462, P0463					
	P0462	short to ground or open circuit	signal voltage	< 0.498 (> 12,15 gal)	[V]	Ignition	"on"		2.5	[s]	100 ms continuous	2 DCY
	P0463	short to battery plus	signal voltage	> 2.998 (< 0 gal)	[V]							2 DCY
	P0461	Gradient	FTL initialidation - moving mean value FTL initialidation - moving mean value	< 0.528 or > 4.751736	[gal] [gal]	Ignition Moving mean value Fuel consumption	"on" >= 1.584 and <= 10.428 >= 2 x 2.64	[gal] [gal]	immediately after fuel consumption		500 ms continuous	2 DCY
				disable conditions:		No active DTCs: No fuel level sensor error	P0461(stuck), P0462, P0463					
Cooling Fan Electrical Diagnosis			The FAN is driven by the ECU via an output driver. The failure detection is done by the driver itself. The purpose is to perform the electrical diagnosis of the FAN actuator to detect electrical faults.									
Relay # 1	P0691	short to ground or open circuit	Fail Time	> 3200	[ms]	Ignition Engine Battery voltage FAN power stage	"on" "running" > 9 configured	[V]	3200	[ms]	200 ms continuous	2 DCY
	P0692	short to battery plus	Fail Time	> 3200	[ms]				3200	[ms]		2 DCY
				disable conditions:		No active DTCs: No ECU SPI error	P0606					
Relay # 2	P0693	short to ground or open circuit	The FAN is driven by the ECU via an output driver. The failure detection is done by the driver itself. The purpose is to perform the electrical diagnosis of the FAN actuator to detect electrical faults. Fail Time	> 3200	[ms]	Ignition Engine Battery voltage FAN power stage	"on" "running" > 9 configured	[V]	3200	[ms]	200 ms continuous	2 DCY
	P0694	short to battery plus	Fail Time	> 3200	[ms]				3200	[ms]		2 DCY
				disable conditions:		No active DTCs: No ECU SPI error	P0606					
Vehicle Speed	C1232	circuit low	CAN message via the Wheel Speed Sensors Signal	= true	[-]	Ignition CAN delay after ignition on	"on"		100	[ms]	100 ms continuous	2 DCY
	C1207	circuit high	CAN message via the Wheel Speed Sensors Signal	= true	[-]	Traction control system on CAN configured						2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
	C1221	no input signal / irrational low	CAN message via the Wheel Speed Sensors Signal	= true	[-]							2 DCY
	C1225	input erratic / noise / irrational high	CAN message via the Wheel Speed Sensors Signal	= true	[-]							2 DCY
	C1233	circuit low	CAN message via the Wheel Speed Sensors Signal	= true	[-]							2 DCY
	C1208	circuit high	CAN message via the Wheel Speed Sensors Signal	= true	[-]							2 DCY
	C1222	no input signal / irrational low	CAN message via the Wheel Speed Sensors Signal	= true	[-]							2 DCY
	C1226	input erratic / noise / irrational high	CAN message via the Wheel Speed Sensors Signal	= true	[-]							2 DCY
				disable conditions:		No active DTCs: No CAN error	U0122, U0073					
	P0501	CAN signal check	CAN message	< 50	[/s]	counter	>= 5	[s]	8	[s]	500 ms	2 DCY
Idle Controller	P0506	out of range low	engine spped deviation between commanded and actual engine speed	< 100	[rpm]	Ignition stable engine speed Battery voltage ECT	"on" = idle > 10 > 50.25	 [V] [°C]	4	[s]	100 ms continuous	2 DCY
	P0507	out of range high	engine spped deviation between commanded and actual engine speed	> 200	[rpm]	Vehicle speed Mass air flow PWM signal for canister purge solenoid opening Transmission range not in reverse	= 0 < 220 < 89.999	[mph] [mg/stk] [%]				2 DCY
				disable conditions:		No active DTCs: No CPS error No Ambient pressure error No Ambient Air Temperature error No Accelerator Pedal Position error No Mass Airflow Sensor error No Ignition Coils error No Injectors error No Camshaft error No Crankshaft error No Throttel Position error No ECT error No Intake Air Flow Performance error No Control Module Programming Read only Memory error No Fuel trim system error No VS error	 P0459, P0459, P0443, P0496 P2227, P2228, P2229 P0071, P0072, P0073 P2123, P2122, P2128, P2127, P2138 P0102, P0103 P2301, P2304, P2307, P2310 P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 P0340, P0341, P0365, P0366, P000A, P0016, P2089, P2088, P0010 P0335, P0336 P2100, P2101, P0121, P0222, P0123 P0116, P0117, P0118, P0119 P0101, P1101, P0068 P061A P0171, P0172 P0501					
	P050A	Cold start out of range low	engine spped deviation between commanded and actual engine speed	< 175	[rpm]	Ignition Vehicle speed ECT Mass air flow PWM signal for canister purge solenoid opening Ignition	"on" = 0 > -9.75 < 400.01 < 89.999 "on"	 [mph] [°C] [mg/stk] [%]	4	[s]	100 ms once / DCY	2 DCY
	P050A	Cold start out of range high	engine spped deviation between commanded and actual engine speed	> 175	[rpm]	stable engine speed Battery voltage Transmission range not in reverse Time delay Catalyst heating	= idle > 10 > 3 = active	 [V] [s]				2 DCY
				disable conditions:		No active DTCs: No CPS error No Ambient pressure error No Ambient Air Temperature error No Accelerator Pedal Position error No Mass Airflow Sensor error No Ignition Coils error No Injectors error No Camshaft error No Crankshaft error No Throttel Position error No ECT error No Intake Air Flow Performance error No Control Module Programming Read only Memory error No Fuel trim system error	 P0459, P0459, P0443, P0496 P2227, P2228, P2229 P0071, P0072, P0073 P2123, P2122, P2128, P2127, P2138 P0102, P0103 P2301, P2304, P2307, P2310 P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 P0340, P0341, P0365, P0366, P000A, P0016, P2089, P2088, P0010 P0335, P0336 P2100, P2101, P0121, P0222, P0123 P0116, P0117, P0118, P0119 P0101, P1101, P0068 P061A P0171, P0172					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No VS error	P0501					
System Voltage Diagnosis						Ignition	"on"		1000	[ms]		(1)--see note below
	P0562	out of range low	signal voltage	< 9	[V]	Battery voltage	>9 <16	[V]			100 ms continuous	
						Engine	"running"					
	P0563	out of range high	signal voltage	> 16	[V]							Special type "C"
(1) Mil will not illuminate for these diagnostics. Either the generator light will come on or the power to the instrument cluster will be lost--This has been discussed with CARB's Staff												
Brake Switch 1 Diagnosis						Ignition	"on"				10 ms	
						Engine	"running"		steady state = 5 Rationality = 25 brake events	(s)	steady state = once per trip	
						VB	> 10	[V]			Rationality = continous	
		This diagnostic utilyzes three seperate functions to test the brake lamp switch circuit, faulty switch, and for a non mounted or misadjusted switch. A rationality test compares brake lamp switch to the brake test switch. A second test checks the brake lamp switch state during driving conditions with VS greater then a threashold. A third test checks the brake light switch during deceleration.										
	P0572		Short to ground / Open	Steady state failure Signal input = 1 Rationality failure = Implausible switch state		Vehicle speed (only used for steady state diagnostic)	> 6 < 55	[mph]				2 DCY
				disable		No active DTCs:						
				conditions:		Wheel Speed Sensors	C1232, C1207, C1221, C1225, C1233, C1208, C1222, C1226					
						BTS	P0719, P0724					
						VS	P0501					
						Ignition	"on"					
						Engine	"running"					
						VB	> 10					
	P0573		Short to battery	Decel diagnostic failure Signal input = 0 Rationality failure = Implausible switch state		vehicle speed (only used for decel diagnostic)	>31	[mph]	decel test = 2.5 Rationality = 25 brake events	(s)	10 ms	2 DCY
						vehicle deceleration rate (only used for decel diagnostic)	> 5.6	(mi/(h*s))			continuous	
											continuous	2 DCY
				disable		No active DTCs:						
				conditions:		Wheel Speed Sensors	C1232, C1207, C1221, C1225, C1233, C1208, C1222, C1226					
						BTS	P0719, P0724					
						Vehicle speed	P0501					
Brake Switch 2 Diagnosis						Ignition	"on"				10 ms	
						Engine	"running"		decel test = 2.5 Rationality = 25 brake events	(s)	continuous	
						VB	> 10				continuous	
		This diagnostic utilyzes three seperate functions to test the brake lamp switch circuit, faulty switch, and for a non mounted or misadjusted switch. A rationality test compares brake lamp switch to the brake test switch. A second test checks the brake lamp switch state during driving conditions with VS greater then a threashold. A third test checks the brake light switch during deceleration.										
	P0724		Short to battery	Decel diagnostic failure Signal input = 0 Rationality failure = Implausible switch state		vehicle speed (only used for decel diagnostic)	>31	[mph]				2 DCY
						vehicle deceleration rate (only used for decel diagnostic)	> 5.6	(mi/(h*s))				
				disable		No active DTCs:						
				conditions:		Wheel Speed Sensors	C1232, C1207, C1221, C1225, C1233, C1208, C1222, C1226					
						BLS	P0572, P0573					
						Vehicle speed	P0501					
						Ignition	"on"					
						Engine	"running"					
						VB	> 10					
	P0719		Short to ground / Open	Steady state failure Signal input = 1		Vehicle speed (only used for steady state diagnostic)	> 6 < 55	[mph]			10 ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
				Rationality failure = Implausible switch state					steady state = 5 Rationality = 25 brake events	(s)	steady state = once per trip Rationality = continous	2 DCY
				disable		No active DTCs:						
				conditions:		Wheel Speed Sensors BLS VS	C1232, C1207, C1221, C1225, C1233, C1208, C1222, C1226 P0572, P0573 P0501					
Engine Control Module Diagnosis		The self-test of the ECU is done once at initialization after key "ON" is detected and check-sum is recognised. There are 16 condition bits in ECU to determine the actual fault on ECU.										
	P0601		checksum error of code			Ignition	"on"		2000	[ms]	once after IGK on once / DCY	1 DCY
	P0602	No Program detected (Service ECU)	checksum error of application data								once after IGK on once / DCY	1 DCY
	P0604		RAM-check extern RAM check intern								once after IGK on once / DCY	1 DCY
	P0606	SPI (Serial peripheral interface) is a ECU-internal serial interface part of the microcontroller in order to control hardware componends (e.g. lowside driver ATIC39). This diagnosis is based on the supervision of the SP by the microcontroller hardware	SPI - Bus conflict						2000	[ms]	200 ms continuous	1 DCY
Control Module Performance	P0607		ECU Performance (Processor Frequency Error detection)						10	[ms]	10 ms continuous	1 DCY
Fuel Pump Relay	P0628	The purpose is to diagnose electrical errors detected by high side driver hardware for static outputs. The information of the error symptom is delivered by the BSW (Basic software).	short to ground			Ignition Fuel pump is running Engine Battery voltage	"on" "running" > 9		2600	[ms]	200 ms continuous	2 DCY
	P0629		short to battery or Open Circuit									2 DCY
Software Incompatibility with Transmission Control Module	U0302	software incompatibility with TCM	inappropriate ECU Dataset (AT vehicle with MT dataset or MT vehicle with AT dataset)			Ignition	"on"		10	[ms]	10 ms continuous	1 DCY
				disable conditions:		No active DTCs: No CAN errors	U0001, U0073					
Throttle Actuator Position	P2108	Actuator malfunction (limp home position)	TPS position - Limp home position	>1.999	[°]	Ignition No adaption is requested	"on"		1	[s]	10 ms triggered	1 DCY
				disable conditions:		No active DTCs:						
						No TPS error	P0121, P0122, P0123, P0221, P0222, P0223, P2176,					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
Throttle Actuator Device	P2100	The MTC is checked by the MTC-powerstage IC. It can only be checked if the powerstage is active.	Power stage			Ignition Engine Battery voltage	"on" "running" >7	[V]	450	[ms]	5 ms continuous	1 DCY
	P2101	plausibility check short to battery plus	1 Actual TPS - Commanded TPS PWM value	> 4.996 > 98.001	[°] [%]	Ignition Battery voltage No adaption is requested	"on" >7	[V]	0.5 2.0	[s] [s]	10 ms continuous	1 DCY
5 Volt Reference 1 Diagnosis	P0642	short to ground	signal voltage	< 4.75	[V]	Ignition Delay time	"on" >1.27	[s]	150	[ms]	10 ms continuous	1 DCY
	P0643	short to battery plus	signal voltage	> 5.25	[V]				150	[ms]	10 ms continuous	1 DCY
5 Volt Reference 2 Diagnosis	P0652	short to ground	signal voltage	< 4.75	[V]	Ignition Delay time	"on" >1.27	[s]	150	[ms]	10 ms continuous	1 DCY
	P0653	short to battery plus	signal voltage	> 5.25	[V]				150	[ms]	10 ms continuous	1 DCY
Malfunction Indicator Lamp (MIL) Control Circuit	P0650	The purpose is to diagnose electrical errors by the hardware for the MIL. The signals are controlled by the Lowside driver ATIC39. The driver ATIC39 can distinguish between three errors: Short to battery (SCB), Short to ground (SCG) and Open load (OL). SCB and real OL are detected by the driver only if the output is driven (ON-state), additionally SCG will be detected as OL in ON-state. If the output is non-driven (OFF-state) by the driver, SCG is detected only.	short to ground short to battery plus open circuit	 disable conditions:		Ignition No active DTCs: No control module errors	"on" P0601, P0604, P0605, P0606, P0607, P2610		immediately		200 ms continuous	2 DCY 2 DCY 2 DCY
Transmission control system (MIL request)	P0700	Transmission control system error	Transmission control system sends request for MIL and freeze frame parameters	 disable conditions:		Ignition No active DTCs: No CAN errors	"on" U0073, U0101		20	[ms]	10 ms continuous	1 DCY
Traction Control (TCS)	P0856	alive rolling count signal protection	Timer alive rolling count torque request protection	>= 3 is decayed (3 Times wrong) is decayed	[ms]	Ignition Traction control system on CAN configured	"on"		immediately		10 ms continuous	2 DCY
Throttle Position Sensor 1	P2122	short to ground or open circuit	signal voltage	< 0.63	[V]	Ignition	"on"		250	[ms]	10 ms continuous	1 DCY
	P2123	short to battery plus	signal voltage	> 4.88	[V]				250	[ms]		1 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
				disable conditions:		No active DTCs: No supply voltage error	P0642, P0643					
Throttle Position Sensor 2	P2127	short to ground or open circuit	signal voltage	< 0.12	[V]	Ignition	"on"		250	[ms]	10 ms continuous	1 DCY
	P2128	short to battery plus	signal voltage	> 2.64	[V]				250	[ms]		1 DCY
				disable conditions:		No active DTCs: No supply voltage error	P0652, P0653					
Throttle Position Sensors	P2138	rationalty check	Voltage Deviation	> 0.420...1.387	[V]	Ignition	"on"		350	[ms]	10 ms continuous	1 DCY
				disable conditions:		No active DTCs: No supply voltage error	P0642, P0643,P0652, P0653					
Ignition Coils	P2301	Detection of errors are done by hardware diagnosis	short to battery plus			Ignition Engine ECT	"on" "running" > -30	[°C]	1800	[°CA]	180°CA continuous	2 DCY
	P2304	Detection of errors are done by hardware diagnosis	short to battery plus			No cylinder shut off active Spark duration detection valid (Bit15 (MSD) of V_DUR_IGC) Battery voltage	 >10	 [V]	1800	[°CA]	180°CA continuous	2 DCY
	P2307	Detection of errors are done by hardware diagnosis	short to battery plus			Time after engine start No raw key-off Spark duration detection valid (Bit15 (MSD) of V_DUR_IGC)	>16	[Cyc.]	1800	[°CA]	180°CA continuous	2 DCY
	P2310	Detection of errors are done by hardware diagnosis	short to battery plus			No missing CRK-tooth detected			1800	[°CA]	180°CA continuous	2 DCY
				disable conditions:		No active DTCs: No CAM error	P0340, P0341, P0365, P0366					
Transmission Torque Request (ETCU)	P2544	This diagnosis is activated only if a variant coding is available and shall supervise the correct transmission system type coding by comparison of the received CAN signals.	alive rolling count signal protection out of range			Ignition	"on"		50	[ms]	10 ms continuous	2 DCY
				disable conditions:		No active DTCs: No CAN error	U0073					
CAN Lost Communication with BCM	U0140	no signal	CAN message			Ignition Battery voltage Delay time	"on" >9.7 V and < 16.5 3	[V] [s]	250	[ms]	10 ms continuous	2 DCY
Engine OFF Timer (EOT) Diagnosis	P2610	engine off timer running too fast	comparison of pulse frequency from the EOT with the ECU internal timer	< 0.8	[s]	Hardware and Engine	available and programmed "stop"		2	[s]	100 ms continuous	2 DCY
		engine off timer running too slow	comparison of pulse frequency from the EOT with the ECU internal timer	> 1.2	[s]	or Engine	 "running"		2	[s]		
		engine off timer stucking	comparison of pulse frequency from the EOT with the ECU internal timer	> 4	[s]	 no internal inhibit by timer detection Enable bits for ES or AST	 "TRUE"		2	[s]		
		engine off timer unplausible too often	comparison of pulse frequency from the EOT with the ECU internal timer	> 5 in DC	[-]	or (error re-or debouncing detected) EOT init routine	 "finished"		2	[s]		
Catalyst Monitor	P0420	CAT damaged	amplitude ratio O2S	> 1	[-]	engine speed Ignition Engine mass air flow Hysteresis for mass air flow Minimum catalyst temperature Maximum catalyst temperature	>= 1312; < 3392 "on" "running" >= 130; < 350 10.033 >450 <850	[rpm] [mg/stk] [mg/stk] [°C] [°C]	90 (driver dependant)	[s]	20 ms once / DCY	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						Hysteresis for catalyst temperature	50	[°C]				
						ambient pressure	>=74.999	[kpa]				
						MAF integral to engage EGTR after DFCO, CL max purge, forced stimulation on, LS_DOWN ready	20	[g]				
						MAF integral for EGTR activation after MAX to NO_PURGE and back	5	[g]				
						Max. p-share from trimcontroller threshold	<190	[s]				
						evap canister load	<=0.8					
						ECT	>54.75	[°C]				
						evap purge valve	not active/wait ramp open/max purge/min purge/no purge					
						The test reporting and/or corresponding fault code is stored after the oxygen sensor monitors have completed with a pass						
				disable conditions:		No active DTCs:						
						No camshaft error	P0340, P0341, P0365, P0366					
						No crankshaft error	P0335, P0336					
						No injection valve error	P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204					
						No misfire error	P0301, P0302, P0303, P0304					
						No ignition coil error	P2301, P2304, P2303, P2307, P2306, P2310, P2309					
						No FSD error	P0171					
						Post Fuel trim Correction error	P2096, P2097					
						No MTC error	P2101, P2100					
						No VIM error	P065E, P0661, P0662					
						No PVS error	P2122, P2123, P2127, P2128					
						Heater Control downstream	P0036, P0037, P0038, P0141					
						Heater Control upstream	P0030, P0031, P0032, P0135					
						System voltage	P0562, P0563,					
						No ECT error	P0118, P0117, P0119, P0116					
						No TPS Error	P0101, P0068, P1101, P0121, P0221, P2176, P0123, P0122, P0223, P0222					
						No MAF error	P0102, P0103					
						No O2 sensor error upstream	P0132, P0131, P0134, P0130, P2A00, P2297, P0133					
						No O2 sensor error downstream	P0136, P0138, P0137, P0140, P2A01, P0139					
						Evaporative Emission Control Function	P0496, P0459, P0458, P0443					
						No EVAM error	P0446					
						No IVVT Error	P2089, P2088, P0010, P000A, P000B, P0016, P0017, P0013, P2090, P2091					
						No ambient pressure Error	P2227, P2228, P2229					
						Supply voltage	P0643, P0642, P0653, P0652					
Misfire	P0300	multiple cylinder misfire	multiple cylinder misfire				more than one single misfire					2 DCY
Cylinder # 1	P0301	single or multiple misfire	emission threshold misfire rate (MR) 1st intervall	AT>2,04 MT>2,70	% %	Ignition Time after engine start engine speed range	"on" +2 crankshaft rev. 608 .. 6528	[rpm]	1000 1000	[rev] [rev]	180°CA continuous	2 DCY 2 DCY
Cylinder # 2	P0302	single or multiple misfire	emission threshold misfire rate (MR)	AT>2,04 MT>2,7	% %	Engine load Engine load rough road	AT > 65...195 MT > 70...185 not active	[mg/stk] [mg/stk]	1000 1000	[rev] [rev]	180°CA continuous	2 DCY 2 DCY
Cylinder # 3	P0303	single or multiple misfire	catalyst damage misfire rate (MR)	> 8,5	%	Fuel cut off Throttle position gradient MAF difference	not active 503.8...949.0 35...40	[°TPS/s] [mg/stk]	200	[rev]	180°CA continuous	2 DCY
Cylinder # 4	P0304	single or multiple misfire				Engine	"running"					2 DCY
	P0313	misfire with low fuel tank level	misfire with low fuel tank level	disable conditions:		No active DTC's: No MAF error No Cam sensor error No Crank sensor error No TPS error	P0101, P1101, P0102, P0103 P0016, P0340, P0341 P0335, P0336 P0068, P0121, P0122, P0123, P0221, P0222, P0223,					2 DCY
Post catalyst fuel trim system correction Fuel Correction Diagnostic, Portion #1	P2096	system too lean	LAM –P-jump delay time from I-share or lambda set-point shifting (O2 sensor downstream intrusive test)	> 315 = active	[ms]	Ignition Trim-controller I-share Evaporative Emission Control Function	"on" = active = canister purge not in adaptation		2.5	[s]	100 ms continuous	2 DCY
	P2097	system too rich	LAM –P-jump delay time from I-share	< -380 disable conditions:	[ms]	No active DTC's: No TCO error No MAF error No FSD error No O2 sensor error No TPS Error	P0116, P0117, P0118, P0119 P0102, P0103 P0171, P0172 P0030, P0031, P0032, P0036, P0037, P0038, P0131, P0132, P0133, P0130, P0137, P0138, P0139, P0140, P0141, P2270, P2271, P2297, P2A00, P2A01 P0121, P0122, P0123, P0221, P0222, P0223, P2176, P0101, P0068, P1101		2.5	[s]	100 ms continuous	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No ignition coil error No CAT error No injection valve error No Canister purge solenoid error No MTC error No misfire error No CKP error No IVVT error No CMP error	P2300, P2301, P2303, P2304, P2306, P2307, P2309, P2310 P0420 P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 P0443, P0458, P0459 P2100, P2101 P0300, P0301, P0302, P0303, P0304, P0313 P0335, P0336 P0365, P0366, P000A, P000B, P0010, P0011, P0013, P0014, P0016, P0017, P2088, P2089, P2090, P2091 P0340, P0341					
Fuel Correction Diagnostic, Portion #2 **O2 Sensor Signal Check**	P2270	Rich voltage not reached (System Lean)	signal voltage down stream	< 0.605 [lambda mixture lean > 1] disable conditions:	[V]	Ignition ECT Time after engine start Integrated MAF inegral after lambda closed loop Mass air flow integrated within rich shift Signal voltage down stream Lambda set-point shifting O2SH state post catalyst fuel trim diagnosis (P2096 or P2097) No active DTCs: No CKP error No CMP error No IVVT error No MAF error No O2 sensor error No Misfire error No canister purge solenoid error No mech. canister purge solenoid error No TPS error No TCO error No FSD error	"on" > 75 > 300 > 1000 > 80 < 0.679 = 0.85 active finished and error detected P0335, P0336 P0340, P0341 P0365, P0366, P000A, P000B, P0010, P0011, P0013, P0014, P0016, P0017, P2088, P2089, P2090, P2091 P0102, P0103 P0030, P0031, P0032, P0036, P0037, P0038, P0130, P0131, P0132, P0133, P0137, P0138, P0139, P0141, P2270, P2271, P2297, P2A00, P2A01 P0300, P0301, P0302, P0303, P0304, P0313 P0443, P0458, P0459 P0496 P0121, P0122, P0123, P0221, P0222, P0223, P2176, P0101, P0068, P1101 P0116, P0117, P0118, P0119 P0171, P0172	[°C] (ms) [g] [g] [V] [-]	25	[s]	100 ms once / DCY	2 DCY
	P2271	Lean voltage not reached (System Rich)	signal voltage down stream	> 0.298 [lambda mixture lean > 1] disable conditions:	[V]	O2SH state post catalyst fuel trim diagnosis (P2096 or P2097) Ignition Time after engine start Integrated MAF inegral after lambda closed loop Mass air flow integrated within lean shift Signal voltage down stream Mass air flow integral in DFCO Lambda set-point shifting ECT No active DTCs: No CKP error No CMP error No IVVT error No MAF error No O2 sensor error No Misfire error No canister purge solenoid error No mech. canister purge solenoid error No TPS error No TCO error No FSD error	active finished and error detected "on" > 300 > 1000 > 80 < 0.2 < 10 = 1.15 > 75 P0335, P0336 P0340, P0341 P0365, P0366, P000A, P000B, P0010, P0011, P0013, P0014, P0016, P0017, P2088, P2089, P2090, P2091 P0102, P0103 P0030, P0031, P0032, P0036, P0037, P0038, P0130, P0131, P0132, P0133, P0137, P0138, P0139, P0141, P2270, P2271, P2297, P2A00, P2A01 P0300, P0301, P0302, P0303, P0304, P0313 P0443, P0458, P0459 P0496 P0121, P0122, P0123, P0221, P0222, P0223, P2176, P0101, P0068, P1101 P0116, P0117, P0118, P0119 P0171, P0172	 [ms] [g] [g] [V] [g] [-] [°C]	20	[s]	100 ms once / DCY	2 DCY
	P0140	no activity	signal voltage down stream and signal voltage down stream	> 0.298 [lambda mixture lean > 1] < 0.605 [lambda mixture lean > 1]	[V] [V]	Ignition ECT O2SH state post catalyst fuel trim diagnosis (P2096 or P2097) Time after engine start Integrated MAF inegral after lambda closed loop Lambda set-point shifting Mass air flow integrated within rich shift Mass air flow integral in DFCO Lambda set-point shifting Mass air flow integrated within lean shift	"on" > 75 active finished and error detected > 300 > 1000 = 0.85 > 80 < 10 = 1.15 > 80	[°C] [g] [g] [-] [g] [g] [-] [g]	50		100 ms once / DCY once / DCY once / DCY	2 DCY 2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
				disable conditions:		No active DTCs: No CKP error No CMP error No IVVT error No MAF error No O2 sensor error No Misfire error No canister purge solenoid error No mech. canister purge solenoid error No TPS error No TCO error No FSD error	 P0335, P0336 P0340, P0341 P0365, P0366, P000A, P000B, P0010, P0011, P0013, P0014, P0016, P0017, P2088, P2089, P2090, P2091 P0102, P0103 P0030, P0031, P0032, P0036, P0037, P0038, P0130, P0131, P0132, P0133, P0137, P0138, P0139, P0141, P2270, P2271, P2297, P2A00, P2A01 P0300, P0301, P0302, P0303, P0304, P0313 P0443, P0458, P0459 P0496 P0121, P0122, P0123, P0221, P0222, P0223, P2176, P0101, P0068, P1101 P0116, P0117, P0118, P0119 P0171, P0172					
EVAP System **EVAP DTP Sensor**	P0453	short to battery plus or open circuit	signal voltage	> 4.902(< -3,75 kPa)	[V]	Ignition Fuel tank level moving mean value	"on" >= 0 or < = 10.428	[gal]	1000	[ms]	100 ms continuous	2 DCY
	P0452	short to ground	signal voltage	< 0.2(> 1,25 kPa)	[V]							2 DCY
				disable conditions:		No active DTCs: No supply voltage error	 P0642, P0643					
	P0451	plausibility check	I max. Voltage - min. Voltage I	< 0.039	[V]	Ignition Engine Signal voltage Time after start Vehicle speed once per DC Moving mean value of the canister load Mass flow through the CPS Uninterupted time Evaporative Emission Control Function No purge and max purge reached once per DC	"on" "running" > 0.2 and < 4.902 >= 10 >= 12.426 < 1 > 0.6 > 5 = max. Purge	[V] [s] [mph] [-] [kg/h] [s]	5	[s]	500 ms continuous	2 DCY
				disable conditions:		No active DTCs: No supply voltage error No DTP Error	 P0642, P0643 P0452, P0453					
	P0454	Signal Noisy	max fuel tank pressure - min fuel tank pressure	> 0.1	[kPa]	Ignition Statistic counter Ambient pressure Coolant temp Time since engine start Idle speed Fuel Tank Level between Degree of canister saturation Tank pressure Vehicle speed IAT Battery voltage Lambda control Modeled Fuel Temperature Minimum purge time at partload	"on" > 10 > 74.999 <= 110.25 70...600 "=active" >=1.584 and <= 10.428 <= 1 > -3 and <1 "=0" > -8.25 and < 70 > 9.99 closed loop < 45 = 20 or = 10	 [kPa] [°C] [s] [gal] [kPa] [°C] [V] [°C] [s]	5	[s]	500 ms once / DCY	2 DCY
				disable conditions:		No active DTCs: No DTP error No shut of valve error No CPS error No EVAM error No AMP error No TAM error No MAF error No TPS error No Ignition coils error No Injectors error No O2 sensor error No IAT error No system voltage error No VS error No idle speed controler error No CAM error	 P0453, P0452, P0451, P0454 P0499, P0498 P0459, P0458, P0443, P0496, P0436 P0446 P2229, P2228, P2227 P0073, P0072, P009A, P0074 P0103, P0102 P0123, P0122, P0121, P2101, P2100, P2119, P2176,P0068, P1101 P2301, P2304, P2307, P2310, P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204 P0132, P0131, P0134, P2297, P0133, P0032, P0031, P0030, P0135 P0113, P0112, P0114, P0111 P0563, P0562 P0501 P0507, P0506 P0340, P0341, P0365, P0366					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No IVVT error No CRK error No ECT error No supply voltage error No control module error No CAN error No FSD error No misfire error No EOT error No EVAP error	P000A, P000B, P0016, P0017, 0, P2089, P2088, P0010, P2091, P2090, P0013 P0335, P0336 P0118, P0117, P0119, P0116 P0643, P0642 P0605, P061A, P061B, P061C U0073, U0002, P0171, P0172 P0301, P0303, P0304, P0302 P2610 P0456, P0442, P0455					
EVAP System (Shut Off Valve - SOV)	P0499	The purpose is to diagnose electrical errors by the hardware for the static output of MAIN relay. The signal is controlled by the Lowside driver ATIC39. The driver ATIC39 can distinguish between three errors: Short to battery (SCB), Short to ground (SCG) and Open line(OL). SCB and OL are detected by the driver only if the output is driven (ON-state), additionally SCG will be detected as OL in ON-state. If the output is non-driven (OFF-state) by the driver, SCG is detected only.	short to battery plus			Ignition Battery voltage	"on" > 10	 [V]	3200	[ms]	200 ms continuous	2 DCY
	P0498		short to ground			Engine	"running"					2 DCY
	P0449		open circuit									2 DCY
				disable conditions:		No active DTCs: No SPI Bus conflict	 P0606					
(SOV - Stuck Closed)	P0446	stuck closed check	signal voltage	> 3.999 < - 3kpa disable conditions:	[V]	Start end Battery voltage Mass flow through the CPS No active DTCs: No supply voltage error No shut off valve error No DTP error No system voltage error	 > 9.99 > 0.015 P0642, P0643 P0499, P0498, P0449 P0453, P452, P0451, P0454 P0562, P0563,	 [V] [kg/h]	2000	[ms]	500 ms continuous	2 DCY
EVAP System **(Canister Purge - CPS)**	P0459	The purpose is to diagnose electrical errors by the hardware for the static output of MAIN relay. The signal is controlled by the Lowside driver ATIC39. The driver ATIC39 can distinguish between three errors: Short to battery (SCB), Short to ground (SCG) and Open line(OL). SCB and OL are detected by the driver only if the output is driven (ON-state), additionally SCG will be detected as OL in ON-state. If the output is non-driven (OFF-state) by the driver, SCG is detected only.	short to battery plus	> 8.203	[%]	Ignition Engine Battery voltage	"on" "running" > 9	 [V]	3200	[ms]	200 ms continuous	2 DCY
	P0458		short to ground	< 91.016	[%]	PWM signal Logical variable for raw KEY_OFF	>= 8.304 and <= 91.016 Off	[%]				2 DCY
	P0443		open circuit	< 91.016 >8.203 disable conditions:	[%] [%]	 No active DTCs: No SPI Bus conflict No FP relay error	 P0606 P0628, P0629					2 DCY
(Canister Purge - CPS)	P0496	stuck open check	DTP difference during the vapour generation phase	<= -0.2	[kPa]	Ignition States during evaporative system monitoring Ambient pressure Coolant temp Time since engine start Idle speed Fuel Tank Level between Degree of canister saturation Tank pressure Vehicle speed IAT Battery voltage Lambda control Modeled Fuel Temperature Minimum purge time at partload	"on" = DTP correction > 74.999 <= 110.25 70...600 "=active" >=1.584 and <= 10.428 <= 1 > -3 and <1 "=0" > -8.25 and < 70 > 9.99 closed loop < 45 = 20 or = 10	 [kPa] [°C] [s] [gal] [kPa] [°C] [V] [°C] [s]	0,5	[s]	50 ms once / DCY	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
				disable conditions:		No active DTCs: No DTP error No shut of valve error No CPS error No EVAM error No AMP error No TAM error No MAF error No TPS error No Ignition coils error No Injectors error No O2 sensor error No IAT error No system voltage error No VS error No idle speed controler error No CAM error No IVVT error No CRK error No ECT error No supply voltage error No control module error No CAN error No FSD error No misfire error No EOT error No EVAP error	P0453, P0452, P0451, P0454 P0499, P0498 P0459, P0458, P0443, P0496, P0436 P0446 P2229, P2228, P2227 P0073, P0072, P009A, P0074 P0103, P0102 P0123, P0122, P0121, P2101, P2100, P2119, P2176,P0068, P1101 P2301, P2304, P2307, P2310, P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204 P0132, P0131, P0134, P2297, P0133, P0032, P0031, P0030, P0135 P0113, P0112, P0114, P0111 P0563, P0562 P0501 P0507, P0506 P0340, P0341, P0365, P0366 P000A, P000B, P0016, P0017, 0, P2089, P2088, P0010, P2091, P2090, P0013 P0335, P0336 P0118, P0117, P0119, P0116 P0643, P0642 P0605, P061A, P061B, P061C U0073, U0002, P0171, P0172 P0301, P0303, P0304, P0302 P2610 P0456, P0442, P0455					
EVAP System Very Small Leak (.5mm)	P0456	Small leak detection	Reduced leakage diameter	< 0.85 and >0.388	[mm]	Ignition Time delay Ambient pressure cCoolant temp Time since engine start Idle speed Fuel Tank Level between Degree of canister saturation Tank pressure Vehicle speed IAT Battery voltage Lambda control Modeled Fuel Temperature Minimum purge time at partload	"on" >= 4 > 74.999 <= 110.25 70...600 "=active" >=1.584 and <= 10.428 <= 1 > -3 and <1 "=0" > -8.25 and < 70 > 9.99 closed loop < 45 = 20 or = 10	[s] [kPa] [°C] [s] [gal] [kPa] [°C] [V] [°C] [s]	30	[s]	50 ms once / DCY	2 DCY
				disable conditions:		No active DTCs: No DTP error No shut of valve error No CPS error No EVAM error No AMP error No TAM error No MAF error No TPS error No Ignition coils error No Injectors error No O2 sensor error No IAT error No system voltage error No VS error No idle speed controler error No CAM error No IVVT error No CRK error No ECT error No supply voltage error No control module error No CAN error No FSD error No misfire error No EOT error No EVAP error	P0453, P0452, P0451, P0454 P0499, P0498 P0459, P0458, P0443, P0496, P0436 P0446 P2229, P2228, P2227 P0073, P0072, P009A, P0074 P0103, P0102 P0123, P0122, P0121, P2101, P2100, P2119, P2176,P0068, P1101 P2301, P2304, P2307, P2310, P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204 P0132, P0131, P0134, P2297, P0133, P0032, P0031, P0030, P0135 P0113, P0112, P0114, P0111 P0563, P0562 P0501 P0507, P0506 P0340, P0341, P0365, P0366 P000A, P000B, P0016, P0017, 0, P2089, P2088, P0010, P2091, P2090, P0013 P0335, P0336 P0118, P0117, P0119, P0116 P0643, P0642 P0605, P061A, P061B, P061C U0073, U0002, P0171, P0172 P0301, P0303, P0304, P0302 P2610 P0456, P0442, P0455					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
EVAP System Small Leak (1mm)	P0442	Small leak detection	Reduced leakage diameter	>= 0.85	[mm]	Ignition Time delay	"on" >= 4	[s]	30	[s]	50 ms once / DCY	2 DCY
						Ambient pressure	> 74.999	[kPa]				
						Coolant temp	<= 110.25	[°C]				
						Time since engine start	70...600	[s]				
						Idle speed	"=active"					
						Fuel Tank Level between	>=1.584 and <= 10.428	[gal]				
						Degree of canister saturation	<= 1					
						Tank pressure	> -3 and <1	[kPa]				
						Vehicle speed	"=0"					
						IAT	> -8.25 and < 70	[°C]				
						Battery voltage	> 9.99	[V]				
						Lambda control	closed loop					
						Modeled Fuel Temperature	< 45	[°C]				
						Minimum purge time at partload	= 20 or = 10	[s]				
				disable conditions:		No active DTCs: No DTP error	P0453, P0452, P0451, P0454					
						No shut of valve error	P0499, P0498					
						No CPS error	P0459, P0458, P0443, P0496, P0436					
						No EVAM error	P0446					
						No AMP error	P2229, P2228, P2227					
						No TAM error	P0073, P0072, P009A, P0074					
						No MAF error	P0103, P0102					
						No TPS error	P0123, P0122, P0121, P2101, P2100, P2119, P2176,P0068, P1101					
						No Ignition coils error	P2301, P2304, P2307, P2310,					
						No Injectors error	P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204					
						No O2 sensor error	P0132, P0131, P0134, P2297, P0133, P0032, P0031, P0030, P0135					
						No IAT error	P0113, P0112, P0114, P0111					
						No system voltage error	P0563, P0562					
						No VS error	P0501					
						No idle speed controler error	P0507, P0506					
						No CAM error	P0340, P0341, P0365, P0366					
						No IVVT error	P000A, P000B, P0016, P0017, 0, P2089, P2088, P0010, P2091, P2090, P0013					
						No CRK error	P0335, P0336					
						No ECT error	P0118, P0117, P0119, P0116					
						No supply voltage error	P0643, P0642					
						No control module error	P0605, P061A, P061B, P061C					
						No CAN error	U0073, U0002,					
						No FSD error	P0171, P0172					
						No misfire error	P0301, P0303, P0304, P0302					
						No EOT error	P2610					
						No EVAP error	P0456, P0442, P0455					
EVAP System Large Leak	P0455	Large Leak Detection	Pressure difference during evacuation	> -1.3	[kPa]	Ignition Time delay	"on" >= 20	[s]	25	[s]	50 ms once / DCY	2 DCY
						Ambient pressure	> 74.999	[kPa]				
						Coolant temp	<= 110.25	[°C]				
						Time since engine start	70...600	[s]				
						Idle speed	"=active"					
						Fuel Tank Level between	>=1.584 and <= 10.428	[gal]				
						Degree of canister saturation	<= 1					
						Tank pressure	> -3 and <1	[kPa]				
						Vehicle speed	"=0"					
						IAT	> -8.25 and < 70	[°C]				
						Battery voltage	> 9.99	[V]				
						Lambda control	closed loop					
						Modeled Fuel Temperature	< 45	[°C]				
						Minimum purge time at partload	= 20 or = 10	[s]				
				disable conditions:		No active DTCs: No DTP error	P0453, P0452, P0451, P0454					
						No shut of valve error	P0499, P0498					
						No CPS error	P0459, P0458, P0443, P0496, P0436					
						No EVAM error	P0446					
						No AMP error	P2229, P2228, P2227					
						No TAM error	P0073, P0072, P009A, P0074					
						No MAF error	P0103, P0102					
						No TPS error	P0123, P0122, P0121, P2101, P2100, P2119, P2176,P0068, P1101					
						No Ignition coils error	P2301, P2304, P2307, P2310,					
						No Injectors error	P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267, P0203, P0271, P0270, P0204					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No O2 sensor error	P0132, P0131, P0134, P2297, P0133, P0032, P0031, P0030, P0135					
						No IAT error	P0113, P0112, P0114, P0111					
						No system voltage error	P0563, P0562					
						No VS error	P0501					
						No idle speed controler error	P0507, P0506					
						No CAM error	P0340, P0341, P0365, P0366 P000A, P000B, P0016, P0017, 0, P2089, P2088,					
						No IVVT error	P0010, P2091, P2090, P0013					
						No CRK error	P0335, P0336					
						No ECT error	P0118, P0117, P0119, P0116					
						No supply voltage error	P0643, P0642					
						No control module error	P0605, P061A, P061B, P061C					
						No CAN error	U0073, U0002,					
						No FSD error	P0171, P0172					
						No misfire error	P0301, P0303, P0304, P0302					
						No EOT error	P2610					
						No EVAP error	P0456, P0442, P0455					
Fuel System	P0171	system to lean	additive adaptive value	> = 1.5	[ms]	Lambda control	closed loop	[-]	> = 25	[s]		2 DCY
	P0172	system to rich	additive adaptive value	> = -1.5	[ms]	Evap canister load	< 0.2	[-]			20 ms	
						Engine speed	> 608	[rpm]			multiple	2 DCY
						Engine load (mass air flow)	> 71	[mg/stk]				
						Engine coolant temperature	> 65.3	[°C]				
	P0171	system to lean	multiplicative adaptive value	> = 17.999	[%]	Ambient pressure	> 69.999	[kPa]	> = 22	[s]	20 ms	2 DCY
	P0172	system to rich	multiplicative adaptive value	> = -17.999	[%]	Intake air temperature	> -9.8	[°C]			multiple	
						Ambient air temperature	> -9.8	[°C]				2 DCY
						Ignition	"on"					
	P0171	system to lean	lambda controller in dead stop	< -35.001...-5	[%]				> = 35	[s]	20 ms multiple	2 DCY
	P0172	system to rich	lambda controller in dead stop	< 25...35.001	[%]				> = 35	[s]	20 ms multiple	2 DCY
				disable conditions:		No active DTCs:						
						No CPS error	P0459, P0458, P0443, P0496					
						No TCO error	P0118, P0117, P0119, P0116					
						No MAF error	P0103, P0102					
						No misfire error	P0301, P0303, P0304, P0302					
						No IAT error	P0113, P0112, P0114, P0111					
						No TPS Error	P0123, P0122, P0223, P0222 P0130, P0134, P0133, P0135, P0132, P0131, P0032, P0031,					
						No upstream error	P0030, P2297, P2A00					
						No CAM error	P0340, P0341, P0365, P0366					
						No TPS_PLAUS error	P0068, P0101, P1101					
						No CRK error	P0335, P0336 P0262, P0261, P0201, P0265, P0264, P0202, P0268, P0267,					
						No injection valve error	P0203, P0271, P0270, P0204					
						No ambient pressure Error	P2229, P2228, P2227					
						No TAM error	P0073, P0072, P009A, P0074, P0071					
Oxygen Sensor Upstream												
HO2S Heater Control	P0030	Open Circuit	done by the heater driver at the "ON" state			O2SH state	active		2500	[ms]	200 ms	
						Ignition	"on"				continuous	2 DCY
						Battery voltage	> 9	[V]				
						PWM value	<= 99.609 and >= 4.297	[%]				
	P0031	Short to Ground	done by the heater driver at the "OFF" state			Ignition	"ON"					2 DCY
						Battery voltage	> 9	[V]				
						PWM value	<= 99.609 and >= 4.297	[%]				
	P0032	Short to Battery	done by the heater driver at the "ON" state			Ignition	"ON"					2 DCY
						Exhaust gas Temp. at lambda sensor up cat	>= 99.98	[°C]				
						Battery voltage	> 9	[V]				
						PWM value	<= 99.609 and >= 4.297	[%]				
	P0135	Resistance Out of Range	resistance	dep. on heater power&rpm >= 1200	[Ohm]	Ignition	"on"					
						Engine start			dep.on driver		1000 ms	2 DCY
						O2S front dewpoint	passed		shortest		once / DCY	
						Battery voltage	>= 9	[V]	about		triggered	
							<= 99.6 and >= 4.3 [max. battery voltage... min. battery					
			number of checks	>= 50	[-]	PWM signal	voltage]	[%]	50	[s]	resistance calc.	
			out of	>= 30	[-]	Timer	>= 0	[s]				
						exhaust gas Temp. at lambda sensor up cat	>= 799.98	[°C]				
						Setpointtemp. used to create power integral	=699.98	[°C]				
						Measure of cooling energy of exhaust gas at sensor location	>= 34256	[J]				
				disable conditions:		No active DTCs:						
						No O2 sensor error	P0130, P0131,P0132, P0134					
						No O2 sensor heater error	P0030, P0031, P0032					
						No MAF error	P0102, P0103					
						No TPS Error	P0068, P0101, P1101					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
HO2S Electrical Diagnosis	P0131	Short to Ground	signal voltage up stream	< 0.024	[V]	Ignition	"on"		1000	[ms]		2 DCY
						Resistance	< 20 [700 °C at HO2S]	[Ohm]			100 ms	
						Signal voltage down stream	> 0.024 [lean mixture > 1.4]	[V]			continuous	
						Mass air flow	>=8	[kg/h]				
						Time for lambda controller at limit	>= 0	[s]				
						Mass air flow for diagnosis (after CPS closed)	>= 30	[g]				
						Time after lambda controller activated	> 20	[s]				
				disable		No active DTCs:						
				conditions:		No O2 sensor error	P0130, P0132, P0133, P0134, P0137, P0138, P0139, P0140, P2270, P2271, P2297, P2A00, P2A01					
						No O2 sensor heater error	P0030, P0031, P0032, P0036, P0037, P0038, P0135, P0141					
						No Canister purge solenoid error	P0443, P0458, P0459					
						No mech. canister purge solenoid error	P0496					
						No MAF error	P0102, P0103					
	P0132	Short to Battery	signal voltage up stream	> 1.201	[V]	Ignition	"ON"		2500	[ms]		2 DCY
				disable		No active DTCs:						
				conditions:		No O2 sensor error	P0130, P0131, P0133, P0134, P2297, P2A00				100 ms	
						No O2 sensor heater error	P0030, P0031, P0032, P0135				continuous	
HO2S Electrical Diagnosis	P0130	open circuit	resistance	< 60000	[Ohm]	Delay time	>= 10	[s]	2500	[ms]		2 DCY
			duration in which the conditions for diag are fulfilled	>= 3	[s]	Duration in which the conditions for diag are fulfilled	>= 3				100 ms	
						Ignition	"on"				continuous	
						Exhaust gas Temp. at lambda sensor upstream cat	> 599.98					
				disable		No active DTCs:						
				conditions:		No O2 sensor error	P0130, P0131, P0132, P0133, P0134, P2297, P2A00					
						No O2 sensor heater error	P0030, P0031, P0032, P0135					
						O2S front dewpoint	passed					
						O2SH state	active					
						Ignition	"ON"					2 DCY
Activity Check	P0134	sensor signal excursion	I max. moving mean value - min moving mean value I	< 0.22	[V]	Exhaust gas Temp. at lambda sensor upstream cat	> 599.98	[°C]	25		100 ms	
						Counter indicating the number of observed p jumps reported by the lambda controller	> 30				once / DCY	
						Lean mixture cycle time	< 2	[s]				
						Rich mixture cycle time	< 2	[s]				
						Lambda control	active					
						Time after start	> 300	[s]				
				disable		No active DTCs:						
				conditions:		No O2 sensor error	P0130, P0131, P0132, P0133, P0134, P2297, P2A00					2 DCY
						No O2 sensor heater error	P0030, P0031, P0032, P0135					
						Engine speed	1504 < rpm <3488	[rpm]				
HO2S Slow Response	P0133	O2 sensor period too long / rich to lean ratio out of range	number of rich to lean and lean to rich cycles	> 50		Exhaust gas Temp. at lambda sensor upstream cat	> 399.98	[°C]	260	[s]	10 ms	2 DCY
			total ratio between measured and max. allowed rich time,	>= 1		Mass air flow	> 27.5 and < 120	[kg/h]			once / DCY	
			total ratio between measured and max. allowed lean time	>= 1		Setpoint stable						
			I ratio lean time - ratio rich time I	< -0.5 or > 0.5		ECT	> 50.25	[°C]				
						Ignition	"ON"					
				disable		No active DTCs:						
				conditions:		No MAF error	P0102, P0103					
						No TPS error	P0121, P0122, P0123, P0221, P0222, P0223, P2176, P0101, P0068, P1101					
						No TCO error	P0116, P0117, P0118, P0119					
						No CMP error	P0340, P0341					
						No IVVT error	P0365, P0366, P000A, P000B, P0010, P0011, P0013, P0014, P0016, P0017, P2088, P2089, P2090, P2091					
						No CKP error	P0335, P0336					
						No misfire error	P0300, P0301, P0302, P0303, P0304, P0313					
						No O2 sensor error	P0130, P0131, P0132, P0134, P2297, P2A00					
						No O2 sensor heater error	P0030, P0031, P0032, P0135					
						No MTC error	P2100, P2101					
						No canister purge solenoid error	P0443, P0458, P0459					
						No mech. canister purge solenoid error	P0496					
						No FSD error	P0171, P0172					
HO2S Performance during Decel Fuel Cut-Off (DFCO) Sensor 1	P2297	Signal Not Plausible in DFCO	signal voltage up stream	> 0.151	[V]	Ignition	"on"		200	[ms]	100 ms	2 DCY
						Operative readiness of sensor	"on"				triggered	
						Exhaust gas Temp. at lambda sensor upstream cat	> 599.98	[°C]				
						Air mass flow integral during pull cut off phase	8 < MAF < 500	[kg/h]				
				disable		No active DTCs:						
				conditions:		No O2 sensor error	P0130, P0131, P0132, P0133, P0134, P2A00					
						No O2 sensor heater error	P0030, P0031, P0032, P0135					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No canister purge solenoid error No mech. canister purge solenoid error No TPS Error No Injection valve error No Misfire error No MAF error No FSD error	P0443, P0458, P0459 P0496 P0068, P0101, P1101 P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 P0300, P0301, P0302, P0303, P0304, P0313 P0102, P0103 P0171, P0172					
	P2A00	sensor not ready in time	Timer or O2 sensor heater plausibility error or Open cirquit O2 sensor upstream of catalyst	> 30 active active disable conditions:	[s]	O2S front dewpoint Ignition No active DTCs: No O2 sensor error No O2 sensor heater error	passed "on" P0130, P0131, P0132, P0133, P0134, P2297, P0030, P0031, P0032				100 ms once / DCY	2 DCY
Oxygen Sensor Downstream HO2S Heater Control	P0036	Open Circuit	done by the heater driver at the "ON" state			Ignition Battery voltage PWM value	"on" > 9 4.3 <= PWM <=99.6	[V] [%]	2500	[ms]	200 ms continuous	2 DCY
	P0037	Short to Ground	done by the heater driver at the "OFF" state			Ignition Battery voltage PWM value	"on" > 9 4.3 <= PWM <=99.6	[V] [%]	2500		200 ms continuous	2 DCY
	P0038	Short to Battery	done by the heater driver at the "ON" state			Ignition exhaust gas Temp. at lambda sensor up cat Battery voltage PWM value	"on" > 24.98 > 9 4.3 <= PWM <=99.6	[°C] [V] [%]	2500		200 ms continuous	2 DCY
	P0141	Resistance Out of Range	resistance number of checks out of	>= 7000 >= 50 >= 30 disable conditions:	[Ohm]	Ignition Timer Operative readiness of sensor Exhaust gas Temp. at lambda sensor downstream cat Setpointtemp. used to create power integral Measure of cooling energy of exhaust gas at sensor location Battery voltage PWM signal No active DTCs: No MAF error No TPS Error No O2 sensor heater error	"on" > 120 passed < 799.98 = 699.98 > 27685 > 10 4.297 < PWM < 99.609 P0102, P0103 P0068, P0101, P1101 P0036, P0037, P0038	[s] [°C] [°C] [J] [V] [%]	dep.on driver shortest about 50		triggered resistance calc. once / DCY	2 DCY
HO2S Electrical Diagnosis	P0137	Short to Ground	signal voltage down stream	< 0.024 disable conditions:	[V]	No MAF error Mass air flow Engine Resistance Detection time Mass air flow integral outside of DFCO Ignition No active DTCs: No O2 sensor error No O2 sensor heater error No canister purge solenoid error No mech. canister purge solenoid error	P0102, P0103 > 8 "running" < 25 > 0 > 80 "on" P0136, P0137, P0138, P0139, P0140, P2270, P2271, P2A01 P0036, P0037, P0038, P0141 P0443, P0458, P0459 P0496	[kg/h] [Ohm] [g]	2500	[ms]	100 ms continuous	2 DCY
	P0138	Short to Battery	signal voltage down stream	> 1.201 disable conditions:	[V]	Ignition No active DTCs: No O2 sensor error No O2 sensor heater error	"on" P0136, P0137, P0138, P0139, P0140, P2270, P2271, P2A01 P0036, P0037, P0038, P0141		2500	[ms]	100 ms continuous	2 DCY
	P0136	open circuit	resistance	>60000 [HO2S temp.< 300°C]	[Ohm]	Ignition Engine Exhaust gas Temp. at lambda sensor downstream cat Signal voltage Detection time or Delay time	"on" "running" > 499.98 <= 0.474 and > 0.376 >= 3 >= 5	 [°C] [V] [s] [s]	2500	[ms]	100 ms continuous	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Conditions		Monitor Time Length		Frequency of Checks	MIL Illum.
						No active DTCs: No O2 sensor error No O2 sensor heater error No MAF error	 P0136, P0137, P0138, P0139, P2270, P2271, P2A01 P0036, P0037, P0038, P0141 P0102, P0103					
HO2S Slow Response	P0139	Slow Response	Number of valid switching times from rich to lean Average of weighted Cycle counter for switching time determination	>=2 >= 1 disable conditions:	[-] [-]	Ignition ECT signal voltage Mass air flow Operative readiness of sensor Exhaust gas Temp. at lambda sensor downstream cat Time after dew point detection Vehicle speed Dynamic catalyst monolith temperature No active DTCs: No FSD error No O2 sensor error No O2 sensor heater error No MAF error No VS error No TCO error No Misfire error No injection valve error No CKP error No CMP error No IVVT error No mech. canister purge solenoid error No Canister purge solenoid error No MTC error No TPS Error	"on" > 60 > 0.552 5 < MAF <= 400 passed > 499.98 >= 60 <= 93.195 and >= 12.426 > 307 P0171, P0172 P0136, P0137, P0138, P2270, P2271, P2A01 P0036, P0037, P0038, P0141 P0102, P0103 P0501 P0116, P0117, P0118, P0119 P0300, P0301, P0302, P0303, P0304, P0313 P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 P0335, P0336 P0340, P0341 P0365, P0366, P000A, P000B, P0010, P0011, P0013, P0014, P0016, P0017, P2088, P2089, P2090, P2091 P0496 P0443, P0458, P0459 P2100, P2101 P0121, P0122, P0123, P0221, P0222, P0223, P2176, P0101, P0068, P1101	[°C] [V] [kg/h] [°C] [s] [mph] [°C]	dep.on driver		20 ms once / DCY	2 DCY
HO2S Performance Sensor 2	P2A01	Signal Not Plausible in DFCO	signal voltage down stream	> 0.151 disable conditions:	[V]	Ignition Signal voltage value before entering fuel cut phase Trailing throttle fuel cut off Air mass flow during fuel cut off phase Signal voltage No active DTCs: No MAF error No Canister purge solenoid error No mech. canister purge solenoid error No O2 sensor error No O2 sensor heater error No TPS Error No Misfire error No injection valve error No FSD error	"on" > 0.601 "ON" > 10 > 0.601 P0102, P0103 P0443, P0458, P0459 P0496 P0136, P0137, P0138, P0139, P0140, P2270, P2271 P0036, P0037, P0038, P0141 P0068, P0101, P1101 P0300, P0301, P0302, P0303, P0304, P0313 P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 P0171, P0172	[V] [g] [V]	2500		100 ms multiple	2 DCY
Control module programming ready only memory	P0605	ROM check	internal error			ECM power up			immetiately		40 ms continuous	1 DCY
		RAM-check	internal error			ECM power up			480		40 ms continuous	1 DCY
		general level 3 error	internal error			ECM power up			480		40 ms continuous	1 DCY
		FS-IST error on MU	internal error			ECM power up			480		40 ms continuous	1 DCY
ECM	P061A	General level 2 error	MON			Ignition	"on"		480	[ms]	40 ms continuous	1 DCY
ECM	P061B	Torque monitoring error	comparison of 2 values (real vs. model)	TQI_SP_MON > TQI_AV_MON delta > characteristic maps		Ignition Electric throttle	"on" active		480	[ms]	40 ms continuous	1 DCY
ECM	P061C	RPM-lim monitoring error	comparison of a value vs. limit	> 1760 rpm		Limp home mode Ignition key Engine speed limitation	no limp home mode active on requested		480	[ms]	40 ms continuous	1 DCY
CAN Bus	U0073	no signal	CAN Bus			Ignition	"on"		immetiately		10 ms continuous	2 DCY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length	Frequency of Checks	MIL Illum.
	U0101	no signal	CAN message		Ignition	"on"	immetiately	10 ms continuous	1 DCY
	U0122	no signal	CAN message		Ignition	"on"	immetiately	10 ms continuous	2 DCY
	P1793	no signal	CAN message		Ignition	"on"	immetiately	10 ms continuous	2 DCY