Repair Manual

Jetta/Taos 2021 ➤

Generic Scan Tool									
Engine ID	DNK A								

Edition 04.2021

List of Workshop Manual Repair Groups

Repair Group

ST - Generic Scan Tool

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

Contents

ST - Generic Scan Tool 1
1 General Information 1
1.1 Safety Precautions 2
1.2 Clean Working Conditions 4
2 Description and Operation 6
2.1 On Board Diagnostic Systems 6
2.2 Evaporative Emission System 6
2.3 Electronic Throttle Control (ETC) System 8
2.4 Electronic Power Control (EPC) Warning Lamp 8
2.5 Engine Control Module (ECM) 9
2.6 Malfunction Indicator Lamp (MIL) 9
2.7 Controller Area Network (CAN) 9
2.8 Fuel Supply 10
2.9 Ignition and Timing 11
2.10 Variable Valve Timing 12
2.11 Exhaust-Gas Recirculation (EGR) System 12
2.12 Secondary Air Injection 12
2.13 Exhaust Systems 13
3 Diagnosis and Testing 14
3.1 Preliminary Check 14
3.2 Readiness Code 15
3.3 Diagnostic Modes 01 – 0A 17
3.4 Engine DTC Tables 40
3.5 Transmission DTC Tables 568

ST – Generic Scan Tool

1 General Information

(Edition 04.2021)

Included in the contents of this Generic Scan Tool (GST) manual is a summary table of the vehicle specific OBD II Emission Related DTCs. The DTC table contains DTC Malfunction Criteria, Threshold Values, Secondary Parameters, Enabling Conditions, Monitoring Time Length, Frequency of Checks, and MIL Illumination information which can be used to accurately monitor and diagnose emissions related faults and perform functions required to run Modes 01 through 0A (if applicable) with a hand held scan tool.

This manual also contains the step by step procedures to accurately diagnose and repair a component or system once a DTC has been set. References to repair procedures and wiring diagrams can be found within the diagnostic test procedures.

- ⇒ P1.1 recautions", page 2
- ⇒ W1.2 orking Conditions", page 4

1.1 Safety Precautions

Check for Technical Bulletins that may supersede any information included in this manual.

WARNING

Failure to follow these instructions may result in personal injury or possible death.

Check the Technical Bulletins for information, cautions and warnings that may supersede or supplement any information included in this manual.

When performing the drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.

Test equipment must always be secured to the rear seat and operated by a second person. If test and measuring equipment is operated from the passenger seat, the person seated could be injured in the event of an accident involving deployment of the passenger-side airbag.

The fuel system is under pressure! Before opening the fuel system, place rags around the connection area. Then release pressure by carefully loosening the connection.

The engine section of the fuel system, after the high pressure pump, is under extremely high pressure! When working on engine or fuel injection system, fuel pressure must be relieved to residual pressure before opening high pressure components. Refer to the Service Manual for the proper procedure.

If the battery has not been disconnected, the fuel pump fuse must be removed before opening the fuel supply system as the fuel pump may be activated by the driver's door contact switch.

Testing of the EVAP and ORVR systems can result in the escape of explosive fuel vapor. Do not smoke while testing the EVAP system, and make sure the area you are working in is well ventilated.

Observe the following for all procedures, especially in the engine compartment due to lack of room:

- *Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.*
- *Watch for sufficient clearance to all moving or hot components.*
- *Do not touch or disconnect the Ignition Coils, ignition wires, connecting parts or adapter cables when the ignition is on or the engine is running or turning at starting RPM.*
- *Only disconnect and reconnect wires for injection and ignition system, including test leads, when the ignition is turned off.*

When removing and installing components from full or partially full fuel tanks, observe the following:

- *The fuel tank must only be partially full. How much fuel can remain in the fuel tank may be read in the respective work description. Empty the fuel tank if necessary.*
- *Before starting work, switch on the exhaust extraction system and place an extraction hose close to the installation opening of the fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a*

radial fan (as long as motor is not in air flow) with a displacement greater than 15 m^3/h can be used.

- *Prevent fuel from contacting the skin! Wear fuel-resistant gloves!*

When servicing the engine control module (ECM), it may be necessary to use a heat gun. The heat gun, shear bolts, and parts of the protective housing will become extremely hot. Use extreme caution when working with or handling these parts to avoid personal injury.

Observe operating instructions when working with a heat gun. To prevent damage (burning) to the wiring and harness connections, insulation and the electronic components, perform outlined work steps exactly!

The cooling system is under pressure. To avoid scalding, use caution when opening the cooling system and servicing cooling system components!

Caution

The battery must only be disconnected and connected with the ignition switched off. Otherwise, the engine control module (ECM) can be damaged.

The use of nails, paper clips, or another unauthorized materials to back-probe harness connectors is strictly prohibited and may cause damage to the harness connectors, terminal ends or to a component. Use only the manufacturers test lead kit or an equivalent aftermarket test lead kit for back-probing all harness connectors.

Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burned in the engine and will damage the oxygen sensors.

Secure all hose connections with the correct hose clips (the same as original equipment).

If engine is to be cranked without starting (for example; as part of a compression test), remove the fuses for the voltage supply of ignition coils and the fuel injectors.

An electrostatic charge can lead to functional problems of electrical components of the engine, transmission and selector lever mechanism. Touch a grounded object, e.g. a water pipe or a hoist, before working on electrical components.

Do not make direct contact with harness connector terminals.

Use only gold-plated terminals when servicing any component with gold-plated harness connector terminals.

1.2 Clean Working Conditions

Even minor contaminations can lead to malfunctions in the fuel injection system. When working on the fuel supply/injection system, pay careful attention to the following rules of cleanliness:

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place removed parts on a clean surface and cover. Use lint-free cloths.
- Carefully cover opened components or seal, if repairs are not performed immediately.

- When the system is open, do not work with compressed air. Do not move vehicle unless absolutely necessary.
- Install clean components: Remove the parts being replaced immediately prior to installation of the new parts. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- Electrical connectors that have been disconnected: Protect from dirt and moisture. Make sure connections are clean and dry when reconnecting.

2 Description and Operation

- ⇒ B2.1 oard Diagnostic Systems", page 6
- ⇒ E2.2 mission System", page 6
- ⇒ T2.3 hrottle Control (ETC) System", page 8
- ⇒ P2.4 ower Control (EPC) Warning Lamp", page 8
- ⇒ C2.5 ontrol Module (ECM)", page 9
- ⇒ I2.6 ndicator Lamp (MIL)", page 9
- ⇒ A2.7 rea Network (CAN)", page 9
- ⇒ S2.8 upply", page 10
- ⇒ a2.9 nd Timing", page 11
- ⇒ V2.10 alve Timing", page 12
- ⇒ R2.11 ecirculation (EGR) System", page 12
- ⇒ A2.12 ir Injection", page 12
- ⇒ S2.13 ystems", page 13

2.1 On Board Diagnostic Systems

On Board Diagnostics, or OBD, is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle sub-systems. Modern OBD implementations use a standardized digital communications port to provide real-time data in addition to a standardized series of Diagnostic Trouble Codes (DTCs) which allow one to rapidly identify and remedy malfunctions within the vehicle. Legislation mandates a vehicle equipped with OBD-II to light up the fault indicator lamp if its emissions exceed the prevailing limit due to system malfunction.

All cars built since January 1st, 1996 (MY 1996) are equipped OBD-II systems. Manufacturers started incorporating OBD-II in various models as early as 1994; however, some early OBD-II cars (MY 1994 and MY 1995) were not 100% compliant.

2.2 Evaporative Emission System

The evaporative emission system has been designed to minimize the release of hydrocarbons from the fuel system into the atmosphere. The evaporative emission system components all work together with the ECM to prevent fuel vapor from escaping and route it to the intake manifold to be burned during normal combustion.

The leak detection system checks the integrity of the evaporative emission system by pressurizing the system.

- There are 3 different types of evaporative emission systems used. These systems are explained below.
- ⇒ D2.2.1 etection Pump (LDP) EVAP System", page 7
- ⇒ L2.2.2 eak Diagnostic Module (DM - TL) EVAP System", page 7
- ⇒ V2.2.3 acuum Leak Detection (NVLD) EVAP System", page 7
- ⇒ S2.2.4 ystem, Checking for Leaks", page 7

2.2.1 Leak Detection Pump (LDP) EVAP System

The leak detection pump (LDP) is integrated into the EVAP system and can have two functions. The LDP can:

- ♦ Pressurize the EVAP system and detect a drop in pressure that would indicate a leak.
- ♦ Function as the EVAP Canister Vent on vehicles that do not have a separate EVAP Canister Vent.

The LDP is a vacuum-driven, ECM controlled, diaphragm pump. In order to operate, the engine must be running and vacuum applied to the Vacuum Switch.

2.2.2 Tank Leak Diagnostic Module (DM - TL) EVAP System

The canister purge valve can be actively checked using the Tank Leak Diagnostic Module (DM - TL). For this purpose the electric pump is shortly activated while the combustion engine is running, to build up a minor pressure in the fuel tank and monitor the pressure decay after opening the canister purge valve. Optionally as a quick pass method, the monitoring can be carried out by passively monitoring the fuel mixture deviation when the canister purge valve is opened. If a significant fuel mixture deviation is detected, the purge valve monitor passes. The Tank Leak Diagnostic Module (DM - TL) consists of an electrically operated air pump, an orifice with a defined diameter serving as a reference leak, and a change-over valve switching the air flow between the reference leak and the tank. If neither the pump nor the change-over valve is activated, the tank is ventilated through a bypass in the module.

2.2.3 Natural Vacuum Leak Detection (NVLD) EVAP System

The system utilizes an engine-off natural vacuum evaporative system integrity check that tests for leaks with a diameter of 0.020 inch while the engine is off and the ignition is off. The natural vacuum leak detection (NVLD) evaporative system integrity check uses a pressure switch to detect evaporative system leaks. The correlation between the pressure and the temperature in a sealed system is used to generate a vacuum in the tank when the temperature drops. If a sufficient temperature drop is detected for a minimum time period, the vacuum level in a sealed system will exceed the threshold to close the NVLD pressure switch. Therefore, if the switch does not close under these conditions, a leak is detected. If the switch closes, the system is considered to be leak-free.

2.2.4 EVAP System, Checking for Leaks

The following procedure is used to diagnose EVAP System leaks.

Special tools and workshop equipment required

- ♦ Smoke tester.
- ♦ EVAP and Fuel Supply System Vacuum hose and line routing diagram.

Leak checking

- – Using a Smoke tester, check the Evaporative Emission (EVAP) canister system for leaks.
- – Always follow the manufacturers directions for the proper installation and operation of the smoke tester being used.

If a leak is detected:

- Check the fuel filler cap seal for damage and for proper installation. Replace if necessary.
- Check all hose connections of the fuel supply system and replace or repair any leaking lines.
- Check all hose connections of the EVAP system and replace or repair any leaking lines.
- Check that the seal under the locking flange is properly tightened on the fuel tank.
- Secure all hose connections using appropriate fittings for the model type.
- Replace seals and gaskets when performing repair work.
- Repair or replace any damaged component.

If no leaks are found in the EVAP system:

- Erase the DTC memory if a DTC was set. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 26 .
- Perform a road test to verify repair.

If a DTC was set and does not return:

Diagnosis complete. Generate readiness code. Refer to ⇒ C3.2 ode", page 15 .

If the same DTC does return and no leaks are found in the EVAP system:

- Check for any related TSB's.
- Perform the diagnostic test procedure for the suspected component.

2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.

2.4 Electronic Power Control (EPC) Warning Lamp

When the ignition is switched on, the engine control module (ECM) checks the electronic throttle control system for static system integrity (e.g. circuit integrity, communications, etc); the electronic power control (EPC) warning light is turned on via the Instrument Cluster during this process. Shortly after engine

start, the EPC warning light is turned off if no malfunction in the electronic throttle control system is detected. In the event of a malfunction while the engine is running, the ECM will activate the EPC warning light via the Instrument Cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.5 Engine Control Module (ECM)

The Engine Control Module (ECM) is a generic term for any embedded system that controls one or more of the electrical systems or subsystems in a vehicle. It controls a series of actuators on an internal combustion engine to ensure that driver commands (e.g. to accelerate) are translated into appropriate engine performance. It reads values from a multitude of sensors, interprets the data, and adjusts the engine actuators accordingly. The ECM also interacts with the transmission control module (TCM), ABS/traction/stability control module and other vehicle function related control systems.

ECM controlled systems and functions (performance and emission related) will be introduced in the following chapters. These include the OBD system, controller area network (CAN), throttle control module, fuel supply, ignition, variable valve timing, exhaust-gas recirculation, secondary air injection, exhaust system, and EVAP system.

2.6 Malfunction Indicator Lamp (MIL)

When the ignition is switched on, the Engine Control Module (ECM) performs checks on static system integrity (e.g. circuit integrity, communications, etc). The Malfunction Indicator Lamp (MIL) is switched on during this process via the Instrument Cluster. After engine starts, the ECM examines engine operation for potential malfunction(s) or failure(s) that can lead to increased emission values. If no malfunction is detected, the ECM switches off the MIL via the Instrument Cluster.

In the event of a malfunction during the operation of the engine, the ECM will activate the MIL via the instrument cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory. In OBD systems, the MIL can have up to three stages: steady, flashing and Stop Vehicle. A steady MIL indicates a minor fault (e.g. a failing oxygen sensor) whereas a flashing MIL indicates a more severe malfunction that could result in damage of engine or exhaust system components (e.g. the catalytic converter) if left uncorrected for an extended period. This would also indicate a severe fault. The three stages are 1. ON, then OFF; 2. ON steady; 3. flashing constantly. The 3rd stage indicates damage may occur and driver must stop.

2.7 Controller Area Network (CAN)

Overview

The Controller Area Network (CAN) bus is a message-based protocol that allows control units and devices to communicate with each other using a shared network. With this system, control units of the various electronic systems are no longer interconnected by multiple separate cables. This does away with a large number of electrical connections and results in a reduced likelihood of failure of the device network.

Broadcast Communication

Each of the devices on the network has a CAN circuit and is therefore is considered “intelligent”. All devices on the network see all transmitted messages. Each device can determine if a message is relevant or if it should be filtered out. This structure allows modifications to CAN networks with minimal impact. Ad-

ditional non-transmitting nodes can be added without modification to the network.

Priority

Every message has an assigned priority. If two nodes try to send messages simultaneously, the one with the higher priority gets transmitted and the one with the lower priority gets postponed. This arbitration does not affect other messages and results in non-interrupted transmission of the highest priority message

2.8 Fuel Supply

Overview

The fuel supply system delivers fuel to an internal combustion engine. With carburetors being replaced by fuel injections systems in the late 1980s and 1990s, the most common types of fuel supply system currently in use are throttle body injection (single-point injection), multiport injection (MPI) and direct injection (DI).

Fuel injectors atomize fuel because high pressure is forcing the fuel through a small nozzle in the injector into the intake air stream or the combustion chamber. This process is often controlled by the ECM and is dependent on data received from other sources (e.g. mass air flow sensor, throttle position sensor, etc.) to determine the precise amount of fuel needed for any given operating condition. The primary advantages of fuel injection over carburetor are improved fuel economy, increased power output and reduced emissions. The following sections will discuss each fuel injection concept in detail.

Throttle Body Injection

Throttle body injection uses a single electrically controlled injector at the throttle body. The fuel is drawn by an electric fuel pump out of the fuel tank and flows through a paper filter into the fuel injector. Since injection happens at the same location as the carburetor, very little engine redesign (intake manifold, fuel line routing, etc.) is necessary. The cost saving of throttle body injection compared to other fuel injection methods encouraged vast adoption in the late 1980s and early 1990s.

Throttle body injection system also inherits many disadvantages of the carburetor. One of them being the inability to precisely control the amount of fuel supplied into each cylinder, and is unable to precisely control combustion and emissions. It also restricts the design of intake manifold as any sharp bends in the intake path will cause atomized fuel to accumulate on the outer wall of the intake path. Supplying moderate engine heat to the intake manifold is also necessary to ensure that the fuel stay vaporized. This results in a relatively high intake air temperature and compromises performance.

Multiport Injection (MPI)

Multiport injection (MPI) consists of an injector for each cylinder just upstream of the intake valve. The fuel pump delivers the fuel into a high-pressure line where it flows to the fuel rail and injectors. When activated by the ECM, each injector sprays fuel at the intake port of its corresponding cylinder – this allows individual cylinders to receive the right amount of fuel in a more precisely timed manner. Sequential fuel injection mode can be applied to activate each injector individually to improve engine response. Lowered fuel consumption and emissions are also achieved.

Sequential multiport injection is still the most common fuel injection system found on most economy cars thanks to its high efficiency, control simplicity and low manufacturing cost (compared to direct injection). However, to further improve drivability

(performance) while reducing emissions and fuel consumption, direct injection becomes a superior alternative.

Direct Injection

Injectors in directly injected (DI) engines are mounted on the cylinder head and fuel is injected directly into the engine's combustion chamber. In order to overcome the pressure in the combustion chamber during compression and power stroke, injectors often operate at a primary pressure as high as 3000 psi. At such extreme pressure level, no single fuel pump can supply the required pressure directly from the fuel tank to the injectors. Instead, a low-pressure and a high-pressure system are employed. The low-pressure system principally utilizes the same fuel systems and components for multiport injected engines. The high-pressure system consists of a high-pressure fuel pump driven directly by the camshaft, a fuel rail (high-pressure accumulator), a high-pressure sensor and, depending on the system, a pressure-control valve or a pressure limiter. The injectors are operated by the ECM to send a precise amount of fuel from the high-pressure rail directly into the combustion chamber.

The distinctive difference between direct injection and other injection methods is that direct injection offers the flexibility regarding when in the combustion cycle the fuel is added and how. MPI systems can only add fuel during induction; A DI system can add fuel whenever it needs to. For example, fuel can be added during induction to create a homogeneous charge then added again after ignition to enhance power delivery under full load conditions.

VW/Audi Fuel Stratified Injection (FSI)

The goal of a stratified-charge operation is to form an ignitable mixture near the spark plug at the instant of ignition. This means that, instead of supplying the corresponding stoichiometric fuel quantity to the amount of air in the combustion chamber, the fuel interacts only with a portion of the air before it is conveyed to the spark plug. The rest of the fresh air surrounds the stratified charge allowing an ultra-lean condition with air-fuel ratio exceeding 50:1 in some instances. As less fuel is used to "burn" more air, stratified injection helps to further reduce fuel consumption when the engine is operating in low-load conditions (e.g. highway cruising). This is created by designing the combustion chamber so that a "swirling" effect of the air-fuel charge is caused.

2.9 Ignition and Timing

Ignition

A spark ignition (SI) engine requires a spark to initiate combustion in the combustion chamber. Voltage is supplied to the spark plug where the electricity will arc across a gap at a voltage as high as 100 kilovolts. The ECM determines the precise moment to fire each spark plug using ignition logic which is preprogrammed into the ECM as a function of engine speed and load. An optimally calibrated ignition system ensures consistent and reliable ignition under all conditions. Knock or misfire as a result of incorrect ignition can lead to destruction of engine components or damage of the catalytic converter.

Timing

Shifts in the moment of ignition (ignition timing) can result in increased emissions, decreased performance and fuel economy. Whereas more spark advance improves power and fuel economy, it also raises HC and NOx emissions. Excessive spark advance can cause engine knock which is potentially destructive to engines. If the ECM detects knock from a signal sent by a knock sensor, it will delay (retard) the timing of the spark. Excessive spark retard lowers power output and produces high

exhaust temperatures, which can also harm the engine. Carefully designed ignition logic provides optimum timing that best balances performance, fuel economy and emissions.

2.10 Variable Valve Timing

Engines equipped with variable valve timing provide the option of adjusting the phase of the camshaft with respect to the crankshaft. This allows the ECM to control the time at which the valves open or close, and therefore better assists engine “breathing” at various engine speeds. When engine speed increases, the duration of intake and exhaust stroke shortens so that less fresh air can be drawn into the combustion chamber and less exhaust gas can escape. In such a scenario, the ECM opens the intake valve before the exhaust gas has completely left the combustion chamber, and their considerable velocity assists in drawing in the fresh charge – this is referred to as “valve overlap”.

In addition to valve timing, some engines also employ variable valve lift that switches to a more aggressive camshaft-lobe profile as engine speed increases. A more aggressive camshaft-lobe profile actuates valves more rapidly and lifts valves to a greater magnitude in comparison to a normal camshaft-lobe profile. This improves intake and exhaust flow rate, allowing engines to raise maximum operating speed and power output.

2.11 Exhaust-Gas Recirculation (EGR) System

Exhaust-Gas Recirculation (EGR) can be utilized to control the cylinder charge and therefore the combustion process. The exhaust gas that is recirculated to the intake manifold increases the proportion of inert gas in the fresh gas filling; this results in a reduction in the peak combustion temperature and, in turn, a drop in temperature-dependent NOx emission.

Exhaust-gas recirculation is made possible by a connection between the exhaust pipe and the intake manifold. Due to the pressure differential, the intake manifold can draw in exhaust gas via this connection. Together with the exhaust-gas recirculation valve, the ECM adjusts the opening cross-section and therefore controls the partial flow tapped from the main exhaust flow. A malfunction in exhaust-gas recirculation system can result in performance loss and increased emissions. In such a scenario, the Malfunction Indicator Lamp (MIL) lights up and a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.12 Secondary Air Injection

Additionally injecting air into the exhaust pipe triggers an exothermic (release of heat) reaction. This leads to the combustion of HC and CO components that prevail mainly during the warm up phase. This oxidation process releases additional heat. Consequently, the exhaust gas becomes hotter, causing the catalytic converter to heat up at a faster rate. For spark-ignition engines, secondary-air injection is an effective means of reducing HC and CO emissions after starting the engine and to rapidly heat up the catalytic converter. This ensures that the conversion of NOx emissions commences earlier.

An electronically controlled valve operates the secondary-air valve (a one-way check valve). The ECM actuates the pump and the control valve, ensuring that secondary air can be injected at a defined point in time. The secondary air must also be injected as close to the outlet valve as possible in order to exploit the high temperatures to utilize the exothermic (release of heat) reaction effectively.

2.13 Exhaust Systems

Overview

There are three important functions of the exhaust system: to reduce the pollutants in exhaust gas, muffle engine combustion noise and to discharge exhaust gas at a convenient location on the vehicle (often underneath the rear bumper). A passenger-car exhaust system consists of the following; exhaust manifold, exhaust treatment components, sound absorption components and the system of pipes connecting these components.

Exhaust Manifold

The manifold is an important component in the exhaust system. It routes the exhaust gas out of the cylinder outlet ports into the subsequent exhaust system. The geometry of the manifold (i.e. length and cross-section of the individual pipes) has an impact on the performance characteristics, the acoustic behavior of the exhaust system, and the exhaust temperature. In some cases, the manifold is insulated with an air gap to quickly reach high exhaust temperature and to shorten the time taken by the catalytic converter to reach its operating temperature.

Emission Control

The primary emission control component is the catalytic converter, which breaks down the gaseous pollutants in the exhaust gas (CO, HC and NOx). Catalytic converters are installed as close as possible to the engine so that they can quickly reach their operating temperature and therefore be effective in urban driving. It also bears a sound-absorbing function, especially to the higher frequency portion of the engine combustion noise.

Sound Absorption

Mufflers dampen or absorb the noise produced by engine combustion. In principle, they can be installed at any position in the exhaust system. However, they are mostly located in the middle and rear sections of the exhaust system. Depending on the number of cylinders and engine output, generally 1 to 3 mufflers are used in an exhaust system. In V-engines, the left and right cylinder banks are often run separately, each being fitted with its own catalytic converters and mufflers. Although the aim of mufflers is to reduce noise in compliance with legislations, they can also help to create the sound specific to the type of vehicle.

3 Diagnosis and Testing

- ⇒ C3.1 heck", page 14
- ⇒ C3.2 ode", page 15
- ⇒ M3.3 odes 01 – 0A", page 17
- ⇒ D3.4 TC Tables", page 40
- ⇒ D3.5 TC Tables", page 568

3.1 Preliminary Check

Note

- *Before performing any pin point test or component diagnosis, a Preliminary Check must be performed.*
- *Check for Technical Bulletins that may supersede any information included in the repair manual or GST Manual.*

- For Electrical Testing: Refer to ⇒ page 14 .
- For Fuel System Mechanical Testing: Refer to ⇒ page 15 .
- For Oxygen Sensor Preliminary Tests: Refer to ⇒ page 15 .

Electrical Testing

Step	Procedure	Result / Action to Take
1	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: For stored or related DTCs. – Were any other DTCs stored?	– YES: ◆ GO TO: Step 2 ⇒ page 14 . – NO: ◆ GO TO: Step 3 ⇒ page 14 .
2	• Repair these DTCs first before performing any of the following steps.	◆ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ D3.4 TC Tables", page 40 .
3	• Using the Scan Tool, erase the DTC memory. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 26 . • Perform a road test to attempt to duplicate the customers complaint. – Does DTC return?	– YES: ◆ GO TO: Step 4 ⇒ page 14 . – NO: ◆ GO TO: Step 5 ⇒ page 14 .
4	• Perform the diagnostic procedure for that DTC.	◆ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ D3.4 TC Tables", page 40 .
5	• FAULT: Intermittent or a sporadic condition. • CHECK: Suspected components. • PERFORM: Visual Inspection of wiring and components. • CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. • REPAIR: Faulty wiring or connector.	◆ Perform a road test to verify the repair. ◆ Generate readiness code. Refer to ⇒ C3.2 ode", page 15 .

Fuel System Mechanical Testing

Check the following items for possible mechanical delivery deficiency:

- Fuel level in tank is too low.
- Fuel lines pinched.
- Fuel filter plugged.
- Fuel pump delivery unit internal leak.
- Clogged injectors.
- Poor fuel quantity delivery. Refer to appropriate repair manual.

Oxygen Sensor Preliminary Tests

Check for the following conditions which can cause Oxygen Sensor Faults to set without requiring Oxygen Sensor replacement:

Common issues for lean faults:

- ♦ Vacuum leaks - check for failed or loose vacuum lines, leaking intake gaskets, or any other source of un-metered air leaks (leaks after the Mass Air Flow Sensor).
- ♦ Restricted fuel filter or bent/pinched fuel system lines.
- ♦ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ♦ Engine misfire.
- ♦ Exhaust leaks.
- ♦ Camshaft timing.

Common issues for rich faults:

- ♦ Leaking or faulty fuel injector.
- ♦ Fuel injector driver shorted in ECM, or wiring short for injectors (short to ground).
- ♦ Leaking or faulty fuel pressure regulator or restricted return line.
- ♦ Faulty fuel pump or fuel pump driver module.
- ♦ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ♦ Aftermarket components or performance chips.
- ♦ Camshaft timing.

3.2 Readiness Code

Caution

When performing the Readiness drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.

Readiness code description

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions related system, a readiness code is generated by road testing the vehicle.

If a malfunction is recognized during the drive cycle, it will be stored in the DTC memory.

The OBD drive cycle operation will be monitored with a hand held diagnostic tool. Consult the manufacturer's instruction manual for correct tool operation.

The readiness code is erased every time the DTC memory is erased or any time the battery is disconnected. If the DTC memory has been erased or the battery is disconnected, a new readiness code must be generated.

Only erase the DTC memory if a DTC has been stored.

General recommendations

Most monitors will complete easier and quicker using a “steady-foot” and “smooth” acceleration during the drive cycle operation.

Operating conditions

For the EVAP monitor test, the coolant temperature and the ambient air temperature must be between 10° C and 35° C with a difference between them no greater than 4° C. The ambient air temperature must not change more than 4° C during the drive cycle procedure (e.g. when driving out of a heated workshop in the winter).

Note

Do not assume that the scan tool ID and engine code are correct if the scan tool communicates. The scan tool does not use the ID to establish communication—the units are automatically identified.

Test requirements

- NO DTC in memory.
- Switch OFF all electrical and electronic accessories.
- Necessary driving speed: 50 – 70 mph.
- Drive profile takes approximately 60 – 90 min.

Readiness Drive Cycle Procedure

– CONNECT: Scan Tool.

Step	Procedure	Result / Action to Take
1	Activate Monitors: • START: Engine and idle for 2 – 3 min.	♦ Monitoring Active. ♦ Executes Misfire Monitoring.
2	O2 Sensor Monitoring: • DRIVE: Vehicle at 45 – 55 mph for a continuous 7 minute period. Avoid stopping.	♦ Executes O2 Sensor Monitoring. ♦ Executes Fuel Trim Monitoring. ♦ Executes EVAP Monitoring.
3	Fuel Cut-Off Monitoring: • ACCELERATE: Vehicle to an engine speed of 5,000 RPM; lift off the throttle until the engine speed is around 1,200 RPM.	♦ Fuel Cut-Off Monitoring Ready.

Step	Procedure	Result / Action to Take
4	Catalyst Monitoring: • ACCELERATE: Vehicle smoothly to 60 – 65 mph, cruise at a constant speed for 5 min.	♦ Executes Catalyst Monitoring. ♦ Executes O2 Sensor Monitoring. ♦ Executes Fuel Trim Monitoring. ♦ Executes Misfire Monitoring. ♦ Executes EVAP Monitoring.
5	Secondary Air Injection, EVAP Monitoring: • DRIVE: Vehicle for 30 – 40 min. at a constant speed of 50 – 70 mph in high gear for 2 min with no coasting.	♦ Executes Secondary Air Injection Monitoring. ♦ Executes EVAP Monitoring. • Check the status of the readiness code.

– If any engine monitor fails the drive cycle test. Repeat the drive cycle test until all engine monitors have successfully run through and passed.

Note

♦ *When repeating the drive cycle operation for a failed evaporative or thermostat monitor, allow the engine to cool until the coolant temperature and the ambient air temperature are between 10° C and 35° C with a difference between them no greater than 4° C and then repeat the drive cycle operation.*

♦ *Depending on the scan tool used, the readiness code status may be displayed as complete, passed or OK. At an ambient air temperature < 7° C, the setting of the readiness for the NOx catalytic converter test is delayed. Here the vehicle must be driven considerably longer.*

Readiness Codes and Monitoring Completed

1 - If any engine monitor fails the drive cycle test, repeat the drive cycle test until all engine monitors have successfully run through and passed.

2 - If the drive cycle operation fails again:

3 - Check the DTC memory for stored DTCs.

4 - Repair the vehicle if necessary.

5 - Repeat the drive cycle operation until all engine monitors have successfully run through and passed.

6 - Remove the scan tool and switch the ignition off.

3.3 Diagnostic Modes 01 – 0A

The information provided in Modes 01 through 09 displays the various levels of emission related data that may be monitored, as well as the ability to retrieve and read stored DTC trouble codes, erase stored DTC trouble codes, generate readiness codes, and select the various PIDs and Test-IDs used within the modes to monitor the engine, and emission related component parameters.

♦ ⇒ M3.3.1 ode 01 – Read Current System Data", page 18

♦ ⇒ M3.3.2 ode 02 – Read Operating Conditions", page 22

♦ ⇒ M3.3.3 ode 03 – Read DTC Memory", page 25

♦ ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 26

- ⇒ M3.3.5 ode 05 – Read Oxygen Sensor Monitoring Test Results", page 27
- ⇒ M3.3.6 ode 06 – Read Test Results for Specific Diagnostic Functions, 2021/2022 MY", page 27
- ⇒ M3.3.7 ode 07 – Read Faults Detected During the Current or Last Driving Cycle", page 36
- ⇒ M3.3.8 ode 08 – Request Control of On-Board System, Test or Component", page 37
- ⇒ M3.3.9 ode 09 – Read Vehicle Information", page 37
- ⇒ M3.3.10 ode 0A – Check Permanent DTC Memory", page 38

3.3.1 Diagnostic Mode 01 – Read Current System Data

Note

Depending on scan tool and protocol used, the information in diagnostic mode 01 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

Diagnostic Mode 01 makes it possible to access current emissions-related measured values and diagnostic data. The original measured values (no replacement values), input and output data and system status information are displayed using Diagnostic Mode 1.

Test requirement

- Coolant temperature at least 80° C.

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 1: Obtain data".

– From the following table, select the desired "PID" that is to be monitored, e.g. "PID $05 Coolant Temperature".

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System	Data Byte
$01:	Monitor Status Since DTCs Cleared	
	– Number Of Emission-Related DTCs And MIL Status	A, byte 1 of 4
	– Supported Tests Which Are Continuous And Status Of Continuous Monitoring Tests Since DTC Cleared	B, byte 2 of 4
	– Supported Tests Run At Least Once Per Trip	C, byte 3 of 4
	– Status Of Tests Run At Least Once Per Trip	D, byte 4 of 4
$03:	Fuel system "A" status	A, byte 1 of 2
	– Fuel system "B" status	B, byte 2 of 2

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PID	Component or System	Data Byte
$04:	Calculated Load Value	A, 100/255%
$05:	Engine Coolant Temperature	A, 1° C with -40° C offset
$06:	Short Term Fuel Trim Bank 1	A, B; 100/128% (0% at 128)
$07:	Long Term Fuel Trim Bank 1	A, B; 100/128% (0% at 128)
$0B:	Intake Manifold Absolute Pressure	A, 1 kPa
$0C:	Engine RPM	A, B; 0.25 rpm
$0D:	Vehicle Speed Sensor	A, 1 km/h
$0E:	Ignition Timing Advance For #1 Cylinder	A, 0.5° (0° at 128)
$0F:	Intake Air Temperature	A, 1° C with -40° C offset
$11:	Absolute Throttle Position	A, 100/255%
$13:	Location of Oxygen Sensors	A, byte 1 of 1
$15:	Oxygen Sensor Output Voltage Bank 1 - Sensor 2	A, 0.005 V
	– Short Term Fuel Trim (Not Used)	B, 100/128% (0% at 128)
$1C:	OBD Requirements To Which Vehicle Or Engine Is Certified	A, byte 1 of 1
$1F:	Time Since Engine Start	A, B; 1 second per count
$21:	Distance Traveled While MIL Is Activated	A, B; 1 km per count
$2E:	Commanded Evaporate Purge	A, 100/255%
$2F:	Fuel Level Input	A, 100/255%

PID	Component or System	Data Byte
$30:	Number Of Warm-Ups Since DTCs Cleared	A, 1 warm-up per count
$31:	Distance traveled Since DTCs Cleared	A, B; 1 km per count
$33:	Barometric Pressure	A, 1 kPa
$34:	Equivalence Ratio (lambda) Bank 1 - Sensor 1	A, B; 0.0000305 mA
	– Oxygen Sensor Current Bank 1 - Sensor 1	C, D; 0.00390625 mA
$3C:	Catalyst Temperature Bank 1, Sensor 1	A, B; 0.1° C with -40° C offset
$41:	Monitor Status This Driving Cycle	A, byte 1 of 4
	– Enable And Completion Status Of Continuous Monitors This Monitoring Cycle	B, byte 2 of 4
	– Enable Status Of Noncontinuous Monitors This Mon. Cycle	C, byte 3 of 4
	– Completion Status Of Noncontinuous Monitors This Mon. Cycle	D, byte 4 of 4
$42:	Control Module Voltage	A, B; 0.001 V
$43:	Absolute Load Value	A, B; 100/255%
$44:	Fuel/Air Commanded Equivalence Ratio	A, B; 0.0000305
$45:	Relative Throttle Position	A, 100/255%
$46:	Ambient Air Temperature	A, 1° C with -40° C offset
$47:	Absolute Throttle Position B	A, 100/255%
$49:	Accelerator Pedal Position D	A, 100/255%
$4A:	Accelerator Pedal Position E	A, 100/255%
$4C:	Commanded Throttle Actuator Control	A, 100/255%

PID	Component or System	Data Byte
$51:	Type Of Fuel Currently Being Utilized By The Vehicle	A, byte 1 of 1
$56:	Long Term Secondary O2 Sensor Fuel Trim Bank 1	A, 100/128% (0% at 128)
$62:	Actual Engine - Percent Torque	A, 1% with -125% offset
$63:	Engine Reference Torque	A, 1 Nm
$65:	Auxiliary Input / Outputs Status	
	– Bit 0: Power Take Off (PTO)	B, byte 2 of 2
$67:	Engine Coolant Temperature	
	– Engine Coolant Temperature 1	B, 1° C with -40° C offset
	– Engine Coolant Temperature 2	C, 1° C with -40° C offset
$6D:	Fuel Pressure Control System	
	– Fuel Rail Pressure A	D, E; 1 kPa = 0.1450377 PSI
$70:	Boost Pressure Control	
	– Boost Pressure Sensor A	D, E; 0.03125 kPa
$75:	Turbocharger A Temperature	
	– Turbocharger A Compressor Outlet Temperature	C, 1° C with -40° C offset
$77:	Charge Air Cooler Temperature (CACT)	
	– Charge Air Cooler Temperature (CACT) Bank 1, Sensor 1	B, 1° C with -40° C offset
$8E;	Engine Friction - Percent Torque	A, 1% with -125% offset
$9D:	Fuel Rate	
	– Engine Fuel Rate	A, B; 0.02 g/s
	– Vehicle Fuel Rate	C, D; 0.02 g/s

PID	Component or System	Data Byte
$9E:	Engine Exhaust Flow Rate	A, B; 0.2 kg/h
$A4:	Transmission Actual Gear	
	– Transmission Actual Gear Status	B, 1 (Bin)
$A6:	Vehicle Odometer	A, B, C, D; 0.1 km

– Switch the ignition off.

3.3.2 Diagnostic Mode 02 – Read Operating Conditions

When an emissions-related fault (pending DTC, visible in mode 07) is first detected, operating conditions are stored. Mode 02 makes it possible to access this freeze frame data as soon as this fault is shown in mode 03. Each control module only shows freeze frame data for one fault via mode 02. Therefore, there are two priority levels. If there is a malfunction with higher priority, the freeze frame data is overwritten.

– Fault with higher priority: Misfire malfunction or fuel trim malfunction. These faults can be damaging to the catalyst system.

– Fault with normal priority: All other emissions-related faults.

Note

Depending on scan tool and protocol used, the information in diagnostic mode 02 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

Note

If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward.

– Select “Diagnostic Mode 2: Obtain operating conditions”.

– From the following table, select the desired “PID”, e.g. “PID $05 Coolant Temperature” that is to be monitored.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System	Data Byte
$02:	DTC That Caused Required Freeze Frame Data Storage	A, B; Hexa-deci-mal

PID	Component or System	Data Byte
$03:	Fuel system "A" status	A, byte 1 of 2
	– Fuel system "B" status	B, byte 2 of 2
$04:	Calculated Load Value	A, 100/255%
$05:	Engine Coolant Temperature	A, 1° C with -40° C offset
$06:	Short Term Fuel Trim Bank 1	A, 100/128% (0% at 128)
$07:	Long Term Fuel Trim Bank 1	A, 100/128% (0% at 128)
$0B:	Intake Manifold Absolute Pressure	A, 1 kPa
$0C:	Engine RPM	A, B; 0.25 rpm
$0D:	Vehicle Speed Sensor	1 km/h
$0E:	Ignition Timing Advance For #1 Cylinder	A, 0.5° (0° at 128)
$0F:	Intake Air Temperature	A, 1° C with -40° C offset
$11:	Absolute Throttle Position	A, 100/255%
$1F:	Time Since Engine Start	1 second per count
$2E:	Commanded Evaporate Purge	A, 100/255%
$2F:	Fuel Level Input	A, 100/255%
$33:	Barometric Pressure	A, 1 kPa
$42:	Control Module Voltage	A, B; 0.001 V
$43:	Absolute Load Value	A, B; 100/255%
$44:	Fuel/Air Commanded Equivalence Ratio	A, B; 0.0000305

PID	Component or System	Data Byte
$45:	Relative Throttle Position	A, 100/255%
$46:	Ambient Air Temperature	A, 1° C with -40° C offset
$47:	Absolute Throttle Position B	A, 100/255%
$49:	Accelerator Pedal Position D	A, 100/255%
$4A:	Accelerator Pedal Position E	A, 100/255%
$4C:	Commanded Throttle Actuator Control	A, 100/255%
$51:	Type Of Fuel Currently Being Utilized By The Vehicle	A, byte 1 of 1
$56:	Long Term Secondary O2 Sensor Fuel Trim Bank 1	A, 100/128% (0% at 128)
$67:	Engine Coolant Temperature	
	– Engine Coolant Temperature 1	B, 1° C with -40° C offset
	– Engine Coolant Temperature 2	C, 1° C with -40° C offset
$6D:	Fuel Pressure Control System	
	– Fuel Rail Pressure A	D, E; 1 kPa = 0.1450377 PSI
$70:	Boost Pressure Control	
	– Boost Pressure Sensor A	D, E; 0.03125 kPa
$75:	Turbocharger A Temperature	
	– Turbocharger A Compressor Outlet Temperature	C, 1° C with -40° C offset
$77:	Charge Air Cooler Temperature (CACT)	
	– Charge Air Cooler Temperature (CACT) Bank 1, Sensor 1	B, 1° C with -40° C offset

– Switch the ignition off.

3.3.3 Diagnostic Mode 03 – Read DTC Memory

Diagnostic Mode 03 makes it possible to read emissions-related faults (confirmed DTCs; faults which have activated the MIL) in the ECM and in the TCM.

When the ECM recognizes an emissions-related fault in two consecutive drive cycles, it sends a request to the instrument cluster over the CAN to turn on the malfunction indicator lamp. If an electronic throttle malfunction is recognized, the ECM will send a request to the instrument cluster over the CAN to turn on the electronic power control warning lamp.

The DTCs are sorted by SAE code with the DTC tables consisting of a 5-digit alphanumeric value.

Note

Depending on the scan tool and protocol used, diagnostic mode 03 and the information provided may be referred to by a different name.

The following tables provide a breakdown and explanation of the DTC code.

P-Codes

Component group					
P	x	x	x	x	DTC for the drivetrain
Norm-Code					
P	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts
P	1	x	x	x	Additional emission relevant DTCs provided by the manufacturer
P	2	x	x	x	DTCs defined by SAE with specified texts, from MY 2000
P	3	x	x	x	Additional emission relevant DTCs provided by the manufacturer from MY 2000

Component group					
Repair group					
P	x	0	x	x	Fuel and air mixture and additional emission regulations
P	x	1	x	x	Fuel and air ratios
P	x	2	x	x	Fuel and air ratios
P	x	3	x	x	Ignition system
P	x	4	x	x	Additional exhaust system
P	x	5	x	x	Speed and idle control
P	x	6	x	x	Control module and output signals
P	x	7	x	x	Transmission
P	x	8	x	x	Transmission
P	x	9	x	x	Control modules, input and output signals

U-Codes

Component group					
U	x	x	x	x	DTC for network (CAN bus)
Norm-Code					
U	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts

Procedure

– Connect the scan tool.
– Switch the ignition to the on position.
– Select Diagnostic Mode 03: Interrogating fault memory.
– The stored DTC or DTCs will be displayed on the scan tool screen.

The following table is an example of the DTC information that may be displayed on the scan tool screen:

Indication example	Explanation
P0444	SAE Diagnostic Trouble Code
Evaporative emission canister purge regulator valve	Malfunctioning wiring path or malfunctioning component
Circuit open	Malfunction type as next

– Refer to the DTC tables below for the diagnostic repair procedures.

♦ ⇒ E3.4.1 ngine/Motor Control Module, 2021/2022 MY", page 40

– Switch the ignition off.

3.3.4 Diagnostic Mode 04 – Erase DTC Memory

Diagnostic Mode 04 makes it possible to erase the DTC memory and to reset all emissions-related diagnostic data. In that way, all faults in the DTC memory in the ECM and TCM are erased. The adaptation values may also be reset.

Emissions-related diagnostic data includes (as applicable):

♦ - MIL Status
♦ - Number of DTCs
♦ - Readiness bits
♦ - Confirmed DTCs
♦ - Pending DTCs
♦ - DTC that belongs to freeze frame
♦ - Freeze frame data
♦ - Test results of specific diagnostic functions
♦ - Distance driven with "MIL ON"
♦ - Number of warm-up cycles after erasing the DTC memory
♦ - Distance driven after erasing the DTC memory

♦ - Misfire counter

Note

Depending on scan tool and protocol used, diagnostic mode 04 and the information provided may be referred to by a different name.

Procedure

– Connect the scan tool.
– Switch the ignition on.
– Select Diagnostic Mode 03: Interrogating fault memory.
– Then select Mode 4: Reset/delete diagnostic data.

The scan tool will display: Diagnostic data are being erased.

– Switch the ignition off.

3.3.5 Diagnostic Mode 05 – Read Oxygen Sensor Monitoring Test Results

Note

Mode 05 may not be supported on all systems. On systems where Diagnostic Mode 05 is not supported, refer to Diagnostic Mode 6 for oxygen sensor Monitoring Test Results.

3.3.6 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2021/2022 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.

- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Mode 6: Check test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Monitor-ID (Hex-ID)	Component or System
$01: ⇒ page 28	Exhaust Gas Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 29	Exhaust Gas Sensor Monitor Bank 1 – Sensor 2
$21: ⇒ page 29	Catalyst Monitor Bank 1
$35: ⇒ page 30	VVT Monitor Bank 1
$3B: ⇒ page 30	EVAP Monitor (0.040" / 1.0 mm)
$3C: ⇒ page 31	EVAP Monitor (0.020" / 0.5 mm)
$3D: ⇒ page 31	Purge Flow Monitor
$41: ⇒ page 32	Exhaust Gas Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 32	Exhaust Gas Sensor Heater Monitor Bank 1 – Sensor 2
$71: ⇒ page 32	Secondary Air Monitor 1
$81: ⇒ page 33	Fuel System Monitor Bank 1
$A2: ⇒ page 34	Misfire Cylinder 1 Data
$A3: ⇒ page 35	Misfire Cylinder 2 Data
$A4: ⇒ page 35	Misfire Cylinder 3 Data
$A5: ⇒ page 36	Misfire Cylinder 4 Data

Monitor-ID $01: Exhaust Gas Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8A	P2195	2nd Lambda Control Loop Out Of Range High.	-0.99	0.07	Refer to DTC P2195 in the DTC summary table. ⇒ page 235
$8B	P2196	2nd Lambda Control Loop Out Of Range Low.	-0.07	0.99	Refer to DTC P2196 in the DTC summary table. ⇒ page 236

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$33	P2414	Signal Range Check	0.0	3.95	Refer to DTC P2414 in the DTC summary table. ⇒ page 238

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $02: Exhaust Gas Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$05	P013A	Rich To Lean Sensor Switch Time (Calculated).	0.0 s	0.60 s	Refer to DTC P013A in the DTC summary table. ⇒ page 295
$06	P013B	Lean To Rich Sensor Switch Time (Calculated).	0.0 s	1.50 s	Refer to DTC P013B in the DTC summary table. ⇒ page 297
$93	P013E	Rich To Lean Delay Time.	0.0 s	0.34 s	Refer to DTC P013E in the DTC summary table. ⇒ page 299
$94	P013F	Lean To Rich Delay Time.	0.0 s	0.60 s	Refer to DTC P013F in the DTC summary table. ⇒ page 302
$95	P2270	Voltage Target Rich.	0.75 V	1.25 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 308
$96	P2271	Voltage Target Lean.	0.0 V	0.15 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 305

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $21: Catalyst Monitor Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	OSC Compared To Borderline Catalyst.	100.0%	655.0%	Refer to DTC P0420 in the DTC summary table. ⇒ page 40

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $35: VVT Monitor Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake.	-28.0 – 19.0°	-25.0 – 22.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 380
$81	P000A	Slow Response Intake.	-28.0 – 19.0°	-25.0 – 22.0°	Refer to DTC P000A in the DTC summary table. ⇒ page 380
$82	P0014	Target Error Outlet.	-25.0 – 4.0°	-22.0 – 15.0°	Refer to DTC P0014 in the DTC summary table. ⇒ page 388
$83	P000B	Slow Response Outlet.	-25.0 – 4.0°	-22.0 – 15.0°	Refer to DTC P000B in the DTC summary table. ⇒ page 387

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $3B: EVAP Monitor (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$86	P0442	Leakage Check.	1,100.0 Pa	8,192.0 Pa	Refer to DTC P0442 in the DTC summary table. ⇒ page 91

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $3C: EVAP Monitor (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0456	Leakage Check.	0.0 mm²	0.12 mm²	Refer to DTC P0456 in the DTC summary table. ⇒ page 88

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $3D: Purge Flow Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8D	P0441	Purge Valve Close Check.	0.0 mA	4.0 – 36.5 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 66
$8E	P04F0	Purge Flow Check Second Purge Line.	0.0 mA	4.1 – 36.5 mA	Refer to DTC P04F0 in the DTC summary table. ⇒ page 72

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $41: Exhaust Gas Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Target Check Ceramic Temperature.	654.0 – 680.0° C	6,513.0° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 293

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $42: Exhaust Gas Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$90	P0141	Internal Resistance Check.	0.0 kΩ	1.8 – 131.0 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 330

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Monitor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Flow Check.	0.10 – 0.55	1.99	Refer to DTC P0491 in the DTC summary table. ⇒ page 123
$85	P0410	Pressure Check.	-32.77 kPa	1.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 125
$8C	P2440	Valve Check Via Pressure Ratio.	0.0	1.50	Refer to DTC P2440 in the DTC summary table. ⇒ page 121

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $81: Fuel System Monitor Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $81”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P02CD	Cylinder 1 Adaptation Monitoring Adaptive Value Limit High.	-327.68 %	99.99%	Refer to DTC P02CD in the DTC summary table. ⇒ page 134
$81	P02CC	Cylinder 1 Adaptation Monitoring Adaptive Value Limit Low.	-99.99%	327.67%	Refer to DTC P02CC in the DTC summary table. ⇒ page 133
$82	P02CF	Cylinder 2 Adaptation Monitoring Adaptive Value Limit High.	-327.68 %	99.99%	Refer to DTC P02CF in the DTC summary table. ⇒ page 135
$83	P02CE	Cylinder 2 Adaptation Monitoring Adaptive Value Limit Low.	-99.99%	327.67%	Refer to DTC P02CE in the DTC summary table. ⇒ page 133
$84	P02D1	Cylinder 3 Adaptation Monitoring Adaptive Value Limit High.	-327.68 %	99.99%	Refer to DTC P02D1 in the DTC summary table. ⇒ page 134
$85	P02D0	Cylinder 3 Adaptation Monitoring Adaptive Value Limit Low.	-99.99%	327.67%	Refer to DTC P02D0 in the DTC summary table. ⇒ page 133
$86	P02D3	Cylinder 4 Adaptation Monitoring Adaptive Value Limit High.	-327.68 %	99.99%	Refer to DTC P02D3 in the DTC summary table. ⇒ page 134

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$87	P02D2	Cylinder 4 Adaptation Monitoring Adaptive Value Limit Low.	-99.99%	327.67%	Refer to DTC P02D2 in the DTC summary table. ⇒ page 133
$8F	P268A	Adaptation Monitoring Functional Check.	0.0 counts	18.0 counts	Refer to DTC P268A in the DTC summary table. ⇒ page 135
$90	P219C	Cylinder 1 Air-Fuel Ratio Imbalance Lean.	0.0 lambda	1.13 lambda	Refer to DTC P219C in the DTC summary table. ⇒ page 136
$91	P219C	Cylinder 1 Air-Fuel Ratio Imbalance Rich.	0.86 lambda	1.99 lambda	Refer to DTC P219C in the DTC summary table. ⇒ page 136
$92	P219D	Cylinder 2 Air-Fuel Ratio Imbalance Lean.	0.0 lambda	1.13 lambda	Refer to DTC P219D in the DTC summary table. ⇒ page 138
$93	P219D	Cylinder 2 Air-Fuel Ratio Imbalance Rich.	0.86 lambda	1.99 lambda	Refer to DTC P219D in the DTC summary table. ⇒ page 138
$94	P219E	Cylinder 3 Air-Fuel Ratio Imbalance Lean.	0.0 lambda	1.13 lambda	Refer to DTC P219E in the DTC summary table. ⇒ page 137
$95	P219E	Cylinder 3 Air-Fuel Ratio Imbalance Rich.	0.86 lambda	1.99 lambda	Refer to DTC P219E in the DTC summary table. ⇒ page 137
$96	P219F	Cylinder 4 Air-Fuel Ratio Imbalance Lean.	0.0 lambda	1.13 lambda	Refer to DTC P219F in the DTC summary table. ⇒ page 137
$97	P219F	Cylinder 4 Air-Fuel Ratio Imbalance Rich.	0.86 lambda	1.99 lambda	Refer to DTC P219F in the DTC summary table. ⇒ page 137

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $A2: Misfire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	EWMA Misfire Counts For Previous Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 44
$0C	P0301	Misfire Counts For Last/Current Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 44

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $A3: Misfire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	EWMA Misfire Counts For Previous Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 46
$0C	P0302	Misfire Counts For Last/Current Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 46

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 25 .

– Switch the ignition off.

Monitor-ID $A4: Misfire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	EWMA Misfire Counts For Previous Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 45
$0C	P0303	Misfire Counts For Last/Current Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 45

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding

diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory", page 25 .

– Switch the ignition off.

Monitor-ID $A5: Misfire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 06: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID $A5".

– Select the desired "Test-ID".

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	EWMA Misfire Counts For Previous Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 46
$0C	P0304	Misfire Counts For Last/Current Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 46

– If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory", page 25 .

– Switch the ignition off.

3.3.7 Diagnostic Mode 07 – Read Faults Detected During the Current or Last Driving Cycle

Mode 07 makes it possible to check emissions-related faults which appeared during the current or last driving cycle (pending DTCs).

A pending DTC is saved the first time a fault is detected (output via Mode 07).

– If the fault is detected again by the end of the following driving cycle, a confirmed DTC is entered (output via Mode 03) and the MIL is activated.

– If this malfunction is not detected again by the end of the following driving cycle, the corresponding pending code will be deleted at the end of the driving cycle.

Note

Depending on scan tool and protocol used, some of the information provided may be referred to by a different name.

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

Note

If the engine does not start, crank the engine using starter for at least 5 seconds. Do not switch the ignition off afterward.

– Select Mode 7: Check test results of components that are continuously monitored.

The number of pending DTCs or 0 malfunctions detected will be displayed on the scan tool screen.

– Refer to the DTC tables below for the diagnostic repair procedures.

♦ ⇒ E3.4.1 ngine/Motor Control Module, 2021/2022 MY", page 40

– Switch the ignition off.

3.3.8 Diagnostic Mode 08 – Request Control of On-Board System, Test or Component

Diagnostic Mode 08 is used to control the operation of an on-board system, test or component. A Mode 8 service can be used to turn on-board system ON or OFF, or to cycle an on-board system, test or component on or off for a specific period of time. The service can also be used to request system status or to report test results.

Test requirements

- No DTCs stored in the DTC memory.
- Intake Air Temperature (IAT) maximum 60° C.
- Coolant temperature 80 – 110° C.
- Throttle valve angle 12.0 – 16.0%.

Function test

Mode 8 is not supported for the DMTL leak detection system on this vehicle. Refer to the individual tests for EVAP codes or EVAP leak checking.

3.3.9 Diagnostic Mode 09 – Read Vehicle Information

Diagnostic Mode 09 makes it possible to access vehicle-specific information from the ECM and the TCM (where applicable).

Note

Depending on scan tool and protocol used, Diagnostic Mode 09 and the information provided may be referred to by a different name.

Test requirement

- No DTCs stored in the DTC memory.

Procedure

– Connect the scan tool.

– Switch the ignition on.

– Select Mode 09: Vehicle information.

– Select the desired Test-ID.
– The information requested will be displayed on the scan tool screen.

The following table is a numerical list of all Test-IDs that may be selected.

Test-ID	Diagnostic text
$02:	Vehicle identification number (VIN) e.g.
	♦ A different 17 digit number will be displayed for each vehicle
$04:	Calibration identification (ID) e.g.
	♦ Engine Control Module
	♦ Transmission Control Module
$06:	Calibration Verification Number (CVN) (check sum) e.g.
	♦ EC5AE460 the check sum is different for every control module version
	♦ 000D105
$08:	In-use Performance Tracking
$0A:	ECU Module Acronym And Text Name
	♦ Engine Control Module
$13:	Certification Test Group, Engine Family Number
$14:	Distance Traveled Since Evap Monitoring Decision
$16:	Vehicle Operation Data - Engine Run/Idle Time
$17:	Vehicle Operation Data - Distance/Fuel Used
$18:	Vehicle Operation Data - PKE/EOE
$1D:	Active Aerodynamic Features #1 Off-cycle Credit Vehicle Data
$22:	Run Time for Stop-Start and Coasting Off-Cycle Credit Vehicle Data

– Switch the ignition off.

3.3.10 Diagnostic Mode 0A – Check Permanent DTC Memory

Note

♦ *The following is a generic explanation of the requirements, coverage, and operation of Mode 0A.*

♦ *Mode 0A may only be supported exclusively by OBD control modules in US vehicles. Mode 0A may not be supported in EOBD vehicles, meaning the control module may not send a response here.*

Mode 0A - Check Permanent DTC Memory (Request emissions-related diagnostic trouble codes with permanent status after code clear)

Permanent Fault Codes From MY 2010 with Phase-In conforming to CCR 1968.2 (d) (2.2.5): 50% from MY 2010 / 75% from MY 2011 / 100% from MY 2012 The vehicle only participates in Phase-In if all of the OBD-relevant control modules in the vehicle meet these requirements.

Mode 0A enables the request of all OBD-relevant faults with the status “Permanent Fault Code”

- Permanent Fault Codes are Confirmed Fault Codes that are currently activating the MIL. That means faults that are still displayed in Mode 03 but no longer activate the MIL (History Fault Codes) are not Permanent Fault Codes.

- Permanent Fault Codes are updated in Mode 0A at the same time as NVRAM storage immediately after switching the ignition off. A newly detected Permanent Fault Code is only visible after switching the ignition off/on in Mode 0A.

- Permanent Fault Codes may only be erased in the control module after they are corrected as long as the last diagnostic result was a PASS and the MIL is no longer activated by this fault. The Permanent Fault Codes should be erased from Mode 0A at the same time the MIL switches off when the ignition is switched off/on.

- Permanent Fault Codes may not be erased by clearing the DTC memory or disconnecting the power supply. Storage in NVRAM is required.

- Permanent Fault Codes may only be erased after clearing the DTC memory under the following conditions: - As long as no FAIL diagnostic result was detected for a Permanent Fault Code - and at least one PASS diagnostic result was detected - and the Minimum Trip Conditions for a General Denominator (without considering high/ambient temperature) were met in this phase in any DCY after erasing the DTC memory.

- The engine control module relays the message “Minimum Trip conditions met” to all other OBD control modules via CAN: CAN message OBD_01, Byte 8, Bit 4: OBD_Minimum_Trip

- Permanent Fault Codes may NOT be erased if the diagnostic result is FAIL after clearing the DTC memory. A Pending Fault Code should be stored and the DTC memory line should be overwritten with new Freeze Frame data. (Exception: If the Pending Fault Code is corrected without a Confirmed Fault Code being detected, the Permanent Fault Code may also be erased under the conditions described below.)

- Permanent Fault Codes should be erased in engine control modules after Update Programming. At this time, all readiness bits (Mode 01 PID $01) must be reset to “not complete” [(g)(4.4.6)(D)]. Permanent Fault Codes should not be erased in OBD control modules with Comprehensive Components (CCM) as a single readiness bit if the identical program/data status is being programmed. If a different program/data status is being programmed, Permanent Fault Codes should be erased after Update Programming.

- The procedure in Mode 01 through Mode 09 and in the service tester is NOT affected by implementation of the Permanent Fault Codes.

Note

After MIL off during the 40 warm-up cycle self-healing process, the fault may not be reported as Permanent Fault Code anymore

Procedure

- Erasing Permanent Fault Codes after code clear Service $0A – Permanent Fault Codes: can only be erased at the end of a driving cycle (during ECM keep alive time) if all the following conditions are fulfilled:

- ERASE: Permanent Fault Codes after code clear, the vehicle needs to be driven!
- NO FAIL: DTC cleared
- MONITORS: PASS
- MINIMUM: Conditions fulfilled 600.0 s (cumulative) Engine running
- DRIVE: 300.0 s (cumulative) vehicle speed > 25 mph (40 km/h)

3.4 Engine DTC Tables

- ⇒ E3.4.1 ngine/Motor Control Module, 2021/2022 MY", page 40

3.4.1 Engine/Motor Control Module, 2021/2022 MY

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Catalyst System	P0420 – Catalyst System Efficiency Below Threshold Bank 1	intrusive monitor	ratio of measured corrected			monitor entry conditions					♦ Three Way Catalytic Converter (TWC) ♦ Oxygen Sensor 1 After Catalytic Converter -GX7- ♦ Oxygen Sensor 1 Before Catalytic Converter -GX10-
			OSC / OSC of borderline								
			catalyst								
		measure of OSC compared to OSC of borderline catalyst	arithmetic average value of OSC ratio	not calibrated	[-]	conditions for active lambda diagnosis (referenced)	checked		15 [s] once / DCY	1 DCY	

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Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or			for arithmetic average value					
						calculation					
			EWMA filtered value of OSC ratio	< 1.00	[-]	number of checks required for valid result	not calibrated	[-]			
						for EWMA-filter					
						K-factor	0.30	[-]			
						minimum number of tests per DCY required	1	[-]			
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation between new measured value and old EWMA filtered value	> 0.75	[-]			
						number of checks for confirmation	5.00	[-]			
						maximum tolerance to confirm filtered value	0.30	[-]			
						conditions for fast initial					
						response mechanism					
						initial value of filtered value	5.00	[-]			
						maximum number of checks per DCY	3.00	[-]			
						additional conditions					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Misfire	P0301 – Cylinder 1 Misfire Detected	crankshaft speed fluctuation(single or multiple)	emission threshold misfire rate (MR)	> 3.50	[%]	case 1			1000 [rev] continuous	2 DCY	♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors ♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
	P0303 – Cylinder 3 Misfire Detected		catalyst damage misfire rate (MR)	> 4.30... 19.05	[%]	ECT downstream engine @ start	not calibrated	[°C]	200 [rev] continuous	immediately	♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors ♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0304 – Cylinder 4 Misfire Detected P0302 – Cylinder 2 Misfire Detected					case 2 ECT downstream engine @ start	not calibrated	[°C]			♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors ♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
	P0363 – Misfire Detected - Fueling Disabled P0300 – Random/ Multiple Cylinder Misfire Detected					then activation if ECT downstream engine additional debouncing for all conditions above ignition counter (additional debouncing)first start in dcy engine speed ignition counter within ignition counter (additional debouncing) restart (if equipped with stop/ start system)engine ignition counter within	not calibrated not calibrated > 500 > 4 not calibrated running > 4 not calibrated not calibrated	[°C] [-] [rpm] [-] [-] [-] [-] [s]			♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors ♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ignition counter (additional debouncing)general conditions time after engine start within					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ignition counter (additional debouncing)	not calibrated	[-]			
						engine torque	>= 0	[Nm]			
						fuel cut off	not active				
						within					
						ignition counter (additional debouncing)	> 8	[-]			
						rough road	not detected				
						within					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ignition counter (additional debouncing)	> 8	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Misfire	P0316 – Engine Misfire Detected on Startup (First 1000 Revolutions)	crankshaft speed fluctuation	emission threshold misfire rate	> 3.50	[%]	case 1			1000 [rev]	2 DCY	♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors ♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		(single or multiple)	(MR)						continuous		
						ECT downstream engine @ start	not calibrated	[°C]			
						case 2					
						ECT downstream engine @ start	not calibrated	[°C]			
						then activation if ECT	not calibrated	[°C]			
						downstream engine					
						additional debouncing for all					
						conditions above					
						ignition counter	not calibrated	[-]			
						first start in dcy					
						engine speed	> 500	[rpm]			
						ignition counter	> 4	[-]			
						within					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						ignition counter (additional	not calibrated	[-]			
						debouncing)					
						restart (in case of PHEV or if					
						equipped with stop/start					
						system)					
						engine	running				
						ignition counter	> 4	[-]			
						within					
						ignition counter (additional	not calibrated	[-]			
						debouncing)					
						general conditions					
						time after engine start	not calibrated	[s]			
						within					
						ignition counter (additional	not calibrated	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						debouncing)					
						engine torque	>= 0	[Nm]			
						fuel cut off	not active				
						within					
						ignition counter (additional	> 8	[-]			
						debouncing)					
						rough road	not detected				
						within					
						ignition counter (additional	> 8	[-]			
						debouncing)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Autoignition	P2D10 – Engine Pre-Ignition Above Threshold - Forced Limited Power	crankshaft speed fluctuation	Cyl. 1 - no dynamic:			engine load	> 60.00	[%]			♦ This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. ♦ Check the spark plugs visually for signs of fouling. ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											♦ Knock Sensor 1 -G61- ♦ Engine Speed Sensor - G28-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P039B – Cylinder 1 Pressure Too High		relative angular crankshaft deceleration	> 15600.00...25900.00	[1/s²]	engine speed	< 6000	[rpm]	30 [rev] continuous	2 DCY	♦ This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. ♦ Check the spark plugs visually for signs of fouling. ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											♦ Knock Sensor 1 -G61- ♦ Engine Speed Sensor - G28-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P03AF – Cylinder 3 Pressure Too High		or			clutch	closed				♦ This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. ♦ Check the spark plugs visually for signs of fouling. ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											♦ Knock Sensor 1 -G61- ♦ Engine Speed Sensor - G28-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P03B9 – Cylinder 4 Pressure Too High		Cyl. 1 - medium dynamic:			gear shift	not active				♦ This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. ♦ Check the spark plugs visually for signs of fouling. ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											♦ Knock Sensor 1 -G61- ♦ Engine Speed Sensor - G28-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P03A5 – Cylinder 2 Pressure Too High		relative angular crankshaft deceleration	> 23400.00...38850.00	[1/s²]	fuel cut off	not active				♦ This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. ♦ Check the spark plugs visually for signs of fouling. ♦ Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											♦ Knock Sensor 1 -G61- ♦ Engine Speed Sensor - G28-
			or			diff. set point vs. actual rail pressure	< 8.00	[MPa]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			Cyl. 1 - high dynamic: relative angular crankshaft deceleration	> 31200.00...51800.00	[1/s²]	tooth angle adaptation diff. basic vs. current ignition timing	finished < 180.00	[°CRK]			
			Cyl. 2 - no dynamic: relative angular crankshaft deceleration	> 15200.00...22900.00	[1/s²]	no dynamic engine speed gradient	<= 2100.00...2700.00	[rpm/s]	30 [rev] continuous	2 DCY	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or Cyl. 2 - medium dynamic: relative angular crankshaft deceleration	> 22800.00...34350.00	[1/s²]	and set point MAP gradient medium dynamic	<= 500.00...825.00	[kPa/s]			
			or			engine speed gradient	> 2100.00...2700.00	[rpm/s]			
			Cyl. 2 - high dynamic: relative angular crankshaft deceleration	> 30400.00...45800.00	[1/s²]	or set point MAP gradient	> 500.00...825.00	[kPa/s]			
			Cyl. 3 - no dynamic: relative angular crankshaft deceleration	>= 14200.00...16400.00	[1/s²]	high dynamic engine speed gradient	> 2100.00...2700.00	[rpm/s]	30 [rev] continuous	2 DCY	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or Cyl. 3 - medium dynamic: relative angular crankshaft deceleration	>= 21300.00...24600.00	[1/s²]	and set point MAP gradient	> 500.00...825.00	[kPa/s]			
			or Cyl. 3 - high dynamic: relative angular crankshaft deceleration	>= 28400.00...32800.00	[1/s²]						
			Cyl. 4 - no dynamic relative angular crankshaft deceleration	> 15600.00...22700.00	[1/s²]				30 [rev] continuous	2 DCY	
			or Cyl. 4 - medium dynamic: relative angular crankshaft deceleration	>= 23400.00...34050.00	[1/s²]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or Cyl. 4 - high dynamic: relative angular crankshaft deceleration	> 31200.00...45400.00	[1/s²]						
Evaporative Emission (EVAP)	P0441 – EVAP System Incorrect Purge Flow	intrusive monitor	purge valve quality	< 0.10	[-]	monitor entry conditions			0.3 [s]	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Fuel Tank Leak Detection Module - GX36-
System									once / DCY		
		functional check				diff. BARO vs. intake manifold	> 19.00	[kPa]			
						pressure					
						relative engine load	> 0.00... 12.00	[%]			
						engine speed	500... 2500	[rpm]			
						idle speed	not calibrated				
						vehicle speed	not calibrated	[km/h]			
						vehicle speed	not calibrated	[km/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine speed deviation	< | 70 |	[rpm]			
						engine load deviation	< | 4.01 |	[%]			
						diff. actual vs. filtered intake	< | 2.50... 3.33|	[kPa]			
						manifold pressure model					
						MAP set point deviation	< | 4.00|	[kPa]			
						and					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fuel cut-off	not calibrated				
						or					
						lambda control	closed loop				
						lambda control value	0.90... 1.10	[-]			
						lambda value	0.90... 1.10	[-]			
						and					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						selected gear	>= 3.00	[-]			
						and					
						case 1					
						integrated air mass through	>= 2.5	[g]			
						canister purge valve					
						or					
						cumulated integrated purge MAF	not calculated	[g]			
						since engine start					
						case 2					
						integrated air mass through	not calibrated	[g]			
						canister purge valve					
						cumulated integrated purge MAF	not calibrated	[g]			
						since engine start					
						and					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						valve opening angle for purge	>= 0.00	[-]			
						adaptation					
						or					
						air mass flow for purge	>= 0.00	[-]			
						adaptation					
						and					
						case 1					
						AAT	> 35	[°C]			
						purge flow adaptation factor	<= 0.00... 3.95	[-]			
						case 2					
						AAT	28...35	[°C]			
						purge flow adaptation factor	<= 0.00... 3.95	[-]			
						case 3					
						AAT	< 28	[°C]			
						purge flow adaptation factor	<= 0.00... 3.95	[-]			
						and					
						cumulated air mass since engine	>= 0.00	[kg]			
						start					
						AAT	> 4	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						BARO	> 66.00	[kPa]			
						battery voltage	10.00...16.00	[V]			
						and					
						ECT downstream engine	> 48	[°C]			
						or					
						modeled ECT	> 48	[°C]			
						conditions for measurement					
						window					
						diff. actual vs. filtered freezed	< | 511.90 |	[kPa]			
						intake manifold pressure model					
						diff. actual vs. filtered intake	< | 20.00|	[kPa]			
						manifold pressure model					
						change of engine mode	not active				
						engine speed	500...2600	[rpm]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						relative engine load	> 0.00	[%]			
						diff. BARO vs. intake manifold	> 18.00	[kPa]			
						pressure					
						diff. BARO vs. boost pressure	>= -300.00	[kPa]			
						maximum throttle position	< | 100.00|	[%]			
						dynamic					
						engine speed deviation	< | 90 |	[rpm]			
						change of manifold pressure	< | 5.00|	[kPa]			
						set point					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						change of modeled manifold pressure	< | 20.00|	[kPa]			
Evaporative Emission (EVAP)	P04F0 – EVAP System High Load Purge Line "A" Performance	intrusive monitor	Turbocharger Purge Line			monitor entry conditions					♦ EVAP Canister Purge Regulator Valve 1 - N80-
System		functional check	purge valve quality	< 0.10	[-]	diff. BARO vs. intake manifold	not calibrated	[kPa]	0.3 [s]	2 DCY	
						pressure			once / DCY		
						MAF	not calibrated	[g/s]			
						selected gear	>= 3.00	[-]			
						and					
						case 1					
						integrated air mass through	>= 9.0	[g]			
						canister purge valve in					
						turbocharged engine mode					
						case 2					
						integrated air mass through	>= 2.5	[g]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						canister purge valve					
						or					
						cumulated integrated purge MAF	not calculated	[g]			
						since engine start					
						case 3					
						integrated air mass through	not calibrated	[g]			
						canister purge valve					
						cumulated integrated purge MAF	not calibrated	[g]			
						since engine start					
						and					
						valve opening angle for purge	>= 0.00	[-]			
						adaptation					
						or					
						air mass flow for purge	>= 0.00	[-]			
						adaptation					
						and					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						case 1					
						AAT	> 35	[°C]			
						purge flow adaptation factor	<= 0.00... 3.95	[-]			
						case 2					
						AAT	28...35	[°C]			
						purge flow adaptation factor	<= 0.00... 3.95	[-]			
						case 3					
						AAT	< 28	[°C]			
						purge flow adaptation factor	<= 0.00... 3.95	[-]			
						and					
						cumulated air mass since engine	>= 0.00	[kg]			
						start					
						AAT	> 4	[°C]			
						BARO	> 66.00	[kPa]			
						battery voltage	10.00...16.00	[V]			
						and					
						ECT downstream engine	> 48	[°C]			
						or					
						modeled ECT	> 48	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						conditions for measurement					
						window					
						change of engine mode	not active				
						MAF	not calibrated	[g/s]			
						engine speed	not calibrated	[rpm]			
						maximum throttle position	not calibrated	[%]			
						dynamic					
						boost pressure dynamic	not calibrated	[kPa]			
Evaporative Emission (EVAP) System	P30DC – Pressure Release For Refueling Gas Tank Not Possible	functional check	evaporative system vapor pressure	>= 2.50; <= -4.00	[kPa]	evaporative system vapor pressure	>= 2.50; <= -4.00	[kPa]	30.0 [s] once / DCY	2 DCY	♦ Tank Switch-Off Valve -N288-
			and								
			time after refueling request	>= 30.0	[s]						

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Evaporative Emission (EVAP) System Fuel Filler Door	P04B5 – Fuel Fill Door Stuck Open	fuel consumption not in expected range	cumulative fuel consumption since refuel	> 80.00	[l]				0.1 [s] continuous	1 DCY	♦ Fuel Filler Door Lock Motor - V155-
Evaporative Emission (EVAP) System Vent Valve	P0498 – EVAP System Vent Valve Control Circuit Low	circuit low	signal voltage	<= 1.64... 1.96	[V]	actuator ECM predrive battery voltage	commanded off not detected 6.00... 17.00	[V]	0.5 [s] continuous	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Tank Switch-Off Valve -N288-
Evaporative Emission (EVAP) System Vent Valve	P0449 – EVAP System Vent Valve Control Circuit/ Open	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	actuator ECM predrive battery voltage	commanded off not detected 6.00... 17.00	[V]	0.5 [s] continuous	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Tank Switch-Off Valve -N288-
Evaporative Emission (EVAP) System Vent Valve	P0499 – EVAP System Vent Valve Control Circuit High	circuit high	signal current	>= 2.8	[A]	actuator ECM predrive battery voltage	commanded on not detected 6.00... 17.00	[V]	0.5 [s] continuous	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Tank Switch-Off Valve -N288-
Evaporative Emission (EVAP)	P2422 – EVAP System Vent Valve Stuck Closed	intrusive monitor	change of evap pump current	> 2.0	[mA]	AAT	4...143	[°C]	110.6 [s]	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Tank Switch-Off Valve -N288-
System Vent Valve									once / DCY		
		stuck close	within time	>= 5.0	[s]	BARO	>= 72.00	[kPa]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						battery voltage	>= 10.90; <= 16.10	[V]			
						difference between low-pass	<= | 0.20 |	[kPa]			
						filtered and actual barometric					
						pressure					
						vehicle speed (upper range)	< 130	[km/h]			
						vehicle speed (lower range)	> 10	[km/h]			
						no refueling event	not calibrated				
						fuel level	not calibrated	[l]			
						fault suspicion from stuck check	active				
						monitoring of EVAP System					
						Vapor Pressure Sensor					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						propulsion off time previous dcy	>= 21600	[s]			
						diff. between ECT downstream	not calibrated	[K]			
						engine @ start and AAT					
						conditions optional					
						EVAP vent valve commanded	8.0	[s]			
						on for cumulative					
						within time	100.0	[s]			
						difference between low-pass	<= | 0.10 |	[kPa]			
						filtered and actual differential					
						evaporative system vapor					
						pressure					
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions optional					
						EVAP vent valve continuously	7.0	[s]			
						commanded on for					
						within time	100.0	[s]			
						additional general conditions					
						change in differential	< | 80.00 |	[kPa]			
						evaporative system vapor					
						pressure since start of pressure					
						reduction					
						time since engine start	> 600.0	[s]			
						at least one leak detection	preceding				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						monitor during engine off					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ratio of actual evap pump current difference between reference measurement and idle to last evap pump current difference at leak detection during engine off	< 1.50	[-]			
						evap leak detection pump	ready				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
						differential evaporative system vapor pressure	< -3.50	[kPa]			
						or					
						integrated EVAP purge mass	> 2.0	[g]			
						evap purge adaptation	< 5.00	[-]			
						change in differential evaporative system vapor pressure when EVAP vent valve closed	< 0.30	[kPa/s]			
						within time	>= 1.8	[s]			
						integrated EVAP purge mass after monitoring break	> 8.0	[g]			
						time after monitoring break	>= 300.0	[s]			
						EVAP vent valve	commanded on				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2422 – EVAP System Vent Valve Stuck Closed	passive monitoring	change of evaporative system pressure	< 1.00	[kPa]	differential evaporative system vapor pressure	not calibrated	[kPa]	110.6 [s] once / DCY	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 -N80- ♦ Tank Switch-Off Valve -N288-
		stuck close	within time	>= 2.0	[s]	EVAP vent valve continuously commanded on	not calibrated				
						evap leak detection pump	not calibrated				
						no refueling event	not calibrated				
						passive monitoring	not active				
						diff. between ECT downstream engine @ start and AAT	not calibrated	[K]			
						or					
						propulsion off time previous dcy	not calibrated	[s]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						EVAP pressure sensor offset diagnosis	not calibrated				
						and					
						DMTL	not calibrated				
	P2421 – EVAP System Vent Valve Stuck Open	intrusive monitor	ratio of actual evap pump current gradient to evap pump current gradient with EVAP vent valve commanded open	<= 2.00	[-]	AAT	4...143	[°C]	110.6 [s] once / DCY	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 -N80- ♦ Tank Switch-Off Valve -N288-
		stuck open	and			BARO	>= 72.00	[kPa]			
			change of evap pump current	<= 1.2	[mA]	battery voltage	>= 10.90; <= 16.10	[V]			
			within time	>= 5.0	[s]	difference between low-pass filtered and actual barometric pressure	<= | 0.20 |	[kPa]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						vehicle speed (upper range)	< 130	[km/h]			
						vehicle speed (lower range)	> 10	[km/h]			
						no refueling event	not calibrated				
						fuel level	not calibrated	[l]			
						fault suspicion from stuck check monitoring of EVAP System Vapor Pressure Sensor	active				
						propulsion off time previous dcy	>= 21600	[s]			
						diff. between ECT downstream engine @ start and AAT	not calibrated	[K]			
						conditions optional					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						EVAP vent valve commanded on for cumulative	8.0	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						within time	100.0	[s]			
						difference between low-pass	<= | 0.10 |	[kPa]			
						filtered and actual differential					
						evaporative system vapor					
						pressure					
						or					
						conditions optional					
						EVAP vent valve continuously	7.0	[s]			
						commanded on for					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						within time	100.0	[s]			
						additional general conditions					
						change in differential	< | 80.00 |	[kPa]			
						evaporative system vapor					
						pressure since start of pressure					
						reduction					
						time since engine start	> 600.0	[s]			
						at least one leak detection	preceding				
						monitor during engine off					
						ratio of actual evap pump	< 1.50	[-]			
						current difference between					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						reference measurement and idle					
						to last evap pump current					
						difference at leak detection					
						during engine off					
						evap leak detection pump	ready				
						differential evaporative system	< -3.50	[kPa]			
						vapor pressure					
						or					
						integrated EVAP purge mass	> 2.0	[g]			
						evap purge adaptation	< 5.00	[-]			
						change in differential	< 0.30	[kPa/s]			
						evaporative system vapor					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						pressure when EVAP vent valve					
						closed					
						within time	>= 1.8	[s]			
						integrated EVAP purge mass	> 8.0	[g]			
						after monitoring break					
						time after monitoring break	>= 300.0	[s]			
						EVAP vent valve	commanded off				
Evaporative Emission (EVAP)	P0456 – EVAP System Leak Detected (Very Small Leak)	intrusive monitor	EVAP - system leakage area	> 0.12	[mm²]	ECT downstream engine @ start	>= 4	[°C]	800.0 [s]	2 DCY	♦ Check the EVAP System for Leaks. ♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Fuel Tank Leak Detection Module - GX36-
System Very Small Leak			calculated from pump current						once / DCY		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
		rationality check	curve			diff. between ECT downstream	not calibrated	[K]			
						engine @ start and AAT					
						propulsion off time previous dcy	>= 21600.0	[s]			
						AAT	< 35; > 4	[°C]			
						BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						evap purge adaptation	< 5.00	[-]			
						integrated purge mass flow since	not calibrated	[g]			
						last purge stop					
						no sudden change in evap pump	< 1.5; > -0.7	[mA]			
						current (filling event)					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation of filtered evap pump current during reference measurement within range	<= 0.5	[mA]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						change in relative evap pump current during monitoring	not calibrated	[-]			
						within time	not calibrated	[s]			
						(during ECM keep alive-time after ignition off, max. time)	< 900.0	[s]			
						airbag	not activated				
						battery voltage	10.90...16.10	[V]			
						fuel level	not calibrated	[l]			
Evaporative Emission (EVAP)	P0442 – EVAP System Leak Detected (Small Leak)	intrusive monitor	modeled pressure from pump	< 2.00	[kPa]	ECT downstream engine @ start	>= 4	[°C]	700.0 [s]	2 DCY	♦ Check the EVAP System for Leaks. ♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Fuel Tank Leak Detection Module - GX36-
System Small Leak			current						once / DCY		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		pressure check				diff. between ECT downstream	not calibrated	[K]			
						engine @ start and AAT					
						propulsion off time previous dcy	>= 21600.0	[s]			
						AAT	< 35; > 4	[°C]			
						BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						no sudden change in evap pump	< 1.5; > -0.7	[mA]			
						current (filling event)					
						deviation of filtered evap pump	<= 0.5	[mA]			
						current during reference					
						measurement within range					
						change in relative evap pump	not calibrated	[-]			
						current during monitoring					
						within time	not calibrated	[s]			
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					
						airbag	not activated				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
						battery voltage	10.90...16.10	[V]			
						fuel level	not calibrated	[l]			
Evaporative Emission (EVAP)	P043E – EVAP System Leak Detection Reference Orifice Low Flow	out of range high	evap pump current during	> 40.0	[mA]	ECT downstream engine @ start	>= 4	[°C]	120.0 [s]	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
Diagnosis Module Tank			reference measurement						once / DCY		
Leakage (DMTL)						diff. between ECT downstream	not calibrated	[K]			
						engine @ start and AAT					
						propulsion off time previous dcy	>= 21600.0	[s]			
						AAT	< 35; > 4	[°C]			
						BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			
						deviation of filtered evap pump	<= 0.5	[mA]			
						current during reference					
						measurement within range					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						airbag	not activated				
						battery voltage	10.90...16.10	[V]			
						fuel level	not calibrated	[l]			
	P043F – EVAP System Leak Detection Reference Orifice High Flow	out of range low	during engine off:			ECT downstream engine @ start	>= 4	[°C]			♦ Fuel Tank Leak Detection Module - GX36-
			evap pump current during	< 15.0	[mA]	diff. between ECT downstream	not calibrated	[K]	120.0 [s]	2 DCY	
			reference measurement			engine @ start and AAT			once / DCY		
						propulsion off time previous dcy	>= 21600.0	[s]			
						AAT	< 35; > 4	[°C]			
						BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			
						deviation of filtered evap pump	<= 0.5	[mA]			
						current during reference					
						measurement within range					
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					
						airbag	not activated				
						battery voltage	10.90...16.10	[V]			
						fuel level	not calibrated	[l]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2407 – EVAP System Leak Detection Pump Sense Circuit Intermittent/ Erratic	signal check	during engine off:			ECT downstream engine @ start	>= 4	[°C]			♦ Fuel Tank Leak Detection Module - GX36-
			fluctuation of evap pump current	> 0.5	[mA]	diff. between ECT downstream	not calibrated	[K]	800.0 [s]	2 DCY	
			during reference measurement			engine @ start and AAT			once / DCY		
			or			propulsion off time previous dcy	>= 21600.0	[s]			
			drop of evap pump current	> 6.0	[mA]	AAT	< 35; > 4	[°C]			
			during pump phase								
			for time	>= 3.0	[s]	BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			
						no sudden change in evap pump	< 1.5; > -0.7	[mA]			
						current (filling event)					
						change in relative evap pump	not calibrated	[-]			
						current during monitoring					
						within time	not calibrated	[s]			
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					
						airbag	not activated				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage	10.90...16.10	[V]			
						fuel level	not calibrated	[l]			
	P2450 – EVAP System Switching Valve Performance/Stuck Open	signal check	during engine off:			ECT downstream engine @ start	>= 4	[°C]			♦ Fuel Tank Leak Detection Module - GX36-
			evap pump current difference	<= 2.0	[mA]	diff. between ECT downstream	not calibrated	[K]	123.5 [s]	2 DCY	
			between reference			engine @ start and AAT			once / DCY		
			measurement to idle								

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						propulsion off time previous dcy	>= 21600.0	[s]			
						AAT	< 35; > 4	[°C]			
						BARO	> 73.95	[kPa]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			
						no sudden change in evap pump	< 1.5; > -0.7	[mA]			
						current (filling event)					
						deviation of filtered evap pump	<= 0.5	[mA]			
						current during reference					
						measurement within range					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						change in relative evap pump	not calibrated	[-]			
						current during monitoring					
						within time	not calibrated	[s]			
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					
						airbag	not activated				
						battery voltage	10.90...16.10	[V]			
						fuel level	not calibrated	[l]			
Evaporative Emission (EVAP)	P148D – Evaporative Emission System Leak Detection Pump Implausible Frequency	functional check	filtered pump frequency	< 60.0	[1/s]	ECT downstream engine @ start	>= 4	[°C]	120.0 [s]	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
Diagnosis Module Tank									once / DCY		
Leakage (DMTL) Pump Motor						diff. between ECT downstream	not calibrated	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						engine @ start and AAT					
						propulsion off time previous dcy	>= 21600	[s]			
						AAT	> 4; < 35	[°C]			
						BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			
						during	300.0	[s]			
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			
						deviation of filtered evap pump	<= 0.5	[mA]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						current during reference					
						measurement within range					
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					
						airbag	not activated				
						battery voltage	10.90...16.10	[V]			
						fuel level	<= 0.00	[l]			
Evaporative Emission (EVAP)	P148D – Evaporative Emission System Leak Detection Pump Implausible Frequency	functional check	filtered pump frequency	> 140.0	[1/s]	ECT downstream engine @ start	>= 4	[°C]	120.0 [s]	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
Diagnosis Module Tank									once / DCY		
Leakage (DMTL) Pump Motor						diff. between ECT downstream	not calibrated	[K]			
						engine @ start and AAT					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						propulsion off time previous dcy	>= 21600	[s]			
						AAT	> 4; < 35	[°C]			
						BARO	> 73.95	[kPa]			
						time since engine start in current	>= 600.0	[s]			
						dcy					
						change of BARO	<= 1.60	[kPa]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						during	300.0	[s]			
						change in battery voltage during	< 1.00	[V]			
						monitoring					
						engine off time	>= 5.0	[s]			
						vehicle speed	0	[km/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation of filtered evap pump	<= 0.5	[mA]			
						current during reference					
						measurement within range					
						(during ECM keep alive-time	< 900.0	[s]			
						after ignition off, max. time)					
						airbag	not activated				
						battery voltage	10.90...16.10	[V]			
						fuel level	<= 0.00	[l]			
Evaporative Emission (EVAP) Diagnosis Module Tank Leakage (DMTL) Pump Motor	P2401 – EVAP System Leak Detection Pump Control Circuit Low	circuit low	signal voltage	<= 1.64...1.96	[V]	evap pump electric drive ECM predrive battery voltage	commanded off not detected 8.90...16.50	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
	P2400 – EVAP System Leak Detection Pump Control Circuit/ Open	open circuit	signal voltage	> 1.64...1.96; <= 2.73...3.27	[V]	evap pump electric drive	commanded off	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ECM pre-drive battery voltage	not detected 8.90... 16.50				
	P2402 – EVAP System Leak Detection Pump Control Circuit High	circuit high	signal voltage at evap pump current measuring resistor	> 4.00	[V]	evap pump electric drive	commanded on		0 [s] once / DCY	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						battery voltage above conditions must be fulfilled for time ECM pre-drive	<= 16.50 >= 120 not detected	[V] [ms]			
	P2402 – EVAP System Leak Detection Pump Control Circuit High	functional check: jammed pump motor	signal voltage at evap pump current measuring resistor	> 1.80	[V]	evap pump electric drive	commanded on		0 [s] once / DCY	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						battery voltage above conditions must be fulfilled for time ECM pre-drive	<= 16.50 >= 450 not detected	[V] [ms]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Evaporative Emission (EVAP) Diagnosis Module Tank Leakage (DMTL) Pump Heater	P240B – EVAP System Leak Detection Pump Heater Control Circuit Low	circuit low	signal voltage	<= 1.64... 1.96	[V]	evap pump heater ECM pre-drive battery voltage	commanded off not detected 10.90...16.10	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
	P240A – EVAP System Leak Detection Pump Heater Control Circuit/Open	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	evap pump heater ECM pre-drive battery voltage	commanded off not detected 10.90...16.10	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
	P240C – EVAP System Leak Detection Pump Heater Control Circuit High	circuit high	signal current	>= 2.8	[A]	evap pump heater ECM pre-drive battery voltage	commanded on not detected 10.90...16.10	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
Evaporative Emission (EVAP) Diagnosis Module Tank Leakage (DMTL) Valve	P0448 – EVAP System Vent Control Circuit Shorted	circuit low	signal voltage	<= 1.64... 1.96	[V]	evap pump solenoid valve ECM pre-drive battery voltage	commanded off not detected 10.90...16.10	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
	P0447 – EVAP System Vent Control Circuit Open	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	evap pump solenoid valve ECM pre-drive battery voltage	commanded off not detected 10.90...16.10	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0448 – EVAP System Vent Control Circuit Shorted	circuit high	signal current	>= 0.6...1.4	[A]	evap pump solenoid valve ECM pre-drive battery voltage	commanded on not detected 10.90...16.10	[V]	0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Evaporative Emission (EVAP) Canister Purge Valve	P0459 – EVAP System Purge Control Valve "A" Circuit High	circuit high	signal current	>= 2.0	[A]	actuator battery voltage	commanded on 6.00...17.00	[V]	0.5 [s] continuous	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80-
Evaporative Emission (EVAP) Canister Purge Valve	P0444 – EVAP System Purge Control Valve "A" Circuit Open	open circuit	signal voltage	> 1.66...1.98; <= 2.73...3.27	[V]	actuator battery voltage	commanded off 6.00...17.00	[V]	0.5 [s] continuous	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80- ♦ Fuel Tank Leak Detection Module - GX36-
Evaporative Emission (EVAP) Canister Purge Valve	P0458 – EVAP System Purge Control Valve "A" Circuit Low	circuit low	signal voltage	<= 1.64...1.96	[V]	actuator battery voltage	commanded off 6.00...17.00	[V]	0.5 [s] continuous	2 DCY	♦ EVAP Canister Purge Regulator Valve 1 - N80-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Evaporative Emission (EVAP) Fuel Tank Pressure Sensor	P0452 – EVAP System Pressure Sensor/Switch "A" Circuit Low	out of range low	filtered pressure	< -6.00	[kPa]	vehicle speed	0...328	[km/h]	4.0 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						BARO AAT time since engine start in preceding dcy fuel level	not calibrated >= -20 > 4.0 not calibrated	[kPa] [°C] [s] [l]			
	P0453 – EVAP System Pressure Sensor/Switch "A" Circuit High	out of range high	filtered pressure	> 10.00	[kPa]	vehicle speed	0...328	[km/h]	4.0 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						BARO AAT time since engine start in preceding dcy fuel level	not calibrated >= -20 > 4.0 not calibrated	[kPa] [°C] [s] [l]			
Evaporative Emission (EVAP) Pressure Sensor	P24D6 – EVAP System Pressure Sensor/Switch "B" Circuit Range/ Performance	rationality check	canister purge pressure delta	< 1.00	[kPa]	ECT downstream engine	> 50	[°C]	0.5 [s] once / DCY	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
			for time	> 5.0	[s]	AAT	> 4	[°C]			
						barometric factor	> 0.65	[-]			
						engine	running				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						diff. MAP vs. BARO	<= -10.0	[kPa]			
						EVAP purge mass flow	>= 2.0	[kg/h]			
Evaporative Emission (EVAP) Pressure Sensor	P24D8 – EVAP System Pressure Sensor/Switch "B" Circuit High	circuit high	signal voltage	> 4.95	[V]	engine	running		0.1 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
Evaporative Emission (EVAP) Pressure Sensor	P24D7 – EVAP System Pressure Sensor/Switch "B" Circuit Low	circuit low	signal voltage	< 0.05	[V]	engine	running		0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
Evaporative Emission (EVAP) Pressure Sensor	P24D6 – EVAP System Pressure Sensor/Switch "B" Circuit Range/ Performance	rationality check low - adaptive value check (limit low)	sensor offset value	< -0.80	[kPa]	ECT downstream engine	> 4	[°C]	2.0 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						altitude factor	> 0.65	[-]			
						EVAP vent valve	closed				
Evaporative Emission (EVAP) Pressure Sensor	P24D6 – EVAP System Pressure Sensor/Switch "B" Circuit Range/ Performance	rationality check high - adaptive value check (limit high)	sensor offset value	> 0.80	[kPa]	ECT downstream engine	> 4	[°C]	2.0 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						altitude factor	> 0.65	[-]			
						EVAP vent valve	closed				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Evaporative Emission (EVAP) Pressure Sensor 2	P24D6 – EVAP System Pressure Sensor/Switch "B" Circuit Range/ Performance	out of range low	pressure signal	< 60.00	[kPa]	engine	running		50 [ms] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						for time	> 0.5	[s]			
						AAT	-32768...32767	[°C]			
Evaporative Emission (EVAP) Pressure Sensor 2	P24D6 – EVAP System Pressure Sensor/Switch "B" Circuit Range/ Performance	out of range high	pressure signal	> 125	[kPa]	engine	running		50 [ms] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						for time	> 0.5	[s]			
						AAT	-32768...32767	[°C]			
Evaporative Emission (EVAP) Fuel Tank Pressure Sensor	P0451 – EVAP System Pressure Sensor/Switch "A" Circuit Range/ Performance	stuck in range	difference between max. and min. evaporative system vapor pressure	< 0.05	[kPa]	vehicle speed time after engine start	0...328> 300.0	[km/h] [s]	300.0 [s] once / DCY	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						BARO	> 74.00	[kPa]			
						AAT	> -20	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fuel level	not calibrated	[l]			
						EVAP vent valve	ready				
Evaporative Emission (EVAP)	P0450 – EVAP System Pressure Sensor/Switch "A" Circuit	offset monitoring	(passive monitoring)			AAT	4...143	[°C]			♦ Fuel Tank Leak Detection Module - GX36-
Fuel Tank Pressure Sensor		out of range high	evaporative system vapor	> | 2.00 |	[kPa]	BARO	>= 72.00	[kPa]	100.1 [s]	2 DCY	
			pressure after tank ventilation						once / DCY		
			(differential pressure sensor)								
			(active monitoring)			battery voltage	>= 10.90; <= 16.10	[V]			
			evaporative system vapor	> | 2.00 |	[kPa]	difference between low-pass	<= | 0.20 |	[kPa]	110.6 [s]	2 DCY	
			pressure after tank ventilation			filtered and actual BARO			once / DCY		
			(differential pressure sensor)			vehicle speed (upper range)	< 130	[km/h]			
						vehicle speed (lower range)	> 10	[km/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						no refueling event	not calibrated				
						fuel level	< 38.00	[l]			
						diff. between ECT downstream	not calibrated	[K]			
						engine @ start and AAT					
						and					
						propulsion off time previous dcy	not calibrated	[s]			
						or					
						propulsion off time previous dcy	>= 21600.0				
						conditions optional					
						differential evaporative system	< 2.00	[kPa]			
						vapor pressure @ start					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						time after engine start	< 120.0	[s]			
						EVAP vent valve commanded	>= 8.0	[s]			
						on for cumulative					
						within time	100.0	[s]			
						difference between low-pass	<= | 0.10 |	[kPa]			
						filtered and actual differential					
						evaporative system vapor					
						pressure					
						or					
						conditions optional					
						EVAP vent valve continuously	7.0	[s]			
						commanded on for					
						within time	100.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						case 1: (passive monitoring)					
						change in differential	>= | 80.00 |	[kPa]			
						evaporative system vapor					
						pressure since start of pressure					
						reduction					
						EVAP vent valve	ready				
						case 2: (active monitoring)					
						change in differential	< | 80.00 |	[kPa]			
						evaporative system vapor					
						pressure since start of pressure					
						reduction					
						time since engine start	> 600.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						at least one leak detection	preceding				
						monitor during engine off					
						ratio of actual evap pump	< 1.50	[-]			
						current difference between					
						reference measurement and idle					
						to last evap pump current					
						difference at leak detection					
						during engine off					
						evap leak detection pump	ready				
						ECT	not calibrated	[°C]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						difference between BARO and	not calibrated	[kPa]			
						MAP					
						differential evaporative system	< -3.50	[kPa]			
						vapor pressure					
						or					
						integrated EVAP purge mass	> 2.0...8.0	[g]			
						and					
						evap purge adaptation	< 5.00	[-]			
						change in differential	< 0.30	[kPa/s]			
						evaporative system vapor					
						pressure when EVAP vent valve					
						closed					
						within time	>= 1.8	[s]			
						integrated EVAP purge mass	> 8.0	[g]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						after monitoring break					
						time after monitoring break	>= 300.0	[s]			
						EVAP vent valve	ready				
Evaporative Emission (EVAP) Fuel Vapor Temperature Sensor	P2027 – EVAP Fuel Vapor Temperature Sensor Circuit High Voltage	circuit high	signal voltage	> 4.95	[V]	engine	running		50 [ms] continuous	2 DCY	◆ Fuel Tank Leak Detection Module - GX36-
Evaporative Emission (EVAP) Fuel Vapor Temperature Sensor	P2026 – EVAP Fuel Vapor Temperature Sensor Circuit Low Voltage	circuit low	signal voltage	< 0.05	[V]	engine	running		50 [ms] continuous	2 DCY	◆ Fuel Tank Leak Detection Module - GX36-
Evaporative Emission (EVAP) Fuel Vapor Temperature	P2025 – EVAP Fuel Vapor Temperature Sensor Performance	rationality check	diff. highest vs. lowest fuel vapor temperture (during dcy)	< 2.0	[K]	general conditions			0 [s] once / DCY	2 DCY	◆ Fuel Tank Leak Detection Module - GX36-
Sensor						ECT @ first start of dcy	> 3	[°C]			
						AAT	> 4	[°C]			
						altitude factor	> 0.70	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions @ fault decision					
						abs. diff. ECT vs. ECT start	>= | 40.0 |	[K]			
						or					
						abs. diff. AAT vs. AAT @ start	>= | 40.0 |	[K]			
Evaporative Emission (EVAP) Fuel Tank Pressure Sensor	P0453 – EVAP System Pressure Sensor/Switch "A" Circuit High	out of range high	signal voltage	> 4.80	[V]	engine cranking	not detected		0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						or engine orstop demand for stop/ start	running active				
	P0452 – EVAP System Pressure Sensor/Switch "A" Circuit Low	out of range low	signal voltage	< 0.20	[V]	engine cranking	not detected		0.5 [s] continuous	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
						or engine or stop demand for stop/ start	running active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Secondary Air Injection (AIR)	P2440 – AIR System Switching Valve Stuck Open Bank 1	intrusive monitor	relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed)	> 1.50	[-]	ECT downstream engine	-2...108	[°C]	0 [s] once / DCY	2 DCY	♦ Secondary Air Injection Solenoid Valve - N112- ♦ Secondary Air Injection Pump Relay - J299- ♦ Secondary Air Injection Pump Motor - V101-
		stuck open	in case of two separately			IAT @ manifold	-273...1263	[°C]			
			controlled AIR valves								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed)	> 1.50	[-]	modeled catalyst temperature MAF for time difference engine load for time BARO	< 7007.00...140.00 > 0.4-10.0...7.6 > 0.4> 70	[°C] [kg/h] [s] [%/rev] [s] [kPa]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						AIR system	commanded on				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Secondary Air Injection (AIR)	P0491 – AIR System Insufficient Flow Bank 1	flow check during catalyst heating	case 1: blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled	< 0.10	[-]	ECT downstream engine IAT @ manifold	-2...108-273...1263	[°C] [°C]	0 [s] once / DCY	2 DCY	♦ Secondary Air Injection Sensor 1 -G609- ♦ Secondary Air Injection Pump Relay -J299- ♦ Secondary Air Injection Pump Motor -V101- ♦ Secondary Air Injection Solenoid Valve -N112-
			leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled	< 0.10	[-]	modeled catalyst temperature	< 700	[°C]			
			case 2:			MAF	7.00...140.00	[kg/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled	< 0.55	[-]	for time	> 0.4	[s]			
			leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled	< 0.55	[-]	difference engine load	-10.0...7.6	[%/rev]			
			case 3:			for time	> 0.4	[s]			
			average pressure difference between absolute value and filtered	not calibrated	[kPa]	BARO AIR system	> 70.00 commanded on	[kPa]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
Secondary Air Injection (AIR)	P0410 – AIR System "A"	rationality check directly after	diff. of measured AIR pressure	> 1.00	[kPa]	ECT downstream engine	-2...108	[°C]	2.0 [s]	2 DCY	♦ Secondary Air Injection Sensor 1 -G609- ♦ Secondary Air Injection Pump Relay -J299- ♦ Secondary Air Injection Pump Motor -V101- ♦ Secondary Air Injection Solenoid Valve -N112-
		catalyst heating	before AIR injection vs. AIR						once / DCY		
			pressure after AIR injection			IAT @ manifold	-273...1263	[°C]			
						modeled catalyst temperature	< 700	[°C]			
						MAF	7.00...140.00	[kg/h]			
						for time	> 0.4	[s]			
						difference engine load	-10.0...7.6	[%/rev]			
						for time	> 0.4	[s]			
						BARO	> 70	[kPa]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						AIR system	commanded off				
Secondary Air Injection (AIR)Valve	P041F – AIR System Switching Valve "A" Circuit Low	circuit low	signal voltage	<= 1.64... 1.96	[V]	actuator	commanded off		0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Solenoid Valve - N112-
						engine speed battery voltage battery voltage AIR valve commanded on (at least once / dcy)	>= 0 > 8.90 < 16.10 detected	[rpm] [V] [V]			
	P0413 – AIR System Switching Valve "A" Circuit Open	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	actuator	commanded off		0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Solenoid Valve - N112-
						engine speed battery voltage battery voltage AIR valve commanded on (at least once / dcy)	>= 0 > 8.90 < 16.10 detected	[rpm] [V] [V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P044F – AIR System Switching Valve "A" Circuit High	circuit high	signal current	>= 4.0	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Solenoid Valve - N112-
						engine speed battery voltage battery voltage AIR valve commanded on (at least once / dcy)	>= 0> 8.90< 16.10 detected	[rpm] [V] [V]			
Secondary Air Injection (AIR) Pump Relay	P2257 – AIR System Control "A" Circuit Low	circuit low	signal voltage	<= 1.64... 1.96	[V]	actuator	commanded off		0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Pump Relay - J299- ♦ Secondary Air Injection Pump Motor - V101-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine speed battery voltage battery voltage AIR pump relay commanded on(at least once / dcy)	>= 0 > 8.90 < 16.10 detected	[rpm] [V] [V]			
	P0418 – AIR System Control "A" Circuit	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	actuator	commanded off	[rpm]	0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Pump Relay - J299- ♦ Secondary Air Injection Pump Motor - V101-
						engine speed	>= 0				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage	> 8.90	[V]			
						battery voltage	< 16.10	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						AIR pump relay commanded on(at least once / dcy)	detected				
	P2258 – AIR System Control "A" Circuit High	circuit high	signal current	>= 3.6...6.9	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Pump Relay -J299- ♦ Secondary Air Injection Pump Motor -V101-
						engine speed	>= 0	[rpm]			
						battery voltage	> 8.90	[V]			
						battery voltage	< 16.10	[V]			
						AIR pump relay commanded on(at least once / dcy)	detected				
SENT: Secondary Air Injection (AIR) Pressure Sensor	P2433 – AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	electrical check	sensor signal: circuit high or received message	detected error detected					0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2432 – AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	electrical check	sensor signal: circuit low or received message	detected error detected					0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
SENT: Secondary Air Injection (AIR) Pressure Sensor	P2430 – AIR System Air Flow/ Pressure Sensor Circuit Bank 1	sensor internal check	sensor signal: electrical check or sensor signal: initialization check	error detected error detected					0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
SENT: Secondary Air Injection (AIR) Pressure Sensor	P2433 – AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	sensor internal check	sensor signal: signal range check	error detected					0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
	P2432 – AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	sensor internal check	sensor signal: signal range check	error detected					0.5 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
Secondary Air Injection (AIR) Pressure Sensor	P2431 – AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	out of range high	AIR pressure	> 150.00	[kPa]	engine	running		1.0 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
	P2431 – AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	out of range low	AIR pressure	< 50.00	[kPa]	engine	running		1.0 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Secondary Air Injection (AIR)Pressure Sensor	P2431 – AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	rationality high	diff. AIR pressure vs. BARO	> 2.50	[kPa]	AIR system	commanded on		1.0 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
						engine speed AIR pump relay for time	< 1000 commanded off > 5.0	[rpm] [s]			
	P2431 – AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	rationality low	diff. AIR pressure vs. BARO	< -2.50	[kPa]	AIR system	commanded on		1.0 [s] continuous	2 DCY	♦ Secondary Air Injection Sensor 1 -G609-
						engine speed AIR pump relay for time	< 1000 commanded off > 5.0	[rpm] [s]			
Cold Start Monitoring	P0562 – System Voltage Low	range check low	battery voltage	< 11.00	[V]	AIR	active	[s]	10.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay -J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module -J623-. If ok, then replace the Engine/ Motor Control Module -J623-.
Secondary Air Injection (AIR)						catalyst heating	active				
Supply Voltage						increased battery voltage by AIR	demanded				
						above conditions must be					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fulfilled					Refer to appropriate repair manual.
						for time	> 0.0				
Cold Start Monitoring	P0563 – System Voltage High	range check high	battery voltage	> 14.00	[V]	AIR	active		10.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Secondary Air Injection (AIR)						catalyst heating	active				
Supply Voltage						increase battery voltage by AIR	demanded				
						above conditions must be					
						fulfilled					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	> 0.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
Fuel System	P02CC – Cylinder 1 Fuel Injector "A" Offset Learning At Min Limit P02D0 – Cylinder 3 Fuel Injector "A" Offset Learning At Min Limit	adaptation monitoring adaptive value limit low	injection adapted value of cylinder (adaptive feedback control has used up all of the adjustment)	< -100	[%]	engine speed rail pressure	570... 2480 > 12.00	[rpm] [MPa]	0 (FTP75: 850.0) [s] multiple	2DCY	◆ Fuel Injectors ◆ If the Fuel Injectors are ok, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P02D2 – Cylinder 4 Fuel Injector "A" Offset Learning At Min Limit					ECT	-48...143	[°C]			◆ Fuel Injectors ◆ If the Fuel Injectors are ok, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P02CE – Cylinder 2 Fuel Injector "A" Offset Learning At Min Limit					for time	> 0.0	[s]			◆ Fuel Injectors ◆ If the Fuel Injectors are ok, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						cylinder deactivation (CD)	not calibrated				
						idle not active	not calibrated				
	P02CD – Cylinder 1 Fuel Injector "A" Offset Learning At Max Limit P02D1 – Cylinder 3 Fuel Injector "A" Offset Learning At Max Limit	adaptation monitoring adaptive value limit high	injection adapted value of cylinder (adaptive feedback control has used up all of the adjustment)	>= 100	[%]	engine speed rail pressure	570... 2480> 12.00	[rpm] [MPa]	0 (FTP75: 850.0) [s] multiple	2 DCY	♦ Fuel Injectors ♦ If the Fuel Injectors are ok, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P02D3 – Cylinder 4 Fuel Injector "A" Offset Learning At Max Limit					ECT	-48...143	[°C]			♦ Fuel Injectors ♦ If the Fuel Injectors are ok, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P02CF – Cylinder 2 Fuel Injector "A" Offset Learning At Max Limit					for time	> 0.0	[s]			♦ Fuel Injectors ♦ If the Fuel Injectors are ok, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						cylinder deactivation (CD)	not calibrated				
						idle not active	not calibrated				
Fuel System	P268A – Fuel Injector Calibration Not Learned/ Programmed	functional check	ratio not plausible fuel rail pressure drops to all pressure drops	> 0.99	[-]	engine speed	570... 2480	[rpm]	120.0 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
			or			rail pressure	12.00. ..50.0 0	[MPa]			
			ratio not plausible fuel rail pressure value to all fuel rail pressure values	> 0.99	[-]	injection time ECT downstream engine for time	> 1-48... 143> 0.0	[ms] [°C] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						cylinder deactivation (CD)	not calibrated				
						idle not active	not calibrated				
Fuel System	P219C – Cylinder 1 Air-Fuel Ratio Imbalance	intrusive monitor	individual cylinder fuel correction	> 1.15	[-]	general:			20 (does not run in FTP) [s]	2 DCY	♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Ignition Coils
			based on measured enleanment						once / DCY		
			for dedicated engine roughness								
			increase								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P219E – Cylinder 3 Air-Fuel Ratio Imbalance	A/F cylinder imbalance: out of	or			camshaft adjustment	ready				♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Ignition Coils
	P219F – Cylinder 4 Air-Fuel Ratio Imbalance	range high	counter for adaptation abort (due	> 10.00	[-]	crankshaft adaptation	not calibrated				♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P219D – Cylinder 2 Air-Fuel Ratio Imbalance		to misfire)			rough road	not detected				♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Ignition Coils
						engine roughness signal	valid				
						engine speed	1200...2400	[rpm]			
						engine load	28.50...90.00	[%]			
						selected gear	>= 6.00	[-]			
						BARO	> 0.00	[kPa]			
						AAT	> -48	[°C]			
						ECT downstream engine	53...3004	[°C]			
						modeled catalyst temperature	370...850	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						electrical check of O2S front	completed				
						electrical check of O2S rear	completed				
						lambda control	closed loop				
						canister load	not calibrated	[-]			
						lambda set value	not calibrated	[-]			
						catalyst heating	not active				
						ratio fuel mass from evap purge	< 0.10	[-]			
						system to fuel mass through					
						injectors					
						integrated air mass	>= 3.00... 7.00	[kg]			
						misfire on currently lean shifted	not detected				
						cylinder					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						scavenging rate	< 1.00	[-]			
Fuel System	P219C – Cylinder 1 Air-Fuel Ratio Imbalance P219E – Cylinder 3 Air-Fuel Ratio Imbalance P219F – Cylinder 4 Air-Fuel Ratio Imbalance	intrusive monitor A/F cylinder imbalance: out of range low	individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase	< 0.85	[-]	general: camshaft adjustment crankshaft adaptation	ready not calibrated		20 (does not run in FTP) [s] once / DCY	2 DCY	♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Ignition Coils

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P219D – Cylinder 2 Air-Fuel Ratio Imbalance					rough road	not detected				♦ Check the spark plugs visually for signs of fouling. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and deliv-
						engine roughness signal	valid				
						engine speed	1200...2400	[rpm]			
						engine load	28.50...90.00	[%]			
						selected gear	>= 6.00	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						BARO	> 0.00	[kPa]			ery quantity.
						AAT	> -48	[°C]			♦ Fuel Injectors.
						ECT downstream engine	53...3004	[°C]			♦ Ignition Coils
						modeled catalyst temperature	370...850	[°C]			
						electrical check of O2S front	completed				
						electrical check of O2S rear	completed				
						lambda control	closed loop				
						canister load	not calibrated	[-]			
						lambda set value	not calibrated	[-]			
						catalyst heating	not active				
						ratio fuel mass from evap purge	< 0.10	[-]			
						system to fuel mass through					
						injectors					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						integrated air mass	>= 3.00... 7.00	[kg]			
						misfire on currently lean shifted	not detected				
						cylinder					
						scavenging rate	< 1.00	[-]			
Fuel System	P2187 – System Too Lean at Idle Bank 1	intrusive monitor / Direct Fuel	adaptive value	> 5.48	[%]	general:			0 (FTP75: 440.0) [s]	2 DCY	♦ Check the vacuum lines visually for leaks. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Injectors. ♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold
		Injection							continuous		
		system too lean @ idle				number of injections after engine	> 1000.00	[-]			
						start					
						engine speed	520... 1120	[rpm]			
						engine load	12...52	[%]			
						IAT @ manifold	< 90	[°C]			
						part load adaptation	completed				
						lambda control	closed loop				
						lambda set point	0.89... 1.11	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine warm up correction	< 1.02	[-]			Sensor - GX9- ♦ Fuel Metering Valve - N290-
						modeled oil temperature	not calibrated	[°C]			
						evap purge valve	closed				
						high PCV purge load due to oil	not detected				
						dilution					
						ratio MAP to BARO	not calibrated	[-]			
						or					
						valve overlap	not calibrated	[°CRK]			
						and					
						case 1					
						integrated air mass	not calibrated	[kg]			
						ECT downstream engine	not calibrated	[°C]			
						or					
						case 2					
						ECT downstream engine	> 50	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						additional conditions:					
						no additional conditions					
						calibrated					
	P2188 – System Too Rich at Idle Bank 1	intrusive monitor / Direct Fuel	adaptive value	< -5.48	[%]	general:			0 (FTP75: 440.0) [s]	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold Sensor - GX9- ♦ Fuel Metering Valve - N290- ♦ EVAP Canister Purge Regulator Valve 1 - N80-
		Injection							continuous		
		system too rich @ idle				number of injections after engine	> 1000.00	[-]			
						start					
						engine speed	520...1120	[rpm]			
						engine load	12...52	[%]			
						IAT @ manifold	< 90	[°C]			
						part load adaptation	completed				
						lambda control	closed loop				
						lambda set point	0.89...1.11	[-]			
						engine warm-up correction	< 1.02	[-]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						modeled oil temperature	not calibrated	[°C]			
						evap purge valve	closed				
						high PCV purge load due to oil dilution	not detected				
						ratio MAP to BARO	not calibrated	[-]			
						or					
						valve overlap	not calibrated	[°CRK]			
						and					
						case 1					
						integrated air mass	not calibrated	[kg]			
						ECT downstream engine	not calibrated	[°C]			
						or					
						case 2					
						ECT downstream engine	> 50	[°C]			
						additional conditions:					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						no additional conditions calibrated					
Fuel System	P2177 – System Too Lean Off Idle Bank 1	intrusive monitor / Direct Fuel	adaptive value	> 23.00	[%]	general:			0 (FTP75: 250.0) [s]	2 DCY	♦ Check the vacuum lines visually for leaks. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel pressure and delivery quantity. ♦ Fuel Injectors. ♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold Sensor - GX9- ♦ Fuel Metering Valve - N290-
		Injection							continuous		
		system too lean @ part load				number of injections after engine	> 1000.00	[-]			
						start					
						engine speed	1080...4040	[rpm]			
						engine load	15...97	[%]			
						IAT @ manifold	< 90	[°C]			
						lambda control	closed loop				
						lambda set point	0.89...1.11	[-]			
						engine warm up correction	< 1.02	[-]			
						modeled oil temperature	not calibrated	[°C]			
						evap purge valve	closed				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						high PCV purge load due to oil	not detected				
						dilution					
						ratio MAP to BARO	not calibrated	[-]			
						or					
						valve overlap	not calibrated	[°CRK]			
						and					
						case 1					
						integrated air mass	not calibrated	[kg]			
						ECT downstream engine	not calibrated	[°C]			
						or					
						case 2					
						ECT downstream engine	> 50	[°C]			
						additional conditions:					
						no additional conditions					
						calibrated					
	P2178 – System Too Rich Off Idle Bank 1	intrusive monitor / Direct Fuel	adaptive value	< -23.00	[%]	general:			0 (FTP75: 250.0) [s]	2 DCY	♦ Check the fuel pressure and delivery quantity.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		Injection							continuous		◆ Fuel Injectors. ◆ Oxygen Sensor 1 Before Catalytic Converter - GX10- ◆ Fuel Delivery Unit - GX1- ◆ Intake Manifold Sensor - GX9- ◆ Fuel Metering Valve - N290-
		system too rich @ part load				number of injections after engine	> 1000.00	[-]			
						start					
						engine speed	1080...4040	[rpm]			
						engine load	15...97	[%]			
						IAT @ manifold	< 90	[°C]			
						lambda control	closed loop				
						lambda set point	0.89...1.11	[-]			
						engine warm-up correction	< 1.02	[-]			
						modeled oil temperature	not calibrated	[°C]			
						evap purge valve	closed				
						high PCV purge load due to oil	not detected				
						dilution					
						ratio MAP to BARO	not calibrated	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or					
						valve overlap	not calibrated	[°CRK]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						and case 1 integrated air mass ECT downstream engine or case 2 ECT downstream engine additional conditions: no additional conditions calibrated	not calibrated not calibrated > 50	[kg] [°C] [°C]			
Fuel System	P0171 – System Too Lean Bank 1	system too lean	low pass filtered lambda controller output	> 23.00	[%]	general:			20.0 [s] continuous	2 DCY	♦ Check the vacuum lines visually for leaks. ♦ Check the intake system visually for leaks (false air). ♦ Check the fuel

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			for time	> 10.0	[s]	number of injections after engine start	>= 1000.00	[-]			pressure and delivery quantity. ◆ Fuel Pressure Sensor -G247- ◆ Fuel Injectors. ◆ Oxygen Sensor 1 After Catalytic Converter -GX7- ◆ Oxygen Sensor 1 Before Catalytic Converter -GX10- ◆ Fuel Delivery Unit -GX1-
						ECT downstream engine	>= 50	[°C]			
						lambda control	closed loop				
						and					
						high PCV purge load due to oil dilution	not detected				
						MAF from brake booster to manifold	not calibrated				
						and					
						case 1:					
						evap purge	not active				
						case 2:					
						integrated EVAP purge mass	>= 2.5	[g]			
						case 3:					
						evap purge controller limitation	>= 1.00	[-]			
						evap purge flow	<= 0.30	[kg/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0172 – System Too Rich Bank 1	system too rich	low pass filtered lambda controller output	< -23.00	[%]	general:			20.0 [s] continuous	2DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Injectors. ♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold Sensor - GX9- ♦ EVAP Canister Purge Regulator Valve 1 - N80-
			for time	> 10.0	[s]	number of injections after engine start	>= 1000.00	[-]			
						ECT downstream engine	>= 50	[°C]			
						lambda control	closed loop				
						high PCV purge load due to oil dilution	not detected				
						MAF from brake booster to manifold	not calibrated				
						and					
						case 1:					
						evap purge	not active				
						case 2:					
						integrated EVAP purge mass	>= 2.5	[g]			
						case 3:					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						evap purge controller limitation	>= 1.00	[-]			
						evap purge flow	<= 0.30	[kg/h]			
Fuel System	P2097 – Post Catalyst Fuel Trim System Too Rich Bank 1	out of range high	case 1: general conditions adapted l-part of 2nd lambda control loop (fuel trim) adapted l-part of 2nd lambda control loop (O2S front offset)case 2: pending fault fuel trim monitor from previous DCY	> 0.04<= 0.08	[-][-]	condition for lambda split operation catalyst heating only CNG vehicles CNG mode	not active not calibrated		450 [s] multiple	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Oxygen Sensor 1 After Catalytic Converter -GX7- ♦ Three Way Catalytic Converter (TWC)

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			adapted I-part of 2nd lambda control loop (O2S front offset)	> 0.08	[-]	case 1: general conditions decrease of adapted I-part of 2nd lambda control loop between previous and actual DCY	< 0.00	[-]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						if no pending fault (O2S front					
						offset or fuel trim monitor)					
						from previous DCY then					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			
						O2S front offset adaptation (referenced), final conditions: heal debounce	fulfilled				
						else pending fault (O2S front					
						offset or fuel trim monitor)					
						from previous DCY					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S front offset adaptation (referenced), final conditions: fault debounce	fulfilled				
						case 2: pending fault fuel trim					
						monitor from previous DCY					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			
						O2S front offset adaptation (referenced), final conditions: fault debounce	fulfilled				
						additional conditions pending					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault fuel trim and O2S front					
						offset monitor from previous					
						DCY					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			
						additional conditions					
						no additional conditions calibrated					
	P2096 – Post Catalyst Fuel Trim System Too Lean Bank 1	out of range low	case 1: general conditions			condition for lambda split					♦ Check the fuel pressure and delivery quantity. ♦ Oxygen Sensor 1 After Catalytic Converter -GX7- ♦ Three Way Catalytic Converter (TWC)
						operation					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			adapted I-part of 2nd lambda control loop (fuel trim)	< -0.04	[-]	catalyst heating	not active		450 [s] multiple	2DCY	
			adapted I-part of 2nd lambda control loop (O2S front offset)	>= -0.08	[-]	only CNG vehicles					
			case 2: pending fault fuel trim			CNG mode	not calibrated				
			monitor from previous DCY								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			adapted l-part of 2nd lambda control loop (O2S front offset)	< -0.08	[-]	case 1: general conditions increase of adapted l-part of 2nd lambda control loop between previous and actual DCY	< 0.00	[-]			
						if no pending fault (O2S front					
						offset or fuel trim monitor)					
						from previous DCY then					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S front offset adaptation (referenced), final conditions: heal debounce	fulfilled				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						else pending fault (O2S front					
						offset or fuel trim monitor)					
						from previous DCY					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S front offset adaptation(referenced), final conditions: fault debounce	fulfilled				
						case 2: pending fault fuel trim					
						monitor from previous DCY					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			
						O2S front offset adaptation (referenced), final conditions: fault debounce	fulfilled				
						additional conditions pending					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault fuel trim and O2S front					
						offset monitor from previous					
						DCY					
						O2S rear Control Loop (i-part, referenced)	active				
						for time	>= 10.0	[s]			
						additional conditions					
						no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fuel System	P30C0 – Poor Fuel Quality	functional check	firing angle offset depending on poor fuel quality	<= -30.00	[°CRK]	knock control	active		10.0 [s] continuous	2DCY	♦ Check for contaminated/ aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. ♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						engine speed	> 500	[rpm]			
						fuel cut off	not active				
						time after engine start	> 1.0	[s]			
						relative engine load	>= 40.01	[%]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fuel Pump Control (FPC)	P0148 – Fuel Delivery Error	functional check - rail pressure rise @ engine start	rail pressure rise @ start low pressure start	not detected detected		ECT rail pressure control high pressure start rail pressure before start	> 0; <= 35 closed loop commanded on< 3.00	[°C] [MPa]	2.5 [s] once / DCY	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-
Fuel Pump Control (FPC)	P0148 – Fuel Delivery Error	functional check	rail pressure @ start high pressure start engine	< 9.00 aborted cranking	[MPa]	ECT rail pressure control high pressure start rail pressure before start	> 0; < 35 closed loop commanded on < 3.00	[°C] [MPa]	3.0 [s] once / DCY	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-
Fuel Pump Control (FPC)	P0634 – Control Module Internal Temperature "A" Too High	overtemperature power stage	power stage temperature	> 165... 175	[°C]	actuator battery voltage	commanded on 8.80... 16.20	[V]	1.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
Fuel Pump Control (FPC)	P025C – Fuel Pump Module "A" Control Circuit Low	circuit low	signal voltage	<= 1.64... 1.96	[V]	actuator battery voltage	commanded off 8.80... 16.20	[V]	1.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P025A – Fuel Pump Module "A" Control Circuit/Open	open circuit	signal voltage	> 1.64... 1.96; <= 2.73... 3.27	[V]	actuator battery voltage	commanded off 8.80... 16.20	[V]	1.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
	P025D – Fuel Pump Module "A" Control Circuit High	circuit high	signal current	>= 0.6...1.40	[A]	actuator battery voltage	commanded on 8.80... 16.20	[V]	1.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
Fuel Injector	P0201 – Cylinder 1 Injector "A" Circuit	circuit low (low side)	voltage @ low side pin	< 3.50	[V]	general condition			3.00 [events] continuous	2 DCY	♦ Fuel Injectors

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0203 – Cylinder 3 Injector "A" Circuit					battery voltage	9.00... 16.00	[V]			♦ Fuel Injectors
	P0204 – Cylinder 4 Injector "A" Circuit					step 1: conditions @ actuator					♦ Fuel Injectors
						commanded off					
	P0202 – Cylinder 2 Injector "A" Circuit					voltage @ high side pin	< 3.0	[V]			♦ Fuel Injectors
						voltage @ low side pin	< 1.5	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						step 2: conditions @ fault					
						decision					
						actuator	commanded on				
	P0201 – Cylinder 1 Injector "A" Circuit	circuit low (high side)	voltage @ low side pin	>= 3.50	[V]	general condition			3.00 [events] continuous	2 DCY	♦ Fuel Injectors
	P0203 – Cylinder 3 Injector "A" Circuit					battery voltage	9.00... 16.00	[V]			♦ Fuel Injectors
	P0204 – Cylinder 4 Injector "A" Circuit					step 1: conditions @ actuator					♦ Fuel Injectors
						commanded off					
	P0202 – Cylinder 2 Injector "A" Circuit					voltage @ high side pin	< 3.0	[V]			♦ Fuel Injectors
						voltage @ low side pin	< 1.5	[V]			
						step 2: conditions @ fault					
						decision					
						actuator	commanded on				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0201 – Cylinder 1 Injector "A" Circuit	open circuit	voltage @ high side pin	> 3.00	[V]	actuator	commanded off		3.00 [events] continuous	2 DCY	♦ Fuel Injectors
	P0203 – Cylinder 3 Injector "A" Circuit		voltage @ low side pin	< 1.50	[V]	battery voltage	9.00... 16.00	[V]			♦ Fuel Injectors
	P0204 – Cylinder 4 Injector "A" Circuit										♦ Fuel Injectors
	P0202 – Cylinder 2 Injector "A" Circuit										♦ Fuel Injectors
	P0201 – Cylinder 1 Injector "A" Circuit	circuit high (low side)	current @ low side path	> 2.35	[A]	general condition			3.00 [events] continuous	2 DCY	♦ Fuel Injectors
	P0203 – Cylinder 3 Injector "A" Circuit		within time	14.5	[us]	battery voltage	9.00... 16.00	[V]			♦ Fuel Injectors
	P0204 – Cylinder 4 Injector "A" Circuit					step 1: conditions @ actuator					♦ Fuel Injectors
						commanded off					
	P0202 – Cylinder 2 Injector "A" Circuit					voltage @ high side pin	> (Ubatt - 1.5)	[V]			♦ Fuel Injectors
						voltage @ low side pin	> 1.5	[V]			
						step 2: conditions @ fault					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
						decision					
						actuator	commanded on				
	P0201 – Cylinder 1 Injector "A" Circuit	circuit high (high side)	current @ low side path	<= 2.35	[A]	general condition			3.00 [events] continuous	2 DCY	♦ Fuel Injectors
	P0203 – Cylinder 3 Injector "A" Circuit		within time	14.5	[Âµs]	battery voltage	9.00... 16.00	[V]			♦ Fuel Injectors
	P0204 – Cylinder 4 Injector "A" Circuit					step 1: conditions @ actuator					♦ Fuel Injectors
						commanded off					
	P0202 – Cylinder 2 Injector "A" Circuit					voltage @ high side pin	> (Ubatt - 1.5)	[V]			♦ Fuel Injectors
						voltage @ low side pin	> 1.5	[V]			
						step 2: conditions @ fault					
						decision					
						actuator	commanded on				
	P0201 – Cylinder 1 Injector "A" Circuit	short between high side and low side	current @ low side path	> 2.35	[A]	general condition			3.00 [events] continuous	2 DCY	♦ Fuel Injectors

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0203 – Cylinder 3 Injector "A" Circuit		within time	14.5	[Âµs]	battery voltage	9.00... 16.00	[V]			♦ Fuel Injectors
	P0204 – Cylinder 4 Injector "A" Circuit					step 1: conditions @ fault					♦ Fuel Injectors
						suspicion					
	P0202 – Cylinder 2 Injector "A" Circuit					actuator	commanded on				♦ Fuel Injectors
						actual current	> 14.00	[A]			
						for time	< 11...14	[us]			
						step 2: conditions after					
						actuator commanded off					
						voltage @ high side pin	< (Ubatt - 1.5)	[V]			
						voltage @ low side pin	> 1.5	[V]			
						step 3: conditions @ fault					
						decision					
						actuator	commanded on				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
Fuel Volume Regulator Control	P0087 – Fuel Rail/ System Pressure - Too Low Bank 1	functional check: stuck open	pressure control activity	> 6.00	[MPa]	engine speed	1200...4000	[rpm]	5.0 [s] multiple	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-
			and			or					
			fuel trim activity	0.85...1.20	[-]	engine speed	not calibrated	[rpm]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
			and			engine load	40.01...1535.98	[%]			
			difference between target pressure vs. actual pressure	> 6.00	[MPa]	evap purge adaptation ECT downstream engine	< 5.00> = 50	[-][°C]			
						IAT @ manifold	< 90	[°C]			
						DFI mode	active				
						fuel cut off	not active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						lambda control	closed loop				
Fuel Volume Regulator Control	P0088 – Fuel Rail/ System Pressure - Too High Bank 1	functional check: stuck close	pressure control activity	< -6.00	[MPa]	engine speed	600... 1000	[rpm]	5.0 [s] multiple	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
			and			or					
			fuel trim activity	0.82... 1.15	[-]	engine speed	not calibrated	[rpm]			
			and			engine load	10.01. ..39.98	[%]			
			difference between target pressure vs. actual pressure	< -6.00	[MPa]	evap purge adaptation ECT downstream engine	< 5.00> = 50	[-][°C]			
						IAT @ manifold	< 90	[°C]			
						DFI mode	active				
						lambda control	closed loop				
						fuel cut off	not active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fuel Volume Regulator Control	P0091 – Fuel Pressure Regulator "A" Control Circuit Low	circuit low (low side)	voltage @ low side pin	< 3.50	[V]	general condition			3 [events] continuous	2 DCY	◆ Fuel Metering Valve - N290- ◆ Fuel Delivery Unit - GX1-
						battery voltage step 1: conditions @ actuator commanded off voltage @ high side pin voltage @ low side pin step 2: conditions @ fault decision actuator	8.00... 16.00 < 3.0 < 1.5 commanded on	[V] [V] [V]			
	P0091 – Fuel Pressure Regulator "A" Control Circuit Low	circuit high (low side)	current @ low side path	> 2.35	[A]	general condition			3 [events] continuous	2 DCY	◆ Fuel Metering Valve - N290- ◆ Fuel Delivery Unit - GX1-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
			within time	14	[us]	battery voltage step 1: conditions @ actuator commanded off voltage @ high side pin voltage @ low side pin step 2: conditions @ fault decision actuator	8.00... 16.00 > (Ubatt - 1.5) > 1.5 commanded on	[V] [V] [V]			
	P0090 – Fuel Pressure Regulator "A" Control Circuit/Open	open circuit	voltage @ high side pin	> 3.00	[V]	actuator	commanded off	[V]	3 [events] continuous	2 DCY	♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-
			voltage @ low side pin	< 1.50	[V]	battery voltage	8.00... 16.00				
	P0092 – Fuel Pressure Regulator "A" Control Circuit High	circuit low (high side)	voltage @ low side pin	>= 3.50	[V]	general condition			3 [events] continuous	2 DCY	♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage step 1: conditions @ actuator commanded off voltage @ high side pin voltage @ low side pin step 2: conditions @ fault decision actuator	8.00... 16.00 < 3.0 < 1.5 commanded on	[V] [V] [V]			
	P0092 – Fuel Pressure Regulator "A" Control Circuit High	circuit high (high side)	current @ low side path	<= 2.35	[A]	general condition			3 [events] continuous	2 DCY	♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			within time	14	[us]	battery voltage conditions @ actuator commanded off voltage @ high side pin voltage @ low side pin conditions @ fault decision actuator	8.00... 16.00 > (Ubatt - 1.5) > 1.5 commanded on	[V] [V] [V]			
	P0090 – Fuel Pressure Regulator "A" Control Circuit/Open	short between high side and low side	current @ low side path	> 2.35	[A]	general condition			3 [events] continuous	2 DCY	♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			within time	14	[us]	battery voltage	8.00... 16.00	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						step 1: conditions @ fault					
						suspicion					
						actuator	commanded on				
						actual current	> 4.72	[A]			
						for time	> 100	[us]			
						step 2: conditions after					
						actuator commanded off					
						voltage @ high side pin	< (Ubatt - 1.5)	[V]			
						voltage @ low side pin	> 1.5	[V]			
						step 3: conditions @ fault					
						decision					
						actuator	commanded on				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fuel Volume Regulator HP Control	P0088 – Fuel Rail/ System Pressure - Too High Bank 1	functional check	filtered diff. target pressure vs. actual pressure	< -2.50	[MPa]	time after engine start	> 5.0	[s]	5.5 [s] multiple	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
						time after fuel cut off fuel cut off catalyst heating fuel volume regulator control relative fuel mass	> 2.5 not active not active active 5.02... 249.98	[s][%]			
	P0087 – Fuel Rail/ System Pressure - Too Low Bank 1	functional check	filtered diff. target pressure vs. actual pressure	> 4.00	[MPa]	time after engine start	> 5.0	[s]	4.0 [s] multiple	2 DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290- ♦ Fuel Delivery Unit - GX1-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
						time after fuel cut off fuel cut off catalyst heating fuel volume regulator control relative fuel mass	> 2.5 not active not active active 5.02... 249.98	[s] [%]			
Fuel Volume Regulator HP Control	P01C8 – Fuel Rail/ System Pressure - Too Low Bank 2	functional check	filtered fuel pressure controller output	> 2.10	[MPa]	time after engine start	> 5.0	[s]	15.0 [s] multiple	2DCY	♦ Check the fuel pressure and delivery quantity. ♦ Fuel Metering Valve - N290-
						time after fuel cut off	> 2.5	[s]			
						fuel cut off	not active				
						catalyst heating	not active				
						fuel volume regulator control	active				
						relative fuel mass	5.02... 249.98	[%]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fuel Rail Pressure (FRP) Sensor	P0190 – Fuel Rail Pressure Sensor Circuit Bank 1	out of range high	signal voltage	> 4.80	[V]				0.5 [s] continuous	2 DCY	♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
	P0192 – Fuel Rail Pressure Sensor Circuit Low Bank 1	out of range low	signal voltage	< 0.20	[V]				0.5 [s] continuous	2 DCY	♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
Fuel Rail Pressure (FRP) Sensor	P0191 – Fuel Rail Pressure Sensor Circuit Range/ Performance Bank 1	out of range low	actual pressure	< 0.01	[MPa]	fuel pump	commanded on		2.0 [s] continuous	2 DCY	♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
Fuel Rail Pressure (FRP)	P01C4 – Fuel Pressure Sensor "A" Circuit Range/ Performance	intrusive monitor	general:			general:					♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
Sensor		rationality check inappropriately low (negative offset)	rail pressure bank 1 @ engine start	< 0.10	[MPa]	ECT downstream engine @ engine shut-off	> 75	[°C]	0 [s] once / DCY	2 DCY	
			and			modeled ECT @ engine shut-off	> 75	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			choice of:			ECT downstream engine @ start	<= 35	[°C]			
			fuel system too rich @ part load	not calibrated	[%]	diff. between ECT downstream engine @ start and IAT @ manifold	> -9.8; <= 9.8	[K]			
			or			engine off time	>= 25000.0	[s]			
			fuel system too rich @ idle	not calibrated	[%]	engine speed	0	[rpm]			
			or			diff. between AAT and ECT downstream engine @ start	-10.0...10.0	[K]			
			fault fuel system too rich @ part load	not calibrated		diff. between AAT and IAT@ manifold @ start	-9.8...9.8	[K]			
			or			and					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
			fault fuel system too rich @ idle	not calibrated		conditions optional					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
			or			lambda control	active				
			misfire fault	not calibrated		DFI mode	active				
			or			catalyst heating	not active				
			sum of lambda adaptation and	< 0.85	[-]	ECT downstream engine	>= 50	[°C]			
			lambda controller deviation								
			or			IAT @ manifold	<= 90	[°C]			
			lambda control	at min limit		engine torque	< 0.00... 45.00	[%]			
						lambda set point	0.95... 1.05	[-]			
						additional conditions:					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						no additional conditions					
						calibrated					
	P01C4 – Fuel Pressure Sensor "A" Circuit Range/ Performance	intrusive monitor	general:			general:					♦ Fuel Pressure Sensor - G247- ♦ Fuel Metering Valve - N290-
		rationality check inappropriately	rail pressure bank 1 @ engine	> 2.50	[MPa]	ECT downstream engine @	> 75	[°C]	0 [s]	2 DCY	
		high (positive offset)	start			engine shut-off			once / DCY		
			and			modeled ECT @ engine shut-off	> 75	[°C]			
			choice of:			ECT downstream engine @ start	<= 35	[°C]			
			fuel system too lean @ part load	not calibrated	[%]	diff. between ECT downstream	> -9.8; <= 9.8	[K]			
						engine @ start and IAT @					
						manifold					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or			engine off time	>= 25000.0	[s]			
			fuel system too lean @ idle	not calibrated	[%]	engine speed	0	[rpm]			
			or			diff. between ECT downstream	-10.0...10.0	[K]			
						engine @ start and AAT					
			fault fuel system too lean @ part	not calibrated		diff. between AAT and IAT@	-9.8...9.8	[K]			
			load			manifold @ start					
			or			and					
			fault fuel system too lean @ idle	not calibrated		conditions optional					
			or			lambda control	active				
			misfire fault	not calibrated		DFI mode	active				
			or			catalyst heating	not active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			sum of lambda adaptation and	> 1.20	[-]	ECT downstream engine	>= 50	[°C]			
			lambda controller deviation								
			or			IAT @ manifold	<= 90	[°C]			
			lambda control	at max limit		engine torque	< 0.00... 45.00	[%]			
						lambda set point	0.95... 1.05	[-]			
						additional conditions:					
						no additional conditions					
						calibrated					
High PCV Purge Load due to Oil Dilution		---				ratio modeled fuel mass evaporation out of oil to actual necessary fuel mass	> 0.09	[-]			
						modeled oil temperature	> 0	[°C]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ratio on calculated fuel mass evaporation out of oil to actual necessary fuel mass	> 0.07	[-]			
						modeled oil temperature	> 0	[°C]			
conditions for fast fuel trim		---				O2S front fault suspicion from	at min limit 1.00 < 1.0 < 0.4 ready				
						lambda control - case 1: lambda controller at min limit					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
O2S Front Offset Adaptation						1st lambda control loop O2S front set point O2S front signal O2S rear voltage O2S rear		[-] [-] [V]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						case 2: lambda controller at					
						max limit					
						1st lambda control loop	at max limit				
						O2S front set point	1.00	[-]			
						O2S front signal	> 1.0	[-]			
						O2S rear voltage	> 0.6	[V]			
						O2S rear	ready				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions for accumulation					
						of exhaust gas mass for					
						steady state					
						O2S rear	ready				
						O2S front set point	1.00	[-]			
						catalyst purge	not active				
						engine speed	> 1000	[rpm]			
						fuel cut off	not active				
						ECT	> 43	[°C]			
						or					
						modeled ECT	> 80	[°C]			
						catalyst reheating	not calibrated				
						catalyst heating during cold start	not active				
						catalyst heating with AIR	not active				
						engine load gradient	< | 16.01 |	[%/CAMr]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
								ev]			
						engine load cycle	< 1.33	[-]			
						engine load	> 12.00	[%]			
						AIR	not active				
						AIR system diagnosis	not active				
						scavenging rate	<= 16.00	[-]			
						accumulation of exhaust gas					
						mass for stead y state after					
						fuel cut off with catalyst purge					
						integrated exhaust gas mass	> 285.0	[g]			
						(stead y state detection)					
						accumulation of exhaust gas					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mass for steady state after					
						fuel cut off without catalyst					
						purge					
						integrated exhaust gas mass	> 285.0	[g]			
						(steady state detection)					
						conditions for accumulation					
						of exhaust gas mass for					
						adaptation					
						O2S front response monitoring	not calibrated				
						in current DCY					
						or					
						O2S rear offset monitor fault	not calibrated				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						suspicion (target voltage not					
						reached)					
						or					
						O2S front fault suspicion from	not calibrated				
						lambda control					
						for time	not calibrated	[s]			
						modeled EGT	400...900	[°C]			
						for time	> 2.0	[s]			
						exhaust gas mass flow	20.00...160.00	[kg/h]			
						or					
						exhaust gas mass flow	12.00...20.00	[kg/h]			
						within time	< 8.0	[s]			
						O2S front	ready				
						H2 correction of O2S rear	not calibrated	[V]			
						voltage					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S front offset monitoring in	not calibrated				
						current DCY					
						catalyst damaging misfire	not detected				
						scavenging rate	< 1.03	[-]			
						and					
						lambda control	not calibrated				
						split factor DFI/MFI	not calibrated				
						catalyst heating (lambda split)	not active				
						lambda control	closed loop				
						for time	>= 2.0	[s]			
						case 1: lambda controller not					
						at min or max limit					
						O2S rear	ready				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S rear Control Loop (i-part,	not calibrated				
						referenced)					
						for time	not calibrated	[s]			
						or					
						O2S rear Control Loop (p-part,	active				
						referenced)					
						for time	>= 30.0	[s]			
						case 2: lambda controller at					
						min or max limit					
						O2S front fault suspicion from	active				
						lambda control					
						above both cases for time	>= 2.0	[s]			
						accumulation of exhaust gas					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						mass for adaptation					
						integrated exhaust gas mass	75.0... 115.0	[g]			
						(adaptation check)					
						reset of exhaust gas mass for					
						adaptation					
						check for adaptation step	finished				
						or					
						conditions for accumulation of	not fulfilled				
						exhaust gas mass for adaptation					
						final conditions: fault					
						debounce - case 1					
						number of checks for adaptation	>= 1.00	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						in row					
						change of abs adapted i-part of	<= 0.30	[%]			
						2nd lambda control loop (O2S					
						front offset) at each check					
						(adaptation finished)					
						or					
						low pass filtered abs sum of	> 0	[%]			
						control value and control error of					
						2nd lambda control loop at each					
						check (adaptation demand in					
						fault direction)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						with filter time	14.0	[s]			
						case 2					
						number of total checks for	>= 2.00	[-]			
						adaptation					
						final conditions: heal					
						debounce					
						number of checks for adaptation	>= 1.00	[-]			
						in row					
						change of abs adapted i-part of	<= 0.30	[%]			
						2nd lambda control loop (O2S					
						front offset) at each check					
						(adaptation finished)					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
conditions for O2S rear		---				i-part global balance primary					
lambda control loop (i-part)						O2S rear control enable					
						conditions					
O2S rear Control Loop (i-part)						EVAP monitoring	not active				
						scavenging rate	< 1.01	[-]			
						band width of lambda control	0	[-]			
						deviation					
						ECT	> 55	[°C]			
						catalyst heating (lambda split)	not calibrated				
						relative fuel mass @ EVAP	not calibrated	[-]			
						purge					
						filtered engine load gradient	< -4.01...4.01	[%/ CAMr			
								ev]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for filtered time	0.1	[s]			
						i-part balance primary O2S					
						rear control enable condition					
						lambda control	no limit				
						primary O2S rear control @					
						open loop (limp home mode)					
						fuel injector power stage error	not calibrated				
						fuel injection time lower	not calibrated				
						threshold					
						O2S front	not calibrated				
						i-part general conditions					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S rear Control Loop (p-part,	active				
						referenced)					
						primary O2S rear control @	not active				
						open loop (limp home mode)					
						i-part global O2S front control					
						enable conditions					
						i-part global balance primary	enabled				
						O2S rear control enable					
						conditions					
						engine speed	1200...6520	[rpm]			
						engine load	21.80...165.00	[%]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						idle speed (without fuel cut off)	not calibrated				
						for time	not calibrated	[s]			
						i-part balance primary O2S					
						rear control enable condition					
						i-part balance primary O2S rear	enabled				
						control enable condition					
						i-part system primary O2S rear					
						control enable conditions					
						exhaust gas mass of O2S rear	> 30.0	[g]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						Control Loop (p-part,					
						referenced)					
						catalyst temperature	400... 1000	[°C]			
						conditions for accumulation					
						exhaust gas mass					
						i-part global balance primary	enabled				
						O2S rear control enable					
						conditions					
						i-part balance primary O2S rear	enabled				
						control enable condition					
						H2 protection primary O2S rear	not calibrated				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						control					
						O2S rear	ready				
						catalyst heating	not calibrated				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						exhaust gas mass after first start exhaust gas mass after restart	> 29.9> 29.9	[g][g]			
conditions for O2S rear		---				p-part primary O2S rear					
lambda control loop (p-part)						control enable conditions					
O2S rear Control Loop (p-part)						lambda control	no limit				
						lambda control	closed loop				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						primary O2S rear control @					
						open loop (limp home mode)					
						fuel injector power stage error	not calibrated				
						fuel injection time lower	not calibrated				
						threshold					
						O2S front	not calibrated				
						p-part global primary O2S rear					
						control enable conditions					
						catalyst heating	not calibrated				
						EVAP monitoring	not calibrated				
						misfire	not detected				
						engine speed	1080...8000	[rpm]			
						engine load	0.00...174.80	[%]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						p-part balance primary O2S					
						rear control enable conditions					
						O2S rear lambda control loop @	active				
						low-temperature mode					
						or					
						O2S rear	ready				
						p-part primary O2S rear control	enabled				
						enable conditions					
						or					
						primary O2S rear control @	enabled				
						open loop (limp home mode)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						p-part system primary O2S					
						rear control enable conditions					
						catalyst temperature	300... 1262	[°C]			
						conditions for accumulation					
						exhaust gas mass					
						O2S front lambda set point	1.00	[-]			
						catalyst purge (rich condition	not active				
						detected)					
						p-part primary O2S rear control	enabled				
						enable conditions					
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						primary O2S rear control @	enabled				
						open loop (limp home mode)					
						exhaust gas mass	> 0.0	[g]			
conditions for active lambda		---				no fault suspicion O2S rear					
diagnosis						target monitor					
Active Lambda Diagnosis						engine speed	>= 0	[rpm]			
						fuel cut off	active				
						for time	<= 0.0	[s]			
						for integrated exhaust gas mass	>= 0.00	[kg]			
						flow					
						vehicle speed	> 5	[km/h]			
						engine speed	1160...2960	[rpm]			
						AAT	not calibrated	[°C]			
						BARO	> 0.00	[kPa]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ECT downstream engine	> -48	[°C]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fuel adaptation (since last reset)	not calibrated				
						gear shifting	not calibrated	[-]			
						for time	not calibrated	[s]			
						engine load during constant	> 12.00	[%]			
						combustion mode					
						scavenging					
						scavenging rate	< 1.05	[-]			
						for					
						integrated air mass	> 0.02	[kg]			
						soot load					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						modeled relative soot mas	not calibrated	[g/l]			
						sensor based relative soot load	not calibrated	[-]			
						regeneration level	not calibrated	[-]			
						or					
						regeneration level	not calibrated	[-]			
						or					
						lambda control factor	> 0.00	[-]			
						O2S front offset error suspicion	not detected				
						or					
						O2S front dynamic error	not detected				
						suspicion					
						lower range window					
						exhaust gas mass flow, lower	20.50...247.50	[kg/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						range to activate diagnosis					
						(narrow range)					
						exhaust gas mass flow, lower	18.00...250.00	[kg/h]			
						range during diagnosis (normal					
						range)					
						exhaust gas mass flow, lower	15.50...250.00	[kg/h]			
						range during diagnosis					
						(extended range)					
						extended range only for time	<= 1.0	[s]			
						modeled EGT in catalyst system,	465...835	[°C]			
						lower range to activate diagnosis					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						(narrow range, gasoline mode)					
						modeled EGT in catalyst system,	450... 850	[°C]			
						lower range during diagnosis					
						(normal range, gasoline mode)					
						modeled EGT in catalyst system,	not calibrated	[°C]			
						lower range during diagnosis					
						(normal range, CNG mode)					
						change of modeled catalyst	-25.0... .25.0	[K]			
						temperature					
						upper range window					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						exhaust gas mass flow, upper	not calibrated	[kg/h]			
						range to activate diagnosis					
						(narrow range)					
						exhaust gas mass flow, upper	not calibrated	[kg/h]			
						range during diagnosis (normal					
						range)					
						modeled EGT in catalyst system,	465... 835	[°C]			
						upper range to activate					
						diagnosis (narrow range,					
						gasoline mode)					
						modeled EGT in catalyst system,	450... 850	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						upper range during diagnosis					
						(normal range, gasoline mode)					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						modeled EGT in catalyst system,	not active	[°C]			
						upper range during diagnosis					
						(normal range, CNG mode)					
						change of modeled catalyst	-25.0...25.0	[K]			
						temperature					
						lower/upper range window					
						(conditions fulfilled)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						catalyst temperature	> 350	[°C]			
						for time	> 90.0	[s]			
						for integrated exhaust gas mass	> 0.02	[kg]			
						flow					
						change of exhaust gas mass	-25.00 ...35.00	[kg/h]			
						flow					
						with delay time	1.0	[s]			
						modeled temperature difference	<= 100.0	[K]			
						over catalyst					
						alternative EVAP condition 1					
						integrated EVAP purge mass	> 0.0	[g]			
						since last purge stop					
						ratio fuel mass from evap purge	<= 0.80	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						system to fuel mass through					
						injectors					
						EVAP purge adaptation value	<= 64.00	[-]			
						or					
						alternative EVAP condition 2					
						EVAP purge mass into intake	<= 0.20	[kg/h]			
						manifold					
						or					
						evap purge in limp-home mode	active				
						or					
						alternative EVAP condition 3					
						evap purge	not active				
						for integrated exhaust gas mass	>= 0.00	[kg]			
						flow					
						fuel injector shut off					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fuel injector shut off	not active				
						for time	>= 0.1	[s]			
						general conditions					
						time after engine start	not calibrated	[s]			
						or					
						modeled catalyst temperature	>= 680	[°C]			
						or					
						integrated air mass	> 1.92... 2.32	[kg]			
						integrated heat energy	not calibrated	[kJ]			
						additional conditions					
						integrated exhaust gas mass	> 0.30	[kg]			
						flow after O2S front and O2S					
						rear ready					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						modeled EGT at O2S rear	> 200	[°C]			
						lambda set point	0.99... 1.01	[-]			
						for					
						integrated air mass	>= 0.00	[kg]			
						condition in case of O2S rear					
						offset suspicion					
						exhaust gas mass flow	12.00. ..150. 00	[kg/h]			
						lambda enable condition					
						monitor - only if					
						lambda set point request	realized				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation between engine	< 0.03	[-]			
						nominal lambda value and					
						expected lambda @ sensor					
						position					
						lambda control	not at min or max limit				
						monitoring stops if lambda	>= -2.00...2.00	[%]			
						deviation					
						with delay time	>= 1.5...4.0	[s]			
						or					
						monitoring stop events per DCY	>= 0.00	[-]			
						(monitoring stop disabled)					
						or					
						O2S front offset fault suspicion	active				
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						O2S rear target fault in previous	detected				
						DCY					
						or					
						conditions for dynamic fault	not calibrated				
						suspicion evaluation					
						conditions to switch from rich					
						to lean phase					
						actual lambda value	0.82... 1.01	[-]			
						for time	> 2.0	[s]			
						integrated exhaust gas mass	>= 0.01	[kg]			
						alternative condition 1					
						O2S rear voltage	>= 0.85	[V]			
						or					
						alternative condition 2					
						O2S rear voltage	>= 0.75	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S rear voltage gradient	-0.15...0.10	[V/s]			
						MAF rich gas integral	>= 0.4	[g]			
						or					
						alternative condition 3:					
						conditions for dynamic fault					
						suspicion evaluation					
						integrated rich gas mass	not calibrated	[mg]			
						for number of events	not calibrated	[-]			
						conditions to switch from lean					
						to rich phase					
						actual lambda value	0.99...1.18	[-]			
						for time	> 2.0	[s]			
						integrated exhaust gas mass	>= 0.01	[kg]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						alternative condition 1					
						O2S rear voltage	<= 0.15	[V]			
						or					
						alternative condition 2					
						O2S rear voltage	<= 0.15	[V]			
						O2S rear voltage gradient	66.50...-66.50	[V/s]			
						MAF O2 integral	>= 0.2	[g]			
						or					
						alternative condition 3: in					
						case of dynamic fault					
						suspicion					
						integrated lean gas mass	not calibrated	[mg]			
						for number of events	not calibrated	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
Oxygen Sensor (O2S) front	P015B – O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 1	intrusive monitor check of delay time at lean to rich transition	arithmetic average value delay time at lean to rich transition	not calibrated	[s]	conditions for dynamic fault suspicion evaluation dev. expected vs. measured lambda (high quality model)	not calibrated	[-]	20 [s] once / DCY	1 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
			or			or					
			EWMA filtered value			dev. expected vs. measured	not calibrated	[-]			
						lambda (low quality model)					
			delay time at lean to rich	> 0.4	[s]	additional conditions					
			transition								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			delayed response and slow			dev. expected vs. measured	not calibrated	[-]			
			transition (while avoiding			lambda (fault model)					
			controller oscillations)								
			sum of adaptation times (delay	not calibrated	[s]	monitor entry conditions					
			and slow response) at lean to			active lambda diagnosis	checked				
			rich transition			(referenced)					
						conditions for avoiding					
						controller oscillations					
						online identification (referenced)	not calibrated				
						for arithmetic average value					
						calculation					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						number of checks required for	not calibrated	[-]			
						valid result					
						for EWMA-filter:					
						K-factor	0.25	[-]			
						minimum number of tests per	1	[-]			
						DCY required					
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					
						deviation between new	> 0.3	[s]			
						measured value and old EWMA					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						filtered value					
						maximum tolerance to confirm	0.08	[s]			
						filtered value					
						or					
						further calculation conditions					
						for EWMA filter					
						number of checks for	5.00	[-]			
						confirmation					
						initial value of filtered value	0	[-]			
						maximum number of checks per	5.00	[-]			
						driving cycle					
						additional conditions					
						no additional conditions					
						calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
Oxygen Sensor (O2S) front	P015A – O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 1	intrusive monitor check of delay time at rich to lean transition	arithmetic average value delay time at rich to lean transition or EWMA filtered value delay time at rich to lean transition delayed response and slow transition (while avoiding controller oscillations)	not calibrated > 0.4	[s] [s]	conditions for dynamic fault suspicion evaluation dev. expected vs. measured lambda (high quality model) or dev. expected vs. measured lambda (low quality model) additional conditions dev. expected vs. measured lambda (fault model)	not calibrated not calibrated not calibrated	[-] [-] [-]	20 [s] once / DCY	1 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			sum of adaptation times (delay and slow response) at rich to lean transition	not calibrated	[s]	monitor entry conditions active lambda diagnosis (referenced) conditions for avoiding controller oscillations online identification (referenced)	checked not calibrated				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for arithmetic average value					
						calculation					
						number of checks required for	not calibrated	[-]			
						valid result					
						for EW-MA-filter:					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						K-factor	0.25	[-]			
						minimum number of tests per	1	[-]			
						DCY required					
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					
						deviation between new	> 0.3	[s]			
						measured value and old EWMA					
						filtered value					
						maximum tolerance to confirm	0.08	[s]			
						filtered value					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or					
						further calculation conditions					
						for EWMA filter					
						number of checks for	5.00	[-]			
						confirmation					
						initial value of filtered value	0	[-]			
						maximum number of checks per	5.00	[-]			
						driving cycle					
						additional conditions					
						no additional conditions					
						calibrated					
Oxygen Sensor (O2S) front	P014D – O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 1	intrusive monitor	arithmetic average value			conditions for dynamic fault					♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
						suspicion evaluation					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		check of transient time at lean to rich transition	time at lean to rich transition	not calibrated	[s]	dev. expected vs. measured lambda (high quality model)	not calibrated	[-]	20 [s] once / DCY	1 DCY	
			or			or					
			EWMA filtered value			dev. expected vs. measured lambda (low quality model)	not calibrated	[-]			
			time at lean to rich transition	> 0.4	[s]	additional conditions					
			delayed response and slow transition (while avoiding			dev. expected vs. measured lambda (fault model)	not calibrated	[-]			
			controller oscillations)								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
			sum of adaptation times (delay and slow response) at lean to rich transition	not calibrated	[s]	monitor entry conditions active lambda diagnosis (referenced)	checked				
						conditions for avoiding					
						controller oscillations					
						online identification (referenced)	not calibrated				
						for arithmetic average value					
						calculation					
						number of checks required for valid result	not calibrated	[-]			
						for EWMA-filter:					
						K-factor	0.25	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						minimum number of tests per DCY required	1	[-]			
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					
						deviation between new measured value and old EWMA filtered value	> 0.3	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						maximum tolerance to confirm	0.08	[s]			
						filtered value					
						or					
						further calculation conditions					
						for EWMA filter					
						number of checks for	5.00	[-]			
						confirmation					
						initial value of filtered value	0	[-]			
						maximum number of checks per	5.00	[-]			
						driving cycle					
						additional conditions					
						no additional conditions					
						calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Oxygen Sensor (O2S) front	P014C – O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 1	intrusive monitor	arithmetic average value			conditions for dynamic fault					♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
						suspicion evaluation					
		check of transient time at rich to	time at rich to lean transition	not calibrated	[s]	dev. expected vs. measured	not calibrated	[-]	20 [s]	1 DCY	
		lean transition				lambda (high quality model)			once / DCY		
			or			or					
			EWMA filtered value			dev. expected vs. measured	not calibrated	[-]			
						lambda (low quality model)					
			time at lean to rich transition	> 0.4	[s]	additional conditions					
			delayed response and slow			dev. expected vs. measured	not calibrated	[-]			
			transition (while avoiding			lambda (fault model)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			controller oscillations)								
			sum of adaptation times (delay	not calibrated	[s]	monitor entry conditions					
			and slow response) at rich to lean transition			active lambda diagnosis (referenced)	checked				
						conditions for avoiding					
						controller oscillations					
						online identification (referenced)	not calibrated				
						for arithmetic average value					
						calculation					
						number of checks required for	not calibrated	[-]			
						valid result					
						for EWMA-filter:					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						K-factor	0.25	[-]			
						minimum number of tests per	1	[-]			
						DCY required					
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					
						deviation between new	> 0.3	[s]			
						measured value and old EWMA					
						filtered value					
						maximum tolerance to confirm	0.08	[s]			
						filtered value					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or					
						further calculation conditions					
						for EWMA filter					
						number of checks for	5.00	[-]			
						confirmation					
						initial value of filtered value	0	[-]			
						maximum number of checks per	5.00	[-]			
						driving cycle					
						additional conditions					
						no additional conditions					
						calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
Oxygen Sensor (O2S) front	P2195 – O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	out of range high	adapted I-part of 2nd lambda control loop (O2S front offset)	> 0.08	[-]	condition for lambda split operation			450 [s] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold Sensor - GX9-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						catalyst heating	not active				
						only CNG vehicles					
						CNG mode	not calibrated				
						pending fault from previous					
						DCY O2S front offset monitor					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S rear Control Loop (i-part, referenced)	checked				
						for time	>= 10.0	[s]			
						O2S front offset adaptation (referenced), final conditions: fault debounce	fulfilled				
						additional conditions					
						no additional conditions calibrated					
	P2196 – O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	out of range low	adapted I-part of 2nd lambda control loop (O2S front offset)	< -0.08	[-]	condition for lambda split operation			450 [s] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold Sensor - GX9- ♦ EVAP Canister Purge Regulator Valve 1 - N80-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						catalyst heating	not active				
						only CNG vehicles					
						CNG mode	not calibrated				
						pending fault from previous					
						DCY O2S front offset monitor					
						O2S rear Control Loop (i-part, referenced)	checked				
						for time	>= 10.0	[s]			
						O2S front offset adaptation (referenced), final conditions: fault debounce	fulfilled				
						additional conditions					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						no additional conditions calibrated					
Oxygen Sensor (O2S) front	P2414 – O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	signal range check (check for sensor at ambient air)	O2S signal front	> 3.95	[-]	engine	running		10.0 [s] multiple	2DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
			for time	> 10.0	[s]	O2S front	ready				
						fuel cut off	not active				
						PCV leakage	not detected				
						lambda set value	< 1.60	[-]			
						O2S front ceramic temperature	valid				
						dev. actual vs. set point O2S ceramic temperature	< 80	[°C]			
						only AIR system					
						AIR	not active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Oxygen Sensor (O2S) front	P0606 – ECM/PCM Processor	circuit continuity - leakage current adaptation	leakage current measurements for number of events	aborted > 80.00	[-]	battery voltage battery voltage for time	> 9.80< 16.10 >= 0.1	[V] [V] [s]	3 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Oxygen Sensor (O2S) front	P0606 – ECM/PCM Processor	circuit continuity - leakage current measurement	leakage current or leakage current	< -0.044 > -0.025	[mA] [mA]	battery voltage battery voltage for time	> 9.80< 16.10 >= 0.1	[V] [V] [s]	0 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Oxygen Sensor (O2S) front	P0606 – ECM/PCM Processor	electrical check (tests for production checks are active)	SPI test port	active		battery voltage	> 9.80	[V]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
			or			battery voltage	< 16.10	[V]			
			built-in self test	failed		for time	>= 0.1	[s]			
	P0606 – ECM/PCM Processor	electrical check (ground resistor by means of ISQ current back-measurement)	ISQ current	>= 2.662	[mA]	battery voltage battery voltage	> 9.80< 16.10	[V][V]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	>= 0.1	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0606 – ECM/PCM Processor	electrical check (ground resistor by means of ISQR current back-measurement)	ISQR current	>= 0.223	[mA]	battery voltage battery voltage for time	> 9.80 < 16.10 >= 0.1	[V] [V] [s]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P0606 – ECM/PCM Processor	electrical check (filter module by means of gain voltage/ current measurements)	filter module 1 voltage or filter module 2 voltage or filter module 3 voltage or filter module 4 current or filter module 5 current	<= 0.7; >= 1.1<= 1.8; >= 2.7<= 5.5; >= 8.1 <= 0.005; >= 0.009 <= 0.008; >= 0.014	[mV] [mV] [mV] [mA] [mA]	battery voltage battery voltage for time	> 9.80 < 16.10 >= 0.1	[V] [V] [s]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
	P0606 – ECM/PCM Processor	electrical check (parallel resistance between APE and MES pins)	resistance	<= 24; >= 360	[Ohm]	battery voltage battery voltage for time	> 9.80 < 16.10 >= 0.1	[V] [V] [s]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P0606 – ECM/PCM Processor	electrical check (internal sequencing of the ASIC)	watch dog signal	error detected		battery voltage	> 9.80	[V]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage for time	< 16.10 >= 0.1	[V] [s]			
	P0606 – ECM/PCM Processor	electrical check (over voltage and under voltage detection)	normal ASIC operation in IDLE mode over voltage	detected		battery voltage battery voltage	> 9.80< 16.10	[V] [V]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
			aborted ASIC operation in IDLE mode over voltage normal ASIC operation in IDLE	detected		for time	>= 0.1	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			mode under voltage within battery voltage aborted ASIC operation in IDLE mode over voltage within battery voltage	detected < 7.25 detected < 7.25	[V] [V]						
	P0606 – ECM/PCM Processor	electrical check (internal voltage supply)	internal supply voltage	<= 2.97; >= 3.63	[V]	battery voltage	> 9.80	[V]	4 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage for time	< 16.10 >= 0.1	[V] [s]			
Oxygen Sensor (O2S) front	P0606 – ECM/PCM Processor	electrical check (memory)	stored measurement data	not available		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0606 – ECM/PCM Processor	electrical check (ASIC initialization)	initialization	failed		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
	P0606 – ECM/PCM Processor	electrical check (ASIC response)	mismatch actual and expected state	detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
	P0606 – ECM/PCM Processor	electrical check (transmission of data registers)	SPI error during data transmission	detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0606 – ECM/PCM Processor	electrical check (availability of diagnostic registers)	no values available in the diagnostic register	detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0606 – ECM/PCM Processor	electrical check (transmission of diagnostic registers)	SPI error during diagnostic transmission	detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
	P0606 – ECM/PCM Processor	electrical check (interrupt handling)	IRQ line is too slow	detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or			battery voltage	< 16.10	[V]			
			IRQ line is too fast	detected		for time	>= 0.1	[s]			
			or								
			IRQ line control flow error	detected							
	P0606 – ECM/PCM Processor	electrical check (mode setting)	requested ASIC mode(requested by UE-GO software)	not detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
	P0606 – ECM/PCM Processor	electrical check (SPI communication during transmission of data stored in RAM)	SPI error during transmission of data stored in RAM	detected		battery voltage battery voltage for time	> 9.80 < 16.10 >= 0.1	[V] [V] [s]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0606 – ECM/PCM Processor	electrical check (register setting)	register could not be set	detected		battery voltage	> 9.80	[V]	6 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
Oxygen Sensor (O2S) front	P2A00 – O2 Sensor Circuit Range/ Performance Bank 1 Sensor 1	range check (signal availability)	temperature corrected O2 concentration	not valid		general condition			5.0 [s] continuous	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Fuel Delivery Unit - GX1- ♦ Intake Manifold Sensor - GX9-
			or			battery voltage	< 16.10	[V]			
			Nernst voltage (upper operation range)	>= 0.05	[V]	conditions incl. additional time delay					
			or			engine has been run at least once in current dcy	detected				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			Nernst voltage (lower operation range)	>= 0.05	[V]	engine running	detected				
			or			dew point exceeded	detected				
			O2 reference model to determine flowed O2 through the Nernst cell and the pump cell	not calibrated		engine stopped at the end of the dcy	detected				
			or			fuel cut off	not calibrated				
			validity of blackening protection activation status	not detected		for time	not calibrated	[s]			
			or			within					
			blackening protection activation status	active		time delay	>= 30.0	[s]			
			or			conditions w/o additional time					
						delay					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			pump current	not activated		engine has been run at least once in current dcy	detected				
			or			engine running	detected				
			O2S ceramic temperature	<= 640	[°C]	dew point exceeded	detected				
			or			engine stopped at the end of the dcy	detected				
			pump current	not active		fuel cut off	not active				
						for time	>= 5.0	[s]			
Oxygen Sensor (O2S) front	P2237 – O2 Sensor Positive Current Control Circuit/Open Bank 1 Sensor 1	circuit continuity check @ pin APE	fault suspicion calculated calibration resistance	>= 3946	[Ohm]	O2S ceramic temperature or	>= 625	[°C]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
			and			heat energy	>= 325	[J]			
			fault decision (@ warm-up			battery voltage	> 9.80	[V]			
			mode)								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			calculated calibration resistance	>= 3072	[Ohm]	battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
						normal ASIC operation in warm-up mode	detected				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						within					
						calculated calibration resistance	>= 3072	[Ohm]			
						or					
						normal ASIC operation in normal	detected				
						mode					
						fault suspicion @ normal					
						mode; resistance @ APE line					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						resistance	>= 1000	[Ohm]			
						fault suspicion @ normal					
						mode; back pump current @					
						pump cell					
						ratio back pump current	<= -0.50	[-]			
						fault suspicion @ normal					
						mode; excessive sensor					
						voltage					
						voltage	> 0.09	[V]			
Oxygen Sensor (O2S) front	P2237 – O2 Sensor Positive Current Control Circuit/Open Bank 1 Sensor 1	circuit continuity check @ pin	measured calibration resistance	< 3464	[Ohm]	O2S ceramic temperature	>= 625	[°C]	5 [events]	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		APES	@ nernst cell						multiple		
			and			or					
			measured calibration resistance	>= 3464	[Ohm]	heat energy	>= 325	[J]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			at pump cell			battery voltage	> 9.80	[V]			
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
						fault suspicion @ warm-up					
						mode; resistance @ Nernst					
						cell					
						measured calibration resistance	>= 3464	[Ohm]			
						@ Nernst cell					
						fault suspicion @ warm-up					
						mode; resistance @ pump cell					
						measured calibration resistance	>= 3464	[Ohm]			
						@ pump cell					
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						normal ASIC operation in normal	detected				
						mode					
						fault suspicion @ normal					
						mode; aborted RAM check					
						aborted RAM check	detected				
						fault suspicion @ normal					
						mode; Nernst voltage					
						voltage	>= 1.74	[V]			
						fault suspicion @ normal					
						mode; reverse pump current					
						ratio reverse pump current	<= -0.50	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ normal					
						mode; reverse pump current					
						incl. Nernst circuit					
						ratio reverse pump current	<= -0.50	[-]			
						conditions @ fault decision					
						ASIC in warm-up mode	detected				
Oxygen Sensor (O2S) front	P2251 – O2 Sensor Negative Current Control Circuit/Open Bank 1 Sensor 1	circuit continuity check @ pin IPE	measured calibration resistance @ nernst cell	< 3464	[Ohm]	O2S ceramic temperature	>= 625	[°C]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
			and			or					
			measured calibration resistance at pump cell	>= 3464	[Ohm]	heat energy battery voltage	>= 325> 9.80	[J][V]			
						battery voltage	< 16.10	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	>= 0.1	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ warm-up					
						mode; resistance @ Nernst					
						cell					
						measured calibration resistance	>= 3464	[Ohm]			
						@ Nernst cell					
						fault suspicion @ warm-up					
						mode; resistance @ pump cell					
						measured calibration resistance	>= 3464	[Ohm]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						@ pump cell					
						or					
						normal ASIC operation in normal	detected				
						mode					
						fault suspicion @ normal					
						mode; aborted RAM check					
						aborted RAM check	detected				
						fault suspicion @ normal					
						mode; Nernst voltage					
						voltage	>= 1.74	[V]			
						fault suspicion @ normal					
						mode; reverse pump current					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ratio reverse pump current	<= -0.50	[-]			
						fault suspicion @ normal					
						mode; reverse pump current					
						incl. Nernst circuit					
						ratio reverse pump current	<= -0.50	[-]			
						conditions @ fault decision					
						ASIC in warm-up mode	detected				
Oxygen Sensor (O2S) front	P2626 – O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	circuit continuity check @ pin	fault suspicion			O2S ceramic temperature	>= 625	[°C]			♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		MES	calculated calibration resistance	>= 3946	[Ohm]	or			5 [events]	2 DCY	
									multiple		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			and			heat energy	>= 325	[J]			
			fault decision (@ warm-up			battery voltage	> 9.80	[V]			
			mode)								
			calculated calibration resistance	>= 3072	[Ohm]	battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
						normal ASIC operation in warm-	detected				
						up mode					
						within					
						calculated calibration resistance	>= 3072	[Ohm]			
						or					
						normal ASIC operation in normal	detected				
						mode					
						fault suspicion @ normal					
						mode; resistance @ APE line					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						resistance	>= 1000	[Ohm]			
						fault suspicion @ normal					
						mode; back pump current @					
						pump cell					
						ratio back pump current	<= -0.50	[-]			
						fault suspicion @ normal					
						mode; excessive sensor					
						voltage					
						voltage	> 0.09	[V]			
Oxygen Sensor (O2S) front	P2243 – O2 Sensor Reference Voltage Circuit/Open Bank 1 Sensor 1	circuit continuity check @ pin RE	measured calibration resistance @ nernst cell and measured calibration resistance	< 3464> = 3464	[Ohm] [Ohm]	O2S ceramic temperature or heat energy	>= 625 >= 325	[°C] [J]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILI lum	Component Diagnostic
			at pump cell			battery voltage	> 9.80	[V]			
						battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
						fault suspicion @ warm-up					
						mode; resistance @ Nernst					
						cell					
						measured calibration resistance	>= 3464	[Ohm]			
						@ Nernst cell					
						fault suspicion @ warm-up					
						mode; resistance @ pump cell					
						measured calibration resistance	>= 3464	[Ohm]			
						@ pump cell					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or					
						normal ASIC operation in normal	detected				
						mode					
						fault suspicion @ normal					
						mode; aborted RAM check					
						aborted RAM check	detected				
						fault suspicion @ normal					
						mode; Nernst voltage					
						voltage	>= 1.74	[V]			
						fault suspicion @ normal					
						mode; reverse pump current					
						ratio reverse pump current	<= -0.50	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ normal					
						mode; reverse pump current					
						incl. Nernst circuit					
						ratio reverse pump current	<= -0.50	[-]			
						conditions @ fault decision					
						ASIC in warm-up mode	detected				
Oxygen Sensor (O2S) front	P2626 – O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	circuit continuity check @ pin	calculated calibration resistance	>= 3946	[Ohm]	O2S ceramic temperature	>= 625	[°C]	5 [events]	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		RC mp							multiple		
						or					
						heat energy	>= 325	[J]			
						battery voltage	> 9.80	[V]			
						battery voltage	< 16.10	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	>= 0.1	[s]			
						normal ASIC operation in warm-	detected				
						up mode					
						within					
						calculated calibration resistance	>= 3072	[Ohm]			
						or					
						normal ASIC operation in normal	detected				
						mode					
						fault suspicion @ normal					
						mode; resistance @ APE line					
						resistance	>= 1000	[Ohm]			
						fault suspicion @ normal					
						mode; back pump current @					
						pump cell					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ratio back pump current	<= -0.50	[-]			
						fault suspicion @ normal					
						mode; excessive sensor					
						voltage					
						voltage	> 0.09	[V]			
Oxygen Sensor (O2S) front	P0132 – O2 Sensor Circuit High Voltage Bank 1 Sensor 1	circuit high (aborted RAM check)	voltage @ RE /IPE /APE /MES	> 9.0...9.6	[V]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		over voltage check @ sensor lines	or voltage @ R Gnd	> 1.54... 1.89	[V]	battery voltage for time	< 16.10 >= 0.1	[V] [s]			
						fault suspicion @ switch-on					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						mode; current evaluation (IPE/					
						APE/ RE/ RC mp)					
						ratio current	> 0.13	[-]			
						fault suspicion @ warm-up					
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	> -0.15	[-]			
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						undervoltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						further conditions for ASIC					
						operation in normal mode with					
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					
						voltage between APE and MES pins	> 0.20	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions @ fault decision					
						ASIC in switch-on mode	detected				
	P0132 – O2 Sensor Circuit High Voltage Bank 1 Sensor 1	circuit high (switch-on mode)	voltage @ RE /IPE /APE /MES	> 3.97	[V]	battery voltage	> 9.80	[V]	5 [events] multiple	2DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		voltage check @ sensor lines				battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
						fault suspicion @ switch-on					
						mode; current evaluation (IPE/					
						APE/ RE/ RCmp)					
						ratio current	> 0.13	[-]			
						fault suspicion @ warm-up					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	> -0.15	[-]			
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						fault suspicion @ warm-up					
						mode; voltage between IPE					
						and GND pins					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						signal voltage	not calibrated	[V]			
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			
						further conditions for ASIC					
						operation in normal mode with					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					
						voltage between APE and MES pins	> 0.20	[V]			
						conditions @ fault decision					
						ASIC in switch-on mode	detected				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0132 – O2 Sensor Circuit High Voltage Bank 1 Sensor 1	circuit high (idle mode)	voltage @ RE /IPE /APE /MES	> 9.0...9.6	[V]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		over voltage check @ sensor lines				battery voltage for time	< 16.10 >= 0.1	[V][s]			
						fault suspicion @ switch-on					
						mode; current evaluation (IPE/					
						APE/ RE/ RC mp)					
						ratio current	> 0.13	[-]			
						fault suspicion @ warm-up					
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	> 0.13	[-]			
						fault suspicion @ aborted					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						further conditions for ASIC					
						operation in normal mode with					
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					
						voltage between APE and MES pins	> 0.20	[V]			
						conditions @ fault decision					
						ASIC in switch-on mode	detected				
	P0132 – O2 Sensor Circuit High Voltage Bank 1 Sensor 1	circuit low (switch-on mode)	shunt current	not calibrated	[A]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		circuit continuity check @ sensor lines	or voltage evaluation @ RE /IPE/APE / RCmp	error detected		battery voltage for time fault suspicion @ switch-on	< 16.10 >= 0.1	[V] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mode; current evaluation (IPE/					
						APE/ RE/ RC mp)					
						ratio current	> 0.13	[-]			
						fault suspicion @ warm-up					
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	> 0.13	[-]			
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						further conditions for ASIC					
						operation in normal mode with					
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						voltage between APE and MES pins conditions @ fault decision ASIC in switch-on mode	> 0.20 detected	[V]			
Oxygen Sensor (O2S) front	P0131 – O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	circuit low (aborted RAM check)	voltage @ RE /IPE /APE /MES	> 0.1	[V]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		under voltage check @ sensor lines				battery voltage for time	< 16.10 >= 0.1	[V][s]			
						fault suspicion @ switch-on					
						mode; current evaluation (IPE/					
						APE/ RE/ RCmp)					
						ratio current	< -0.15	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ warm-up					
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	< -0.15	[-]			
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			
						further conditions for ASIC					
						operation in normal mode with					
						O2S heated up (fault					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					
						voltage between APE and MES pins	> 0.20	[V]			
						conditions @ fault decision					
						ASIC in switch-on mode	detected				
	P0131 – O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	circuit low (switch-on mode)	voltage @ RE /IPE /APE /MES	< 1.93	[V]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		voltage check @ sensor lines				battery voltage	< 16.10	[V]			
						for time	>= 0.1	[s]			
						fault suspicion @ switch-on					
						mode; current evaluation (IPE/					
						APE/ RE/ RC mp)					
						ratio current	< -0.15	[-]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ warm-up					
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	< -0.15	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			
						further conditions for ASIC					
						operation in normal mode with					
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					
						voltage between APE and MES pins	> 0.20	[V]			
						conditions @ fault decision					
						ASIC in switch-on mode	detected				
	P0131 – O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	circuit low (idle mode)	voltage @ RE /IPE /APE /MES	> 0.1	[V]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		under voltage check @ sensor lines				battery voltage for time	< 16.10 >= 0.1	[V][s]			
						fault suspicion @ switch-on					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mode; current evaluation (IPE/					
						APE/ RE/ RC mp)					
						ratio current	< -0.15	[-]			
						fault suspicion @ warm-up					
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	< -0.15	[-]			
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion @ aborted					
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			
						further conditions for ASIC					
						operation in normal mode with					
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						voltage between APE and MES pins	> 0.20	[V]			
						conditions @ fault decision					
						ASIC in switch-on mode	detected				
	P0131 – O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	circuit low (switch-on mode)	shunt current	not calibrated	[A]	battery voltage	> 9.80	[V]	5 [events] multiple	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
		circuit continuity check @ sensor lines	or voltage evaluation @ RE /IPE/APE / RCmp	error detected		battery voltage for time fault suspicion @ switch-on	< 16.10 >= 0.1	[V] [s]			
						mode; current evaluation (IPE/					
						APE/ RE/ RCmp)					
						ratio current	< -0.15	[-]			
						fault suspicion @ warm-up					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mode; current evaluation (IPE/					
						APE/ RE)					
						ratio current	< -0.15	[-]			
						fault suspicion @ aborted					
						RAM check @ warm-up;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						fault suspicion @ warm-up					
						mode; voltage between IPE					
						and GND pins					
						signal voltage	not calibrated	[V]			
						fault suspicion @ aborted					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						RAM check @ normal mode;					
						under voltage detection					
						battery voltage	>= 7.25	[V]			
						or					
						normal ASIC operation in normal mode	detected				
						within					
						O2S ceramic temperature	>= 625	[°C]			
						or					
						heat energy	>= 325	[J]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						further conditions for ASIC					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						operation in normal mode with					
						O2S heated up (fault					
						suspicion)					
						Nernst voltage	not calibrated	[V]			
						or					
						pump current	< -0.5	[mA]			
						or					
						ratio reverse pump current	not calibrated	[-]			
						or					
						ratio reverse pump current (incl. Nernst circuit)	not calibrated	[-]			
						or					
						voltage between APE and MES pins	> 0.20	[V]			
						conditions @ fault decision					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ASIC in switch-on mode	detected				
Oxygen Sensor (O2S) Heater front	P0135 – O2 Sensor Heater Circuit Bank 1 Sensor 1	out of range - heater performance (permanent)	O2S ceramic temperature	<= 680	[°C]	time after fuel cut off	not calibrated	[s]	100.0 [s] continuous	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
Oxygen Sensor (O2S) Heater front	P0031 – HO2S Heater Control Circuit Low Bank 1 Sensor 1	circuit low	signal voltage	<= 1.64... 1.96	[V]	forced test pulse	sent	[V] [V] [s]	0.7 [s] continuous	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
						battery voltage battery voltage for time	> 9.80 < 16.10 >= 0.1				
	P0030 – HO2S Heater Control Circuit Bank 1 Sensor 1	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	forced test pulse	sent	[V] [V] [s]	0.7 [s] continuous	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
						battery voltage battery voltage for time	> 9.80 < 16.10 >= 0.1				
	P0032 – HO2S Heater Control Circuit High Bank 1 Sensor 1	circuit high	signal current	> 13.5	[A]	forced test pulse	sent		0.7 [s] continuous	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage battery voltage for time modeled heat energy @ O2S heater	> 9.80< 16.10 >= 0.1>= 80	[V] [V] [s] [J]			
Oxygen Sensor (O2S) Heater front	P0135 – O2 Sensor Heater Circuit Bank 1 Sensor 1	out of range - heater performance (@ start)	O2S ceramic temperature	< 680	[°C]	ECT @ start	>= -48	[°C]	0 [s] once / DCY	2 DCY	♦ Oxygen Sensor 1 Before Catalytic Converter - GX10-
			for time	>= 15.0	[s]	time after fuel cut off	not calibrated	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Oxygen Sensor (O2S) rear	P013A – O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	intrusive monitor check of transient time at rich to lean transition	arithmetic average value time at rich to lean transition or EWMA filter value transient time at rich to lean transition	not calibrated > 0.6	[s] [s]	active diagnosis conditions for active lambda diagnosis (referenced) passive diagnosis conditions for passive lambda diagnosis during fuel cut off (referenced)for arithmetic average value calculation number of checks required for valid result for EWMA-filter K-factor minimum number of tests per DCY required step	checked not calibrated not calibrated 0.301	[-] [-] [-]	10.0 [s] once / DCY	1 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						change detection will initiate multiple tests per DCY conditions for step change detection					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation new measured value	> 0.4	[s]			
						vs. old EWMA filtered value					
						number of checks for	2.00	[-]			
						confirmation					
						maximum tolerance to confirm	0.08	[s]			
						filtered value					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						initial value of filtered value	0.0	[s]			
						maximum number of checks per	2.00	[-]			
						DCY					
						additional conditions					
						no additional conditions					
						calibrated					
Oxygen Sensor (O2S) rear	P013B – O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	intrusive monitor	arithmetic average value			monitor entry conditions					♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
		check of transient time at lean to rich transition	time at lean to rich transition	not calibrated	[s]	conditions for active lambda diagnosis (referenced)	checked		10.0 [s] once / DCY	1 DCY	
			or			for arithmetic average value					
						calculation					
			EWMA filter value transient			number of checks required for valid result	not calibrated	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			time at lean to rich transition	> 1.5	[s]	for EWMA-filter:					
						K-factor	0.30	[-]			
						minimum number of tests per DCY required	1				
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					
						deviation between new measured value and old EWMA filtered value	> 1.0	[s]			
						number of checks for confirmation	3.00	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						maximum tolerance to confirm filtered value	0.15	[s]			
						initial value of filtered value	0.0	[s]			
						maximum number of checks per driving cycle	3.00	[-]			
						additional conditions					
						no additional conditions calibrated					
Oxygen Sensor (O2S) rear	P013E – O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	intrusive monitor	arithmetic average value			monitor entry conditions					
		delayed response monitoring, delay measurement	delay time at rich to lean transition	not calibrated	[s]	conditions for active lambda diagnosis (referenced)	checked		20.0 [s] once / DCY	1 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or			for arithmetic average value					
						calculation					
			EWMA filter value transient			number of checks required for valid result	not calibrated	[-]			
			delay time at rich to lean transition	> 0.5	[s]	for EWMA-filter:K-factor	0.30	[-]			
						minimum number of tests per DCY required	1				
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation between new measured value and old EWMA filtered value	> 0.4	[s]			
						number of checks for confirmation	5.00	[-]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						maximum tolerance to confirm filtered value initial value of filtered value maximum number of checks per driving cycle additional conditions no additional conditions calibrated	0.080. 03.00	[s] [s] [-]			
Oxygen Sensor (O2S) rear	P013F – O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	intrusive monitor	arithmetic average value			monitor entry conditions					♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
		delayed response monitoring, delay measurement	delay time at lean to rich transition	not calibrated	[s]	conditions for active lambda diagnosis (referenced)	checked		20.0 [s] once / DCY	1 DCY	
			or			for arithmetic average value					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						calculation					
			EWMA filter value transient			number of checks required for valid result	not calibrated	[-]			
			delay time at lean to rich transition	> 0.7	[s]	for EWMA-filter:K-factor	0.30	[-]			
						minimum number of tests perDCY required	1				
						step change detection will					
						initiate multiple tests per DCY					
						conditions for step change					
						detection					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						deviation between new measured value and old EWMA filtered value	> 0.4	[s]			
						number of checks for confirmation	5.00	[-]			
						maximum tolerance to confirm filtered value	<= 0.08	[s]			
						initial value of filtered value	0.0	[s]			
						maximum number of checks per driving cycle	3.00	[-]			
						additional conditions					
						no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Oxygen Sensor (O2S) rear	P2271 – O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	intrusive monitor	O2S sensor voltage	> 0.15	[V]	only if no target fault from previous DCY			0 (FTP75: 20.0) [s] once / DCY	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
		active O2S signal check with offset check - stuck high				O2S front offset if fault suspicion from O2S	checked				
						front offset from current DCY					
						or target fault from previous					
						DCY					
						conditions for active lambda diagnosis (referenced)	checked				
						requested lambda	>= 1.15	[-]			
						and					
						integrated exhaust gas mass flow	>= 0.15	[kg]			
						for time	> 0.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						else: correct O2S front offset					
						check from current DCY and					
						no target fault from previous					
						DCY					
						conditions for active lambda diagnosis (referenced)	checked				
						requested lambda	>= 1.08	[-]			
						and					
						cumulated O2 mass flow into catalyst	>= 1.8	[g]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	> 0.2	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						additional conditions					
						no additional conditions calibrated					
	P2271 – O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	intrusive monitor	O2S sensor voltage	not calibrated	[V]	general conditions			0 (FTP75: 20.0) [s] once / DCY	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
		active O2S signal check without offset check - stuck high				conditions for active lambda diagnosis (referenced)	not calibrated				
						step 1					
						requested lambda	not calibrated	[-]			
						and					
						cumulated O2 mass flow into catalyst	not calibrated	[g]			
						for time	not calibrated	[s]			
						step 2 (only if no target fault					
						from previous DCY)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						requested lambda	not calibrated	[-]			
						and					
						integrated exhaust gas mass flow	not calibrated	[kg]			
						for time	not calibrated	[s]			
						additional conditions					
						no additional conditions calibrated					
Oxygen Sensor (O2S) rear	P2270 – O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	intrusive monitor	O2S sensor voltage	< 0.75	[V]	only if no target fault from previous DCY			0 (FTP75: 20.0) [s] once / DCY	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
		active O2S signal check with offset check - stuck low				O2S front offset if fault suspicion from O2S	checked				
						front offset from current DCY					
						or target fault from previous					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						DCY					
						conditions for active lambda diagnosis (referenced)	checked				
						requested lambda	<= 0.75	[-]			
						and					
						integrated exhaust gas mass flow	>= 0.15	[kg]			
						for time	> 0.0	[s]			
						else: correct O2S front offset					
						check from current DCY and					
						no target fault from previous					
						DCY					
						conditions for active lambda diagnosis (referenced)	checked				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						requested lambda	<= 0.92	[-]			
						and					
						cumulated O2 mass flow into catalyst	>= 1.8	[g]			
						for time	> 0.2	[s]			
						additional conditions					
						no additional conditions calibrated					
	P2270 – O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	intrusive monitor	O2S sensor voltage	not calibrated	[V]	general conditions			0 (FTP75: 20.0) [s] once / DCY	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
		active O2S signal check without offset check - stuck low				conditions for active lambda diagnosis (referenced)	not calibrated				
						step 1					
						requested lambda	not calibrated	[-]			
						and					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						cumulated O2 mass flow into catalyst	not calibrated	[g]			
						for time	not calibrated	[s]			
						step 2 (only if no target fault					
						from previous DCY)					
						requested lambda	not calibrated	[-]			
						and					
						integrated exhaust gas mass flow	not calibrated	[kg]			
						for time	not calibrated	[s]			
						additional conditions					
						no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Oxygen Sensor (O2S) rear	P0137 – O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	O2S signal check - circuit continuity (circuit low)	difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements)	< 0.01	[V]	engine ECM drive mode battery voltage	running detected > 10.70	[V]	3.0 [s] multiple	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
	P0138 – O2 Sensor Circuit High Voltage Bank 1 Sensor 2	O2S signal check - circuit continuity (circuit high)	signal voltage	> 1.26	[V]	general conditions			0.2 [s] multiple	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ECM drive mode battery voltage engine internal resistance check during last dcy within number of successful resistance measurements and time between two successful resistance measurements main conditions below must be fulfilled for time internal resistance or O2S rear protective heating within	detected > 10.70 running successful > 10.00 <= 8 >= 0.2 <= 700.00 finished >= 15.0	[V] [-] [s] [s] [Ohm] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						time delay conditions for O2S sufficiently					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						heated up for time normalized heating power or EGT @ O2S rear internal sensor resistance is sufficiently low O2S readiness (based on internal resistance) within sensor voltage or sensor voltage O2S readiness (in case of sensor voltage stuck in the counter voltage band) sensor	>= 20.0 >= 0.25 >= 700 not calibrated not calibrated not calibrated not calibrated not calibrated>= 15.03 0.0	[s] [-] [°C] [V] [V] [V] [s] [s] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						voltage for time alternative conditions time after protection heating mode finished additional delay time					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						O2S is sufficiently electrically heated within time delay	not calibrated not calibrated	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Oxygen Sensor (O2S) rear	P0140 – O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	O2S signal check - circuit continuity (open circuit)	sensor signal line difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements)	>= 3.60	[V]	general conditions ECM drive mode	detected		0 [s] multiple	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
			sensor ground line			battery voltage	> 10.70	[V]			
			internal resistance	not calibrated	[Ohm]	engine	running				
			and			internal resistance check during last dcy	successful				
			EGT	not calibrated	[°C]	within					
						number of successful resistance measurements	> 10.00	[-]			
						and					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						time between two successful resistance measurements	8	[s]			
						main conditions below must					
						be fulfilled					
						for time	>= 0.2	[s]			
						internal resistance	<= 700.00	[Ohm]			
						or					
						O2S rear protective heating	finished				
						within					
						time delay	>= 15.0	[s]			
						conditions for O2S sufficiently					
						heated up					
						for time	>= 20.0	[s]			
						normalized heating power	>= 0.25	[-]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						EGT @ O2S rear	>= 700	[°C]			
						internal sensor resistance is					
						sufficiently low					
						O2S readiness (based on internal resistance)	not calibrated				
						within					
						sensor voltage	not calibrated	[V]			
						or					
						sensor voltage	not calibrated	[V]			
						O2S readiness (in case of					
						sensor voltage stuck in the					
						counter voltage band)					
						sensor voltage	not calibrated	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	not calibrated	[s]			
						alternative conditions					
						time after protection heating mode finished	>= 15.0	[s]			
						additional delay time	30.0	[s]			
						O2S is sufficiently electrically heated	not calibrated				
						within					
						time delay	not calibrated	[s]			
						conditions for fault suspicion					
						(only for "sensor signal line")					
						O2S rear signal voltage	0.40... 0.50	[V]			
						for time	>= 3.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						number of loaded measurements	3	[-]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						time delay between two load pulses (for confirming suspicion)	5.0	[s]			
Oxygen Sensor (O2S) Heater	P0037 – HO2S Heater Control Circuit Low Bank 1 Sensor 2	circuit low	signal voltage	<= 1.64... 1.96	[V]	general conditions			1.0 [s]	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
rear									continuous		
						duty cycle	<= 98	[%]			
						engine speed	>= 0	[rpm]			
						battery voltage	> 8.90; < 16.10	[V]			
						ECM drive mode	detected				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions for cold O2S with					
						dew point end and heater					
						readiness reached					
						battery voltage	<= 16.50	[V]			
						ECM post-drive	not detected				
						heating @ ECM pre-drive	not calibrated				
						or					
						engine	running				
						conditions for electrical start					
						only and heating @ stop					
						phase					
						electrical start (only drive motor)	not calibrated				
						normal heating @ stop phase or	active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						after engine stall					
						protection heating	active				
						above conditions must be					
						fulfilled					
						for time	>= 10.0	[s]			
						conditions for turning off					
						heating @ stop phase					
						wall temperature	not calibrated	[°C]			
						or					
						EGT	not calibrated	[°C]			
						above conditions must be					
						fulfilled					
						for time	>= 10.0	[s]			
						fast enable conditions (for					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						sufficient battery voltage or					
						AAT)					
						battery voltage	< 16.00	[V]			
						or					
						AAT	not calibrated	[°C]			
						for time	>= 5.0	[s]			
						conditions above must be					
						fulfilled					
						for time	>= 10.0	[s]			
	P0036 – HO2S Heater Control Circuit Bank 1 Sensor 2	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	general conditions			1.0 [s]	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
									continuous		
						duty cycle	<= 98	[%]			
						engine speed	>= 0	[rpm]			
						battery voltage	> 8.90	[V]			
						ECM drive mode	detected				
						conditions for dew point end					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage	<= 16.50	[V]			
						ECM post-drive	not detected				
						heating @ ECM pre-drive	not calibrated				
						or					
						engine	running				
						or					
						electrical start (only drive motor)	not equipped				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						normal heating @ stop phase or	active				
						after engine stall					
						protection heating	active				
						above conditions must be					
						fulfilled					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	>= 10.0	[s]			
						conditions for turning off					
						heating @ stop phase					
						wall temperature	not calibrated	[°C]			
						or					
						EGT	not calibrated	[°C]			
						above conditions must be					
						fulfilled					
						for time	>= 10.0	[s]			
						fast enable conditions (for					
						sufficient battery voltage or					
						AAT)					
						battery voltage	< 16.00	[V]			
						or					
						AAT	not calibrated	[°C]			
						for time	>= 5.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						conditions above must be					
						fulfilled					
						for time	>= 10.0	[s]			
	P0038 – HO2S Heater Control Circuit High Bank 1 Sensor 2	circuit high	signal current	>= 11.3	[A]	general conditions			1.0 [s]	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
									continuous		
						duty cycle	>= 3	[%]			
						engine speed	>= 0	[rpm]			
						battery voltage	> 8.90	[V]			
						ECM drive mode	detected				
						conditions for cold O2S with					
						dew point end and heater					
						readiness reached					
						battery voltage	<= 16.50	[V]			
						ECM post-drive	not detected				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						heating @ ECM pre-drive	not calibrated				
						or					
						engine	running				
						or					
						conditions for electrical start					
						only and heating @ stop					
						phase					
						electrical start (only drive motor)	not calibrated				
						normal heating @ stop phase or	active				
						after engine stall					
						protection heating	active				
						above conditions must be					
						fulfilled					
						for time	>= 10.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						conditions for turning off					
						heating @ stop phase					
						wall temperature	not calibrated	[°C]			
						or					
						EGT	not calibrated	[°C]			
						above conditions must be					
						fulfilled					
						for time	>= 10.0	[s]			
						fast enable conditions (for					
						sufficient battery voltage or					
						AAT)					
						battery voltage	< 16.00	[V]			
						or					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						AAT for time conditions above must be fulfilled for time	not calibrated >= 5.0 >= 10.0	[°C] [s] [s]			
Oxygen Sensor (O2S) Heater	P0141 – O2 Sensor Heater Circuit Bank 1 Sensor 2	out of range (during normal	internal resistance	> 300.00...131070.00	[Ohm]	general conditions			130.0 [s]	2 DCY	♦ Oxygen Sensor 1 After Catalytic Converter -GX7-
rear		heater operation after Dew Point							multiple		
		is exceeded)				O2S heated up for time	>= 45.0	[s]			
						modeled EGT	250...550	[°C]			
						modeled EGT	valid				
						IAT @ manifold	> -48	[°C]			
						engine off time	> 560.0	[s]			
						counter for engine off time	valid				
						engine	running				
						battery voltage	10.70...16.10	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						number of valid internal	> 10.00	[-]			
						resistance checks					
						fuel cut off	not active				
						O2S heater	commanded on				
						conditions after long stop					
						phase:					
						time after engine stop	>= 240.0	[s]			
						time after next engine start	>= 120.0	[s]			
Exhaust Pressure (EP) Sensor	P0473 – Exhaust Pressure Sensor "A" Circuit High	out of range high	exhaust pressure	> 500.00	[kPa]	conditions for sensor sufficiently heated up (none-			0.5 [s] continuous	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						icing conditions)					
						ECT @ engine start	>= 6	[°C]			
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
	P0472 – Exhaust Pressure Sensor "A" Circuit Low	out of range low	exhaust pressure	< 45.00	[kPa]	conditions for sensor sufficiently heated up (none-			0.5 [s] continuous	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						icing conditions)					
						ECT @ engine start	>= 6	[°C]			
						or					
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
Exhaust Pressure (EP) Sensor	P0471 – Exhaust Pressure Sensor "A" Circuit Range/ Performance	rationality check high	diff. exhaust pressure vs. BARO	> 42.11	[kPa]	engine speed	< 1000	[rpm]	1.0 [s] multiple	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						conditions for sensor					
						sufficiently heated up (none-					
						icing conditions)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ECT @ engine start	>= 6	[°C]			
						or					
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
	P0471 – Exhaust Pressure Sensor "A" Circuit Range/ Performance	rationality check low	diff. exhaust pressure vs. BARO	< -18.11	[kPa]	engine speed	< 1000	[rpm]	1.0 [s] multiple	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						conditions for sensor					
						sufficiently heated up (none-					
						icing conditions)					
						ECT @ engine start	>= 6	[°C]			
						or					
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
Exhaust Pressure (EP) Sensor	P0473 – Exhaust Pressure Sensor "A" Circuit High	circuit high	signal voltage	> 4.83	[V]	engine	running		0.5 [s] continuous	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0472 – Exhaust Pressure Sensor "A" Circuit Low	circuit low	signal voltage	< 0.18	[V]	engine	running		0.5 [s] continuous	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
Exhaust Pressure (EP) Sensor	P0471 – Exhaust Pressure Sensor "A" Circuit Range/ Performance	cross check	diff. exhaust pressure vs. average value of all pressure sensors @ start	> 10.00	[kPa]	conditions from previous DCY: ECT @ engine start	>= 6	[°C]	0 [s] once / DCY	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						or					
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
	P0471 – Exhaust Pressure Sensor "A" Circuit Range/ Performance	cross check	diff. exhaust pressure vs. average value of all pressure sensors @ start	< -10.00	[kPa]	conditions from previous DCY: ECT @ engine start	>= 6	[°C]	0 [s] once / DCY	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
Exhaust Pressure (EP) Sensor	P0471 – Exhaust Pressure Sensor "A" Circuit Range/ Performance	rationality check high	diff. exhaust pressure vs. upper threshold model	> 20.00	[kPa]	boost control	active		1.6 [s] multiple	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						engine speed	500... 7000	[rpm]			
						safety fuel deactivation	not active				
						cylinder deactivation (CD)	not active				
						throttle area adaptation	finished				
						lambda control	not calibrated				
						lambda control adaptation	not calibrated				
						conditions for sensor					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						sufficiently heated up (none-					
						icing conditions)					
						ECT @ engine start	>= 6	[°C]			
						or					
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
						additional conditions					
						no additional conditions calibrated					
	P0471 – Exhaust Pressure Sensor "A" Circuit Range/ Performance	rationality check low	diff. exhaust pressure vs. lower threshold model	< -20.00	[kPa]	boost control	active		1.6 [s] multiple	2 DCY	♦ Exhaust Pressure Sensor 1 - G450-
						engine speed	500... 7000	[rpm]			
						safety fuel deactivation	not active				
						cylinder deactivation (CD)	not active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
						throttle area adaptation	finished				
						lambda control	not calibrated				
						lambda controller adaptation	not calibrated				
						conditions for sensor					
						sufficiently heated up (none-					
						icing conditions)					
						ECT @ engine start	>= 6	[°C]			
						or					
						modeled sensor temperature	>= 0...10	[°C]			
						for time	>= 8.0	[s]			
						additional conditions					
						no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
Crankcase Oil Separator	P290C – Centrifugal Crankcase Oil Separator "A" Underspeed	intrusive monitor functional check - separator speed deviation	diff. measured vs. set point speed for time	< -25> 25.5	[rpm] [s]	speed set point LIN separator speed set point monitoring fuel in oil conditions (for separator speed set point active)	> 0 active active	[rpm]	25.5 [s] multiple	2 DCY	♦ Oil Pressure Regulation Valve - N428-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIllum	Component Diagnostic
						modeled fuel mass in engine oil	not calibrated	[g]			
						ECT downstream engine	not calibrated	[°C]			
						water in oil conditions (for					
						separator speed set point					
						active)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						modeled water mass in engine	not calibrated	[g]			
						oil					
						ECT downstream engine	not calibrated	[°C]			
						supply voltage condition (for					
						separator speed set point					
						active)					
						supply voltage	not calibrated	[V]			
						further conditions (for					
						separator speed set point					
						active)					
						modeled EOT	> 15	[°C]			
						ECM pre-drive	not detected				
						ECM post-drive	not detected				
						rocking function (in case of					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						fault suspicion)					
						rotational speed ramp-down	requested				
						(target speed to zero)					
						within					
						time delay @ zero speed	> 5.0	[s]			
						rotational speed ramp-up (zero	requested				
						to target speed)					
						within					
						time delay @ target speed	> 30.0	[s]			
						number of cycles (ramp -down	>= 5.00	[-]			
						and ramp-up)					
Crankcase Oil Separator	P290B – Centrifugal Crankcase Oil Separator "A" Stuck/Stalled	intrusive monitor	diff. measured vs. set point rotational angle @ actuator start-up	> 90	[Â°]	speed set point	> 0	[rpm]	0 [s] multiple	2 DCY	♦ Oil Pressure Regulation Valve - N428-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		actuator internal check - blocked actuator	or diff. measured vs. set point rotational angle @ actuator start-up	> 8.24	[Â°]	LIN fuel in oil conditions (for separator speed set point active)	active				
			for time	>= 1.2	[ms]	modeled fuel mass in engine oil	not calibrated	[g]			
			rotational actuator speed			ECT downstream engine	not calibrated	[°C]			
			during closed loop control								
			measured speed	< 1500	[rpm]	water in oil conditions (for					
						separator speed set point					
						active)					
			for time	>= 10	[ms]	modeled water mass in engine oil	not calibrated	[g]			
			or			ECT downstream engine	not calibrated	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
			measured speed	> 20000	[rpm]	supply voltage condition (for					
						separator speed set point					
						active)					
			for time	>= 13	[ms]	supply voltage	not calibrated	[V]			
						further conditions (for					
						separator speed set point					
						active)					
						modeled EOT	> 15	[°C]			
						ECM predrive	not detected				
						ECM postdrive	not detected				
						rocking function (in case of					
						fault suspicion)					
						rotational speed rampdown (target speed to zero)	requested				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						within time delay @ zero speed rotational speed ramp-up (zero to target speed)within time delay @ target speed number of cycles (ramp -down and ramp-up)	> 5.0 requested > 30.0 >= 5.00	[s] [s] [-]			
Crankcase Oil Separator	P290A – Centrifugal Crankcase Oil Separator "A" Performance	intrusive monitor	separator speed set point monitoring	not active		speed set point	> 0	[rpm]	25.5 [s] multiple	2 DCY	♦ Oil Pressure Regulation Valve - N428-
		actuator internal check - set point monitoring				LIN fuel in oil conditions (for	active				
						separator speed set point					
						active)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						modeled fuel mass in engine oil	not calibrated	[g]			
						ECT downstream engine	not calibrated	[°C]			
						water in oil conditions (for					
						separator speed set point					
						active)					
						modeled water mass in engine oil	not calibrated	[g]			
						ECT downstream engine	not calibrated	[°C]			
						supply voltage condition (for					
						separator speed set point					
						active)					
						supply voltage	not calibrated	[V]			
						further conditions (for					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						separator speed set point					
						active)					
						modeled EOT	> 15	[°C]			
						ECM pre-drive	not detected				
						ECM post-drive	not detected				
						rocking function (in case of					
						fault suspicion)					
						rotational speed ramp-down (target speed to zero)	requested				
						within					
						time delay @ zero speed	> 5.0	[s]			
						rotational speed ramp-up (zero to target speed)	requested				
						within					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						time delay @ target speed	> 30.0	[s]			
						number of cycles (ramp-down and ramp-up)	>= 5.00	[-]			
Crankcase Oil Separator	P2904 – Centrifugal Crankcase Oil Separator "A" Supply Circuit/ Open	intrusive monitor	case 1			speed set point	> 0	[rpm]			♦ Oil Pressure Regulation Valve - N428-
		actuator internal check - supply voltage	supply voltage	< 6.5; > 18	[V]	LIN	active		0 [s] multiple	2DCY	
			for time	> 200	[ms]	fuel in oil conditions (for					
						separator speed set point					
						active)					
			case 2			modeled fuel mass in engine oil	not calibrated	[g]			
			supply voltage	< 6; > 24	[V]	ECT downstream engine	not calibrated	[°C]			
			for time	> 230	[Âµs]	water in oil conditions (for					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						separator speed set point					
						active)					
			case 3			modeled water mass in engine oil	not calibrated	[g]			
			supply voltage	> 16	[V]	ECT downstream engine	not calibrated	[°C]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			for time	> 120	[min]	supply voltage condition (for					
						separator speed set point					
						active)					
			case 4			supply voltage	not calibrated	[V]			
			supply voltage	> 17	[V]	further conditions (for					
						separator speed set point					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						active)					
			for time	> 60	[min]	modeled EOT	> 15	[°C]			
			case 5			ECM pre-drive	not detected				
			internal supply voltage	error detected		ECM post-drive	not detected				
			for time	> 20	[ms]	rocking function (in case of					
						fault suspicion)					
						rotational speed ramp-down (target speed to zero)	requested				
						within					
						time delay @ zero speed	> 5.0	[s]			
						rotational speed ramp-up (zero to target speed)	requested				
						within					
						time delay @ target speed	> 30.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						number of cycles (ramp-down and ramp-up)	>= 5.00	[-]			
Crankcase Oil Separator	P290A – Centrifugal Crankcase Oil Separator "A" Performance	intrusive monitor	case 1			speed set point	> 0	[rpm]			♦ Oil Pressure Regulation Valve - N428-
		actuator internal check - electrical check	power-stage temperature	< -45	[°C]	LIN	active		0 [s] multiple	2 DCY	
			for time	> 200	[ms]	fuel in oil conditions (for					
						separator speed set point					
						active)					
			case 2			modeled fuel mass in engine oil	not calibrated	[g]			
			A/D converter input voltage	< 1.34; > 2.69	[V]	ECT downstream engine	not calibrated	[°C]			
			case 3			water in oil conditions (for					
						separator speed set point					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						active)					
			task scheduler	error detected		modeled water mass in engine oil	not calibrated	[g]			
			for time	> 20	[ms]	ECT downstream engine	not calibrated	[°C]			
			case 4			supply voltage condition (for					
						separator speed set point					
						active)					
			parameter mismatch EPROM vs. software version	detected		supply voltage	not calibrated	[V]			
			case 5			further conditions (for					
						separator speed set point					
						active)					
			memory initialization	error detected		modeled EOT	> 15	[°C]			
			case 6			ECM pre-drive	not detected				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
			memory usage (parameter saving)	error detected		ECM post-drive rocking function (in case of	not detected				
						fault suspicion)					
						rotational speed ramp-down (target speed to zero)	requested				
						within					
						time delay @ zero speed	> 5.0	[s]			
						rotational speed ramp-up (zero to target speed)	requested				
						within					
						time delay @ target speed	> 30.0	[s]			
						number of cycles (ramp -down and ramp-up)	>= 5.00	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Crankcase Oil Separator	P2909 – Centrifugal Crankcase Oil Separator "A" Current Too High	intrusive monitor	over current			speed set point	> 0	[rpm]			♦ Oil Pressure Regulation Valve - N428-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		actuator internal check - current	internal fault voltage	> 1.5	[V]	LIN	active		0 [s]	2DCY	
		monitoring	(powerstage)						multiple		
			for time	> 4	[Âµs]	fuel in oil conditions (for					
						separator speed set point					
						active)					
			or			modeled fuel mass in engine oil	not calibrated	[g]			
			phase current (during start-up	> 40	[A]	ECT downstream engine	not calibrated	[°C]			
			mode)								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			for time	> 20	[ms]	water in oil conditions (for					
						separator speed set point					
						active)					
			or			modeled water mass in engine	not calibrated	[g]			
						oil					
			phase current (during run mode)	> 18	[A]	ECT downstream engine	not calibrated	[°C]			
			for time	> 20	[ms]	supply voltage condition (for					
						separator speed set point					
						active)					
			or			supply voltage	not calibrated	[V]			
			line current (during run mode)	< -15	[A]	further conditions (for					
						separator speed set point					
						active)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			for time	> 200	[ms]	modeled EOT	> 15	[°C]			
			or			ECM predrive	not detected				
			line current (during run mode)	> 15	[A]	ECM postdrive	not detected				
			for time	> 200	[ms]	rocking function (in case of					
						fault suspicion)					
						rotational speed rampdown	requested				
						(target speed to zero)					
						within					
						time delay @ zero speed	> 5.0	[s]			
						rotational speed rampup (zero	requested				
						to target speed)					
						within					
						time delay @ target speed	> 30.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
						number of cycles (ramp -down	>= 5.00	[-]			
						and ramp-up)					
Crankcase Oil Separator	P2907 – Centrifugal Crankcase Oil separator "A" Temperature Too High	intrusive monitor	power-stage temperature	> 175	[°C]	speed set point	> 0	[rpm]	0 [s] multiple	2 DCY	♦ Oil Pressure Regulation Valve - N428-
		actuator internal check - over temperature	for time or	> 200	[ms]	LIN fuel in oil conditions (for	active				
						separator speed set point					
						active)					
			inverter temperature	> 148	[°C]	modeled fuel mass in engine oil	not calibrated	[g]			
			for time	> 500	[ms]	ECT downstream engine	not calibrated	[°C]			
			temperature limitation			water in oil conditions (for					
						separator speed set point					
						active)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			inverter temperature	> 145	[°C]	modeled water mass in engine oil	not calibrated	[g]			
			for time	> 200	[ms]	ECT downstream engine	not calibrated	[°C]			
						supply voltage condition (for					
						separator speed set point					
						active)					
						supply voltage	not calibrated	[V]			
						further conditions (for					
						separator speed set point					
						active)					
						modeled EOT	> 15	[°C]			
						ECM predrive	not detected				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ECM post-drive	not detected				
						rocking function (in case of					
						fault suspicion)					
						rotational speed ramp-down (target speed to zero)	requested				
						within					
						time delay @ zero speed	> 5.0	[s]			
						rotational speed ramp-up (zero to target speed)	requested				
						within					
						time delay @ target speed	> 30.0	[s]			
						number of cycles (ramp -down and ramp-up)	>= 5.00	[-]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Cooling System	P2181 – Cooling System Performance	cooling system performance not	cooling system temperature too	< 54...65	[°C]	monitor entry conditions:			0 (Unified 500.0) [s]	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83- ♦ Engine Coolant Temperature Sensor on Engine - G82- ♦ Check the engine coolant thermostat. Refer to appropriate repair manual.
		in the expected range	low after a sufficient MAF						once / DCY		
			integral								
			for time	>= 10.0	[s]	ECT downstream engine @ start	-10...46	[°C]			
						and					
						AAT	-10...3004	[°C]			
						or					
						IAT @ manifold	not calibrated	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
						begin of air mass integration:					
						ECT downstream engine	> 10	[°C]			
						conditions for diagnosis:					
						MAF	< 3276.70	[kg/h]			
						delta BARO	< 3276.70	[kPa]			
						delta AAT	< 3003.6	[K]			
						and					
						accum. time required	not calibrated	[s]			
						or					
						accum. integrated air mass	< 0.20... 1.20	[kg]			
						accumulation enable if					
						fuel cut off	active				
						or					
						engine load	not calibrated	[%]			
						or					
						engine load	< 18.01	[%]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						start of fault decision:					
						integrated air mass	> 2.74...8.24	[kg]			
						conditions at fault decision:					
						(average values since start)					
						MAF (lower threshold)	>= 22.80...69.10	[kg/h]			
						MAF (upper threshold)	<= 57.70...189.50	[kg/h]			
						vehicle speed (lower threshold)	>= 20...30	[km/h]			
						vehicle speed (upper threshold)	<= 120	[km/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Cooling System	P2181 – Cooling System Performance	cooling system performance not in the expected range	filtered ECT downstream engine	< 54	[°C]	general			0 (Unified 945.0) [s] once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83- ♦ Engine Coolant Temperature Sensor on Engine - G82- ♦ Check the engine coolant thermostat. Refer to appropriate repair manual.
			for time	>= 10.0	[s]	AAT	> -10	[°C]			
						air mass flow integral	> 2.9...7.8	[g]			
						or					
						modeled ECT	not calibrated	[°C]			
						for					
						ECT once after engine start	> 50...66	[°C]			
						valid operating points					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine	running				
						for time	> 20.0	[s]			
						fuel cut off	not active				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	> 20.0	[s]			
						modeled ECT	not calibrated	[°C]			
						thermostat overdrive	not detected				
						for time	> 20.0	[s]			
						vehicle speed	> -328	[km/h]			
						and					
						vehicle speed	< 328	[km/h]			
						for time	> 20.0	[s]			
						engine load	> 25.00	[%]			
						and					
						engine load	< 399.99	[%]			
						for time	> 200.0	[s]			
						additional conditions for re-					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						entry after strong ECT drop					
						integrated air mass flow during	> 1000.0...5000.0	[g]			
						valid operating points					
						depending on					
						min. AAT @ current DCY	-10...45	[°C]			
						ECT @ entry of valid operating	20...50	[°C]			
						points					
						all conditions above (except					
						general) must be fulfilled					
						for time	> 10.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Cooling System	P0125 – Insufficient Coolant Temperature for Closed Loop Fuel Control	engine coolant temperature too low after a sufficient time	ECT	< 31	[°C]	general			0 [s] once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83- ♦ Engine Coolant Temperature Sensor on Engine - G82- ♦ Check the engine coolant thermostat. Refer to appropriate repair manual.
			depending on			timer value since first engine start	>= 119.0...3100.0	[s]			
			ECT @ start	-40...40	[°C]	depending on					
						diff. ECT for closed loop enable vs. actual ECT	-0.1...70.0	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions for timer start/					
						increment					
						engine	running				
						conditions for timer freeze					
						fuel cut off	not calibrated				
						or					
						fuel volume flow	<= 3.60	[l/h]			
						above conditions must be					
						fulfilled					
						for time	<= 2.0	[s]			
						conditions for timer					
						decrement					
						fuel cut off	active				
						or					
						fuel volume flow	<= 0.00	[l/h]			
						above conditions must be					
						fulfilled					
						for time	> 1.0...5.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						depending on					
						AAT	-40...40	[°C]			
						timer set value	119.0...500.0	[s]			
						conditions for timer reset					
						fuel cut off	not calibrated				
						or					
						fuel volume flow	not calibrated	[l/h]			
						above conditions must be					
						fulfilled					
						for time	not calibrated	[s]			
						depending on					
						AAT	not calibrated	[°C]			
						or					
						for accumulated time	not calibrated	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						depending on AAT timer set value	not calibrated not calibrated	[°C] [s]			
Engine Cooling System: Bypass Actuator	P2B61 – Engine Coolant Flow Control Valve Stuck Closed	intrusive monitor	difference between target and actual position	< 5.00; > 10.00	[%]	engine	running		11.6 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
		functional check: stuck open	and								
			engine cooling system bypass valve position	< 80.00	[%]						
	P2B61 – Engine Coolant Flow Control Valve Stuck Closed	intrusive monitor	difference between target and actual position	< 5.00; > 10.00	[%]	engine	running		11.6 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
		functional check: stuck closed	and								
			engine cooling system bypass valve position	>= 80.00	[%]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Cooling System: Bypass Actuator	P2B5A – Engine Coolant Flow Control Valve Control Circuit Low	circuit low	signal current	>= 6.90... 11.50	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
	P2B59 – Engine Coolant Flow Control Valve Control Circuit/Open	open circuit	load resistance	> 50.00	[kOhm]	actuator	commanded off		0.6 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
	P2B5B – Engine Coolant Flow Control Valve Control Circuit High	circuit high	signal current	>= 6.70... 11.10	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
Engine Cooling System: Bypass Actuator	P2B60 – Engine Coolant Flow Control Valve Position Sensor Circuit Range/ Performance	sooting of bypass valve	position sensor voltage	> 0.60	[V]	engine	not running		0 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
						battery voltage ECT downstream engine actuator	9.00... 16.00 -40...120 commanded on	[V] [°C]			
	P2B60 – Engine Coolant Flow Control Valve Position Sensor Circuit Range/ Performance	sooting of bypass valve	position sensor voltage	< 0.26	[V]	engine	not running		0 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage ECT downstream engine actuator	9.00...16.00 -40...120 commanded on	[V] [°C]			
Engine Cooling System: Bypass Actuator	P2B60 – Engine Coolant Flow Control Valve Position Sensor Circuit Range/ Performance	mechanical bound between sensor and upper end stop	position sensor voltage	> 4.71	[V]	engine	not running		0.5 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
	P2B60 – Engine Coolant Flow Control Valve Position Sensor Circuit Range/ Performance	mechanical bound between sensor and lower end stop	position sensor voltage	< 0.26	[V]	engine	not running		0.5 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
Supplementary Coolant Pump	P261C – Coolant Pump "B" Control Circuit Low	circuit low	signal voltage	< 1.64...1.96	[V]	actuator	commanded off		0.5 [s] continuous	2 DCY	♦ Low Temperature Circuit Coolant Pump - V468-
						battery voltage	>= -655.36	[V]			
						for time	>= 0	[ms]			
	P261A – Coolant Pump "B" Control Circuit/Open	open circuit	signal voltage	>= 1.64...1.96; <= 2.73...3.27	[V]	actuator	commanded off		0.5 [s] continuous	2 DCY	♦ Low Temperature Circuit Coolant Pump - V468-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage	>= -655.36	[V]			
						for time	>= 0	[ms]			
	P261D – Coolant Pump "B" Control Circuit High	circuit high	signal current	>= 0.6...1.4	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Low Temperature Circuit Coolant Pump - V468-
						battery voltage	>= -655.36	[V]			
						for time	>= 0	[ms]			
Drive Motor Coolant Bypass Actuator	P2B5F – Engine Coolant Flow Control Valve Position Sensor Circuit High	circuit high	signal voltage	> 4.75	[V]				0.5 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
Drive Motor Coolant Bypass Actuator	P2B5E – Engine Coolant Flow Control Valve Position Sensor Circuit Low	circuit low	signal voltage	< 0.15	[V]				0.5 [s] continuous	2 DCY	♦ Engine Temperature Control Module - GX33-
Engine Oil Pressure (EOP) Control	P0524 – Engine Oil Pressure Too Low	functional check	EOP	< 65.00...165.00	[kPa]	engine speed	> 500	[rpm]	3.0 [s] continuous	2 DCY	♦ Oil Pressure Sensor - G10-
						for time	> 2.0...25.0	[s]			
						additional delay time					
						(depending on engine speed					
						and EOT)					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						delay time	> 0.0...5.0	[s]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Oil Pressure (EOP) Sensor	P0521 – Engine Oil Pressure Sensor/ Switch "A" Range/ Performance	rationality check	EOP @ ECM post-drive	> | 70.00 |	[kPa]	general conditions			3.0 [s] continuous	2 DCY	♦ Oil Pressure Sensor - G10-
						EOT	> 40	[°C]			
						ECM drive	not active				
						engine	not running				
						for time	> 30.0	[s]			
						additional conditions for					
						prolonged ECM post-drive					
						ECM post-drive	active				
						engine	not running				
						for time	<= 30.0	[s]			
						if any additional condition					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						above is not fulfilled then					
						delay time (prolonged ECM post-drive)	>= 0.0	[s]			
Engine Coolant Temperature	P01E4 – Engine Coolant Temperature Sensor 3 Circuit Range/ Performance	rationality check high	ECT @ crankcase @ start	> 25...85	[°C]	engine off time	> 360.00	[min]	5.0 [s]	2 DCY	♦ Engine Coolant Temperature Sensor on Engine - G82-
(ECT) Sensor @ Crankcase									once / DCY		
						engine	running				
						for time	>= 5.0	[s]			
Engine Coolant Temperature (ECT) Sensor @ Crankcase	P01E4 – Engine Coolant Temperature Sensor 3 Circuit Range/ Performance	rationality check low	diff. ECT @ crankcase @ start vs. minimum temperature from cross check	< -24.8	[K]	cross check (temperature)	finished		0 [s]once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor on Engine - G82-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Coolant Temperature (ECT) Sensor downstream engine	P0117 – Engine Coolant Temperature Sensor 1 Circuit Low	circuit low	signal voltage	<= 0.20	[V]				0.5 [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-
Engine Coolant Temperature (ECT) Sensor downstream engine	P0118 – Engine Coolant Temperature Sensor 1 Circuit High	circuit high	signal voltage	>= 4.98	[V]				0.5 [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Coolant Temperature (ECT) Sensor downstream	P3081 – Engine Temperature Too Low	rationality check low	diff. modeled vs. measured ECT downstream engine	> 10.0	[K]	engine	running		0 (FTP75: 240.0) [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83- ♦ Engine Coolant Temperature Sensor on Engine - G82- ♦ Check the engine coolant thermostat. Refer to appropriate repair manual.
engine											
			or			residual heat	not detected				
			diff. measured vs. modeled ECT downstream engine	not calibrated	[K]	ECT downstream engine @ start	<= 3004	[°C]			
						reference model ECT	>= -3550	[°C]			
						engine speed	>= 0	[rpm]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for					
						time required	> 0.0	[s]			
Engine Coolant Temperature (ECT) Sensor @ Crankcase	P01E5 – Engine Coolant Temperature Sensor 3 Circuit Low	circuit low	signal voltage	<= 0.20	[V]				0.5 [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor on Engine - G82-
Engine Coolant Temperature (ECT) Sensor @ Crankcase	P01E6 – Engine Coolant Temperature Sensor 3 Circuit High	circuit high	signal voltage	>= 4.98	[V]				0.5 [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor on Engine - G82-
Engine Coolant Temperature (ECT) Sensor downstream	P0116 – Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	rationality check: stuck sensor signal	diff. max. vs. min. ECT downstream engine	< 1.5	[K]	Monitor Entry Conditions: Case 1:			0 (FTP75: 220.0) [s] once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-
engine											
						engine off time	not calibrated	[s]			
						Case 2:					
						ECT downstream engine @ start	not calibrated	[°C]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						Case 3:					
						engine off time	> 0.0	[s]			
						or					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ECT downstream engine @ start	< 3004; > not calibrated	[°C]			
						driving condition H (low					
						cooling performance,					
						substantial engine warm-up):					
						vehicle speed	0...50	[km/h]			
						MAF (lower threshold)	4.00... 60.00	[kg/h]			
						MAF (upper threshold)	300.00	[kg/h]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						reference model ECT	> -3550	[°C]			
						for					
						time required	> 25.0	[s]			
						frequency	2	times			
						driving condition L (high					
						cooling performance,					
						substantial engine cool-					
						down):					
						vehicle speed	30...300	[km/h]			
						MAF (lower threshold)	0.00	[kg/h]			
						MAF (upper threshold)	20.00...52.00	[kg/h]			
						or					
						fuel cut off	active				
						for					
						time required	> 10.0	[s]			
						frequency	2	times			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Coolant Temperature (ECT) Sensor downstream	P0116 – Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	rationality check high	ECT downstream engine @ start	> 25...85	[°C]	engine off time	> 21600.0	[s]	5.0 [s] once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-
engine						engine	running				
						for time	>= 5.0	[s]			
						Block heater not detected:					
						ECT downstream engine @ start vs. minimum ECT downstream engine since start	not calibrated	[K]			
Engine Coolant Temperature (ECT) Sensor downstream engine	P0116 – Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	rationality check low	ECT downstream engine @ start vs. minimum temperature from cross check	< -20.0	[K]	cross check (temperature)	finished		0 [s] once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor - G62- ♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet	P2184 – Engine Coolant Temperature Sensor 2 Circuit Low	circuit low	signal voltage	< 0.20	[V]				0.50 [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-
	P2185 – Engine Coolant Temperature Sensor 2 Circuit High	circuit high	signal voltage	> 4.98	[V]				0.50 [s] continuous	2 DCY	♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83- ♦ Engine Coolant Temperature Sensor - G62-
Engine Coolant Temperature	P2183 – Engine Coolant Temperature Sensor 2 Circuit Range/ Performance	rationality check high	ECT @ radiator outlet @ start	> 25...85	[°C]	engine off time	> 21600.0	[s]	5.0 [s]	2 DCY	♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-
(ECT) Sensor @ Radiator									once / DCY		
Outlet						engine	running				
						for time	>= 5.0	[s]			
Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet	P2183 – Engine Coolant Temperature Sensor 2 Circuit Range/ Performance	rationality check low	ECT @ radiator outlet @ start vs. minimum temperature from cross check	< -25.0	[K]	cross check (temperature)	finished		0 [s] once / DCY	2 DCY	♦ Engine Coolant Temperature Sensor on Radiator Outlet - G83-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Variable Valve Timing (VVT) Intake Actuator	P000A – "A" Camshaft Position Slow Response Bank 1	slow response	difference between target position vs. actual position for time and adjustment angle and number of checks	> | 3.00 | > 2.0...3.0 > | 3.00 | 3	[°CRK] [s] [°CRK] times	time after engine start modeled oil temperature engine speed camshaft position adjustment catalyst heating change of target position battery voltage	> 5.0...300.0 -10...120600...6000 active not active > | 10.00...20.00| > 9.00	[s] [°C] [rpm] [°CRK] [V]	3.5 [s] multiple	2 DCY	♦ Intake Camshaft Adjustment Valve 1 -N727- ♦ Camshaft Position Sensor -G40- ♦ Fuel Metering Valve -N290- ♦ Engine Speed Sensor -G28-
	P0011 – "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	target error	difference between target position vs. actual position	> | 3.00 |	[°CRK]	time after engine start	> 5.0...300.0	[s]	3.5 [s] multiple	2 DCY	♦ Engine Speed Sensor -G28- ♦ Camshaft Position Sensor -G40- ♦ Intake Camshaft Adjustment Valve 1 -N727-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			for time and adjustment angle and number of checks	> 2.0...3.0 <= | 3.00 | 3	[s] [°CRK] times	modeled oil temperature engine speed camshaft position adjustment catalyst heating change of target position battery voltage	-10...120600...6000 active not active > | 10.00...20.00| > 9.00	[°C] [rpm] [°CRK] [V]			
Variable Valve Timing (VVT) Intake Actuator	P2088 – "A" Camshaft Position Actuator Control Circuit Low Bank 1	circuit low	signal voltage	<= 1.64...1.96	[V]	actuator	commanded off	[rpm] [V]	1.0 [s] continuous	2 DCY	♦ Camshaft Position Sensor -G40- ♦ Intake Camshaft Adjustment Valve 1 -N727-
						engine speed battery voltage	>= 0> 8.90; < 16.10				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0010 – "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	actuator	commanded off	[rpm] [V]	1.0 [s] continuous	2 DCY	♦ Engine Speed Sensor -G28- ♦ Camshaft Position Sensor -G40- ♦ Intake Camshaft Adjustment Valve 1 -N727-
						engine speed battery voltage	>= 0> 8.90; < 16.10				
	P2089 – "A" Camshaft Position Actuator Control Circuit High Bank 1	circuit high	signal current	>= 4.0	[A]	actuator	commanded on	[rpm] [V]	1.0 [s] continuous	2 DCY	♦ Camshaft Position Sensor -G40- ♦ Intake Camshaft Adjustment Valve 1 -N727-
						engine speed battery voltage	>= 0> 8.90; < 16.10				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Cold Start Monitoring	P052A – Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	target error	diff. target vs. actual position	> | 6.00|	[°CRK]	time after engine start	not calibrated	[s]	2.5 [s] once / DCY	2 DCY	♦ Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. ♦ Intake Camshaft Adjustment

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											Valve 1 -N727-
Variable Valve Timing (VVT)						modeled oil temperature	-10...150	[°C]			
Intake Actuator						engine speed	> 600...1120	[rpm]			
						camshaft position adjustment intake	active				
						catalyst heating	active				
						commanded camshaft timing correction for catalyst heating	active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Cold Start Monitoring	P054A – Cold Start "B" Camshaft Position Timing Over-Advanced Bank 1	target error	diff. target vs. actual position	> | 5.00... 6.00|	[°CRK]	time after engine start	not calibrated	[s]	2.5 [s]once / DCY	2 DCY	♦ Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. ♦ Exhaust Camshaft Adjustment

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											Valve 1 -N318-
Variable Valve Timing (VVT)						modeled oil temperature	-10...150	[°C]			
Exhaust Actuator						engine speed	> 600... 1120	[rpm]			
						camshaft position adjustment exhaust	active				
						catalyst heating	active				
						commanded camshaft timing correction for catalyst heating	active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Variable Valve Timing (VVT) Exhaust Actuator	P000B – "B" Camshaft Position Slow Response Bank 1	slow response	difference between target position vs. actual position for time and adjustment angle and number of checks	> | 3.00 | > 2.0...3.0 > | 3.00 | 3	[°CRK] [s] [°CRK] times	time after engine start modeled oil temperature engine speed camshaft position adjustment catalyst heating change of target position battery voltage	> 5.0...300.0-10...120600...6000 active not active > | 8.00...16.00| >= 9.00	[s] [°C] [rpm] [°CRK] [V]	3.5 [s] multiple	2 DCY	♦ Exhaust Camshaft Adjustment Valve 1 -N318-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0014 – "B" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	target error	difference between target position vs. actual position for time and adjustment angle and number of checks	> | 3.00 | > 2.0...3.0 <= | 3.00 | 3	[°CRK] [s] [°CRK] times	time after engine start modeled oil temperature engine speed camshaft position adjustment catalyst heating change of target position battery voltage	> 5.0...300.0 -10...120600...6000 active not active > | 8.00...16.00| >= 9.00	[s] [°C] [rpm] [°CRK] [V]	3.5 [s] multiple	2 DCY	♦ Exhaust Camshaft Adjustment Valve 1 -N318- ♦ Intake Camshaft Adjustment Valve 1 -N727-
Variable Valve Timing (VVT) Exhaust Actuator	P2090 – "B" Camshaft Position Actuator Control Circuit Low Bank 1	circuit low	signal voltage	<= 1.64...1.96	[V]	actuator	commanded off	[rpm] [V]	1.0 [s] continuous	2 DCY	♦ Exhaust Camshaft Adjustment Valve 1 -N318-
						engine speed battery voltage	>= 0> 8.90; < 16.10				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0013 – "B" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	actuator	commanded off	[rpm]	1.0 [s] continuous	2 DCY	♦ Exhaust Camshaft Adjustment Valve 1 -N318- ♦ Intake Camshaft Adjustment Valve 1 -N727-
						engine speed	>= 0				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						battery voltage	> 8.90; < 16.10	[V]			
	P2091 – "B" Camshaft Position Actuator Control Circuit High Bank 1	circuit high	signal current	>= 4.0	[A]	actuator engine speed battery voltage	commanded on >= 0 > 8.90; < 16.10	[rpm] [V]	1.0 [s] continuous	2 DCY	♦ Exhaust Camshaft Adjustment Valve 1 -N318-
Camshaft Position (CMP) Sensor	P03EB – "A" Camshaft Profile Actuator Position Sensor "C" Exceeded Learning Limit	rationality check	correction value for each cylinder caused by tolerances during production	not programmed					0.5 [s] continuous	1 DCY	♦ Camshaft Position Sensor 3 - G300-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Intake Camshaft Position (CMP) Sensor	P0343 – Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	circuit high	signal voltage and crankshaft signal counter	permanently high>= 8	[-]				0.5 [s] continuous	2 DCY	♦ Camshaft Position Sensor - G40- ♦ Camshaft Position Sensor 3 - G300- ♦ Engine Speed Sensor - G28-
	P0342 – Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	circuit low	signal voltage and crankshaft signal counter	permanently low>= 8	[-]				0.5 [s] continuous	2 DCY	♦ Camshaft Position Sensor - G40- ♦ Camshaft Position Sensor 3 - G300- ♦ Engine Speed Sensor - G28-
	P0341 – Camshaft Position Sensor "A" Circuit Range/ Performance Bank 1 or Single Sensor	rationality check	signal pattern defect counter	incorrect 24	[-]				0.5 [s] continuous	2 DCY	♦ Camshaft Position Sensor - G40- ♦ Camshaft Position Sensor 3 - G300- ♦ Engine Speed Sensor - G28-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Intake Camshaft Position	P0016 – Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	angular offset check	permissible deviation	< -8.02	[°CRK]	camshaft adaptation	not completed		8 [rev]	2 DCY	♦ Engine Speed Sensor -G28- ♦ Camshaft Position Sensor -G40- ♦ Intake Camshaft Adjustment Valve 1 -N727-
(CMP) Sensor									multiple		
			or			engine speed	> 80	[rpm]			
			permissible deviation	> 8.02	[°CRK]						
Intake Camshaft Position (CMP) Sensor	P0016 – Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	rationality check (only once after EEPROM reset)	difference between target position vs. actual position	> 8.02	[°CRK]	engine speed	> 80	[rpm]	1.0 [s] / once per lifetime	1 DCY	♦ Engine Speed Sensor -G28- ♦ Camshaft Position Sensor -G40- ♦ Intake Camshaft Adjustment Valve 1 -N727-
			for			condition for empty EEPROM					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			camshaft signals or	> 4.00	[-]	camshaft adaptation @ 1st start in lifetime	not finished				
			difference between target position vs. actual position	< 8.02	[°CRK]						
			for								
			camshaft signals	> 4.00	[-]						
Intake Camshaft Position (CMP) Sensor	P03EA – "A" Camshaft Profile Actuator Position Sensor "B" Exceeded Learning Limit	rationality check	correction value of intake camshaft caused by tolerances of installed position of intake CMP sensor and flywheel	not programmed					0.5 [s] continuous	1 DCY	♦ Camshaft Position Sensor 3 - G300-
Exhaust Camshaft Position (CMP) Sensor	P0368 – Camshaft Position Sensor "B" Circuit High Bank 1	circuit high	signal voltage and crankshaft signal counter	permanently high >= 8	[-]				0.5 [s] continuous	2 DCY	♦ Camshaft Position Sensor 3 - G300- ♦ Engine Speed Sensor - G28-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0367 – Camshaft Position Sensor "B" Circuit Low Bank 1	circuit low	signal voltage and crankshaft signal counter	permanently low >= 8	[-]				0.5 [s] continuous	2 DCY	♦ Camshaft Position Sensor 3 - G300- ♦ Engine Speed Sensor - G28-
	P0366 – Camshaft Position Sensor "B" Circuit Range/ Performance Bank 1	rationality check	signal pattern defect counter	incorrect 24	[-]				0.5 [s] continuous	2 DCY	♦ Camshaft Position Sensor 3 - G300- ♦ Engine Speed Sensor - G28-
Exhaust Camshaft Position	P0017 – Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	angular offset check	permissible deviation	< -8.02	[°CRK]	camshaft adaptation	not completed		8.0 [rev]	2 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40- ♦ Exhaust Camshaft Adjustment Valve 1 -N318-
(CMP) Sensor									multiple		
			or			engine speed	> 80	[rpm]			
			permissible deviation	> 8.02	[°CRK]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Exhaust Camshaft Position (CMP) Sensor	P0017 – Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	rationality check (only once after EEPROM reset)	difference between target position vs. actual position	> 8.02	[°CRK]	engine speed	> 80	[rpm]	1.0 [s] / once per lifetime	1 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40- ♦ Exhaust Camshaft Adjustment Valve 1 -N318-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			for			condition for empty EEPROM					
			camshaft signals or	> 4.00	[-]	camshaft adaptation @ 1st start in lifetime	not finished				
			difference between target position vs. actual position	< 8.02	[°CRK]						
			for								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			camshaft signals	> 4.00	[-]						
Exhaust Camshaft Position (CMP) Sensor	P03E9 – "A" Camshaft Profile Actuator Position Sensor "A" Exceeded Learning Limit	rationality check	correction value of exhaust camshaft caused by tolerances of installed exhaust CMP sensor and flywheel	not programmed					0.5 [s] continuous	1 DCY	♦ Camshaft Position Sensor - G40-
Crankshaft Position (CKP) Sensor	P0321 – Ignition/ Distributor Engine Speed Input Circuit Range/ Performance	rationality check	counted teeth vs. reference	> 80.00	[-]	vehicle speed	< 1; > 25	[km/h]	8 [rev] continuous	2 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor 3 - G300- ♦ Camshaft Position Sensor - G40-
			or monitoring reference gap	failure		or engine speed or actual engine state or engine speed gradient	> 500 cranking > -8000.00	[rpm] [rpm/s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0322 – Ignition/ Distributor Engine Speed Input Circuit No Signal	signal activity check	camshaft signals	> 3.00	[-]	vehicle speed	< 1; > 25	[km/h]	3 [rev] continuous	2 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor 3 - G300- ♦ Camshaft Position Sensor - G40-
			and crankshaft signals	no signal		or engine speed or actual engine state or engine speed gradient	> 500 cranking > -8000.00	[rpm] [rpm/s]			
Crankshaft Position (CKP) Sensor	P0315 – Crankshaft Position System Variation Not Learned	rationality check	correction value of CKP sensor and flywheel caused by tolerances during production	not programmed					0.5 [s] continuous	1 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Crankshaft Position System	P0315 – Crankshaft Position System Variation Not Learned	check of max. value of segment time adaptation	reduced segment length adaptation value for segment length (during catalyst heating)	> 4.20	[°CRK]	general conditions segment time adaptation	active		1.00 [events] multiple	1 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40-
			or			misfire	not detected				
			adaptation value for segment length (without catalyst heating)	not calibrated	[°CRK]	counter for engine working cycles before start of adaptation	>= 10	CAM [rev]			
			normal segment length			adaptation range conditions					
			adaptation value for segment length	> 1.40	[°CRK]	engine speed average	> 0; < 0	[rpm]			
			for			engine torque	> 30.00; < 160.00	[Nm]			
			segment length	180.00	[°CRK]	condition for adaptation @					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						normal operation mode					
						segment time adaptation	not calibrated				
						or					
						condition for adaptation @					
						fuel cut off					
						segment time adaptation	ready				
	P0315 – Crankshaft Position System Variation Not Learned	check of max. variance of segment time adaptation	variance of segment time ratio	> 0.45	[°CRK]	general conditions			2.00 [events] multiple	1 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40-
						segment time adaptation	active				
						misfire	not detected				
						counter for engine working cycles before start of adaptation	>= 10	CAM [rev]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						adaptation range conditions					
						engine speed average	> 0; < 0	[rpm]			

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine torque	> 30.00; < 160.00	[Nm]			
						condition for adaptation @					
						normal operation mode					
						segment time adaptation	not calibrated				
						or					
						condition for adaptation @					
						fuel cut off					
						segment time adaptation	ready				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0315 – Crankshaft Position System Variation Not Learned	check of spread values of segment time adaptation	simultaneous monitoring of normal and alternative			general conditions					♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40-
			segment position								
			max. spread of segment time variation during normal operation mode	> 0.12	[°CRK]	segment time adaptation	active		2.00 [events] multiple	1 DCY	
			or			misfire	not detected				
			max. spread of segment time variation during fuel cut off	> 0.36	[°CRK]	counter for engine working cycles before start of adaptation	>= 10	CAM [rev]			
			or			adaptation range conditions					
			current monitoring of			engine speed average	> 0; < 0	[rpm]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			alternative segment position								
			max. spread of segment time variation during normal operation mode	> 0.12	[°CRK]	engine torque	> 30.00; < 160.00	[Nm]			
			or			condition for adaptation @					
						normal operation mode					
			max. spread of segment time variation during fuel cut off	> 0.36	[°CRK]	segment time adaptation or	not calibrated				
						condition for adaptation @					
						fuel cut off					
						segment time adaptation	ready				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0315 – Crankshaft Position System Variation Not Learned	plausibility check of segment time adaptation	during fuel cut off diff. previous vs. actual adaptation value	not calibrated	[°CRK]	general conditions segment time adaptation	active		2.00 [events] multiple	1 DCY	♦ Engine Speed Sensor - G28- ♦ Camshaft Position Sensor - G40-
			or			misfire	not detected				
			during normal operation mode			counter for engine working cycles before start of adaptation	>= 10	CAM [rev]			
			diff. previous vs. actual adaptation value	not calibrated	[°CRK]	adaptation range conditions engine speed average	> 0; < 0	[rpm]			
						engine torque	> 30.00; < 160.00	[Nm]			
						condition for adaptation @					
						normal mode					
						segment time adaptation	ready				
						or					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						condition for adaptation @					
						fuel cut off					
						segment time adaptation	ready				
						and					
						plausibility check	not calibrated				
						or					
						plausibility check	relevant				
Ambient Air Temperature	P0071 – Ambient Air Temperature Sensor Circuit "A" Range/ Performance	cross check	deviation count			propulsion off time	> 21600.0	[s]			♦ Outside Air Temperature Sensor -G17- ♦ Check the CAN-Bus terminal resistance.
(AAT) Sensor			counter of detected temperature deviations	>= 3.00	[-]	Retained-Heat Detection after driving conditions	not equipped		0.0 [s] once / DCY	2 DCY	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			and			Retained-Heat Detection after driving conditions with combustion	checked				

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			counter of detected temperature deviations of the other involved temperature sensors	< 2.00	[-]	Retained-Heat Detection after Purge Manifold	checked				
			required temperature			(referenced)					
			deviation to increment								
			counter								
			AAT								
			vs.								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			ECT downstream	not equipped	[K]						
			or								
			AAT								
			vs.								
			ROT	not equipped	[K]						
			or								
			AAT								
			vs.								
			ECT @ cylinder head	not equipped	[K]						
			or								
			AAT								
			vs.								
			IAT upstream Throttle	> 20.0	[K]						
			or								
			AAT								
			vs.								
			IAT @ manifold	> 20.0	[K]						
			or								
			AAT								
			vs.								
			IAT 3	not equipped	[K]						
			or								
			AAT								
			vs.								
			IAT 4	not equipped	[K]						
			or								
			AAT								
			vs.								
			EOT	> 20.0	[K]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or								
			AAT								
			vs.								
			heating circuit temperature	not equipped	[K]						
			or								
			AAT								
			vs.								
			inverter coolant temperature	not equipped	[K]						
			or								
			AAT								
			vs.								
			EOT @ cylinder head	not equipped	[K]						
			or								
			AAT								
			vs.								
			ECT @ crankcase	not equipped	[K]						
			or								
			AAT								
			vs.								
			engine compartment temperature	not equipped	[K]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Intake Air Temperature (IAT) Sensor upstream Throttle	P0111 – Intake Air Temperature Sensor 1 Circuit Range/ Performance Bank 1	cross check	deviation count counter of detected temperature deviations	>= 3.00	[-]	propulsion off time Retained-Heat Detection after driving conditions	> 21600.0 not equipped	[s]	0.0 [s] once / DCY	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			counter of detected temperature deviations of the other involved temperature sensors	< 2.00	[-]	Retained-Heat Detection after Purge Manifold	checked				
			required temperature			(referenced)					
			deviation to increment								
			counter								
			AAT								
			vs.								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			ECT downstream	not equipped	[K]						
			or								
			AAT								
			vs.								
			ROT	not equipped	[K]						
			or								
			AAT								
			vs.								
			ECT @ cylinder head	not equipped	[K]						
			or								
			AAT								
			vs.								
			IAT upstream Throttle	> 20.0	[K]						
			or								
			AAT								
			vs.								
			IAT @ manifold	> 20.0	[K]						
			or								
			AAT								
			vs.								
			IAT 3	not equipped	[K]						
			or								
			AAT								
			vs.								
			IAT 4	not equipped	[K]						
			or								
			AAT								
			vs.								
			EOT	> 20.0	[K]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or								
			AAT								
			vs.								
			heating circuit temperature	not equipped	[K]						
			or								
			AAT								
			vs.								
			inverter coolant temperature	not equipped	[K]						
			or								
			AAT								
			vs.								
			EOT @ cylinder head	not equipped	[K]						
			or								
			AAT								
			vs.								
			ECT @ crankcase	not equipped	[K]						
			or								
			AAT								
			vs.								
			engine compartment temperature	not equipped	[K]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Intake Air Temperature (IAT) Sensor upstream Throttle	P0111 – Intake Air Temperature Sensor 1 Circuit Range/ Performance Bank 1	cross check	deviation count counter of detected temperature deviations	>= 3.00	[-]	propulsion off time Retained-Heat Detection after driving conditions	> 21600 not equipped	[s]	0.0 [s] once / DCY	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			and			Retained-Heat Detection after driving conditions with combustion	checked				
			counter of detected temperature deviations of the other involved temperature sensors	< 2.00	[-]	Retained-Heat Detection after Purge Manifold	checked				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			required temperature			(referenced)					
			deviation to increment								
			counter								
			IAT upstream Throttle								
			vs.								
			ECT downstream	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			ROT	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			ECT @ cylinder head	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			AAT	> 20.0	[K]						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			or								
			IAT upstream Throttle								
			vs.								
			IAT @ manifold	> 20.0	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			IAT 3	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			IAT 4	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			EOT	> 20.0	[K]						
			or								
			IAT upstream Throttle								
			vs.								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			heating circuit temperature	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			inverter coolant temperature	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			EOT @ cylinder head	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								
			ECT @ crankcase	not equipped	[K]						
			or								
			IAT upstream Throttle								
			vs.								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			engine compartment temperature	not equipped	[K]						
Intake Air Temperature (IAT)	P0096 – Intake Air Temperature Sensor 2 Circuit Range/ Performance Bank 1	cross check	deviation count			propulsion off time	> 21600.0	[s]			♦ Charge Air Temperature Sensor - G1001-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Sensor @ Manifold			counter of detected temperature deviations	>= 3.00	[-]	Retained-Heat Detection after driving conditions	not equipped		0.0 [s] once / DCY	2 DCY	
			and			Retained-Heat Detection after driving conditions with combustion	checked				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			counter of detected temperature deviations of the other involved temperature sensors	< 2.00	[-]	Retained-Heat Detection after Purge Manifold	checked				
			required temperature			(referenced)					
			deviation to increment								
			counter								
			IAT @ manifold								
			vs.								
			ECT downstream	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			ROT	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			ECT @ cylinder head	not equipped	[K]						
			or								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			IAT @ manifold								
			vs.								
			AAT	> 20.0	[K]						
			or								
			IAT @ manifold								
			vs.								
			IAT upstream Throttle	> 20.0	[K]						
			or								
			IAT @ manifold								
			vs.								
			IAT 3	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			IAT 4	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			EOT	> 20.0	[K]						
			or								
			IAT @ manifold								
			vs.								
			heating circuit temperature	not equipped	[K]						
			or								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			IAT @ manifold								
			vs.								
			inverter coolant temperature	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			EOT @ cylinder head	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			ECT @ crankcase	not equipped	[K]						
			or								
			IAT @ manifold								
			vs.								
			engine compartment temperature	not equipped	[K]						

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Oil Temperature (EOT)	P0196 – Engine Oil Temperature Sensor "A" Range/ Performance	cross check	deviation count			propulsion off time	> 21600.0	[s]			♦ Oil Level Thermal Sensor - G266-
Sensor			counter of detected temperature deviations	>= 3.00	[-]	Retained-Heat Detection after driving conditions	not equipped		0.0 [s] once / DCY	2 DCY	
			and			Retained-Heat Detection after driving conditions with combustion	checked				
			counter of detected temperature deviations of the other involved temperature sensors	< 2.00	[-]	Retained-Heat Detection after Purge Manifold	checked				
			required temperature			(referenced)					
			deviation to increment								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILI lum	Component Diagnostic
			counter								
			EOT								
			vs.								
			ECT downstream	not equipped	[K]						
			or								
			EOT								
			vs.								
			ROT	not equipped	[K]						
			or								
			EOT								
			vs.								
			ECT @ cylinder head	not equipped	[K]						
			or								
			EOT								
			vs.								
			AAT	> 20.0	[K]						
			or								
			EOT								
			vs.								
			IAT upstream Throttle	> 20.0	[K]						
			or								
			EOT								
			vs.								
			IAT @ manifold	> 20.0	[K]						
			or								
			EOT								
			vs.								
			IAT 3	not equipped	[K]						
			or								
			EOT								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			vs.								
			IAT 4	not equipped	[K]						
			or								
			EOT								
			vs.								
			heating circuit temperature	not equipped	[K]						
			or								
			EOT								
			vs.								
			inverter coolant temperature	not equipped	[K]						
			or								
			EOT								
			vs.								
			EOT @ cylinder head	not equipped	[K]						
			or								
			EOT								
			vs.								
			ECT @ crankcase	not equipped	[K]						
			or								
			EOT								
			vs.								

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			engine compartment temperature	not equipped	[K]						
Evaporative Emission (EVAP) Fuel Vapor Temperature Sensor	P2025 – EVAP Fuel Vapor Temperature Sensor Performance	rationality check	abs. diff. EVAP temperature sensor vs. mean value of all involved cross check temperature sensors	> | 20.0|	[K]	all temperature cross checks	finished		0.00 [s] once / DCY	2 DCY	♦ Fuel Tank Leak Detection Module - GX36-
conditions temperature cross		---				Conditions:					
check											
Retained-Heat Detection after						accum. time engine running	>= 30.0	[s]			
driving conditions with						accumulation enable if:					
combustion						engine speed	>= 400	[rpm]			
						vehicle speed	> 30	[km/h]			
						for time	> 30.0	[s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						temperature difference					
						diff. ECT downstream @ start	not calibrated	[K]			
						vs. min temp. until conditions					
						diff. ROT @ start vs. min temp.	not calibrated	[K]			
						until conditions					
						diff. ECT @ cylinder head @	not calibrated	[K]			
						start vs. min temp. until					
						conditions					
						diff. AAT @ start vs. min temp.	<= 5.0	[K]			
						until conditions					
						diff. EOT @ start vs. min temp.	<= 5.0	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						until conditions					
						diff. heating circuit temperature	not calibrated	[K]			
						@ start vs. min temp. until					
						conditions					
						diff. inverter coolant temperature	not calibrated	[K]			
						@ start vs. min temp. until					
						conditions					
						diff. EOT @ cylinder head @	not calibrated	[K]			
						start vs. min temp. until					
						conditions					
						diff. ECT @ crankcase @ start	not calibrated	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						vs. min temp. until conditions					
						diff. engine compartment	not calibrated	[K]			
						temperature @ start vs. min					
						temp. until conditions					
Conditions temperature Cross		---				Conditions:					
Check											
Retained-Heat Detection after						throttle position	> 12.00	[%]			
Purge Manifold						engine speed	> 400	[rpm]			
						for time	> 10.0	[s]			
						temperature difference					
						diff. IAT upstream throttle @	<= 5.0	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						start vs. min. temp. until					
						conditions					
						IF (for high electric range					
						vehicles)					
						diff. IAT upstream throttle @	> 5.0	[K]			
						start vs. min. temp. until					
						conditions					
						then					
						diff. (IAT upstream throttle -	<= 0.0	[K]			
						AAT) @ start vs. diff. until					
						conditions					
						temperature difference					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						diff. IAT @ manifold @ start vs.	<= 5.0	[K]			
						min. temp. until conditions					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						IF (for high electric range vehicles)					
						diff. IAT @ manifold @ start vs. min. temp. until conditions	> 5.0	[K]			
						then					
						diff. (IAT @ manifold - AAT) @start vs. diff. until conditions	<= 0.0	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						temperature difference					
						diff. IAT @ start vs. min. temp. until conditions	not calibrated	[K]			
						IF (for high electric range vehicles)					
						diff. IAT @ start vs. min. temp. until conditions	not calibrated	[K]			
						then					
						diff. (IAT - AAT) @ start vs. diff. until conditions	not calibrated	[K]			
						temperature difference					
						diff. IAT @ start vs. min. temp. until conditions	not calibrated	[K]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						IF (for high electric range vehicles)					
						diff. IAT @ start vs. min. temp. until conditions	not calibrated	[K]			
						then					
						diff. (IAT - AAT) @ start vs. diff. until conditions	not calibrated	[K]			
Engine Oil Temperature (EOT) Sensor	P0198 – Engine Oil Temperature Sensor "A" Circuit High	circuit high	signal input stage: short to battery plus for time	detected > 2.0	[s]	time after ignition on	> 3.0	[s]	3.0 [s] continuous	2 DCY	♦ Oil Level Thermal Sensor - G266-
Engine Oil Temperature (EOT) Sensor	P0197 – Engine Oil Temperature Sensor "A" Circuit Low	circuit low	signal input stage: short to ground for time	detected > 2.0	[s]	time after ignition on	> 3.0	[s]	3.0 [s] continuous	2 DCY	♦ Oil Level Thermal Sensor - G266-
Engine Oil Temperature (EOT) Sensor	P0196 – Engine Oil Temperature Sensor "A" Range/ Performance	range check	period of time	< 28; > 88	[ms]	time after ignition on	> 3.0	[s]	6.0 [s] continuous	2 DCY	♦ Oil Level Thermal Sensor - G266-
Engine Oil Temperature (EOT)	P0196 – Engine Oil Temperature Sensor "A" Range/ Performance	no change on signal	diff. MAX engine oil temperature	<= 1.5	[K]	engine off time	> 21600.0	[s]	0 [s]	2 DCY	♦ Oil Level Thermal Sensor - G266-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Sensor			vs. MIN engine oil temperature						once / DCY		
						time after engine start	> 5.0	[s]			
						ECT	> 49	[°C]			
						integrated air mass	> 3.30... 6.20	[kg]			
						condition					
						engine stop					
						vehicle speed	> 328	[km/h]			
						for					
						time	< 6553.5	[s]			
						condition					
						accum. fuel cut off					
						accum. engine load	> 21.00	[%]			
						accum. engine load	< 0.00	[%]			
						for					
						integrated air mass	< 4.30... 7.20	[kg]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Oil Pressure (EOP) Control Actuator	P06DB – Engine Oil Pressure Control Circuit Low	circuit low	signal voltage	<= 1.64... 1.96	[V]	actuator	commanded off		480 [ms] continuous	2 DCY	♦ Oil Pressure Sensor - G10-
						battery voltage	>= -655.36	[V]			
						for time	>= 0	[ms]			
Engine Oil Pressure (EOP) Control Actuator	P06DA – Engine Oil Pressure Control Circuit/Open	open circuit	signal voltage	> 1.66... 1.98; <= 2.73... 3.27	[V]	actuator battery voltage	commanded off >= -655.36	[V]	480 [ms] continuous	2 DCY	♦ Oil Pressure Sensor - G10-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for time	>= 0	[ms]			
Engine Oil Pressure (EOP) Control Actuator	P06DC – Engine Oil Pressure Control Circuit High	circuit high	signal current	>= 3.6...6.9	[A]	actuator battery voltage for time	commanded on >= -655.36 >= 0	[V] [ms]	480 [ms] continuous	2 DCY	♦ Oil Pressure Sensor - G10-
SENT: Engine Oil Pressure (EOP) Sensor	U0600 – Lost Communication With Engine Oil Pressure Sensor "A"	communication with EOP sensor	received message	no message		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
SENT: Engine Oil Pressure (EOP) Sensor	U11F0 – Sensor/ Switch 1 For Engine Oil Pressure Implausible Message	communication with EOP sensor	received message	implausible message		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
SENT: Engine Oil Pressure (EOP) Sensor	P0521 – Engine Oil Pressure Sensor/ Switch "A" Range/ Performance	sensor internal check	sensor signal: electrical check or sensor signal: initialization check	error detected error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Oil Pressure Sensor - G10-
Barometric Pressure (BARO) Sensor	P2227 – Barometric Pressure Sensor "A" Circuit Range/ Performance	rationality check	signal gradient	> 0.25	[kPa/s]				0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P2227 – Barometric Pressure Sensor "A" Circuit Range/ Performance	rationality check	signal gradient	< -0.25	[kPa/s]				0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2227 – Barometric Pressure Sensor "A" Circuit Range/ Performance	rationality check	diff. barometric sensor vs. last driving cycle and diff. barometric sensor signal vs. boost pressure signal	> | 10.00 |> 9.00	[kPa] [kPa]	time after engine start engine speed throttle position	< 5.0< 1000< 8.01	[s] [rpm] [%]	0.5 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P2227 – Barometric Pressure Sensor "A" Circuit Range/ Performance	rationality check	diff. barometric sensor vs. last driving cycle and diff. barometric sensor signal vs. boost pressure signal	> | 10.00 |< -8.50	[kPa] [kPa]	time after engine start engine speed throttle position	< 5.0< 1000< 8.01	[s] [rpm] [%]	0.5 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Barometric Pressure (BARO) Sensor	P2229 – Barometric Pressure Sensor "A" Circuit High	out of range high	BARO	> 115.00	[kPa]				0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2228 – Barometric Pressure Sensor "A" Circuit Low	out of range low	BARO	< 45.00	[kPa]				0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Barometric Pressure (BARO) Sensor	P2227 – Barometric Pressure Sensor "A" Circuit Range/ Performance	cross check	diff. BARO to average value of all pressure sensors @ start	< -1.75	[kPa]	engine shut-off-time	> 4.0	[s]	0 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P2227 – Barometric Pressure Sensor "A" Circuit Range/ Performance	cross check	diff. BARO to average value of all pressure sensors @ start	> 1.75	[kPa]	engine shut-off-time	> 4.0	[s]	0 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Turbocharger (TC) Boost Pressure Control	P0234	rationality check high	diff. set point vs. actual boost pressure	< -30.00	[kPa]	general conditions max. set point of boost pressure variation for time max. actual boost pressure variation for time boost pressure control deviation throttle position boost pressure set point IAT @ throttle BARO engine speed (without cylinder deactivation) or engine speed (cylinder deactivation	< 1.00 > 1.0 not calibrated not calibrated not calibrated not calibrated > 142.50...192.50 > -20; < 160 > 45.00; < 120.002150...7000 not calibrated	[kPa] [s] [kPa] [s] [kPa] [%] [kPa] [°C] [kPa] [rpm] [rpm]	2.8 [s] multiple	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						active)					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						boost pressure control deviation boost pressure conditions boost pressure control or boost pressure control (switched to open loop) within accelerator pedal position and engine speed and boost pressure set point further conditions ECT gear shifting for time selected gear time since engine start boost pressure con-	not calibrated closed loop active >= 50.00 >= 3500...5400 >= 55.00...100.00 > -40; < 130 not active > 0.8 >= 1 > 1.0 not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not active not calibrated not calibrated not cali-	[kPa] [%] [rpm] [kPa] [°C] [s] [s] [s] [s] [%] [mg] [mg] [mg] [mg] [s] [s] [s] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						trol or boost pressure control for time TC compressor actuator ESP / TCS boost pressure control adaptation diagnosis for stationary boost pressure control deviation for time boost pressure control boost control actuator duty cycle in case of CNG engine change of fuel mode in case of GPF equip-	brated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated > 1.0				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ped and sequential boost pressure monitoring strategy calibrated calculated soot mass calculated soot mass soot mass for reactivation in case of GPF equipped and sequential boost pressure monitoring strategy not calibrated calculated soot mass in case of cylinder deactivation (both transition direc-					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						tions)transition between cylinder deactivation (CD) and normal operation mode for time VVL intake CAM condition change of camshaft position for time VVL exhaust CAM condition change of camshaft position for time all above conditions must be fulfilled for time					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						additional conditions no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Turbocharger (TC) Boost Pressure Control	P0299 – Turbocharger/ Supercharger "A" Underboost Condition	rationality check low	equipped with GPF (low soot mass) diff. set point vs. actual boost pressure within sequential boost pressure monitoring strategy for calculated soot mass equipped with GPF (high soot mass) diff. set point vs. actual boost pressure within sequential boost pressure monitoring strategy for calculated soot mass	not calibrated calibrated not active not calibrated calibrated not calibrated > 17.50. ..100. 00 not calibrated	[kPa] [mg] [kPa] [mg] [kPa]	general conditions max. set point of boost pressure variation for time max. actual boost pressure variation for time boost pressure control deviation throttle position boost pressure set point IAT @ throttle BARO engine speed (without cylinder deactivation) or engine speed (cylinder deactivation ac-	< 1.00 > 1.0 not calibrated not calibrated not calibrated not calibrated > 142.5 0...19 2.50 > -20; < 160 > 45.00; < 120.0 02150 ...700 0 not calibrated not calibrated closed loop active >= 50.00 >= 3500.. .5400 >= 55.00. ..100. 00 > -40; < 130 not active> 0.8 >= 1 > 1.0 not calibrated not calibrated not calibrated not calibrated not cali-	[kPa] [s] [kPa] [s] [kPa] [%] [kPa] [°C] [kPa] [rpm] [rpm] [kPa] [%] [rpm] [kPa] [°C] [s] [s] [s] [s] [%]	2.8 [s] multiple	2 D C Y	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			without sequential boost pressure monitoring strategy diff. set point vs. actual boost pressure within sequential boost pressure monitoring strategy			tive)boost pressure control deviation boost pressure conditions boost pressure control or boost pressure control (switched to open loop)within accelerator pedal position and engine speed and boost pressure set point further conditions ECT gear shifting for time selected gear time since engine start boost pressure con-	brated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not active				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						trol or boost pressure control for time TC compressor actuator ESP / TCS boost pressure control adaptation diagnosis for stationary boost pressure control deviation for time boost pressure control boost control actuator duty cyclein case of CNG engine change of fuel mode					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						in case of GPF equipped and sequential boost pressure monitoring strategy calibrated calculated soot mass calculated soot mass soot mass for reactivation in case of GPF equipped and sequential boost pressure monitoring strategy not calibrated calculated soot mass in case of cylinder deactiva-	not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated> 0.8...2.5	[mg] [mg] [mg] [mg] [s][s] [s] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						tion (both transition directions)transition between cylinder deactivation (CD) and normal operation mode for time VVL intake CAM condition change of camshaft position for time VVL exhaust CAM condition change of camshaft position for time all above conditions must be fulfilled for time additional					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Turbocharger (TC) Boost Pressure Control	P2279 – Intake Air System Leak Bank 1	functional check	boost pressure and MAP within a range around the actual BARO	-15.00 ...7.00	[kPa]	general conditions max. set point of boost pressure variation for time max. actual boost pressure variation for time boost pressure control deviation throttle position boost pressure set point IAT @ throttle BARO engine speed (without cylinder deactivation) or engine speed (cylinder deactivation ac-	not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated > 90.00...140.00 not calibrated > 45.00; < 120.0 02200...7000 not calibrated not calibrated closed loop active >= 50.00 >= 3500...5400	[kPa] [s] [kPa] [s] [kPa] [%] [kPa] [°C] [kPa] [rpm] [rpm] [kPa] [%] [rpm]	2.6 [s] multiple	2 DCY	♦ Check for air leaks (between the MAF and) (near) the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. ♦ Intake Manifold Sensor - GX9- ♦ Throttle Valve Control

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						tive)boost pressure control deviation boost pressure conditions boost pressure control or boost pressure control (switched to open loop) within accelerator pedal position and engine speed and					Module -GX3- ♦ EVAP Canister Purge Regulator Valve 1 -N80-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						boost pressure set point further conditions ECT gear shifting for time selected gear time since engine start boost pressure control or boost pressure control for time TC compressor actuator ESP / TCS boost pressure control adaptation diagnosis for stationary boost pressure control deviation for time boost	>= 55.00...100.00 not calibrated not active > 0.8 not calibrated > 1.0 not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated > 0.8...2.5 not calibrated not calibrated not active not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated	[kPa] [°C] [s] [s] [s] [s] [%] [mg] [mg] [mg] [mg] [s] [s] [s] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						pressure control boost control actuator duty cycle in case of CNG engine change of fuel mode in case of GPF equipped and sequential boost pressure monitoring strategy calibrated calculated soot mass calculated soot mass soot mass for reactivation in case of GPF equipped and sequential	not calibrated not calibrated not calibrated not calibrated> 0.7				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						boost pressure monitoring strategy not calibrated calculated soot mass in case of cylinder deactivation (both transition directions)transition between cylinder deactivation (CD) and normal operation mode for time VVL intake CAM condition change of camshaft position for time VVL exhaust CAM condi-					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						tion change of camshaft position for time all above conditions must be fulfilled for time additional conditions no additional conditions calibrated					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
Turbocharger (TC) Boost Pressure Control	P2279 – Intake Air System Leak Bank 1	functional check	modeled turbocharger rotation	> 270000	[rpm]	general conditions max. set point of boost pressure variation for time max. actual boost pressure variation for time	< 1.00 > 1.1 < 2.00 > 1.1	[kPa] [s] [kPa] [s]	3.0 [s] multiple	2 DCY	♦ Check for air leaks (between the MAF and) (near) the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. ♦ Intake Manifold Sensor - GX9- ♦ Throttle Valve Control

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											Module - GX3- ◆ EVAP Canister Purge Regulator Valve 1 -N80-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						boost pressure control deviation throttle position boost pressure set point IAT @ throttle BARO engine speed (without cylinder deactivation) or engine speed (cylinder deactivation active) boost pressure control deviation boost pressure conditions boost pressure control or boost pressure control (switc	< 25.00 not calibrated > 142.50...192.50 > -20; < 160 > 45.00; < 120.0 02200...7000 not calibrated > -6.00 closed loop active >= 50.00 >= 3500...5400 >= 55.00...100.00 > -40; < 130 not active > 0.8>= 1 > 1.0 not calibrated not calibrated not calibrated not active not active not calibrated not calibrated not cali-	[kPa] [%] [kPa] [°C] [kPa] [rpm] [rpm] [kPa] [%] [rpm] [kPa] [°C] [s] [s] [s] [s] [%] [mg] [mg] [mg] [mg]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						hed to open loop) within accelerator pedal position and engine speed and boost pressure set point further conditions ECT gear shifting for time selected gear time since engine start boost pressure control or boost pressure control for time TC compressor actuator ESP / TCS boost pressure control adaptation diagnosis	brated not calibrated not calibrated not active not calibrated not calibrated not calibrated not calibrated not calibrated				

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						for stationary boost pressure control deviation for time boost pressure control boost control actuator duty cycle in case of CNG engine change of fuel mode in case of GPF equipped and sequential boost pressure monitoring strategy calibrated calculated soot mass calculated soot mass soot					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						mass for reactivation in case of GPF equipped and sequential boost pressure monitoring strategy not calibrated calculated soot mass in case of cylinder deactivation (both transition directions)					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						transition between cylinder deactivation (CD) and normal operation mode for time VVL intake CAM condition change of camshaft position for time VVL exhaust CAM condition change of camshaft position for time all above conditions must be fulfilled for time additional conditions no additional condi-	not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated not calibrated> 0.1	[s] [s] [s] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIlum	Component Diagnostic
						tions calibrated					
Turbocharger (TC) Actuator	P003A – Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	signal range check @mechanical stop low	position sensor signal voltage	< 0.30; > 1.70	[V]	actuator	commanded close		0.2 [s] multiple	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
Turbocharger (TC) Actuator	P0634 – Control Module Internal Temperature "A" Too High	over current	power stage temperature	>= 150... 165	[°C]	actuator	commanded on		0.5 [s] continuous		♦ Fuel Delivery Unit - GX1-
Turbocharger (TC) Actuator	P0033 – Turbocharger/ Supercharger Bypass Valve "A" Control Circuit	overload circuit	current @ low side path current @ high side path	>= 6.7...11.1 >= 6.9...11.5	[A] [A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
Turbocharger (TC) Actuator	P0034 – Turbocharger/ Supercharger Bypass Valve "A" Control Circuit Low	circuit low	signal current	>= 6.9...11.5	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
	P0033 – Turbocharger/ Supercharger Bypass Valve "A" Control Circuit	open circuit	load resistance	> 50.00	[kOhm]	actuator	commanded off		0.6 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
	P0035 – Turbocharger/ Supercharger Bypass Valve "A" Control Circuit High	circuit high	signal current	>= 6.7...11.1	[A]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Turbocharger (TC) Actuator	P00AF – Turbocharger/ Supercharger Boost Control "A" Module Performance	intrusive monitor functional check: stuck open	difference between target and actual position and boost pressure actuator position	< 12.00; > 12.00 < 30.00	[%][%]	engine	running		3.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
	P00AF – Turbocharger/ Supercharger Boost Control "A" Module Performance	intrusive monitor functional check: stuck close	difference between target and actual position and boost pressure actuator position	< 12.00; > 12.00 >= 30.00	[%] [%]	engine	running		3.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
Cold Start Monitoring Turbocharger (TC) Actuator	P056E – Cold Start Turbocharger/ Supercharger Boost Control "A" Performance	intrusive monitor functional check: stuck open	difference between target and actual position and boost pressure actuator position	< 12.00; > 12.00 < 30.00	[%] [%]	engine catalyst heating	running active		3.5 [s] continuous	2 DCY	♦ Charge Air Pressure Sensor - GX26-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P056E – Cold Start Turbocharger/ Supercharger Boost Control "A" Performance	intrusive monitor functional check: stuck close	difference between target and actual position and boost pressure actuator position	< 12.00; > 12.00 >= 30.00	[%] [%]	engine catalyst heating	running active		3.5 [s] continuous	2 DCY	♦ Charge Air Pressure Sensor - GX26-
Turbocharger (TC) Boost Pressure Sensor	P0238 – Turbocharger/ Supercharger Boost Sensor "A" Circuit High	out of range @ start	boost pressure	> 140.00	[kPa]	engine off time	> 4.0	[s]	0.5 [s] once / DCY	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
Turbocharger (TC) Boost Pressure Sensor	P0237 – Turbocharger/ Supercharger Boost Sensor "A" Circuit Low	out of range low	boost pressure	< 30.00	[kPa]				0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
	P0238 – Turbocharger/ Supercharger Boost Sensor "A" Circuit High	out of range high	boost pressure	> 370.00	[kPa]				0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0236 – Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance	cross check	diff. boost pressure to average value of all pressure sensors @ start	< -6.32	[kPa]	engine shut-off-time	> 4.0	[s]	0 [s] once / DCY	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
	P0236 – Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance	cross check	diff. boost pressure to average value of all pressure sensors @start	> 6.32	[kPa]	engine shut-off-time	> 4.0	[s]	0 [s] once / DCY	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
Turbocharger (TC) Boost Pressure Sensor	P0238 – Turbocharger/ Supercharger Boost Sensor "A" Circuit High	rationality check high	diff. boost pressure signal vs. barometric sensor signal	> 14.00	[kPa]	engine speed throttle position both conditions must be fulfilled for time	< 1000 < 8.01 >= 2.6	[rpm] [%] [s]	2.5 [s] multiple	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
	P0237 – Turbocharger/ Supercharger Boost Sensor "A" Circuit Low	rationality check low	diff. boost pressure signal vs. barometric sensor signal	< -14.00	[kPa]				4.5 [s] multiple	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
SENT: Turbocharger (TC) Boost Pressure Sensor and Intake Air Temperature (IAT) Sensor upstream throttle	P0235 – Turbocharger/ Supercharger Boost Sensor "A" Circuit	sensor internal check	sensor signal: electrical check or sensor signal: initialization check	error detected error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Sensor - GX26- ♦ Charge Air Pressure Control Module - GX34-
SENT: Turbocharger (TC) Boost Pressure Sensor and Intake Air Temperature (IAT) Sensor upstream throttle	U060B – Lost Communication With Turbocharger/ Supercharger Boost Sensor "A"	communication with TC boost pressure sensor and IAT sensor	received message	no message		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
SENT: Turbocharger (TC) Boost Pressure Sensor and Intake Air Temperature (IAT) Sensor upstream throttle	U129E – Charging Pressure And Suction Air Temperature Sensor Implausible Signal	communication with TC boost pressure sensor and IAT sensor	received message	implausible message		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Turbocharger (TC) Position Sensor	P2564 – Turbocharger Boost Control Position Sensor "A" Circuit Low	circuit low	signal voltage	< 0.10	[V]				0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
Turbocharger (TC) Position Sensor	P2562 – Turbocharger Boost Control Position Sensor "A" Circuit	circuit high	signal voltage	> 4.75	[V]				0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
Turbocharger (TC) Position Sensor	P2263 – Turbocharger/ Supercharger "A" Boost System Performance	out of range	signal voltage	4600.. .4750	[mV]				0.5 [s] continuous	2 DCY	♦ Charge Air Pressure Control Module - GX34-
Intake Air Temperature (IAT) Sensor @ Manifold	P0113 – Intake Air Temperature Sensor 1 Circuit High Bank 1	circuit high	signal voltage	> 4.56	[V]	ECT downstream engine MAF vehicle speed above conditions must be fulfilled for time alternative condition ECT downstream engine @ start	>= 0 <= 92.00 <= 100 >= 10.0 not calibrated	[°C] [kg/h] [km/h] [s] [°C]	0.5 [s] multiple	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Intake Air Temperature (IAT) Sensor @ Manifold	P0112 – Intake Air Temperature Sensor 1 Circuit Low Bank 1	circuit low	signal voltage	< 0.10	[V]	conditions for low/ medium engine load ratio MAP to BARO or engine speed conditions for high engine load ratio MAP to BARO and engine speed for time	<= 1.60 <= 1520 > 1.60 > 1520 < 10.0	[-] [rpm] [-] [rpm] [s]	0.5 [s] multiple	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						conditions for returning from high engine load to low/medium engine load ratio MAP to BARO or engine speed for time	<= 1.60 <= 1520 > 120.0	[-] [rpm] [s]			
SENT: Intake Air Temperature (IAT) Sensor upstream Throttle	P0110 – Intake Air Temperature Sensor 1 Circuit Bank 1	sensor internal check	sensor signal: electrical check or sensor signal: initialization check	error detected error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-
Intake Air Temperature (IAT) Sensor upstream Throttle	P0113 – Intake Air Temperature Sensor 1 Circuit High Bank 1	out of range high	IAT	> 140.06	[°C]				2.0 [s] continuous	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-
Intake Air Temperature (IAT) Sensor upstream Throttle	P0112 – Intake Air Temperature Sensor 1 Circuit Low Bank 1	out of range low	IAT	< -49.04	[°C]				2.0 [s] continuous	2 DCY	♦ Intake Manifold Sensor - GX9- ♦ Charge Air Pressure Sensor - GX26-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	rationality check	absolute value of difference between actual throttle position and limp home position	> 3.00	[%]	return spring check opening direction	active		0.3 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	adaptation value monitoring	diff. between adapted sensor value at bottom limit and sensor value at limp home position	> 0.61	[V]	throttle adaptation (@ initial start or after detection of throttle exchange or check sum error)	active		0.01 once / lifetime [s]	2 DCY	♦ Throttle Valve Control Module - GX3-
	P0638 – Throttle Actuator Control Range/ Performance Bank 1	adaptation value monitoring	diff. between adapted sensor value at bottom limit and sensor value at limp home position	< 0.01	[V]	throttle adaptation (@ initial start or after detection of throttle exchange or check sum error)	active		0.01 once / lifetime [s]	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	functional check @ throttle valve limp home position drift	absolute value of difference between actual adaption value of throttle valve limp home position and last adaption value of throttle valve limp home position	> 0.10	[V]	throttle adaptation	active		1.5 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	functional check @ throttle valve limp home position absolute drift	absolute value of difference between initial adapted voltage at sensor 1 limp home position and actual voltage at sensor 1 limp home position or absolute value of difference between initial adapted voltage at sensor 2 limp home position and actual voltage at sensor 2 limp home position	>= 0.50> = 0.50	[V][V]	throttle adaptation	active		1.5 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P2119 – Throttle Actuator "A" Control Throttle Body Range/ Performance	out of range high	throttle position sensor (TPS) 1 voltage or throttle position sensor (TPS) 2 voltage	> 0.72> 4.64	[V][V]	throttle adaptation	active		0.01 once / lifetime [s]	2 DCY	♦ Throttle Valve Control Module - GX3-
	P2119 – Throttle Actuator "A" Control Throttle Body Range/ Performance	out of range low	throttle position sensor (TPS) 1 voltage or throttle position sensor (TPS) 2 voltage	< 0.40< 4.28	[V][V]	throttle adaptation	active		0.01 once / lifetime [s]	2 DCY	♦ Throttle Valve Control Module - GX3-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	rationality check	absolute value of difference between actual throttle position and limp home position	> 3.00	[%]	return spring check closing direction	active		0.4 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	rationality check	diff. between actual throttle position and limp home position	< 15.00	[%]	return spring check closing direction	active		0.2 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	adaptation value monitoring	engine speed or vehicle speed or IAT @ manifold or ECT downstream engine	> 300> 1< 5; > 120< 5; > 115	[rpm] [km/h] [°C] [°C]	throttle adaptation (@ initial start or after detection of throttle exchange or check sum error)	active		0.01 once / lifetime [s]	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Actuator	P2106 – Throttle Actuator Control System - Forced Limited Power	functional check	power-stage temperature	>= 150... 165	[°C]	ECM pre-drive battery voltage safety fuel cut off actual throttle position adaptation actuator conditions for fault decision actuator	not detected >= 7.77 not active valid not active commanded on commanded off	[V]	0 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P2100 – Throttle Actuator "A" Control Motor Circuit/ Open	open circuit	load resistance	> 50.00	[kOhm]	ECM predrive battery voltage safety fuel cut off actual throttle position adaptation actuator conditions for fault decision actuator for time	not detected >= 7.77 not active valid not active commanded on commanded off >= 0.8	[V] [s]	0 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Actuator	P2106 – Throttle Actuator Control System - Forced Limited Power	short circuit	current @ low side path current @ high side path	>= 6.7...11.1 >= 6.9...11.5	[A] [A]	ECM predrive battery voltage safety fuel cut off actual throttle position adaptation actuator conditions for fault decision actuator	not detected >= 7.77 not active valid not active commanded on commanded off	[V]	0 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P2101 – Throttle Actuator "A" Control Motor Circuit Range/ Performance	out of range	absolute value of control duty cycle	> 80.00	[%]	throttle adaptation actuator absolute value of difference between throttle position set point and throttle flap opening angle for electronic throttle control	not active commanded on< 5.00	[%]	0.6 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Actuator	P2101 – Throttle Actuator "A" Control Motor Circuit Range/ Performance	functional check	absolute value of difference between throttle position set point and throttle flap opening angle for electronic throttle control	> 5.00	[%]	throttle adaptation actuator	not active commanded on		0.5 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Actuator	P0638 – Throttle Actuator Control Range/ Performance Bank 1	rationality check	diff. between actual throttle position and bottom limit	> 1.00	[%]	return spring check opening direction	active		0.3 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3-
Accelerator Pedal Position (APP) Sensor 1	P2122 – Throttle/ Pedal Position Sensor/Switch "D" Circuit Low	circuit low	signal voltage	<= 0.61	[V]	status high resistance redundancy failure	not calibrated not calibrated		200 [ms] continuous	2 DCY	♦ Accelerator Pedal Module - GX2-
	P2123 – Throttle/ Pedal Position Sensor/Switch "D" Circuit High	circuit high	signal voltage	>= 4.79	[V]				200 [ms] continuous	2 DCY	♦ Accelerator Pedal Module - GX2-
Accelerator Pedal Position (APP) Sensor 1 and 2	P2138 – Throttle/ Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	rationality check	signal voltage sensor 1 vs. 2	>= | 0.17... 0.26|	[V]	signal voltage sensor 1 signal voltage sensor 2	> 445> 445	[mV] [mV]	0.26 [s] continuous	2 DCY	♦ Accelerator Pedal Module - GX2-
Accelerator Pedal Position (APP) Sensor 2	P2127 – Throttle/ Pedal Position Sensor/Switch "E" Circuit Low	circuit low	signal voltage	<= 0.27	[V]	status high resistance redundancy failure	not calibrated not calibrated		200 [ms] continuous	2 DCY	♦ Accelerator Pedal Module - GX2-
	P2128 – Throttle/ Pedal Position Sensor/Switch "E" Circuit High	circuit high	signal voltage	>= 2.43	[V]				200 [ms] continuous	2 DCY	♦ Accelerator Pedal Module - GX2-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Throttle Position Sensor (TPS) 1	P0121 – Throttle/ Pedal Position Sensor/Switch "A" Circuit Range/ Performance	TPS 1 in comparison with main charge signal rationality check	absolute value of deviation between throttle position from TPS 1 and modeled throttle position	> 9.02	[%]	ECM pre-drive safety fuel cut off conditions for synchronization check (TPS 1 vs. main charge signal) TPS 2 or redundancy failure for time engine speed throttle actuator	not detected not active failure detected> 5.00... 6.25 >= 140 > 480 not at max. value	[%] [ms] [rpm]	280 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
	P0121 – Throttle/ Pedal Position Sensor/Switch "A" Circuit Range/ Performance	main charge signal monitoring rationality check	signal range check or MAP signal	error detected error detected		ECM pre-drive safety fuel cut off conditions for synchronization check (TPS 1 vs. main charge signal) TPS 2 or redundancy failure for time	not detected not active failure detected > 5.00... 6.25 >= 140	[%] [ms]	140 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0121 – Throttle/ Pedal Position Sensor/Switch "A" Circuit Range/ Performance	synchronization monitoring rationality check	absolute value of deviation between throttle position from TPS 1 and throttle position from TPS 2	> 0	[%]	TPS 2 engine speed throttle actuator redundancy failure for time	failure detected> 480 not at max. value> 5.00... 6.25> = 140	[rpm] [%] [ms]	360 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Position Sensor (TPS) 2	P0221 – Throttle/ Pedal Position Sensor/Switch "B" Circuit Range/ Performance	TPS 2 in comparison with main charge signal rationality check	absolute value of deviation between throttle position from TPS 2 and modeled throttle position	> 9.02	[%]	ECM pre-drive safety fuel cut off conditions for synchronization check (TPS 2 vs. main charge signal) TPS 1 or redundancy failure for time engine speed throttle actuator	not detected not active failure detected > 5.00... 6.25 >= 140 > 480 not at max. value	[%] [ms] [rpm]	280 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
	P0221 – Throttle/ Pedal Position Sensor/Switch "B" Circuit Range/ Performance	main charge signal monitoring rationality check	signal range check or	error detected		ECM pre-drive safety fuel cut off	not detected not active		140 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
			MAP signal	error detected		conditions for synchronization check (TPS 2 vs. main charge signal)TPS 1 or redundancy failure for time	failure detected > 5.00... 6.25 >= 140	[%] [ms]			
	P0221 – Throttle/ Pedal Position Sensor/Switch "B" Circuit Range/ Performance	synchronization monitoring rationality check	absolute value of deviation between throttle position from TPS 1 and throttle position from TPS 2	> 0	[%]	TPS 1 engine speed throttle actuator redundancy failure for time	failure detected > 480 not at max. value > 5.00... 6.25 >= 140	[rpm] [%] [ms]	360 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
Throttle Position Sensor (TPS) 1	P0122 – Throttle/ Pedal Position Sensor/Switch "A" Circuit Low	circuit low	signal voltage	< 0.12	[V]	ECM pre-drive safety fuel cut off	not detected not detected		140 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
	P0123 – Throttle/ Pedal Position Sensor/Switch "A" Circuit High	circuit high	signal voltage	> 4.86	[V]	ECM pre-drive safety fuel cut off	not detected not detected		140 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIIum	Component Diagnostic
Throttle Position Sensor (TPS) 2	P0222 – Throttle/ Pedal Position Sensor/Switch "B" Circuit Low	circuit low	signal voltage	< 0.12	[V]	ECM pre-drive safety fuel cut off	not detected not detected		140 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-
	P0223 – Throttle/ Pedal Position Sensor/Switch "B" Circuit High	circuit high	signal voltage	> 4.86	[V]	ECM pre-drive safety fuel cut off	not detected not detected		140 [ms] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Idle Speed Control (ISC)	P0506 – Idle Control System RPM - Lower Than Expected	out of range low	engine speed deviation and RPM controller torque value	> 100 not calibrated	[rpm] [Nm]	time after engine start BAROECT downstream engine IAT @ manifold torque safety limitation conditions vehicle speed: vehicle speed or engine running and decoupled from powertrain (for hybrid) conditions driver request: accelerator pedal for time for manual transmission: engine load	>= 2.0 > 0.00 -48...143 > -48 not active 0 not equipped released by driver > 5.0 < 30.00...50.02	[s] [kPa] [°C] [°C] [km/h] [s] [%]	7.0 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0507 – Idle Control System RPM - Higher Than Expected	out of range high	engine speed deviation and RPM controller torque value or integrated number of fuel cut off transitions	< -200 not calibrated >= 10.00	[rpm] [Nm] [-]	time after engine start BAROECT downstream engine IAT @ manifold torque safety limitation conditions vehicle speed: vehicle speed or engine running and decoupled from powertrain (for hybrid) conditions driver request: accelerator pedal or engine running and decoupled from powertrain (for hy-	>= 2.0 > 0.00-48...143 > -48 not active 0 not equipped released by driver no equipped> 5.0	[s] [kPa] [°C] [°C] [km/h] [s]	10.0 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						brid)for time					
Cold Start Monitoring	P050A – Cold Start Idle Control System Performance	out of range high	engine speed deviation	< -200	[rpm]	catalyst heating	active		5.6 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Idle Speed Control (ISC)			and RPM controller torque value or integrated number of fuel cut off transitions	not calibrated >= 10.00	[Nm] [-]	time after engine start BAROECT downstream engine torque safety limitation diff. Engine speed set point: with catalyst heating vs. without catalyst heating conditions vehicle speed: vehicle speed or engine running and decoupled from powertrain (for hybrid) conditions driver request: accelerator pedal	>= 2.0 > 0.00 -48...143 not active > 00 not equipped released by driver not equipped > 2.0	[s] [kPa] [°C] [rpm] [km/h] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or engine running and decoupled from powertrain (for hybrid)for time					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Cold Start Monitoring Idle Speed Control (ISC)	P050A – Cold Start Idle Control System Performance	out of range low	engine speed deviation and RPM controller torque value	> 100 not calibrated	[rpm] [Nm]	catalyst heating time after engine start BAROECT downstream engine torque safety limitation diff. Engine speed set point: with catalyst heating vs. without catalyst heating conditions vehicle speed: vehicle speed or engine running and decoupled from powertrain (for hybrid) conditions driver re-	active >= 2.0 > 0.00 -48...143 not active > 00 not equipped released by driver not equipped > 2.0 < 30.00...50.02	[s] [kPa] [°C] [rpm] [km/h] [s] [%]	7.0 [s] multiple	2 DCY	◆ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						quest: accelerator pedal or engine running and decoupled from powertrain (for hybrid) for time for manual transmission: engine load					
Manifold Absolute Pressure (MAP) Sensor	P0107 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	out of range low	MAP signal	< 10.00	[kPa]	delay time engine speed engine angle position	> 0.0> 300 not calibrated	[s] [rpm]	1.5 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-
	P0108 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	out of range high	MAP signal	> 370.00	[kPa]	delay time engine speed engine angle position	> 0.0> 300 not calibrated	[s] [rpm]	1.5 [s] multiple	2 DCY	♦ Intake Manifold Sensor - GX9-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Manifold Absolute Pressure(MAP) Sensor	P0108 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	out of range @ start	MAP signal	> 140.00	[kPa]	engine off time	> 4.0	[s]	1.5 [s] once / DCY	2 DCY	♦ Intake Manifold Sensor - GX9-
Manifold Absolute Pressure (MAP) Sensor	P0106 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	cross check	diff. manifold pressure to average value of all pressure sensors @ start	< -4.50	[kPa]	engine shut-off-time	> 4.0	[s]	0 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-
	P0106 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	cross check	diff. manifold pressure to average value of all pressure sensors @ start	> 4.50	[kPa]	engine shut-off-time	> 4.0	[s]	0 [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-
Turbocharger (TC) Boost Pressure Sensor	P0237 – Turbocharger/ Supercharger Boost Sensor "A" Circuit Low	rationality check low	diff. MAP - upper threshold model less MAP tolerance	> 06.32	[kPa] [kPa]	engine speed	>= 550	[rpm]	1.8 [s] multiple	2 DCY	♦ Charge Air Pressure Sensor - GX26-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			within model range	0...120	[kPa]						
	P0238 – Turbocharger/ Supercharger Boost Sensor "A" Circuit High	rationality check high	diff. MAP - lower threshold model addtitional MAP tolerance within model range	< 06.32 0...120	[kPa] [kPa] [kPa]	engine speed	>= 550	[rpm]	1.8 [s] multiple	2 DCY	♦ Charge Air Pressure Sensor - GX26-
Manifold Absolute Pressure (MAP) Sensor	P0106 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	rationality check low	difference manifold pressure - lower threshold model	< -6.32	[kPa]	engine speed	>= 550	[rpm]	1.8 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-
	P0106 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	rationality check high	difference manifold pressure - upper threshold model	> 6.32	[kPa]	engine speed	>= 550	[rpm]	1.8 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0106 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	rationality check	diff. barometric sensor signal vs. manifold pressure signal @engine start	> 25.00	[kPa]	time after engine start engine speed	< 25.0< 400	[s] [rpm]	1.8 [s] multiple	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Manifold Absolute Pressure (MAP) Sensor	P0106 – Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	rationality check	manifold pressure signal: variation between state 1 and 2	< 5.00	[kPa]	general engine temperature @ engine start or ECT downstream engine min. sensor defreezing time diagnostic state 1 engine speed throttle angle turbocharger bypass actuator position conditions fulfilled for time diagnostic state 2 engine speed throttle angle turbocharger bypass actuator position or throttle an-	> 1> 30 > 100.0 < 3000 > 12.00 < 99.01; > -400.0 0 > 1.0 > 1500 < 6.50 > -400.0 0 > 110.0 0 < 25.00 > 1.0	[°C] [°C] [s] [rpm] [%] [%] [s] [rpm] [%] [%] [%] [%] [s]	1.0 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Charge Air Pressure Sensor - GX26- ♦ Intake Manifold Sensor - GX9-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						gle turbocharger bypass actuator position conditions fulfilled for time					
Manifold Absolute Pressure(MAP) Sensor	U0609 – Lost Communication With Manifold Absolute Pressure Sensor "A"	circuit low	signal voltage	< 0.20	[V]				0.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
Manifold Absolute Pressure(MAP) Sensor	U0609 – Lost Communication With Manifold Absolute Pressure Sensor "A"	circuit high	signal voltage	> 4.80	[V]				0.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Intake Manifold	P2279 – Intake Air System Leak Bank 1	rationality check	adaptation value for effective throttle area	> 8.98	[mm²]	time after engine start fuel cut off for time EVAP purge valve diagnosis for time engine speed pressure ratio @ throttle ECT downstream engine BARO MAP gradient gradient of pressure ratio @ throttle MAF @ throttle diff. MAP vs. BPU pressure throttle area adaptation	>= 3.0 not active > 0.0 not active > 0.0 <= 1500; >= 600 not calibrated not calibrated not calibrated not calibrated not calibrated <= 20.00; >= 0.00 not calibrated finished	[s] [s] [s] [rpm] [-] [°C] [kPa] [1/s] [1/s] [kg/h] [kPa]	3.0 [s] multiple	2 DCY	♦ Check for air leaks (between the MAF and) (near) the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. ♦ Intake Manifold Sensor - GX9- ♦ Throttle Valve Control

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
											Module -GX3- ♦ EVAP Canister Purge Regulator Valve 1 -N80-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Cold Start Monitoring Ignition Control (IC)	P050B – Cold Start Ignition Timing Performance	idle ignition timing monitor	diff. commanded vs. actual spark timing	> 20.00	[%]	general conditions commanded spark retard during CSERS conditions CSERS conditions for time fuel cut off BARO idle condition diff. relative engine load vs. filtered relative engine load (for relative engine load dynamic detection) diff. engine speed vs. filtered engine speed (for engine speed dynamic	< 75.0 active > 2.5 not active > 40.00 active <= | 10.01 |<= | 150 | <= 100.0 10.0 not equipped > 1.0 finished > 6.0	[%] [s] [kPa] [%] [rpm] [%] [km/h] [s] [s]	0 (FTP75 : 50.0) [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other codes are set, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						detection)relative engine load conditions vehicle speed vehicle speed or engine running and decoupled from powertrain (for hybrid)all conditions above must be fulfilled for time conditions at fault decision CSERS conditions required monitoring time					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
catalyst temperature hold mode monitoring Ignition Control (IC)	P13EA – Cold Start Ignition Timing Performance Off Idle	part load ignition timing monitor	diff. commanded vs. actual spark timing	>= 0.12... 0.15	[%]	general conditions commanded spark retard during catalyst temperature hold mode conditions catalyst temperature hold mode for time fuel cut off BARO diff. relative engine load vs. filtered relative engine load diff. engine speed vs. filtered engine speed idle condition and conditions vehicle speed	< 80.00 active > 2.5 not active > 40.00 <= | 10.01 |<= | 150 | not active >= 2 not calibrated not equipped finished > 6.0	[%] [s] [kPa] [%] [rpm] [km/h] [km/h] [s]	0 (FT75: 50.0) [s] once / DCY	2 DCY	♦ If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module . Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						vehicle speed or vehicle speed additional conditions (only for hybrid)engine running and decoupled from powertrain conditions @ fault decision CSERS conditions required monitoring time					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
catalyst temperature hold mode monitoring	P050B – Cold Start Ignition Timing Performance	idle	diff. commanded vs. actual spark timing	>= 0.20	[%]	general conditions			0 (FTP75 : 50) [s] once / DCY	2 DCY	♦ Throttle Valve Control Module - GX3- ♦ Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other codes are set, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Ignition Control (IC)		ignition timing monitor				commanded spark retard during catalyst temperature hold mode conditions catalyst temperature hold mode for time fuel cut off BARO idle condition diff. relative engine load vs. filtered relative engine load diff. engine speed vs. filtered engine speed relative engine load and conditions vehicle	< 75.00 active > 2.5 not active > 40.00 active <= | 10.01 |<= | 150 | <= 100.0 10.0 not equipped finished > 6.0	[%] [s] [kPa] [%] [rpm] [%] [km/h] [s]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						speed vehicle speed additional conditions (only for hybrid)engine running and decoupled from powertrain conditions @ fault decision CSERS conditions required monitoring time					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
Cold Start Monitoring Ignition Control (IC)	P13EA – Cold Start Ignition Timing Performance Off Idle	part load ignition timing monitor	diff. commanded vs. actual spark timing	> 12.00. ..16.50	[%]	general conditions commanded spark retard during CSERS conditions CSERS conditions for time fuel cut off BARO diff. relative engine load vs. filtered relative engine load (for relative engine load dynamic detection)diff. engine speed vs. filtered engine speed (for engine speed dynamic detection)idle condi-	< 80.0 active > 2.5 not active > 40.00 <= | 10.01 |<= | 150 | not active >= 2 not calibrated not equipped > 1.0 finished > 6.0	[%] [s] [kPa] [%] [rpm] [km/h] [km/h] [s] [s]	0 (FTP75 : 50.0) [s] once / DCY	2 DCY	♦ If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module . Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						tion conditions vehicle speed vehicle speed or vehicle speed additional (only for hybrid) engine running and decoupled from powertrain all conditions above must be fulfilled for time conditions at fault decision CSERS conditions required monitoring time					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Ignition Coil	P2300 – Ignition Coil "A" Primary Control Circuit Low P2306 – Ignition Coil "C" Primary Control Circuit Low P2309 – Ignition Coil "D" Primary Control Circuit Low P2303 – Ignition Coil "B" Primary Control Circuit Low	circuit low	signal current	>= 24...36	[mA]	actuator ECM drive battery voltage engine speed or engine speed for	commanded on active > 8.90; < 16.10 > 1400 <= 1400	[V] [rpm] [rpm]	10 [events] multiple	2 DCY	♦ Ignition Coils

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						ignition counter ignition fade out	> 5 not requested	[-]			
	P0351 – Ignition Coil "A" Primary Control Circuit/Open P0353 – Ignition Coil "C" Primary Control Circuit/Open P0354 – Ignition Coil "D" Primary Control Circuit/Open P0352 – Ignition Coil "B" Primary Control Circuit/Open	open circuit	signal current	<= 0.25... 2.00	[mA]	actuator ECM drive battery voltage engine speed or engine speed for ignition counter ignition fade out	commanded on active > 8.90; < 16.10 > 1400 <= 1400 > 5 not requested	[V] [rpm] [rpm] [-]	10 [events] multiple	2 DCY	♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2301 – Ignition Coil "A" Primary Control Circuit High P2307 – Ignition Coil "C" Primary Control Circuit High P2310 – Ignition Coil "D" Primary Control Circuit High P2304 – Ignition Coil "B" Primary Control Circuit High	circuit high	signal voltage	>= 5.6	[V]	actuator ECM drive battery voltage engine speed or engine speed for ignition counter ignition fade out	commanded on active > 8.90; < 16.10 > 1400 <= 1400 > 5 not requested	[V] [rpm] [rpm] [-]	10 [events] multiple	2 DCY	♦ Ignition Coils

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Knock Sensor (KS)	P0327 – Knock/ Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	circuit low Port A	signal voltage for number of tests	< -0.70 >= 3.00	[V] [-]	engine speed engine speed gradient for time conditions for engine load detection MAP or engine load or idle mode conditions above must be fulfilled for time crankshaft limp home mode normal interval between tests (without fault suspicion)crankshaft revolutions interval between tests (in case	> 500 < 2100.00...2700.00 > 0.5 < 40.00...66.00 < 6.00...35.53 active > 0.5 not active 1000.0060.00100 0.00	[rpm] [rpm/s] [s] [kPa] [%] [s] CRK [rev] CRK [rev] CRK [rev]	1.0 [s] multiple	2 DCY	♦ Knock Sensor 1 -G61-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						of fault suspicion in current DCY) crankshaft revolutions interval between tests (in case					
						of fault memory entry in previous DCY) crankshaft revolutions					
	P0328 – Knock/ Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	circuit high Port A	signal voltage for number of tests	> 1.00 >= 3.00	[V] [-]	engine speed engine speed gradient for time conditions for engine load detection MAP or	> 500 < 2100.00...2700.00 > 0.5 < 40.00...66.00	[rpm] [rpm/s] [s] [kPa]	1.0 [s] multiple	2 DCY	♦ Knock Sensor 1 -G61-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine load or idle mode conditions above must be fulfilled for time crankshaft limp home mode normal interval between tests (without fault suspicion)crankshaft revolutions interval between tests (in case	< 6.00... 35.53 active > 0.5 not active 1000.0060.00100 0.00	[%] [s] CRK [rev] CRK [rev] CRK [rev]			
						of fault suspicion in current DCY) crankshaft revolutions interval between tests (in case					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						of fault memory entry in previous DCY) crankshaft revolutions					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0327 – Knock/ Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	circuit low Port B	signal voltage for number of tests	< -0.70 >= 3.00	[V] [-]	engine speed engine speed gradient for time conditions for engine load detection MAP or engine load or idle mode conditions above must be fulfilled for time crankshaft limp home mode normal interval between tests (without fault suspicion)crankshaft revolutions interval between tests (in case	> 500 < 2100.00...2700.00 > 0.5 < 40.00...66.00 < 6.00...35.53 active > 0.5 not active 1000.0060.00100 0.00	[rpm] [rpm/s] [s] [kPa] [%] [s] CRK [rev] CRK [rev] CRK [rev]	1.0 [s] multiple	2 D C Y	♦ Knock Sensor 1 -G61-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						of fault suspicion in current DCY) crankshaft revolutions interval between tests (in case					
						of fault memory entry in previous DCY) crankshaft revolutions					
	P0328 – Knock/ Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	circuit high Port B	signal voltage for number of tests	> 1.00 >= 3.00	[V] [-]	engine speed engine speed gradient for time conditions for engine load detection MAP or engine load	> 500 < 2100.00...2700.00 > 0.5 < 40.00...66.00 < 6.00...35.53	[rpm] [rpm/s] [s] [kPa] [%]	1.0 [s] multiple	2 DCY	♦ Knock Sensor 1 -G61-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						or idle mode conditions above must be fulfilled for time crankshaft limp home mode normal interval between tests (without fault suspicion)crankshaft revolutions interval between tests (in case	active > 0.5 not active 1000.0060.00100 0.00	[s] CRK [rev] CRK [rev] CRK [rev]			
						of fault suspicion in current DCY)crank shaft revolutions interval between tests (in case					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						of fault memory entry in previous DCY) crankshaft revolutions					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Knock Sensor (KS)	P0327 – Knock/ Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	out of range low	reference knock signal	< 0.450...5.000	[bar]	engine speed injection cut off knock control ECT downstream engine engine engine load engine speed DFI stratified injection fuel cut off conditions for engine load dynamic detection accelerator pedal or engine load dynamic or MAP signal dynamic conditions for engine speed dynamic detection engine	> 1400 not detected active > 40 running > 40.01 > 500 not detected not detected released by driver not calibrated < 40.00...66.00 < 2100...2700 > 1400	[rpm] [°C] [%] [rpm] [%] [kPa] [rpm/s] [rpm]	3.0 [s] multiple	2 DCY	♦ Knock Sensor 1 -G61-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						speed gradient engine speed					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0328 – Knock/ Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	out of range high	reference knock signal	> 43.00. ..208. 68	[bar]	injection cut off knock control ECT downstream engine engine engine load engine speed DFI stratified injection fuel cut off conditions for engine load dynamic detection accelerator pedal or engine load dynamic or engine load dynamic (set point) or MAP signal dynamic condition for engine speed dynamic	not detected active > 40 running > 40.01 > 500 not detected not detected released by driver not calibrated not calibrated< 40.00. ..66.0 0	[°C] [%] [rpm] [%] [%] [kPa]	3.0 [s] multiple	2 D C Y	♦ Knock Sensor 1 -G61-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						detection					

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						engine speed gradient engine speed	< 2100...2700 > 1400	[rpm/s] [rpm]			
Brake Light Switch	P0571 – Brake Switch "A" Circuit	rationality check	state of the main brake switch and the redundant brake switch for number of events	not equal >= 10.00	[-]	ECM drive mode	detected		2.0 [s] continuous	2 DCY	♦ Check the brake light switch and its associated circuits. Refer to appropriate electrical schematic.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fan Control (FC) Module	P2B2F – Fan 1 Performance/ Stuck Off	only for fan equipped with PWM control actuator internal check (fan blocked)	error counter actuator diagnostic signal - counting sequence: time duration of ground signal sent by fan control with delay time	> 3.00> 1.7...2.3> 1.9...2.1	[-] [s] [s]	conditions @ fault decision duty cycle for time	> 13> 90	[%] [s]	0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-
Fan Control (FC) Module	P2D88 – Fan 1 Control Module Performance	only for fan equipped with PWM control actuator internal check (short circuit)	error counter actuator diagnostic signal - counting sequence: time duration of ground signal sent by fan control with delay time	> 3.00 > 2.7...3.3 > 1.9...2.1	[-] [s] [s]				0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MILIIum	Component Diagnostic
- if equipped - Fan Control (FC) Module	P2B31 – Fan 2 Performance/ Stuck Off	only for fan equipped with PWM control actuator internal check (fan 2 blocked)	error counter actuator diagnostic signal - counting sequence: time duration of ground signal sent by fan control with delay time	> 3.00 > 4.7...5.3 > 1.9...2.1	[-] [s] [s]	conditions @ fault decision duty cycle for time	> 13 > 90	[%] [s]	0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-
- if equipped - Fan Control (FC) Module	P2D8B – Fan 2 Control Module Performance	only for fan equipped with PWM control actuator internal check (short circuit fan 2)	error counter actuator diagnostic signal - counting sequence: time duration of ground signal sent by fan control with delay time	> 3.00 > 5.7...6.3 > 1.9...2.1	[-] [s] [s]				0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fan Control (FC) Module	P2D89 – Fan 1 Control Module Supply Voltage Circuit	only for fan equipped with PWM control actuator internal check (electronics)	error counter actuator diagnostic signal - counting sequence: time duration of ground signal sent by fan control with delay time	> 3.00 > 3.7...4.3 > 1.9...2.1	[-] [s] [s]				0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-
Fan Control (FC) Module	P2D87 – Fan 1 Control Module Over Temperature	only for fan equipped with PWM control actuator internal check (overtemperature warning power stage)	error counter actuator diagnostic signal - counting sequence: time duration of ground signal sent by fan control with delay time	> 3.00 > 0.7...1.3 > 1.9...2.1	[-] [s] [s]				0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fan Control (FC) Module	P0691 – Fan 1 Control Circuit Low	circuit low	signal voltage	< 1.64... 1.96	[V]	actuator ECM pre-drive battery voltage duty cycle (once in current DCY)	commanded off not detected >= 9.00; <= 16.00 > -400.00	[V] [%]	10.0 [s] continuous	2 DCY	♦ Radiator Fan - VX57-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0480 – Fan 1 Control Circuit	open circuit	signal voltage	> 1.64... 1.96; <= 2.73... 3.27	[V]	actuator ECM pre-drive battery voltage duty cycle (once in current DCY)	commanded off not detected >= 9.00; <= 16.00 > -400.00	[V] [%]	0.5 [s] continuous	2 DCY	♦ Radiator Fan - VX57-
	P0692 – Fan 1 Control Circuit High	circuit high	signal current	>= 0.6...1.4	[A]	actuator ECM pre-drive battery voltage duty cycle (once in current DCY)	commanded on not detected >= 9.00; <= 16.00 > -400.00	[V] [%]	0.5 [s] continuous	2 DCY	♦ Radiator Fan - VX57-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Fan Control (FC) Module	P0634 – Control Module Internal Temperature "A" Too High	overtemperature power stage	power stage temperature	> 165... 175	[°C]	actuator ECM predrive battery voltage duty cycle (once in current DCY)	commanded on not detected >= 9.00; <= 16.00 > -400.00	[V][%]	0.5 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
Main Relay	P0686 – ECM/PCM Power Relay Control Circuit Low	circuit continuity check	circuit low	detected					0 [s] once / DCY	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271-
Main Relay	P0685 – ECM/PCM Power Relay Control Circuit/ Open	open circuit	no load	detected					0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271-
Main Relay	P0687 – ECM/PCM Power Relay Control Circuit High	circuit high	signal current	>= 0.7...1.5	[A]	actuator	commanded on		0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271-
Main Relay	P068B – ECM/PCM Power Relay De-Energized Performance - Too Late	functional check - stuck check	main relay closed while main relay	detected commanded off					0.5 [s] once / DCY	1 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Battery Voltage	U3501 – Control Module Input Power "A" Circuit Low	vehicle state: not ready to drive out of range low	battery voltage	< 9.00	[V]	ignition engine engine start @ current DCY	on not running not detected		9.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Battery Voltage	U3502 – Control Module Input Power "A" Circuit High	vehicle state: not ready to drive out of range high	battery voltage	> 16.00	[V]	ignition engine engine start @ current DCY	on not running not detected		9.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Battery Voltage	U3501 – Control Module Input Power "A" Circuit Low	vehicle state: ready to drive out of range low	battery voltage	< 9.80	[V]	case 1 engine time after first engine start case 2 engine stop/ start mode	running > 1.0 not running active	[s]	9.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Battery Voltage	U3502 – Control Module Input Power "A" Circuit High	vehicle state: ready to drive out of range high	battery voltage	> 16.00	[V]	case 1 engine time after first engine start case 2 engine stop/ start mode	running > 1.0 not running active	[s]	9.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Battery Voltage	U3501 – Control Module Input Power "A" Circuit Low	vehicle state: ECM keep alive mode out of range low	battery voltage	< 9.00	[V]	ECM keep alive mode	active		9.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Battery Voltage	U3502 – Control Module Input Power "A" Circuit High	vehicle state: ECM keep alive mode out of range high	battery voltage	> 16.00	[V]	ECM keep alive mode	active		9.0 [s] continuous	2 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): voltage monitoring	P0562 – System Voltage Low	ECM power supply check	signal voltage	<= 1.5...2.0	[V]	ECM initialization	active		2 [events] once / DCY	1 DCY	♦ Motronic Engine Control Module Power Supply Relay - J271- ♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Internal Timer	P2610 – ECM/PCM Engine Off Timer Performance	internal hardware check	internal check	failure		ECM power on or ignition or ignition (during ECM keep alive-time)	completed on off		none [-] continuous	2 DCY	♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Internal Timer	P2610 – ECM/PCM Engine Off Timer Performance	rationality check high	deviation engine-off-time and ECM keep alive-time	> 8.00	[%]	reference ECM keep alive time	63.0	[s]	none [-]once / DCY	2 DCY	♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P2610 – ECM/PCM Engine Off Timer Performance	rationality check low	deviation engine-off-time and ECM keep alive-time	< -8.00	[%]	reference ECM keep alive time	63.0	[s]	none [-]once / DCY	2 DCY	♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P2610 – ECM/PCM Engine Off Timer Performance	rationality check low	deviation engine-off-time and ECM keep alive-time	< -8.00	[%]	ECM shut down completed ignition	>= 1on	[-]	none [-] once / DCY	2 DCY	♦ Check powers/ grounds to the Engine/ Motor Control Module - J623-. If ok, then replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Barometric Pressure (BARO) Sensor	P2228 – Barometric Pressure Sensor "A" Circuit Low	internal hardware check	circuit low internal check sum SPI communication	detected failed error detected		time delay after sensor reset test phase during calibration	> 0.1 not active	[s]	0.5 [s] multiple	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P2229 – Barometric Pressure Sensor "A" Circuit High	internal hardware check	circuit high internal check sum SPI communication	detected failed error detected		time delay after sensor reset test phase during calibration	> 0.1 not active	[s]	0.5 [s] multiple	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Barometric Pressure (BARO) Sensor	P2229 – Barometric Pressure Sensor "A" Circuit High	sensor internal check (rationality)	sensor signal: rationality check	error detected		time delay after sensor reset test phase during calibration ECM drive mode	> 0.1 not active detected	[s]	0.5 [s] multiple	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Coding	P064F – Unauthorized Software/Calibration Detected	code check of ECM	internal check	not valid					0.5 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): EEPROM	P0606 – ECM/PCM Processor	functional check (EEPROM writing)	write access	failed		ECM EEPROM ECM switch-on conditions	active ready fulfilled		3 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): EEPROM	P0606 – ECM/PCM Processor	functional check (EEPROM reading)	read access	failed		ECM EEPROM ECM switch-on conditions	active ready fulfilled		3 [events] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: direct fuel injection mass ratio	internal check	failed		internal engine speed	> 1200	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: Direct Fuel Injection mixture control	internal check	failed		internal engine speed	> 1200	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P0169 – Incorrect Fuel Composition	function monitoring: Direct Fuel Injection	corrections of fuel mass on single cylinders	incorrect		internal engine speed	> 1200	[rpm]	0.52 [s] continuous	2 DCY	♦ Check for contaminated/ aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. ♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: Direct Fuel Injection	injection cut off	incorrect		internal engine speed	> 1200	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: A/D converter	test pulse check	failed					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: A/D converter	test voltage check	failed					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: engine speed deviation	difference between calculated and internal engine speed	> 400	[rpm]	internal engine speed	> 500	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: coding	internal check	failed					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: coding	internal check	failed					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: ignition angle	internal check	failed		internal engine speed	> 1200	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: injection rate limitation	system reaction	incorrect					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: intern	system reaction	incorrect					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: input signals for torque monitoring	internal check	failed		internal engine speed	> 400	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: cylinder deactivation (CD)	ignition on deactivated cylinders or injection on deactivated cylinders	active active		internal engine speed cylinder deactivation (CD)	> 1200 active	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: injection mode	internal check	failed		internal engine speed	> 1200	[rpm]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: accelerator position	comparison voltage sensor 1 with sensor 2	implausible					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: injection quantity limitation	Injection power-stage deactivation or CAN / FlexRay transreceiver deactivation	failed failed					0.1 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P0169 – Incorrect Fuel Composition	function monitoring: load plausibility	abs. difference between predicted and real air mass	> 9.75	[%]	engine speed	>= 1200	[rpm]	0.5 [s] continuous	2 DCY	♦ Check for contaminated/ aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. ♦ Oxygen Sensor 1 Before Catalytic Converter - GX10- ♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: powertrain activation	monitoring conditions for powertrain activation	failure					0.2 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: powertrain activation (ignition off detected)	powertrain activation	detected		ignition for time	off>= 1.1	[s]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P060C – Internal Control Module Main Processor Performance	function monitoring: powertrain activation (ignition on detected)	powertrain activation and signal ignition on from hardware and BUS	detected not equal		engine speed remote start starter above conditions must be fulfilled for time	> 500 not active not active>= 1.0	[rpm] [s]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P060C – Internal Control Module Main Processor Performance	function monitoring: powertrain activation (internal check)	powertrain activation	detected		internal check (RAM)	failed		0.5 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P060C – Internal Control Module Main Processor Performance	function monitoring: powertrain activation (park assist on)	powertrain activation	detected		engine start by park assist for time park assist above conditions must be fulfilled for time	commanded on >= 0.1 active >= 3.0	[s] [s]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
	P060C – Internal Control Module Main Processor Performance	function monitoring: powertrain activation (charger plug used - only PHEV / BEV)	powertrain activation for electrical drive and external charging during vehicle speed	not calibrated not calibrated not calibrated	[km/h]	engine start by park assist for time park assist above conditions must be fulfilled for time	commanded on >= 0.1 active >= 3.0	[s] [s]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: speed control	torque interventions from speed control	incorrect		ignition	on		0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: maximum torque comparison	monitoring detects that actual level 1 torque set point is greater than torque set point plus offset	incorrect		ignition	on		0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: maximum torque comparison	monitoring detects that actual torque is greater than torque set point plus offset	incorrect		ignition	on		0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: stability control interventions and recuperation	invalid/ implausible stability intervention	detected					0.1 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	internal hardware check	internal check	failure					none [-] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: hardware watch dog	over voltage detection	failure					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: hardware watch dog	hardware check injection deactivation line	failure					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P0606 – ECM/PCM Processor	function monitoring: hardware watch dog	hardware check error pin line	failure					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P0606 – ECM/PCM Processor	function monitoring: hardware watch dog	internal check	failure					0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Electronic Throttle Control Module	P060C – Internal Control Module Main Processor Performance	function monitoring: error case pinion starter energized	engine start and pinion starter energized or pinion starter energized and fuel injection	not allowed detected not allowed detected					0.1 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Electronic Throttle Control Module	P2106 – Throttle Actuator Control System - Forced Limited Power	functional check	actuator diagnostic signal: internal error	failure		ECM predrive battery voltage safety fuel cut off actual throttle position throttle actuator adaption actuator conditions for fault decision actuator	not detected >= 7.77 not detected valid not active commanded on detected	[V]	0 [s] continuous	2 DCY	♦ Throttle Valve Control Module - GX3-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Fuel Injector	P0606 – ECM/PCM Processor	function monitoring: multi injection	rel. diff. measured vs. set point injection angle or rel. diff. measured vs. set point of injection time or mismatch measured vs. requested number of injections or rel. diff. measured vs. set point of split injection time and additional criterion (combined with each criterion above)fault rate @ multi injection mode all criteria above	> | 34.99 |> | 0.10 | detected > | 1.00 | > 0 >= 200	[°CRK] [ms] [ms] [-] [-]	multi injection catalyst heating	active not active		0 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			must be fulfilled for number of working cycles								
Engine Control Module (ECM): Ignition Control (IC)	P0606 – ECM/PCM Processor	communication check	internal check	error detected		ECM drive battery voltage ignition fade out engine speed conditions for low engine speed engine speed ignition counter	detected> 8.90; < 16.10 not requested > 1400 <= 1400 > 5	[V] [rpm] [-]	0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Knock Control	P0324 – Knock/ Combustion Vibration Control System Error	internal hardware check	signal fault counter (combustion)	> 48.00	[-]	engine speed gradient	< | 1000.00 |	[rpm/s]	400.00 [events] multiple	2 DCY	♦ Knock Sensor 1 -G61-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
						number of expected measured values in measurement window engine speed	<= 200 not calibrated	[-] [rpm]			
	P0324 – Knock/ Combustion Vibration Control System Error	internal hardware check	signal fault counter (measuring window)	> 6.00	[-]	engine speed	> 1000	[rpm]	3 [s] multiple	2 DCY	♦ Knock Sensor 1 -G61-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Cold Start Monitoring Engine Control Module (ECM): Multi Injection	P0606 – ECM/PCM Processor	rationality check	ratio injection fault counter to number of requested injections	> 0.16	[-]	general conditions engine injection mode for catalyst heating injection on all cylinders catalyst heating conditions at fault decision catalyst heating within number of combustions	running active active active finished > 200	[-]	60 [s] once / DCY	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Processor	P0606 – ECM/PCM Processor	internal hardware check	memory or initialization or reset	error detected error detected error detected		ECM drive	active		0 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Processor	P0606 – ECM/PCM Processor	internal hardware check	memory or initialization or reset	error detected error detected error detected		ECM pre-drive	active		0 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Production Mode	U1103 – Production Mode Active	function monitoring: mode change	production mode	active		for activation: during ECM keep alive-time after ignition off vehicle speed engine speed max trip mileage since initial vehicle start-up for hybrid: drive motor	<= 50 < 100 off	[km/h] [rpm] [km]	0 [s] continuous	1 DCY	♦ Vehicle is in production mode. Refer to appropriate repair manual for resolution. Note the mode can be deactivated with a factory scan tool or will automatically turn off after vehicle accumulates the first 100 km (62.14 miles) of driving.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Sensor Reference Circuit A	P0641 – Sensor Reference Voltage "A" Circuit/ Open	short circuit	signal voltage or signal voltage or signal current	< 4.61... 5.00 > 5.00... 5.41 > 220... 800	[V] [V] [mA]	ignition	on		0 [s] continuous	2 DCY	♦ If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Sensor Reference Circuit B	P0651 – Sensor Reference Voltage "B" Circuit/ Open	short circuit	signal voltage or signal voltage or signal current	< 4.61... 5.00 > 5.00... 5.41 > 220... 800	[V] [V] [mA]	ignition	on		0 [s] continuous	2 DCY	♦ If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Sensor Reference Circuit C	P0697 – Sensor Reference Voltage "C" Circuit/ Open	short circuit	signal voltage or signal voltage or signal current	< 4.61... 5.00 > 5.00... 5.41 > 220... 800	[V] [V] [mA]	ignition	on		0 [s] continuous	2 D C Y	♦ If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Active Grille Air Shutter	U35FF – Forced Vehicle Speed Limitation	communication with Active Grille Air Shutter	vehicle speed limitation	<= 135	[km/h]	ignition calculation of limiting request for Active Grille Air Shutter calculation of diagnosis monitoring	on active released	[-]	1.00 [events] continuous	2 D C Y	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Repair Mode	P195E – Routine With Data Transmission	function monitoring: service routine of quick start external stimulation interface	routine	active		vehicle speed service tester interface service tester	0 connected requested	[km/h]	0 [s] continuous	1 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
Engine Control Module (ECM): Transport Mode	P169A – Loading Mode Active	function monitoring: mode change	transport mode	active		for activation: during ECM keep alive-time after ignition off vehicle speed engine speed max trip mileage since initial vehicle start-up production mode for hybrid: drive motor	<= 50 < 100 not active off	[km/h] [rpm] [km]	0 [s] continuous	1 DCY	♦ Vehicle is in Transport Mode (Loading Mode). It can be turned off with a scan tool or will automatically switch off after approximately 100 km (62.15 miles) have accumulated on the vehicle. May need to perform readiness check. Refer to ⇒ C3.2 ode', page 15 .

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
Engine Control Module (ECM): Turbocharger (TC) Actuator	P0606 – ECM/PCM Processor	under voltage	supply voltage	< 3.1...4.5	[V]	actuator	commanded on		0.5 [s] continuous	2 DCY	♦ Replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
COM: Ambient Air Temperature (AAT) Sensor	P0072 – Ambient Air Temperature Sensor Circuit "A" Low	communication with AAT Sensor	AAT signal: circuit low	error detected		time after ignition on	>= 2.0	[s]	1.0 [s] continuous	2 DCY	♦ Outside Air Temperature Sensor - G17- ♦ Check the CAN-Bus terminal resistance.
COM: Ambient Air Temperature (AAT) Sensor	P0070 – Ambient Air Temperature Sensor Circuit "A"	communication with AAT Sensor	AAT signal: circuit high	error detected		time after ignition on	>= 2.0	[s]	1.0 [s] continuous	2 DCY	♦ Outside Air Temperature Sensor - G17- ♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Ambient Air Temperature (AAT) Sensor	U0322 – Software Incompatibility With Body Control Module	communication with AAT Sensor	AAT signal: coding	error detected		time after ignition on	> 500	[ms]	2.0 [s] continuous	2 DCY	♦ Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Vehicle Electrical System Control Module - J519-. Refer to appropriate repair manual.
COM: Ambient Air Temperature (AAT) Sensor	U0422 – Invalid Data Received From Body Control Module	communication with AAT Sensor	AAT signal: initialization	error detected		time after ignition on	> 500	[ms]	3.00 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Airbag Control Module	U0151 – Lost Communication With Restraints Control Module	communication with Airbag	received message	no message		CAN	active		2.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Airbag Control Module	P1609 – Crash Shut-Off Was Triggered	communication with Airbag	received data: crash intensity for shut down Fuel Injection	detected					0 [s] continuous	1 DCY	♦ After proper repair of damage, erase the Engine Control Module - J623- DTC. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 26 .

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Battery Energy Control Module (BECM)	U029A – Lost Communication With Hybrid/EV Battery Pack Sensor Module	communication with BECM	received message	no message		time after ignition on conditions for measurement window (hysteresis)battery voltage @ diagnosis on battery voltage @ diagnosis off	>= 0.5> 8.90; < 16.10 > 16.20; < 8.80	[s] [V] [V]	5.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
	U059B – Invalid Data Received From Hybrid/EV Battery Pack Sensor Module	communication with BECM	received message	implausible message		time after ignition on conditions for measurement window (hysteresis)battery voltage @ diagnosis on battery voltage @ diagnosis off	>= 0.5> 8.90; < 16.10 > 16.20; < 8.80	[s] [V] [V]	5.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Body Control Module (BCM)	U0422 – Invalid Data Received From Body Control Module	communication with BCM	received message	implausible message		time after ignition on	>= 0.5	[s]	1.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Body Control Module (BCM)	U0140 – Lost Communication With Body Control Module	communication with BCM	received message	no message		battery voltage time after ignition on	9.5...16.0>= 500	[V] [ms]	2.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
- if equipped - COM: Brake Booster Pressure Sensor	U0416 – Invalid Data Received From Vehicle Dynamics Control Module	communication check	received message	implausible message		ignition CAN communication	onno failure		0.1 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
	U0416 – Invalid Data Received From Vehicle Dynamics Control Module	cross check	vacuum caused by vacuum pump only	not calibrated	[kPa]	break pedal CAN communication	commanded off no failure		0.2 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
	U0416 – Invalid Data Received From Vehicle Dynamics Control Module	cross check	diff. brake booster pressure measured by electronic stability program	not calibrated	[kPa]	CAN communication	no failure		0.2 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	U0416 – Invalid Data Received From Vehicle Dynamics Control Module	rationality check	previous and actual brake boost pressure measured by electronic stability program	no change		CAN communication	no failure		0.1 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Brake System Control Module (BSCM)	U0415 – Invalid Data Received From Anti-Lock Brake System (ABS) Control Module "A"	communication with BSCM	received message	implausible message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	500 [ms] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance. ♦ Check the vehicle speed signal to the Instrument Cluster Control Module - J285-.
COM: Brake System Control Module (BSCM)	U0121 – Lost Communication With Anti-Lock Brake System (ABS) Control Module "A"	communication with BSCM	received message	no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	500 [ms] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Climate Control (CC)	U0164 – Lost Communication With HVAC Control Module	communication with CC Module	received message	no message		time after ignition on	> 500	[ms]	1.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Crankcase Oil Separator	U04C4 – Invalid Data Received From Crankcase Oil Separator "A"	communication with crankcase oil separator	received data	implausible message		LIN	active		4.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Crankcase Oil Separator	U01C3 – Lost Communication With Crankcase Oil Separator "A"	communication with crankcase oil separator	received message	no message		LIN	active		4 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Door Control Module	U0199 – Lost Communication With "Door Control Module A"	communication with door control module	received message	no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	1.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Door Control Module	U049A – Invalid Data Received From "Door Control Module A"	communication with door control module	received message	implausible message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	1.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Electronic Brake Boost Control Module (EBBC)	U01B4 – Lost Communication with Brake System Control Module "B"	communication with EBBC	received message	no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	0.8 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Fuel Filler Door	P04C0 – Fuel Fill Door Unlock Control Range/ Performance	communication with BCM	electrical check fuel fill door actuator	error detected		CAN: Body Control Module	no time out		0.5 [s] continuous	2 DCY	♦ Fuel Filler Door Lock Motor - V155-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Fuel Level (FL) Sensor 1	P0462 – Fuel Level Sensor "A" Circuit Low	communication with IPC	IPC module signal: signal range check	error detected		ECM drive	active		0.5 [s] continuous	2 DCY	♦ Refer to appropriate wiring diagram. If fuel level sensor and circuitry are ok, then replace the Instrument Cluster Control Module - J285-. Refer to appropriate repair manual.
COM: Fuel Level (FL) Sensor 1	P0463 – Fuel Level Sensor "A" Circuit High	communication with IPC	IPC module signal: circuit high	error detected		ECM drive	active		0.5 [s] continuous	2 DCY	♦ Refer to appropriate wiring diagram. If fuel level sensor and circuitry are ok, then replace the Instrument Cluster Control Module - J285-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Fuel Level (FL) Sensor 1	P0462 – Fuel Level Sensor "A" Circuit Low	communication with IPC	IPC module signal: circuit low	error detected		ECM drive	active		0.5 [s] continuous	2 DCY	♦ Refer to appropriate wiring diagram. If fuel level sensor and circuitry are ok, then replace the Instrument Cluster Control Module -J285-. Refer to appropriate repair manual.
COM: Fuel Pump Control Module (FPCM)	P064A – Fuel Pump Control Module "A"	actuator internal check (electronics)	internal check	failed		PWM signal battery voltage	0.00...100.0 09.0...16.0	[%][V]	4.7 [s] continuous	2 DCY	♦ Fuel Delivery Unit -GX1-
COM: Fuel Pump Control Module (FPCM)	P025B – Fuel Pump Module "A" Control Circuit Range/Performance	actuator internal check (overtemperature warning power	power stage temperature	> 125.0...144.0	[°C]	PWM signal	0.00...100.00	[%]	1.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit -GX1-

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
		stage)				battery voltage	9.0...16.0	[V]			

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Fuel Pump Control Module (FPCM)	P2635 – Fuel Pump "A" Low Flow/ Performance	actuator internal check (signal range check)	phase current	> 3.0...22.0	[A]	PWM signal battery voltage	0.00...100.0 09.0...16.0	[%] [V]	2.1 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
COM: Fuel Pump Control Module (FPCM)	P2635 – Fuel Pump "A" Low Flow/ Performance	actuator internal check (pump blocked)	phase current	> 6.0...25.0	[A]	PWM signal battery voltage	0.00...100.0 09.0...16.0	[%] [V]	2.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
COM: Fuel Pump Control Module (FPCM)	P0628 – Fuel Pump "A" Control Circuit Low	actuator internal check (short circuit)	phase current	> 25.0...32.0	[A]	PWM signal battery voltage	0.00...100.0 09.0...16.0	[%] [V]	1.5 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
COM: Fuel Pump Control Module (FPCM)	P0627 – Fuel Pump "A" Control Circuit/ Open	actuator internal check (open circuit)	phase current for consecutive number of checks	< 0.3020	[A][-]	PWM signal battery voltage	0.00...100.0 09.0...16.0	[%] [V]	2.0 [s] continuous	2 DCY	♦ Fuel Delivery Unit - GX1-
COM: Gateway	U0146 – Lost Communication With Gateway "A"	communication with Gateway	received message	no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	5.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
COM: Instrument Panel Cluster (IPC)	U0155 – Lost Communication With Instrument Panel Cluster (IPC) Control Module	communication with IPC	received message	no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	5.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Instrument Panel Cluster (IPC)	U0423 – Invalid Data Received From Instrument Panel Cluster Control Module	communication with IPC	received message	implausible message		time after ignition on	>= 0.5	[s]	0.5 [s] continuous	2 DCY	♦ Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285-. Refer to appropriate repair manual.
COM: Instrument Panel Cluster (IPC)	U0423 – Invalid Data Received From Instrument Panel Cluster Control Module	communication check	diff. delta distance value received from IPC vs. delta distance value from ECU	> 0.29	[km]	vehicle speed	not calibrated	[km/h]	5 [events] continuous	2 DCY	♦ Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285-. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
			diff. actual value vs. last received value from IPC or diff. actual value vs. last received value from IPC	< 0> 12.7	[km] [km]				255 [events] continuous		
COM: Refueling Button	P04CD – Fuel Fill Door Open Request Sensor/ Switch Stuck On	communication with door control module (driver-side)	refueling button signal	error detected		CAN: driver's door control	no time out		30.0 [s] continuous	2 DCY	♦ Fuel Filler Door Lock Motor - V155-
COM: Refueling Button	P04C8 – Fuel Fill Door Open Request Sensor/ Switch Circuit	communication with door control module (driver-side)	open circuit: measured resistance	> 4.7	[kOhm]				30 [s] continuous	2 DCY	♦ Fuel Filler Door Lock Motor - V155-
	P04CA – Fuel Fill Door Open Request Sensor/ Switch Circuit Low	communication with door control module (driver-side)	short to ground: measured resistance	< 32	[Ohm]				30 [s] continuous	2 DCY	♦ Fuel Filler Door Lock Motor - V155-

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
	P04CB – Fuel Fill Door Open Request Sensor/ Switch Circuit High	communication with door control module (driver-side)	short to battery plus: measured resistance	< 1	[kOhm]				0.5 [s] continuous	2 DCY	♦ Fuel Filler Door Lock Motor - V155-
COM: Supplementary Coolant Pump	P2B9F – Coolant Pump "B" Underspeed	actuator internal check (minimal revolution speed not reached)	time duration of ground signal sent by pump and pause time between ground signal sent by pump	> 2300; < 2700 > 800; < 1200	[ms] [ms]	actuator ground key monitoring	commanded on active		11.7 [s] continuous	2 DCY	♦ Low Temperature Circuit Coolant Pump - V468-
COM: Transmission Control Module (TCM)	U0402 – Invalid Data Received From TCM	communication with TCM	received message	implausible message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	500 [ms] continuous	2 DCY	♦ Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Transmission Control Module (TCM)	U0101 – Lost Communication with TCM	communication with TCM	received message	no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	0.8 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

Table continues below.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Vehicle Speed Sensor (VSS)	P0502 – Vehicle Speed Sensor "A" Circuit Low	communication with VSS	speed sensor signal: circuit low	error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the vehicle speed signal. ♦ Check the CAN-Bus terminal resistance.
COM: Vehicle Speed Sensor (VSS)	P0502 – Vehicle Speed Sensor "A" Circuit Low	communication with VSS	speed sensor signal: circuit high	error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the vehicle speed signal. ♦ Check the CAN-Bus terminal resistance.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Vehicle Speed Sensor (VSS)	P0502 – Vehicle Speed Sensor "A" Circuit Low	communication with VSS	speed sensor signal: open circuit	error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the vehicle speed signal. ♦ Check the CAN-Bus terminal resistance.
COM: Vehicle Speed Sensor (VSS)	P0501 – Vehicle Speed Sensor "A" Circuit Range/ Performance	communication with VSS	speed sensor signal: out of range	error detected		time after ignition on	> 500	[ms]	0.5 [s] continuous	2 DCY	♦ Check the vehicle speed signal. ♦ Check the CAN-Bus terminal resistance.
COM: Vehicle Speed Sensor (VSS)	U0415 – Invalid Data Received From Anti-Lock Brake System (ABS) Control Module "A"	communication with VSS	speed sensor signal: sensor error	655.35	[km/h]	time after ignition on	> 500	[ms]	0.6 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance. ♦ Check the vehicle speed signal to the Instrument Cluster Control Module -J285-.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
COM: Vehicle Speed Sensor (VSS)	U0415 – Invalid Data Received From Anti-Lock Brake System (ABS) Control Module "A"	communication with VSS	speed sensor signal: low voltage error	655.33	[km/h]	time after ignition on	> 500	[ms]	0.6 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance. ♦ Check the vehicle speed signal to the Instrument Cluster Control Module - J285-.
COM: Vehicle Speed Sensor (VSS)	U0415 – Invalid Data Received From Anti-Lock Brake System (ABS) Control Module "A"	communication with VSS	speed sensor signal: out of range high	> 325.00	[km/h]	time after ignition on	> 500	[ms]	2.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance. ♦ Check the vehicle speed signal to the Instrument Cluster Control Module - J285-.
COM: Vehicle Speed Sensor (VSS)	U0415 – Invalid Data Received From Anti-Lock Brake System (ABS) Control Module "A"	communication with VSS	speed sensor signal: initialization error	655.34	[km/h]	time after ignition on	> 500	[ms]	0.6 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance. ♦ Check the vehicle speed signal to the Instrument Cluster Control Module - J285-.

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value		Secondary Parameters	Enable Condition		Monitoring Time Length	MIL Illum	Component Diagnostic
CAN: Controller	U0001 – High Speed CAN Communication Bus	reading back sent message	CAN message	no feedback		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	500 [ms] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
CAN: Controller	U0002 – High Speed CAN Communication Bus Performance	communication check	global time out	receiving no message		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	500 [ms] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
LIN: Crankcase Oil Separator	U01C3 – Lost Communication With Crankcase Oil Separator "A"	communication check	global time out	receiving no message					25.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
LIN: Controller	U0092 – Vehicle Communication Bus H	communication check	LIN message	no feedback		battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	3.0 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.
LIN: Controller	U0093 – Vehicle Communication Bus H Performance	communication check	global time out for time	receiving no message> 3.5	[s]	battery voltage time after ignition on	9.5...16.0 >= 500	[V] [ms]	3.5 [s] continuous	2 DCY	♦ Check the CAN-Bus terminal resistance.

3.5 Transmission DTC Tables

♦ ⇒ T3.5.1 ransmission Control Module, AQ300-8F (8 speed) 09S (2021/2022 MY)", page 569

3.5.1 Transmission Control Module, AQ300-8F (8 speed) 09S (2021/2022 MY)

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Shift Solenoid								
SC2	P0974 – Shift Solenoid "A" Control Circuit High	Conduction check in ON/OFF solenoid. Output Shorted High and Open Circuit check	Comparison of the signal of solenoid monitor and solenoid driver output	Wrong solenoid driver output signal	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	20 ms 5 times	2 DCY
SC3 +B short / Open	P0977 – Shift Solenoid "B" Control Circuit High							
SL	P0999 – Shift Solenoid "F" Control Circuit High							
SC2	P0973 – Shift Solenoid "A" Control Circuit Low	Conduction check in ON/OFF solenoid. Output Shorted Low check	Comparison of the signal of solenoid monitor and solenoid driver output	Wrong solenoid driver output signal	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	20 ms 5 times	
SC3 GND short	P0976 – Shift Solenoid "B" Control Circuit Low							
SL	P0998 – Shift Solenoid "F" Control Circuit Low							
Pressure Control Solenoid								
SLT	P0748 – Pressure Control Solenoid "A" Electrical	Linear solenoid feedback current Output Functional check	Comparison of target current and Feedback current	Sum of difference of two current > 30000 mA or Absolute value of the difference of two current >= 50 mA for 2000 ms continuously	Ignition Battery voltage Battery voltage Linear solenoid driver Malfunction	ON >= 9 V <=17 V No fault	1 Time	2 DCY
SL5	P0778 – Pressure Control Solenoid "B" Electrical							
SL6	P2810 – Pressure Control Solenoid "G" Electrical							
SL1 stuck	P0798 – Pressure Control Solenoid "C" Electrical							
SL2	P2716 – Pressure Control Solenoid "D" Electrical							

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Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
SL3	P2725 – Pressure Control Solenoid "E" Electrical							
SL4	P2734 – Pressure Control Solenoid "F" Electrical							
SLU	P2759 – Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical							
SLT	P0963 – Pressure Control Solenoid "A" Control Circuit High	Solenoid driver Hardware Output Shorted High check	Driver IC hardware detection flag	Driver IC battery short flag detection	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	100 ms	
SL5	P0777 – Pressure Control Solenoid "B" Stuck On							
SL6	P2809 – Pressure Control Solenoid "G" Stuck On							
SL1 +B short	P0797 – Pressure Control Solenoid "C" Stuck On							
SL2	P2715 – Pressure Control Solenoid "D" Stuck On							
SL3	P2724 – Pressure Control Solenoid "E" Stuck On							
SL4	P2733 – Pressure Control Solenoid "F" Stuck On							

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
SLU	P2758 – Torque Converter Clutch Pressure Control Solenoid Control Circuit Stuck On							
SLT	P0962 – Pressure Control Solenoid "A" Control Circuit Low	Solenoid driver Hardware Output Shorted Low check		Driver IC GND short flag detection	Ignition Battery voltage Battery voltage	ON >=9 V <= 17 V	20 ms 5 times	
SL5	P0776 – Pressure Control Solenoid "B" Performance/ Stuck Off							
SL6	P2808 – Pressure Control Solenoid "G" Performance/ Stuck Off							
SL1 GND short	P0796 – Pressure Control Solenoid "C" Performance/ Stuck Off							
SL2	P2714 – Pressure Control Solenoid "D" Performance/ Stuck Off							
SL3	P2723 – Pressure Control Solenoid "E" Performance/ Stuck Off							
SL4	P2732 – Pressure Control Solenoid "F" Performance/ Stuck Off							

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
SLU	P2757 – Torque Converter Clutch Pressure Control Solenoid Control Circuit Performance/ Stuck Off							
SLT	P0960 – Pressure Control Solenoid "A" Control Circuit/ Open	Linear solenoid feedback current Output Open Circuit check	Feedback current	Feedback current < 20 mA	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	100 ms	
SL5	P0964 – Pressure Control Solenoid "B" Control Circuit/ Open							
SL6	P2812 – Pressure Control Solenoid "G" Control Circuit/ Open							
SL1 open	P0968 – Pressure Control Solenoid "C" Control Circuit/ Open							
SL2	P2718 – Pressure Control Solenoid "D" Control Circuit/ Open							
SL3	P2727 – Pressure Control Solenoid "E" Control Circuit/ Open							
SL4	P2736 – Pressure Control Solenoid "F" Control Circuit/ Open							
SLU	P2761 – Torque Converter Clutch Pressure Control Solenoid Control Circuit/Open							

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Solenoid driver communication								
Driver IC communication error	P0702 – Transmission Control System Electrical	Solenoid driver IC Communication Loss/ Errors check	Checksum detection	Calculated checksum error of signal from Linear solenoid driver	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	80 ms	2 DCY

Table continues below.

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Speed sensor								
Output speed sensor GND short / Open	P19AB – Output Speed Sensor Intermittent/Circuit Low	Input Out-of-Range Low and Open Circuit check	Detection of wrong input AD value	AD value < 45	Ignition Battery voltage Battery voltage	ON >=9 V <= 17 V	20 ms 26 times	2 DCY
Output speed sensor B+ short	P077D – Output Shaft Speed Sensor Circuit High	Input Out-of-Range High check	Detection of wrong input AD value	AD value > 545	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	20 ms 26 times	
Output speed sensor No pulse	P0721 – Output Shaft Speed Sensor Circuit Range/ Performance	Input Rationality Low check	Comparison pulse of input revolution and output revolution	No pulse of output sensor during 11 pulses of input sensor	Engine speed	400 rpm	500 ms	
					Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V		
					Emergency mode	Deactive		
					Garage shifting	None		
					Time after garage shifting	>= T_GarageFin		
					Neutral control	None		
					Time after Neutral control	>= T_NCon Fin		
					Shifting	None		
					Time after shifting	>= T_Shift-Fin		
					C1 OFF control	None		

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
					Time after C1 OFF control	>=T_C1 ctrlFin		
					C2 OFF control	None		
					Time after C2 OFF control	>=T_C3 ctrlFin		
					Power supply cut for linear solenoids (SL1, SL2, SL3, SL4, SL5, SL6, SLT) and SC2 solenoid driver outputs ON signal	FALSCH		
					Time after (Solenoid cut condition (SL1, SL2, SL3,SL4, SL5, SL6, SLT) and SC2 solenoid driver outputs ON signal)	>= 8 s		
					Transmission internal range	D (including S)		
					Input speed sensor	No fault		
					SC2,SC3,SLC1, SLC2,SLC3,SLC4,SL5,SL6,SLT	No fault		
					out Rpm NC1	>= 600 rpm		
					Output speed sensor electrical failure	No fault		
Input speed sensor GND short / Open	P19AA – Input/Turbine Speed Sensor Intermittent/Circuit Low	Input Out-of-Range Low and Open Circuit check	Detection of wrong input AD value	AD value < 45	Ignition Battery voltage Battery voltage	ON >=9 V <= 17 V	20 ms 26 times	
Input speed sensor B+ short	P07C0 – Input/Turbine Shaft Speed Sensor "A" Circuit High	Input Out-of-Range High check	Detection of wrong input AD value	AD value > 545	Ignition Battery voltage Battery voltage	ON >= 9 V <= 17 V	20 ms 26 times	
Input speed sensor No pulse	P0716 – Input/Turbine Shaft Speed Sensor "A" Circuit Range/ Performance	Input Rationality Low check	Comparison pulse of input revolution and output revolution	No pulse of input sensor during 28 pulses of output sensor	Engine speed	400 rpm	500 ms	
					Ignition Battery voltage Battery voltage	ON >=9 V <= 17 V		
					Output speed sensor	No fault		
					Output speed	>= 300 rpm		

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
					Input speed sensor electrical failure	No fault		

Table continues below.

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Oil temperature sensor								
Oil temperature sensor Stuck	P0710 – Transmission Fluid Temperature Sensor "A" Circuit	Input Rationality Low check	Detection of wrong input temperature value	Measurement block shows Value 30° C and doesn't change this value by 1° C	oil temp.	-55° C to 200° C	15 min.	2 DCY
					Engine speed	400 rpm		
					Transmission internal range Ignition Battery voltage Battery voltage CAN Emergency mode	D (including S), R ON >= 9 V <= 17 V Active Deactive		
Oil temperature sensor High Stuck	P0710 – Transmission Fluid Temperature Sensor "A" Circuit	Input Rationality High check		Measurement block shows Value > 120° C	EG coolant temp. was after EG coolant temp. was Ignition Battery voltage Battery voltage CAN	>= 50° C for 10 s < 45° C for 10 s ON >= 9 V <= 17 V Active	10 ms	
					EG coolant temp	No fault		
Oil temperature sensor GND short	P0712 – Transmission Fluid Temperature Sensor "A" Circuit Low	Input Out-of-Range High check		Measurement block shows Value > 200° C	Ignition Battery voltage Battery voltage CAN	ON >= 9 V <= 17 V Active	5 s	
Oil temperature sensor Battery short / open	P0713 – Transmission Fluid Temperature Sensor "A" Circuit High	Input Out-of-Range Low and Open Circuit check		Measurement block shows Value < -55° C	Range Ignition Battery voltage Battery voltage Engine speed CAN	D,S ON >= 9 V <= 17 V 400 rpm Active	10 s	
Microcontroller Hardware								

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Flash ROM	P0700 – Transmission Control System (MIL Request)	Input Other Rationality check	Comparison of stored checksum value and calculated checksum	Two checksum values are not the same.	Ignition	ON	1 Time	2 DCY
DataFlash	P0700 – Transmission Control System (MIL Request)	Input Other Rationality check	Comparison of stored checksum value and calculated checksum	Two checksum values are not the same.	Ignition	ON		
Random Access Memory	P0700 – Transmission Control System (MIL Request)	Input Other Rationality check	Comparison of writing data and reading data.	Writing data is different from reading one.	Ignition	ON		

Table continues below.

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Functional Safety								
High braking torque detection	P2711 – Unexpected Mechanical Gear Disengagement	Input Other Rationality for check solenoid state	Check of solenoid state pattern and input torque	To detect braking torque > 1055 Nm	Ignition	ON	700 ms	2 DCY
Wrong gear select detection(by New Gear)	P0613 – TCM Processor	Input Other Rationality for check target gear	Detection of wrong target gear	target gear < allowed lowest gear	Ignition	ON	150 ms	

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Wrong gear select detection(by Solenoid Gear)	P0613 – TCM Processor	Input Other Rationality for check solenoid state	Detection of wrong solenoid state pattern	gear judged from solenoid pattern < allowed lowest gear	Ignition	ON	150 ms	
Wrong gear select detection(by Engine PRM)	P0613 – TCM Processor	Input Other Rationality for check engine speed	Detection of engine over revolution	engine speed > over revolution value x 1.05	Ignition	ON	150 ms	
Wrong direction engagement detection	P0613 – TCM Processor	Input Other Rationality for check solenoid state	Detection of wrong solenoid state pattern	range judged from solenoid pattern is different from driver request range.	Ignition	ON	200 ms	
Safe state impossible detection	P0613 – TCM Processor	Input Other Rationality check	Detection of linear solenoid feedback current when power supply for linear solenoid is cut or Comparison of the signal of solenoid monitor and solenoid driver output	linear solenoid feedback current > 20 mA Wrong solenoid driver signal for 2000 ms continuously	Ignition	ON	1 Time	
CPU core check	P0613 – TCM Processor	Input Other Rationality check	To detect a CPU processing error	Abnormal CPU processing is detected by using a micro controller function	Ignition	ON	1 Time	

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
ROM check	P0613 – TCM Processor	Input Other Rationality check	To detect an error about the ROM	ROM error is detected by using the micro controller functions and software function.	Ignition	ON	1 Time	
RAM data protection	P0613 – TCM Processor	Input Other Rationality check	To check detect about the RAM	ROM error is detected by using the micro controller functions and software functions.	Ignition	ON	1 Time	
Communication data check	P0613 – TCM Processor	Input Other Rationality check	To detect the error by checking the communication between Central Processing Unit (CPU) and Peripheral Control Unit (PCU)	Error is detected by checking the communication between CPU and PCU.	Ignition	ON	1 Time	
Program flow check	P0613 – TCM Processor	Input Other Rationality for TCM program miscalculation check	To detect TCM program flow problem	Comparison of processing address and predefined address.	Ignition	ON	1 Time	
Clock monitoring	P0613 – TCM Processor	Input Other Rationality check	To detect an error about the clock	Clock error is detected by using the micro controller function.	Ignition	ON	1 Time	

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Built in Self Test (BIST)	P0613 – TCM Processor	Input Other Rationality check	To detect errors of error detection functions	BIST error is detected by using the micro controller function.	Ignition	ON	1 Time	

Table continues below.

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
CAN								
Bus off	U0001 – High Speed CAN Communication Bus	Digital Input Communication Loss/ Errors check	Detection of CAN controller states	CAN controller becomes Bus off.	Communication initialization	WAHR	1 Time	2 DCY
ECU no communication (640h)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >=9 V <= 17 V	max. 5000 ms**	
ECU no communication (0A7h)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU no communication (0A8h)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU no communication (121h)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU no communication (641h)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
ECU no communication (391h)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU no communication (3BEh)	U0100 – Lost Communication With ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	ECU no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
Waehlhebel No Communication (0AFh)	U0103 – Lost Communication With Gear Shift Control Module "A"	Digital Input Communication Loss/ Errors check	Detection of communication error	Waehlhebel no communication	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU Message Counter Error (0A7h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal data freeze	Message counter not updated	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU Message Counter Error (0A8h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal data freeze	Message counter not updated	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU Message Counter Error (121h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal data freeze	Message counter not updated	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU Message Counter Error (641h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal data freeze	Message counter not updated	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
Waehlhebel Message Counter Error (0AFh)	U0404 – Invalid Data Received From Gear Shift Control Module "A"	Digital Input Communication Loss/ Errors check	Waehlhebel signal data freeze	Message counter not updated	CAN Ignition Battery voltage Battery voltage	Active ON >= 9 V <= 17 V	max. 5000 ms**	
ECU Check sum (0A7h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal check sum error	Wrong check sum value in 2 messages	Ignition	ON	max. 5000 ms**	

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
ECU Check sum (0A8h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal check sum error	Wrong check sum value in 2 messages	Ignition	ON	max. 5000 ms**	

Table continues below.

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
ECU Check sum (121h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal check sum error	Wrong check sum value in 2 messages	Ignition	ON	max. 5000 ms**	2 DCY
ECU Check sum (641h)	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	ECU signal check sum error	Wrong check sum value in 2 messages	Ignition	ON	max. 5000 ms**	
Accelerator undefined	U0401 – Invalid Data Received From ECM/PCM "A"	Digital Input Communication Loss/ Errors check	Detection of error signal	0xFF	CAN Ignition Battery voltage Battery voltage ECU communication ECU data update	Active ON >= 9 V <= 17 V Active Active	20 ms 13 times	
ECU wrong level	U0301 – Software Incompatibility With ECM/PCM	Digital Input Communication Loss/ Errors check	Detection of error signal	Transmission coding is manual transmission code (0Fh) or CAN signal: Motor code <> as expected Motor power <> as expected	CAN Ignition Battery voltage Battery voltage ECU communication ECU data update	Active ON >= 9 V <= 17 V Active Active	1000 ms 2 times	
Longitudinal G sensor malfunction check	C0062 – Longitudinal Acceleration Sensor	CAN receive data check	Comparison of CAN ax signal to TCU calculated value	To calculate signal difference of >3%8% (quick rating)	CAN bus Brake communication	Active Active	11.5 km 4 km	

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
CAN Shift Lever								
Lever position Undefined	P0919 – Gear Shift Position Control Error	Digital Input Communication Loss/ Errors check	Detection of error signal	0x0F	CAN Ignition Battery voltage Battery voltage Shift lever communication	Active ON>=9 V<=17V Active	20 ms 16 times	2 DCY
Lever position QA failure	P0919 – Gear Shift Position Control Error	Digital Input Communication Loss/ Errors check	Detection of error signal	Q&A check result mismatch	CAN Ignition Battery voltage Battery voltage Shift lever communication	Active ON >= 9 V <= 17 V Active	20 ms 16 times	2 DCY
Shift Lock CAN invalid failure	P0919 – Gear Shift Position Control Error	Digital Input Communication Loss/ Errors check	Detection of error signal	0x07	CAN Ignition Battery voltage Battery voltage Shift lever communication	Active ON >= 9 V <= 17 V Active	20 ms 16 times	
Tip CAN invalid failure	P0919 – Gear Shift Position Control Error	Digital Input Communication Loss/ Errors check	Detection of error signal	16 or 32 or 64	CAN Ignition Battery voltage Battery voltage Shift lever communication	Active ON >= 9 V <= 17 V Active	20 ms 16 times	
Functional lock up control								
Lock up control	P0741 – Torque Converter Clutch Circuit Performance/Stuck Off	Lock up off Output Functional check	Comparison of engine rpm and input rpm	Engine rpm – input rpm > SS_LupOFFfail	Engine speed Engine speed	400 rpm< 4000 rpm	Time_LupOff_fail 6 times	2 DCY
					Ignition Battery voltage Battery voltage	ON>=9 V<=17V		
					Shift Lever	D		
					Linear solenoid(SLU)	No fault		
					SL solenoid	No fault		
					SL solenoid output	OFF		
					Estimated engine torque	>= 0 Nm		
					Input speed sensor	No back up condition		
					SLU target current	>= 1000 mA		
					Time after above SLU target current condition	>= Time_SLU_Full		
					Accelerator pedal	No fault		

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
					Common parameter (see footnote) ⇒ page 584	common condition(see footnote) ⇒ page 584		

Table continues below.

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
Gear ratio error								
1st gear	P0731 – Gear 1 Incorrect Ratio	Input and output rpm signal check. Separate error memory for each gear.	Comparison of indicated slip and actual slip with stored values	Clutch not release abs (1 – current gear ratio/other gear ratio) < 0.04 or Clutch not engage abs (input rev. – output rev. x expected gear ratio) > 400 rpm or Unusual shifting Shift progress ratio < 10% during shifting	Engine speed	400 rpm	Clutch not release 500 ms 5 times cumulative or Clutch not engage 1 sec 5 times cumulative or Unusual shifting 5 counts cumulative	2 DCY
2nd gear	P0732 – Gear 2 Incorrect Ratio				Ignition	ON		
3rd gear	P0733 – Gear 3 Incorrect Ratio				Battery voltage	>= 9 V		
4th gear	P0734 – Gear 4 Incorrect Ratio				Battery voltage	<= 17 V		
5th gear	P0735 – Gear 5 Incorrect Ratio				Output rev. for Clutch not release for Clutch not engage for Unusual shifting	60 rpm 0 rpm 300 rpm		
6th gear	P0729 – Gear 6 Incorrect Ratio				Input torque for Clutch not release for Clutch not engage for Unusual shifting	(>= 30 Nm or <=-20 Nm) (>= 30 Nm or <=-20 Nm)(>= Torque_fail_ON or<= Torque_fail_OFF)		
7th gear	P076F – Gear 7 Incorrect Ratio				Accelerator pedal for Clutch not release of 1st Gear	>=0.1%		

Component / System	Fault Code	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Monitor Time Length/ Frequency of Checks	MIL Illum.
8th gear	P07D9 – Gear 8 Incorrect Ratio				Engine torque for Clutch not release of 1st Gear	>= 60 Nm		
					Transmission internal range	D (including S)		
					Time after neutral control	>= T_NCon Fin		
					Input speed sensor	No back up condition		
					Output speed sensor	No back up condition		
					Quick stop condition	FALSCH		
					Common parameter (see footnote) ⇒ page 584	common condition(see footnote) ⇒ page 584		

Footnote:

Common parameters for enabling gear ratio or lock up errors:

- Garage shifting none
- Time after garage shifting >= T_GarageFin
- Shifting none
- Time after shifting >= T_ShiftFin
- Quick turning condition FALSCH
- Wheel spin condition (only for Unusual shifting in Gear ratio) FALSCH Time after spinning change from TRUE to FALSE (only for Unusual shifting in Gear ratio) >= 10s SC2,SC3 solenoid No fault
- Linear solenoid (SL1, SL2, SL3, SL4, SL5, SL6, SLT) No fault
- CAN Bus No fault
- ECU communication No fault
- ECU message counter No fault
- ECU checksum No fault
- ECU level No fault
- Engine speed No fault
- Lever position No fault

- ROM No fault
- RAM No fault
- Gear ratio No fault
- Power supply cut for linear solenoids (SL1, SL2, SL3, SL4, SL5, SL6, SLT) Deactive Time after power supply cut for linear solenoids (SL1, SL2, SL3, SL4, SL5, SL6, SLT) >= 8s Engine stall avoidance control Deactive
- ** depend on message cycle rate

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