Fuel Injection System

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Cautions

- ***Never perform service on any component of the system while the engine is running.***
- ***Do not smoke while is servicing on the fuel system or any other system of the engine.***
- ***Avoid contact with electric components that may produce sparks.***
- ***Always check tanks, piping, hoses and other components of the fuel system for leakages.***
- ***When the engine is in operation, do not touch on the injectors connectors. The high tension can cause serious injuries.***
- ***Do not bleed the fuel injection system with the engine in operation. The high pressure in the system can cause serious injuries if disassembled.***
- ***The ECM, under no circumstances, can be disassembled for any kind of service. Only the Bosch authorized service station can check or repair any problem in this component after analyzed by the scanner. The inappropriate repair causes the cancellation of the component warranty and consequently the cancellation of the total warranty of the engine.***
- ***The solenoids installed on the Rail only can be disassembled if problems on its operation are shown up by the scanner. Otherwise it must not be disassembled under any circumstances.***
- ***Before beggining to assembly the harness on the ECM, make sure that the battery cables are disconnected.***
- ***The repairing on the injection system only can be performed after 30 seconds of the engine stop, necessary time to assure the total reduction of the pressure in the Rail.***

Common Rail Modulated Pressure Fuel Injection System

1 Fuel from Tank
2 Fuel from Gearing Pump
3 Filtred Fuel
4 Fuel Under High Pressure
5 Return Fuel

Common Rail Harness “4.12”

CP 3.3 Pump – Rear Part View

A - Filter fuel inlet
B - Rail pressure control valve (m-prop)
C - Fuel return to the tank
D - Fuel outlet to filter
E - ECM cooler fuel inlet
F - Fuel outlet to the Rail
G - Fuel lift pump

BCP 3.3 – Identification Plate

The identification plate of the high-pressure fuel pump is important to help in the tracking of the component and to indicate its origin.

The loss can delay or even cancel the warranty of the product.

Disassembly high pressure piping and nozzle.

Remove the nozzle harness.

Before loosening the high pressure piping, it is suggested to lock the connection of the high pressure nozzle with a wrench and, after that, to apply the untightening torque. This measure is necessary to avoid the loosening of the nozzle connection and later leakage.

After loosening the connections, to remove the pipes and to keep it in a safe local against beats.

Remove the locks of the fuel injectors.

After removing the locks, remove fuel injectors using the tool MWM nr. 9.612.0.690.001.4 and put them away. The solenoid must be protected against impacts.

Attention

- ***The withdrawal of the connections of high pressure nozzle during the assembly or disassembly is prohibited with risks of particles contamination.***

Fuel High-Pressure Pump Removal

After loosening and removing the pipes, loosen high pressure pump fixation bolts on the intermediary piece.

Loosen and remove the fixation nut of the high pressure pump gear by the side of the gearing cover. Remove the gear.

After removing the gear, totally loosen the bolts and remove the high pressure pump.

Tightening Torques Specification - 6.12 Fuel Piping

Bolts Tightening Torques Specification

Tightening Torques Specification - ECM

Tightening Torques Specification - 4.12 Fuel Piping

Tightening Torques Specification - Harness Brackets

The removal must be done with caution. The friction between the o-ring and the housing of the pump can difficult its removal. As it is a component that requires extreme care, keep it in a reserved place and far from accidents.

Attention

- ***The high pressure pump must never be disassembled. Any violation cancels the warranty.***
- ***If it is necessary to repair the pump, it must to be sent to the Bosch authorized network.***

Electronic Control Module Disassembly/ Assembly (ECM)

If it is necessary to change the ECM, first loosen the bolts that fix the module to the cooler.

At the module removal, remove the sealing o-ring.

Clean the residues from the cooler.

⚠ Attention

- ***The ECM is a "Black-Box" and must never be disassembled for any reason;***
- ***Before the replacement, check for erosions, crookedness and humidity on the connecting pins of the harness of the sensors and ECM harness;***
- ***Use the owning probes for checking the measurings and;***
- ***Verify all the active troubleshootings.***

Inspection

Perform a visual analysis on the cooler to check for any irregularity. Change it if necessary.

Check cooler drain plug for leakages.

Change it if necessary.

Tighten with 10 ± 1.5 Nm.

Visually check the condition of the nipples. If necessary, change them. Apply the specified torque. The cooler has a drain plug. If the change is necessary, first apply liquid gasket and then apply the specified torque.

If problems in injection system are caused by the ECM, the component, under no circumstances, must not be open to check or repair. The violation of the module cancels the warranty of the component and, consequently, the total warranty of the engine.

Visually check the ECM pins set. Check for dirt and clean if necessary.

Assembly

Assembly the cooler bracket. Apply the specified torque. After assembling the bracket, assembly cushions on the bracket and apply the specified torque.

Assembly the cooler.

The new o'ring.

Assembly the ECM. Attention to the centralization of the fixation bolts in the cooler.

After positioning the ECM, tighten the bolts and apply the specified torque.

Assembly the bracket of the nipples for fast-connector. Apply the specified torque.

Tighten the nuts. Apply the specified torque.

High Pressure Pump Assembly

Clean the housing of the high pressure pump.

Assembly a new o-ring on the high pressure pump. Clean the area and put on a Vaseline layer on the contact area of the o-ring with the housing on the intermediary piece.

Install high pressure pump. Perform tightening with care in order to the o-ring to do not bite the lateral of the pump. Position the pump with the bolts until touch on the wall of the intermediary piece and apply the specified torque.

Check if there is a perfect seat of the pump on the intermediary piece.

Apply tighten of 40 ± 6 Nm.

After assembling the pump, position the gear on the shaft and assembly. Once there is not timing on this gear the pump shaft does not have cotter for positioning.

Position gear washer and fixation nut and apply the specified torque.

The protective caps must be removed only immediately before the piping assembly, avoiding contaminations.

Attention

- ***The cone of the high pressure pump shaft and the gear must be clean and free of oil and grease before the fixation. The materials for cleaning can be: test benzene, ethyl alcohol, glycol or isopropanol.***
- ***The high-pressure pump, due to its lubrication by the fuel, in any case may work dry. Before the first start, fill approximately 60 ml of fuel to guarantee the lubrication of the inner parts. For the first filling, a electric fuel pump can be used with minimum pressure of 2 bar and 4 bar maximum.***

Fuel Injection System Assembly

First, position new o-ring on the injector and put on a Vaseline layer on the ring area.

Install sealing washers.

Install injector in cylinder head.

Assembly the fixation locks of the fuel injectors. Tighten bolts according the specification.

After positioning the injectors, assembly the return pipe.

The assembly must be performed carefully in the connector tightening sense, to avoid loosening.

If the connector loosen, apply the torque of 3 ± 0.5 Nm.

Begin to assembly the Rail. First, assembly the bracket of the rail and apply the specified torque.

Assembly the Rail and apply the specified tightening torque. Until the moment of the high-pressure piping assembly, keep the nut-caps inlet and return pipe protected.

The central fixation screw of the rail needs an extension for the tightening. Apply the torque according to the previous procedure.

If the fuel filter is assembled, use also an articulated tool to tighten and remove the screw.

Assembly the fuel filter head. Apply the specified torque.

After assembling the Rail, begin to assembly high pressure pipes.

Apply the specified torque.

Firstly, check the correct position of pipes manually in both of ends (nozzle and rail).

Assembly the high pressure pipe on the Rail. Apply the specified torque.

The high-pressure piping must be assembled free of tension, avoiding damages and deformations in the piping and nut-caps.

After the installation of the high pressure pipes, assembly low pressure piping. First, assembly ECM cooler fuel inlet and outlet pipes.

After assembly on the cooler, connect the nipple of fast connection on the bracket.

Assembly return pipe of the high pressure pump to the fuel tank. Apply the specified tightening torque on the nut-cap, assembly the nipple of fast connection on the bracket.

Assembly the cooler fuel outlet pipe to the high pressure pump.

Assembly the cooler pipe nut-cap of the high pressure pump and apply the specified torque.

The assembly of the nut-cap of the pipe must be carefully made, therefore the tightening torque of the nut of the fuel lift pump is lesser.

This way, during the assembly, use a spanner to perform the counter-tightening.

Assembly the fuel outlet pipe. Keep the same procedure used in the fuel inlet pipe assembly. Assembly fuel inlet and outlet pipes of the filter head. First, visually check the condition of the nipples. If necessary, change them. Apply the specified torque.

Assembly the fuel inlet pipe. First, assembly the nut-cap and apply the specified torque and then assembly the fast connector.

Assembly the fuel outlet pipe. Keep the same procedure used in the fuel inlet pipe assembly.

Assembly the fast connector of the return pipe on the pressure limiter valve.

Fit the return pipe on the injector.

Apply the specified tightening torques on the nut-caps of the fuel lift pump and of the high pressure pump.

Assembly the high pressure pipe of the pump to the Rail. Apply the specified torque.

General view of the fuel injection system assembled.

General view of the high-pressure piping assembled.

Assembly the harness on the ECM.

Pam attention of the position of assembly the connecting lock harness.

Deaeration of Low Pressure System

In concluding the maintenance of injection system or in case of lack of fuel, drain the air of the low pressure system with the manual pump (repeat this procedure until the appearing of movement restriction) and start the engine.

In case of engine failure, repeat the procedure and, then, start the engine again.

After the engine start, leave the engine for a few minutes, in idle speed.

Attention

- ***This procedure must be used on the cases below***
  - ***Lack of fuel;***
  - ***Maintenance (ex: replacement of filters / pipes).***