

Case WX 150 excavator engine common rail application of fuel supply system

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Annotation. This article shows that the performance of a car engine depends on factors such as optimal fuel consumption, low emissions, full power transfer to the required units. Keeping the engine in good condition depends on the accuracy and reliability of the materials used in the engine during production, and in the process of its use depends on the quality of maintenance.

Key words. Car, engine, fuel, gasoline, diesel, electromagnet, injector, sensor.

One of the main indicators of quality changes in modern car engines per unit of operating time is the reliability of the engine. This indicator not only makes it possible to improve the existing and new designs of engines, but also expands the possibilities of increasing their efficiency.

At present, the use of computer systems to control the operation of diesel engines of cars and trucks is becoming more common. These systems use sensors, and control forms, as considered. The EBB uses a sensor to control the pressure in the accumulator rail, and through the injectors provides electronic control of the periodic delivery of fuel in accordance with the operating mode of the car, as well as the engine, and the advancement of the fuel injection angle.

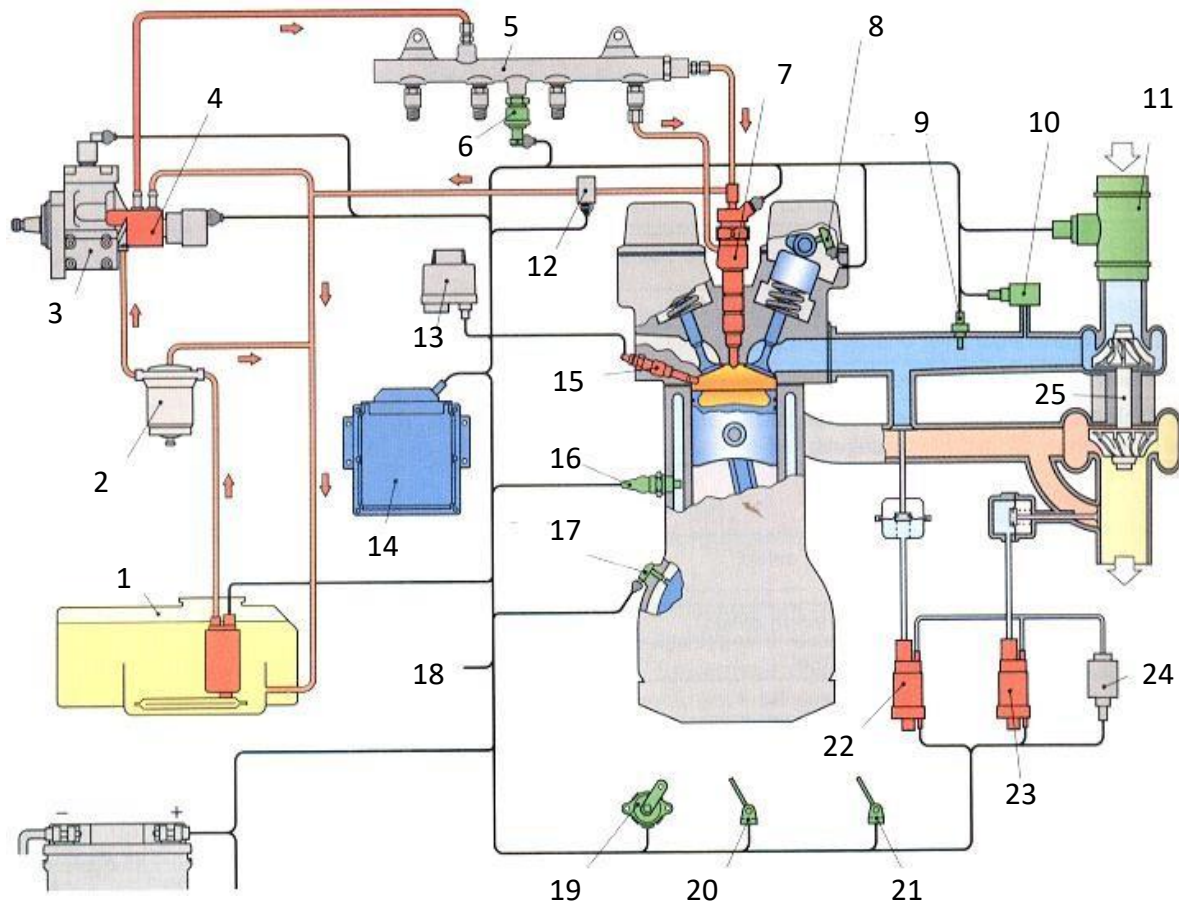


Figure 1. Common-Rail system.

1- fuel tank, 2- fuel filter, 3- high-pressure fuel pump, 4- fuel line regulator, 5- fuel ramp, 6- ramp pressure sensor, 7- injector, 8- gas distribution shaft position sensor, 9- inlet pipe sensor, 10- load pressure sensor, 11- air mass meter, 12- fuel temperature sensor, 13- spark plug controller, 14- electronic control unit, 15 spark plug, 16- engine temperature sensor, 17- crankshaft speed sensor, 18- CAN, 19- driver accelerator pedal sensor, 20-brake pedal igniter, 21-clutch pedal igniter, 22-AGR-valve, 23-load valve, 24-low pressure pump, 25-turbocharger.

A new generation of diesel engines, as well as different generations of fuel injection systems in gasoline engines (K-Jetronic, KE-Jetronic, L-Jetronic, LH-Jetronic, Mono-Jetronic, ME-Motronic,... and so on), is a Common-Rail system. This system also has its own stage of development, below we consider the system of electronic control of fuel injection in diesel engines (Figure 2).

This 3rd generation of the Common Rail fuel injection system is mainly used in cars running on diesel fuel. For example, one of the modern cars is a V-shaped 6-cylinder (V6) AUDI A8 with a full working volume of 3.0 cm³ (Piezo-Inline-Injector). Its pressure reaches 180-240 MPa (1800-2400 bar).

The Common-Rail refueling system means a "**Common Distribution Ramp**", which is sent to the general distribution ramp of a high-pressure system, which is mainly regulated by electronic fuel injection, by a high-pressure fuel pump.

From the distribution ramp, fuel is sprayed directly into the combustion chamber of the cylinders on the basis of electro-hydro-mechanically controlled injectors.

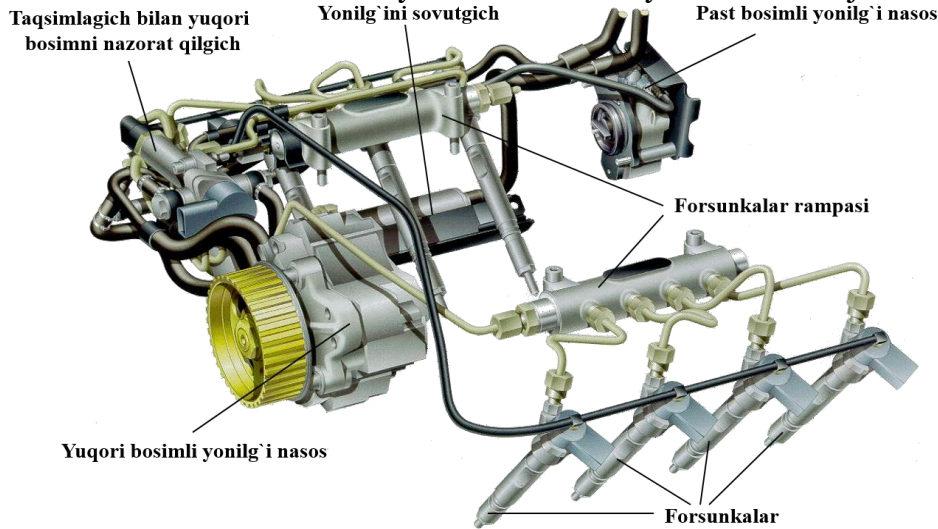
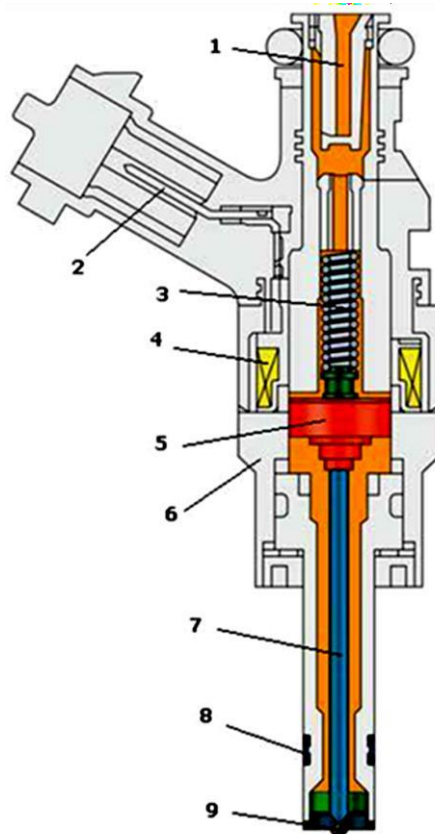


Figure 2. Common Rail 3 generation, produced by the parent company. Another name for a nozzle is an injector. Widespread use of these injectors is one of the main elements of the fuel supply network of diesel engines, which injects diesel fuel into the combustion chamber of cylinders under high pressure, heated to 700-1000 ° C at the end of the second cycle of the operating cycle. sparks diesel and ignites. Injectors are used in gasoline and diesel engines. In modern engines, injectors are used with electronically controlled fuel injection systems.

There are the following main types of fuel injectors:

- Electromagnetic;
- Electric hydraulic;
- Piezoelectric.

Electromagnetic injectors. Electromagnetic injectors are installed on gasoline engines. The structure of the nozzle is very simple, it consists of a needle solenoid valve and a corrective plate.



The electromagnetic injector works as follows. All sensors of the supply system provide information on the load of the motor to the electronic control unit in the form of voltage, and in a short time EBB algorithmically calculates the data and sends a current of the required voltage to the electromagnetic field of the electromagnetic injector. There is a physical process in which, depending on the amount of magnetic field in the coil, the solenoid valve opens and injects fuel. When the voltage at the electromagnetic poles is interrupted by the EBB, the spring returns the injector needle to its position. Figure 3. Electromagnetic injectors.

1 fuel filter, 2 rubber-shell electrical outlets, 3 springs, 4 electromagnetic coils, 5 electromagnetic arches, 6 injector housings, 7-injector needle, 8-densifier. Correction plate 9.

Electric hydraulic injector. Electric hydraulic injectors are installed on diesel engines. In particular, it was used in the Common-Rail supply system.

The structure of the nozzle consists of a solenoid valve 4, control chamber 2, inlet 10 and outlet 3.

The principle of operation of the electro-hydraulic injector depends on the fuel pressure, the fuel pressure is increased in the high-pressure fuel station, in the final process of the piston compression stroke, ie 20-25 ° to the upper end point pulse from the electronic control unit. Depending on the current, the solenoid valve on the injector opens the inlet choke 3, As a result, the piston 11 in the control chamber of the injector is raised by means of a solenoid valve 4, and diesel fuel in the range of 130-160 MPa formed in the high-pressure fuel station, due to the high pressure of the

needle 14 in the control chamber of the injector. with a diamic motion, rises upwards, and the fuel is sprayed through the correcting plate of the injector. When the pulse current is interrupted, the spring ensures that the gypsum needle valve is in place. This type of injectors is used in diesel engines of modern cars.

A high pressure pump is pumped into the engine cylinders, and a certain amount of fuel is pumped through closed injectors (depending on engine load and operating speed). In this way, the high-pressure pump distributes the required amount of fuel per piston line. Taking into account that the amount of fuel injected in each cylinder should be slightly different from each other, the distribution of fuel using a high-pressure pump should be precise. Fuel must be delivered to the cylinders in a very short time at a clearly defined time. Diesels mainly use plunger-type high-pressure fuel pumps. This pump is one of the most complex devices in the diesel supply network. There are two types of high pressure fuel pumps: multi-chamber and distributor. In multi-chamber pumps, each chamber delivers fuel to only one cylinder of the engine. Diesel engines for cars are mainly equipped with multi-chamber spool pumps.

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