

Document Title: Engine, description	Function Group: 200	Information Type: Service Information	Date: 2014/9/2 0
Profile: EXC, FC3329C [GB]			

Engine, description

D7E - tier 3 compliant

The D7E configuration is a four stroke, straight six cylinder, turbocharged, direct injected diesel engine with charge air cooling and wet, replaceable cylinder liners.

The D7E engine uses a Common Rail Fuel System controlled by the engine electronic control (E-ECU) software.

Electronically controlled IEGR (Internal Exhaust Gas Recirculation) reduces NO_x formation and lowers emissions without the need for exhaust after treatment. Volvo's latest engine management system, EMS 2 is used to control all engine electronic functions.

The cylinders are numbered consecutively beginning at the flywheel end. Engine rotational direction is counterclockwise as seen from the flywheel end.

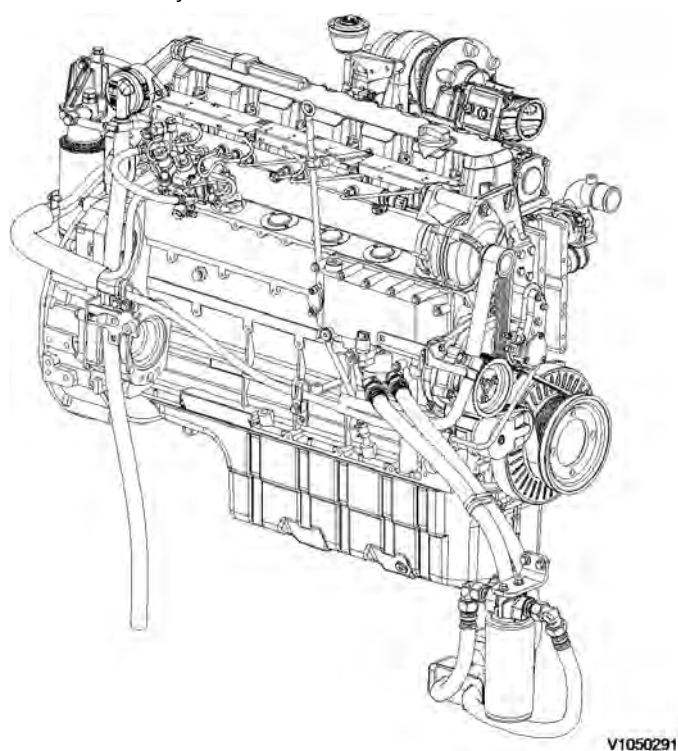


Figure 1
Engine, D7E

Document Title: Engine, identification	Function Group: 200	Information Type: Service Information	Date: 2014/9/2 0
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Engine, identification

Identification plate

The engine model, serial number and performance data are stamped on an identification plate which is attached on the cylinder head cover. The engine model designation and serial number must be indicated when ordering spare parts.

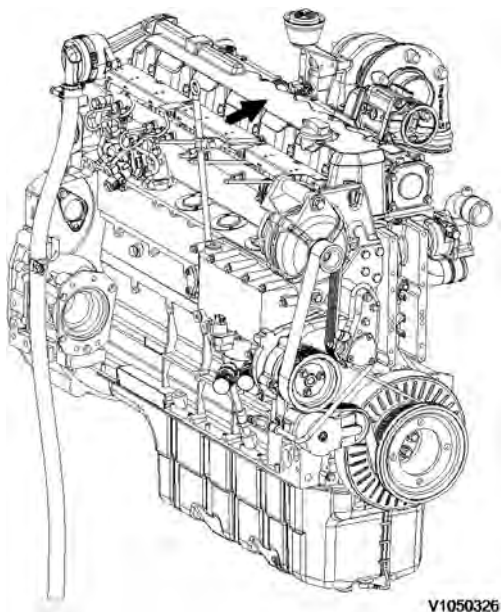


Figure 1
Engine identification, D7E

Document Title: Engine, tightening torques	Function Group: 200	Information Type: Service Information	Date: 2014/9/2 0
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Engine, tightening torques

NOTICE

Regarding bolted joints which are not listed here, see "Volvo standard tightening torques"

Engine, tightening torque	
Rocker arm bracket on cylinder head	30 Nm (22.2 lbf ft)
Cylinder head cover (M6) on cylinder head	13 Nm (9.6 lbf ft)
Exhaust return module on cylinder head	Step 1: 10 Nm (7.4 lbf ft) Step 2: 30 Nm (22.2 lbf ft)
Lock nut, valve adjusting screw	20 ±2 Nm (14.8 ±1.5 lbf ft)
Locking screw on cylinder head	34 Nm (25.2 lbf ft)
Solenoid valve on cylinder head	24 Nm (17.8 lbf ft)
Front cover on crankcase	Step 1: 3 Nm (2.2 lbf ft) Step 2: 21 Nm (15.5 lbf ft)
Drain plug on oil pan, M18	55 Nm (40.7 lbf ft)
Crankcase ventilation on cylinder head	21 Nm (15.5 lbf ft)
Return line to return stop valve	30 Nm (22.2 lbf ft)
Return stop valve to crankcase	80 Nm (59.2 lbf ft)
Impulse transmitter (crankshaft) on holder on front cover	9 Nm (6.7 lbf ft)
Impulse transmitter (camshaft) on gearcase	9 Nm (6.7 lbf ft)
Turbocharger on exhaust manifold	42 Nm (31.1 lbf ft)
Clamping shoe injector on cylinder head	16 Nm (11.8 lbf ft)
Injection lines on rail and injector, high pressure line on high-pressure pump	25 Nm (18.5 lbf ft)
Fuel supply pump on holder	22 Nm (16.3 lbf ft)
Holder fuel supply pump on holder	30 Nm (22.2 lbf ft)
V-belt pulley on fuel supply pump	27 Nm (20.0 lbf ft)
High pressure pump on crankcase, M10	Step 1: 10 Nm (7.4 lbf ft) Step 2: 50 Nm (37.0 lbf ft)
Fuel control valve	30 Nm (22.2 lbf ft)
Fuel pipe on high pressure pump	29 Nm (21.5 lbf ft)
Fuel pipe on control block	39 Nm (28.9 lbf ft)
Rail on cylinder head	30 Nm (22.2 lbf ft)
Pressure relief valve on rail	100 Nm (74.0 lbf ft)
Rail pressure sensor on rail	70 Nm (51.8 lbf ft)
Pipe clips, fuel line fastening	30 Nm (22.2 lbf ft)
Fuel line on control block, fuel filter console and rail	39 Nm (28.9 lbf ft)
Fuel pipe (return) on control block	49 Nm (36.3 lbf ft)
Fuel pipe (return) on cylinder head	29 Nm (21.5 lbf ft)
Fuel line on fuel filter8	39 Nm (28.9 lbf ft)
Fuel filter console/radiator tank on crankcase	30 Nm (22.2 lbf ft)

Fuel pressure sensor on fuel filter console	30 Nm (22.2 lbf ft)
Cover plate on cylinder cover, M6	30 Nm (22.2 lbf ft)

Document Title: Component locations	Function Group: 200	Information Type: Service Information	Date: 2014/9/2 0
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Component locations

Component position, engine D7E. The following figures show the position of a number of components on engine D7E.

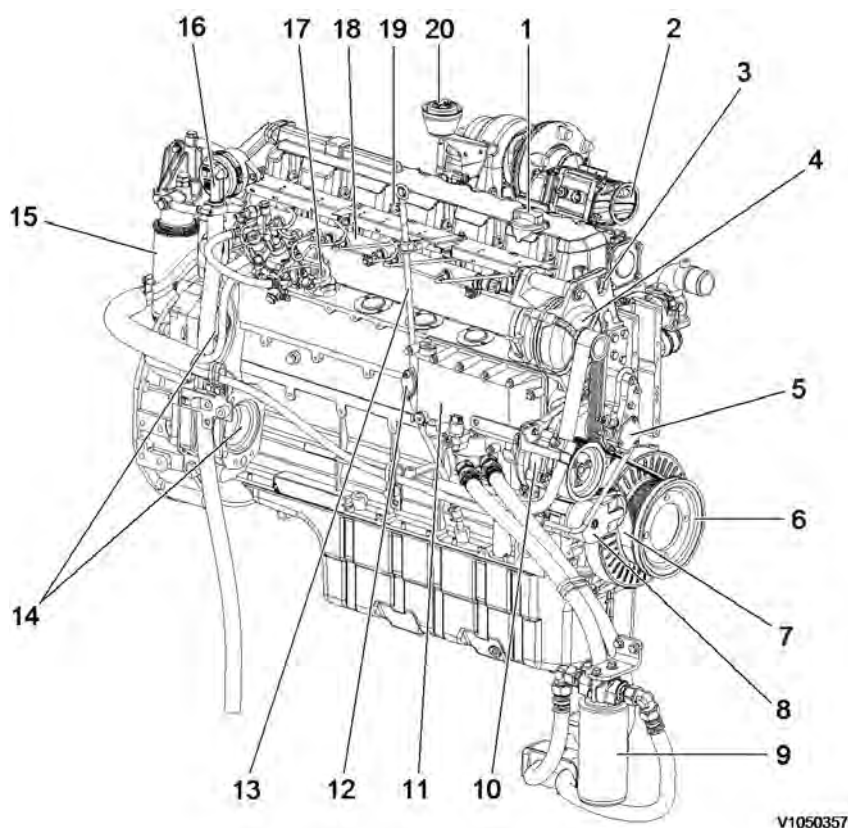


Figure 1
Component locations, front side

1	Engine oil filler	11	Engine oil cooler
2	Air inlet	12	Coolant heater port
3	Transport eye	13	Oil dipstick gauge
4	Alternator	14	Power take off
5	Fuel feed pump	15	Fuel filter
6	V-rib belt drive on crankshaft	16	Crankcase bleeding valve
7	V-rib belt	17	High pressure fuel pump
8	Automatic belt tensioner	18	Common rail
9	Engine oil filter	19	Injector
10	Coolant pump	20	Waste gate actuator

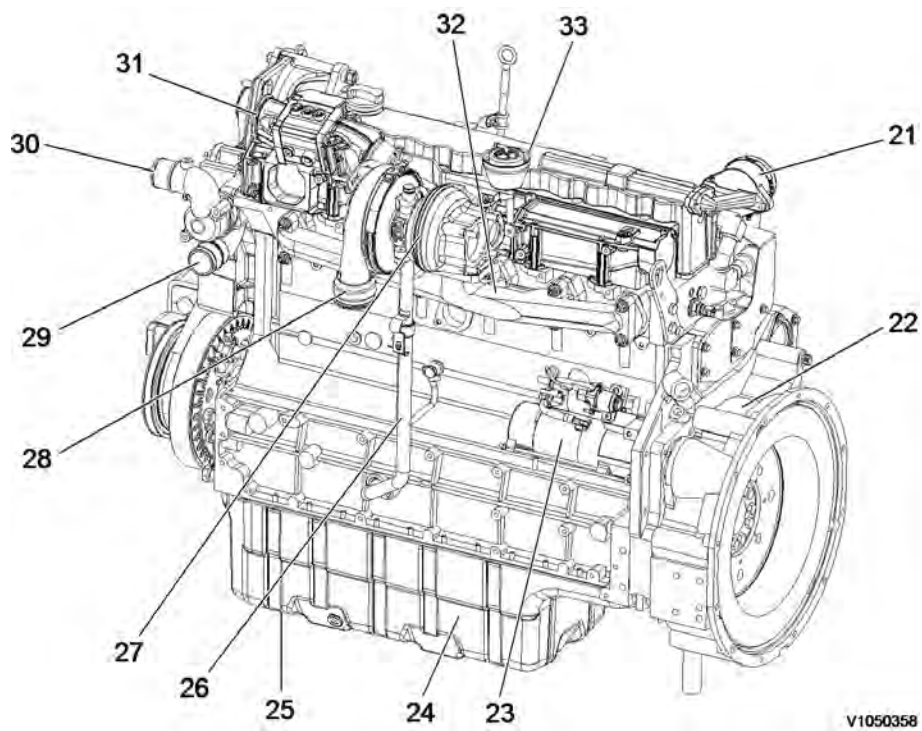


Figure 2
Component locations, flywheel side

21	Crankcase bleeding valve	28	Air outlet (to charge air cooler)
22	Flywheel housing	29	Coolant inlet
23	Starter motor	30	Coolant outlet
24	Oil pan	31	Air inlet (from charge air cooler)
25	Drain plug	32	Exhaust manifold
26	Oil return line from turbocharger	33	Cylinder rocker arm cover
27	Turbocharger		

Document Title: Valves, description	Function Group: 214	Information Type: Service Information	Date: 2014/9/2 0
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Valves, description

The engines are equipped with one inlet and one exhaust valve per cylinder.

At the upper end of the valve guide, there is an O-ring seal (A) against the valve spindle to prevent major oil consumption and to reduce the amount of hydrocarbons in the exhausts.

The valves are rotated by the eccentric action of the rocker arms.

The new compressed tapered shape enables the valves to turn easily despite loading.

Rocker arm lubrication is part of the engine force-feed lubrication system. The oil is supplied via the tappets and push rods.

If the valve guides are replaced, they are obtained in another version (B) to facilitate installation.

Figure 1 shows a valve guide installed in production and figure 2 shows a replacement guide.

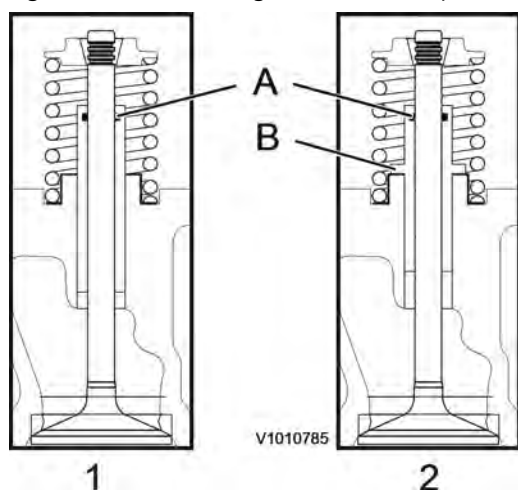


Figure 1

Document Title: Internal Exhaust Gas Recirculation description	Function Group: 214	Information Type: Service Information	Date: 2014/9/2 0
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Internal Exhaust Gas Recirculation (IEGR), description

A system for IEGR (**I**nternal **E**xhaust **G**as **R**ecirculation) is used as part of V-ACT (Volvo Advanced Combustion Technology). On D6E and D7E this takes place by an IEGR-opening piston, controlled by the lubrication oil's system pressure, acting on the exhaust rocker arm which enables a second opening of the exhaust valves. When activated, the secondary piston will give a limited valve opening of the exhaust valves during the induction phase, which leads exhausts back into the cylinder.

Included components

IEGR-unit

The hydraulic mechanism is housed in two interconnected IEGR-units, located on the rocker arm holders. Lubrication oil is routed from the cylinder head via the solenoid valve to the high-pressure channel in the IEGR-unit through a channel in one of the rocker arm holders.

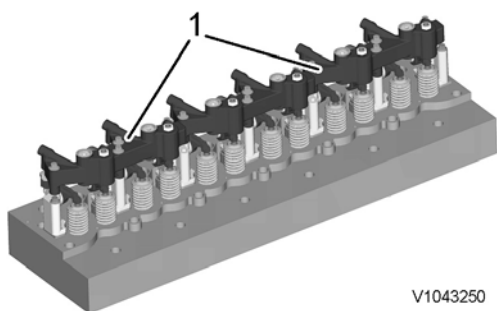


Figure 1

1. IEGR-unit

Solenoid valve

The solenoid valve is located in the cylinder head on the flywheel side and is activated by the EECU via the control system EMS 2. When IEGR is not activated, the solenoid valve is closed and no oil flow is allowed into the IEGR-unit. At activation of IEGR, the solenoid valve opens the channel from the engine's lubrication system to the IEGR-unit.

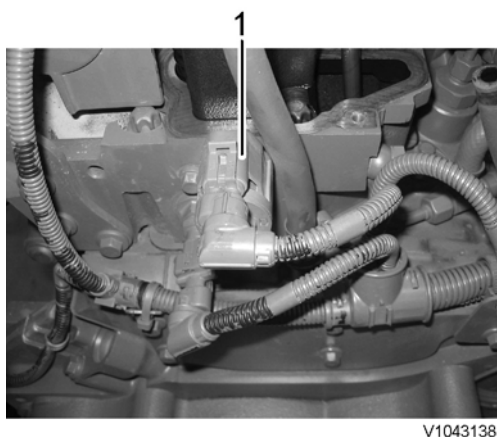


Figure 2

1. Solenoid valve

Control valve

The control valve is located in the IEGR-unit between the high-pressure circuit and low-pressure circuit. When the low-pressure circuit is supplied from the lubrication oil system, the control valve is lifted and closes the high-pressure circuit. The ball in the control valve enables filling of the high-pressure circuit when IEGR is activated.

The lubrication oil is drained through the control valve.

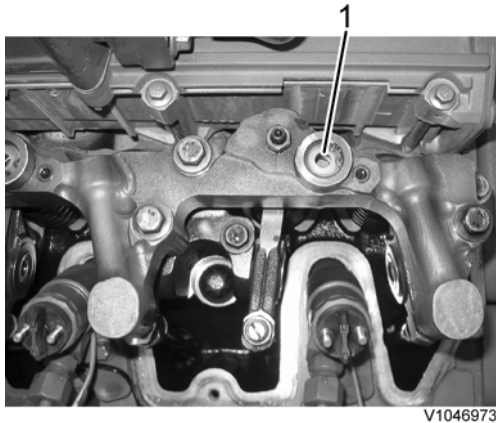


Figure 3

1. Control valve

Main piston

The main piston is acted on by the adjusting screw on the inlet valve's rocker arm, and affects the oil pressure in the IEGR-unit's high-pressure channel. At the end of the IEGR-phase, a pressure of 100 bar is generated in the high-pressure circuit.

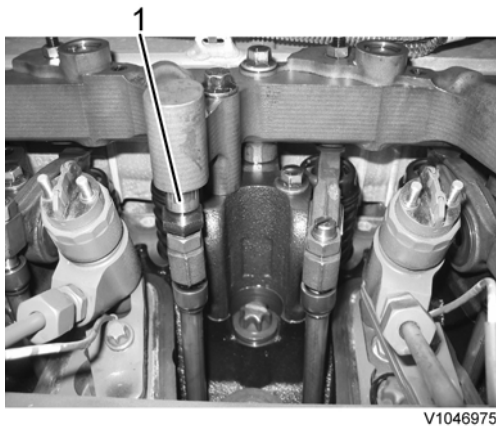
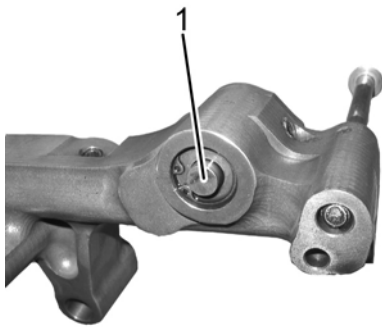


Figure 4

1. Main piston

Servo piston

The servo piston is activated by the hydraulic pressure from the main piston via a channel in the IEGR-unit when the IEGR-function is active/on (solenoid valve in open position). Then the servo piston opens the exhaust valves via the rocker arm an extra time during the induction stroke.



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Figure 5

1. Servo piston

Function

IEGR is activated by the system being supplied with full lubrication oil system pressure via the solenoid valve. The solenoid valve is activated by the E-ECU.

The control valve closes the high-pressure circuit and the ball inside the valve enables filling of the system.

With the same movement as the inlet valve's rocker arm opens the valve, the main piston is forced upward. The pressure in the IEGR-unit's high-pressure channel (up to 100 bar) overcomes the spring force in the servo piston. The servo piston forces down the rocker arm, which results in the exhaust valve being open for a short time at the end of the induction stroke. Exhausts from the exhaust manifold are sucked into the cylinder by vacuum from the other cylinders.

The breather hole between the low-pressure channel and the high-pressure channel in the IEGR-unit enables longer exhaust recirculation at high engine speed.

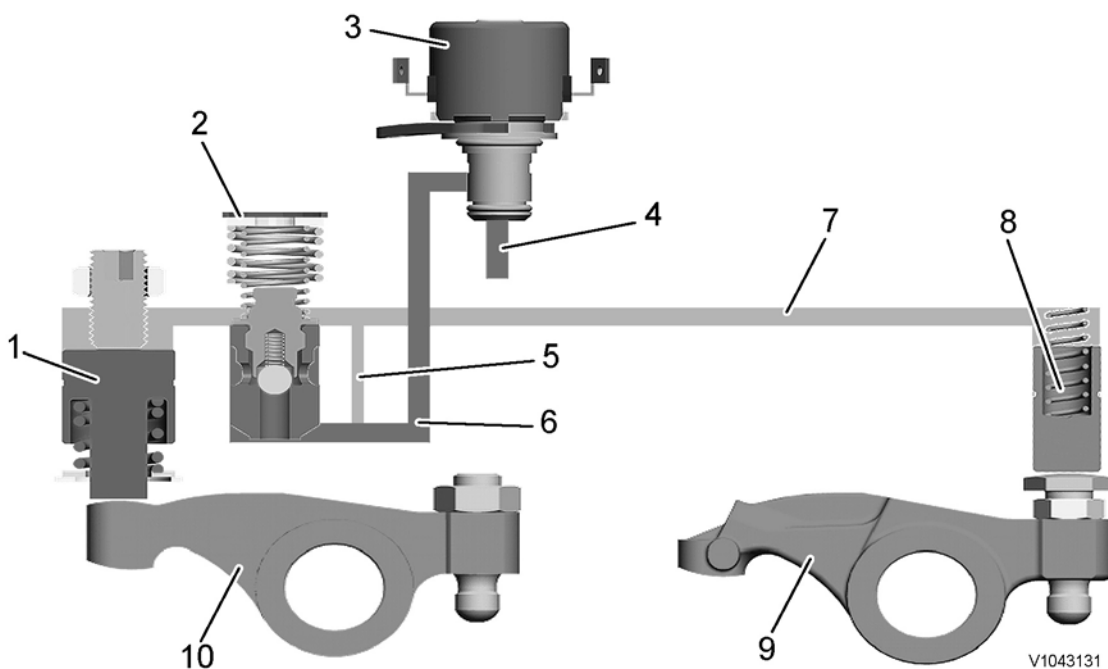


Figure 6

IEGR-system (inactive)

1. Servo piston
2. Control valve
3. Solenoid valve
4. 2–5 Bar lubrication oil pressure
5. Breather hole
6. Oil channel, low-pressure

- 7. Oil channel, high-pressure
- 8. Main piston
- 9. Induction rocker arm
- 10. Exhaust rocker arm

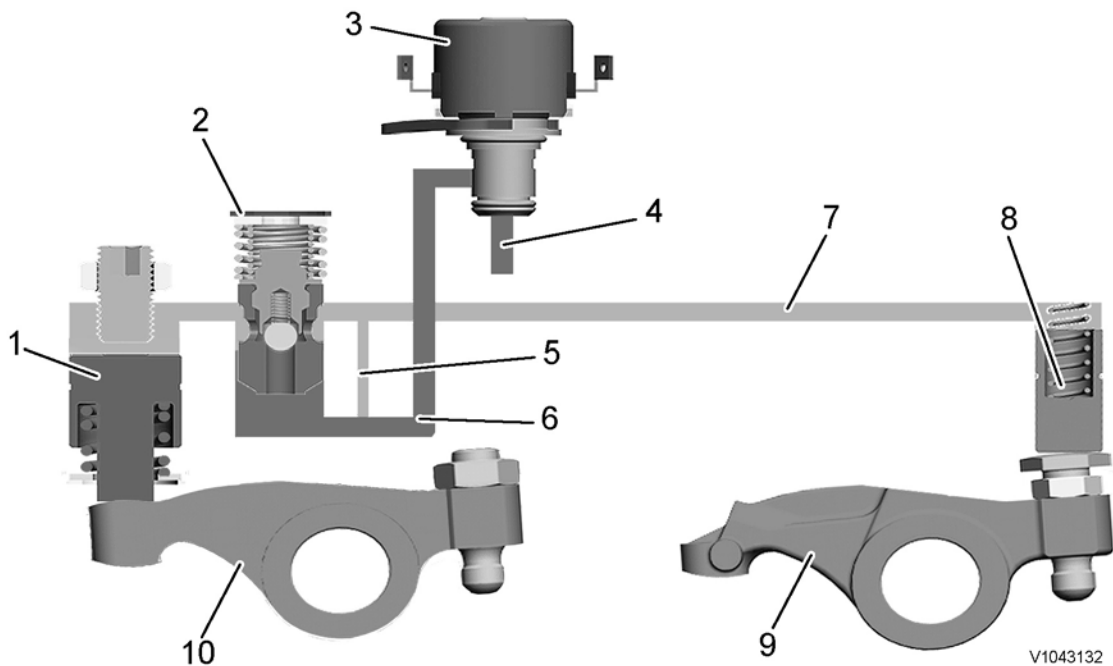


Figure 7
IEGR-system activated

- 1. Servo piston
- 2. Control valve
- 3. Solenoid valve
- 4. 2–5 Bar lubrication oil pressure
- 5. Breather hole
- 6. Oil channel, low-pressure
- 7. Oil channel, high-pressure
- 8. Main piston
- 9. Induction rocker arm
- 10. Exhaust rocker arm

Checking and adjusting

Checking and adjusting of the IEGR-opening piston's clearance against the exhaust rocker arm should be done in connection with checking and adjusting valves according to [214 Valves, adjusting](#).

Software

The function monitors the EGR valve for return of combustion gases and informs the operator if the function is not ensured or if there is a system malfunction.

The function is also used as input signal for Engine protection.

Document Title: Engine timing gear, description	Function Group: 215	Information Type: Service Information	Date: 2014/9/2 0
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Engine timing gear, description

On the engines, the timing gears are located at the flywheel end for the camshaft and power take-off. Stamped markings on the crankshaft and camshaft gears are used to facilitate correct setting.



Figure 1

Document Title: Camshaft, description	Function Group: 215	Information Type: Service Information	Date: 2014/9/2 0
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Camshaft, description

The camshaft is carried in seven bearings. The axial stop for the camshaft is located in the timing gear casing's cover.

On the camshaft gear there are seven teeth pressed in for the cylinder position sensor.

Each bearing runs in a bearing bushing which is pressed into the cylinder block. There is an inlet cam and an exhaust cam for each cylinder. There are also two cams (1) with three cam lobes for the injection pumps.

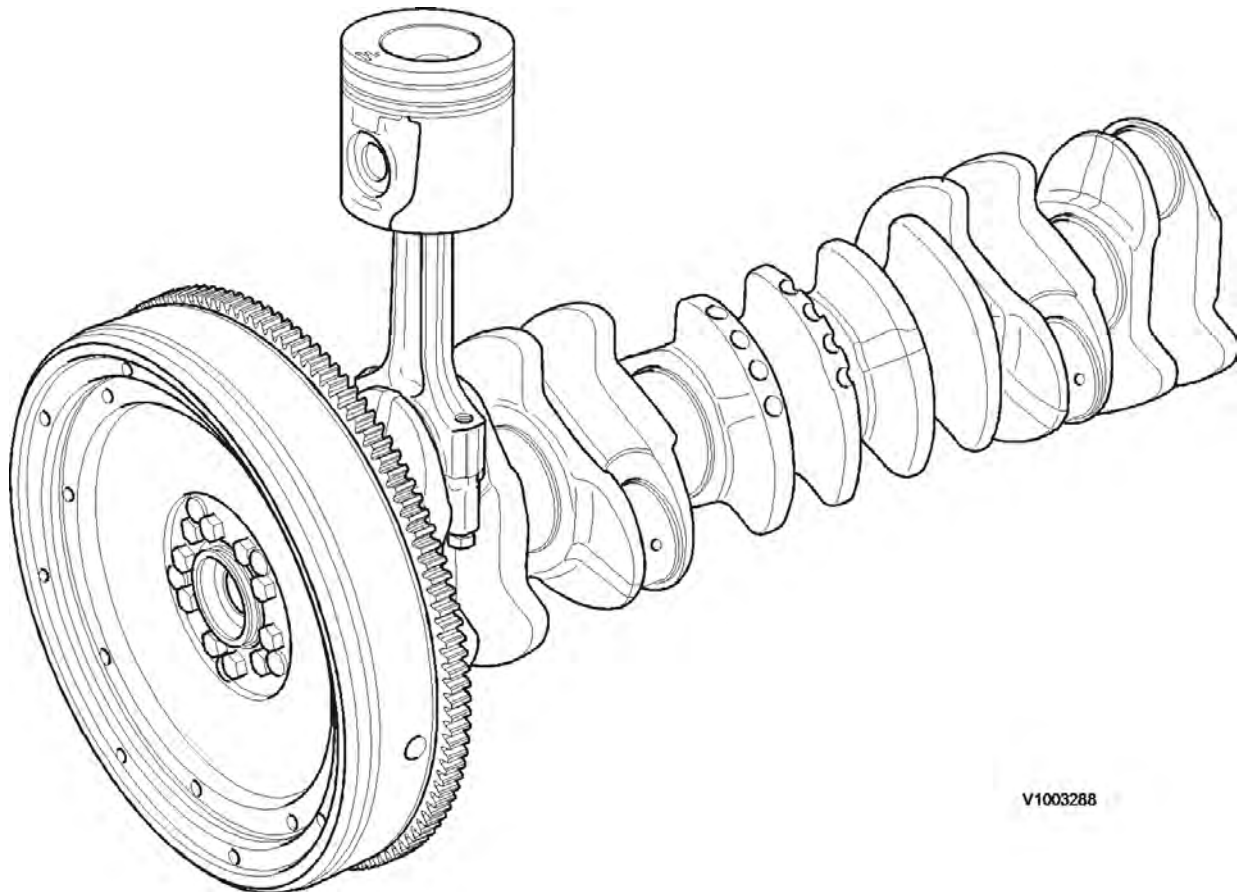


Figure 1

Document Title: Crankshaft, description	Function Group: 216	Information Type: Service Information	Date: 2014/9/2 0
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Crankshaft, description

The forged crankshaft is provided with integrated balancing weights. The gear that drives the engine's timing gear and the flange for the flywheel are shrink-mounted on the crankshaft.



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Figure 1



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