

Document Title: Engine, description	Function Group: 200	Information Type: Service Information	Date: 2014/12/22
Profile: EXC, EC180C L [GB]			

Engine, description

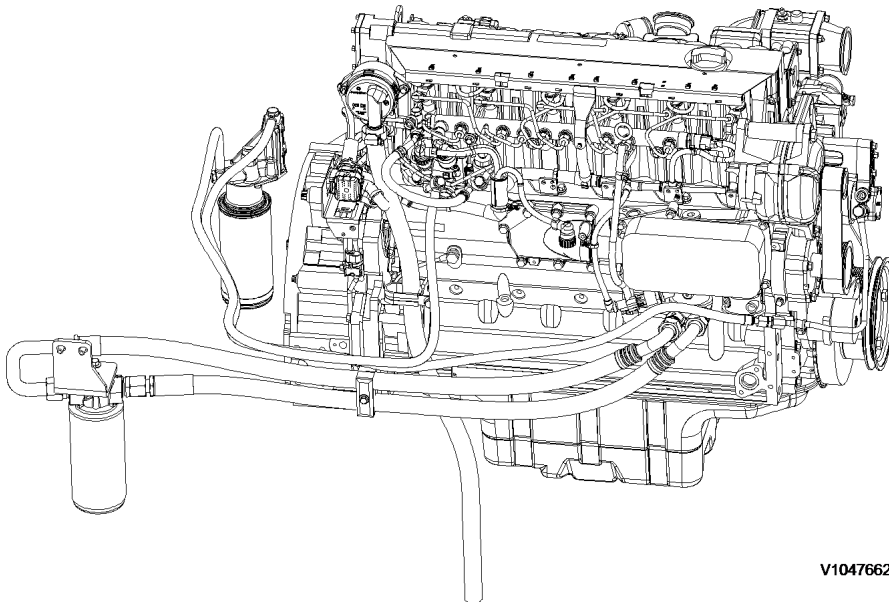
D6E - tier 3 compliant

The D6E configuration is a four stroke, straight six cylinder, turbocharged, direct injected diesel engine with charge air cooling and wet, replaceable cylinder liners.

The D6E 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, E-ECU 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.



V1047662

Figure 1
Engine, D6E

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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.

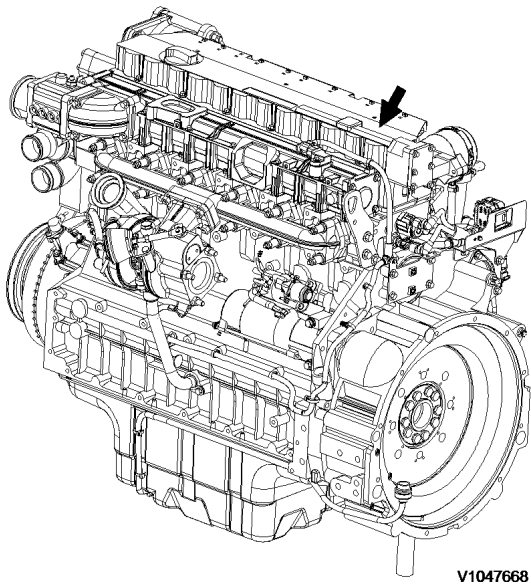
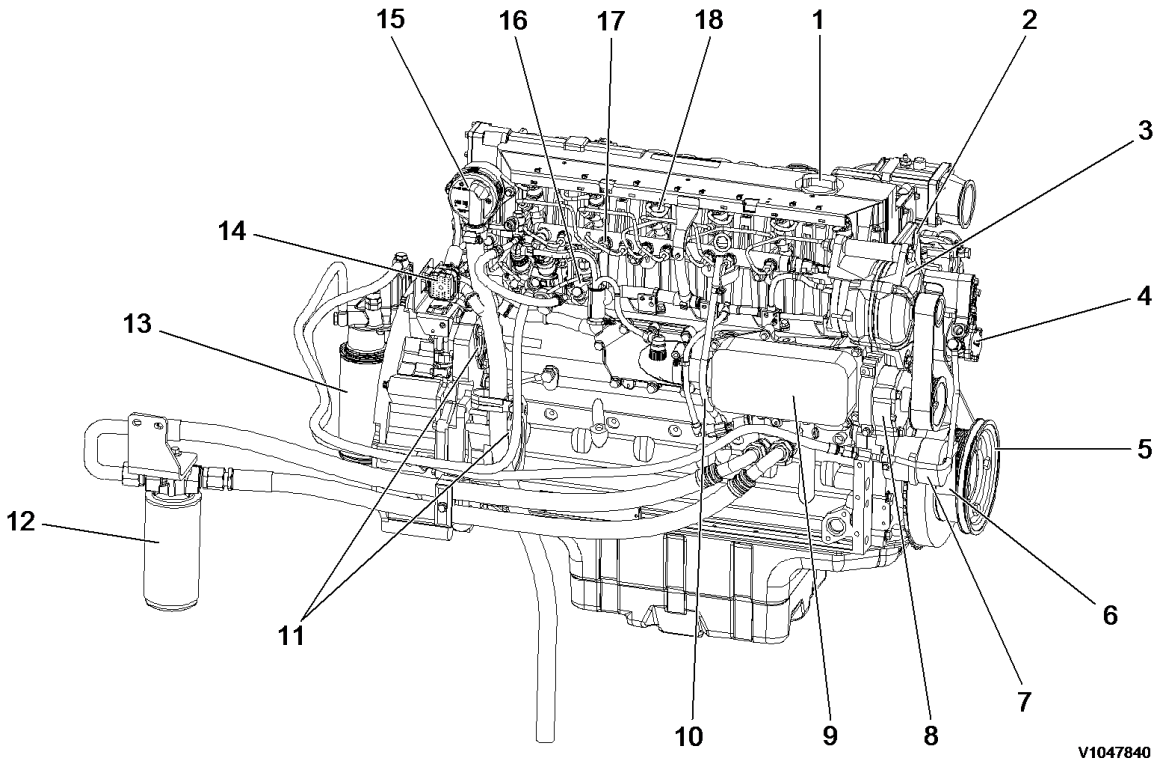


Figure 1
Engine identification, D6E

Document Title: Component locations	Function Group: 200	Information Type: Service Information	Date: 2014/12/22
Profile: EXC, EC180C L [GB]			

Component locations

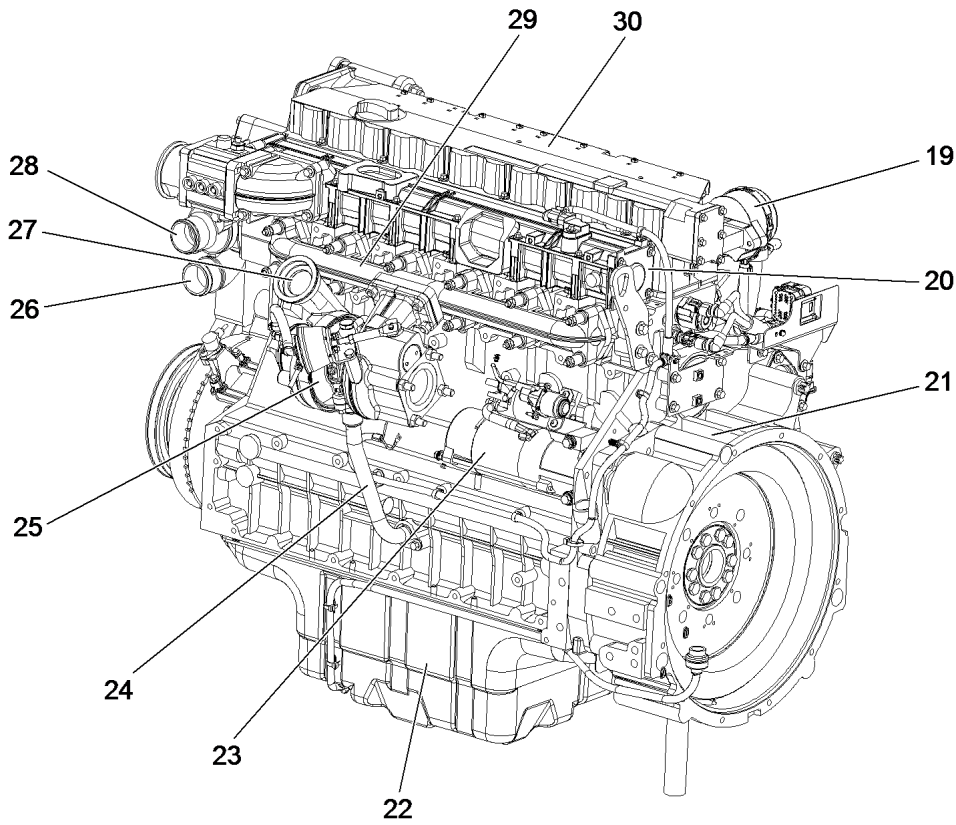
Component position, engine D6E. The following figures show the position of a number of components on engine D6E.



V1047840

Figure 1
Component locations, front side

1	Engine oil filler	10	Oil dipstick
2	Transport eye	11	Power take off
3	Alternator	12	Engine oil filter
4	Fuel feed pump	13	Fuel filter
5	V-rib belt drive on crankshaft	14	Connection to E-ECU
6	V-rib belt	15	Crankcase bleeding valve
7	Automatic belt tensioner	16	High pressure fuel pump
8	Coolant pump	17	Common rail
9	Engine oil cooler	18	Injector



V1047841

Figure 2
Component locations, flywheel side

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

Document Title: Internal Exhaust Gas Recirculation description	Function Group: 214	Information Type: Service Information	Date: 2014/12/22
Profile: EXC, EC180C L [GB]			

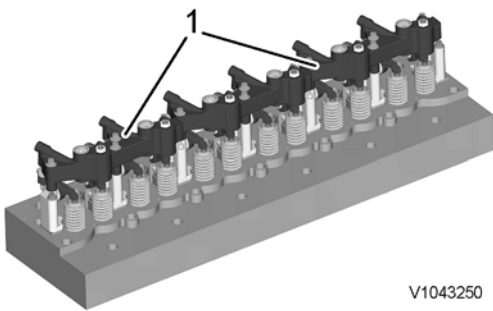
Internal Exhaust Gas Recirculation (IEGR), description

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.



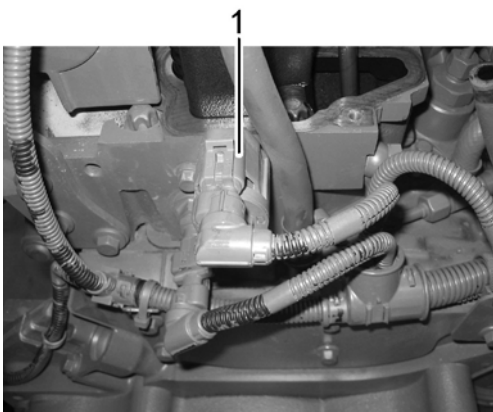
V1043250

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.



V1043138

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.

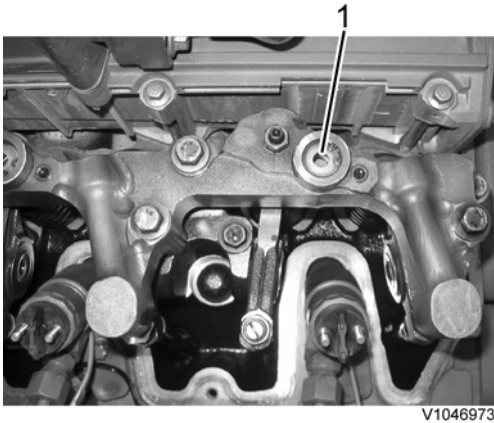


Figure 3

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.

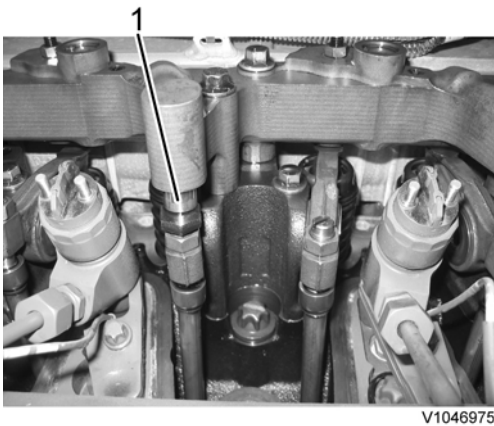
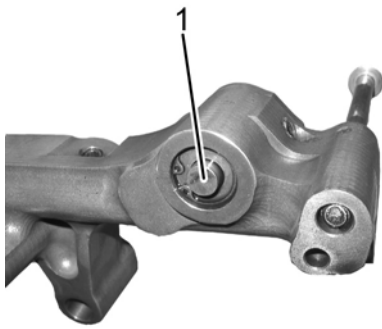


Figure 4

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

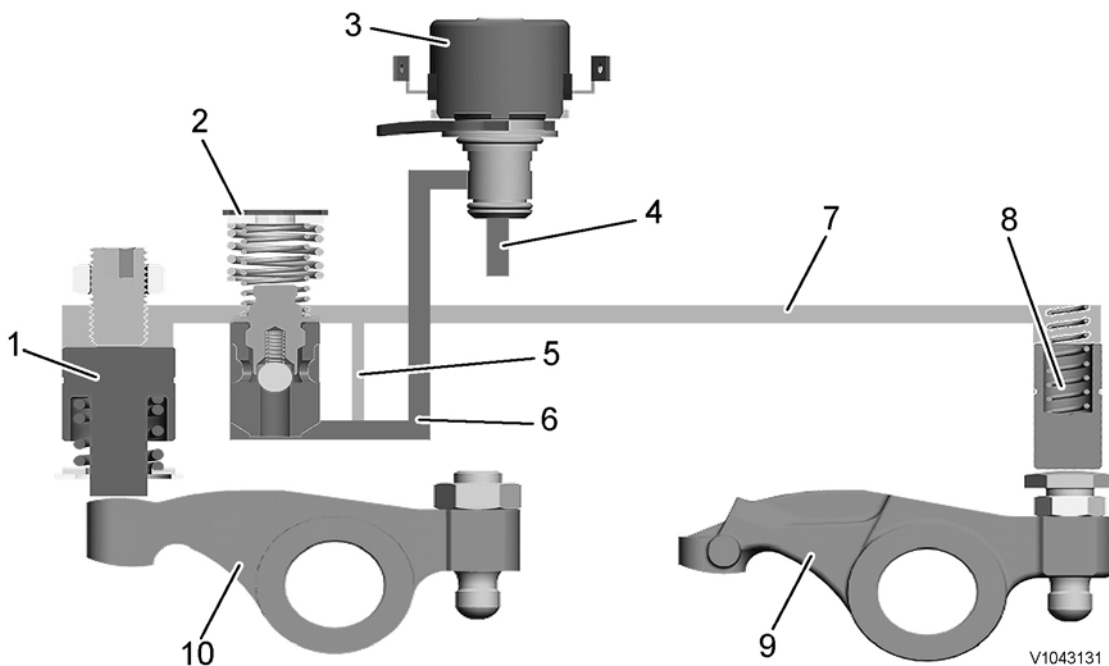
Function

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.



V1043131

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

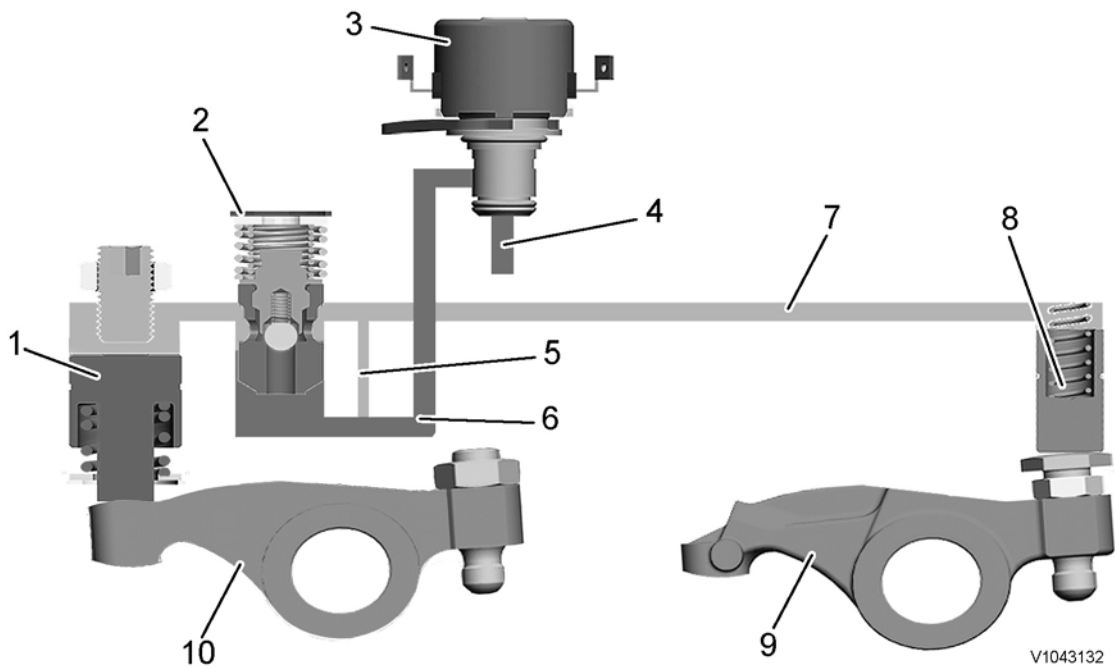


Figure 7
IEGR-system activated

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: Valves, adjusting	Function Group: 214	Information Type: Service Information	Date: 2014/12/22
Profile: EXC, EC180C L [GB]			

Valves, adjusting

Op nbr 214-012

[9998681 Rotation tool](#)

[885812 Timing tool](#)

Feeler gauge



Risk of burns - stop the diesel engine and allow it to cool down before starting any work.

1. Place the machine in service position B. See [091 Service positions](#)
2. Open the engine hood.
3. Remove cover plate (1).

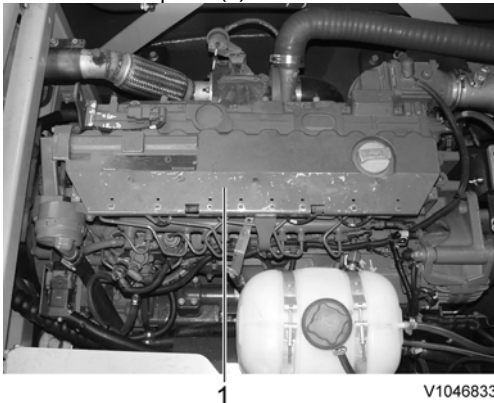


Figure 1
Removal, cover plate

4. Remove screws (arrows) and remove crankcase ventilation duct (1).

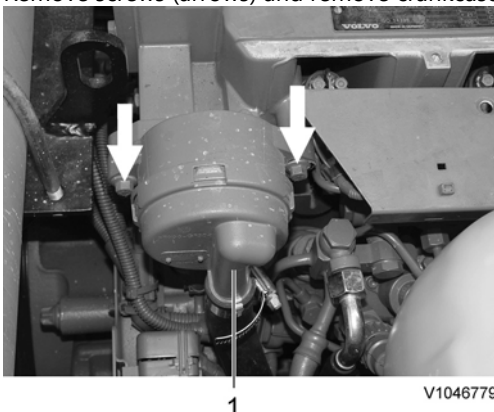


Figure 2
Removal, crankcase ventilation duct

5. Remove rocker arm valve cover (1) with the gasket.

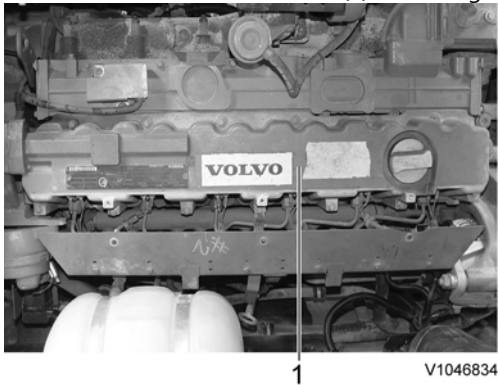


Figure 3
Removal, rocker arm cover

6. Remove the camshaft gear cover and install turning gear (1).

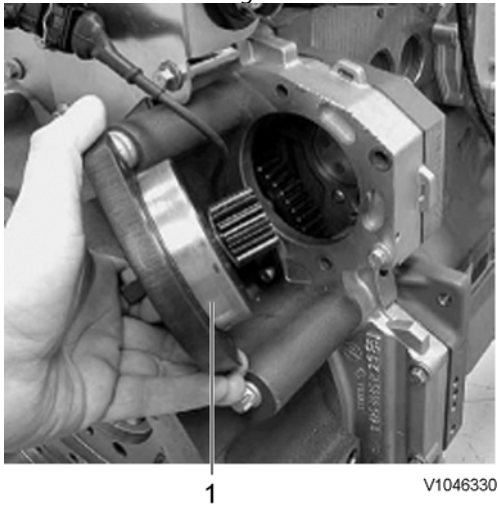


Figure 4

NOTE!

The teeth of the turning gear must mesh fully with the teeth of the camshaft gear.

7. Remove the IEGR unit.
Install M 8 x 75 mm – 10.9 screws in the holes for the IEGR unit on the rocker arm holders.

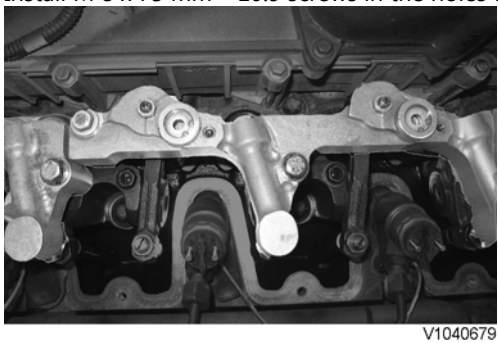
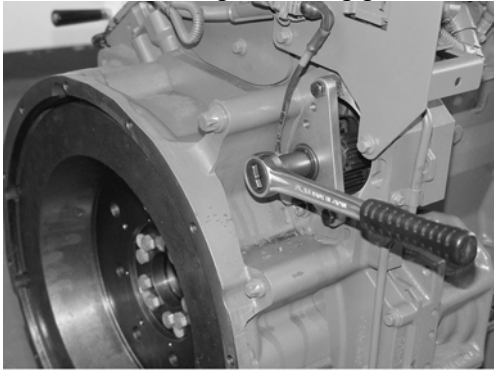


Figure 5

8. **Setting engine to valve overlap**

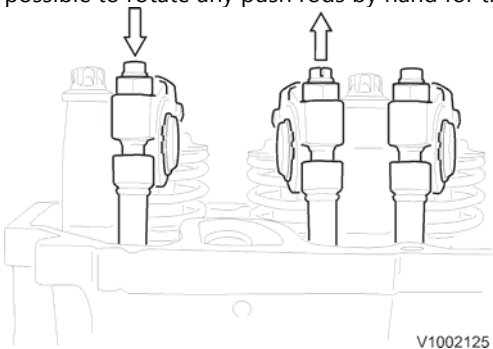
Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.



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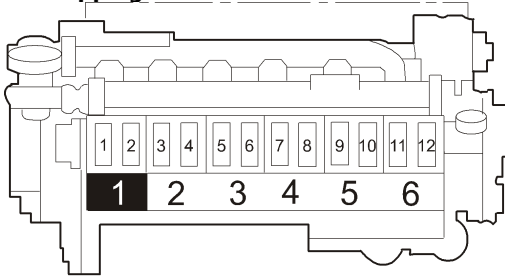
Figure 6

Overlapping means that the exhaust valve is about to open and the inlet valve is about to close. It should not be possible to rotate any push rods by hand for the cylinder in question in this position.



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Figure 7
Overlapping

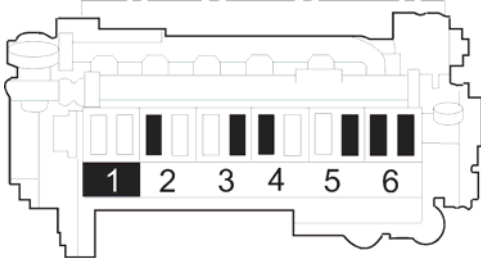


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Figure 8

1, 3, 5, 7, 9 and 11 are exhaust valves
2, 4, 6, 8, 10 are 12 inlet valves

9. Adjust the valve clearance for each cylinder according to the black markings in the figure. Procedure for adjusting:



V1003318

Figure 9

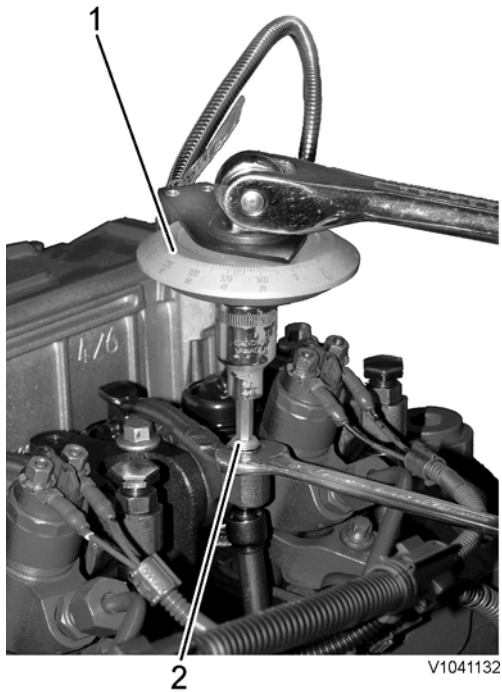


Figure 10

1. 885812 Timing tool
2. Adjusting screw

1. Loosen the adjusting screw's lock bolt on the rocker arm.
2. Install the protractor on the adjusting screw.
3. Turn the adjusting screw until zero clearance is obtained between rocker arm and valve. Reset the protractor to zero.
4. Turn the adjusting screw counterclockwise 75° for inlet valve and 120° for exhaust valve.
5. Hold the adjusting screw and tighten the lock nut at the same time. Tightening torque: see [200 Engine, tightening torques](#)

10. Rotate the crankshaft another full turn until the valves for cylinder 6 overlap. Adjust the valve clearance for each cylinder according to the black markings in the figure.

NOTE!

When all valves are adjusted, do not rotate the engine. Continue directly with installing and adjusting the IEGR unit.

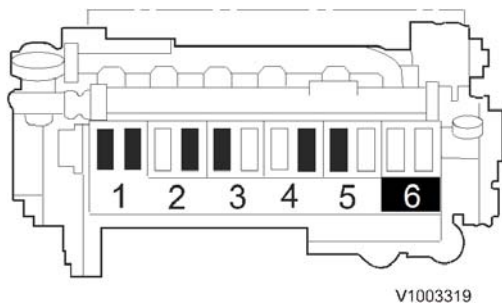


Figure 11

Installing and adjusting IEGR unit

11. Change the O-rings on the pipe between the two IEGR sections. Lubricate the O-rings.

12. Remove the replacement bolts from the IEGR unit's installation holes.
13. Install the IEGR unit.
14. With overlapping valves for cylinder 6, adjust IEGR-opening piston for cylinder 1, 3 and 5. Procedure for adjusting IEGR-opening piston:

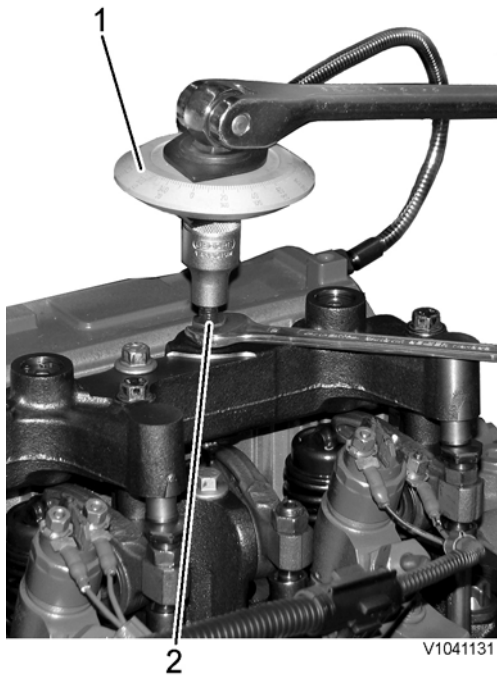


Figure 12

1. 885812 Timing tool
2. Adjusting screw

1. Loosen the adjusting screw's lock bolt on the IEGR unit.
2. Install the protractor on the adjusting screw.
3. Turn the adjusting screw until zero clearance is obtained between the IEGR-opening piston and exhaust rocker arm. Reset the protractor to zero.
4. Turn the adjusting screw counterclockwise 144°.
5. Hold the adjusting screw and tighten the lock nut at the same time. Tightening torque: see [200 Engine, tightening torques](#)

15. Rotate the crankshaft another full turn until the valves for cylinder 1 overlap. Adjust IEGR-opening piston for cylinder 2, 4 and 6.
16. Install the new gasket on the valve cover.

NOTE!

Make sure that the tab (1) on the gasket is positioned correctly.

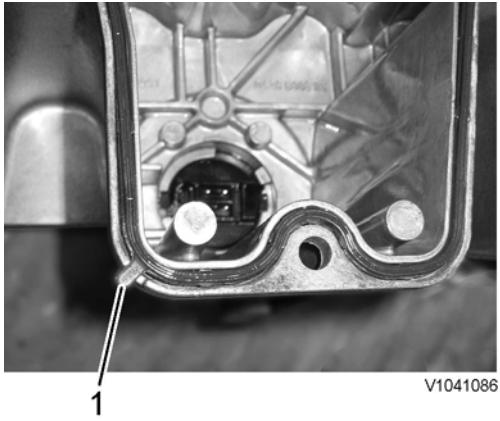


Figure 13

Assembly

17. For assembly, reverse disassembly procedure.

NOTE!

Do not reuse the O-rings and gasket.

18. After the completion of the work, start the engine and check for leaks and operating condition.

Document Title: Engine timing gear, description	Function Group: 215	Information Type: Service Information	Date: 2014/12/22
Profile: EXC, EC180C L [GB]			

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.

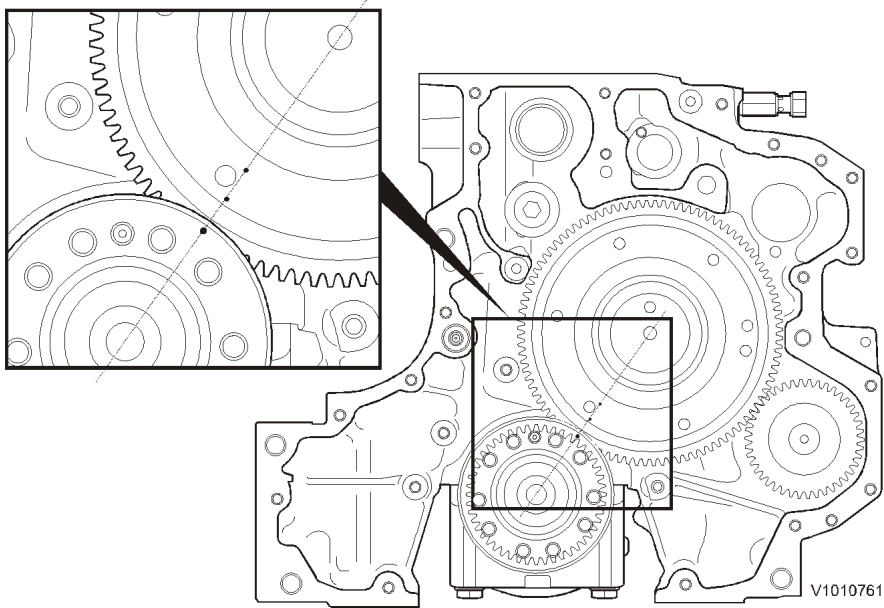


Figure 1

Document Title: Camshaft, description	Function Group: 215	Information Type: Service Information	Date: 2014/12/22
Profile: EXC, EC180C L [GB]			

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.

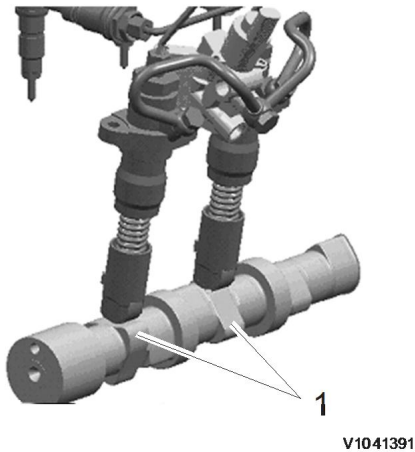


Figure 1

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