

Document Title: <b>Engine, description</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
Profile: <b>EXC, EC290C NL [GB]</b>			

## Engine, description

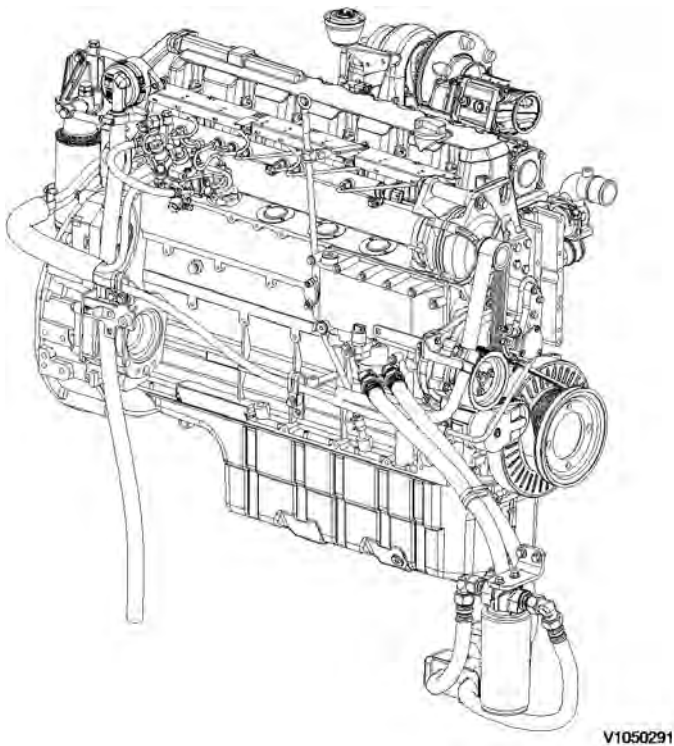
### D7E - tier 3 compliant

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<sub>x</sub> 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.



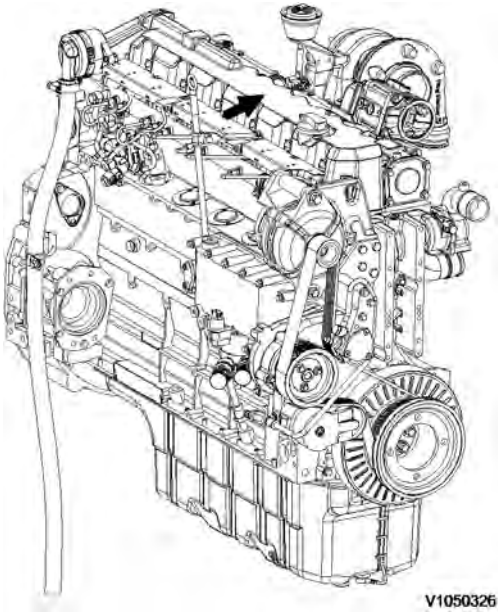
**Figure 1**  
**Engine, D7E**

Document Title: <b>Engine, identification</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
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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: <b>Valves, adjusting</b>	Function Group: <b>214</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
Profile: <b>EXC, EC290C NL [GB]</b>			

## Valves, adjusting

Op nbr 214-012

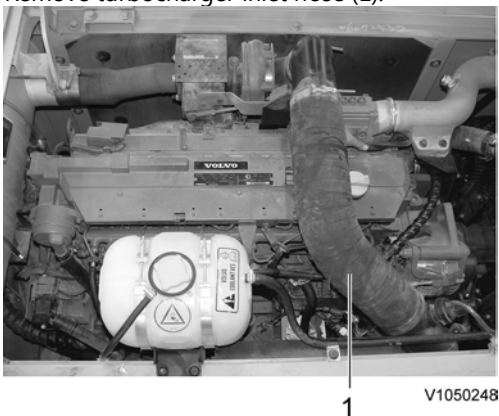
[9998681 Rotation tool](#)

[885812 Timing tool](#)

### **WARNING**

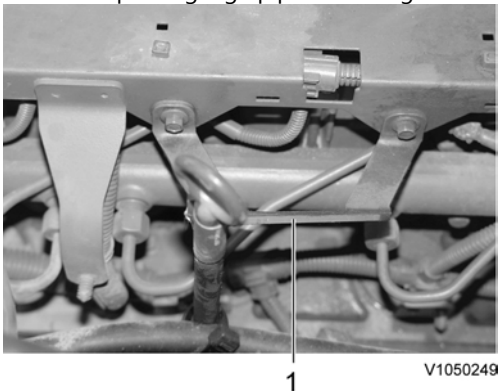
**Risk of burns - stop the diesel engine and allow it to cool down before starting any work.**

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



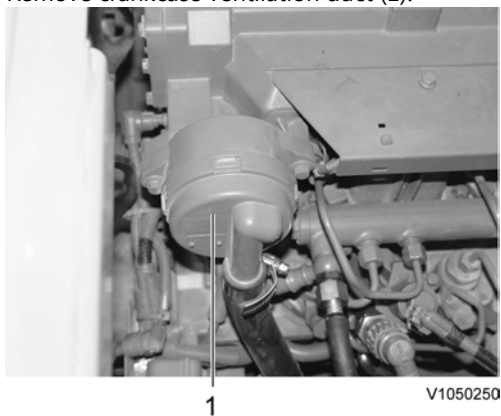
**Figure 1**

4. Remove dipstick gauge pipe mounting bracket (1).



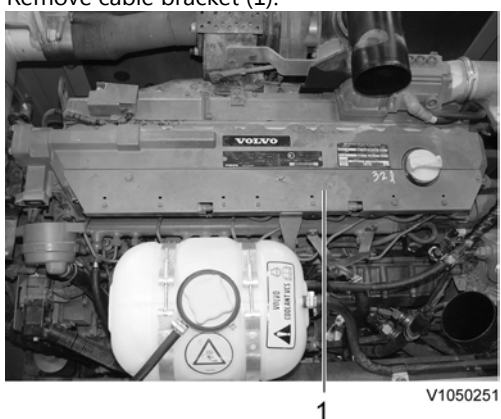
**Figure 2**

5. Remove crankcase ventilation duct (1).



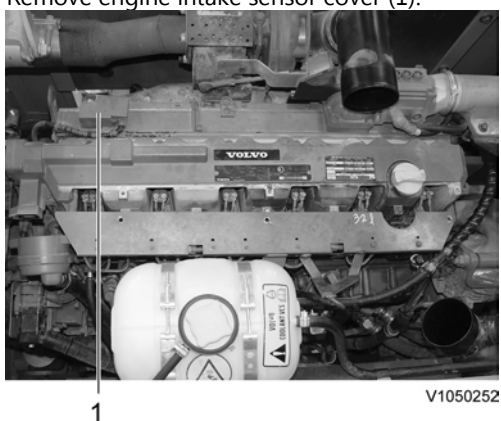
**Figure 3**

6. Remove cable bracket (1).



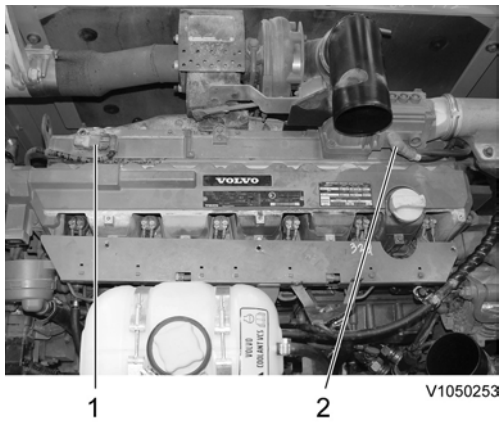
**Figure 4**

7. Remove engine intake sensor cover (1).



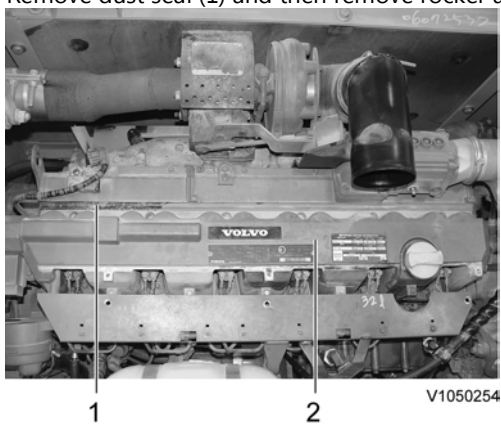
**Figure 5**

8. Disconnect engine intake sensor (1) and preheating coil terminal (2).



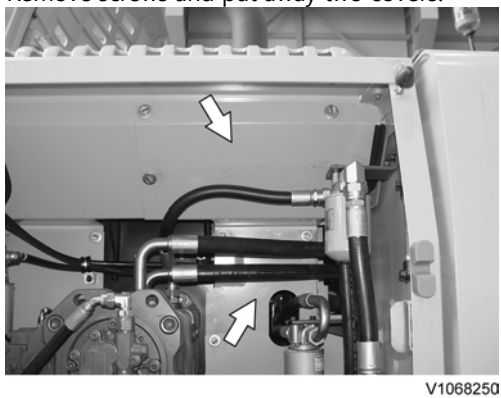
**Figure 6**

9. Remove dust seal (1) and then remove rocker arm cover (2).



**Figure 7**

10. Open the side door on the right side of the machine.
11. Remove screws and put away two covers.

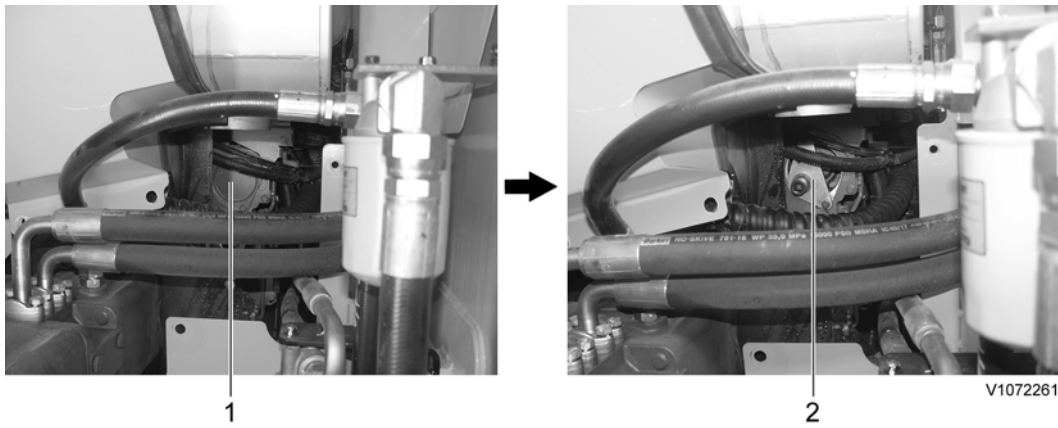


**Figure 8**

12. Remove the camshaft gear cover (1) and install turning gear (2).

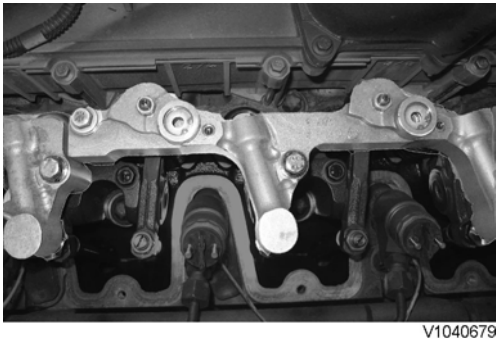
**NOTE!**

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



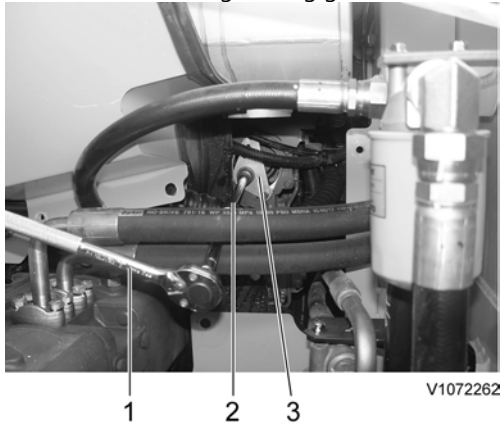
**Figure 9**

13. Remove the IEGR unit. (If installed)  
Install M 8 x 75 mm – 10.9 screws in the holes for the IEGR unit on the rocker arm holders.



**Figure 10**

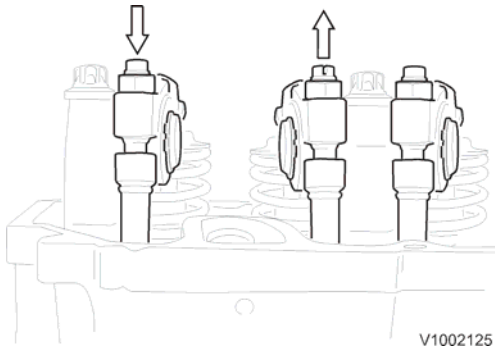
14. **Setting engine to valve overlap**  
Turn crankshaft using turning gear (3) until the valve overlap of cylinder 1 is reached.



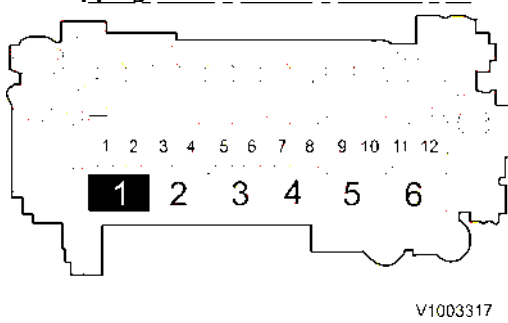
**Figure 11**

1. Wrench
2. Extension bar
3. Turning gear

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.



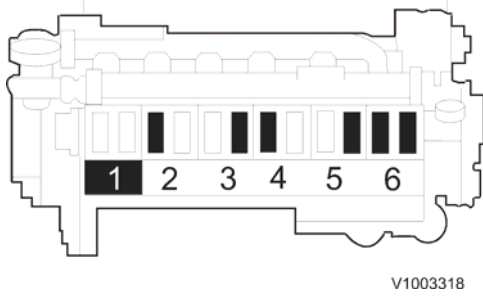
**Figure 12**  
**Overlapping**



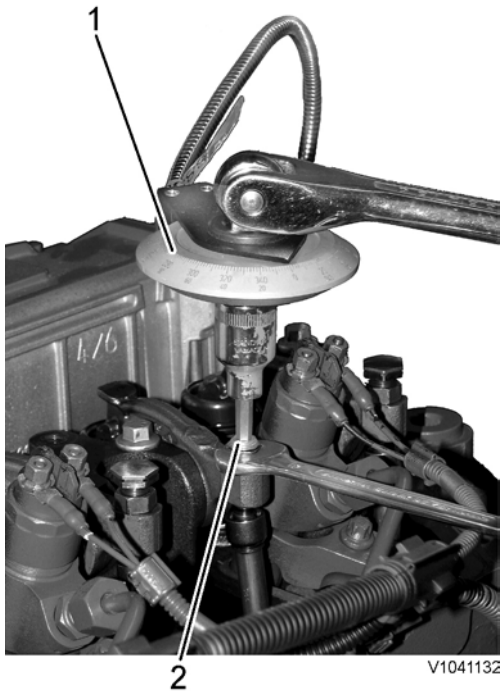
**Figure 13**

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

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



**Figure 14**



**Figure 15**

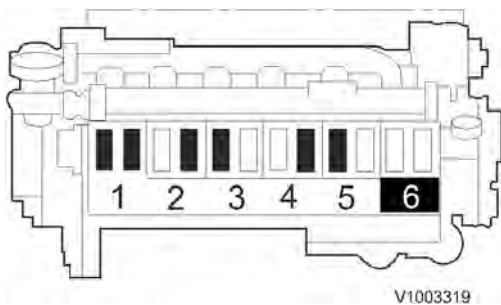
1. 885812 Timing tool
2. Adjusting screw

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 90° for inlet valve and 150° for exhaust valve.
5. Hold the adjusting screw and tighten the lock nut at the same time. Tightening torque: see [200 Engine, tightening torques](#)

16. 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.



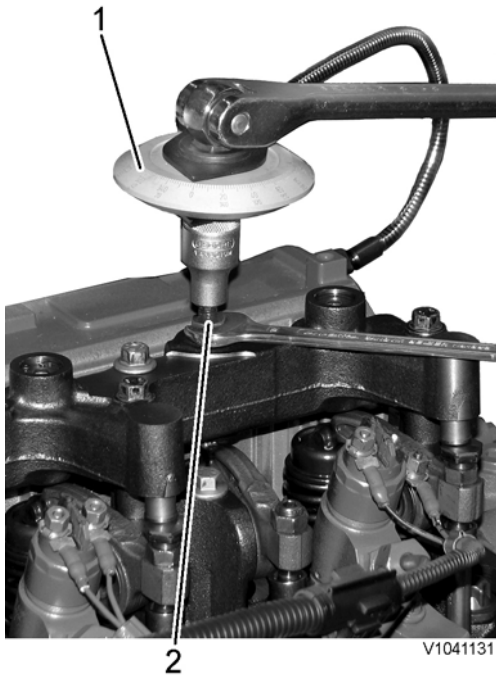
**Figure 16**

**Installing and adjusting IEGR unit (If installed)**

17. Change the O-rings on the pipe between the two IEGR sections. Lubricate the O-rings.
18. Remove the replacement bolts from the IEGR unit's installation holes.



19. Install the IEGR unit.
20. With overlapping valves for cylinder 6, adjust IEGR-opening piston for cylinder 1, 3 and 5. Procedure for adjusting IEGR-opening piston:



**Figure 17**

1. 885812 Timing tool
2. Adjusting screw

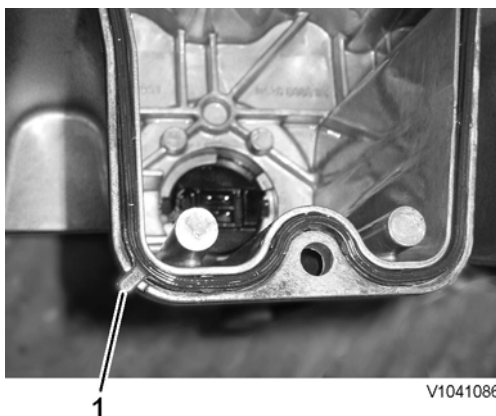
1. Loosen the adjusting screw's lock bolt on the IEGR unit.
2. Install the protractor on the adjusting screw.
3. Turn the adjusting screw until zero clearance is obtained between the IEGR-opening piston and exhaust rocker arm. Reset the protractor to zero.
4. Turn the adjusting screw counterclockwise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

21. Rotate the crankshaft another full turn until the valves for cylinder 1 overlap. Adjust IEGR-opening piston for cylinder 2, 4 and 6.

22. Install the new gasket on the valve cover.

**NOTE!**

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



## Figure 18

### Assembly

23. For assembly, reverse disassembly procedure.

**NOTE!**

Do not reuse the O-rings and gasket.

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

Document Title: <b>Engine timing gear, description</b>	Function Group: <b>215</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
Profile: <b>EXC, EC290C NL [GB]</b>			

## 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: <b>Camshaft, description</b>	Function Group: <b>215</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
Profile: <b>EXC, EC290C NL [GB]</b>			

## 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.

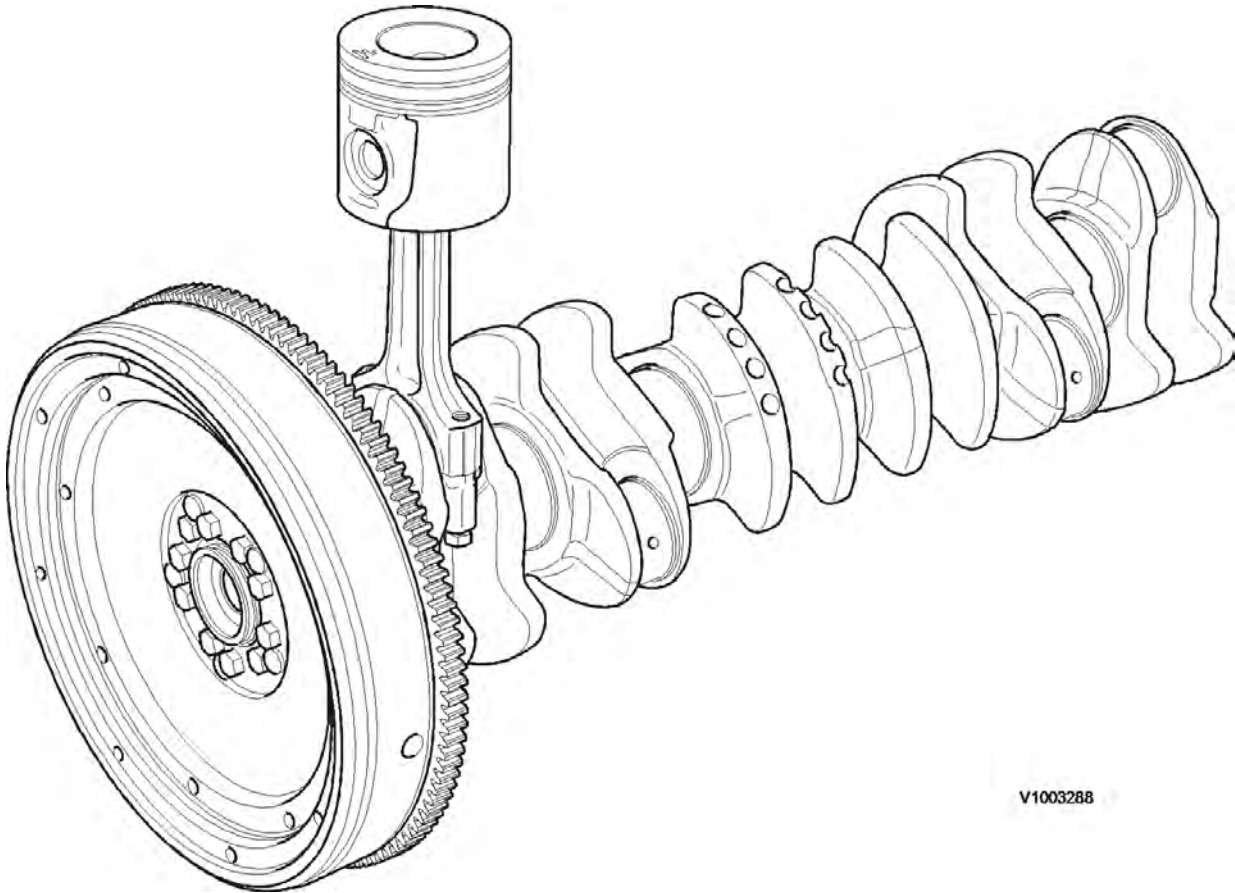


**Figure 1**

Document Title: <b>Crankshaft, description</b>	Function Group: <b>216</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
Profile: <b>EXC, EC290C NL [GB]</b>			

## 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.



V1003288

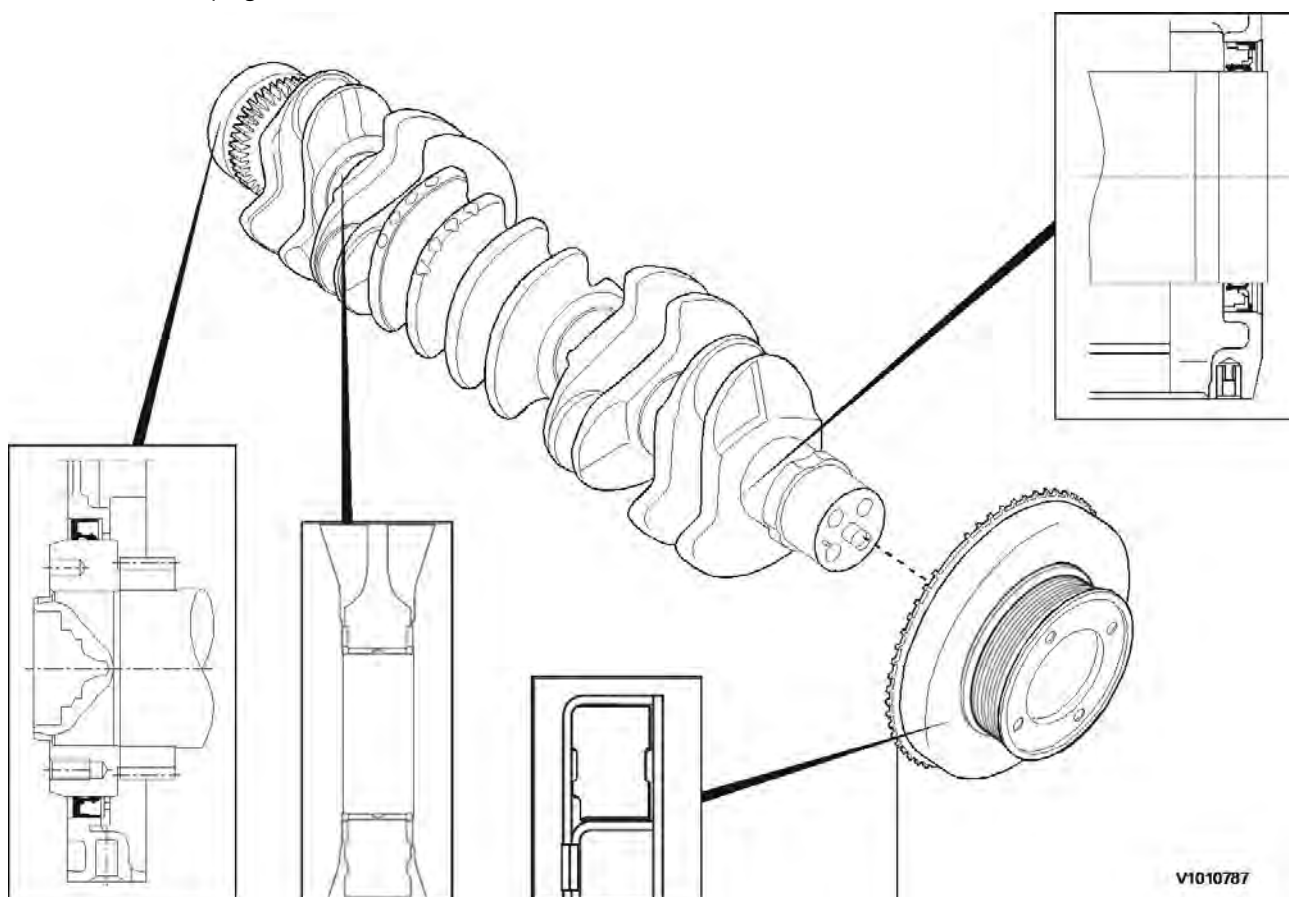
**Figure 1**

Document Title: <b>Vibration description</b>	damper,	Function Group: <b>216</b>	Information Type: <b>Service Information</b>	Date: <b>2014/7/3 0</b>
Profile: <b>EXC, EC290C NL [GB]</b>				

## Vibration damper, description

The engines are standard-equipped with a vibration damper.

The vibration damper is hydraulic and has a steel ring damper body. The damper's steel ring is not mechanically connected to the damper's housing and thus rotates freely. The space between the steel ring and the housing is filled with viscous oil. When the shaft rotates, the force pulses are transmitted from the pistons and converted to vibrations (oscillations) in the crankshaft. The viscous oil achieves an equalization of the crankshaft's pulsing rotation. The uniform rotation of the steel ring contributes to damping the vibrations.



**Figure 1**  
**Principle illustration**

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