VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Engine, description (Deutz D6D EBE2)	**200**	**Service Information**	**2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Engine, description (Deutz D6D EBE2)

The engine is a 6–cylinder, 4–stroke, direct injected, turbocharged, aftercooled with a cast iron block and cylinder head.
Gears in the engine gear case are hardened helical type for strength and reduced noise, arranged to provide quiet, smooth transmission of power.
The cylinder block and head are designed with internal passages forming galleries for both lubricating oil and coolant.
The fan belt is a poly type V-belt for improved performance and an auto tension adjuster maintains belt tension.

Starter side view

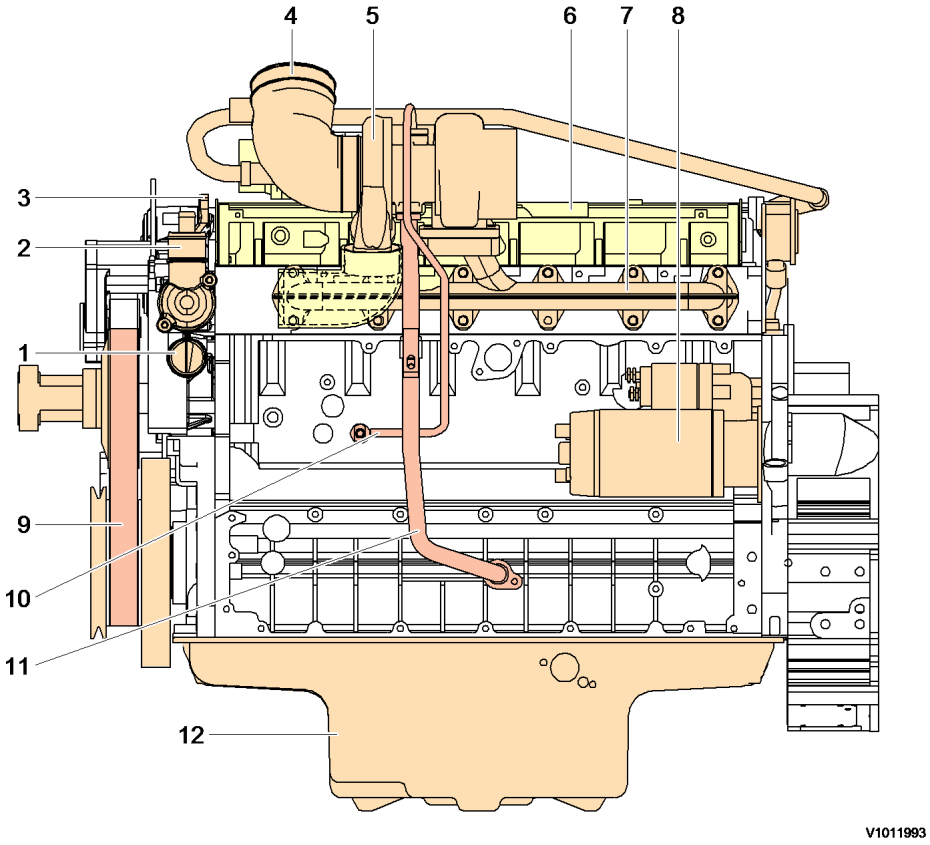

Figure 1
Engine, starter side view

1. Coolant inlet (from radiator)
2. Coolant outlet (to radiator)
3. Coolant make up port
4. Air inlet (from air cleaner)
5. Turbocharger
6. Intake manifold
7. Exhaust manifold
8. Starter
9. Poly-V belt
10. Lube oil pipe (supply)
11. Lube oil pipe (return)

12. Engine oil pan

Alternator side view

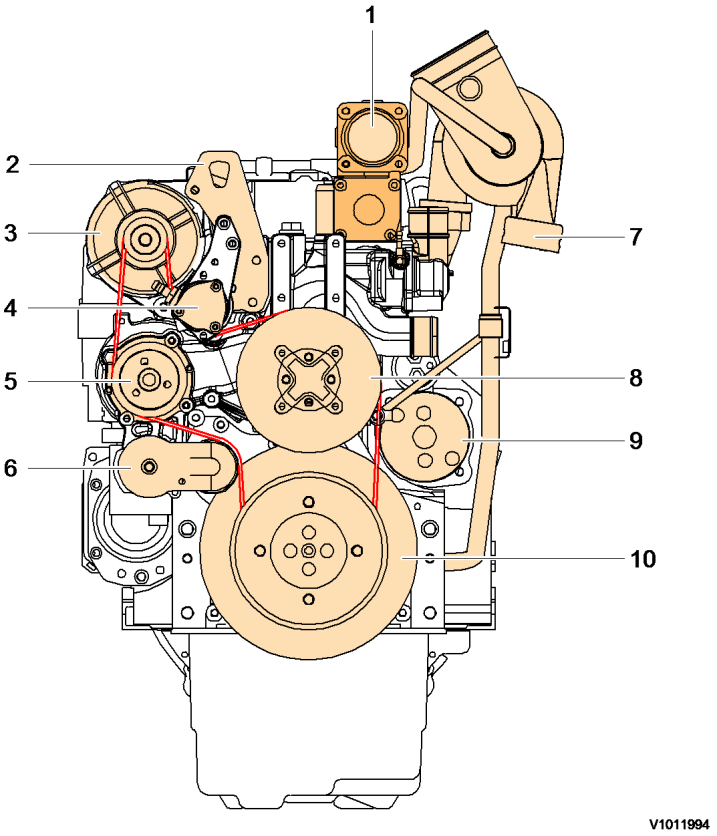

Figure 2
Engine, alternator side view

1. Air inlet (from charge air cooler)
2. Lifting eye (front)
3. Alternator
4. Fuel feed pump
5. Coolant pump
6. Belt tensioner
7. Air outlet (to charge air cooler)
8. Fan drive pulley
9. Air conditioner compressor pulley
10. Pulley with vibration damper

Top view

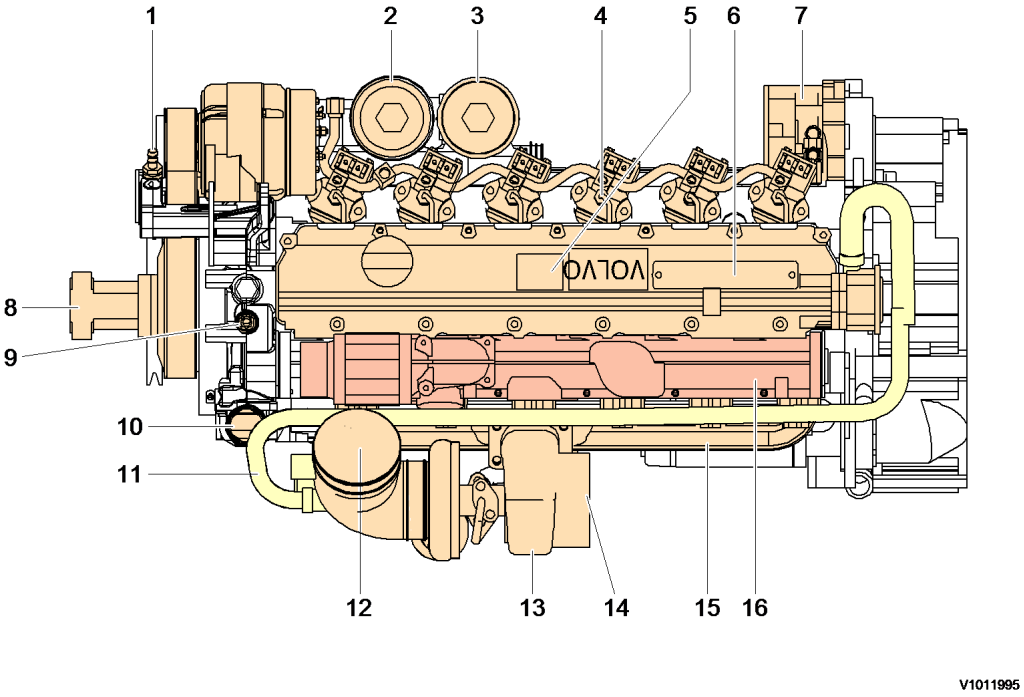

Figure 3
Engine, top view

1	Fuel suction port	9	Coolant make up port
2	Engine oil filter	10	Coolant outlet (to radiator)
3	Fuel filter	11	Blowby gas pipe
4	Unit injection pump	12	Air inlet (from air cleaner)
5	Emission label	13	Turbocharger
6	Engine name plate	14	Exhaust gas outlet
7	Power take off device (option)	15	Exhaust manifold
8	Fan drive	16	Intake manifold

Flywheel end view

Figure 4
Engine, flywheel end view

1. Flywheel
2. Lifting eye (rear)
3. Crankcase breather
4. Coolant temperature sensor port

Document Title: **Engine characteristic curve**	Function Group: **210**	Information Type: **Service Information**	Date: **2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Engine characteristic curve

Engine characteristics

Item	Specification
Maximum power (Net)	109 HP (81 kW, 110 PS) / 1900 rpm
Maximum torque (Net)	50.9 kgf·m (367.5 lbf·ft, 498.8 N·m) / 1450 rpm
Minimum fuel consumption	160 g / PS·h
Rated fuel consumption	165 g / PS·h

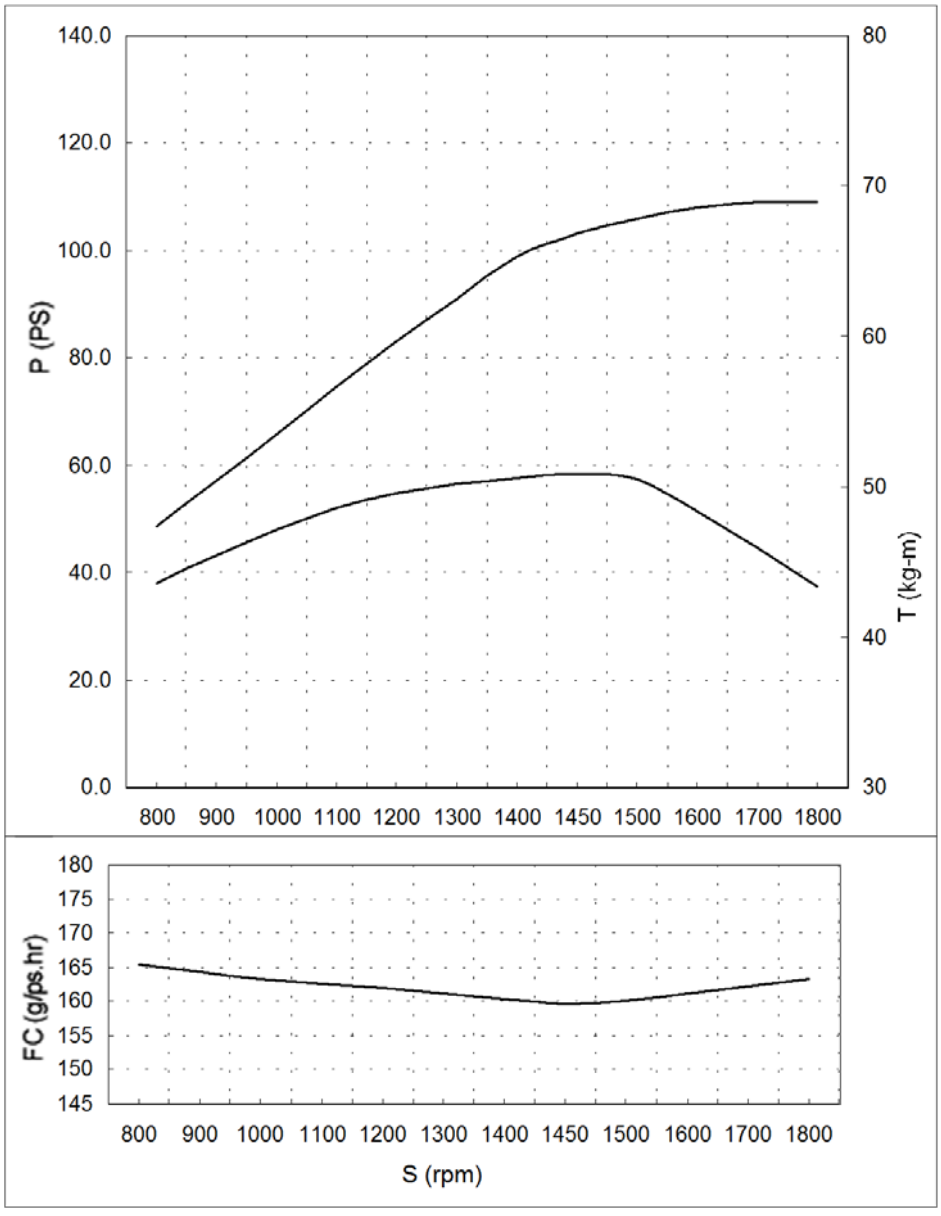

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Figure 1
Engine, characteristic curve

P	Output power
S	Engine speed
T	Torque
FC	Fuel consumption

VOLVO
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Service Information

Document Title:	Function Group:	Information Type:	Date:
Basic check, Engine	**210**	**Service Information**	**2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Basic check, Engine

WARNING

Certain tests and checks are performed with unlocked control lockout lever. Make sure that the machine cannot operate unexpectedly when the control lockout lever is unlocked.

Purpose of the basic check

The purpose of the basic check is to provide fast and accurate information about the general condition of the engine.

The basic check should be performed and evaluated according to instructions in the PC-tool VCADS Pro.

Tests included in the basic check

The basic check which is divided into the following tests should be performed after **reading out error codes and checking parameters**.

Tests:

1. **Cylinder compression, test**
   The purpose of the test is to show if any cylinder has a deviating compression pressure. The test replaces the old pressure check method but does not give any absolute values.
2. **Cylinder balancing, test**
   The purpose of the test is to show if there is any deviation in the fuel injection to a cylinder.
3. **Feed pressure, test**
   The purpose of the test is to check that the feed pressure is as per specification.
4. **Sensor, test**
   The purpose of the test is to check the function of all sensors.

Document Title: **Troubleshooting**	Function Group: **210**	Information Type: **Service Information**	Date: **2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Troubleshooting

When a malfunction is suspected or has been confirmed, it is important to identify the cause as soon as possible.

The starting point for all troubleshooting is that there is some type of trouble symptom or malfunction.

Malfunctions can be indicated by:

- generation of error codes
- detection of a malfunction symptom.

Troubleshooting work

The first step in troubleshooting is to gather information from the operator concerning the malfunction symptoms, refer to the Section 3:3, Collection of basic data. Then, attempt to pin-point the cause by checking in a certain order, for more information, refer to the Section 3:3, troubleshooting strategy.

The different checking steps are:

- Check error codes
- Check parameters
- Perform basic check

Troubleshooting information

The following is included in Section 3:3 and is used when troubleshooting:

1. **Troubleshooting strategy**
   Describes troubleshooting work, step by step.
2. **Troubleshooting, assistive devices**
   Brief summary of the assistive devices that are available for troubleshooting.
3. **Functional checks and tests, VCADS Pro**
   Brief description of VCADS Pro. For a detailed description, refer to the VCADS Pro User's Manual.
4. **Error code information**
   Contains information regarding error code design, lists of all error codes and error code information about each error code.
5. **Components, troubleshooting and specifications**
   Contains methods and measuring values for troubleshooting of components. Also includes wiring diagrams and certain specifications.
6. **Parameters**
   Incorrectly set parameters may cause malfunction symptoms. The parameter list includes all limit and command values for parameters.
7. **Control units, functional description**
   Describes the functions of the control units, inputs and outputs as well as communication between the various control units.
8. **Control units, active and passive measuring**
   Contains measuring values for active and passive measuring of the ACAS.
9. **Software functions**
   Describes the prerequisite conditions for the control and monitoring functions that are performed by the software in the ACAS.

Document Title:	Function Group:	Information Type:	Date:
Cylinder head, description	**211**	**Service Information**	**2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Cylinder head, description

The cylinder head of the D6D engine is made of grey cast iron and designed as block type head. The combustion air enters vertically and the exhaust air is discharged laterally. Inlet and outlet are located on one side of the cylinder head.

VOLVO
Construction Equipment

Service Information

Document Title: **Determining cylinder head gasket**	Function Group: **211**	Information Type: **Service Information**	Date: **2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Determining cylinder head gasket

- The thickness of the cylinder head gasket is responsible for the correct piston crown clearance of the engine. The piston crown clearance (0.65 mm) essentially influences the combustion and thus:
  - Power
  - Fuel consumption
  - Exhaust emission
- The piston crown clearance is adjusted by determining the piston projection and the thickness of the cylinder head gasket.

Measuring piston projection

- A dial gauge with a fixture is needed to measure the piston projection.
- The piston is in its TDC position above the cylinder block face.

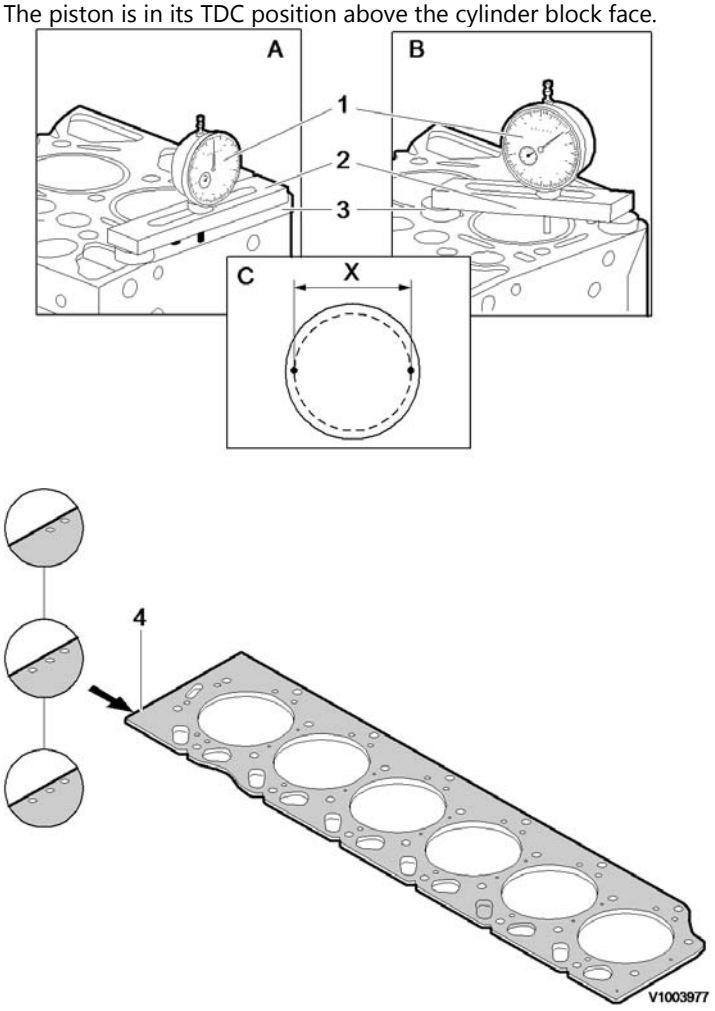

Figure 1
Piston projection, measurement

1. Dial gauge
2. Bridge
3. Two spacer plates

A. Set the dial gauge on the level of the cylinder block face to “zero”.
B. Position the dial gauge at measuring points (C), at the piston pin axis on the piston and determine the maximum projection.
C. Measuring points on the piston.

Distance X = 90 mm

This measurement is performed on each piston. The maximum measured piston projection determines the thickness of the cylinder head gasket (see table). There are 3 different gasket thicknesses identified by bores (4):

- 1 bore = 1.2 mm
- 2 bores = 1.3 mm
- 3 bores = 1.4 mm

Piston projection

Piston projection	**Identification of cylinder head gasket**
0.33 ~ 0.55 mm	1 bore
0.56 ~ 0.65 mm	2 bores
0.66 ~ 0.76 mm	3 bores

Document Title: **Fitting cylinder head**	Function Group: **211**	Information Type: **Service Information**	Date: **2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Fitting cylinder head

- Prior to fitting the cylinder head onto the crankcase, the sealing surfaces for the cylinder head gasket must be clean and free from oil. Pay attention to dowel sleeves.
- Lightly oil the cylinder head bolts.
- It is absolutely necessary to observe the bolt tightening order in the adjacent schematic.

Tightening order

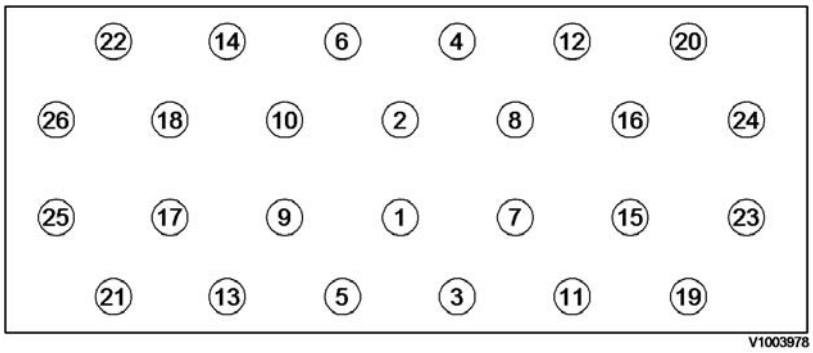

Figure 1
Tightening order (exhaust manifold side)

Tightening specification:

- 1st step: 30 N·m (22.2 lbf·ft, 3.1 kgf·m)
- 2nd step: 80 N·m (59 lbf·ft, 8.2 kgf·m)
- 3rd step: 90° turn

Document Title: **Cylinder, description**	Function Group: **213**	Information Type: **Service Information**	Date: **2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Cylinder, description

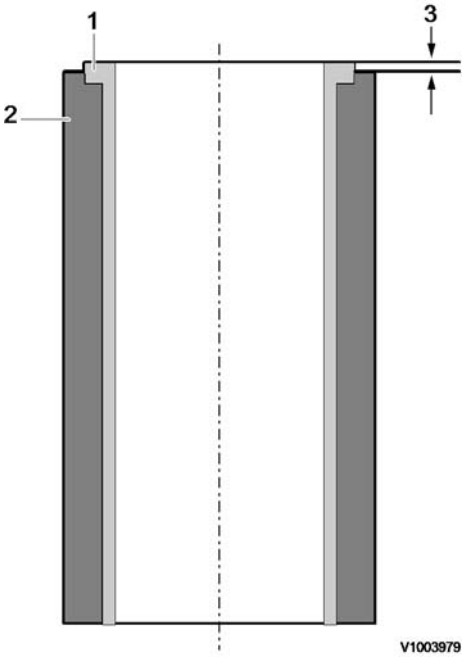

Figure 1
Cylinder liner

1	Cylinder liner
2	Crankcase
3	Liner projection: 0.07 - 0.12 mm

D6D engine with a bore about 98 mm (3.86 in) is provided with dry, plateau-honed slip-fit cylinder liners. In case of damage, the cylinders of the D6D series are repaired by replacing the slip-fit liners.

Document Title:	Function Group:	Information Type:	Date:
Pistons, description	**213**	**Service Information**	**2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Pistons, description

- The pistons of the D6D engine are made of a special aluminium alloy. The piston bowl has a small amount of eccentricity to the piston axis.
- The piston must be installed so that flywheel symbol (1) on the piston top faces the flywheel.
- The pistons are equipped with 3 piston rings. The 1st ring has a ring carrier (2) of cast iron.
- The cross section of the 1st piston ring is asymmetrical. The cross section of the 2nd piston ring is conical (compression ring). When installing the piston, the TOP mark at the ring gap must point upwards. The 3rd ring is the bevelled-edge oil control ring.

Document Title:	Function Group:	Information Type:	Date:
Piston cooling	**213**	**Service Information**	**2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Piston cooling

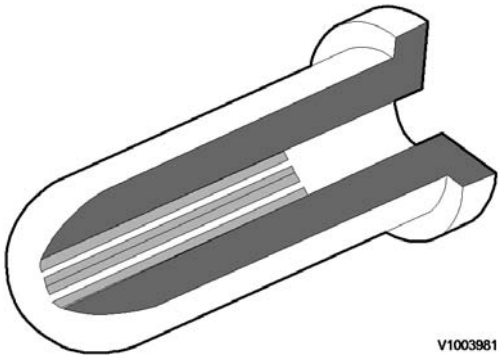

Figure 1
Piston cooling

The piston is cooled by spraying lube oil against the inside of the piston top.

The 2-hole piston cooling nozzles made of plastic are fitted in the main bearing pedestals.

Document Title: **Valves, description**	Function Group: **214**	Information Type: **Service Information**	Date: **2015/3/11**
Profile: **EXC, EC160B LC [GB]**			

Valves, description

- The engine is provided with one inlet and one exhaust valve per cylinder. The valve guides are shrunk in the cylinder head. The valve seat inserts are made of high-quality steel and are also shrunk in the cylinder head.
- The valves are turned by eccentric actuation through the rocker arms. The new compressed cone connection permits easy turning of the valve despite stress load.
  NOTE!
  The valve springs of the D6D have a special installation direction. The colored mark on the spring must show to the bottom.
- Rocker arm lubrication is integrated in the lube oil circuit. The oil is supplied via tappets and push rods.

Valve seat angle

Inlet	**Exhaust**
30°	45°