

Document Title: Engine, description	Function Group: 200	Information Type: Service Information	Date: 2015/3/16
Profile: EXC, EC135B LC [GB]			

Engine, description

The engine is a 4-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

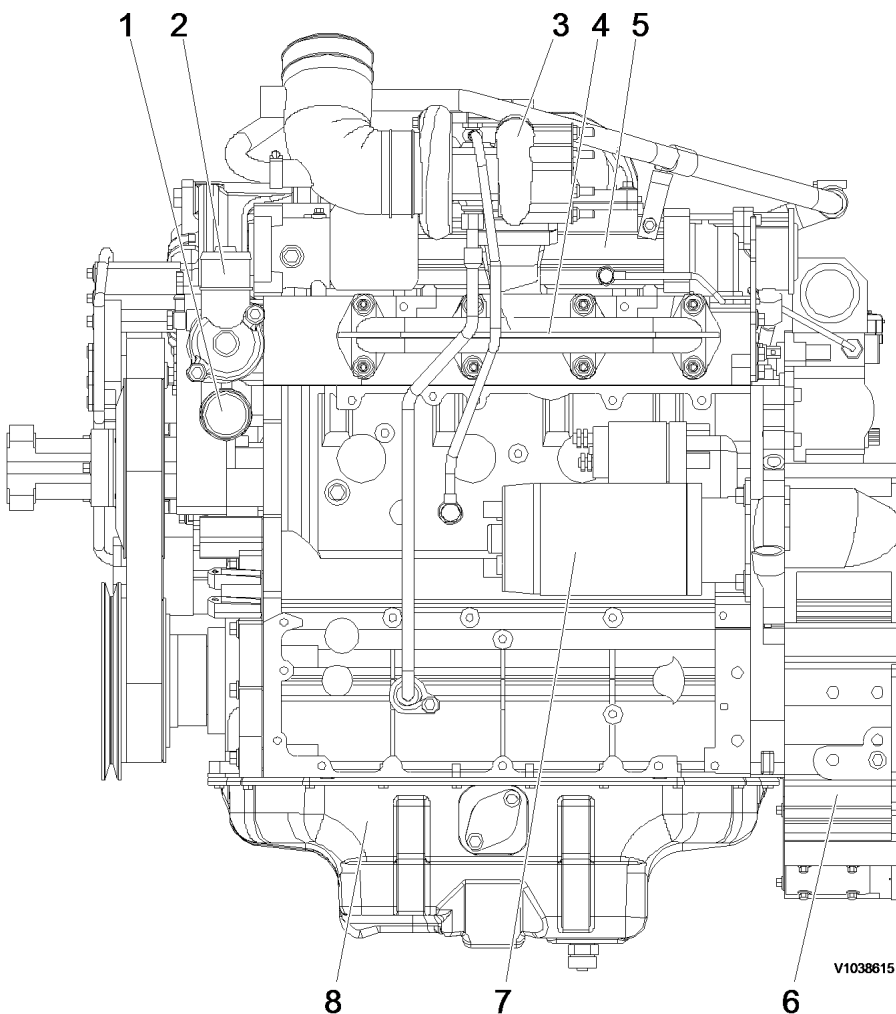
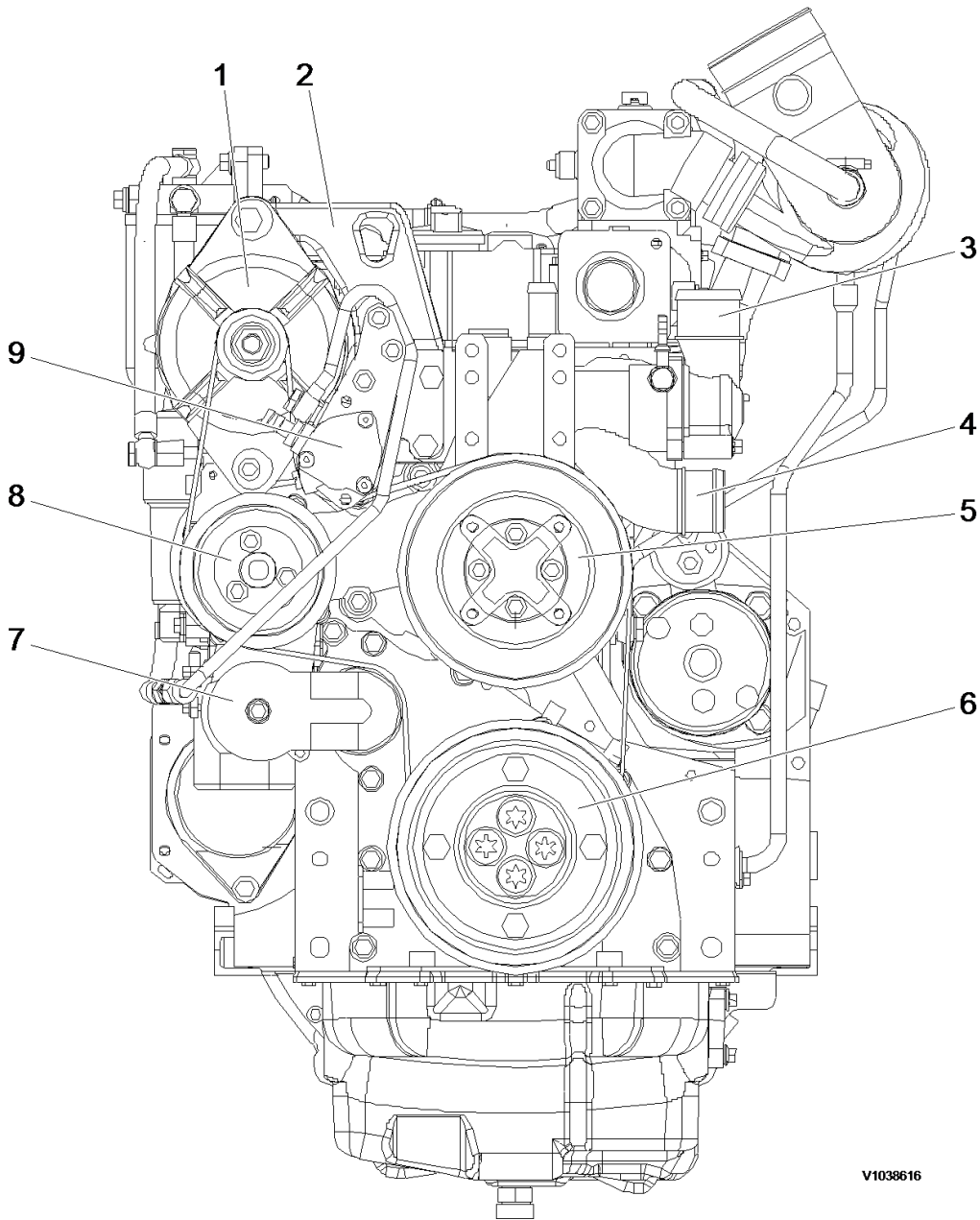


Figure 1
Engine, starter side view

1. Coolant inlet
2. Coolant outlet
3. Exhaust turbocharger
4. Exhaust manifold
5. Air intake manifold
6. Flywheel housing
7. Starter
8. Flywheel housing

8. Oil pan

Alternator side view

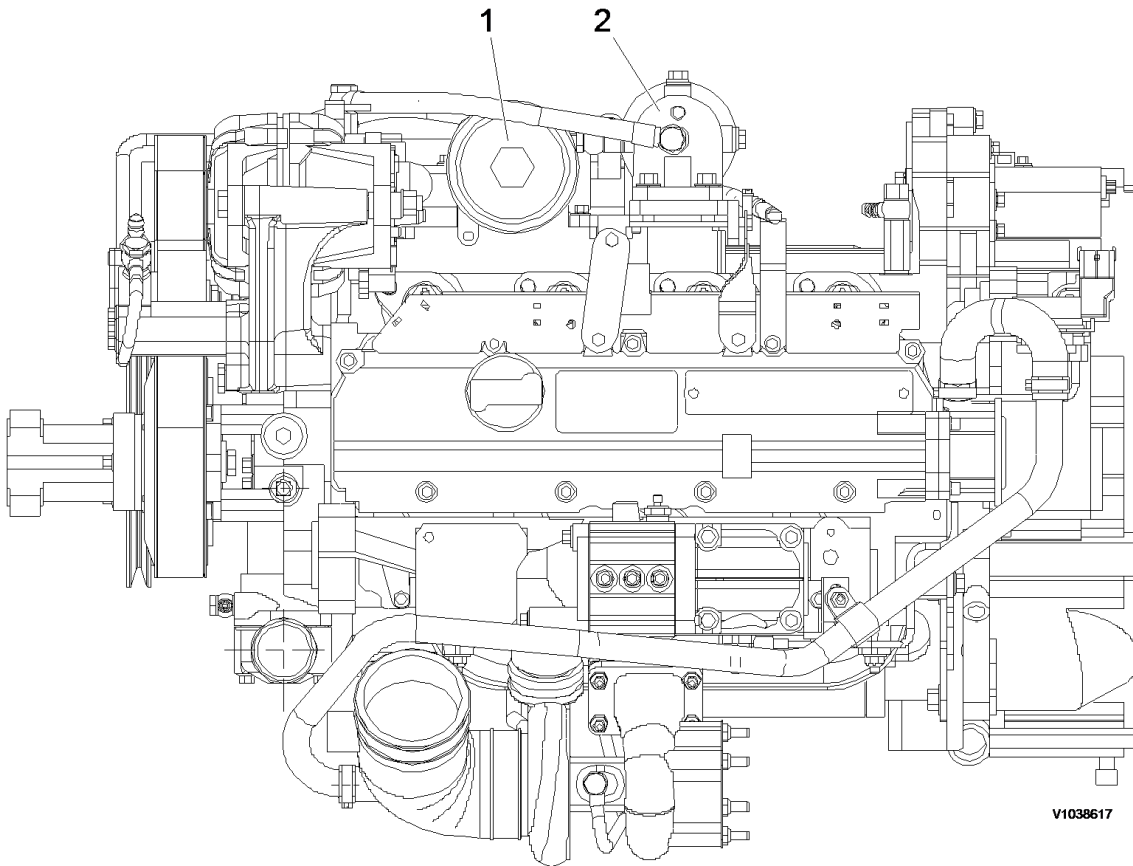


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Figure 2
Engine, Alternator side view

1. Alternator
2. Engine lifting bracket
3. Coolant outlet
4. Coolant inlet
5. Fan pulley
6. Poly - V-pulley with vibration damper
7. Poly - V-belt tension pulley
8. Coolant pump
9. Fuel pump

Top view

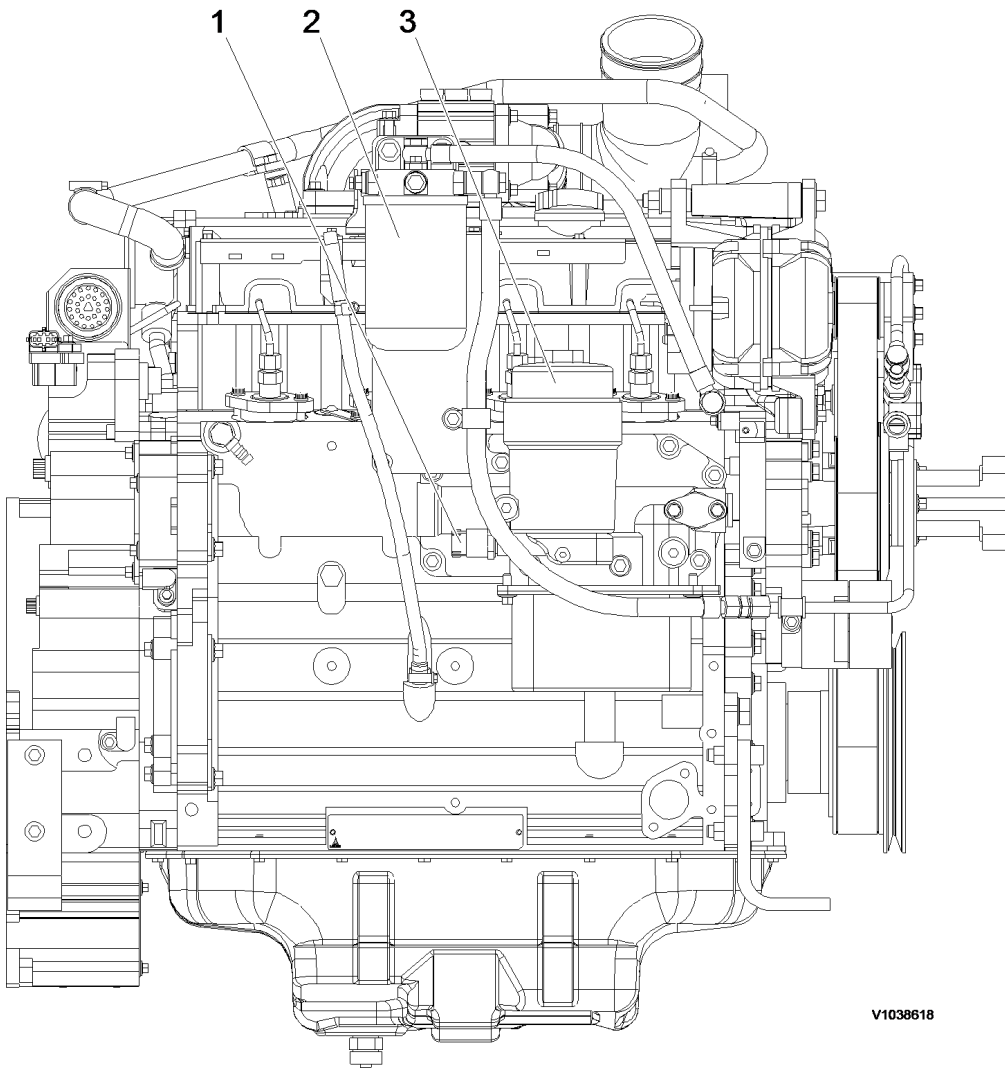


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Figure 3
Engine, top view

1. Engine oil filter
2. Fuel filter

Fuel filter side view

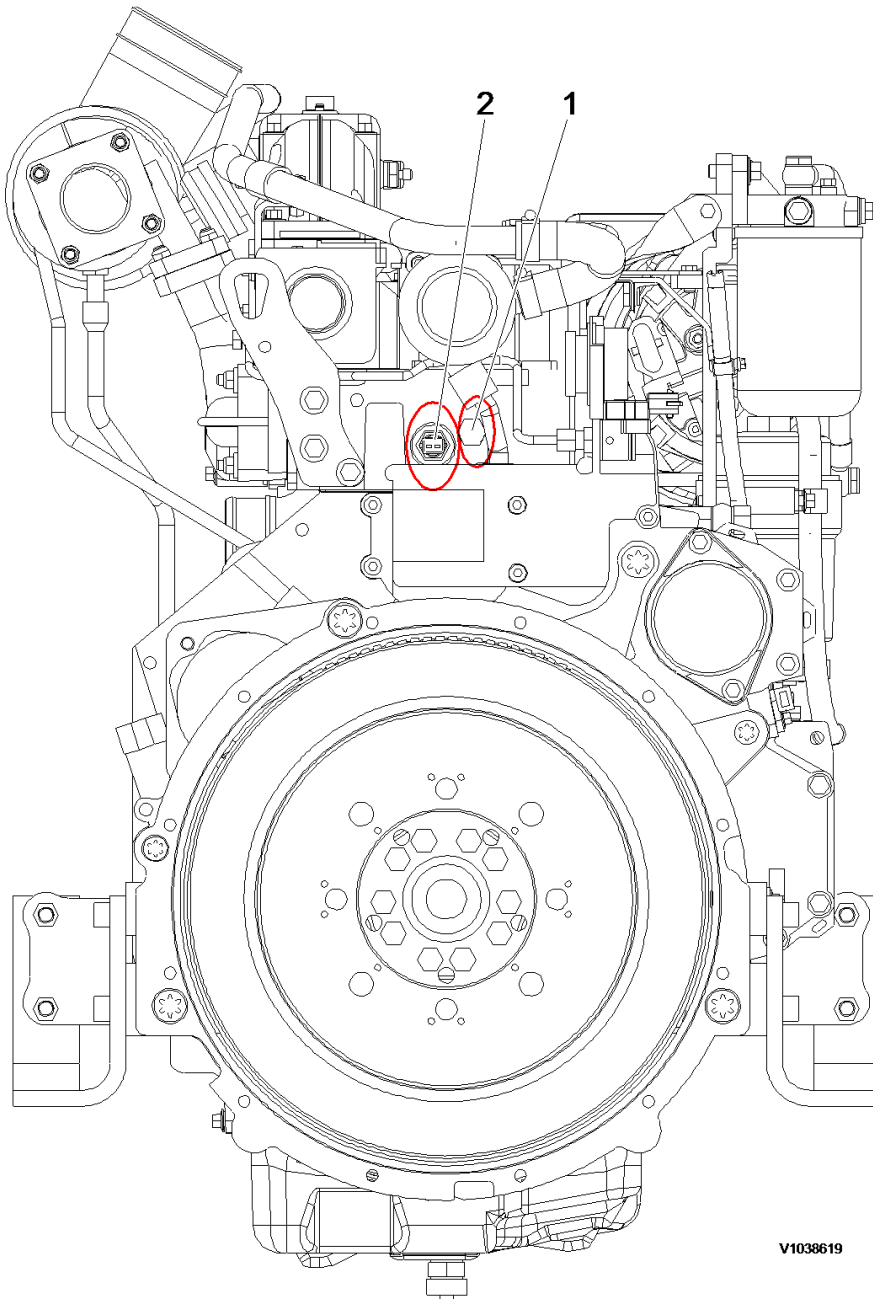


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Figure 4
Engine, fuel filter side view

1. Lube oil pressure port (M14 × 1.5)
2. Fuel filter
3. Engine oil filter

Flywheel end view



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Figure 5
Engine, flywheel end view

1. Coolant temperature check port
2. Coolant temperature sensor port

Document Title: Engine characteristic curve	Function Group: 210	Information Type: Service Information	Date: 2015/3/16
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Engine characteristic curve

Engine characteristics

Item	Specification
Maximum power (Net)	94 PS (69 kW) / 2100 rpm
Maximum torque (Net)	38 kgf·m (274 lbf·ft, 372 N·m) / 1500 rpm
Minimum fuel consumption	157 g / PS·h
Rated fuel consumption	163 g / PS·h

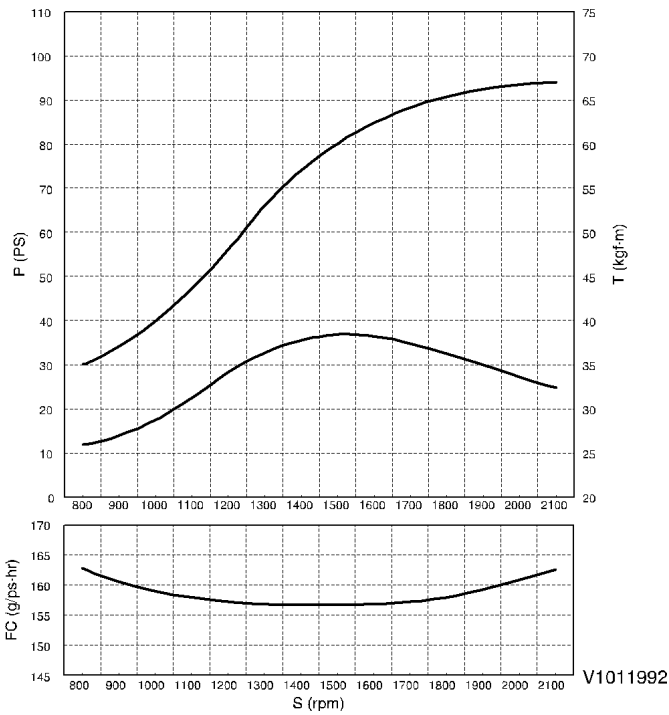


Figure 1
Engine, characteristic curve

P	Power
T	Torque
FC	Fuel consumption
S	Speed

Document Title: Cylinder head, description	Function Group: 211	Information Type: Service Information	Date: 2015/3/16
Profile: EXC, EC135B LC [GB]			

Cylinder head, description

The cylinder head of the D4D 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.

Document Title: Determining cylinder head gasket	Function Group: 211	Information Type: Service Information	Date: 2015/3/16
Profile: EXC, EC135B 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.

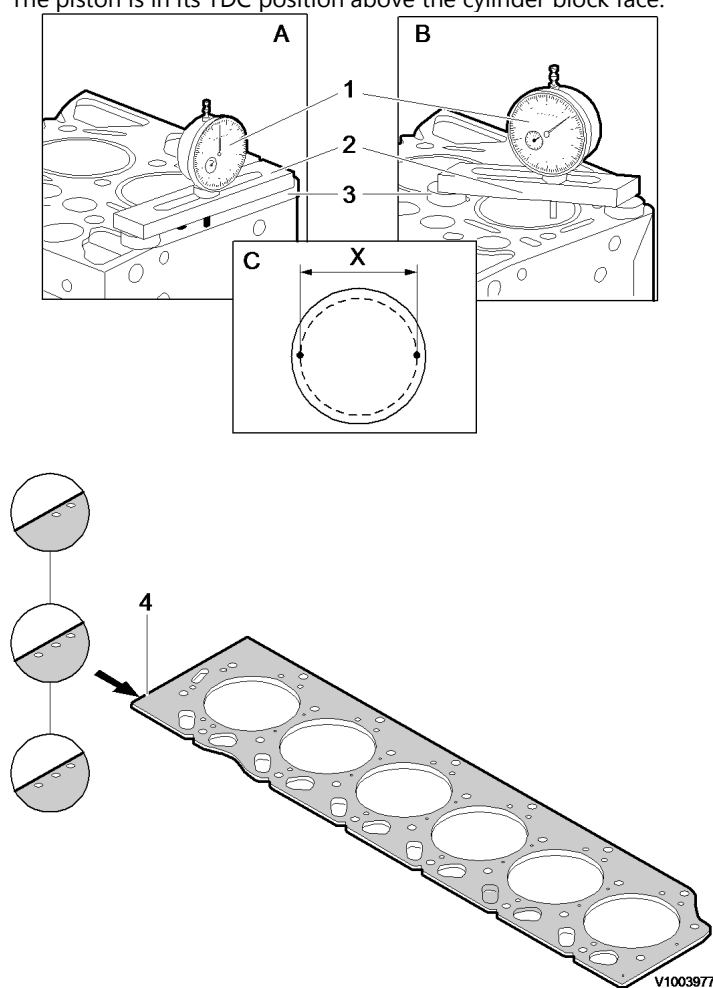


Figure 1
Measurement, piston projection

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

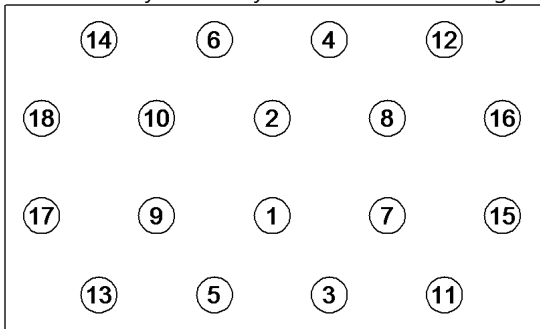
Piston projection	Identification of cylinder head gasket
0.33 ~ 0.55 mm	1 bore
0.56 ~ 0.65 mm	2 bores
0.66 ~ 0.76 mm	3 bores

Document Title: Fitting cylinder head	Function Group: 211	Information Type: Service Information	Date: 2015/3/16
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Fitting cylinder head

Op nbr 21182

1. 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.
2. Lightly oil the cylinder head bolts.
3. It is absolutely necessary to observe the bolt tightening order in the adjacent schematic.



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Figure 1
Tightening order (exhaust manifold side)

Tightening torque 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

Tightening order

Document Title: Cylinder, description	Function Group: 213	Information Type: Service Information	Date: 2015/3/16
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Cylinder, description

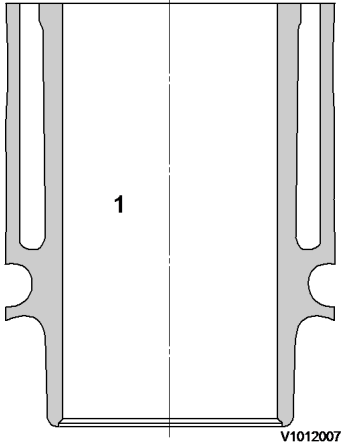


Figure 1
Cylinder liner

D4D engine with a bore about 101 mm (3.98 in) has a crankcase with integrated cylinder liners (1), i.e. crankcase and non-replaceable liners form one casting.

Document Title: Pistons, description	Function Group: 213	Information Type: Service Information	Date: 2015/3/16
Profile: EXC, EC135B LC [GB]			

Pistons, description

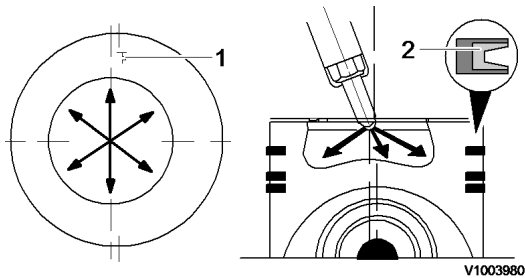


Figure 1

Piston

- The pistons of the D4D 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: Piston cooling	Function Group: 213	Information Type: Service Information	Date: 2015/3/16
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Piston cooling

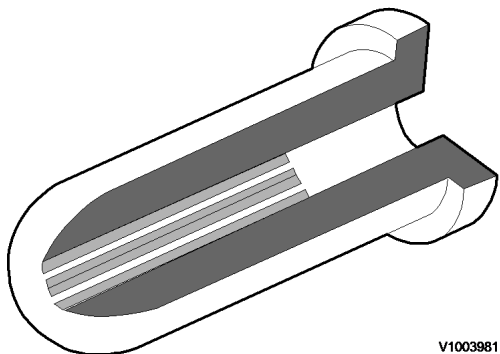


Figure 1
Piston cooling

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: 2015/3/16
Profile: EXC, EC135B 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 D4D 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°

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