Section 2 Engine

Group 20 General

Performance and other data, petrol and diesel engines:

Engine type: (Geometric compression ratio)	Fuel: Recommended Octane number*. Diesel: Cetane number.	Power:		Maximum torque:
		kW at rps	Hp at rpm	Nm at rpm
B 5204 T5 (9.5:1)	95	132 / 88	180 / 5300	240 / 2200-5300
B 5244 T3 (9.0:1)	95	147 / 100	200 / 6000	285 / 1800-5000
B 5234 T3 (8.5:1)	95	184 / 87	250 / 5200	330 / 2500-5200
D 5252 T (20.5:1)	Cetane number: 51	103 / 67	140 / 4000	290 / 1900-3200

* Use only unleaded petrol.

Can be driven using 91-98 octane petrol.

For the best performance and lowest fuel consumption use unleaded 98 octane petrol.

Other general data

Engine type:	B 5204 T5 Engine code 49	B 5234 T3 Engine code 53	B 5244 T3 Engine code 58	D 5252 T Engine code 72
Number of cylinders	5	5	5	5
Bore ..... mm (inches)	81 (3.19")	81 (3.19")	83 (3.27")	81 (3.19")
Stroke ..... mm (inches)	77 (3.03")	90 (3.54")	90 (3.54")	95.5 (3.76")
Displacement ..... litres	1,984	2,319	2.4352	2,461
Boost pressure, absolute pressure at sea level kPa	Normal: 153 Maximum: 158	Normal: 140 Maximum: 147	Normal: 182 Maximum: 193	Normal: 170 Maximum: 190
Firing order	1-2-4-5-3	1-2-4-5-3	1-2-4-5-3	1-2-4-5-3
Engine speed, idling . rpm	670	670	670	790
Engine speed, maximum ..... rpm	6200	6200	6200	4500/5700
Weight, gross, including auxiliary equipment and oil .... kg (lb.)	166-186 (366-410)	144-156 (317-344)	143-156 (315-344)	184-222 (406-489)

Group 21 Cylinder block

Technical data for the D 5252 T diesel engine

Cylinder head:		
If the cylinder head is too distorted replace it. **It cannot be ground flat.**		
Maximum distortion, front-rear	0.2 mm/0.008"	
Maximum distortion, lateral	0.2 mm/0.008"	
Cylinder head gasket:		
Select one of the following gaskets depending on the height of the piston above the cylinder block:	Gasket:	
Height 0.76 - 1.01 mm 0.03" - 0.04"	1.53 mm 0.06"	Marking with 1 hole.
Height 1.02 - 1.05 mm 0.04" - 0.041"	1.57 mm 0.062"	Marking with 2 holes.
Height 1.06 - 1.13 mm 0.042" - 0.044"	1.61 mm 0.063"	Marking with 3 holes.
Cylinder block Dimensions:	Piston diameter	Cylinder bore
Standard	80.96 mm 3.1874"	81.01 3.1893"

Tightening torques for petrol engines: B 5XX4 TX, cylinder block

Tightening torques for nuts and bolts, lubricated:	Nm/ft.lb.
Cylinder head (tighten the bolts in sequence from the centre outwards):	
Stage 1	20/15
Stage 2	60/44
Stage 3 angle-tighten	130°
Middle section: Tighten the bolts in sequence from the centre outwards.	
Stage 1, M10	20/15
Stage 2, M10	40/30
Stage 3, M8	24/18
Stage 4, M7	17/13
Stage 5, M10 angle-tighten	90°
Connecting rod cap:	
Stage 1	20/15
Stage 2 angle-tighten	90°
Crankshaft centre nut	180/133
Flange screw, vibration damper:	
Stage 1	25/18
Stage 2 angle-tighten	30°
Carrier plate:	
Stage 1	45/33
Stage 2 angle-tighten	50°
Transmission - engine	48/35
Torque converter	50/37
Timing cover, front	12/9
Timing cover, upper	8/6
Timing gear pulley, camshaft without VVT	20/15
Timing gear pulley, camshaft with VVT	10/7.4
Camshaft pulley with VVT, centre screw	120/89
Camshaft pulley with VVT, centre plug	35/26
Belt tensioner, mechanical	20/15
Idler pulley, timing belt	24/18
Water pump	17/13
Exhaust manifold	23/17

Tightening torques for nuts and bolts, lubricated:	Nm/ft.lb.
Manifold, exhaust port, stud, turbocharger	20/15
Intake manifold	19/14
Fuel rail:	
Stage 1	10/7.4
Stage 2 angle-tighten	75°
Oil sump	17/13
Oil pump	10/7.4
Plug, oil sump	38/28
Oil intake line	17/13
Drain hose, turbocharger	12/9
Pipescrews, crankcase ventilation	26/19
Pipescrews, oil pressure lines, turbocharger	26/19
Pipe screws, coolant pipes, turbocharger	26/19
Pipe screws, oil pressure lines, cylinder block	38/28
Cover, front edge	17/13
Oil trap	15/11
Oil filter, environmental filter	25/19
Oil pressure switch	27/20
Engine speed sensor	10/7.4
Knock sensor	20/15
Temperature sensor, engine coolant	22/16
Spark plugs	30/22
Flywheel:	
Stage 1	45/33
Stage 2 angle-tighten	65°

Tightening torques for intake and exhaust systems

Tightening torques for nuts and bolts, lubricated. Specific component:	Nm/ft. lb.
Exhaust manifold, cylinder head side	23/17
Exhaust manifold - heat shield	15/11
Exhaust manifold - turbocharger, nuts	25/18
Exhaust manifold - turbocharger, studs	20/15
Exhaust system, pipe to turbocharger	30/22
Exhaust system, flange front - rear pipe	25/18
Exhaust system, pipe to exhaust manifold	10/7.4
Intake pipe	17/12.5

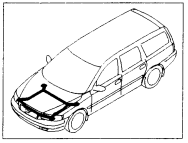
Tightening torques for diesel engines: D 5252 T:

Tightening torques for nuts and bolts, lubricated:		Nm/ft.lb.
Cylinder head Tighten the bolts in sequence from the centre outwards:		
Stage 1		35/26
Stage 2		60/44
Stage 3	angle-tighten	90°
Stage 4	angle-tighten	90°
Main bearing cap		65 ± 6.5/48 ± 5
Connecting rod cap:		
Stage 1		30 ± 3/22 ± 2
Stage 2	angle-tighten	90° ± 10°
Camshaft cover		20/15
Camshaft pulley:		
Front		100 ± 10/74 ± 7
Rear		160/118
Toothed belt tensioner		20/15
Belt cover, rear, plastic		M8: 22/16 M6: 8/6
Belt cover, rear, metal		M8: 22/16 M6: 8/6
Cover, metal, for rear belt cover		8/6
Idler pulley, auxiliary equipment		65/48

Tightening torques for nuts and bolts, lubricated:	Nm/ft.lb.
Tensioner, auxiliaries belt	40/30
Water pump	22/16
Fuel lines	8/6
Pulley, crankshaft, (vibration damper)	
Centre screw. Tighten with special tool:	
Stage 1	160/118
Stage 2 angle-tighten	180°
Allen screws:	
Stage 1	20/15
Stage 2 angle-tighten	90°
Flywheel / carrier plate. Use new screws:	
Stage 1	60/44
Stage 2 angle-tighten, alternately	90°
Heater plug	15/11
Heater plug, for engine coolant heating	18/13
Coolant pipe, rear	M10 = 40/30 M8 = 22/16
Intake manifold, cylinder head side	22/16
Exhaust manifold, studs, nuts	25/18
EGR Valve	Nut 25/18 Bolt 22/16
Exhaust manifold, turbocharger, studs	30/22
Turbocharger, exhaust manifold	Bi-hex bolt 60/44 Nuts 60/44
Engine mounting, engine side, rear	M10 8.8 = 15/11 + 40/30 M10 10.9 = 15 + 65/58
Drive shaft mounting	M8 = 25/18
Oil cooler, nut	30/20
Collision protection system	25/18
Starter motor	80/60
Gutter, oil	8/6
Oil return line, turbocharger, cylinder block	25/18
Oil return line, turbocharger, oil filter, cap nut	30/22

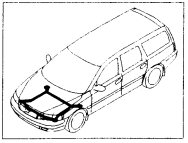
Tightening torques for nuts and bolts, lubricated:	Nm/ft.lb.
Crankcase ventilation pipe	12/9
Heat deflector plate, turbocharger	8/6
Coolant pipe	M8 = 22/16 M6 = 8/6
Auxiliary equipment, bracket	M10 = 40/30 M8 = 20/15
Compressor, air conditioning	25/18
Generator	25/18
Power steering pump	25/18
Vacuum pump	Nuts 25/18 Studs 15/11
Engine coolant temperature sensor	20/15
Dip stick	22/16
Fuel injection pump, mounting	M8 8.8 = 20/15 M8 10.9 = 30/22 Nut M8 20/15
Delivery line, between fuel injection pump and injector	When first installing: 25/18 When reinstalling: 50/37
Connector pipe, thermostat	8/6
Oil pressure sensor	22/16
Fuel injection pump, bracket, engine cover	22/16
Injector	20/15
Engine speed sensor	8/6
Fuel injection pump, pump wheel	45/33
Idler pulley	Stud: 10/7.5 Nut: 25/20
Tensioner pulley	20/15
Toothed belt cover	M8 8.8 = 20/15 M8 10.9 = 30/22
Oil sump plug	38/28
Charge air pipe	10/7.5

Engine mountings for petrol engines: 5-cylinder



Engine mountings for 5-cylinder petrol engines	
Number (as illustrated):	Tightening torques for nuts and bolts, lubricated: Nm/ft. lb. And angle tightening if necessary: Degrees
5	105/78 Angle tightening: 120°
7	50/37
9	20/15
11	50/37
13	50/37
15	65/48 Angle tightening: 60°
17	35/26 Angle tightening: 60°
17 b	20/15 Angle tightening: 60°
18	35/26 Angle tightening: 90°
19	50/37
21,23	35/26 Angle tightening: 90°
22,23	35/26 Angle tightening: 90°
24	35/26 Angle tightening: 40°
25	65/48 Angle tightening: 60°
29	50/37
31	50/37
32	50/37
37,38	80/59
39	50/37
40,41	80/59
44,45	50/37
46	50/37
48,49	80/59

Engine mountings for diesel engine D 5252 T



Engine mountings for diesel engine D 52252 T	
Number as illustrated:	Tightening torques for nuts and bolts, lubricated: Nm/ft. lb. And angle tightening if necessary: Degrees.
5	105/78 Angle tightening: 120°
7	45/33 Angle tightening: 90°
11	50/37
13	50/37
15	65/48 Angle tightening: 60°
18	35/26 Angle tightening: 90°
19	50/37
21,23	35/26 Angle tightening: 90°
22,23	35/26 Angle tightening: 90°
24	35/26 Angle tightening: 40°
26	10/7
29	50/37
31	50/37
32	50/37
37,38	80/59
39	20/15
40,41	80/59
42	50/37
43	65/48 Angle tightening: 60°

Group 22 Lubrication system

General:

Oil volumes and grades, see:
Section 1: Service and maintenance.Group 16: Lubrication.

Oil pressure: Engine at operating temperature, thermostat open and new oil filter. Engine speed rps (rpm)		Petrol engines:	Diesel engines:
14 (810), minimum	MPa	0.1	0.015
67.7 (4000), minimum	MPa	0.35	-
33.3 (2000)	MPa	-	0.2
Relief valve:			
The relief valve opens at a pressure of	Mpa	0.60	0.53 - 0.63
Maximum oil pressure	MPa	0.7	0.7
Oil pressure sensor: Breakpoint			
The indicator lamp goes out at a pressure of	MPa	0.04 - 0.06	0.015 - 0.035

Group 23 Fuel system

Fuel system, Diesel engine D 5252 T:

Fuel injection pump:	
Type	Distributor pump
Make	Bosch
Designation	VP 37
Engine version:	
D 5252 T	Type designation: L 649
Injector:	Assembly:
MSA 15.8 Cylinder 4	Designation: 074 130 203 A Volvo P/N: 94 70 520
MSA 15.8 Cylinder 1, 2, 3, 5	Designation: 074 130 201 Q Volvo P/N: 94 70 521
Injector opening pressure:	
Control value	17.5 - 20 MPa
Set values	19 -20 MPa
Turbocharger boost pressure, absolute pressure:	170 - 190 kPa
Boost pressure at full load, 3,000 rpm, absolute pressure:	190 kPa

Tightening torques for intake and exhaust system components

Petrol engines: Specific component:	Tightening torques Nm/ft. lb.
Exhaust manifold, cylinder head side	23/17
Exhaust manifold - heat shield	15/11
Exhaust manifold - turbocharger, nuts	25/18
Exhaust manifold - turbocharger, studs	20/15
Exhaust system, pipe to turbocharger	30/22
Exhaust system, flange front - rear pipe	25/18
Exhaust system, pipe to exhaust manifold	10/7.4
Intake pipe	17/12.5
Diesel engines:	
Turbocharger - front exhaust pipe Use copper paste: Volvo P/N: 11 61 408-8	40/30

Group 26 Cooling system

General

Never top up with water only.

Use Volvo Genuine parts **green coolant** (see table below) diluted 50/50 with **clean water**.

This mixture prevents corrosion and frost damage.

The coolant does not usually need replacing.

In the case of major repairs when coolant needs to be drained, use new coolant because the old coolant has been exposed to oxidation and dirt.

Clean the cooling system when replacing coolant.

Use Volvo cleaning agent P/N: 11 61 328.

Coolant, Volvo, green	Volvo P/N:
1 liters/0.26 gallons, cold market	13 81 076
5 liters/1.32 gallons, cold market	13 81 077
1 liters/0.26 gallons, EU, rest of the world	13 81 078
5 liters/1.32 gallons, EU, rest of the world	13 81 079
210 liters/55.5 gallons, whole world	13 81 080
1 gallon (3.785 liters), USA	13 81 081
5 liters/1.32 gallons, ready-mixed: 50/50, Australia	13 81 082

Cooling system: Volume, pressure and thermostat

Engine type:	Volume litres (gallons)	Expansion tank pressure valve opens at		Thermostat °C (°F)		
		Pressure kPa (psi)	Negative pressure kPa (psi)	Marking	Starts to open	Fully open
B 5204 T5	8.8 (2.32)	150 (22 psi)	7 (1 psi)	90°(194°)	90° (194°)	105° (221°)
B 5244 T3	8.0 (2.1)	150 (22 psi)	7 (1 psi)	90° (194°)	90° (194°)	105° (221°)
B 5234 T3	8.0 (2.1)	150 (22 psi)	7 (1 psi)	90° (194°)	90° (194°)	105° (221°)
D 5252 T	12.5 (3.3)	150 (22 psi)	7 (1 psi)	87° (188°)	87° (188°)	102° (216°)

Group 28 Ignition system

General

Engine type	Ignition system	Ignition timing (btdc)	Engine speed rpm
B 5204 T5	Bosch ME 7.0	6° ± 2°	670 ± 50
B 5244 T3	Bosch ME 7.0	6° ± 2°	670 ± 50
B 5234 T3	Bosch ME 7.0	6° ± 2°	670 ± 50
D 5252 T	MSA 15.8	See the information in VADIS regarding injection timing	810 ± 50

Group 28 Components

Technical data, spark plugs and tightening torques:

Components: Related to the ignition system		
Ignition coil, ignition discharge module	Volvo P/N	91 25 601
Spark plugs:		
B 5204 T5, B 5244 T3 and B 5234 T3	Volvo kit number	272 313
Electrode gap:	mm	0.75
Tightening torques	Nm (ft.lb)	30 (22)
Knock sensor	Volvo P/N	94 32 570
Tightening torques	Nm (ft.lb)	20 (15)
Engine speed sensor, flywheel	Volvo P/N	12 75 599
Resistance in coil, at 20°C/68°F	Ω	125 ± 25
Inductance in coil, at 20°C/68°F	mH	85 ± 10 (1 kHz)
Camshaft position sensor	Volvo P/N	92 25 134
Engine cooling fan, control module, 30 A	Volvo P/N	92 09 813
Engine cooling fan, control module, 40 A	Volvo P/N	92 09 814

Components: Related to the ignition system		
Relay, A/C	Volvo P/N	91 62 300

Components Bosch ME-7.0:

Components related to the fuel and ignition system Type ME-7.0:	
Control module	Built-in atmospheric pressure sensor.
Throttle unit	Damper motor integrated with electronic module.
Accelerator pedal position sensor	Pulse width modulated and linear signal (digital / analogue).
Pressure regulator	Line pressure 380 kPa.
Mass air flow sensor	Mass air flow sensor resistive film. Measurement range 12 - 640 kg/h.
Fuel pump	Pump capacity: at a line pressure of 380 kPa and 13 > V 125 l/min. Power consumption at line pressure: 7.5 A.
Injector	Resistance. coil: 12 Ω.
Boost pressure sensor	Piezo resistive linear pressure sensor. Measurement range 20 - 250 kPa.
Turbocharger control valve	Pulse width modulation controlled valve. Resistance 29.7 Ω.
Reset valve camshaft, variable valve timing	Pulse width modulation controlled valve. Resistance 3.7 Ω.
Temperature sensor intake air	NTC resistance.
Knock sensor	Piezoelectric crystal
Camshaft position sensor	Magneto-resistive sensor with a permanent magnet.
Engine speed sensor At 20°C/68°F	Inductive sensor with permanent magnet. Resistance 125.5±25Ω.
Heated oxygen sensor (HO2S), front Preheating	Linear sensor. Resistance 3 Ω, at 20°C/68°F.
Heated oxygen sensor (HO2S), rear Preheating	Binary sensor. Resistance 9 Ω, at 20°C/68°F.
Ignition coil	Individually mounted ignition coil. Integrated ignition discharge module and diagnostics.
Outside temperature sensor	NTC resistance.
A/C pressure sensor	Linear pressure sensor. Measurement range 0 - 3,100 kPa.

Components related to the fuel and ignition system
Type ME-7.0:

Canister purge valve	Pulse width modulation controlled Resistance 29.7±1.4Ω.
EVAP canister shut-off valve	Solenoid valve. Resistance 17±1Ω.
Fuel tank pressure sensor	Piezo electric linear pressure sensor.
Fuel pump relay	Frequency controlled mechanical relay.
Air conditioning relay	Mechanical relay. Resistance in coil 96 Ω.
Engine cooling fan control module	Pulse width modulation controlled ignition discharge module with variable output voltage and diagnostics.
System relay	Mechanical relay. Resistance 80 Ω.
Clutch pedal position sensor	Self-adjusting.
Brake pedal position sensor	Self-adjusting.
Brake lamp switch	Two. One switch + one sensor.
Engine coolant level switch	Level indicator.
Oil pressure switch	Pressure switch

Technical data
For the fuel and ignition system ME-7.0:

Mass air flow sensor:				
Q kg/h	12	15	30	60
Voltage V	1.3	1.4	1.7	2.1
Boost pressure sensor:				
P kPa	90	101	150	200
Voltage V	1.7	1.9	2.8	3.7
Engine coolant temperature sensor:				
Temperature °C (F°)	10 (50°)	20 (68°)	80 (176°)	100 (212°)
Resistance Ω	3700	2450	318	184
Voltage V	2.1	1.6	0.3	0.2
Temperature sensor, intake air:				
Temperature °C (F°)	0 (32°)	20 (68°)	30 (86°)	40 (104°)

Technical data
For the fuel and ignition system ME-7.0:

Resistance ..... Ω	15 931	6 068	3 923	2 603
Voltage V	4.3	3.5	3	2.5
Outside temperature sensor:				
Temperature ..... °C (F°)	0 (32°)	20 (68°)	25 (77°)	30 (86°)
Resistance ..... Ω	6318	2424	1941	1513
Voltage V	4.3	3.5	3.3	3
Air conditioning pressure switch (Pressostat):				
Pressure ..... kPa	195 - 325		160 - 180	
Status ..... On/Off	On		Off	
Fuel tank pressure sensor:				
Pressure P ..... kPa	0			
Voltage V	3.3			
Clutch pedal position sensor:				
Position ..... mm	0	25 (0.98")	50 (1,97")	100 (3.93")
Resistance ..... Ω	1500 - 2500	1000 - 2000	750 - 1750	500 - 1000
Brake pedal position sensor:				
Position ..... mm	0	20 (0.79")	30 (1.18")	50 (1.97")
Resistance ..... Ω	1300 - 2100	1000 - 1800	900 - 1700	600 - 1400