

## Section 2 Engine

## Group 20 General data engines

Performance and other data, petrol engines:

Engine type: (Geometric compression ratio)	Fuel: Recom- mended Oc- tane rating*. Diesel: Cetane rating.	Power:		Maximum torque:
		kW at rps	hp / rpm	Nm / rpm
B5254T3 (9.0:1)	91	162 / 83	218 / 5000	320 / 1500-4800
B5244S4 (10.3:1)	91	125 / 100	162 / 6000	320 / 1500-4800

\* Use only unleaded gasoline.

For best performance and fuel economy use 91 octane or higher.

## Other general data

Engine type:	B5244S4 Engine code 38	B5254T3 Engine code 68
Engine management system	Denso	Bosch ME 7
No. of cylinders	5	5
Cylinder diameter           mm (inches)	83 (3.27")	83 (3.27")
Cylinder stroke           mm (inches)	90 (3.54")	93.2 (3.67")
Cylinder displacement           litres	2,435	2,521
Boost pressure, absolute pressure at sea level           kPa	-	-
Firing order	1-2-4 -5-3	1-2-4 -5-3
Engine speed (RPM), idle speed           rpm	720	770
Engine speed (RPM), maximum           rpm	6500/6800	6500/6800
Total weight, including oil           kg (lb.)	-	-

## Group 21 Cylinder block

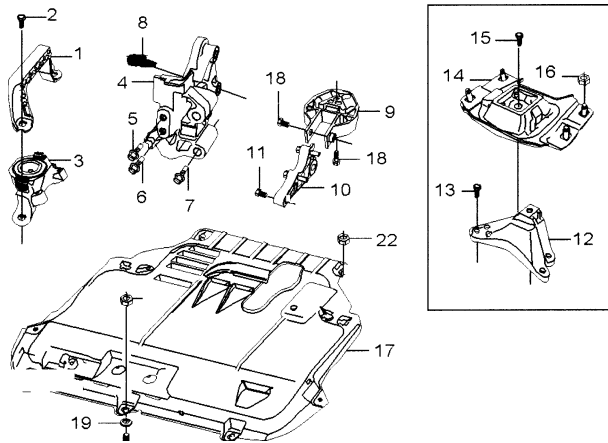
## Tightening torques for 5 cylinder engines: Cylinder block

Tightening torques for lubricated screws and nuts:	Nm / lb.ft.
Cylinder head (tighten the screws in sequence from the centre outwards):	
Stage 1 . . . . .	20/15
Stage 2	60/44
Step 3 angle-tighten	130°
Intermediate section:	
Tighten the screws in sequence from the centre outwards.	
Stage 1, M10	20/15
Stage 2, M10	45/33
Stage 3, M8	24/18
Stage 4, M7	17/13
Step 5, M10 angle tighten	90°
Connecting rod cap:	
Stage 1 . . . . .	15/11
Stage 2 . . . . .	25/19
Step 3 angle-tighten	100°
Crankshaft centre nut / vibration damper	180/133
Flange screw, vibration damper:	
Stage 1 . . . . .	25/19
Step 2 angle-tighten	60°
Carrier plate:	
Stage 1	45/33
Step 2 angle-tighten	50°
Gearbox - engine	50±12/37±8.9
Torque converter:	50/37
Stage 1	20
Step 2 angle-tighten	40°
Pendulum bracket, engine mounting (M10 for cylinder head):	
Stage 1	35/26
Step 2 angle-tighten	75°
Limiters, Right-hand side, M12	80/59
Engine mounting, Left side:	
M14 screw	120/88.5
Nuts, bracket gearbox left-hand side:	
Stage 1 . . . . .	35/26

Tightening torques for lubricated screws and nuts:		Nm / lb.ft.
Step 2	angle-tighten	60°
Timing cover, front		8/6
Timing cover, upper		10/7.4
Timing cover, rear:		
M7x20 - x 2	.....	12/8.8
M8x30 - x 1	.....	25/19
Valve cover		14/10.3
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		24/18
Idler pulley, timing belt		24/18
Water pump ...		17/13
Exhaust manifold	.....	25/19
Studs (at exhaust port, manifold, turbocharger (TC))		20/15
Throttle body (TB). Tighten the screws crosswise		8/6
Intake manifold:		
Lower section against cylinder head		19/14
Oversize ..	.....	10/7.4
Fuel rail:		
Stage 1		10/7.4
Step 2	angle-tighten	75°
Temperature/manifold absolute pressure (MAP) sensor		2/1.5
Oil sump		17/13
Oil pump, countersunk Allen screw, M6x20		6/4.5
Plug, oil sump		38/28
Plug, gauge hole / crankshaft seal		38/28
Plug, oil pressure line, cylinder block		38/28
Plug, gauge hole for gauging valve clearance		20/15
Oil intake line		17/13
Oil return line, turbocharger (TC)		12/9
Pipe screw, crankcase ventilation		26/19
Pipe screw, oil pressure pipes, turbocharger (TC)	....	26/19
Pipe screw, coolant pipes, turbocharger (TC)		38/28
Pipe screw, oil pressure pipes, cylinder block		38/28

Tightening torques for lubricated screws and nuts:		Nm / lb.ft.
Cover, front edge		17/13
Oil trap		16/12
Nipple, oil filter ...		40/30
Oil filter, environmental filter		35/26
Oil pressure switch:		
Dry joint		50±5/37±4
Lubricated joint		27±2/20±1.5
Dip stick		10/7.5
Engine speed (RPM) sensor		10/7.4
Knock sensor (KS), turn to position: 8		20±5/15±4
Temperature sensor, engine coolant		22/16
Piston cooling valve, oil duct		32/23.6
Spark plugs		28/20.7
Flywheel:		
Stage 1		45/33
Step 2	angle-tighten	65°
Gearbox screw (lower torque rod):		
Stage 1		35/26
Step 2	angle-tighten	60°

## Engine mountings for 5 cylinder engines



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## Engine mountings for 5-cylinder engines

Number (as illustrated):	P/N	Designation	Tightening torques, lubricated joint Nm/ft. lb.
1	30639975	Limiter	—
2	965227	Flanged screw, M12x55	80±15/59±11
3	30636960	Engine mounting, right	—
4	8670393	Bracket, front	—
5	985685	Flanged screw, M12x40x45	90±10/66±7.4
6	985721	Flanged screw, M8x70	25±6/19±4.4
7, 8	975207	Flanged screw, M10x75	35/26 +Angle tightening: 75°
9	30680338	Torque control arm, lower	—
10	30666626	Torque control arm, lower	—
11	965186	Flanged screw, M10x50	35/26 Angle tightening: 60°
12	30636861	Gearbox mount	—

Engine mountings for 5-cylinder engines			
Number (as illustrated):	P/N	Designation	Tightening torques, lubricated joint Nm/ft. lb.
13	946752	Flanged screw, M10x35	50±9/37±6
14	30636875	Engine pad, left	—
15	966361	Flanged screw, M14x55	120±5/88.5±3.7
16	971095	Flanged nut, M10x10	35/26 Angle tightening: 60°
17	30680226	The engine cover	—
18	8698474	Flanged screw, M12x63	
19	960138	Washer	—
20	979190	Allen screw, PF5x20	2.5±0.4/1.8±0.3
21	30683256	Nut	2.5±0.4/1.8±0.3
22	30683311	Plastic nut	
Other engine mountings for 5-cylinder engines			
Remarks	P/N	Designation	Tightening torques, lubricated joint Nm/ft. lb.
5-cylinder, automatic	30636875	Engine pad, left	—

## Group 22 Lubrication system

## General

Oil volumes and grades, see: Section 1: Service and maintenance, Group 17: Service

Oil pressure:		5 cylinder
14 (810), minimum ..	MPa	0.1
67.7 (4000), minimum	MPa	0.35
The relief valve opens at a pressure of	Mpa	0.48
Maximum oil pressure:		
5 cylinder	Mpa	0.7
Oil pressure sensor:		
Breakpoint, indicator lamp goes out at a pressure ...	MPa	0.04 - 0.06

## Group 25 Intake and exhaust system

Tightening torques for the intake and exhaust system components

Component	Tightening torques Nm/lb. ft.
5 cylinder engines	
Exhaust manifold, cylinder head side	25/19
Exhaust manifold - heat shield	20/15
Exhaust manifold - turbocharger (TC), nuts	25/19
Exhaust manifold - turbocharger (TC), studs	20/15
Exhaust system, pipe to turbocharger (TC)	30/22
Catalytic converter:	
towards the turbocharger (TC)	25/19
towards the exhaust system	24/17
Exhaust system, flange front - rear pipe	25/19
Exhaust system, pipe to exhaust manifold	25/19
Intake manifold, cylinder head side	20/15

## 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

Clean the cooling system when replacing coolant.

Coolant Volvo, green:	Volvo P/N:
1 gallon (3.785 liters) USA .....	94 34 699
1 gallon (3.785 liters) CANADA .....	13 81 081

## Cooling system: Volume, pressure and thermostat

Engine type:	Volume: liters (US gallon)	Expansion tank pressure valve opens at:		Starts to open: C (°F)	Fully open: °C (°F)
		Pressure kPa (psi)	Negative pressure kPa (psi)		
B52XX	9.5	150 (22 psi)	10 (1.4 psi)	90° (194°)	1050 (221°)



## Group 28 Engine management system

## B52XX

Components related to the ignition system		
Ignition coil, ignition discharge module .....	Volvo P/N	86 77 837
Spark plugs:		
Turbocharger (TC) .....	Volvo kit no.	30650379
Naturally aspirated engine .....	Volvo kit no.	30650843
Spark gap:		
Turbocharger (TC) .....	mm	0.7 (0.027")
Naturally aspirated engine .....	mm	0.6±0.1(0.024±0.004)
Tightening torque spark plugs .....	Nm (lbf ft.)	28±3 (21±2.2)
Knock sensor (KS), Turbocharged engine .....	Volvo P/N.	8653171
		Denso own system
Knock sensor (KS), Naturally aspirated engine ..	Volvo P/N.	31104959
		Denso own system
Tightening torque knock sensor (KS) .....	Nm (lbf ft.)	20 (15)
Crankshaft position (CKP) sensor .....	Volvo P/N	86 27 355
Resistance in coil, at 20C/68F degrees .....	Ω	125 ± 25
Camshaft position (CMP) sensor .....	Volvo P/N.	86 58 495
Relay, engine cooling fan (FC) .....	Volvo P/N	94 42 933
Resistance in coil .....	Ω	80
Relay, A/C .....	Volvo P/N	35 45 619

## Components Bosch ME-7:

Components related to the ignition and fuel system Type ME-7:	
Control module .....	Built-in atmospheric pressure sensor.
Throttle unit .....	Damper motor integrated with electronic module.
Accelerator pedal (AP) position sensor .....	Pulse width modulated and linear signal (digital / analogue).
Pressure regulator .....	Line pressure 380 kPa.
Mass air flow (MAF) sensor .....	Mass air flow (MAF) sensor resistive film. Measurement range 12 - 640 kg/h.
Fuel pump .....	Pump capacity: > 125 l/hour at line pressure of 380 kPa and 13 V. Power consumption at line pressure: 7.5 A.
Injector .....	Resistance, coil: 12 $\Omega$ .
T-MAPS: Charge air sensor/Intake air temperature sensor .....	Piezo resistive linear pressure sensor. Measurement range 20 - 250 kPa. NTC resistor.
Turbocharger (TC) control valve ...	PWM controlled valve. Resistance 29.7 $\Omega$ .
Camshaft reset valve VVT .....	PWM controlled valve. Resistance 3.7 $\Omega$ .
Knock sensor (KS) .....	Piezo-electric crystal. Resistance 200 $\pm$ 80 $\Omega$ .
Camshaft position (CMP) sensor ...	Magneto-resistive sensor with a permanent magnet.
Crankshaft position (CKP) sensor. Applies at 20°C/68°F .....	Inductive sensor with permanent magnet. Resistance 125.5 $\pm$ 25 $\Omega$ .
Heated oxygen sensor (HO2S), front Preheating .....	Linear sensor. Resistance 3.2 $\Omega$ , at 20°C/68°F.
Heated oxygen sensor (HO2S), rear Preheating .....	Binary sensor. Resistance 9 $\Omega$ , at 20°C/68°F.
Ignition coil .....	Individually mounted ignition coil. Integrated ignition discharge module (IDM) and diagnostics.
Outside temperature sensor .....	NTC resistor.
A/C pressure sensor .....	Linear pressure sensor. Measurement range 0 -3100 kPa.
Canister purge (CP) valve .....	PWM controlled Resistance 29.7 $\pm$ 1.4 $\Omega$ .
Fuel pump (FP) relay .....	Frequency controlled mechanical relay.

Components related to the ignition and fuel system

Type ME-7:

Air conditioning (A/C) relay .....	Mechanical relay. Resistance in coil 96 Ω.
Engine cooling fan (FC) control module .....	PWM controlled 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 and one sensor.
Engine coolant level switch .....	Level indicator.
Oil pressure switch .....	Pressure switch.

**Technical data**

Applies to ME-7 ignition and fuel system:

Mass air flow (MAF) 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 (ECT) 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: 2003-

Temperature .....	°C (F°)	0° (32°)	20° (68°)	30° (86°)	40° (104°)
Resistance .....	Ω	5886±5%	2510±5%	1715±5%	1199±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 (A/C) compressor:

Start temperature sensor ... °C	6.5	5.5	
Status .....	To/From	On	Off

**Technical data**

Applies to ME-7 ignition and fuel system:

Clutch pedal position sensor:

Position .....	mm	0	25 (0.98")	50 (1.97")	100 (3.93")
Resistance .....	$\Omega$	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 .....	$\Omega$	1300 - 2100	1000 - 1800	900 - 1700	600 - 1400

**Components DENSO:**

Components:

Control module .....	Built-in atmospheric pressure sensor.
Throttle unit .....	Damper motor integrated with electronic module.
Accelerator pedal (AP) position sensor .....	Pulse width modulated and linear signal (digital / analogue).
Pressure regulator .....	
Mass air flow (MAF) sensor .....	Wire mass air flow (MAF) sensor. Measurement range 1.4-180 g/s.
Fuel pump .....	Pump capacity at line pressure of 380 kPa and 12.5 V is > 125 l/h. Power consumption at line pressure: 7.5 A.
Injector .....	12 hole Resistance, coil: 13.8 $\Omega$ .
Manifold absolute pressure (MAP) sensor .....	Semi-capacitive linear pressure sensor. Measurement range 13.3 -120 kPa.
Temperature sensor, intake .....	Integrated into the mass air flow (MAF) sensor. NTC resistor.
Engine coolant temperature (ECT) sensor .....	NTC resistor.
Knock sensor (KS) .....	Piezo-electric crystal. Resistance 200 $\pm$ 80 $\Omega$ .
Camshaft position (CMP) sensor .....	Magneto-resistive sensor with a permanent magnet.
Crankshaft position (CKP) sensor .....	Inductive sensor with permanent magnet. Resistance 125 $\pm$ 25 $\Omega$ , at 20°C/68°F.
Heated oxygen sensor (HO2S), front Preheating .....	Linear sensor. Resistance 2.4 $\Omega$ , at 20°C/68°F.
Heated oxygen sensor (HO2S), rear Preheating .....	Binary sensor. Resistance 13 $\Omega$ , at 20°C/68°F.

Components:	
Ignition coil .....	Individually mounted ignition coil. 6.6W Integrated ignition discharge module (IDM) and diagnostics.
Spark plug type .....	Multi-electrode.
Outside temperature sensor ..	NTC resistor.
A/C pressure sensor .....	Linear pressure sensor. Measurement range 0 -3100 kPa.
Canister purge (CP) valve .....	Pulse width modulated valve. Resistance $29.7 \pm 1.4 \Omega$ .
Fuel pump (FP) relay .....	Frequency controlled mechanical relay.
Air conditioning (A/C) relay .....	Mechanical relay. Resistance in coil $85 \Omega$ .
Engine cooling fan (FC) control module .....	Two-coil relay. Resistance $80 \Omega$ . -2002
System relay .....	Mechanical relay. Resistance $80 \Omega$ .
Clutch pedal sensor .....	Self-adjusting.
Brake pedal sensor .....	Self-adjusting.
Brake lamp switch .....	Two separate switches.
Engine coolant level switch .....	Level indicator.

#### Technical data for the DENSO system:

Mass air flow (MAF) sensor:					
Q .....	g/s	3.1	5.7	7.3	9.3
Engine speed (RPM) .....	rpm	750	1500	2000	2500
Voltage .....	V	1.3	1.6	1.7	1.8
Manifold absolute pressure (MAP) sensor:					
P .....			90	70	50
kPa					
Voltage .....	V		3.3	2.7	2.1
Engine coolant temperature (ECT) sensor:					
Temperature .....	°C		40	80	100
Resistance .....	$\Omega$		1150	318	184
Voltage .....	V		2.2	0.9	0.6

Temperature sensor, intake:				
Temperature .....	°C	20	25	30
Resistance .....	Ω	2450	2000	1800
Voltage .....	V	2.4	2.1	1.9
Outside temperature sensor:				
Temperature .....	°C	20	25	30
Resistance .....	Ω	2424	1941	1513
Voltage .....	V	3.5	3.3	3
Air conditioning (A/C) pressure sensor:				
Pressure .....	kPa	1206	1894	3100
Voltage .....	V	2	3	4.75
Air conditioning (A/C) compressor:				
Start temperature sensor ..	°C		5.5	
Status .....	To/From		Off	
Clutch pedal sensor				
Position .....	mm	25	50	100
Resistance .....	Ω	1000 - 2000	750 - 1750	500 - 1000
Brake pedal sensor:				
Position .....	mm	20	30	50
Resistance .....	Ω	850 - 1550	700 - 1400	400 - 1000