Section 2 D 20, D 24 Engines

Group 20 General

Performance, compression

Engine variant	Comp. ratio	Power		Max. torque	
		kW at r/s	hp at rpm	Nm at r/s	kpm (ft.lbs) at rpm
D 20	23.0:1	50/80	68/4800	120/50	12.2/3000
D 24	23.0:1	58/78	79/4700	140/40	14.3/2400
D 24 (USA/CDN)	23.0:1	60/80	82/4800	140/47	14.3/2800

Other general data

		D 20	D 24
No. of cylinders		5	6
Cylinder bore	mm	76.5	76.5
Stroke	mm	86.4	86.4
Displacement	dm^3 (litres)	1.986	2.383
Firing order		1-2-4-5-3	1-5-3-6-2-4
Compression, new	MPa	3.2	3.2
min.	MPa	2.4	2.4
max. deviation between cylinders	MPa	0.8	0.8
Weight	kg	180	200

Group 21 Engine block

Cylinder head

Max. warp, along ..... mm 0.5
across ..... mm 0.2

Note! Do not surface grind the cylinder head.
Replace if warp is over 0.5 mm.

Gasket, cylinder head	
Three alternative gaskets are used, depending on the piston height above the cylinder block.	
Piston height above cylinder block surface in mm.	**Gasket, no. notches (thickness in mm)**
0.67 - 0.80	1 (1.4)
0.81 - 0.90	2 (1.5)
0.91 - 1.02	3 (1.6)

Cylinder block			
Dimension	**Marking (honing group)**	**Piston diameter (mm)**	**Cylinder-diameter (mm)**
Standard	651	76.48	76.51
	652	76.49	76.52
	653	76.50	76.53
Oversize 1.....	676	76.73	76.76
(0.25 mm)	677	76.74	76.77
	678	76.75	76.78
Oversize 2.....	701	76.98	77.01
(0.50 mm)	702	76.99	77.02
	703	77.00	77.03
Oversize 3.....	751	77.48	77.51
(1.00 mm)	752	77.49	77.52
	753	77.50	77.53
Max. wear. (compared to nominal diameter)..... mm	0.04		

Pistons		
Piston diameter See table on previous page. (measured at right angles to gudgeon pin hole, 15 mm from the lower edge).		
Piston clearance		
new	mm	0.03 - 0.05
max.	mm	0.13
Max. wear. (compared to nominal diameter)	mm	0.04
Piston weight		
• Max. diff. between pistons in the same engine	g	12
Piston rings, axial clearance (measured with ring on piston)		
• upper comp. ring, new	mm	0.11 - 0.14
max.	mm	0.20
• lower comp. ring, new	mm	0.07 - 0.10
max.	mm	0.20
• oil scraper ring, new	mm	0.03 - 0.07
max.	mm	0.15
Piston rings, gap (measured in cylinder)		
• upper comp. ring, new	mm	0.30 - 0.50
max.	mm	1.00
• lower comp. ring, new	mm	0.30 - 0.50
max.	mm	1.00
• oil scraper ring, new	mm	0.25 - 0.50
max.	mm	1.00

Gudgeon (piston) pin,

- fit in connecting rod ..... Light thumb pressure (close running fit)
- fit in piston ..... Thumb pressure (push fit)

Valve system

Valve clearance

Intake				Exhaust			
Check		Adjustment		Check		Adjustment	
hot	cold	hot	cold	hot	cold	hot	cold
0.20 - 0.30	0.15 - 0.25	0.25	0.20	0.40 - 0.50	0.35 - 0.45	0.45	0.40

Adjustment washers available in sizes from 3.00 to 4.25 in intervals of 0.05 mm.

Valves	Intake	Exhaust
• diameter, disc ..... mm	36.00	31.00
stem ..... mm	7.97	7.95
• height, disc edge, min. after machining ..... mm	0.5	*
• matching surface angle ..... °	44.5	45.0
*The exhaust valves are stellite coated and must not be machine ground.		

Valve seats	Inlopp	Utlopp
Diameter, standard ..... mm	37.090 - 37.105	33.090 - 33.105
oversize 1 ..... mm	37.290 - 37.305	33.290 - 33.305
Matching surface angle ..... °	45.0	45.0
Reduction angle, upper ..... °	15	15
Width ..... mm	2.0	2.4
Interference ..... mm	0.074 - 0.105	0.074 - 0.105

Valve springs			
Inner valve spring		Outer valve spring	
Length in mm	Load in N	Length in mm	Load in N
33.9	0	40.2	0
28.6	67 - 77	32.6	167 - 185
18.3	209 - 231	22.3	433 - 479

Valve guides		Intake valve	Exhaust valve
Inner diameter	mm	8.000 - 8.015	8.000 - 8.015
Height above upper face of cylinder head	mm	40.1 - 40.5	40.1 - 40.5
Play, valve spindle – guide (measured with new valve)			
new	mm	0.3	0.3
max.	mm	1.3	1.3

Timing gear		
Toothed belts		
Belt tension (measured with tool 999 5197)		
nominal value		12 - 13
adjustment		12.5
Camshaft		
Max. lift height, intake	mm	8.5
exhaust	mm	9.0
Radial clearance, new	mm	0.05 - 0.10
Axial clearance, max.	mm	0.15

Crank assembly

Crankshaft		
Out-of-true, max. deviation, two centre main bearings	mm	0.06
others	mm	0.04
Crankshaft, axial clearance, new	mm	0.07 - 0.18
max.	mm	0.25
Main bearings, radial clearance, new	mm	0.016 - 0.075
max.	mm	0.16
Crankshaft bearing, radial play, new	mm	0.015 - 0.062
max.	mm	0.12
Crankshaft bearing, axial play, max.	mm	0.4
Main bearing journals		
Diameter, standard	mm	58.00
undersize 1	mm	57.75
undersize 2	mm	57.50
undersize 3	mm	57.25
Out-of-round, max.	mm	0.03
Taper, max.	mm	0.05
Connecting rod bearing journals		
Diameter, standard	mm	47.80
undersize 1	mm	47.55
undersize 2	mm	47.30
Out-of-round, max.	mm	0.03
Taper, max.	mm	0.05
Connecting rod		
Axial play at crankshaft, max.	mm	0.4
Max. weight difference between connecting rods in the same engine	g	6
Flywheel		
Axial runout, max. per 150 mm diameter	mm	0.05

Glow plugs

Part number	12 57 889-4

Tightening torque	Nm
Applies to greased nuts and bolts.	
Cylinder head, M 11 bolts,	
(stage 1)	50
(stage 2)	70
(stage 3)	90
run engine until	
oil temp. reaches min. 50°C	
(stage 4)	90
Tighten bolts in sequence from the middle and out.	
Cylinder head, M 12 bolts,	
(stage 1)	40
(stage 2)	60
(stage 3)	75
(stage 4) angle tightening	180°
run engine until	
oil temp. reaches min. 50°C	
(stage 5) angle tightening	90°
Tighten bolts in sequence from the middle and out.	
Main bearing cap	65
Connecting rod cap	45
Camshaft cap	20
Camshaft wheel, front	45
rear	100
Crankshaft pulley, (vibration damper)	
centre bolt	350
socket head bolts	20
Flywheel/carrier	
(use new bolts)	75
Glowplugs	22

General	
Oil capacity and quality, see page 16 .	
Oil pressure at + 80° C oil temperature	
engine speed r/s (rpm)	oil pressure, min. kPa
33.3 (2000)	200

Oil pump		D 20 / D 24
Reduction valve opens at	kPa	600 - 700
Reduction valve spring, length at different loads	mm/N	49.0 / 0
	mm/N	22.0/ 175 - 195
	mm/N	19.8/ 200
Oil pressure sensor		
Limit, warning lamp switches off at	kPa	15 - 45

Injection timing, idling speed

Engine variant	Injection timing, mm Adjustment (check)	Idling, r/s (rpm)	
		Low	High
D 20	0.80 (0.75 - 0.83)	12.5 (750)	90 (5400)
D 24 –1986	0.70 (0.65 - 0.73)	12.5 (750)	90 (5400)
D 24 1987–	0.80 (0.77 - 0.85)	12.5 (750)	90 (5400)
D 24 *	0.85 (0.82 - 0.90)	12.5 (750)	90 (5400)

* USA / Canada 1982-

Injection pump

Type ..... Distributor pump

Make and designation ..... Bosch VE6/10 F 2400 + designation below

Engine variant	Designation	
	Manual	Automatic
D 20	L 45	L 45-1
D 24	L 32-2	L 32-3

Injectors					
Engine	Injectors – compl.		Nozzle (Bosch)		Make and type
	Designation	Volvo P/N	Designation	Volvo P/N	Bosch
D 20 / D 24	068 130 201	12 57 144	DNO SD 193	12 57 146	KCA 30 SD 27/4
	068 130 201 E	13 28 336	DNO SD 293	13 28 298	/
	068 130 201 F	13 28 073	DNO SD 1930	13 28 096	KCA 30 SD 27/44
	068 130 201 B	13 28 208		13 28 298	
		13 28 815	SD 297	13 28 816	
	068 130 201 H	13 28 209		13 28 096	

Injector opening pressure		D 24
Nominal value	MPa	12.0 - 14.0
Adjustment value	MPa	13.0 - 13.8
Tightening torque		**Nm**
Injectors, in cylinder head		70
Injectors, upper and lower section		70
Injection pump		45

Group 26 Cooling system

General

Use Genuine Volvo green coolant, type C, diluted 50/50 with clean water. This mixture helps prevent corrosion and damage by freezing.

- Never top up with only water. Use Genuine Volvo coolant diluted 50/50 with clean water.
- The coolant does not normally need to be changed. In the case of major repairs requiring the draining of the coolant, fresh coolant must be used since the drained coolant will have been subjected to oxidation and will contain dirt particles.
- Flush the cooling system when changing the coolant.
  Use flushing agent P/N 11 61 328-8.

Engine type	Approx volume litres	Expansion tank. Pressure valve opens at		Thermostat* °C (°F)			
		Pos. pressure kPa	Neg. pressure kPa	Type	Marking	Starts opening	Fully open
D 20	8.2	100 (65-85*)	7	87	87 (188)	102 (216)	8 mm
D 24	9.2	100 (65-85*)	7	87	87 (188)	102 (216)	8 mm

early type

Drive belts

Without A/C:

Generator/engine cooling fan (FC) ..... HC 38 cog x 975
Servo pump ..... HC 50 cog x 913

With A/C:

Generator ..... HC 38 cog x 800
Engine cooling fan(FC)/servo pump ..... HC 38 cog x 1238
A/C Compressor ..... HC 50 cog x 913

Tightening torque

Engine cooling fan (FC) ..... Nm(ft lbs) 9 (6.6)