

Section 2 B27, B28 Engines

Group 20 General

Performance, compression, octane requirements

Engine variant	Comp. ratio	Rec. octane RON	Power (DIN)		Max. torque (DIN)	
			kW at r/s	hp at rpm	Nm at r/s	kpm (ft.lbs) at rpm
B 27 A	8.7:1	91-93	92/88	125/5250	196/58	20.0/3500
B 27 E	8.7:1	91-93	103/100	140/6000	204/50	20.8/3000
	9.5:1	97-98	104/95	141/5700	216/50	22.0/3000
	9.5:1	97-98	109/95	148/5700	218/50	22.2/3000
B 27 F	8.8:1	91	98/92	133/5500	205/46	20.9/2750
B 28 A	8.8:1	91-93	95/98	129/5250	212/50	21.6/3000
B 28 E	9.5:1	98	114/92	155/5500	230/50	23.4/3000
B 28 F	8.8:1	91	100/92	136/5500	215/46	21.9/2750

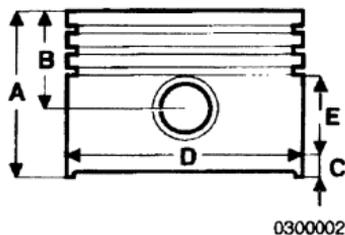
- 1) Unleaded fuel can be used.
- 2) Unleaded fuel must be used. Can be run on 91 octane unleaded.

Other general data	B 27	B 28
No. of cylinders.....	6	6
Cylinder bore..... mm	88.0	91.0
Stroke..... mm	73	73
Displacement..... dm ³ (litres)	2.664	2.849
Firing order.....	1-6-3-5-2-4	1-6-3-5-2-4
Compression (standard value)..... MPa	0.8 - 1.1	0.8 - 1.1
max. deviation between cylinders..... MPa	0.2	0.2
Weight..... kg	150	150

Group 21 Engine block

Cylinder head	B 27, B 28
Height, new mm	111.07
Max. warp / 100 mm mm	0.05
Cylinder head gasket thickness, unloaded mm	1.14 - 1.50

Cylinder block	B 27	B 28
Cylinder liner		
Cylinder diameter,		
liner marked 1 (A-marked piston) mm	88.00 - 88.01	91.00 - 91.01
2 (B-marked piston) mm	88.01 - 88.02	91.01 - 91.02
3 (C-marked piston) mm	88.02 - 88.03	91.02 - 91.03
Liner height above block face mm	0.16 - 0.23	0.16 - 0.23
Shims for adjusting liner height:		
thickness, blue marking mm	0.070 - 0.105	0.070 - 0.105
white marking mm	0.085 - 0.120	0.085 - 0.120
red marking mm	0.105 - 0.140	0.105 - 0.140
yellow marking mm	0.130 - 0.165	0.130 - 0.165



Pistons					
Piston and engine type	Weight	mm			
		A	B	C	E
Demolin					
B 27 A/E,	445 ± 3	74.0	40.0	11.0	8.5
B 27 F, 1979	445 ± 3	74.0	40.0	11.0	
B 27 F, 1976-1978	445 ± 3	63.4	39.4		
Mahle					
B 27 A, 1976-1979	445 ± 3	63.4	39.4	8.0	
B 27 E, 1975-1978	445 ± 3	63.4	39.4	8.0	
B 27 E, 1979-1980	445 ± 3	65.3	41.3	8.0	
B 27 F, 1976-1978	445 ± 3	62.2	38.2	8.0	
B 27 F, 1979	445 ± 3	63.4	39.4	8.0	
B 28 A/F	445 ± 3	62.8	38.8	8.0	
B 28 E	445 ± 3	65.3	41.3	8.0	

Max. weight diff. between pistons
in same engine = 6 g

Pistons	B 27	B 28
Cylinder bore (D) (measured at right angles to gudgeon (piston) pin hole, distance C from lower edge)		
• Demolin , A-marked piston mm	87.90 - 87.91	-
B-marked piston mm	87.91 - 87.92	-
C-marked piston mm	87.92 - 87.93	-
• Mahle , A-marked piston mm	87.97 - 87.98	90.97 - 90.98
B-marked piston mm	87.98 - 87.99	90.98 - 90.99
C-marked piston mm	87.99 - 88.00	90.99 - 91.00
Piston clearance , Demolin piston mm	0.090 - 0.110	-
Mahle piston, mm	0.020 - 0.040	0.020 - 0.040
Piston rings, height		
• upper comp. ring mm	1.478 - 1.490	
• lower comp. ring mm	1.978 - 1.990	
• oil scraper ring mm	2.629 - 2.731	
Piston rings, axial play (measured with ring on piston)		
• upper comp. ring mm	0.045 - 0.074	
• lower comp. ring mm	0.025 - 0.054	
• oil scraper ring mm	0.009 - 0.233	
Piston rings, gap (measured in cylinder)		
• upper comp. ring mm	0.40 - 0.60	
• lower comp. ring mm	0.40 - 0.60	
• oil scraper ring mm	0.38 - 1.45	
Gudgeon (piston) pin hole, diameter		
Marking on piston and piston pin:		
blue mm	23.510 - 23.513	
white mm	23.507 - 23.510	
red mm	23.504 - 23.507	
Gudgeon (piston) pin, diameter		
Marking on piston and piston pin:		
blue mm	23.500 - 23.497	
white mm	23.497 - 23.494	
red mm	23.494 - 23.491	
Clearance in connecting rod mm	0.020 - 0.041	
Play in piston:		
Demolin mm	0.014 - 0.020	
Mahle mm	0.010 - 0.016	

Valve system

Valve clearance in mm Intake Exhaust

Cold engine:

B 27 E 1979–1980 excl. Sweden and Australia,

B 28 A, B 28 F 1980..... 0.30 - 0.40 0.30 - 0.40

Others..... 0.35 - 0.45 0.35 - 0.45

Hot engine:

B 27 E 1979–1980 excl. Sweden and Australia,

B 28 A, B 28 F 1980..... 0.30 - 0.40 0.30 - 0.40

Others..... 0.35 - 0.45 0.35 - 0.45

Valve springs					
Springs - grey marking			Springs - green marking		
Ø mm	Length mm	Load N (kp)	Ø mm	Length mm	Load. N (kp)
32.5	47.2	0	25.9	47.1	0
	40.0	233-268 (23.3-26.8)		40.0	230-266 (23.0-26.6)
	32.2	521-589 (52.1-58.5)		30.0	613-689 (61.3-68.9)

Valve guides Intake Exhaust

Inner diameter..... mm 8.000 - 8.022 8.000 - 8.022

Press-in height..... mm 39.5 - 40.5 36.9 - 37.9

Play, valve spindle –guide
(measured with new valve)

new..... mm 0.03 - 0.06 0.06 - 0.09

max. mm 0.15 0.15

Valve guides	Size	Marking	Reamer
available in three oversizes indicated by grooves.	Standard	No groove	–
	O/s 1	1 groove	5166
	O/s 2	2 grooves	5167
	O/s 3	3 grooves	5168

Valve seats	B 27, B 28	
	Intake	Exhaust
<ul style="list-style-type: none"> • diameter, <ul style="list-style-type: none"> oversize 1 mm 45.134 oversize 2 mm 45.334 oversize 3 mm 45.634 oversize 4 mm 45.7 oversize 5 mm 45.8 oversize 6 mm 45.9 • matching surface width, early type mm 1.7 - 2.1 <li style="padding-left: 100px;">late type mm 1.3 - 1.7 • matching surface angle ° 45 • reduction angle, <ul style="list-style-type: none"> upper ° 15 lower ° 60 interference mm 0.070 - 0.134 		
Valves		
<ul style="list-style-type: none"> • diameter, disc mm 44.00 <li style="padding-left: 20px;">stem, 26.5 mm below disc mm 7.965 - 7.980 <li style="padding-left: 20px;">stem, 32.0 mm below disc mm 7.945 - 7.960 <li style="padding-left: 20px;">stem at locking mm 7.975 - 7.990 • max. machining <ul style="list-style-type: none"> valve stem mm 0.4 • height, disc edge, new mm 1.5 <li style="padding-left: 20px;">min. after machining mm 1.2 • matching surface angle ° 29.5 		
Rocker arm assembly		
Diameter, rocker arm shaft mm 19.959 - 19.980		
Hole diameter, rocker mm 19.992 - 20.013		
Clearance shaft - arm mm 0.012 - 0.054		
Note! Rocker arm contact face against camshaft is surface hardened and must not be ground.		

Timing gear			
Camshaft variant	1	2	3
Marking (P/N), left	79 10 245 522	74 01 269 138	74 01 269 615
alt. 1	79 10 245 143		
alt. 2	79 10 245 144		
right	79 10 245 412	74 01 269 139	74 01 269 616
Max. lift height, left..... mm	5.144	6.004	5.960
right	5.059	6.004	5.960
Checking camshaft adjustment: (cold engine) adjust valve clearance for No. 1 and 6 inlet valves to 07 mm. Intake valve should open at			
1st	9 ± 3	9 ± 3	8 ± 3
6th	7 ± 3	9 ± 3	8 ± 3
Engine variant			
B 27 A 1976-1979	X		
B 28 A 1980		X	
1981-1982.....			X
B 27 E 1975-1978.....	X		
1979-1980 Sweden+Australia	X		
1979-1980 Other.....		X	
B 28 E 1981-1983.....			X
B 27 F 1976-1979.....	X		
B 28 F 1980		X	
1981-1982			X

Camshaft		
Diameter, journals, 1st	mm	40.440 - 40.465
2nd	mm	41.040 - 41.065
3rd	mm	41.640 - 41.665
4:th	mm	42.240 - 42.265
Radial play	mm	0.035 - 0.085
End float, new	mm	0.070 - 0.144
max.	mm	0.5

Crank assembly

Crankshaft

Out-of-true, deviation, max.	mm	0.02
Crankshaft, axial clearance, max.	mm	0.070 - 0.270
Main bearing, radial clearance	mm	0.038 - 0.088
Crankshaft bearing, radial play	mm	0.030 - 0.080
Rear sealing ring diameter, standard	mm	79.926 - 80.000
undersize	mm	79.726 - 79.800

Main bearing journals

Diameter, standard	mm	70.043 - 70.062
undersize 1	mm	69.743 - 69.762
Out-of-round, max.	mm	0.007
Taper, max.	mm	0.01
Main bearing shells thickness, standard	mm	1.961 - 1.967
undersize	mm	2.111 - 2.117
Width of crankshaft for thrust bearing, standard	mm	29.20 - 29.25
oversize 1	mm	29.40 - 29.45
oversize 2	mm	29.50 - 29.55
oversize 3	mm	29.60 - 29.65
Thrust bearing washer thickness, standard	mm	2.30 - 2.35
oversize 1	mm	2.40 - 2.45
oversize 2	mm	2.45 - 2.50
oversize 3	mm	2.50 - 2.55

Connecting rod bearing journals

Diameter, standard	mm	52.267 - 52.286
undersize	mm	51.967 - 51.986
Out-of-round, max.	mm	0.007
Taper, max.	mm	0.01
Bearing shells thickness, standard	mm	1.842 - 1.848
oversize	mm	1.992 - 1.998
Bearing journal width	mm	39.99 - 40.09

Connecting rod

End float at crankshaft (both conrods installed)	mm	0.20 - 0.38
Length, between centres	mm	146.15
Max. weight diff. between conrods in same engine	g	2.5

Flywheel

Axial runout, max. per 100 mm diameter	mm	0.05
Radial runout, max.	mm	0.15

Tightening torques

Applies to greased nuts and bolts.

Nm

Cylinder head

(step 1) Tighten bolts in sequence from centre and out.....	60
(step 2) Loosen bolt 1 and retighten	20
(step 3) Angle tighten bolt 1	106°
(step 4) Repeat steps 2 and 3 with the other bolts. Loosen and tighten one bolt at a time.	

(step 5) Adjust valves and run engine warm.	
(step 6) Leave engine to cool for two hours.	
(step 7) Angle tighten each screw again	45°
Tighten bolts in sequence from the middle and out.	

Main bearings

(step 1) Tighten all bolts in order	30
(step 2) Loosen nut 1	
(step 3) Tighten nut 1	30 - 35
(step 4) Angle tighten nut 1	73° - 77°
(step 5) Slacken off and retighten the other nuts in specified order according to steps 2 - 4.	

Connecting rod cap	45 - 50
Camshaft pulley	70 - 90
Crankshaft, centre bolt, 1975-1977	160 - 180
1978-.....	240 - 280

Flywheel

(use new bolts).....	45 - 50
Valve cover	15
Spark plugs	12 ± 2

Group 22 Lubrication system

General

Oil capacity and quality, see page 16

Oil pressure with warm engine and new oil filter:

engine speed r/s (rpm)	oil pressure MPa
15 (900)	0.1
50 (3000)	0.4

Oil pump

Axial play	mm	0.025 - 0.084
Radial play (excl. bearing play)	mm	0.110 - 0.185
Gear flank play (excl. bearing play)	mm	0.17 - 0.27
Bearing play, drive spindle	mm	0.015 - 0.053
trailing spindle	mm	0.015 - 0.051
Reduction valve spring length at different loads:		
unloaded	mm	89.5
loaded to 88.3 N (8.83 kp)	mm	56.5 - 60.5

Group 23 Fuel system

CO-content, idle speed				
Engine variant	Remarks	CO-content % *		Idle speed r/s (rpm)
		Adjustment	Check	
B 27 A	1976	2.5	1.5 - 4.0	14.2 (850)
	1977	2.5	1.5 - 4.0	15.0 (900)
	1978-1979	2.5	2.0 - 3.5	15.0 (900)
B 28 A	1980-1982	2.5	2.5 - 3.5	15.0 (900)
B 27 E	1975-1977 ¹⁾	1.5	1.0 - 4.0	15.0 (900)
	1975-1977 ⁷⁾	2.0	1.0 - 4.0	15.0 (900)
	1978-1980	2.0	1.0 - 3.0	15.0 (900)
				16.7 (1000)***
B 28 E	1981-1983	2.0	1.0 - 3.0	15.0 (900)
				16.7 (1000)***
B 27 F	1976	1.7	1.4 - 2.0	15.0 (900)
	1977 ²⁾	0.7	0.4 - 1.0	15.8 (950)
	1977 ³⁾	1.0	0.7 - 1.3	15.0 (900)
	1977 ⁴⁾	1.7	1.4 - 2.0	15.0 (900)
	1978 ⁵⁾	1.0	0.7 - 1.3	15.0 (900)
	1978 ⁶⁾	1.0**	0.7 - 1.3**	15.0 (900)
	1979	1.0**	0.7 - 1.3**	15.0 (900)
B 28 F	1980	1.0**	0.7 - 1.3**	15.8 (950)
	1981-1982	1.0**	0.7 - 1.3**	15.0 (900)

* Pulsed Secondary Air Injection (PAIR) system disconnected and plugged if fitted.

** Heated oxygen sensor (HO2S) disconnected. Measured upstream of the three-way catalytic converter (TWC). When the HO2S is connected the CO-content should drop below 1.0

*** With automatic transmission

¹⁾ Sweden/Australia

²⁾ USA California

³⁾ USA Federal

⁴⁾ Canada + Japan

⁵⁾ USA federal + Canada

⁶⁾ USA California + Japan

⁷⁾ Others

Fuel pump

Fuel pressure measured at the same height as the pump at 50 r/s (3000 rpm):	kPa	15 - 27
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Solenoid valve

Model year	P/N	Marking
1976	12 19 792-7 (12 66 026-2)	3,2
1977-1982	12 66 004-9 (13 36 381-7)	*

* Valve with one connection pin

Carburettor**SU-HIF 6**

Metering needle	BDK
Needle valve, size	mm 2.7
Float level, below surface	mm 0.5 - 1.5
Gap between piston and bridge, position at rest	mm 0.2 - 0.3
Clearance, damping piston	mm 1.1 - 1.7
Dashpot oil level (below edge)	mm 6
Fast idle	
with choke control out 25 mm	
B 27 A, 1976 - 1977	r/s(rpm) 20.0 - 26.7 (1200-1600)
1978 - 1979	r/s(rpm) 23.3 - 26.7 (1400-1600)
B 28 A	r/s(rpm) 20.8 - 22.5 (1250-1350)

Continuous Fuel Injection (CFI) system

System pressure..... kPa 450 - 530
 Shut-off pressure, min..... kPa 150 - 240

PRESSURE REGULATOR					
Engine type	Bosch P/N	Volvo P/N	Control pressure, hot engine kPa		Resistance Ω
			engine turned off	engine running	
B 27 E	0 438 140 005	269 291-1	275 - 305	345 - 375	20 - 24
B 27 E	0 438 140 018	269 531-0	305 - 335	345 - 375	20 - 24
B 27/28 E	0 438 140 038	269 837-0	305 - 335	345 - 375	20 - 24
B 27 F	0 438 140 004	463 971-2	345 - 375		20 - 30
B 27 F	0 438 140 018	269 531-0	305 - 335	345 - 375	20 - 24
B 27 F	0 438 140 021	12 19 952-7	340 - 515		20 - 30
B 27 F	0 438 140 029	269 777-9	305 - 335	345 - 775	20 - 24
B 28 F	0 438 140 066	12 69 315-6	345 - 375	145 - 175*	16.5 - 19.5**

* On acceleration (cold engine but heated valve)

** Temperature over +18° C. For temperatures below +12° C should be 32 - 38 Ω .

START INJECTOR				
Engine	Model year	Bosch P/N	Volvo P/N	Injection volume cm^3/min
B 27 E	1975-1978	0 280 170 400	269 292-2	165
	1979-1980	0 280 170 405	462 865-7	115
B 28 E	1981-1983	0 280 170 405	462 865-7	115
B 27 F	1976-1979	0 280 170 400	269 292-2	165
B 28 F	1980-1982	0 280 170 405	462 865-7	115

Auxiliary air valve				
Engine	Model year	Bosch P/N	Volvo P/N	Resistance
B 27 E	1975	0 280 140 200	269 309-1	15 - 21
B 27 E	1976-1978	0 280 140 202	269 532-8	15 - 21
B 27 E	1979	0 280 140 213	12 69 193-7	15 - 21
B 27 E, man	1980	0 280 140 110	12 69 319-8	40 - 60
B 27 E, auto	1980	0 280 140 114	12 66 910-7	40 - 60
B 28 E, man	1981-1983	0 280 140 110	460 833-7	40 - 60
auto	1981-1983	0 280 140 114	12 66 910-7	40 - 60
B 27 F	1976-1979	0 280 140 202	269 532-8	15 - 21
B 28 F, man	1980-1981	0 280 140 114	12 66 910-7	40 - 60
B 28 F, auto		0 280 140 100	460 833-7	40 - 60

Injectors	1975-1978	1979-1983
Bosch P/N	0 437 502 005	0 437 502 013
Volvo P/N	269 184-8	12 69 274-5
Opening pressure kPa	300 - 360	320 - 380
No leakage permitted below kPa	240	260
Fuel pump	1975-1978	1979-1983
Bosch P/N	0 580 254 996	0 580 254 949
Volvo P/N	460 821-2	13 36 517-6
Pump capacity at 500 kPa, 12 V and + 20° C l/h	100	120
Current consumption, max. A	9.5	9.5
Prepump		
Current consumption A		1- 2
Mass Air Flow (MAF) Sensor		
Sensor plate rest position (measured at max. control pressure)		
B 27 E 1975-1978, below edge..... mm		0 - 0.3
B 27 E 1979-1980, above edge mm		0 - 0.3
B 28 E, B 27 F, B 28 F , above edge mm		0 - 0.3

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.

Approx. volume litres	Expansion tank. Pressure valve opens at		Thermostat* °C (°F)			
	Pos. pressure kPa	Neg. pressure kPa	Type	Marking	Starts opening	Fully open
10.9	65 - 85	7	1	82	82 (180)	92 (198)
			2	87	87 (189)	97 (207)
			3	92	92 (198)	102 (216)

Fan belts	
B 27 A 1976–1978	
B 27 E 1975–1976	
Designation	HC 38 x 1125
Volvo P/N (set of two).....	968 980-5 (958 360-0)
B 27A 1979, B 28A 1980–	
B 27 E 1977–1980, B 28 E 1981–	
Designation	HC 38 x 1100
Volvo P/N (set of two).....	968 936-5 (958 359-2, 966 978-9)

Group 28 Distributor ignition (DI) system

General

Engine type	Model year	Ignition setting ° bt/dc		Spark plugs		
		11.7-13.3 r/s 700-800 rpm	41.7 r/s 2500 rpm	Designation	P/N	Kit no.
B 27 A	1975-1979	10	22 - 25	H 6 D	269 464-4	273 541-3
B 28 A	1980-1984	10	22 - 25	H 6 D	269 464-4	273 541-3
B 27 E	1975	10	30 - 34	H 6 D	269 464-4	273 541-3
B 27 E	1976	10	30 - 34 *	H 6 D	269 464-4	273 541-3
B 27 E	1977-1978	10	30 - 34	H 6 D	269 464-4	273 541-3
B 27 E	1979-1980	10	25 - 29	H 5 D	269 465-1	273 579-3
B 28 E	1980-1982	10	25 - 29	H 6 D	269 464-4	273 541-3
B 28 E	1983-1984	12	27 - 31	H 6 D	269 464-4	273 541-3
B 27 F	-1977	10	27 - 32	H 6 D	269 464-4	273 541-3
B 27 F	1979	10***	27 - 32***	H 6 D	269 464-4	273 541-3
	1980-1984	10	20 - 24	H 6 D	269 464-4	273 541-3
B 28 F	1980-1982	10		H 6 D **	269 464-4	273 541-3

* Sweden. Australia. 22 - 26°

** USA: HR 6 DS

** California: 7° and 20 - 24°

Spark plugs

Electrode gap 0.6 - 0.7 mm

Tightening torques, do not oil plugs 12 ± 2 Nm

Firing order

..... 1 - 6 - 3 - 5 - 2 - 4

Components

Distributor

Engine	Model year/market	Bosch	Volvo
B 27 A	1975-1979	0 237 402 006	269 995-7
B 28 A	1980-1984	0 237 402 006	269 995-7
B 27 E	1975	0 237 402 001	269 323-2
B 27 E	1976, Sweden, Australia	0 237 402 005	269 565-8
	Others	0 237 402 001	269 323-2
B 27 E	1977-1978, Sweden, Australia	0 237 402 005	269 565-8
	Others	0 237 402 007	269 733-2
B 27 E	1979-1980	0 237 402 013	12 69 191-1
B 28 E	1981-1984	0 237 402 013	12 69 191-1
B 27 F	-1976	0 237 402 004	269 134-3
	1977-1978, Japan, Canada	0 237 402 004	269 134-3
	USA	0 237 402 001	269 739-9
	1979	0 237 402 004	12 69 291-9
B 28 F	1980-1984	0 237 402 017	12 69 380-0

Ignition coil

Distributor Ignition DI	Volvo P/N	Manufacturer P/N	Resistance of coils	
			primary (1 and 15)	secondary (1 and high)
TSZ-4	269 322-4	0 221 122 003	0.5 ± 0.1 Ω	9.5 ± 1.5 kΩ

Series resistance

Resistance 1.0 ± 0.1 Ω

Breaker arm

Resistance 5.0 ± 1.0 kΩ