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GROUP 20 GENERAL

Data

GENERAL

Type designation	B 30 A – 498211
Max output, kW at r/s DIN	86/67
h.p. at r/m DIN	117/4 000
Max. torque, Nm at r/s DIN	206/42
kpm at r/m DIN	21/2 500
lbftf	152
Compression pressure (hot engine) when turned over with starter motor 4.2–5.0 r/s (250–300 r/m)	1 000–1 200 kPa (10–12 kp/cm^2) (142–170 lbf/in^2)
Compression ratio	9.3:1
Number of cylinders	6
Bore	88.9 mm (3.50")
Stroke	80 mm (3.15")
Displacement	2.98 dm^3 (litres)
Idle speed	11.67–13.33 r/s (700–800 r/m)

CYLINDER HEAD

Height, measured from cylinder head contact face to face for bolt heads	86.7 mm (3.413")
Distance from top side of head to overflow pipe upper end (pipe placed under thermostat)	35 mm (1.38")
Cylinder head gasket, thickness, unloaded	0.8 mm (0.031")
loaded	0.7 mm (0.028")

CYLINDER BLOCK

Material	Special alloy cast iron
Bore, mm (in.)	
Standard (D-marked)	88.91–88.92 mm (3.5004–3.5008")
"Oversize" 0.03 mm (0.0012")	88.94–88.95 mm (3.5016–3.5020")
Oversize 0.015"	89.29–89.30 mm (3.5153–3.5157")
Oversize 0.030"	89.67–89.68 mm (3.5303–3.5307")
The cylinders should be drilled with a wear of (if engine has abnormal oil consumption)	0.25 mm (0.010")

PISTONS

Material	Light alloy
Permissible weight difference between pistons in same engine	10 grammes (0.35 oz.)
Height, total	71 mm (2.79")
Height from piston pin centre to piston crown	46 mm (1.81")
Piston clearance	0.01–0.03 mm (0.0004–0.0012")
Diameter, right angles to gudgeon pin 7 mm (0.28") from lower edge of piston:	
Standard, D-marked	88.890–88.900 mm (3.4995–3.5000")
"Oversize" 0.0012"	88.928–88.930 mm (3.5008–3.5011")
Oversize 0.015"	89.267–89.282 mm (3.5144–3.5150")
Oversize 0.030"	89.647–89.662 mm (3.5294–3.5300")

Piston rings

Piston ring gap, measured in ring opening	0.40–0.55 mm (0.016–0.022")
Oversize on piston rings	0.03 mm (0.0012")
	0.015"
	0.030"

Compression rings

Upper ring chromed	
Number on each piston	2
Height	1.98 mm (0.078")
Compression ring clearance in groove	0.040–0,072 mm (0.0016–0.0028")

Oil scraper rings

Number on each piston	1
Height	4.74 mm (0.186")
Scraper ring clearance in groove	0.040"–0.072 mm (0.0016–0.0028")

Gudgeon pins

Floating fit. Circlips at both ends on piston.	
Fit in connecting rod bushing	Close running fit (light thumb pressure)
Clearance, gudgeon pin-connecting rod bushing	0.0100–0.0135 mm (0.0004–0.0005")
Fit in piston	Slide fit (thumb pressure)
Clearance, gudgeon pin – piston	0.0035–0.0070 mm (0.00001–0.00003")
Diameter, standard	24.00 mm (0.945")
oversize 0.05 mm (0.002")	24.05 mm (0.947")

VALVE MECHANISM

Valves

Intake

Disc diameter	42 mm (1.654")
Stem diameter	7.955–7.970 mm (0.3132–0.3138")
Stem, max. permissible wear	0.02 mm (0.0008")
Valve seat angle	44.5°
Cylinder head seat angle	45.25°
Seat width in cylinder head	2 mm (0.08")

Exhaust

Disc diameter	35 mm (1.378")
Stem diameter	7.925–7.940 mm (0.3120–0.3126")
Stem, max. permissible wear	0.02 mm (0.0008")
Valve seat angle	44.5°
Cylinder head seat angle	45.25°
Seat width in cylinder head	2 mm (0.08")

Valve clearance

Clearance, hot and cold engine, exhaust	0.40–0.45 mm (0.016–0.018")
Clearance, hot and cold engine, intake	0.40–0.45 mm (0.016–0.018")

Valve guides

Length, inlet valve	52 mm (2.047")
exhaust valve	59 mm (2.323")
Inner diameter	8.000–8.022 mm (0.3150–0.3158")
Height above upper face of cylinder head	17.5 mm (0.689")
Clearance, valve stem – valve guide, inlet valve	0.030–0.067 mm (0.0012–0.0026")
exhaust valve	0.060–0.097 mm (0.0024–0.0038")
max. permissible clearance	0.15 mm (0.006")

Valve springs

Length, unloaded, approx.	45 mm (1.77")
with a loading of 255±20N (25.5±2 kp = 56±4.4 lbf.)	39 mm (1.54")
with a loading of 660±35 N (66±3.5 kp = 145±7.7 lbf.)	30.5 mm (1.20")

Rocker arm mechanism

Rocker arm radius at valve end	12 mm (0.48")
Rocker arm bushing, max. permissible wear	0.1 mm (0.004")

CAMSHAFT TRANSMISSION

Timing gears

Crankshaft drive, number of teeth	28
Camshaft gear, number of teeth	56
Backlash	0.04–0.08 mm (0.0016–0.0032")
Max. permissible backlash	0.12 mm (0.0048")
End float, camshaft	0.02–0.06 mm (0.0008–0.0024")

Camshaft

Marking/max. lifting height	A/6 mm (0.24")
Number of bearings	4
Bearing journal, diameter	46.975–47.000 mm (1.8494–1.8504")
Max. permissible out-of-round (with new bearings)	0.07 mm (0.0028")
Radial clearance	0.020–0.075 mm (0.0008–0.0030")
End float	0.020–0.060 mm (0.0008–0.0024")
Valve clearance for checking camshaft setting (cold engine)	1.10 mm (0.043")
Intake valve should then open at	10° A.T.D.C.

Camshaft bearing

Bearing diameter	47.020–47.050 mm (1.8512–1.8524'
Max. permissible wear	0.02 mm (0.0008")

CRANK MECHANISM

Connecting rods

End float on crankshaft	0.15–0.35 mm (0.006–0.014")
Length, centre-centre	144.9–145.1 mm (5.70–5.71")
Max. permissible weight deviation between connecting rods in same engine	10 grammes (0.35 oz.)

Crankshaft

Crankshaft end float	0.037–0.147 mm (0.0015–0.0058")
max. permissible end float	0.15 mm (0.0060")
Main bearings, radial clearance	0.028–0.083 mm (0.0011–0.0033")
Big-end bearings, radial clearance	0.024–0.070 mm (0.0009–0.0028")

Main bearings

Main bearing journals

Diameter, standard	63.451–63.464 mm (2.4981–2.4986")
undersize 0.010"	63.197–63.210 mm (2.4881–2.4886")
0.020"	62.943–62.956 mm (2.4781–2.4786")
Width on crankshaft for pilot bearing shell	
standard	38.960–39.000 mm (1.5338–1.5354")
oversize 1 (undersize shell 0.010")	39.061–39.101 mm (1.5378–1.5394")
2 (undersize shell 0.020")	39.163–39.203 mm (1.5419–1.5434")
Max. permissible out-of-roundness	0.05 mm (0.0020")

Main bearing shells

Thickness, standard	1.975–1.985 mm (0.0780–0.0781")
undersize 0.010"	2.102–2.112 mm (0.0827–0.0831")
0.020"	2.229–2.239 mm (0.0878–0.0881")

Big-end bearings

Big-end bearing journals

Width of bearing recess	29.95–30.05 mm (1.1779–1.1830")
Diameter, standard	53.987–54.000 mm (2.1255–2.1260")
undersize 0.010"	53.733–53.746 mm (2.1155–2.1160")
0.020"	53.479–53.492 mm (2.1055–2.1060")
Max. permissible out-of-round	0.07 mm (0.0028")

Big-end bearing shells

Thickness, standard	1.978–1.988 mm (0.0779–0.0783")
undersize 0.010"	2.105–2.115 mm (0.0829–0.0833")
0.020"	2.232–2.242 mm (0.0879–0.0883")

Flywheel

Minimum permissible thickness (after grinding)	29.7 mm (1.17")
Permissible axial throw, max.	0.05 mm (0.002")/150 mm (5.9") diameter
Ring gear (chamfer forwards)	153 teeth

LUBRICATING SYSTEM

Lubricating oil, type	See lubricating chart
Oil change quantity	5.2 litres (4.5 Imp. qts. = 5.5 US qts.)
incl. oil filter	5.7 litres (5.0 Imp. qts. = 6.0 US qts.)
Incl. oil filter and oil cooler	6.2 litres (5.5 Imp. qts. = 6.5 US qts.)
Oil pressure at 33 r/s (2000 r/m) (with hot engine and new oil filter)	250–600 kPa (2.5–6.0 kp/cm^2 = 35–85 lbf/in^2)

Lubricating oil pump

Lubricating oil pump, type	Gear
number of teeth on each gear wheel	9
end float	0.02–0.10 mm (0.0008–0.0039")

Lubricating oil pump, radial clearance (between tooth crown and pump body)	0.08–0.14 mm (0.0032–0.0055")
backlash	0.15–0.35 mm (0.0060–0.0140")

Relief valve spring (in oil pump)

Length, unloaded	39 mm (1.54")
loaded with 50±4 N (5.0±0.4 kp = 11.0±8.8 lbf.)	26.25 mm (1.03")
70±8 N (7.0±0.8 kp = 15.4±1.7 lbf.)	21.0 mm (0.83")

Lubricating oil filter

Type	Full-flow

FUEL SYSTEM

Carburettors

Type	Horizontal
Make and designation	Zenith-Stromberg 175 CD-2S E
Number	2
Air intake diameter	41.3 mm (1.63")
Metering needle designation	B2 BA
Idling speed	11.67–13.33 r/s (700–800 r/m)
CO-test	2.5%

Fuel pump

Diaphragm pump alt. 1	Pierburg PE 15695
alt. 2	SEV 200 050 12
Fuel pressure at 16.6–100 r/s (1000–6000 r/m) min	15 kPa (0.15 kp/cm^2 = 2.1 lbf/in^2)
max.	28 kPa (0.28 kp/cm^2 = 4.0 lbf/in^2)

Fuel filter

Make and designation	Carter F 827 S

Fuel tank

Capacity, two- axle with wheelbase 2300 mm	125 litres
(90.5")	(27.5 Imp. gals. = 33.0 US gals.)
two-axle with wheelbase 2530 mm	
(99.6")	150 litres
and three-axle	(33.0 Imp. gals. = 40.0 US gals.)

COOLING SYSTEM

Type	Sealed system
Expansion tank valve (in cap) opens at	70 kPa (0.7 kp/cm^2 = 10 lbf/in^2)
Capacity	10 litres (2,2 Imp. gals. = 2.6 US gals.)
Drive belts, designation	two HC-38x888

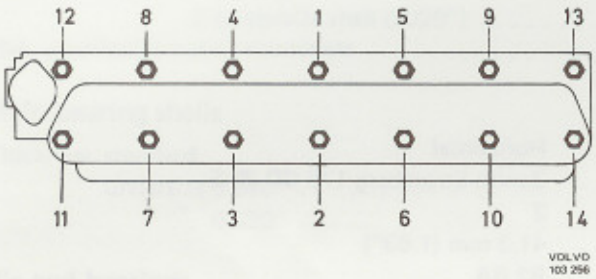
Thermostat

Type	Wax
Marked	82°
Starts opening at	79–83°C (175–182°F)
Fully open at	95°C (203°F)

TIGHTENING TORQUES

	Nm	Kpm	Lbftf
Cylinder head bolts (oiled)[1]	90	9	65
Spark plugs	40	4	29
Main bearing bolts	120–130	12–13	87–94
Big-end bearing nuts	63–70	6.3–7.0	45–50
Flywheel bolts	65–70	6.5–7.0	47–50
Oil sump bolts	8–11	0.8–1.1	6–8
Camshaft gear nuts	130–150	13–15	94–108
Crankshaft pulley bolts	95–105	9.5–10.5	69–75
Nipple for oil cooler and filter	45–55	4.5–5.5	32–40
Oil cooler nuts	30–35	3.0–3.5	22–25
Manifold nuts	18–22	1.8–2.2	13–16

1)



The cylinder head bolts should be tightened in three stages and according to the sequence illustrated here; step 1: 40 Nm (4 kpm = 29 lbftf), step 2: 80 Nm (8 kpm = 58 lbftf), step 3: after running the engine for about 10 minutes, allow the engine to cool and final-tighten the cylinder head bolts to 90 Nm (9 kpm = 65 lbftf).

Special tools

The following special tools are required for work on the engine

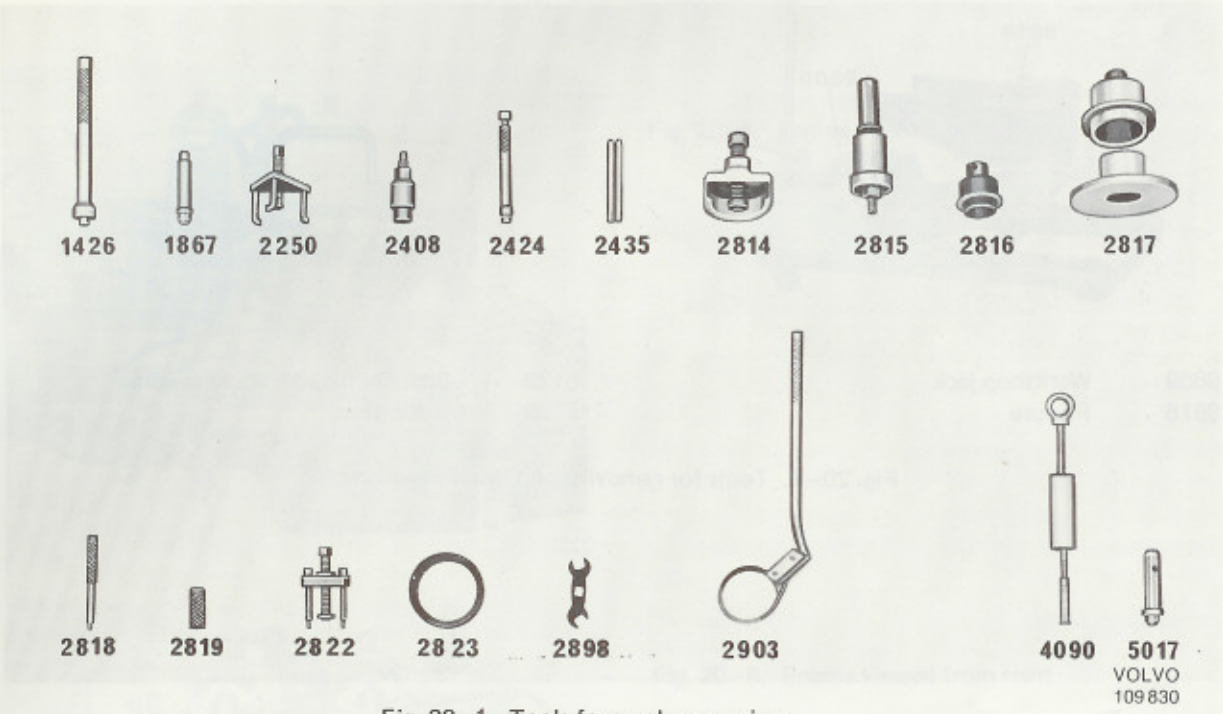
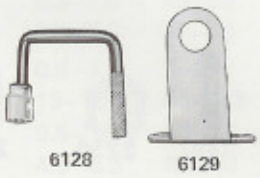


Fig. 20–1. Tools for work on engine

1426	Drift fot fitting pilot bearing
1867	Drift for removing and fitting bushing in rocker arm
2250	Puller for camshaft gear
2408	Press tool for fitting camshaft gear
2424	Grip tool for valve tappets
2435	Dowel pins for fitting cylinder head
2814	Puller for polygon hub
2815	Press tool for fitting crankshaft drive and polygon hub
2816	Drift for fitting crankshaft oil seal on engine front end
2817	Drift for fitting crankshaft oil seal on engine rear end
2818	Drift for pressing out valve guide
2819	Drift for pressing in valve guide
2822	Puller for crankshaft drive
2823	Ring for fitting standard piston
2898	Spanner for re-tightening cylinder head bolts
2903	Tool for removing oil filter
4090	Puller for crankshaft pilot bearing
5017	Drift for removing and fitting bushing in connecting rod



9809	Workshop jack	6128	Spanner for speedometer wire
9916	Fixture	6129	Lifting lug

Fig. 20–2. Tools for removing and installing engine

Fig. 20-3. Stand for engine

2520 Stand. Used together with fixture 2820

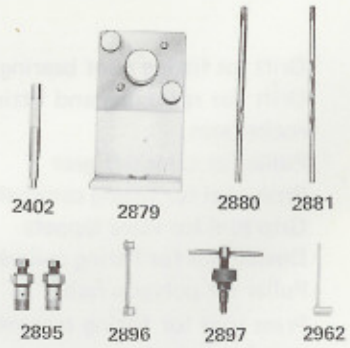


Fig. 20-4. Carburettor tools

2402	Drift for throttle spindle bushing
2879	Fixture for carburettor housing
2880	Reamer for seat, throttle spindle bushing
2881	Reamer for throttle spindle bushing
2895	Press tool for pressing out fuel jet
2896	Gauge, placed between air valve and fuel jet
2897	Press tool for pressing down fuel jet
2962	Drift for pressing out fuel jet

Description

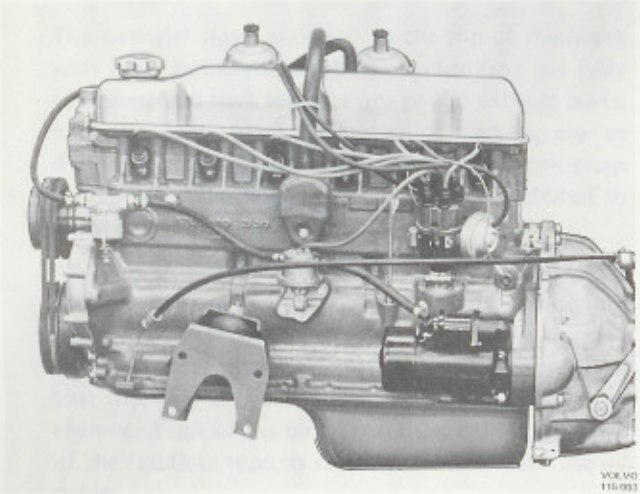


Fig. 20–5. Engine viewed from left

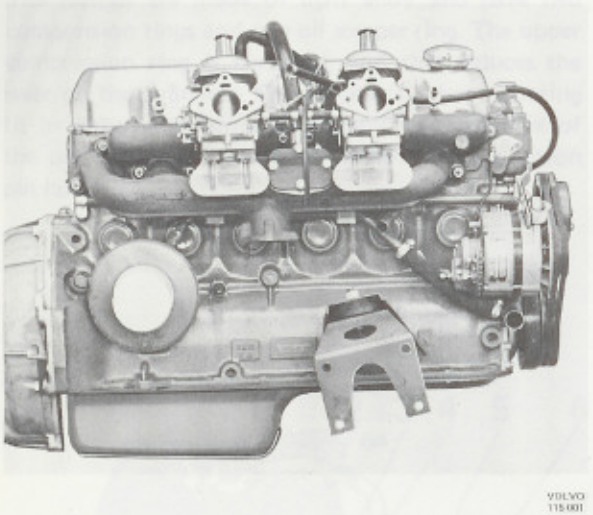


Fig. 20–6. Engine viewed from right

GENERAL

The engine has type designation B30A-498211 and is a six-cylinder, fluid-cooled overhead valve engine. It is provided with twin horizontal carburettors. The cylinder head has separate intake and exhaust ports. Engine performance can be seen from Fig. 20-7.

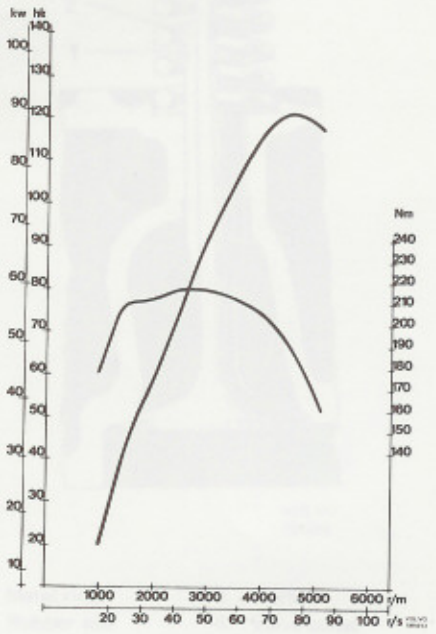


Fig. 20–7. Output and torque curves (DIN)