4-CYLINDER DIESEL & TURBO-DIESEL

Jetta, Rabbit, Rabbit Pickup, Vanagon & Quantum

ENGINE CODING

ENGINE IDENTIFICATION

Engine identification is stamped on left side of cylinder block on machined pad near No. 3 cylinder.

ENGINE IDENTIFICATION

Application	Code
Quantum	CY
Vanagon	CS
All Others	CR

ENGINE, CYLINDER HEAD & MANIFOLDS

ENGINE

NOTE: Engine and transmission assembly must be LOWERED out of Rabbit models as a unit. Removal and installation procedures for Quantum not available from manufacturer.

Removal (All Except Quantum & Vanagon)

1) Disconnect battery ground. Open coolant expansion tank. Open heater valve and drain all coolant from system at thermostat flange (engine cool). Remove radiator with fan. Remove alternator and detach fuel filter from body.

NOTE: Never drain coolant while engine is hot. Doing so could cause engine block or cylinder head to warp.

2) Disconnect wires for fuel shut-off solenoid, glow plugs, oil pressure switch and coolant temperature sensor. Disconnect hoses for heater and expansion tank. Remove fuel supply and return lines and disconnect accelerator cable with bracket from injection pump. Disconnect cold start cable.

3) On air conditioned vehicles, remove air conditioner compressor and mounting brackets and set out of way without disconnecting hoses. On all models, disconnect wires from starter and back-up light switch and ground from transmission mount. On manual transmission models, detach clutch cable and remove relay shaft lever.

4) Remove exhaust flex pipe nuts or spring clips. Disconnect drive shafts from drive flanges. Remove starter, horn, oil filter and front engine mount. Remove axle nuts (vehicle must be on ground) and disconnect lower ball joints from bearing housings. Remove drive shaft while holding strut assembly away from vehicle.

5) Reconnect ball joints so vehicle may be lowered onto wheels. Remove complete rear mount. Remove right front wheel. Attach sling (US 1105) to engine and lift slightly. On manual transmission models, remove relay shaft and gearshift lever rods.

6) On all models, remove bolts holding side mounts to body. Lower engine and transmission assembly to dolly. Raise vehicle to clear and remove assembly.

Installation

To install, reverse removal procedures noting that fuel supply and return union screws are not interchanged. Fuel return pipe union screw is marked "OUT" on hexagonal head.

Removal (Vanagon)

1) Disconnect battery ground. Remove top of air cleaner. Remove lower engine cover. Open coolant expansion tank cap. Drain cooling system (engine cool). Disconnect lower hose from water pump at connecting pipe to radiator. Disconnect center hose from water pump.

NOTE: Never drain coolant while engine is hot. Doing so could cause engine block or cylinder head to warp.

2) Disconnect wiring from oil pressure switch, temperature sensors and glow plugs. Disconnect all remaining fuel, coolant, emission control and vacuum lines and position out of way. Disconnect accelerator cable from pump lever and bracket. Disconnect cold start cable.

3) Disconnect wire from fuel shut-off solenoid. Remove coolant reservoir. Remove oil fill cap and dipstick. Remove nuts from rear engine mounts (leave bolts in place). Remove all (7) engine and transmission mounting bolts. Remove bolts. Remove support member. Support engine with a crane and adapter (3058 or equivalent).

4) Remove nuts from front engine mount and remove engine mount bolts. Lower engine and transmission assembly until engine can be separated from transmission. Support transmission, remove engine from transmission and lower out of vehicle.

Installation

To install, reverse removal procedures noting that fuel supply and return union screws are not interchanged. Fuel return pipe union screw is marked "OUT" on hexagonal head.

CYLINDER HEAD & MANIFOLDS

NOTE: Cylinder head may be removed and installed with engine in vehicle. Complete removal and installation procedures for Quantum and Vanagon not available from manufacturer.

Removal (All Except Quantum & Vanagon)

1) Remove air cleaner and ducting, then drain cooling system (engine cool). Remove camshaft drive belt. Unbolt thermostat housing from water pump. Disconnect battery ground strap.

NOTE: Never drain coolant while engine is hot. Doing so could cause engine block or cylinder head to warp.

2) Disconnect accelerator cable from injection pump. Detach fuel lines at injectors by unscrewing unions. Disconnect wire from glow plug bus, temperature sending wire and any other wires which could interfere with removal of cylinder head.

3) Remove spring clips holding exhaust pipe to manifold using clip remover tool (3059 or equivalent). Unbolt exhaust pipe support from engine and transaxle assembly (if equipped). From underneath vehicle, remove bolts and nuts holding exhaust manifold to cylinder head. Remove manifold from head.

4) Disconnect coolant hoses from head and remove any other hoses which may interfere with head

4-CYLINDER DIESEL & TURBO-DIESEL (Cont.)

removal. Remove cylinder head cover bolts and retaining plate. Carefully lift off cover and gasket. Loosen head bolts in reverse order of tightening sequence. *See Fig. 2.* Lift off head. Remove injectors and glow plugs to prevent damage while working on head.

5) Remove combustion chamber inserts by placing drift through injector hole and tapping out with hammer. Prior to installation, pre-chamber inserts must be reinstalled. When installing injectors, new heat shields must be installed between each injector and cylinder head. Place new shield in position with recess upward, toward injector. Tighten injector.

NOTE: Combustion chamber inserts are NOT supplied as spare parts on latest models. If inserts are damaged it will be necessary to replace cylinder head.

Installation

1) Clean gasket surface and ensure that cylinder head and block are not warped. Maximum distortion of .004" (.010 mm) is allowed. If installing on original piston and block assembly select a new head gasket that has the same marks as the original.

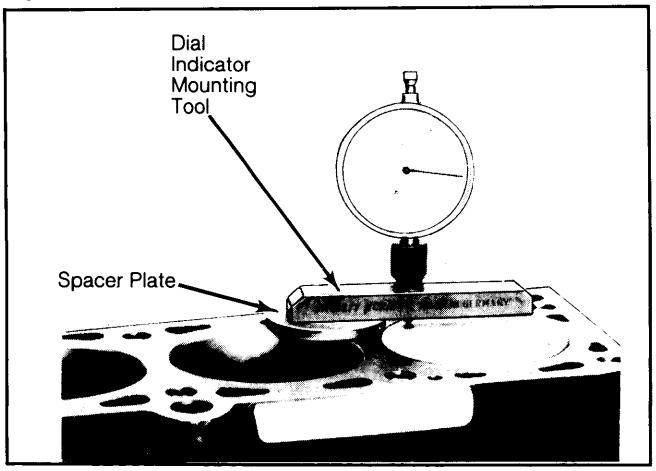
2) To determine proper gasket, measure projection of piston above block when at TDC. Select proper gasket from following table. Gasket must be installed with word "OBEN" facing up.

AVAILABLE CYLINDER HEAD GASKETS

Piston Projection In. (mm)	Gasket Thickness In. (mm)	Ident. Notches
Quantum		
.026-.031 (.67-.80)		1
.032-.035 (.81-.90)		2
.036-.040 (.91-1.02)		3
All Others		
.025-.032 (.63-.82)	.055 (1.40)	1
.033-.036 (.83-.92)	.059 (1.50)	2
.037-.040 (.93-1.02)	.063 (1.60)	3

NOTE: Due to the aluminum construction of the head, do not use metal brushes or scrapers to clean gasket sealing surface or combustion chambers. Use solvent and wooden or plastic scrapers to remove foreign material. Do not mar piston tops when cleaning cylinder block. Ensure that all bolt holes and cylinder bores are absolutely free of debris prior to installation head or bolts.

Fig. 1: Measuring Piston Projection



3) Lower head carefully onto gasket. Use guide pins (3070) or 2 of the outermost bolts and washers to keep gasket and head aligned with block. Diesel engines use either 6-point, head 11 mm bolts or 12-point, 12 mm head bolts. The 12-point bolts must be replaced with every engine repair.

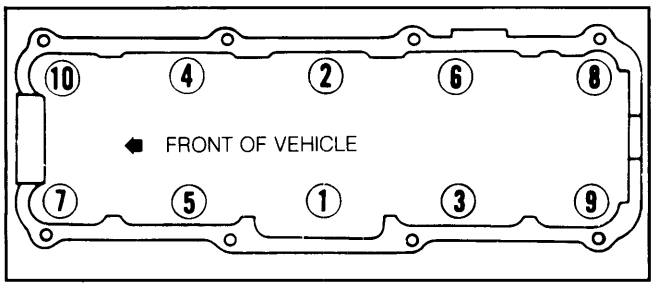
4) On the 6-point bolts, tighten in 3 steps to specifications listed in table. After the third step, warm up engine until fan cycles on. Torque once again, without backing off, to third step specification. After 1000 miles of use, retorque by loosening bolts 30° at a time and then tighten again to third step specification.

5) On the 12-point bolts, tighten in 3 steps to specifications listed in table. After the third step, tighten the bolts an additional 1/2 turn. Warm up engine until fan cycles on. Tighten an additional 1/4 turn. After 1000 miles of use, retorque an additional 1/4 turn. To complete installation, reverse removal procedure.

CYLINDER HEAD BOLT TIGHTENING

Application	Ft. Lbs. (N.m)
6-Point Bolts	
Step No. 1	35 (50)
Step No. 2	50 (70)
Step No. 3	65 (90)
12-Point Bolts	
Step No. 1	29 (40)
Step No. 2	43 (75)
Step No. 3	54 (75)

Fig. 2: Cylinder Head Tightening Sequence



Loosen in reverse order.

CAMSHAFT

TIMING BELT

NOTE: Sprockets do not have to be removed to replace drive belt.

Removal

1) Loosen alternator and remove V-belt. Remove crankshaft V-belt pulley. Remove air cleaner and ducting. Remove drive belt and cylinder head cover. Remove timing plug on top of bell housing. Rotate engine to bring No. 1 piston to TDC. Check that TDC mark on flywheel is aligned with reference.

4-CYLINDER DIESEL & TURBO-DIESEL (Cont.)

2) Using locking tool (2065A for Vanagon, 2065 for other models) lock camshaft in position. Align tool by turning camshaft until one end of tool touches cylinder head. Measure gap at other end with feeler gauge. Insert feeler gauges of 1/2 thickness measured between tool and cylinder head at each end of tool.

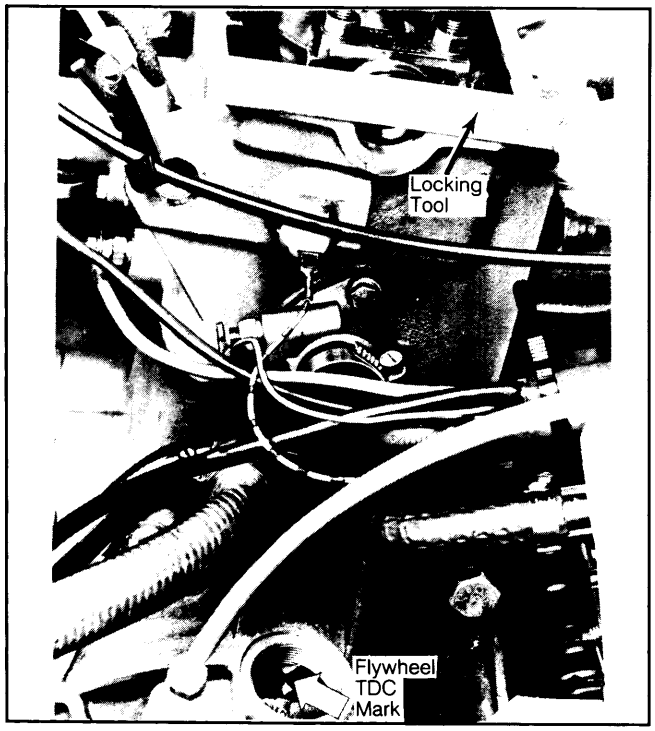
3) Lock injection pump sprocket at TDC with special pin (2064). Loosen belt tensioner and remove timing belt from sprockets.

CAUTION: Do not TURN camshaft or crankshaft with drive belt removed.

Installation

1) Ensure that flywheel is still aligned with TDC mark. With camshaft and injection pump locked in place, loosen camshaft sprocket bolt 1/2 turn. Lightly tap camshaft gear loose from camshaft. Install drive belt so there is no slack between camshaft sprocket and injection pump and injection pump and crankshaft sprocket.

Fig. 3: Flywheel TDC Mark and Camshaft Locking Tool



Do not turn camshaft or crankshaft with drive belt removed.

2) Tighten tension adjuster just enough to keep belt firmly in place. Remove injection pump locking pin. Adjust belt tension by turning tensioner until scale reads 12-13 on tension adjuster tool (VW 210). Tighten camshaft sprocket bolt and tensioner adjuster lock nut. Remove lock from camshaft.

3) Turn crankshaft 2 revolutions in direction of engine rotation. Using a rubber hammer, strike belt once between camshaft sprocket and injection pump sprocket. Recheck belt tension and install remaining components in reverse order of removal. Check injection pump timing.

CAMSHAFT

Removal

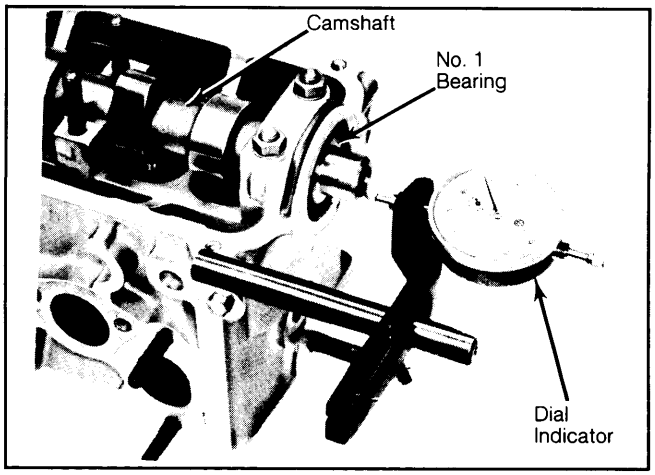
Remove timing belt. Loosen bearing caps in following sequence: 5, 1, and 3, then loosen caps 2 and 4 diagonally. Bearing caps are numbered front (sprocket end) to rear (flywheel end).

Inspection

1) Number and remove cam followers, then reinstall camshaft using only end (1 and 5) bearing caps. Check axial play of camshaft with dial indicator. If play exceeds .006" (.15 mm), either head or camshaft is worn and must be replaced.

2) To measure camshaft bearing clearance, install caps 1 at a time and check with either a dial indicator or Plastigage. Check camshaft runout by installing shaft between centers and applying dial indicator at center bearing journal. Runout must not exceed .0004" (.010 mm) when camshaft is rotated.

Fig. 4: Measuring Camshaft End Play



End play must not exceed .006" (.15 mm).

3) Inspect cam lobes, followers, and all bearing surfaces. Ensure that all oil passages are clean. Replace any components showing signs of pitting, galling or signs of seizure.

Installation

1) Lightly lubricate all components for assembly. Install cam followers in original bores with matching adjusting discs. Place camshaft and number 2 and 4 bearing caps in position with cam lobes of No. 1 cylinder pointing upward.

2) Gradually tighten all 4 bearing cap nuts until camshaft is fully seated. Install caps 5, 3, and 1. Use seal installer (10-203 or equivalent) to install front oil seal and complete installation in reverse order of removal.

VALVE TIMING

See Timing Belt procedures in this article.

INJECTION PUMP TIMING

1) To check injection pump timing, set crankshaft to TDC on No. 1 cylinder and align marks on flywheel and clutch housing. Check marks on injection pump sprocket and mounting plate.

2) If timing needs adjustment, remove plug from the injection pump cover and install adapter and dial indicator in place of plug. Preload the dial indicator to .097" (2.5 mm).

3) Turn engine slowly counterclockwise until dial indicator needle stops moving. Zero indicator. Turn engine clockwise until TDC mark on flywheel is lined up with reference mark.

4-CYLINDER DIESEL & TURBO-DIESEL (Cont.)

4) Check dial indicator against specifications listed in table. If out of adjustment, loosen bolts on mounting plate and support. Turn pump to adjust timing and tighten bolts.

INJECTION PUMP TIMING SPECIFICATIONS

Application	Range In. (mm)
Quantum	[1] .037-.041 (.95-1.05)
Rabbit & Rabbit Pickup	
With no paint dot	[2] .033-.037 (.83-.93)
With yellow paint dot	[3] .043-.047 (1.10-1.20)
Vanagon	[2] .031-.035 (.78-.88)

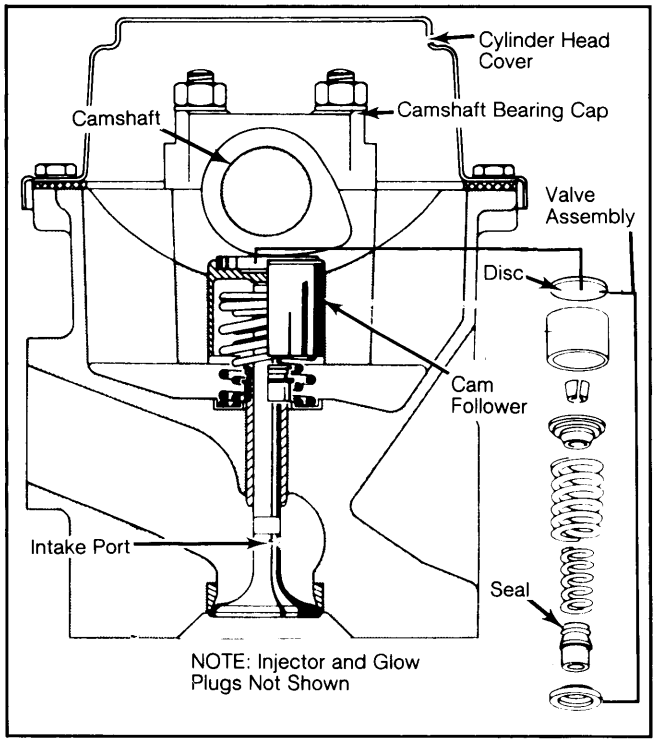
[1] — Set to .039 (1.00 mm).
[2] — Set to .034" (.86 mm).
[3] — Set to .045" (1.15 mm).

VALVES

VALVE ARRANGEMENT

E-I-E-I-I-E-I-E (Front-to-rear).

Fig. 5: End View of Camshaft and Valve Assembly



VALVE GUIDE SERVICING

1) To check for wear, insert NEW valve in clean valve guide until stem end is flush with spring end of guide. Use dial indicator to check that lateral (rocking) movement is not more than .051" (1.3 mm) when moved back and forth against indicator.

2) Prior to replacing worn guides, check that head is not cracked and that valve seats can be refaced. Press out old guides and coat new guides with oil. Press new guides in up to shoulder but do not use more than one ton of pressure once shoulder is seated. Hand ream the guides to a uniform diameter of .315-.316" (8.013-8.035 mm).

VALVE STEM SEALS AND SPRINGS

NOTE: It is possible to replace valve springs and seals with head installed provided camshaft and tappets are removed. Piston of cylinder concerned must be at top dead center position

Use spring compressor to depress spring and retainer. Remove keepers, then remove retainer and springs. Remove stem seal. Use protective sleeve over valve stem and install new seal. Complete assembly in reverse order of disassembly.

VALVE CLEARANCE ADJUSTMENT

1) Engine should be near operating temperature. Rotate crankshaft so that cam lobes for No. 1 cylinder (curb side) point upward. Check intake and exhaust clearance between heel of cam lobe and follower.

2) Use crankshaft pulley to rotate crankshaft 180° at a time and check No. 3, No. 4, and No. 2 clearance. If clearances are not within specifications, use thinner or thicker adjusting discs to increase or decrease clearance.

NOTE: Do not turn engine by camshaft pulley as this will stretch drive belt. Use a wrench to turn crankshaft or push vehicle in fourth gear to move crankshaft and valve train.

3) Twenty-six different thicknesses of discs are available in increments of .0019" (.05 mm) from .1181" (3.0 mm) to .1673" (4.25 mm). To install, turn crankshaft about 1/4 turn past TDC and press cam follower down with tool (VW 546). Remove old disc with special pliers (VW 10-208) and insert new disc with etched thickness marking toward cam follower.

VALVE CLEARANCE SPECIFICATIONS

Application	In. (mm)
Intake	
Hot	.008-.012 (.20-.30)
Cold	.006-.010 (.15-.25)
Exhaust	
Hot	.016-.020 (.40-.50)
Cold	.014-.018 (.35-.45)

NOTE: Cold settings are given for reference as initial settings to be used during cylinder head rework. Final adjustments are made at normal operating temperatures and should be checked after 1000 miles of operation

PISTONS, PINS & RINGS

PISTON & ROD ASSEMBLY

Removal

1) Mark cylinder number on crown of each piston. If necessary, mark arrows pointing toward front of block on piston crowns. Remove rod cap bolts and push piston out top of cylinder using wooden hammer handle.

4-CYLINDER DIESEL & TURBO-DIESEL (Cont.)

2) If ridge at top of cylinder prevents piston removal, use ridge reamer prior to further disassembly. DO NOT force piston out of cylinder. Mark rods and bearing caps for proper installation.

Installation

1) Turn crankshaft so No. 1 journal is at BDC. Install piston and rod assembly until ring compressor contacts block. Guide rod over journal and use wooden handle of hammer to push piston into cylinder.

2) Repeat with No. 4 piston and rod assembly ensuring that tabs on bearing halves engage notches in respective rod and cap. Tighten caps on rods 1 and 4, then rotate crankshaft 180° and install No. 2 and No. 3 piston and rod assemblies.

PISTON PINS

Removal

Use needle-nose pliers to remove circlips. Press out pin and remove piston, noting direction piston is fitted to rod. If pin is too tight, heat piston to approximately 140°F (60°C) and then press out.

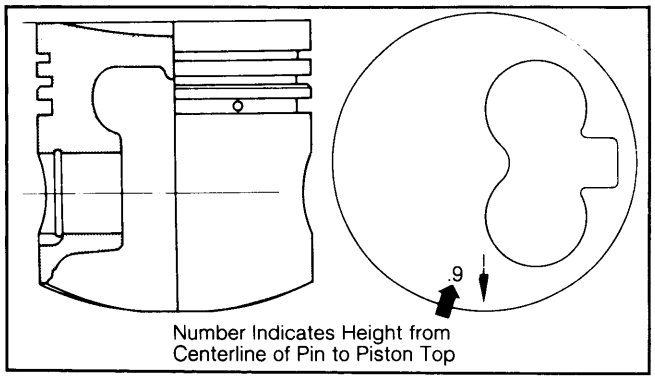
Installation

Check piston and pin fit for thumb push fit. Connecting rod and pin wear limit is .0015" (.040 mm). Connecting rod may be rebushed and honed to proper size if required. If pin is too loose in piston, replace both pin and piston.

FITTING PISTONS

Measure cylinder at 3 points: 3/8" (10 mm) from top and bottom, and at center of bore. Measure in line with and at 90° to thrust face. Cylinder wear limit is .0015" (.040 mm) out of round. If limit is exceeded, cylinders must be honed and new pistons fitted.

Fig. 6: Side and Top View of Diesel Piston



Quantum pistons have notch in skirt for oil jet.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

1) Push crankshaft toward one end and measure end play at No. 3 (thrust) bearing. Main bearing caps are numbered "1" through "5" with "1" at drive belt end and "5" at flywheel end. Measure connecting rod end play (side play). Check all bearing clearances with Plastigage, tightening bearings to 26 ft. lbs. (35 N.m).

2) Measure crankshaft journals to determine size and any out-of-round. Maximum allowable out of round is .0012" (.030 mm). Install main inserts with bearing half having oil groove into block. Lubricate bearings and install caps in original positions.

CRANKSHAFT JOURNAL DIAMETERS

Size	Main Bearing In. (mm) [1]	Rod Bearing In. (mm) [1]
Standard	2.125 (53.97)	1.810 (45.97)
1st US	2.115 (53.72)	1.800 (45.72)
2nd US	2.105 (53.47)	1.790 (45.47)
3rd US	2.095 (53.22)	1.780 (45.22)

[1] — Journal diameter is ± .0004" (.010 mm).

REAR MAIN BEARING OIL SEAL

NOTE: Rear main bearing oil seal may be replaced with engine in vehicle. Transmission and flywheel must be removed.

Removal

Insert screwdriver between crankshaft and flywheel flange and inside lip of seal. Pry seal out.

Installation

Install guide sleeve tool 2003/2A (or equivalent) over crankshaft flange. Start new seal into recess in carrier. Remove guide sleeve. Fit drive plate 2003/1 (or equivalent) and seat seal by tightening bolts.

FRONT MAIN BEARING OIL SEAL & INTERMEDIATE SHAFT OIL SEAL

NOTE: Diesel engine intermediate shaft rotates counterclockwise and utilizes a different seal than the gas engine. Arrow pointing counterclockwise on seal indicates correct application for Diesel model.

Removal (Quantum)

Remove crankshaft sprocket. Insert hex head bolt of seal removal/installation tool (3083) into seal extractor guide (2085) and remove oil seal.

Installation

To install, slide sleeve of seal removal/installation tool (3083) on crankshaft journal. Dip seal into engine oil and slide over sleeve. Slide thrust sleeve over guide sleeve. Press seal in with thrust sleeve and bolt until fully seated.

Removal (All Others)

Remove camshaft belt and crankshaft sprocket. On Vanagon, screw seal extractor 2085 (or equivalent) into seal to remove. On all others, pry seal from carrier using care not to damage carrier. Use seal extractor 10-219 (or equivalent) to remove seal.

Installation

Coat seal lips with oil and press into carrier until flush. Use special tool 10-203 (or equivalent). Remove steel sleeve from carrier and use aluminum part of the tool to drive seal in to a depth of .08" (2 mm) from front of carrier.

NOTE: Same procedures are used for intermediate shaft seal except that intermediate shaft sprocket is removed. Seal is pressed in only until flush with carrier.

4-CYLINDER DIESEL & TURBO-DIESEL (Cont.)

ENGINE OILING

CRANKCASE CAPACITY

OIL CAPACITY

Application	Qts. (L)
Quantum	
With Filter Change	3.7 (3.5)
Without Filter Change	3.2 (3.0)
Jetta, Rabbit & Rabbit Pickup	
With Filter Change	4.7 (4.5)
Without Filter Change	4.2 (4.0)
Vanagon	
With Filter Change	4.2 (4.0)
Without Filter Change	3.7 (3.5)

OIL FILTER

Oil filter is the replaceable, spin-on type.

NORMAL OIL PRESSURE

For Quantum, the oil pressure at normal operating temperature should be 7 psi (.49 kg/cm²) @ 1000 RPM, and 74 psi (5.2 kg/cm²) @ 5000 RPM. On all others, the oil pressure should be a minimum of 28 psi (2.0 kg/cm²) @ 2000 RPM and at normal operating temperature.

ENGINE OILING SYSTEM

Gear type oil pump provides oil for pressure feed to crankshaft journals, camshaft bearings, and intermediate shaft. A larger, heavy-duty oil filter and revised oil pump drive are used in the Diesel. Other lubrication characteristics are similar to the spark ignition engines.

OIL PUMP

Removal

Drain oil and remove oil pan. Remove pump mounting bolts and pump along with pick-up tube. Install in vise and remove pick-up tube.

Inspection

Check oil pump gear backlash with feeler gauge. Clearance should be between .002-.008" (.05-.20 mm). Measure the pump gear end play using a machinist's square and feeler gauge for .006" (.15 mm) clearance or less. If specifications are exceeded, replace the gears or the pump.

Installation

To install, make sure that all mating surfaces are clean. Install gaskets and reverse removal procedure.

ENGINE COOLING

COOLING SYSTEM CAPACITY

COOLANT CAPACITY

Application	Qts. (L)
Jetta	6.9 (6.5)
Quantum, Rabbit & Rabbit Pickup	7.3 (7.0)
Vanagon	16.9 (16.0)

THERMOSTAT

NOTE: Thermostat information not available for Quantum.

Thermostat to open at 185°F (85°C) on Vanagon and 176°F (80°C) on all others. Fully open at 221°F (105°C) on Vanagon and 201°F (94°C) on all others. Fan thermoswitch starts fan at 200-208°F (93-98°C).

RADIATOR CAP

Cap opens at 17-21 psi (1.2-1.5 kg/cm²) for Quantum, 11-16 psi (.8-1.1 kg/cm²) for Vanagon, and 17-19 (1.2-1.3 kg/cm²) for all others.

WATER PUMP

NOTE: Never drain the coolant while the engine is hot. Cylinder head or engine block could warp if not allowed to cool prior to draining.

Removal

Drain cooling system. Disconnect battery ground cable and unplug alternator wires. Remove alternator and bracket. Disconnect thermostat housing and hoses from water pump. Remove bolts holding pump to camshaft belt cover and engine block and remove pump.

Installation

To install, reverse removal procedure. Use new "O" ring in recess in pump mounting flange.

NOTE: Do NOT use sealer between water pump mounting flange and engine block.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Timing Belt Tensioner Lock Nut	33 (45)
Intermediate Sprocket Bolt	33 (45)
Crankshaft Sprocket Bolt	[1] 81 (110)
Water Pump Pulley Bolts	15 (20)
Crankshaft Pulley Bolts	15 (20)
Main Bearing Cap Bolts	48 (65)
Flywheel-to-Crankshaft Bolts	55 (75)
Connecting Rod Caps	33 (45)
Camshaft Sprocket Bolt	33 (45)
Camshaft Bearing Cap Bolts	15 (20)
Cylinder Head Bolts	See Text
Manifolds-to-Cylinder Head	18 (25)

[1] — Vanagon 110 ft. lbs. (150 N.m).

Volkswagen Engines

4-CYLINDER DIESEL & TURBO-DIESEL (Cont.)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displacement		Fuel System	HP@RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	Bore		Stroke	
	Cu. In.	cc					In.	mm	In.	mm
1982	97.0	1588	Fuel Inj.	52@4800 [1]	72@2000 [2]	23:1	3.012	76.5	3.40	86.40

[1] — Quantum 68@4500 RPM, Vanagon 48@4200 RPM. [2] — Quantum 98@2800 RPM.

VALVES

Engine Size & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1588 cc							
Intake	1.338 (40.00)	45°	45°	.079 (2.00)	.314 (7.97)	.051 (1.30)	....
Exhaust	1.220 (31.00)	45°	45°	.095 (2.40)	.313 (7.95)	.051 (1.30)	....

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Ring No.	End Gap In. (mm)	Side Clearance In. (mm)
1588 cc	.001 [1] (.03)	Push Fit	.0004-.0008 [2] (.01-.02)	No. 1	.012-.020 [3] (.30-.50)	.002-.004 [4] (.06-.09)
				No. 2	.012-.020 [3] (.30-.50)	.002-.003 [4] (.06-.08)
				No. 3	.010-.016 [3] (.25-.40)	.001-.002 [5] (.03-.06)

[1] — Wear limit .028" (.07 mm). [2] — Specification not available for Quantum. [3] — Wear limit .039" (1.0 mm).
[4] — Wear limit .008" (.20 mm). [5] — Wear limit .006" (.15 mm).

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1588 cc	2.124-2.125 (53.96-53.98)	.001-.003 [1] (.03-.08)	No. 3	.003-.007 [2] (.07-.17)	1.880-1.881 (47.76-47.78)	.0011-.0035 [3] (.028-.088)	.014 (.37)

[1] — Wear limit .007" (.17 mm). [2] — Wear limit .015" (.37 mm). [3] — Wear limit .0047" (.12 mm).

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (Kg @ mm)	
		Valve Closed	Valve Open
1588 cc			
Inner	....	46-51@.719 (21-23@18.3)	....
Outer	....	96-106@.875 (43.5-48@22.3)	....

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1588 cc	....	.0008-.002 [1] (.02-.05)	....

[1] — End play .006" (.1 mm).