1.6L 4-CYL DIESEL & TURBO DIESEL
Article Text

1989 Volkswagen Golf
For Volkswagen Technical Site

Monday, August 23, 1999 11:32PM

ARTICLE BEGINNING

1987-90 VOLKSWAGEN ENGINES
1.6L Diesel & Turbo Diesel 4-Cylinder

Golf, Jetta

*** PLEASE READ THIS FIRST ***

NOTE: For engine repair procedures not covered in this article, see ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATION article in the GENERAL INFORMATION section.

ENGINE CODING

ENGINE IDENTIFICATION

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

ENGINE IDENTIFICATION CODES TABLE

Application	Engine Code
1.6L Diesel 4-Cylinder	
Golf & Jetta	ME
1.6L Turbo Diesel 4-Cylinder	
Jetta	MF

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

NOTE: Engine and transmission assembly must be removed as a complete unit.

CAUTION: Do not allow weight of vehicle to rest on wheels unless outer CV joint axle stub is installed with nut tightened. (Bolt, nut and large washers may also be used to hold hub bearing together.) Damage to hub bearings will occur if stub axle and nut are not in place.

Removal

1) Remove battery. Disconnect drive axle inner constant velocity joints from transaxle drive flanges. Disconnect exhaust pipe from exhaust manifold. Drain coolant and remove hoses connected to engine.

2) Remove lower apron bolt and unclip lower trim piece. Disconnect the following electrical connectors: radiator cooling fan,

radiator thermoswitch, headlights. Disconnect hood release cable and upper radiator mounts. Remove grill, front apron and radiator.

3) Remove alternator and detach fuel filter from body. Disconnect wires for fuel shutoff solenoid, glow plugs, oil pressure switch and coolant temperature sensor.

4) 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.

5) Remove A/C condenser and compressor without disconnecting hoses. On Turbo models disconnect air cleaner duct from turbocharger's intake. Remove air cleaner assembly and disconnect blow-off valve.

6) Disconnect engine vibration damper from engine block and right side shock absorber tower (California models). Remove all engine ground connections.

7) Remove speedometer drive cable from transaxle housing. On manual transmission models, detach clutch cable and shift linkage. On automatic transmission models, place selector lever in "Park" position and remove accelerator cable and selector cable.

8) Attach Lifting Sling to engine and lift slightly. 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 procedure. Fuel supply and return union screws are not interchanged. Fuel return pipe union screw is marked "OUT" on hexagonal head.

CYLINDER HEAD & MANIFOLDS

Removal

1) Disconnect negative battery cable and ground strap from cylinder head or intake manifold. Remove air cleaner and intake duct. Drain cooling system. On turbo diesel engines, remove turbocharger. On all engines remove camshaft drive belt.

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

3) Unbolt exhaust pipe support (if equipped). Disconnect exhaust pipe from manifold. Loosen alternator mounting bolts and remove upper alternator mounting bracket. Disconnect coolant hoses from head and remove any other hoses which may interfere with head removal. Remove valve cover. Loosen head bolts in reverse order of tightening sequence. See Fig. 2. Lift off head.

4) Combustion chamber inserts are NOT supplied as spare parts. If inserts are damaged it will be necessary to replace cylinder head. Remove injectors and glow plugs to prevent damage while working on head.

NOTE: Diesel cylinder heads must be replaced and NOT resurfaced if head is warped beyond limit.

Inspection

1) Clean gasket surface. Use straightedge to ensure that cylinder head is not warped. Maximum distortion of .004" (.01 mm) on head surface is allowed. If head is to be installed on original piston and block assembly, select new head gasket that has same number of identification notches as original.

2) To determine proper head gasket, measure projection of piston above block at TDC. See Fig. 1. Select proper gasket from CYLINDER HEAD GASKET IDENTIFICATION table. Gasket must be installed with word "OBEN" ("TOP") facing up.

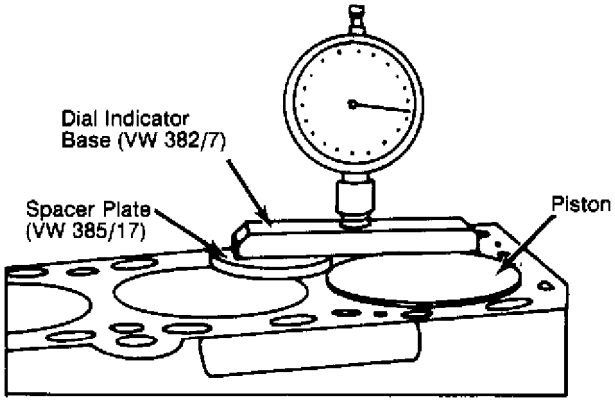


Fig. 1: Measuring Piston Projection

CYLINDER HEAD GASKET IDENTIFICATION TABLE

Piston Projection In. (mm)	Identification Notches
.026-.034 (.66-.86)	1
.034-.036 (.87-.90)	2
.036-.040 (.91-1.02)	3

NOTE: Always replace cylinder head bolts. Cylinder bores and head bolt holes must be absolutely free of any debris or fluid prior to installation of head or bolts. Any debris or fluid in bolt holes could cause block to crack when head bolts are tightened.

Installation

1) Lower head carefully onto gasket. Use Guide Pins (3070) to keep gasket and head aligned with block. Tighten cylinder head bolts in sequence in 3 stages. See Fig. 2. Tighten 12-point bolts to 29 ft. lbs. (40 N.m) in first step.

2) Tighten to 43 ft. lbs. (60 N.m) in second step. On third step, turn bolt 180 degrees (1/2 turn) in one movement. Two 90 degree (1/4 turn) movements are also acceptable.

3) Start and run engine until oil temperature is 122øF (50øC). Tighten bolts 90 degrees (1/4 turn) further without first loosening them. After vehicle has been used for 1000 miles, tighten

bolts 90 degrees (1/4 turn) further without loosening. Engine may be warm or cold for 1000 mile service.

4) When installing injectors, new heat shields must be installed in cylinder head below each injector. Place new shield in position with recess facing toward injector. Tighten injector.

5) To complete cylinder head installation, reverse removal procedure.

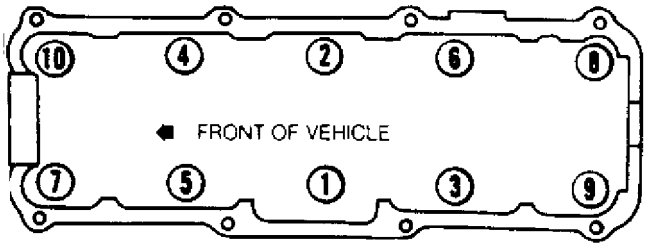


Fig. 2: Cylinder Head Tightening Sequence

CAMSHAFT

TIMING BELT

CAUTION: DO NOT turn camshaft or crankshaft with drive belt removed. Due to internal clearances, valves or pistons will be damaged if engine is not correctly timed when it is rotated.

Removal

1) Loosen alternator and remove "V" belt. Remove crankshaft "V" belt pulley. Remove air cleaner and ducting. Remove drive belt and cylinder head covers. 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.

2) Use Locking Bar (2065A) to lock camshaft in position. Align bar by turning camshaft until one end of bar touches cylinder head. Measure gap at other end with feeler gauge. Insert feeler gauges of 1/2 thickness measured between bar and cylinder head at each end of bar. See Fig. 3.

3) Secure injection pump sprocket at TDC with Lock Pin (2064). See Fig. 6. Make sure that timing marks on pump sprocket, bracket and body are aligned with engine at TDC. Loosen belt tensioner and remove timing belt.

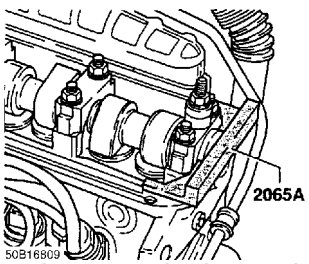


Fig. 3: Aligning Camshaft Locking Bar (2065A)
Courtesy of Volkswagen United States, Inc.

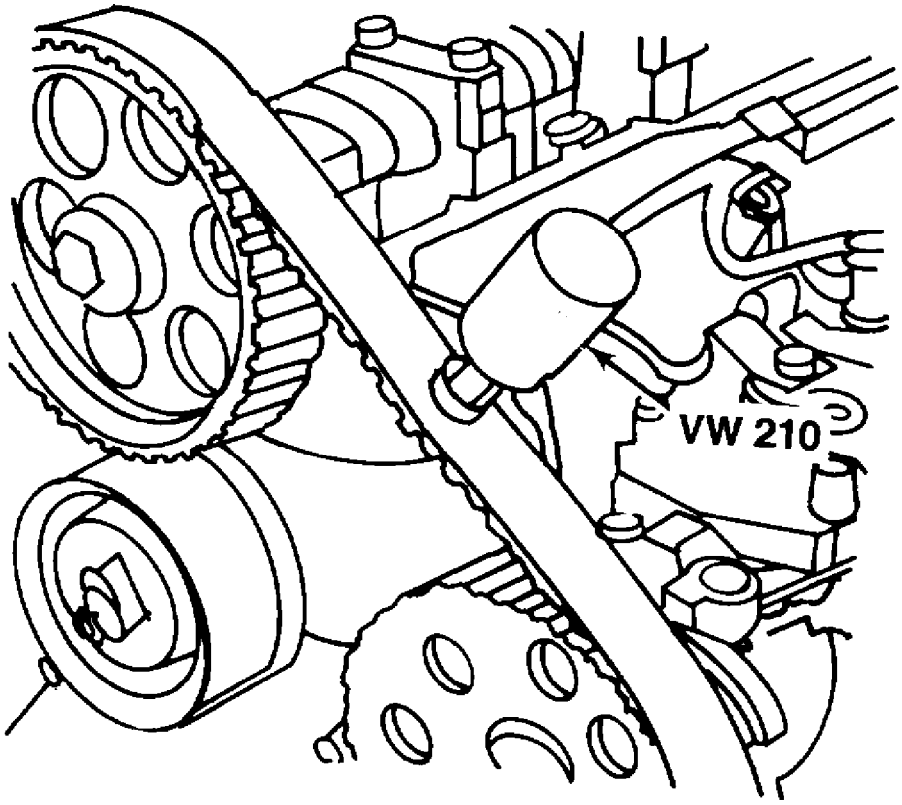


Fig. 4: Adjusting Timing Belt Tension
Courtesy of Volkswagen United States, Inc.

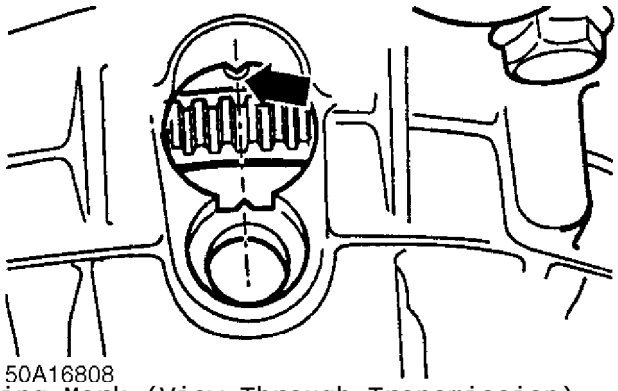


Fig. 5: Timing Mark (View Through Transmission)
Courtesy of Volkswagen United States, Inc.

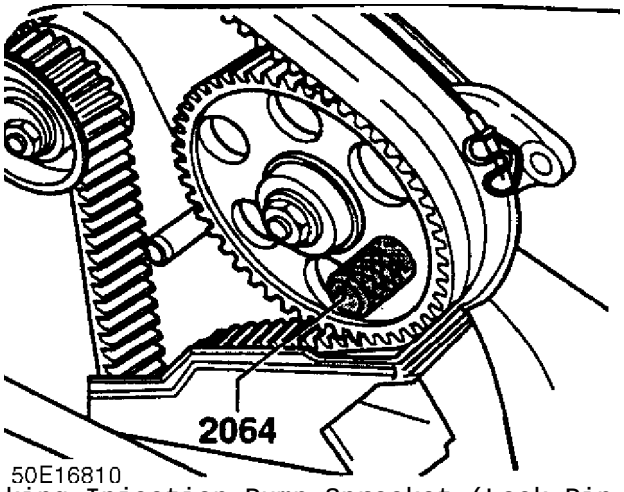


Fig. 6: Locking Injection Pump Sprocket (Lock Pin 2064)
Courtesy of Volkswagen United States, Inc.

Installation

1) Ensure that TDC mark on flywheel is still aligned with pointer. 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. Remove lock pin from pump sprocket.

2) Tighten belt by turning tensioner to right. Adjust belt tension until scale reads 12-13 on Tension Gauge (VW 210). Measure tension between camshaft and injection pump sprockets. Tighten camshaft sprocket bolt and tensioner adjuster lock nut. Remove lock bar from camshaft.

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

CAMSHAFT

Removal

Turn engine over by hand until No. 1 cylinder is at TDC and remove timing belt. Remove cylinder head cover and gasket. Remove bearing caps 1, 3 and 5. Loosen nuts on caps 2 and 4 a little at a time so that valve spring tension is relieved evenly.

CAUTION: To avoid uneven and accelerated wear, the bearing caps must be reinstalled in their exact original positions. Although each bearing cap is numbered, the numbers are not always marked in the same place on the cap.

Installation

Begin with bearing caps 2 and 4. Install washers and nuts, gradually tightening all four nuts until camshaft is drawn down fully and evenly into bearing saddles. Install remaining bearing caps with washers and nuts. Torque all nuts to 15 ft.lbs. (20 N.m). Install

timing belt.

INJECTION PUMP TIMING

Removal

1) Remove camshaft drive belt. Loosen injection pump sprocket retaining nut, but do not completely remove it. Using Puller (3032) apply tension to sprocket. Lightly tap puller bolt until sprocket pops loose from tapered shaft. Remove puller, nut and washer, and sprocket.

2) Disconnect negative battery terminal. Disconnect injection pump's fuel pipes and hoses including fuel intake line from fuel filter and fuel return line. Remove injector fuel pipes as a unit. Use lint-free cloth to cover unions.

WARNING: When fuel lines are loosened fuel will be expelled, therefore DO NOT smoke or work near fire hazards such as heaters.

CAUTION: DO NOT disconnect fuel lines w/o thoroughly clean all unions first.

3) On turbo diesel models, remove bolt and hose at top of boost pressure enrichment housing leading from housing to intake manifold.

4) On all models, disconnect electrical wire from stop solenoid. Disconnect wires attached to idle and full throttle switches (if equipped w/upshift indicator). Disconnect accelerator and cold start cables. Remove pump after removing bolts from injection pump rear support and injection pump mounting plate.

Installation

1) Install pump on front and rear mounting plates, and loosely tighten bolts. Align marks, then torque bolts to 18 ft.lbs. (25 N.m).

2) Connect fuel lines and pipes to injectors and tighten connection to 18 ft.lbs. (25 N.m).

3) The fuel return line is labeled OUT. On normally-aspirated diesels, the return line connection is on the pump housing. On turbo diesels, the return line connection is on the boost pressure enrichment housing. Do not interchange fuel supply union bolt with return line union bolt.

4) Injector line connections are marked "A","B", "C" and "D". Connect cylinder to appropriate connection. Refer to INJECTOR LINE CONNECTIONS TABLE below. When connecting fuel hoses, take care not to interchange fuel supply union bolt with return line union bolt, which is marked "OUT" on its head and contains a restrictor.

INJECTOR LINE CONNECTIONS TABLE

Cylinder No.	Injector Line Connection
1	A

3 ..... B
4 C
2 ..... D

5) On turbo diesels, connect hose leading from intake manifold to boost pressure enrichment housing and tighten to 89 inch lbs. (10 N.m).

6) On all models, connect electrical wire to stop solenoid and upshift sensors where applicable. Connect accelerator and cold start cables. Position injection pump sprocket on shaft and install nut loosely. Hand-turn sprocket until it lines up with mounting plate and pump body. Lock sprocket in position and tighten to 33 ft.lbs. (45 N.m).

7) Install camshaft. Inspect & adjust injection pump timing as described below. Check and adjust idle speed.

Inspection & Adjustment

1) To check injection pump timing, set crankshaft to TDC on No. 1 cylinder and align marks on flywheel and clutch housing. Check that marks on injection pump sprocket, mounting plate and pump body are aligned. Make sure that cold start device is off with handle completely pushed in.

2) Remove plug from injection pump cover. Install Adapter (2066) and dial indicator (0-3 mm range) in place of plug. Preload dial indicator to .097" (2.5 mm). Turn engine slowly counterclockwise until dial indicator needle stops moving. Zero indicator.

3) Turn engine clockwise until TDC mark on flywheel is lined up with reference mark. Check dial indicator reading against specifications. See INJECTION PUMP TIMING SPECIFICATIONS table.

4) If outside of checking range, loosen mounting plate bolts and support bolt. Rotate pump slightly to set timing within adjustment range. Tighten bolts and recheck pump timing.

INJECTION PUMP TIMING SPECIFICATIONS TABLE

Application	Range In. (mm)
Diesel	
Checking	(.83-.97)
Adjusting	(.88-.92)
Turbo Diesel	
Checking	(.95-1.05)
Adjusting	(1.00-0.02)

VALVES

VALVE ARRANGEMENT

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

VALVE SEAT

1) To check valve guides for wear, insert new valve in clean valve guide until stem tip is flush with upper end of guide. Setting dial indicator tip against valve head, check that lateral movement is not more than .051" (1.3 mm) when moved back and forth.

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 guides to size.

3) Measure valves for minimum dimensions. Refer to VALVE SPECIFICATIONS table at end of article. Overall length of new valves (from face to tip of stem) is 3.74" (95 mm).

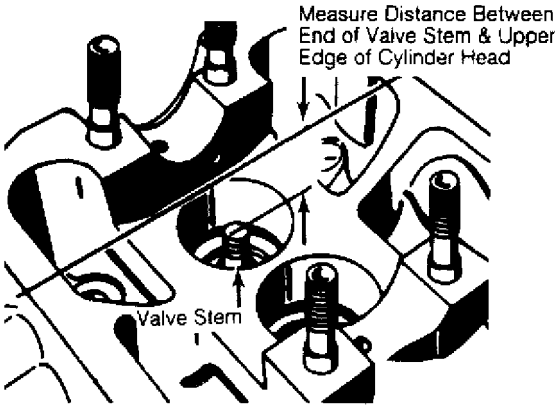
4) To establish limit for cutting valve seats (dimension "Y"), measure distance "X" between end of valve stem and upper edge of cylinder head. See Fig. 7.

5) Insert valve into guide and hold tightly against seat. Measure distance "X". Subtract minimum dimension "X" from measured distance "X". Result is maximum cut allowed (dimension "Y") for refacing valve seats.

6) If minimum dimension "X" is greater than measured distance "X", cylinder head MUST be replaced. If minimum dimension is not observed, hydraulic valve lifters may not function properly.

VALVE SEAT REFACING SPECIFICATIONS TABLE

Application	Minimum Dimension "X"
Exhaust Valves	1.41" (35.8 mm)
Intake Valves	1.42" (36.1 mm)



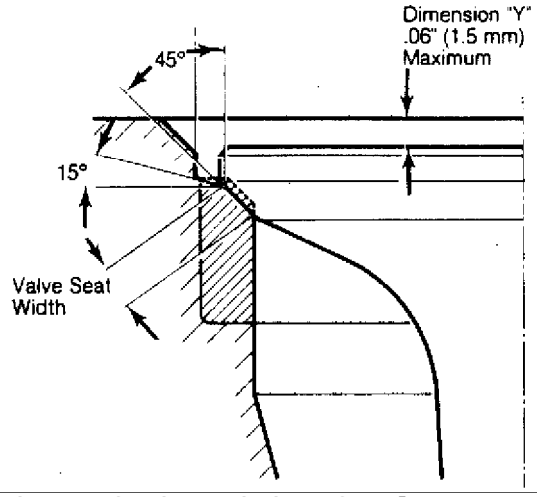


Fig. 7: Measuring Refacing Limit Of Valve Seat

VALVE STEM SEALS & SPRINGS

1) Valve springs and seals can be replaced with head installed after camshaft and tappets are removed. Set piston of cylinder to be serviced at TDC. Remove keepers, retainer and springs. Remove stem seal. Let valve move down to be supported by piston.

2) Place protective sleeve over valve stem. If sleeve is not used, edge of tip could cut new seal. Install new seal with Seal Installer (10-204). Complete assembly in reverse order of disassembly.

HYDRAULIC VALVE LIFTERS

NOTE: All diesel engines are equipped with hydraulic lifters. On hydraulic lifter equipped engines, tighten cylinder head bolts 90 degrees (1/4 turn) and replace camshaft cover gasket at initial 1000 mile service.

Inspection

1) Hydraulic valve lifters are neither repairable nor adjustable. Any worn, damaged or noisy lifter must be replaced as complete assembly. Some occasional valve/lifter noise is normal

immediately after starting engine.

2) Run engine until radiator cooling fan has cycled at least once. Hold engine at steady 3500 RPM for 2 minutes. Allow engine speed to return to idle. If lifter is still noisy, go to next step.

3) Remove camshaft cover. Turn engine crankshaft until both camshaft lobes of cylinder to be checked point upward. Push down on lifter with wooden stick. If lifter can be compressed more than .004" (.10 mm), it must be replaced.

4) If hydraulic valve lifters are removed for engine repairs, keep them in correct order for installation. Store lifters on a clean surface with contact surface facing down (upside down compared to installed position).

PISTONS, PINS & RINGS

PISTON & ROD ASSEMBLY

Removal

1) DO NOT force piston out of cylinder. If ridge or carbon prevent piston removal, use ridge reamer to cut down lip at top of cylinder. Mark cylinder number on crown of each piston. If necessary, mark arrows pointing toward front of block on piston crowns.

2) Mark both halves of rods for proper reassembly. Remove rod caps and push piston with rod through top of cylinder using wooden hammer handle. Connect rod caps and rods loosely to avoid any mixups.

Installation

1) Turn crankshaft until No. 1 journal is at BDC. Use hose or tape over rod bolts to protect crankshaft journals. 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. Snug down caps on rods No. 1 and 4. Rotate crankshaft 180 degrees to install No. 2 and No. 3 piston and rod assemblies.

3) If OVERSIZE pistons are being installed, use only new chamfered pistons and cylinder head gasket. If improper piston/cylinder head gasket combination is used, pistons will come in contact with gasket. See CYLINDER HEAD GASKET IDENTIFICATION table.

PISTON PINS

Removal

Remove circlips. Press out pin and remove piston, noting direction piston is fitted to rod. If pin is too tight, heat piston to about 140øF (60øC) and then press out.

Installation

Check piston and pin fit for thumb push fit. 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

Sizing

1) Take 3 cylinder bore measurements with inside micrometer or cylinder bore gauge. Take one set of measurements at 90 degrees to crankshaft centerline.

2) Take second set of measurements in line with crankshaft centerline. Measuring points should be at point 3/8" from top of bore, at middle of bore and at point 3/8" from bottom of bore.

NOTE: Do not measure cylinder bore when block is on engine stand as block could be distorted. Resulting measurements would be inaccurate.

3) Difference between sets of measurements at same point is cylinder out-of-round. Maximum cylinder out-of-round is .0016" (.040 mm). If cylinder bore measurements vary from top to bottom, taper of bore may be excessive.

4) If out-of-round or taper is excessive, block must be honed or bored to next oversize. Maximum deviation allowed from nominal dimensions, as shown in PISTON & CYLINDER DIMENSIONS table, is .003" (.08 mm).

5) If cylinder bore is within limit for out-of-round, measure piston diameter at 90 degrees to piston pin bore, about 9/16" from bottom of piston skirt. Compare this measurement with measurement of corresponding cylinder bore. If taper is such that piston skirt clearance is excessive, block must be honed or bored to next oversize.

6) Clearance between piston and cylinder wall should be .001" (.03 mm) for new parts. Wear limit for clearance between piston and cylinder wall is .003" (.08 mm). Install oversize pistons if wear limit is exceeded. Pistons are available in oversizes of 81.23 mm and 81.48 mm. Pistons have 4-digit number marked on face, which gives diameter in millimeters.

PISTON & CYLINDER DIMENSIONS TABLE

Size	Piston Diameter	Cylinder Bore
Standard	76.48 mm	76.51 mm
1st Over	76.73 mm	76.76 mm
2nd Over	76.98 mm	77.01 mm
3rd Over	77.48 mm	77.51 mm

CRANKSHAFT & 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 side play. Check all bearing clearances with Plastigage.

NOTE: On Turbo models with stretch bolts, only tighten rod nuts to 26 ft. lbs. (35 N.m) when checking clearances.

2) Measure crankshaft journals to check out-of-round. Maximum allowable out-of-round is .0012" (.030 mm). Install main bearings with shell half having oil groove in block. Bearing tangs must butt against one another. Lubricate bearings and install caps in original positions.

REAR CRANKSHAFT 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 flywheel flange of crankshaft and inside lip of seal. Carefully pry seal out.

Installation

Install Guide Sleeve (2003/2A) over crankshaft flange. Start new seal into recess in carrier. Remove guide sleeve after seal lips are past edge of flange. Fit Seal Driver (2003/1) and seat seal by tightening bolts.

FRONT CRANKSHAFT OIL SEAL

Removal

1) Thread bolt from Seal Installer (3083) into crankshaft. Back inner part of Seal Extractor (2085) out 2 turns from outer portion of seal extractor. Lock extractor parts with set screw. Place extractor over bolt after lubricating threaded head of tool.

2) Screw extractor into seal as far as possible using ratchet in square drive of inner portion of tool. Loosen set screw and turn inner portion of extractor until seal pulls out. Clamp extractor into vise and remove seal.

Installation

To install, slide guide sleeve of seal installer onto crankshaft journal. Lubricate seal with engine oil. Slide seal over sleeve. Slide installer thrust sleeve over guide sleeve. Press seal in with thrust sleeve and bolt until fully seated.

INTERMEDIATE SHAFT OIL SEAL

NOTE: Diesel engine intermediate shaft rotates counterclockwise so seal used is different from that used in gasoline engine. Arrow pointing counterclockwise on seal indicates correct application for Diesel models.

Removal

Remove intermediate shaft sealing flange. Drive seal out of

flange.

Installation
Coat sealing lip and outer edge lightly with engine oil. Drive seal into carrier until flush, using Seal Driver (10-203).

ENGINE OILING

ENGINE OILING SYSTEM

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

CAUTION: Use only API "CD" rated oil in Turbo Diesel models.

CRANKCASE CAPACITY

Crankcase capacity is 4.7 qts. (4.5L) with oil filter replacement; 4.2 qts. (4.0L) without filter replacement.

OIL FILTER

Oil filter is replaceable, spin-on type.

NORMAL OIL PRESSURE

Oil pressure should be minimum of 28 psi (2.0 kg/cmý) at 2000 RPM with oil temperature at 140øF (68øC).

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 pump gear end play. Wear limit for end play is .006" (.15 mm). If limit is exceeded, replace gears or pump.

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

ENGINE COOLING

WATER PUMP

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: For information on cooling system capacities and other cooling system components, see appropriate article in ENGINE COOLING SYSTEMS section.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Camshaft Bearing Cap Bolts	15 (20)
Camshaft Sprocket Bolt	33 (45)
Connecting Rod Cap Nuts	(1) 22 (30)
Crankshaft Pulley Nuts	15 (20)
Crankshaft Sprocket Bolt	(4) 77 (90)
Cylinder Head Cover To Cylinder Head (nut)	29 (40)
Cylinder Head To Engine Block (Engine Cold)	(4) 43 (60)
Flywheel-to-Crankshaft Bolts	(3) 74 (100)
Intermediate Sprocket Bolt	33 (45)
Main Bearing Cap Bolts	48 (65)
Manifolds-to-Cylinder Head Nuts	18 (25)
Timing Belt Tensioner Lock Nut	33 (45)
Water Pump Pulley Bolts	15 (20)
Without Shoulder	55 (75)
With Shoulder	74 (100)

(1) - Use stretch bolts. Turn bolts 90 degrees (1/4 turn) after reaching specified torque.
(2) - On third step, turn bolts 180 degrees (1/2 turn) in one movement. Two 90 degree (1/4 turn) may also be used.
(3) - Use locking compound.
(4) - Plus 1/2 turn (180 degrees

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS TABLE

1.6L 4-CYL DIESEL & TURBO DIESEL
Article Text (p. 16)

1989 Volkswagen Golf
For Volkswagen Technical Site

Monday, August 23, 1999 11:32PM

Application	In.(mm)
Diesel	
Displacement	
Cu. In.	97.0
Liters	1.6
Fuel System	Diesel Inj.
HP @ RPM	52@4800
Torque Ft. @ RPM (1)	70@2000
Compr. Ratio	23:1
Bore	
In. (mm)	3.01 (76.5)
Stroke	
In. (mm)	3.40 (86.4)
Turbo Diesel	
Displacement	
Cu. In.	97.0
Liters	1.6
Fuel System	Diesel Inj.
HP @ RPM	68@4500
Torque Ft. @ RPM	98@2800
Compr. Ratio	23:1
Bore	
In. (mm)	3.01 (76.5)
Stroke	
In. (mm)	3.40 (86.4)

(1) - Jetta 71.5@2000 RPM

VALVE SPECS

VALVE SPECIFICATIONS TABLE

Application	In. (mm)
Intake	
Head Diam.	1.338 (34.00)
Face Angle	45ø
Seat Angle	45ø
Seat Width	.079 (2.00)
Stem Diameter	.314 (7.97)
Stem Clearance	...
Valve Lift	...
Exhaust	
Head Diam.	1.220 (31.00)
Face Angle	45ø
Seat Angle	45ø
Seat Width	.095 (2.40)
Stem Diameter	.313 (7.95)
Stem Clearance	...
Valve Lift	...

PISTON/PIN/RING SPECS

PISTONS, PINS & RINGS SPECIFICATIONS TABLE

Application	In. (mm)
Piston Clearance (1)	.0011 (.03)
Pins	
Piston Fit (2)	Interference
Rod Fit	Interference
Rings Nos. 1 & 2	
End Gap (3)	.012-.020 (.30-.50)
Side Clearance (4)	.002-.004 (.06-.09)
Rings No. 3	
End Gap (3)	.010-.016 (.25-.40)
Side Clearance (5)	.001-.002 (.03-.06)

(1) - Wear limit is .031"(.08mm).
(2) - If too tight, heat at 140øF(60øC).
(3) - Wear limit is .039"(1.0mm).
(4) - Wear limit is .008"(.20mm).
(5) - Wear limit .006"(.15mm).

BEARING SPECS

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS TABLE

Application	In. (mm)
Std. Size	
Main Bearings	
Journal Diam. (1)	2.124-2.125 (53.96-53.98)
Clearance (2)	.001-003 (.03-07)
Thrust Bearing	No. 3
Crankshaft End Play (3)	.003-.007 (.07-.17)
Connecting Rod Bearings	
Journal Diam. (1)	1.880-1.881 (47.76-47.78)
Clearance (4)	.0011-0034 (.030-.088)
Side Play	.014 Max. (.38)
1st U/Size	
Main Bearings	
Journal Diam.	2.114-2.115 (53.71-53.73)
Connecting Rod Bearings	
Journal Diam.	1.871-1.872 (47.51-47.53)
2nd U/Size	
Main Bearings	
Journal Diam.	2.104-2.105 (53.46-53.48)
Connecting Rod Bearings	

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  Journal Diam.  .....................  1.860-1.861 (47.26-47.28)
3rd U/Size
Main Bearings
  Journal Diam.  .....................  2.095-2.096 (53.21-53.23)
Connecting Rod Bearings
  Journal Diam.  .....................  1.851-1.852 (47.01-47.03)

(1) - Out-of-round limit is .001" (.03mm).
(2) - Wear limit is .007" (.17mm).
(3) - Wear limit is .015" (.37mm).
(4) - Wear limit is .005" (.12mm).
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