Revised Camshaft Sprocket Bolt Torque for 1996-1999 VW/ Audi 1.8L AEB Engines

Previously published service information regarding camshaft sprocket bolt torque specifications for the 1.8L Volkswagen/ Audi 1.8L AEB engines may have incorrectly listed the torque value at 74 ft.lbs.

The correct torque value for the camshaft sprocket bolt is 48 ft.lbs. (65 Nm). These cylinder heads are beginning to be seen in machine shops because many miles have accumulated since they were new. If the incorrect torque value is used, the result may be engine failure. Even if the bolt does not break after over-torquing, it is possible that all engine valves (20) will bend/break if the head bolts fail while engine is running (**Figure 1,** left).

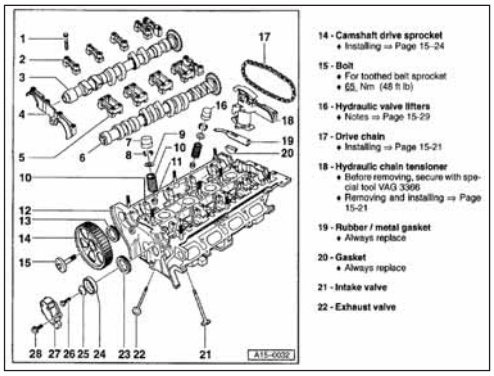


Figure 1 Previously published service information for 1.8L Volkswagen/ Audi 1.8L AEB engines may have incorrectly listed camshaft sprocket bolt torque at 74 ft.lbs. Correct bolt torque is 48 ft.lbs.

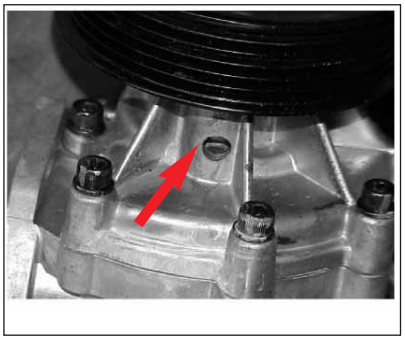


Figure 2 Water pump coolant leaks on 1990-2006 Suzuki engines.

Water Pump Coolant Leaks On 1990-2006 Suzuki Engines

The AERA Technical Committee says that water pump coolant leaks on all 1990-2006 Suzuki engines may be a normal part of the break-in cycle. Numerous water pumps have been returned to Suzuki under warranty due to leaks, however after testing these pumps they've been determined satisfactory for service.

Suzuki has determined that signs of coolant leakage at water pump weep holes are normal during break in. For a period of time some coolant will pass through the seal and leave green and white deposits around and below the weep hole (see **Figure 2,** above). This is not detrimental to the function of the water pump.

There is however a limit to what is considered normal leakage, according to the company.

• If these deposits of coolant are

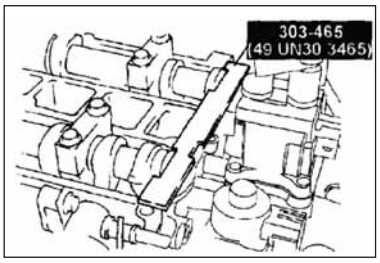


Figure 3 Install the camshaft alignment plate on 2.0 and 2.3L Mazda engines.

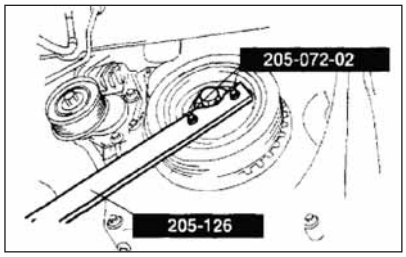


Figure 4 Tighten the crankshaft pulley lock bolt on 2.0L and 2.3L Mazda engines.

found around the weep hole and this area is not leaking, do not replace the water pump.

• If these deposits of coolant are found and coolant is visibly leaking from the weep hole enough to drip on to the ground, replace the water pump.

To test the cooling system for leaks, follow the procedure listed below.

1) Remove the radiator cap and pressurize the system to 17.8 psi (123 kPa)

2) Caution: applying more than the prescribed pressure can damage the hoses, fittings and other components, and cause leaks.

3) Wait approximately 5 minutes, and then verify if cooling system did or did not hold applied pressure.

4) If system held applied pressure, water pump replacement is NOT necessary. If system did not hold applied pressure and the water pump is leaking, replace water pump.

5) If system did not hold applied pressure and the pump is not leaking, do further diagnostics of the cooling system until the leak is uncovered.

Vehicle	"Freewheeling"	"Interference"
Rio		1.5L
Rio Cinco		1.5L
Sephia	1.6 & 1.8L	
Spectra	1.8L	
Sportage	2.0L	
Optima		2.4L & 2.5L
Optima		2.7L
Sedona		3.5L
Amanti		3.5L

Chart 1 Some engines used by Kia are "interference" engines. Kia identifies them by vehicle model.

Crankshaft Pulley Replacement Caution For 2001-2005 Mazda 2.0 & 2.3L Engines

The AERA Technical Committee offers the following information regarding the crankshaft pulley replacement for 2001-2005 Mazda 2.0L and 2.3L engines. The crankshaft pulley is NOT KEYED to the crankshaft on these engines.

If the crankshaft pulley bolt is loosened, the pulley may move position on the crankshaft. The engine MUST be re-timed whenever the crankshaft pulley bolt is loosened, removed or replaced. Several service tools are required to correctly re-time all the components.

Follow the procedure listed below to time the cams and crankshaft and tighten the NEW crankshaft bolt (p/n LF0111406).

1) Install the camshaft alignment plate 303-465 to the camshaft as shown in **Figure 3** (page 24).

2) Install the M6 x 1.0 bolt by hand as shown in Figure 3.

3) Rotate the crankshaft clockwise until the crankshaft is in the No.1 cylinder TDC position (until the crankshaft balance weight contacts the crankshaft alignment pin p/n 303-507).

4) Hold the crankshaft pulley using the service tools shown in **Figure 4**, above.

5) Tighten the crankshaft pulley lock bolt in the order shown following two steps using the service tool (49 D032 31 6).

• Tighten to 70.9 - 76.7 ft.lbs. (96 - 104 Nm)

• Tighten 87°- 93°

6) Remove the M6 x 1.0 bolt.

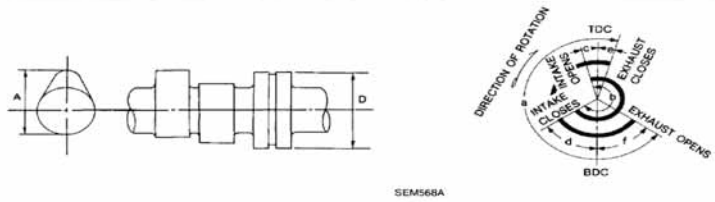
7) Remove the service tool from the camshafts.

8) Remove the service tool from the cylinder block lower blind plug.

9) Rotate the crankshaft two times clockwise until the crankshaft is in the TDC position, reinstall the service tools to the camshaft and cylinder block, and inspect the valve timing.

10) If not aligned, loosen the crankshaft pulley lock bolt and repeat from Step 1.

CAMSHAFT AND CAMSHAFT BEARING



Unit: mm (in)

		Standard	Limit
Cam height (A)	Intake	42.415 - 42.605 (1.6699 - 1.6774)	—
	Exhaust	42.415 - 42.605 (1.6699 - 1.6774)	—
Wear limit of cam height		—	0.2 (0.008)
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.12 (0.0047)
Inner diameter of camshaft bearing	#1 to #6 journals	28.000 - 28.025 (1.1024 - 1.1033)	—
Outer diameter of camshaft journal (D)	#1 to #6 journals	27.935 - 27.955 (1.0998 - 1.1006)	—
Camshaft runout*		Less than 0.02 (0.0008)	0.04 (0.0016)
Camshaft end play		0.070 - 0.148 (0.0028 - 0.0058)	0.2 (0.008)
Valve timing (Degree on crankshaft)	a	232	—
	b	232	—
	c	-1	—
	d	53	—
	e	4	—
	f	48	—

* Total indicator reading

Chart 2 Camshaft identification for 1991-'98 2.4L Nissan KA24DE engines.

Valve Timing Interference On 1994-2005 Kia Engines

The AERA Technical Committee offers the following information regarding valve timing interference on 1994-2005 Kia engines. Some engines used by Kia are "interference" engines. Kia identifies them by vehicle model.

An interference engine could be described as one in which valve-to-piston contact may result if the valve timing is interrupted. This most commonly occurs when a timing belt or chain breaks or loses positioning. Thus, the reference to "interference" is that the moving parts contact each other. An engine that does not allow contact has been referred to as "freewheeling."

Refer to **Chart 1** (page 26) to help determine whether a particular Kia engine is freewheeling or interference.

Identifying Camshafts In Nissan 2.4L KA24DE Engines

The AERA Technical Committee offers the following information regarding camshaft identification for 1991-'98 2.4L Nissan KA24DE engines. This information will help

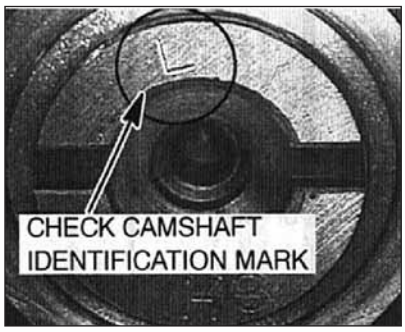


Figure 5 To identify the cam on 2004 Mitsubishi 2.4L engines, look at the slotted cam end for either a letter "L" or "G."

during reassembly if the camshafts are not marked for location before disassembly.

The camshafts for these engines appear identical at first glance. They are, in fact, dimensionally the same. The one difference that makes them unique to location is the front dowel pin drilling. Originally, there was color coding on the cams (brown for exhaust and green for intake). Later model year camshafts have different lobe configurations between intake and exhaust locations.

To determine which cam is which, use the camshaft dowel pin to locate the intake and exhaust lobe positions. As viewed from the front of the head, the intake dowel pin will be at 12 o'clock with the front lobes on No. 1 cylinder at 12 o'clock position (or, pointing straight up). On the other cam, the exhaust, when the dowel pin is at 12 o'clock the front lobes are at the 3 'clock position (or, pointing toward the exhaust ports).

For details, refer to the published camshaft information in the illustration and chart (**Chart 2**, page 27).

CAMSHAFT ID "L"

COLD ENGINE mm (in.)		HOT ENGINE mm (in.)	
Intake	0.11 (0.004)	Intake	0.20 (0.008)
Exhaust	0.20 (0.008)	Exhaust	0.30 (0.012)

CAMSHAFT ID "G"

COLD ENGINE mm (in.)		HOT ENGINE mm (in.)	
Calif. Emissions		Calif. Emissions	
Intake	.11 (0.004)	Intake	0.20 (0.008)
Exhaust	.21 (0.008)	Exhaust	0.31 (0.012)
Fed. Emissions		Fed. Emissions	
Intake	.11 (0.004)	Intake	0.20 (0.008)
Exhaust	.22 (0.009)	Exhaust	0.32 (0.013)

Chart 3 Camshaft identification for 2004 Mitsubishi 2.4L SOHC, G69M engines.

Valve Lash and Cam Identification For 2004 Mitsubishi 2.4L SOHC Engines

The AERA Technical Committee says Mitsubishi's published information seems to have listed incomplete specifications as two different camshaft profiles were use. The following information regarding the correct valve lash specification and camshaft identification for 2004 Mitsubishi 2.4L SOHC, G69M engines may be helpful.

You must identify which camshaft is being used to obtain the correct valve lash specifications. To identify the cam, examine the slotted cam end and look for either a letter "L" or "G" as shown in **Figure 5**, above left.

Lash adjustments can be slightly different for the two different cam profiles. **Chart 3,** above, can be used once you've correctly identified which cam you have.

Revised Crankshaft Sensor For 2001-2002 Hyundai 2.7L Engines

The AERA Technical Committee offers the following information regarding a revised crankshaft sensor for 2001-2002 Hyundai 2.7L

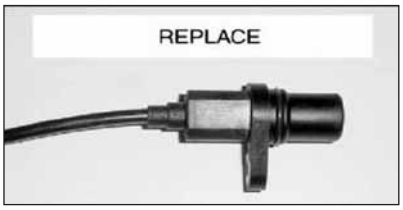


Figure 6 If Hyundai 2.7L CKP sensor wiring comes out straight from the top of the sensor (39180-37200), REPLACE sensor.

engines. Since this engine was first designed, three crankshaft sensors have been used. The original design sensor should not be used.

To help determine which sensor is appropriate for use, Hyundai has supplied visual aids for positive identification. Refer to the following part numbers to select the proper crankshaft sensor. The current sensor has two different designs, p/n 39180-37200 and p/n 39180-37150.

• **P/N 39180-37200**: Inspect the CKP Sensor. If the wiring of the CKP sensor comes out straight from the top of the sensor (**Figure 6**, above), REPLACE the sensor.

• **P/N 39180-37150:** If the wiring of the CKP sensor comes out at a 90 degree angle from the top of the sensor, do not replace the sensor.

• **P/N 39180-37150**: If the wiring of the CKP sensor comes out straight from the top of the sensor AND has a 90 degree plastic knob at the top of the sensor, then do not replace the sensor unless it is damaged.

Main Bearing Cap Bolt Caution For 1993-95 BMW 4.0L M60 Engines

The assembly procedure to torque the main bearing cap bolts for 1993-'95 BMW 4.0L M60 engines has changed, according to the AERA Technical Committee.

New crankshaft main bearing cap bolts have been introduced in production since approximately 10-1995 on all M60 engines. Prior to this date, M10 hex head or Torx head bolts were used to secure the main bearing caps to the cylinder block. After that date, M11 Torx head type bolts were used.

	M10 Hex or Torx head type bolts	M11 Torx Head type bolt
Step 1	Torque to 15 ft/lbs (20 Nm)	Torque to 15 ft/lbs (20 Nm)
Step 2	Rotate Bolt 70°	Rotate Bolt 100°
Side Bolts	15 ft/lbs (20 Nm) and then rotated 45°	15 ft/lbs (20 Nm) and then rotated 45°
Part No.	11111741294	11111745188

Chart 4 Revised assembly torque procedure for the main bearing cap bolts on 1993-1995 BMW 4.0L M60 engines.

Along with the change of bolts came a change in the amount of applied bolt torque to use when assembling the caps to the block. See the chart (**Chart 4**, above) for details.

Important Note: If repairs involve the removal and installation of the crankshaft main bearing cap bolts, new bolts must always be used during reassembly. These new bolts are coated; do not remove coating before assembly.

The M60 main caps also use side bolts, consisting of protective bushings and bolts, to secure them to the block. BMW suggests using new side bolts while bushings may be reused. Tighten the threaded protective bushings to 8 ft.lbs. (10Nm). The side bolts should be torqued to 15 ft.lbs. (20 Nm) and then rotated 45°. ***TSG***