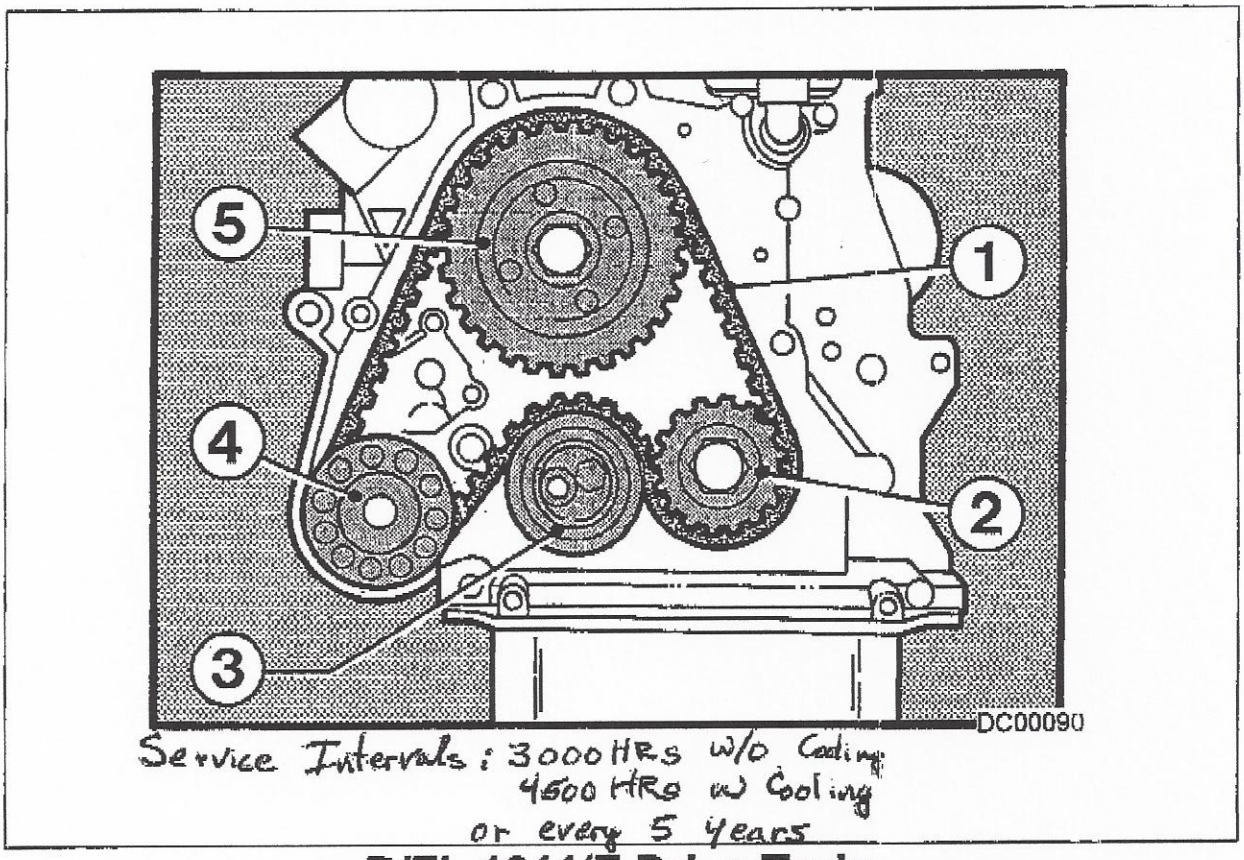
KHD DEUTZ **Service Training**

Toothed Belt Installation

B/FL 1011/E

Attn Robert Jeff

KHD DEUTZ **Service Training**



Service Intervals: 3000 HRS w/o Cooling
4500 HRS w Cooling
or every 5 years

B/FL 1011/E Drive Train

1. Toothed belt
2. Crankshaft gear
3. Tensioning pulley
4. Oil pump
5. Camshaft gear

The belt (1) is located at the blower end of the engine. It is driven by the crankshaft (2) and driving the camshaft (5) and the externally mounted engine oil pump (4). It is tensioned by the tensioning pulley (3).

The use of a toothed belt, instead of gears, has two main advantages: flexibility of selecting the camshaft location and low noise emission. A reinforced plastic cover protects the drive train. A duct supplies air to the belt for cooling and cleaning, thus extending the life expectancy by 50%.

When replacing the toothed belt on an engine that is still assembled, the following must be removed to have easy access to the belt: rocker brackets, V-belt pulley, dust cover, fuel injection pumps.

The following special tools are required:
1 set locking pins P/N 030 1093
1 tension measuring gauge P/N 030 1095
1 wrench; camshaft gear clamping washer P/N 030 1129

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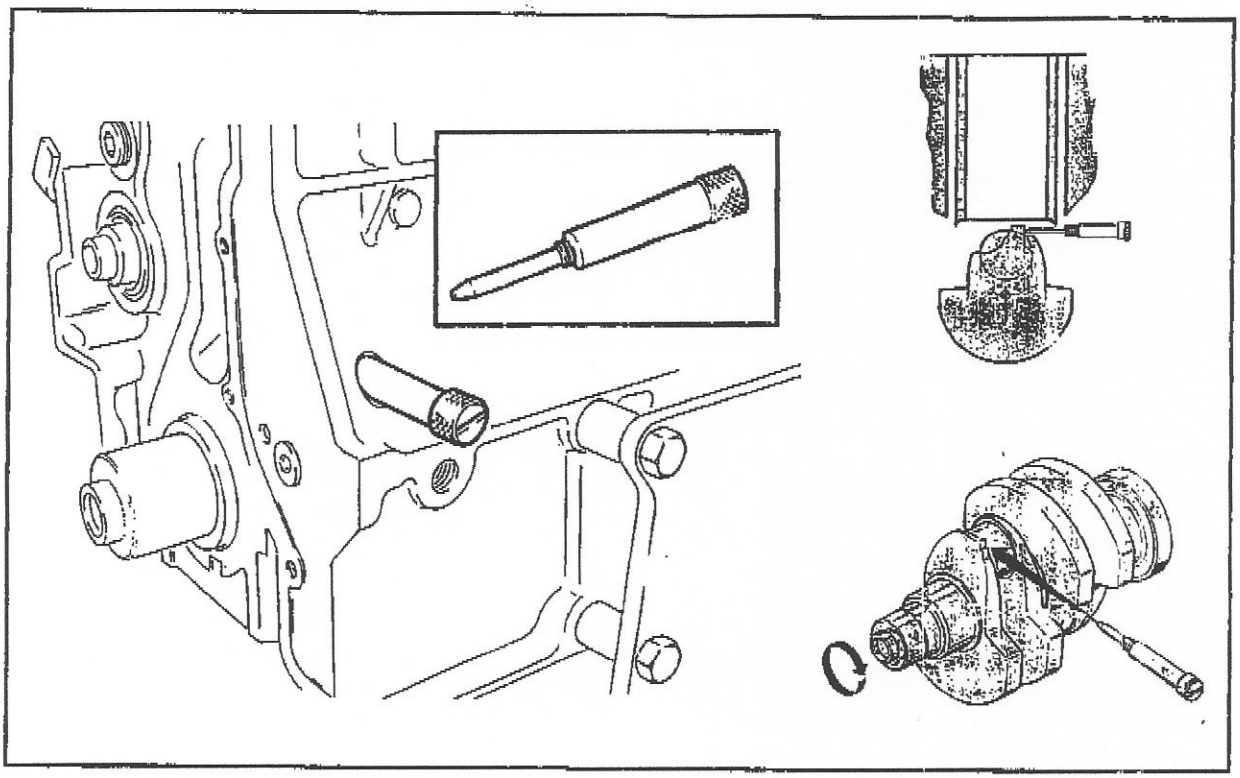

Crankshaft Locking Position

It is necessary to time the camshaft to the crankshaft. This determines the fuel injection timing and valve timing. For this procedure, the crankshaft and camshaft have to be locked into a pre-determined position.

Remove the hex head screw plug from the crankcase located on the right side at the blower end right above the crankcase rim (looking at the engine from the blower end). Turn the crankshaft in rotating direction.

While shining light through the screw plug hole, a machined surface on the crank journal web becomes visible, when turning the crankshaft. Insert the locking pin (special tool) and tighten. Slowly turn crankshaft in rotating direction until it contacts the pin.

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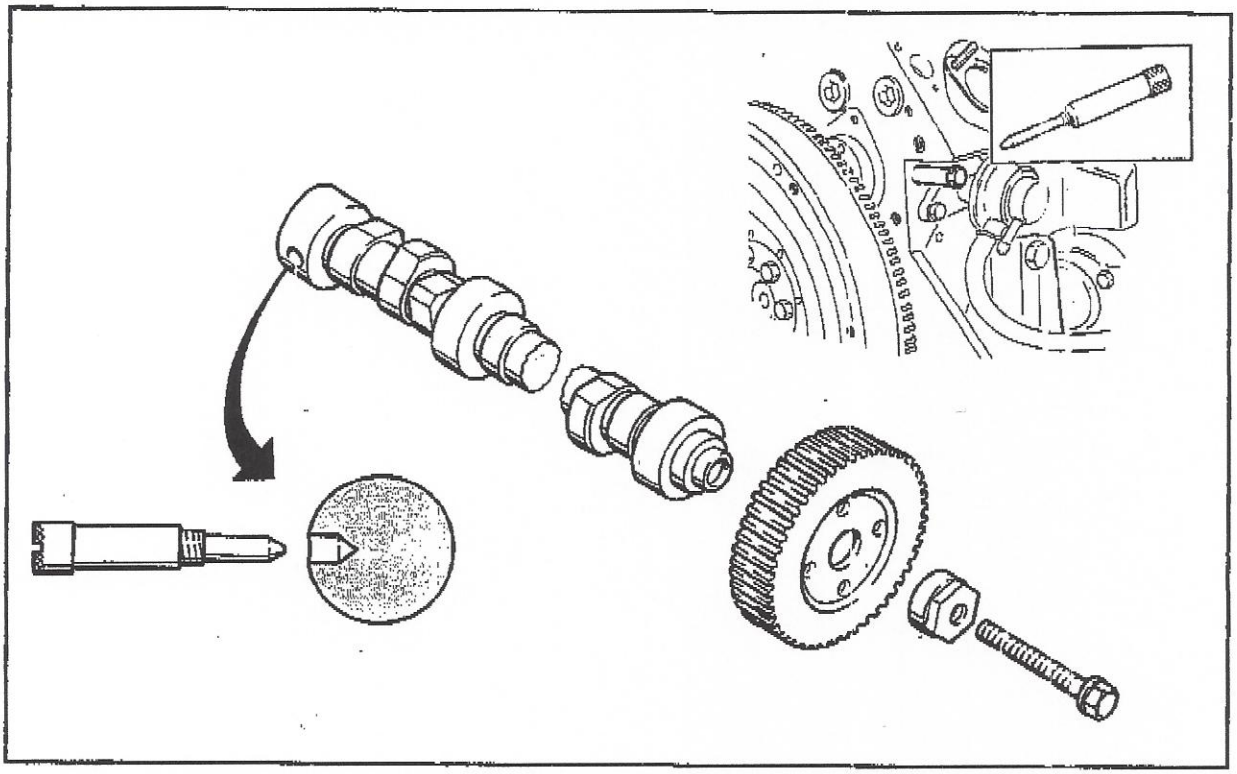

Camshaft Locking Position

To be able to lock the camshaft in its correct position, remove the screw plug at the right side of the crankcase nearest the flywheel end. The plug is located behind the clamping bracket for the cowling cover (the engine should be looked at from the flywheel end).

Shining light through the opening of the crankcase, camshaft journal #1 can be seen. Turn the camshaft until the locating hole becomes visible. It might also be necessary to move the shaft in axial direction to align the locating hole with the bore in the crankcase.

Insert the locking pin and turn it in until it bottoms out against the crankcase.

Both camshaft and crankshaft are timed to each other.

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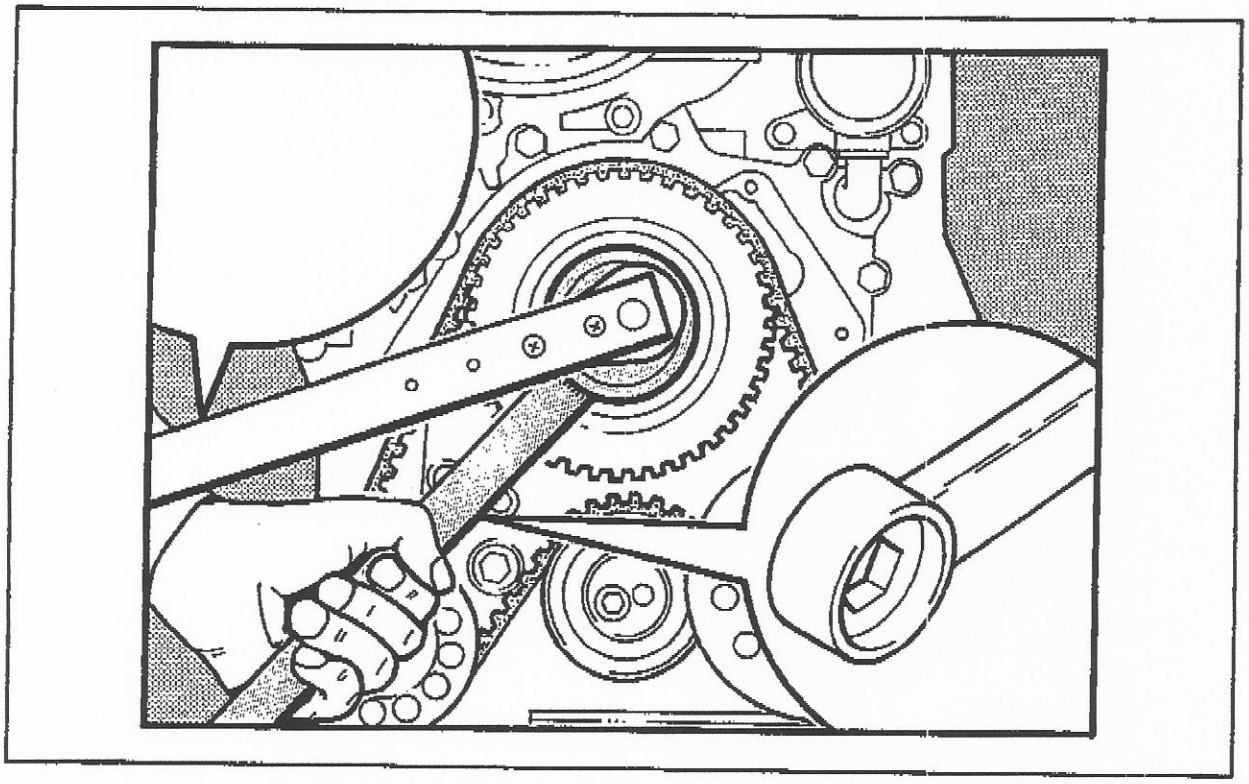

Camshaft Locking Position

Once the camshaft is locked in position, loosen the center bolt that holds the camshaft gear in place.

For safety reasons, use the Deutz special tool to hold the gear clamping washer.

If required, remove gear assembly and clean all parts from oil. All contact surfaces **must** be free of oil and completely **dry**.

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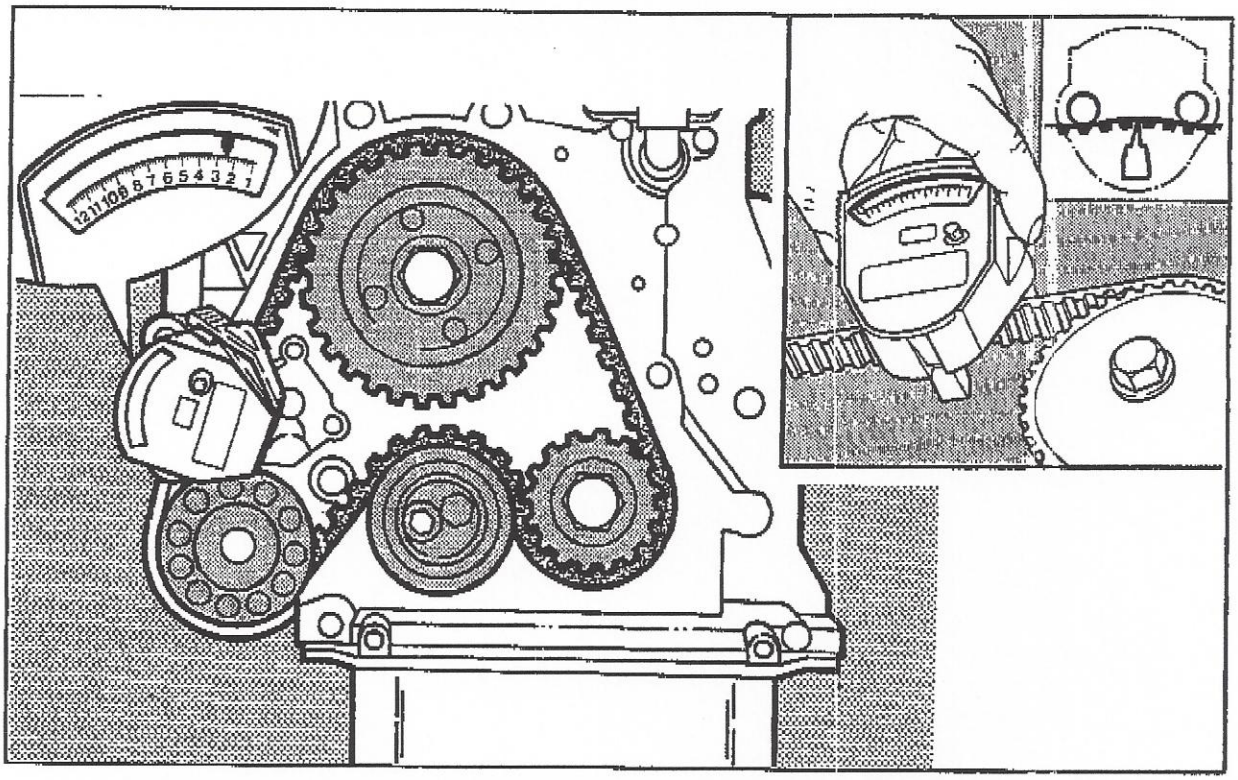

Toothed Belt Installation

Rotate tensioning pulley that the opening for the allen wrench is located towards the oil sump sealing surface. Fit toothed belt to all gears. Equally space the belt around its assembly, i.e. measure the distance from the crankcase surface to the edge of the belt. The spacing should measure 8 - 9mm.

Note: Make sure the crankshaft is resting securely against the locking pin.

Slide tension measuring gauge onto the toothed belt. The procedure should be as follows:

Press the two levers of the gauge together. Push in the button on the gauge and hold. Release the two levers. The measuring device is now tensioned and locked. The belt tension should be measured between camshaft gear and oil pump gear. Slide the instrument onto the belt and make sure that the rollers are flush with the edge and the tensioning finger is between two teeth of the belt.

Press the levers of the gauge together which releases the lock. The gauge is now secure and tight on the belt.

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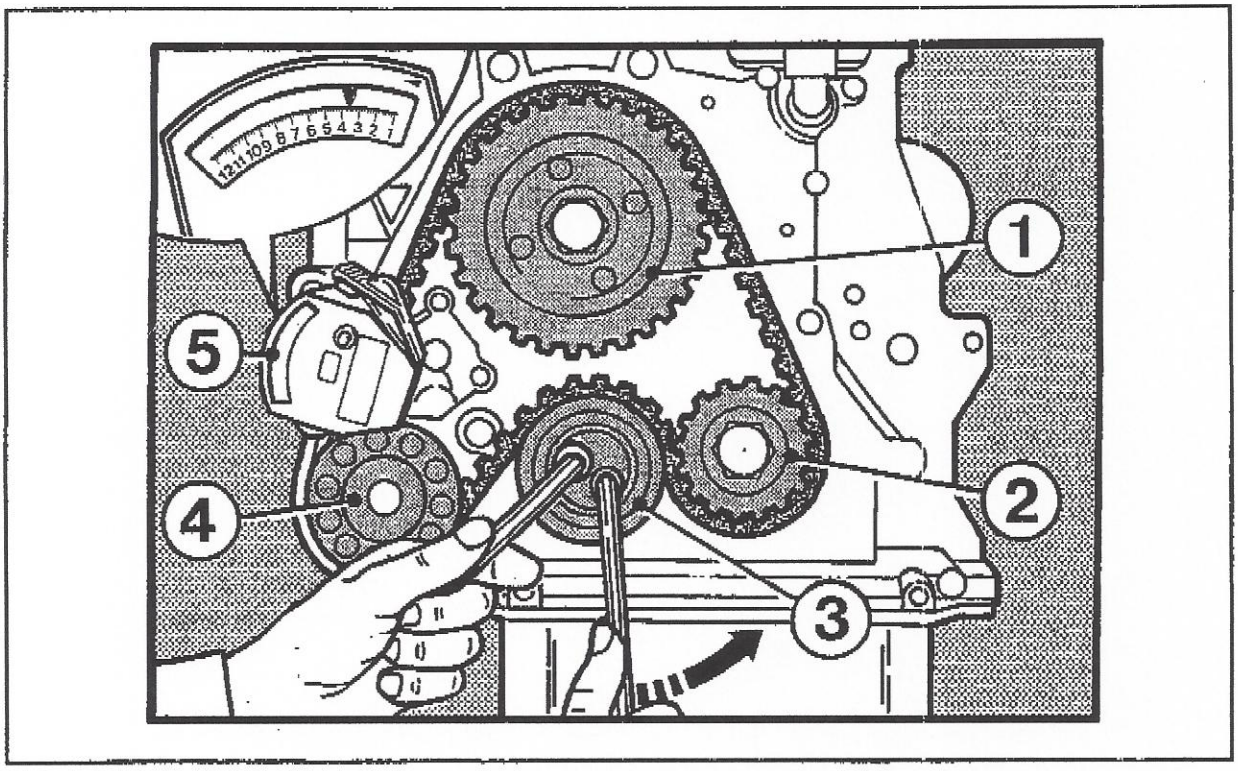

Toothed Belt Tensioning

1. Camshaft gear
2. Crankshaft gear
3. Tensioning pulley
4. Oil pump drive
5. Tensioning measuring gauge

Note: Make sure the belt tensioning device is not touching any engine components, e.g. pump gear, cam gear.

Pre-tension toothed belt. Turn tensioning pulley with the aid of an allen wrench counter-clockwise. Turn until a scale reading of 3-3.5 is achieved.

Tighten the tensioning pulley bolt with 45-49Nm.

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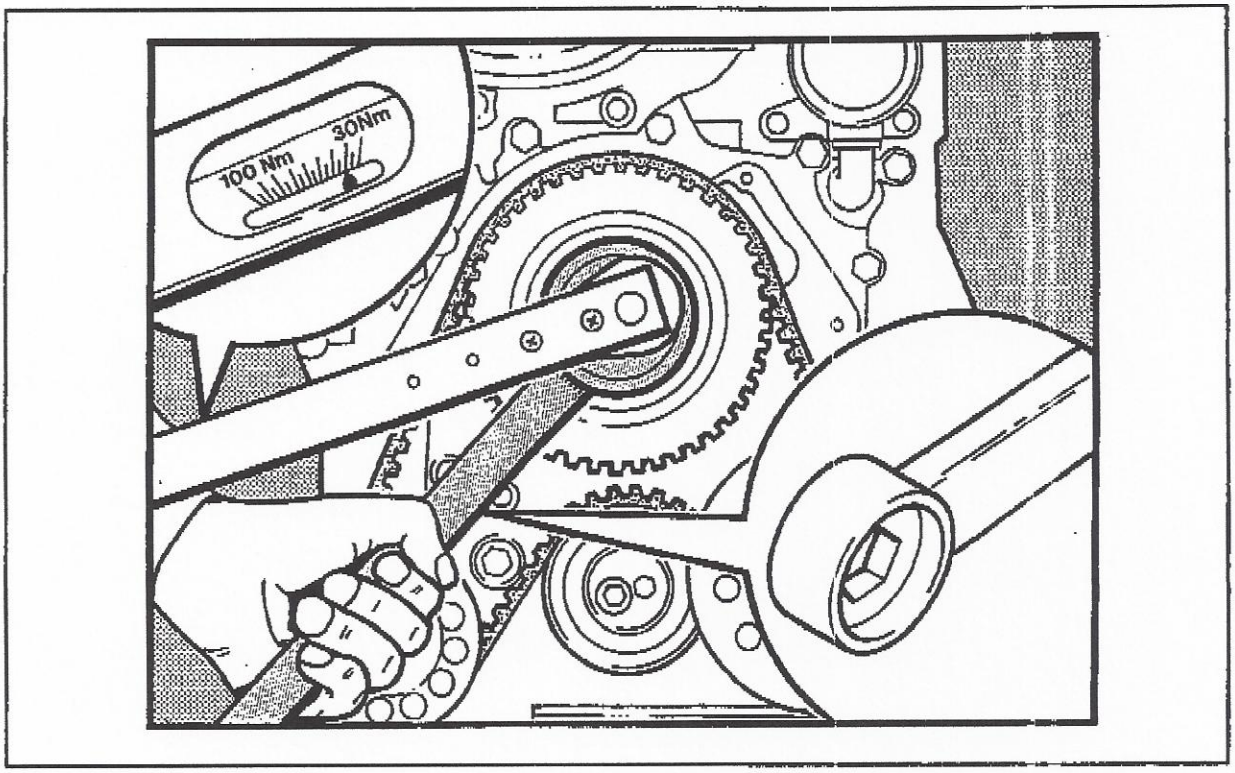

Camshaft Gear Tightening

Hold camshaft gear clamping washer with special tool. Pre-load camshaft bolt with 30Nm.

Note: Pay special attention to the bolt grade.

Tighten the camshaft bolt as follows:

1. Bolt grade 10.9 tighten to 150°
2. Bolt grade 12.9 tighten to 210°

30 Nm

Remove adjusting pins from crankshaft and camshaft. Remove also tension measuring gauge.

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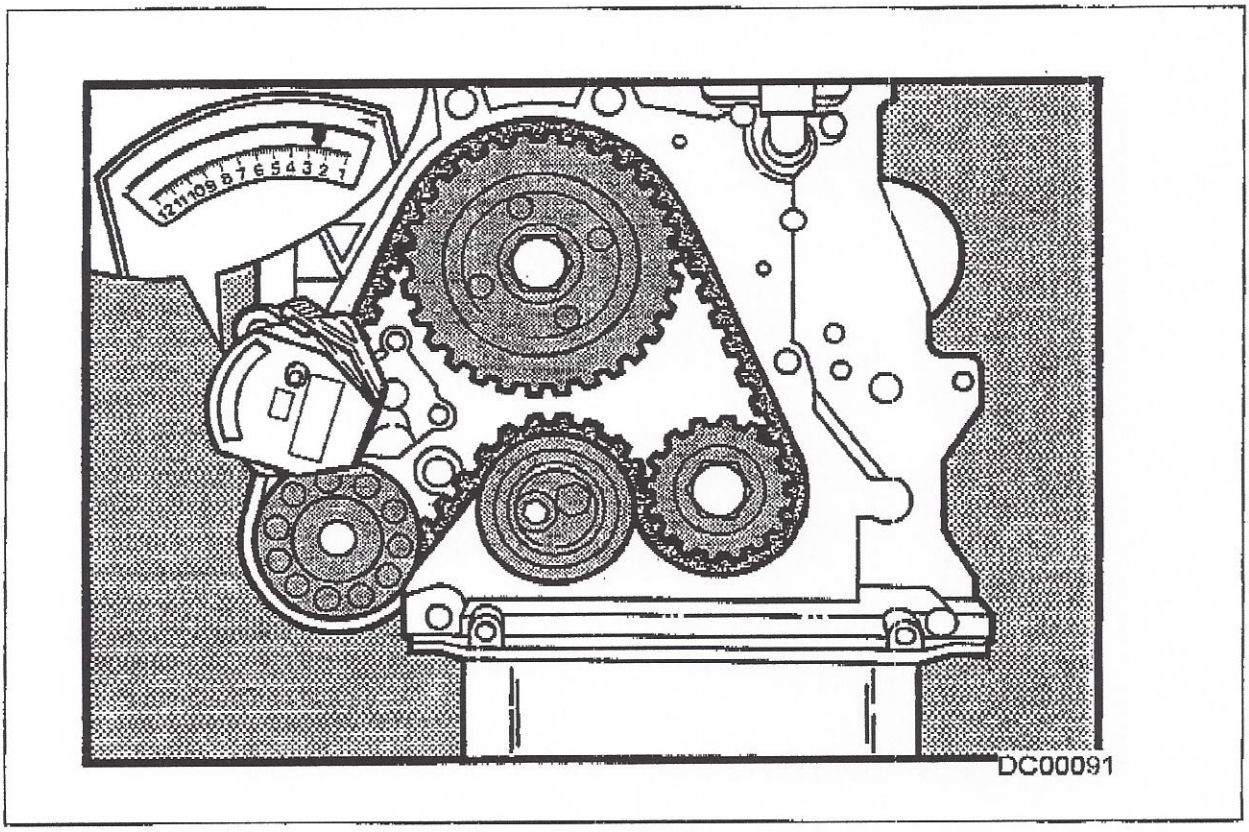

Toothed Belt Tensioning Check

Turn **crankshaft** in rotating direction through **four** complete rotations. Reinstall tension measuring gauge as described earlier. A reading of 6.5 - 9.5 should be obtained. If the scale reading is not obtained, re-adjust the belt tension, following the previous procedure.

Note: A toothed belt, that has been in operation for more than 200 operating hours, **must not** be reused.

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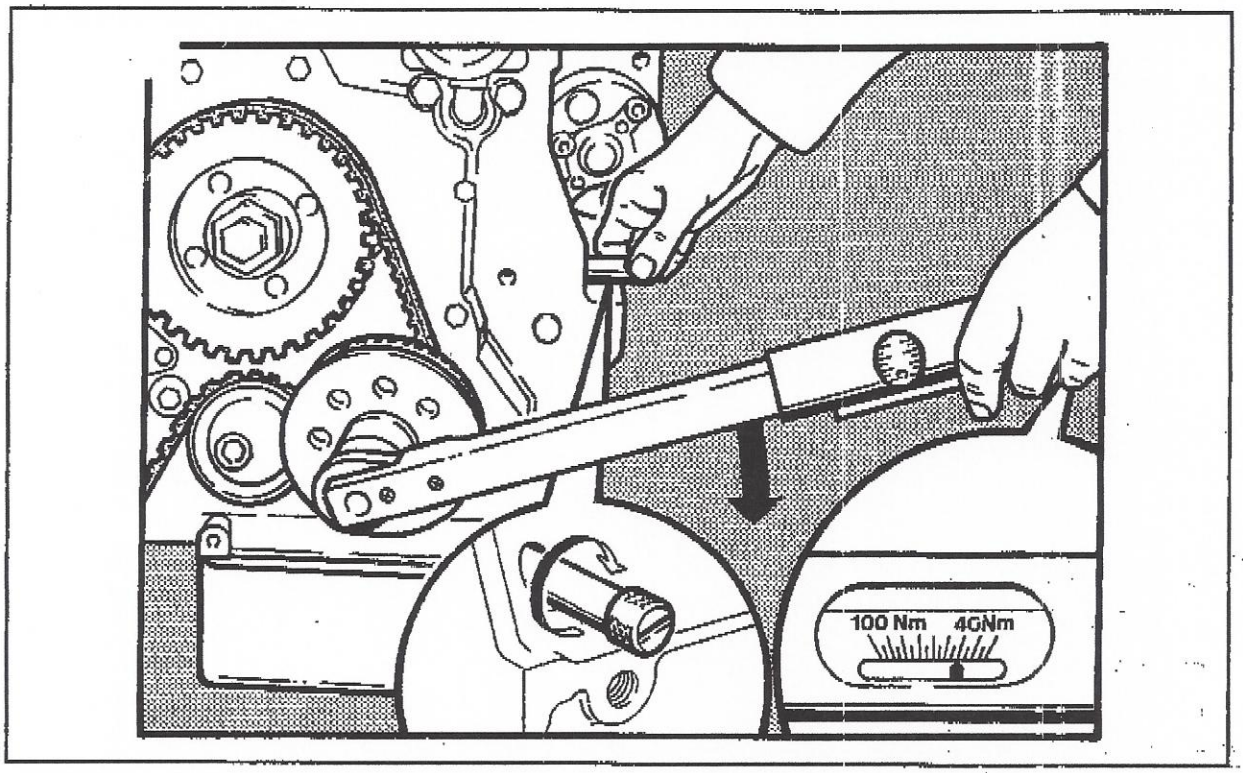

Valve Timing Check

It is necessary that the hex head screw plugs are removed.

Install **camshaft** locking pin and turn it into the crankcase as far as it will go. Attach a torque wrench to the central crankshaft bolt. Apply a torque of 40Nm in the direction of crankshaft rotation. Do not hold the load, slowly release it and remove the torque wrench. Turn the **crankshaft** locking pin into the crankcase until it makes slight contact with the crankshaft. Mark the position of the locking pin. The timing is correct when the pin still can be turned in for ¾ or 2½ turns until it bottoms out. If the pin cannot be turned in that far, repeat all previous procedures. If the checks are within specification, remove both locking pins. Close the holes with the screw plugs, applying new copper seals.

Reassemble engine.