Variable Valve timing unit, checking and adjusting

Special Tools:
999 5451
999 5452

Note: This procedure must be carried out with precision as any deviation could generate a fault symptom.

Installing the crankshaft adjustment tool

- Remove the mounting screws for the starter motor. Pull out starter motor and place it to one side. Remove blind cover plug from the hole for the adjustment tool. Turn the crankshaft clockwise slightly. Install tool 999 5451. Ensure that the tool bottoms out against the cylinder block.

Aligning the crankshaft

- Turn the crankshaft counter-clockwise until it stops against the adjustment tool. Check that the marking on the the crankshaft timing gear pulley corresponds to the marking on the oil pump.
Installing the variable valve timing unit on the camshaft

Note: Some engines have double VVT units/belt pulleys. If this is the case, the method is to be performed on both.

Note: Oil the center screw before installation.

- Press the variable valve timing unit/timing gear pulley onto the camshaft. Do not tighten yet.

- Slacken off, but do not remove the screws (2) which secure the timing gear pulley to the variable valve timing unit.

- Position the upper timing cover.

- Turn the timing gear pulley so that the screws at the oval holes are in the limit position. Continue turning clockwise until the timing gear pulley's marking is 1 tooth before the marking on the upper cover.
- Check that the timing gear pulley is still in the limit position in the oval holes.

- Tighten the center screw (1) in the VVT unit to 120 Nm.

- Check that the variable valve timing unit does not rotate when tightening. Install the center plug and tighten to 35 Nm. Install the belt pulley on the intake camshaft with three screws. **Do not tighten yet.**
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- Turn the timing gear pulley to the marking. Check that the markings on the timing gear pulley/intake camshaft and upper timing cover correspond.

**Installing the timing belt**

Install the belt in the following order:
1. The belt pulley on the crankshaft
2. The idler pulley
3. Cam wheel, intake camshaft
4. Water pump
5. Belt tensioner

- Turn the variable valve timing unit clockwise to the stop.

**Note:** Hold the VVT unit fixed in the limit position clockwise when the belt if fitted.

- Check that the markings on the belt pulley and the upper timing cover align.
- Fix the timing belt over the exhaust camshaft's cam wheel.

**Adjusting the belt tensioner**

**Note:** This adjustment is done on a cold engine. A suitable temperature is approximately 20° C/68° F.

- At higher temperatures (with the engine at operating temperature or a high ambient temperature for example) the indicator is further to the right. The illustration shows the position of the indicator when aligning the timing belt tensioner at different engine temperatures.

**Tension the timing belt as follows:**

- Fix the belt tensioner center screw in position and turn the belt tensioner eccentric counter-clockwise until the tensioner indicator
passes the marked position.

- Then turn the eccentric back so that indicator reaches the marked position in relation to actual temperature.
- At the same time, ensure that the center screw remains fixed. At 20° C/68° F, the indicator should be centered in the window.
- If the indicator is not in the right position, the adjustment must be repeated.

**Note:** The variable valve timing unit must not be released from the limit position until after the timing gear pulleys have been tightened.
- Tighten the screws (2) on the timing gear pulley for the exhaust camshaft to **10 Nm**.
- **Tighten the screws on the intake camshaft to 20 Nm.**

**Remove:** The camshaft adjustment tools **999 5452**. The crankshaft stop **999 5451**.
- Install the plug with a new sealing washer. Tighten to **40 Nm**.

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