

Camshaft seal/variable valve timing (VVT) unit, replacing

Special tools: [999 5452](#) , [999 5651](#) , [999 5719](#) , [999 5718](#) , [999 5474](#) , [999 5451](#) , [999 5919](#) , [999 5450](#)

Note! As the illustrations in this service information are used for different model years and / or models, some variation may occur. However, the essential information in the illustrations is always correct.

Removal

Caution! There are a number of versions of the variable valve timing unit. Therefore it is extremely important to always read the information referring to the engine variant/model year to be remedied.

Removing the camshaft seal

Note! Crankshaft and camshafts must not be turned more than is stated in the method description!

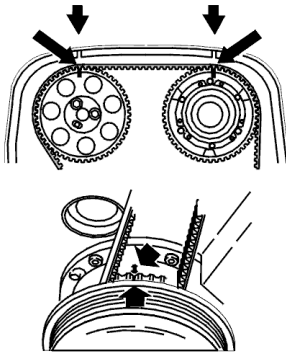
If the shafts are turned in any other way the valves may be damaged.

Remove:

- the cable from the battery negative terminal.
First read [Note when disconnecting/connecting the battery lead](#) .
- the cross stay between the suspension turrets
- the upper timing belt cover
- the cover over the ignition coils
- the inlet hose between the air cleaner (ACL) and throttle body (TB)
- the crankcase ventilation hose from the inlet hose
- place the inlet hose to one side
- the upper engine stabilizer brace
- the camshaft position (CMP) sensor housing
- the trigger wheel
- the rear cover for the intake camshaft
- the servo reservoir and the expansion tank.
Lift them up and place them on top of the engine
- Warning!** Ensure that no power steering fluid is spilled. Extremely flammable.
- the auxiliaries belt
- the front timing belt cover.

Position the engine according to the marking





Raise the car.

Remove:

- the right front wheel
- the nuts for the cover in the fender liner.

Install the upper timing belt cover.

Turn the crankshaft clockwise until the markings on the crankshaft and camshaft pulley correspond.

Remove the upper timing belt cover.

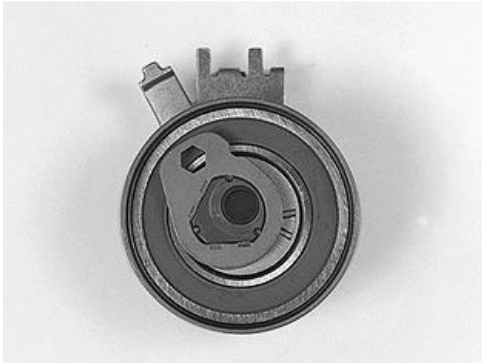
Removing the timing belt

Slacken off the belt tensioner.

Slacken off the center screw for the belt tensioner slightly.

Hold the center screw in place. Turn the tensioner eccentric clockwise to 10 o'clock using a 6 mm Allen key.

Remove the timing belt from the camshaft pulleys.



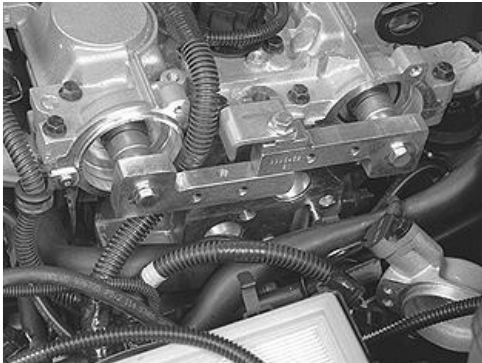
Removing the timing gear pulley with the variable valve timing unit

Use camshaft adjustment tool:

- Install camshaft adjustment tool [999 5452](#) at the rear of the camshafts.

Remove:

- the plug at the front edge of the variable valve timing unit (TORX 55)
 - the center screw in the variable valve timing unit (TORX 55).
- Carefully pull out the timing gear pulley with the VVT unit
- timing gear pulley without VVT
 - the screws and the timing gear pulley.



Replacing the camshaft seal

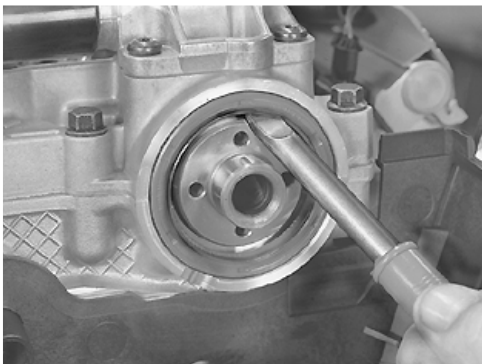
Carefully press in tool [999 5651](#) between the sealing ring and the camshaft.

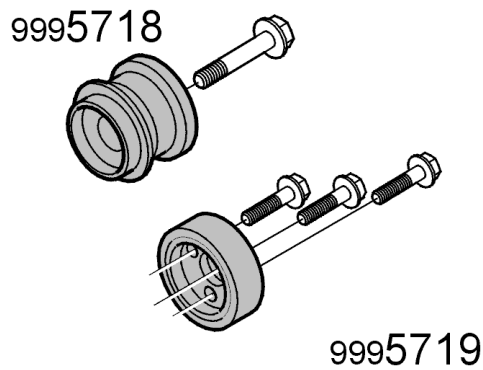
Carefully pry out the seal.

Cleaning

To clean the shaft journal and mating surface, use emery cloth P/N 951 1024.

Note! When cleaning work around the shaft journal, not in and out. It is essential that any residue from the emery cloth and any other contaminants are completely removed before the new sealing ring is installed.





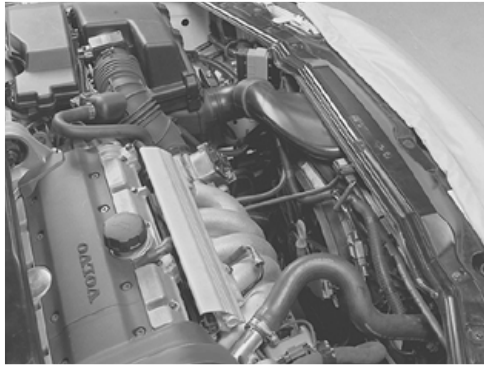
Oil the new seal.

Install the new seal for the exhaust camshaft.

Use drift [999 5719](#) .

Install the new seal for the intake camshaft.

Use drift [999 5718](#) .



Remove the engine cooling fan (FC)

Remove:

- slacken off the brake vacuum hose from the intake
- the air cleaner (ACL) housing intake pipe from the connection above the radiator.
Twist the pipe up
- the manifold absolute pressure (MAP) sensor from the front cover plate
- the evaporative emission system (EVAP) valve from the engine cooling fan (FC) shroud
- release the wiring from the fan shroud.

Lift out the hose for the expansion tank from the holders on top of the fan shroud.

Disconnect both the engine cooling fan (FC) connectors.

- both screws holding the fan shroud.

Carefully lift up the engine cooling fan (FC).

Install radiator protection [999 5474](#) .



Secure the crankshaft position

Install the adjustment tool.

Remove the 3 mounting screws for the starter motor. Place the starter motor to one side.

Remove the blind cover plug and the sealing washer.

Turn the crankshaft clockwise slightly to avoid the adjustment tool being in the wrong position.

Install adjustment tool: [999 5451](#) . Ensure that the camshaft adjustment tool reaches the cylinder block.

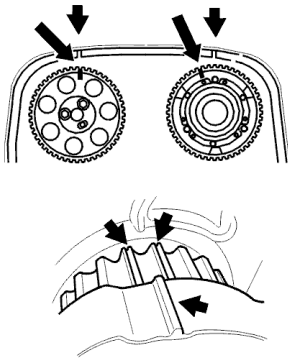
Turn the crankshaft back counter-clockwise until it stops against the drift.

Check that the marking on the crankshaft timing gear pulley corresponds with the marking on the oil pump.

Installation

Note! The purpose of the section, "Installing the VVT unit/timing gear pulley", described here is to ensure that the VVT unit is correctly positioned and to reset the camshaft timing gear pulley to the correct position using the markings made at the factory. This is to ensure that the conditions are correct for any later fault-tracing.

Installing the timing gear pulley for the camshafts. The toothed belt with the Variable valve timing (VVT) unit



Slacken off, but do not remove the screws which secure the timing gear pulley to the VVT unit.

Press the variable valve timing unit / timing gear onto the camshaft.

Install the center screw which secures the VVT unit to the camshaft. Tighten the screw slightly.

Rotate the variable valve timing (VVT) unit counterclockwise to its stop.

Remove the center screw.

Position the upper timing cover.

Turn the timing gear pulley clockwise until the screws at the oval holes are in the limit position.

Continue turning clockwise until the timing gear pulley marking is **1 cog** before the marking on the upper timing cover.

Note! Do not turn counter-clockwise during this procedure!

Check that the timing gear pulley is still in its limit position at the oval holes.

Tighten the center screw for the variable valve timing (VVT) unit. Tighten to **120 Nm**.

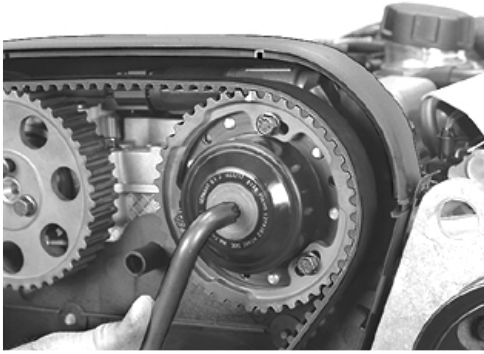
Check that the variable valve timing unit does not rotate when tightening.

Install the center plug. Tighten to **35 Nm**.

Installing the timing gear pulley for the camshafts. Timing gear pulleys without variable valve timing units

Install the timing gear pulley on the intake camshaft with two screws, but **do not tighten**.

Adjust the timing gear pulleys so that the markings on the timing gear pulleys / upper timing cover correspond.



Timing belt, installing

Install the timing belt:

Tighten the center screw on the timing belt tensioner to **5 Nm**.

Turn the variable valve timing unit clockwise to the stop.

Hold the variable valve timing unit secure in the limit position. (As illustrated).

Install the belt in the following order:

- crankshaft
- the idler pulley
- intake cam pulley
- exhaust cam pulley
- water pump
- belt tensioner.

Note! Adjust the timing gear pulleys so that the screws are not at a limit position in the oval holes.

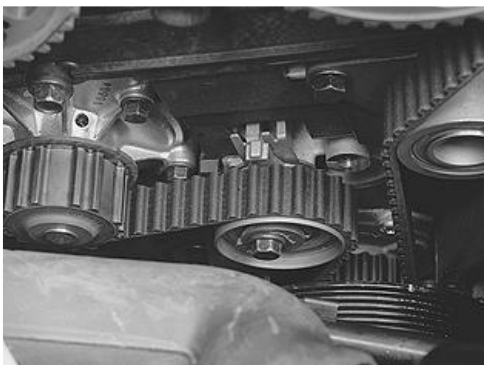
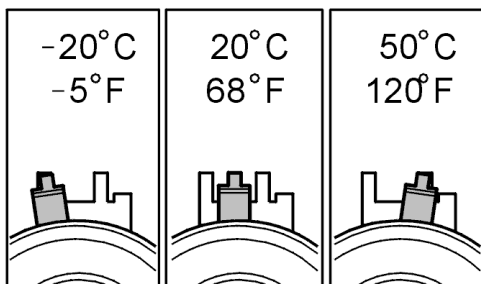
Also check that the markings correspond.

Tighten the timing belt

This adjustment is carried out 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 outside 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 temperatures.



Tighten the timing belt:

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

Note! Check that the variable valve timing unit is in its limit position.

Tighten the 3 screws on the timing gear pulley for the intake camshaft. Tighten to **10 Nm**.

Install the screw missing on the exhaust timing belt pulley.

Tighten the 3 screws on the timing gear pulley for the exhaust camshaft. Tighten to **20 Nm**.

Turn the eccentric back so that the indicator reaches the marked position in the center of the window. Remember to hold the center

screw secure at the same time.
Hold the eccentric secure and tighten the center screw. Tighten to **20 Nm**.
Check that the indicator is in the correct position.

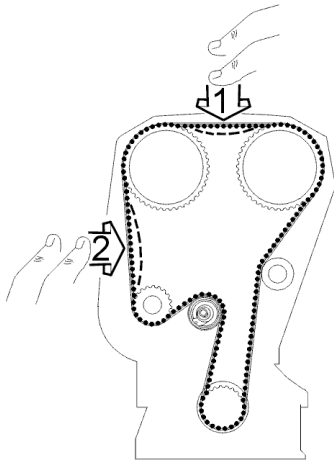
Remove:

- the camshaft adjustment tools
 - the crankshaft stop.
- Install the plug with a new sealing washer.
Tighten to **40 Nm**.

Checking the markings and belt tension

Check:

Press the toothed belt to check that the indicator on the tensioner moves easily.
Install the upper timing belt cover.
Turn the crankshaft 2 rotations and check that the markings on the crankshaft and camshaft pulleys correspond.
Check that the indicator on the belt tensioner is within the marked position.



Reinstall

Install:

- the front timing belt cover. Tighten to **12 Nm**
- the cover over the ignition coils
- the upper timing belt cover
- the auxiliaries belt
- the expansion tank
- the servo reservoir.

Check that the hoses are correctly positioned

- the starter motor. Tighten the screws at the transmission to **40 Nm**. Tighten the screw for the support bracket. Tighten to **25 Nm**.
Remove the radiator protector.

Carefully lower the fan shroud. Align it with the holders at the sides of the radiator.

Tighten both the mounting screws.
Connect the engine cooling fan (FC) connectors.

Press the hose down from the expansion tank into the holder on the fan shroud.

Secure the wiring with tie straps as before.
Press the manifold absolute pressure (MAP) sensor onto the holder at the front cover plate.



Press the evaporative emission system (EVAP) valve into the holder on the fan shroud. Turn down the air cleaner (ACL) intake manifold and locate against the sleeve connector above the air conditioning aggregate.

Install

- the brake vacuum hose
- the trigger wheel.
Tighten to **17 Nm**
- the camshaft position (CMP) sensor housing and a new cover.
Tighten to **17 Nm**
- the torque rod bracket.
Tighten to **50 Nm**
- the inlet hose between the air cleaner (ACL) and throttle body (TB)
- the crankcase ventilation hose on the inlet hose
- the plastic nuts for the cover in fender liner
- the wheel. See [Installing wheels](#)
- the engine stabilizer brace. Tighten the screws at the suspension turrets. Tighten to **50 Nm**. Tighten the engine bracket screw.
Tighten to **80 Nm**
- the cable to the battery negative terminal.
First read [Note when disconnecting/connecting the battery lead](#) .

Checking the engine

Test drive the car to check the function of the engine.

Rear camshaft seal

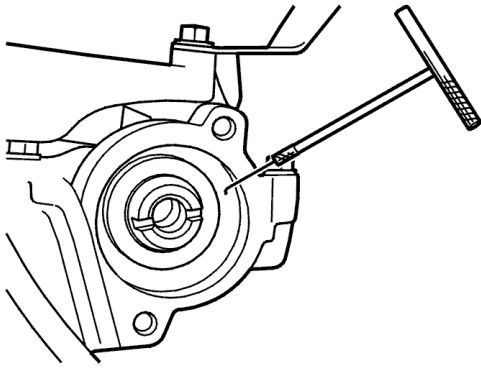
The following components must be removed when replacing the rear camshaft seal:

- the inlet hose between the air cleaner (ACL) and throttle body (TB)
- the crankcase ventilation hose from the inlet hose
- place the air cleaner (ACL) cover to one side
- the cover over the ignition coils
- the upper torque rod bracket
- the camshaft position sensor (CMP) housing and trigger wheel.

Replacing the rear camshaft seal

Pull out the seal. Use puller [999 5919](#) . Use emery cloth 951 1024 to clean the shaft journal and mating surface.





Note! When cleaning work around the shaft journal, not in and out. It is essential that any residue from the emery cloth and any other contaminants are completely removed before the new sealing ring is installed.

Lubricate the surface of the seal that the camshaft rotates against. Install the camshaft seal. Use drift [999 5450](#).

Note! The seal is normally pressed in so that it is level with the internal beveled edge. If the shaft journal is showing signs of wear, the seal can be pressed in 2 mm deeper by turning the drift socket.

Reinstall

Install:

- the trigger wheel.
Tighten to **17 Nm**
- the camshaft position (CMP) sensor housing and a new cover.
Tighten to **17 Nm**
- the torque rod bracket.
Tighten to **50 Nm**
- the cover over the ignition coils
- air cleaner (ACL) cover
- the inlet hose between the air cleaner (ACL) and throttle body (TB)
- the crankcase ventilation hose on the inlet hose

Check the engine compartment. Wipe the engine compartment clean.

Checking the engine

Test drive the car to check the function of the engine.

