

Replacing the camshaft seals / variable valve timing (VVT) unit

Special tools: [951 2050](#) , [999 5450](#) , [999 5451](#) , [999 5452](#) , [999 5651](#) , [999 5718](#) , [999 5719](#) , [999 5919](#)

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

Removing the camshaft seal

The abbreviation VVT stands for:

Variable

Valve

Timing.

Note! Crankshaft or camshafts must not, under any circumstances, be rotated more than is listed below. Failure to follow these instructions may cause damage to the valves.

Remove:

- the cable from the battery negative terminal.

Note when disconnecting/connecting the battery lead .

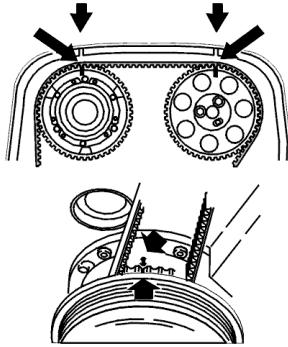
- the charge air pipe over the engine.
Seal the openings.
- the upper camshaft belt cover.
- the cover over the ignition coils.
- lift the solenoid valves away from the air cleaner (ACL) cover.
- the air intake hose for the turbocharger (TC) from the air cleaner (ACL) cover.
Put to one side.
- the upper torque rod bracket.
- the camshaft position (CMP) sensor housing.
- the trigger wheel.
- the rear cover for the intake camshaft.
- the servo reservoir and the expansion tank.
Lift up and place on top of the engine.

Note! Take care not to spill servo oil from the bleed hole in the cap.

Place paper wipe around the reservoir and then cover with a plastic bag as protection. Spilled servo oil is highly inflammable.

- 3 nuts for the cable duct at the right suspension turret.
Lift the duct away from the screws.
- the auxiliaries belt.
- the front camshaft 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 camshaft belt cover.

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

Turn the crankshaft a further 1/4 of a turn clockwise, then back counter-clockwise until the markings correspond.

The markings are illustrated.

Remove the upper camshaft belt cover.

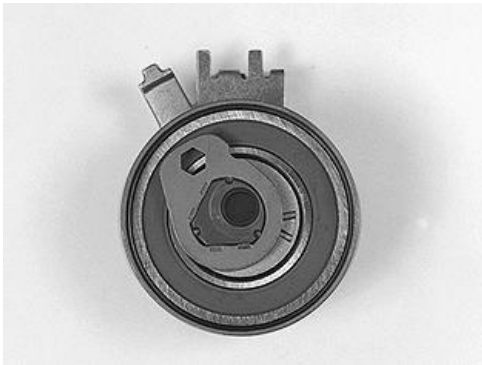
Removing the camshaft belt

Slacken off the belt tensioner.

Slacken off the belt tensioner centre screw slightly.

Hold the centre screw still and turn the tensioner eccentric clockwise with a 6 mm Allen key to "10 o'clock".

Remove the camshaft belt from the belt tensioner, camshaft pulley and idler pulley.



Removing the timing gear pulley with the variable valve timing (VVT) unit

Use camshaft adjustment tool:

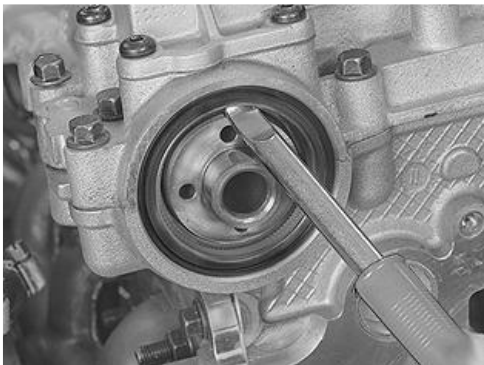
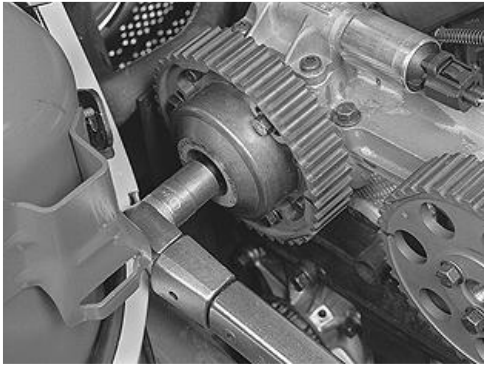
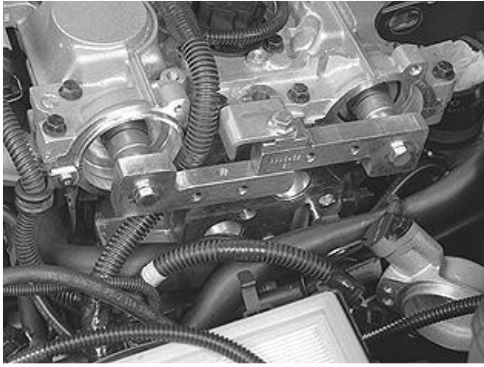
- Install camshaft adjustment tool [999 5452](#) at the rear edge of the camshafts.
- First screw in the part of the tool intended for the exhaust camshaft.



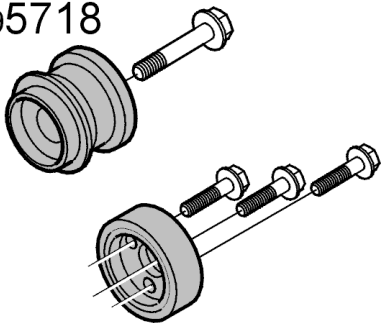
Install the adjustment tools

Screw the camshaft adjustment tools together

- Carefully turn the exhaust camshaft clockwise with the camshaft adjustment tool until the intake camshaft tool can be applied.
- Screw the camshaft adjustment tools together as illustrated.



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Remove the timing gear pulley

Remove

- Exhaust camshaft pulley:

- The plug at the front edge of the variable valve timing (VVT) unit (TORX 55).

The centre screw from the variable valve timing (VVT) unit (TORX 55).

Carefully pull out the timing gear pulley with the variable valve timing (VVT) unit.

Intake camshaft pulley:

Remove the screws and remove the timing gear pulley.

Replace the camshaft seal

Replacing the camshaft seal:

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

Carefully pry out the seals.

Install a new seal:

- Grease the new seal.
- Install the new seal for the intake camshaft using drift [999 5719](#).
- Install the new seal for the exhaust camshaft using drift [999 5718](#).

Remove the engine cooling fan (FC)

Remove:

- detach the brake vacuum hose from the intake.
- the air duct for the control module box and



the air cleaner (ACL) air intake hose.

- the connectors, relays and canister purge (CP) valve from the fan shroud.

Place the wiring to one side.

- the screws for the fan shroud and the relay holder mounting.

Lift up the relay holder and remove the upper hose between the charge air cooler and the intake.

Seal the openings.

Slacken off the screw clip on the throttle body (TB) (electronic throttle module) so that the charge air pipe can be pressed backwards. Press the charge air pipe backward and lift up the engine cooling fan (FC) with its cover. As illustrated.

Secure the crankshaft position

Install the adjustment tool.

Pull the charge air pipe forward

Remove the 3 starter motor screws for the starter motor mounting.

Place the starter motor to one side.

Remove the blind cover plug and the sealing washer.

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

Install crankshaft adjustment tool: **999 5451**.

Ensure that the crankshaft adjustment tool reaches down to 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.

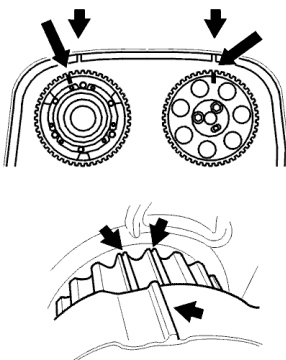
Reinstall

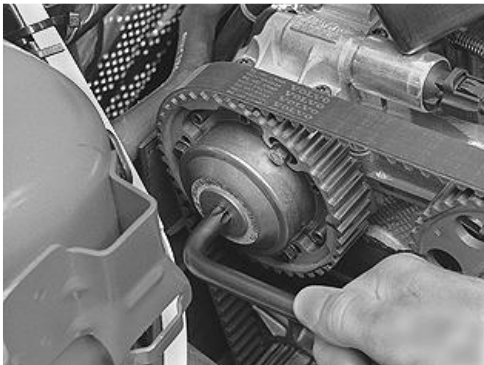
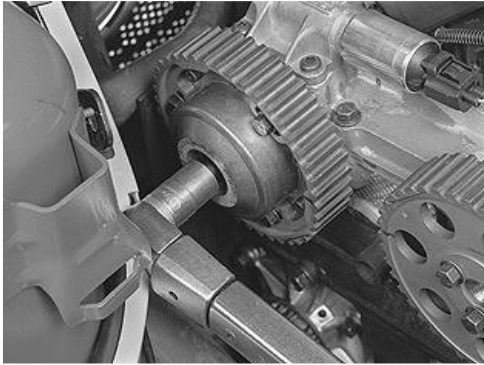
Install the variable valve timing (VVT) unit with the toothed belt pulley:

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

Press the timing gear pulley and variable valve timing (VVT) unit on to the camshaft.

Install the centre screw which secures the variable valve timing (VVT) unit to the





camshaft. **Do not tighten yet!**

Install the upper camshaft belt 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.

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

Tighten the centre screw in the variable valve timing (VVT) unit to **120 Nm**.

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

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

Install the timing gear pulley on the intake camshaft:

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

Check that the markings on the timing gear pulley and the upper timing cover correspond.

Installing the timing belt

Install the timing belt:

Tighten the centre screw on the camshaft belt tensioner to **5 Nm**.

Turn the variable valve timing (VVT) unit clockwise until stop.

Hold the variable valve timing (VVT) unit secure at the clockwise limit position when the belt is being installed.

As illustrated.

Install the belt in the following order:

- Install the camshaft belt over the pulley on the crankshaft.

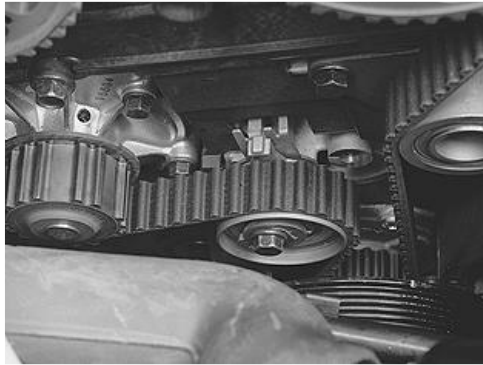
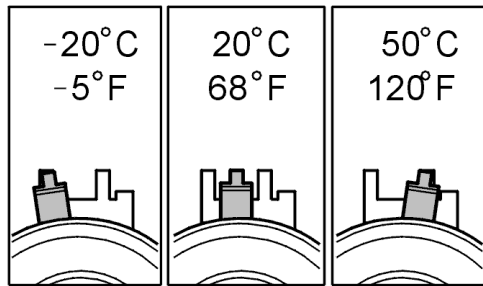
Then install the belt as follows

- 1. Idler pulley.
- 2. Intake cam pulley.
- 3. Exhaust cam pulley.
- 4. Water pump.
- 5. Belt tensioner.

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

Tighten the timing belt

Adjust the belt tensioner:



Note! This adjustment is to be made with a cold engine.

A suitable temperature is 20°C/68°F.

At a higher temperature, for example with a warm engine or a higher ambient temperature, the needle is further to the right.

The illustration shows the needle position when adjusting the camshaft belt tensioner at different engine temperatures.

Tighten the timing belt as follows:

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

Tighten the screws on the exhaust camshaft timing gear pulley to **10 Nm**.

Install the screw missing on the intake camshaft belt pulley.

Tighten the screws on the intake camshaft timing gear pulley to **20 Nm**.

Note! The variable valve timing (VVT) unit must not be released from the limit position until after the timing gear pulleys have been tightened.

Then turn the eccentric back so that the needle reaches the marked position corresponding to the relevant temperature. Remember to hold the centre screw secure at the same time.

At 20°C the needle must be centred in the window.

See the illustration above.

Hold the eccentric secure and tighten the centre screw to **20 Nm**.

Check that the indicator is in the correct position.

As illustrated.

If the indicator is not in the correct position, a new alignment must be carried out.

Remove:

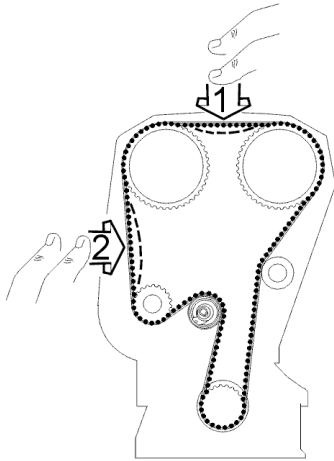
- the camshaft adjustment tools.
- the crankshaft stopper.

Install the plug with a new sealing washer.

Tighten to **40 Nm**.

Checking the markings and belt tension

Check:



- Press the belt to check that the indicator on the tensioner moves easily.
- Install the upper timing belt cover.
- Turn the crankshaft two turns and check that the markings on the crankshaft and camshaft pulley correspond.
- Check that the indicator on the belt tensioner is within the marked area.

Reinstall

Install:

- the front camshaft belt cover.
Tighten to **12 Nm**.
 - the upper camshaft belt cover.
Tighten to **8 Nm**.
 - the auxiliaries belt.
 - the cable duct. 3 nuts.
 - the expansion tank.
 - the servo reservoir.
- Wipe clean.
Check the level and top up as necessary.

Note! Check that the hoses are correctly positioned.

- the starter motor.
Tighten the screws at the gearbox to **40 Nm**.
Tighten the support bracket screw to **25 Nm**
- the engine cooling fan (FC).
- the hose between the charge air cooler and the intake.
Remove the seals.
Tighten the clamp on the charge air pipe at the throttle body (TB).
- screw the relay bracket and the fan shroud into place.
- the canister purge (CP) valve, relays and connectors.
- the air ducts.
- the brake vacuum hose.
- the trigger wheel.
Tighten to **17 Nm**.
- the camshaft position (CMP) sensor housing and a new cover.
Tighten the screws.

- the torque rod bracket.
Tighten to **50 Nm**.
- the upper torque rod.
Tighten to **35 Nm**. Angle-tighten **90 degrees**.
- the cover over the ignition coils.
Tighten to **8 Nm**.
- the charge air pipe over the engine.
Remove the seals.
- the air cleaner (ACL) cover and the intake air hose.
- the solenoid valves on the air cleaner (ACL) cover.
- the cable to the battery negative terminal.
Note when disconnecting/connecting the battery lead.
- The cover in the fender liner.
- The front wheel.

Checking work

Check the engine function by test driving the car.

Wipe clean and check the engine compartment.

Wipe the steering wheel and the gear selector lever.

Replacing the rear seal

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

- the solenoid valves.
Lift out from the air cleaner (ACL) cover.
- the air hose from the air cleaner (ACL) to the turbocharger (TC). Place to one side.
Seal the hose.
- place the air cleaner (ACL) cover to one side.
- the charge air pipe over the engine.
Seal the openings.
- the cover over the ignition coils.
- the upper torque rod bracket.
- the camshaft position (CMP) sensor housing.
- the trigger wheel.

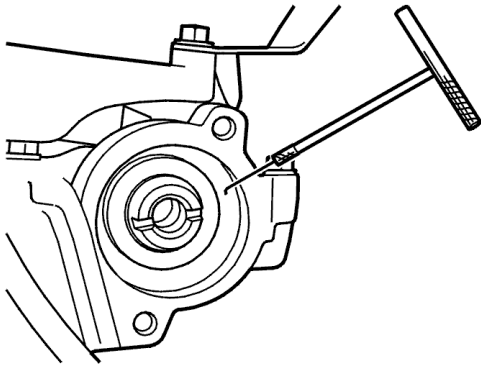
Replacing the rear camshaft seal

Remove and replace the seal:

Carefully pull out the old seal.

Use extractor 999 5919.





Replacing the rear camshaft seal

Install new seals:

Grease and install the new seal.

Use drift [999 5450](#) .

Note! The seal is normally pressed in so that it is level with the internal bevelled 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 **10 Nm**.
- the torque rod bracket.
Tighten to **50 Nm**.
- the upper torque rod.
Tighten to **35 Nm**. Angle-tighten **90 degrees**.
Use bevel protractor: [951 2050](#)
- the cover over the ignition coils.
Tighten to **8 Nm**.
- the charge air pipe over the engine.
Remove the seals.
- the air cleaner (ACL) cover and the intake air hose.
- the solenoid valves on the air cleaner (ACL) cover.
- connect the battery negative terminal. **Note**
[when disconnecting/connecting the battery lead](#) .

Check the engine compartment and wipe it clean.

Checking the engine

Check the engine function by test driving the car.

Wipe the steering wheel and gear selector lever clean.