

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

Special tools:

999 5452 CAMSHAFT ADJUSTMENT TOOL [See: Tools and Equipment\999 5452 Camshaft Adjustment Tool](#)

999 5651 Extractor [See: Tools and Equipment\999 5651 Extractor](#)

999 5719 Drift [See: Tools and Equipment\999 5719 Drift](#)

999 5718 Drift [See: Tools and Equipment\999 5718 Drift](#)

999 5474 RADIATOR PROTECTION [See: Tools and Equipment\999 5474 Radiator Protection](#)

999 5451 ADJUSTMENT TOOL [See: Tools and Equipment\999 5451 Adjustment Tool](#)

999 5919 PULLER [See: Tools and Equipment\999 5919 Puller](#)

999 5450 PUNCH [See: Tools and Equipment\999 5450 Punch](#)

Removal

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 is always correct.

Removing the camshaft seal

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

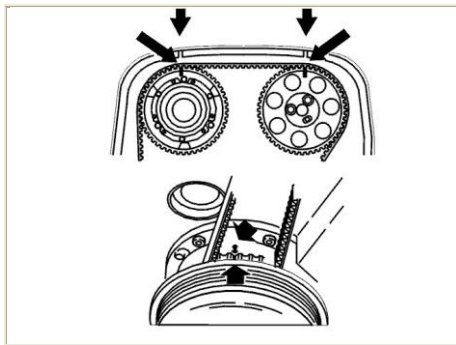


Note! Crankshaft and camshafts must not be turned more than is stated in the method description! If the shafts are turned in any other way the valves may be damaged.

Remove:

- the cable from the battery negative terminal. **First read** Battery, disconnecting [See: Starting and Charging\Battery\Service and Repair\Procedures\Battery, Disconnecting.](#)
- the cross stay between the suspension turrets
- the intake pipe between the air cleaner (ACL) and the front cover plate
- air cleaner (ACL) assembly
- the air intake hose for the turbocharger (TC) from the air cleaner (ACL) cover
- the charge air pipe over the engine. Seal the openings
- the upper timing belt cover
- the cover over the ignition coils
- the upper and lower engine stabilizer brace
- the camshaft position (CMP) sensor housing and trigger wheels
- the power steering fluid reservoir and the expansion tank. Lift them up and place them on top of the engine
- the front timing belt cover.

Aligning the engine according to the marking



Raise the car.

Remove:

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

Install the upper timing belt cover.

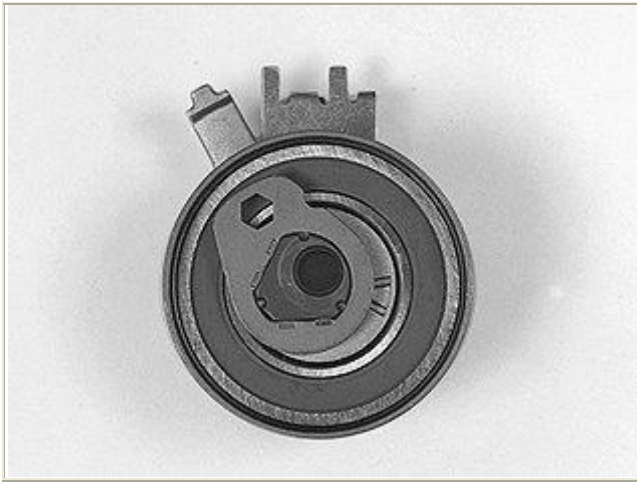
Turn the [crankshaft](#) clockwise until the markings on the crankshaft and camshaft pulley correspond.

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 timing belt cover.

Removing the [timing belt](#)



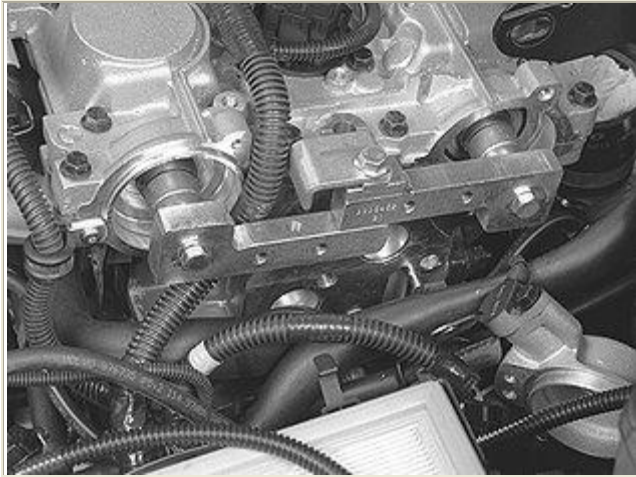
Remove:

- the belt tensioner
- the centre screw for the belt tensioner slightly.

Hold the centre screw still. 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



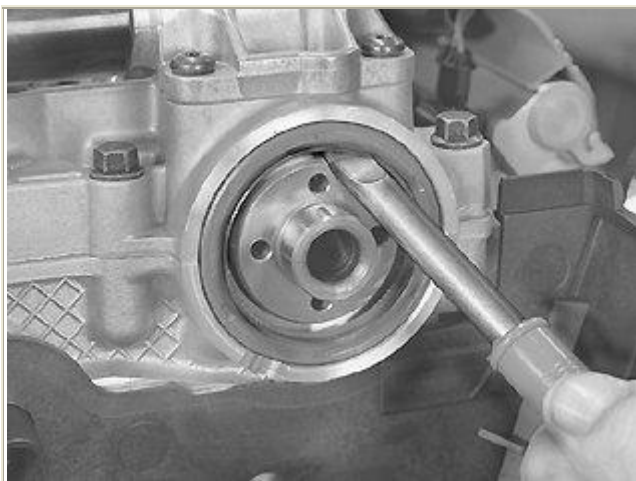
Install [camshaft](#) adjustment tool 999 5452 CAMSHAFT ADJUSTMENT TOOL [See: Tools and Equipment\999 5452 Camshaft Adjustment Tool](#) at the rear of the camshafts.

Screw the adjustment tool sections together into one.

Remove:

- the centre plugs for the variable valve timing units (Tx55)
- the centre screws for the variable valve timing units (Tx55). Pull or work off the variable valve timing units and timing gear pulleys.

Removing the front [camshaft](#) seal



Carefully press in tool 999 5651 Extractor [See: Tools and Equipment\999 5651 Extractor](#) between the sealing ring and the [camshaft](#).
Carefully pry out the seal.

Installation

Note! For tightening torques, see: Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).

Cleaning

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.

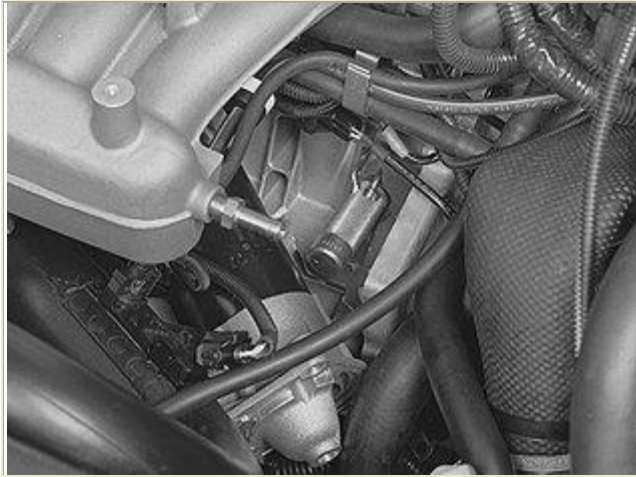
Use emery cloth 951 1024 to clean the shaft journal and mating surface.

Installing the front [camshaft](#) seal



Lubricate the surface of the seal that the [camshaft](#) rotates against.
Install the [camshaft](#) seal. Use drift 999 5718 Drift [See: Tools and Equipment\999 5718 Drift](#). Use the mounting screws for the variable valve timing unit. Tighten until the drift bottoms out.

Installing the [crankshaft](#) adjustment tool



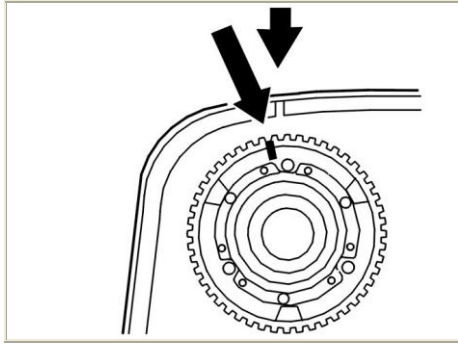
Remove the starter motor mounting screws.
Pull out the starter motor and put to one side.
Remove the blind cover plug from the hole for the adjustment tool.
Turn the [crankshaft](#) clockwise slightly.
Install adjustment tool 999 5451 ADJUSTMENT TOOL [See: Tools and Equipment\999 5451 Adjustment Tool](#). Ensure that the tool bottoms out against the engine block.

Aligning the [crankshaft](#)

Turn the crankshaft counter-clockwise until it stops against the adjustment tool.
Check that the marking on the [crankshaft](#) timing gear pulley corresponds with the marking on the [oil pump](#).

Installing the variable valve timing (VVT) unit on the exhaust [camshaft](#)

Note! The purpose of the "Installing the VVT unit/timing gear pulley" section described here is to ensure that the VVT unit is correctly positioned and to reset the 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.



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

Tighten slightly.

Turn the variable valve timing unit counter-clockwise as far as it will go.

Remove the centre 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 tooth** before the marking on the upper [timing cover](#).

Note! Do not turn anti-clockwise during this procedure.

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

Tighten the centre screw in the VVT unit. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).

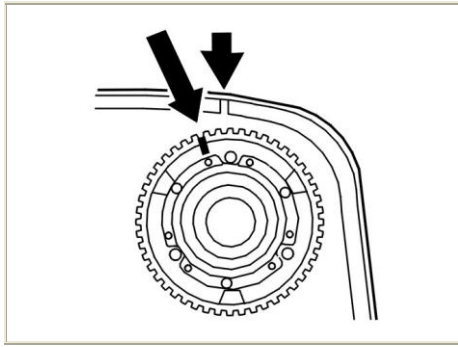
Check that the variable valve timing unit does not rotate when tightening.

Tighten the centre plug. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).

Turn the variable valve timing unit clockwise to the limit position.

Turn the timing gear pulley so that the markings correspond.

Installing the variable valve timing (VVT) unit on the intake [camshaft](#)



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](#).

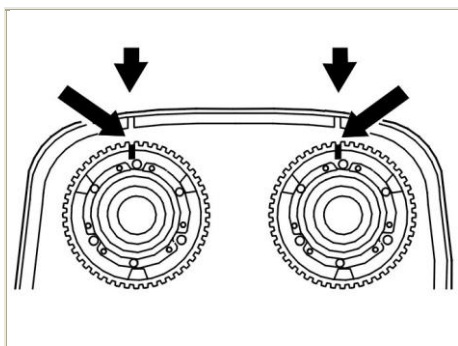
Install the centre screw which secures the variable valve timing unit to the [camshaft](#). Tighten slightly.

Turn the variable valve timing unit counter-clockwise as far as it will go. Remove the centre 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 $1\frac{1}{2}$ cogs before the marking on the upper [timing cover](#).

Note! Do not turn anti-clockwise during this procedure.



Check that the timing gear pulley is still in the limit position in the oval holes. Tighten the centre screw in the VVT unit. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).

Check that the variable valve timing unit does not rotate when tightening. Install and tighten the centre plug. See Tightening torque [See:](#)

[Specifications\Mechanical\Tightening Torque.](#)

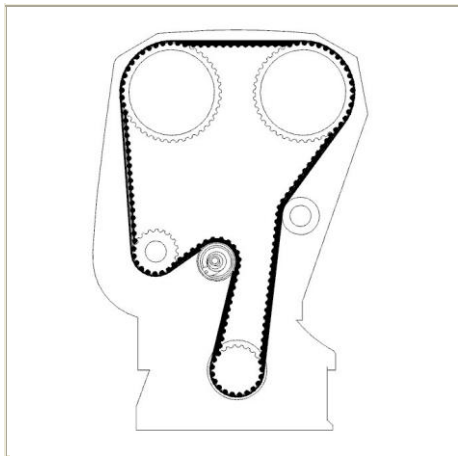
Turn the variable valve timing unit clockwise to the limit position.

Turn the timing gear pulley so that the markings correspond. Remove the upper timing belt cover.

Finishing

Tighten the centre screw for the [timing belt tensioner](#). Tighten to 5 Nm .

Installing the [timing belt](#)

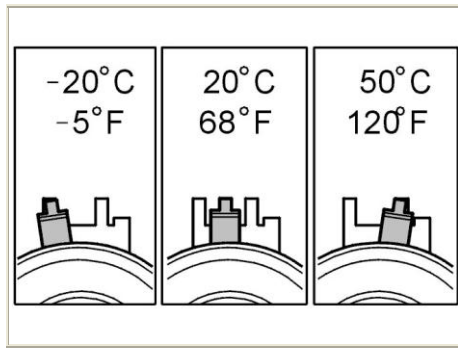


Install the belt in the following order:

- [crankshaft](#)
- the [idler pulley](#)
- intake cam pulley
- exhaust cam pulley
- [water pump](#)
- tension pulley.

Note! The variable valve timing units does not have a return spring and is easily dislodged when reinstalling the [timing belt](#). Check that the markings correspond.

Adjusting the [timing belt](#)



This adjustment is always carried out on a cold engine. A suitable temperature is approximately 20°C/68°F.

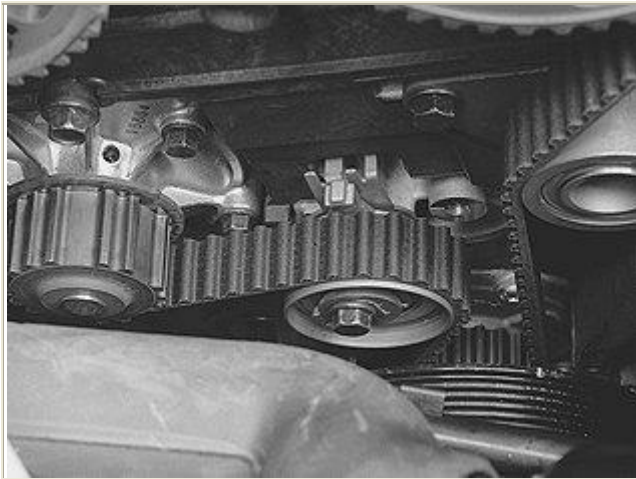
At higher temperatures (with the engine at operating temperature or a high outside temperature for example) the indicator is further to the right.

The illustration shows the position of the indicator when aligning the [timing belt tensioner](#) at different temperatures.

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

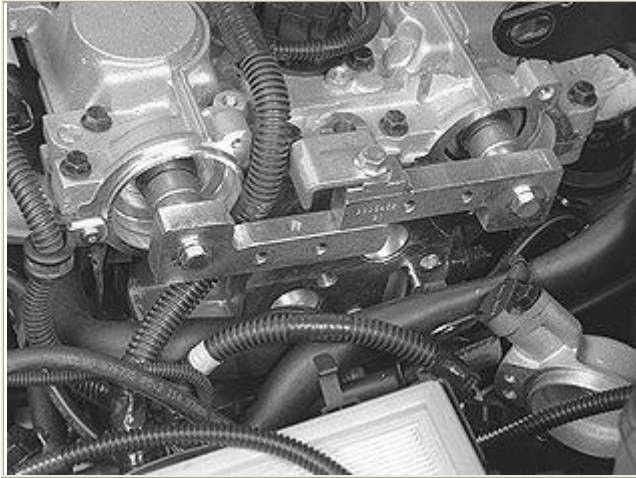
Tighten the 3 screws on the timing gear pulley for the exhaust [camshaft](#). Tighten. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).

Tighten the 3 screws on the intake [camshaft](#) timing gear pulley. Tighten. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).



Note! Check that the variable valve timing units are in the limit position.

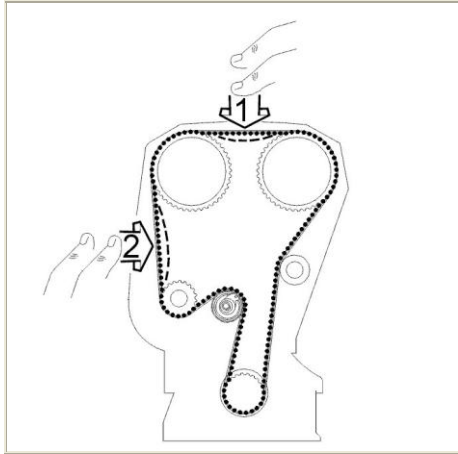
Turn the eccentric back so that the indicator reaches the marked position in the centre of the window. Remember to hold the centre screw secure at the same time. Hold the eccentric secure. Tighten the centre screw. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#). Check that the indicator is in the correct position.



Remove:

- the [camshaft](#) adjustment tools
- the [crankshaft](#) stop. Install the plug with a new sealing washer. Tighten according to Tightening torque [See: Specifications\Mechanical\Tightening Torque](#).

Checking the markings and belt tension



Press the toothed belt to check that the indicator on the tensioner moves easily.

Position the upper [timing cover](#).

Turn the [crankshaft](#) 2 rotations and check that the markings on the crankshaft and camshaft pulleys correspond.

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.

Remove the upper [timing cover](#).

Installing components

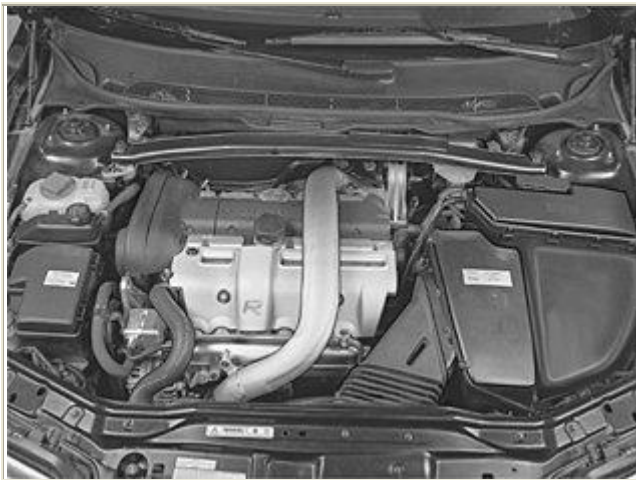
Install:

- the trigger wheel. Tighten the screw
- the camshaft position (CMP) sensor housing. Tighten the screws
- the lower and upper torque rod bracket on the cylinder head. Tighten. See Tightening torque [See: Specifications\Mechanical\Tightening Torque](#)



Install:

- the front timing belt cover
- the cover over the ignition coils
- the upper timing belt cover
- the auxiliaries belt
- the expansion tank
- the power steering fluid reservoir. Check that the hoses are correctly positioned
- the starter motor. Tighten the screws at the gearbox unit. See Tightening torque [See: Specifications\Mechanical\Tightening Torque.](#)



Install:

- the intake air hose between the turbocharger (TC) and the air cleaner (ACL) cover
- air cleaner (ACL) assembly
- the intake pipe between the air cleaner (ACL) and the front cover plate
- the charge air pipe above the engine. Remove the seals
- the engine stabilizer brace
- the cable to the battery negative terminal. **First read** Battery, disconnecting [See: Starting and Charging\Battery\Service and Repair\Procedures\Battery, Disconnecting.](#)

Checking the engine

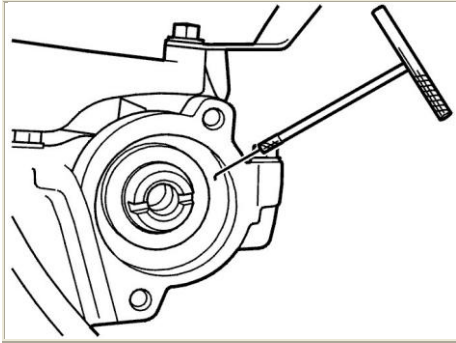
Test drive the car to check the function of the engine.

Rear [camshaft](#) seal**Removing the rear [camshaft](#) seal****Remove:**

- the cross stay between the suspension turrets
- the air hose from the air cleaner (ACL) to the turbocharger (TC). Place to one side. Seal the openings
- the intake pipe between the air cleaner (ACL) and the front cover plate
- air cleaner (ACL) assembly
- the charge air pipe over the engine. Seal the openings

- the cover over the ignition coils
- the upper and lower engine stabilizer brace
- the camshaft position sensor (CMP) housing and trigger wheel.

Removing the rear [camshaft](#) seal



Pull out the seal. Use puller 999 5919 PULLER [See: Tools and Equipment\999 5919 Puller](#).

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 PUNCH [See: Tools and Equipment\999 5450 Punch](#).

Note! The seal is normally positioned at the same level as the internally bevelled edge. If the shaft journal is showing signs of wear, the seal can be pressed in a further 2 mm: Turn the drift socket.

Installing components



Install:

- the trigger wheel. Tighten the screw
- the camshaft position (CMP) sensor housing. Tighten the screws
- the upper and lower engine stabilizer brace
- the cover over the ignition coils
- the charge air pipe over the engine. Remove the seals
- the intake air hose and air cleaner (ACL)
- the intake pipe between the air cleaner (ACL) and the front cover plate
- the engine stabilizer brace. Tighten the screws at the suspension turrets and the screw for the engine bracket. Check the engine compartment. Wipe the engine compartment clean.