Camshafts and camshaft adjuster, removing and installing

Special tools and equipment

3036

3366

T10092

T40011
Removing

Cylinder head installed
Lock carrier must be in service position.

- Remove engine cover -arrows-.
- Remove combination valve for secondary air inlet.
- Disconnect connector -arrow- from camshaft adjuster.
- Remove upper toothed belt guard.

- Set crankshaft to markings for TDC of No. 1 cylinder by turning central bolt on crankshaft sprocket in direction of rotation -arrows-.
- Remove cylinder head cover.
- Thread socket head fastener T1 0092 into tensioner for toothed belt.
- Tension pressure piston of tensioner until piston is secured with pin T4001 1.
- Remove toothed belt from camshaft sprocket.
- Loosen camshaft sprocket (counter hold with 3036).
- Remove camshaft sprocket.
- Remove camshaft position sensor completely.

- Hold camshaft adjuster in position with retainer for chain tensioner 3366.

**Note:** If the retainer for chain tensioner is tightened excessively, this can damage the camshaft adjuster.
- Re-check TDC position of camshafts. Marks on two camshafts must be in line with arrows on bearing caps.
- Clean chain and camshaft sprockets opposite two arrows on bearing caps and mark installation position with color marks.
Distance between two arrows or color markings are 16 rollers on drive chain. Notch on exhaust camshaft is offset slightly toward inside in relation to chain roller -1-.

**Note:** Do not mark chain with a center punch or by making a notch or similar marking.

- Remove bearing caps 3 and 5 on intake and exhaust camshafts.
- Remove double bearing cap.
- Remove both bearing caps next to intake and exhaust camshaft chain sprockets.
- Remove securing bolts for camshaft adjuster.

- Loosen bearing caps 2 and 4 of intake and exhaust camshafts alternately and diagonally, and remove.
- Remove intake and exhaust camshafts with camshaft adjuster.
Installing

- Replace rubber/metal gasket for hydraulic chain tensioner and apply a thin coat of sealant AMV 188 001 02 to shaded area.
- Install drive chain on camshaft sprockets as follows:

When old chain is being re-installed, install so that colored markings are in line -arrows-.
When a new chain is being installed, distance between notches -A- and -B- on camshafts must be 16 rollers on chain. The illustration shows exact positions of 1st and 16th rollers on sprockets. Notch -A- is offset slightly toward inside in relation to chain roller -1-.

- Push camshaft adjuster between drive chain (2nd mechanic required).
- Position camshafts together with drive chain and camshaft adjuster on cylinder head.
- Oil running surfaces of both camshafts.

**Note:** Dowel sleeves for bearing caps and camshaft adjuster must be located in cylinder head.

When installing bearing caps ensure that the identification mark is readable from the intake side of the cylinder head.

- Tighten mountings of camshaft adjuster (watch position of dowel sleeves).
- Tighten bearing caps 2 and 4 of intake and exhaust camshafts in stages and in diagonal sequence (watch position of dowel sleeves).
- Install two bearing caps next to chain sprockets on intake and exhaust camshafts.
- Check correct setting of camshafts:

Two markings on camshafts must be in line with two arrows on bearing caps arrows. 
Distance between two arrows on bearing caps or color markings are 16 rollers on drive chain. Notch on exhaust camshaft is offset slightly toward inside in relation to chain roller - 1 -.

- Remove holder for chain tensioner 3366.

- Slightly coat shaded area of dual bearing cap with sealant AMV 188 001 02 and install bearing cap (observe position dowel sleeves).
- Install remaining bearing caps (watch position of dowel sleeves).
- Replace sealing rings for intake and exhaust camshafts.
- Install camshaft sprocket.
- Note correct installation position: Narrow web of camshaft sprocket faces outward - arrows- and marking for No. 1 is visible from front.
- Install securing bolt for camshaft sprocket (use counter hold tool 3036).
- Install camshaft position sensor
- Install cylinder head cover.
- Align markings on camshaft sprocket with marking on cylinder head cover.
- Align marking on vibration damper with marking on lower part of toothed belt guard.

**Note:** When turning the camshaft the crankshaft must not be at TDC. There is a danger of damage to the valves/piston crown.

- Install toothed belt (adjust valve timing).

**Note:** Observe all instructions on removing and installing the toothed belt.

- Wait about 30 minutes after installing the camshafts before starting the engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

**Tightening torques**

**Tightening Torque (Part 1 Of 2)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing cap to cylinder head</td>
<td>10</td>
</tr>
<tr>
<td>Camshaft adjuster to cylinder head</td>
<td>10</td>
</tr>
<tr>
<td>Camshaft position sensor rotor to camshaft</td>
<td>25</td>
</tr>
</tbody>
</table>

**Tightening Torque (Part 2 Of 2)**
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Camshaft position sensor housing to cylinder head</td>
<td>10</td>
</tr>
<tr>
<td>Camshaft sprocket to camshaft</td>
<td>65</td>
</tr>
</tbody>
</table>