15 – Cylinder Head, Valvetrain

Removal and Installation

Camshafts and Camshaft Adjuster

- Retainer -3036-
- Bracket for Chain Adjustment -3366-
- Sealant, refer to the electronic parts catalog ETKA

Removing

- Bring the lock carrier into service position. Refer to Lock Carrier, Moving into Service Position.
- Remove toothed belt from camshaft. Refer to Toothed Belt, Removing from Camshaft Sprocket.
- Turn the crankshaft at the toothed belt pulley bolt approximately 45° counter-clockwise until the piston is at TDC.
- Loosen the camshaft pulley using the -3036-. 
- Remove the camshaft pulley.

- Disconnect electrical harness connector -arrow- from camshaft adjustment valve 1 -N205-. 
- Remove cylinder head cover. Refer to Cylinder Head Cover. 
- Remove both oil deflectors.
- Disconnect electrical harness connector -arrow- at camshaft position (CMP) sensor -G40-. 
- Remove the camshaft position sensor housing as well as the washer and trim for the sensor.
- Verify camshaft TDC position again:

1. The two camshaft markings must align with both arrows on bearing caps.

**If Using the Old Drive Chain Again:**
- Clean the drive chain and camshaft chain sprockets across from both arrows on the bearing caps and mark installed position with a color marking.
1. The distance between both arrows or colored markings consists of 16 rollers of the drive chain.
1. The notch on exhaust camshaft is slightly offset inward toward drive chain roller -1-.

Do not mark chain using a center punch or similar means!

Using All Chains Again:
Secure camshaft adjuster using -3366-.

If the chain tensioner retainer is fastened too tightly, the camshaft adjuster can be damaged.
– First remove bearing covers 3 and 5 for the intake and exhaust camshaft.
– Remove the double bearing cover.
– Remove both bearing covers on the chain pulleys for the intake and exhaust camshafts.
– Remove mounting bolts of camshaft adjuster.
– Alternating in diagonal sequence, loosen bearing caps 2 and 4 of intake and exhaust camshafts and remove.
– Remove the intake and exhaust camshafts and camshaft adjuster.

Installing

1. The pistons must not be positioned at TDC.

   - Replace the camshaft adjuster bonded rubber seal and lightly coat the coat hatched surface with sealant; sealant, refer to the electronic parts catalog ETKA.

   - Place the drive chain onto the camshaft chain sprockets as follows:

**When Reusing the Old Drive Chain:**
Align color markings -arrows-.

**When Using a New Drive Chain:**

The number of rollers given only serves an aid when positioning the chain on the camshaft.

When positioning the camshafts (with chain) in the cylinder head, make sure the arrows on the bearing caps and the notches on the camshafts align. **The two camshaft markings must align with both arrows on bearing caps.**
Distance between notches -A- and -B- at camshafts must be distance of 16 rollers at drive chain. Illustration shows where first and sixteenth drive chain rollers must be installed on chain gears.

The notch -A- is slightly offset inward toward the chain roller -1-

Using All Chains Again:

- Install the camshaft adjuster between the drive chain (a 2nd technician is needed).
- Install camshafts with drive chain and camshaft adjuster in cylinder head.
- Oil journal surfaces of camshafts.

Alignment bushings for bearing caps and camshaft adjuster must be installed in cylinder head.
When installing bearing caps, verify marking on cap is readable from intake side of cylinder head.

- Tighten the camshaft adjuster; pay close attention to the dowel sleeves while doing this.
– **Tighten bearing covers 2 and 4 for the intake and exhaust camshaft in a diagonal sequence while paying close attention to the dowel sleeves.**

– **Install both bearing covers on the chain pulleys for the intake and exhaust camshafts.**

– **Remove the -3366-**.

– **Check whether the camshafts are correctly adjusted:**

1. **The two camshaft markings must align with both arrows on bearing caps -arrows-**.
So that both markings line up, turn camshaft slightly back or forth, if necessary.
− Lightly coat the hatched surface of the double bearing cap as well as outer bearing cap next to camshaft adjuster with sealant; sealant, refer to the electronic parts catalog ETKA.

− Install the remaining bearing covers; pay close attention to the dowel sleeves.

− Replace the camshaft seals, refer to Exhaust Camshaft Seal and Intake Camshaft Sealing Ring.

− Tighten the remaining bearing covers.

− Install camshaft gear.

1. Installed position: The thin rib on the camshaft sprocket faces outward -arrows- and the TDC marking is visible.
- Tighten the camshaft pulley bolt using the -3036-.
- Install the camshaft position sensor. Refer to 25 -.
- Install cylinder head cover. Refer to Cylinder Head Cover.
- Turn the crankshaft at the toothed belt pulley bolt approximately 45° clockwise until the piston is at TDC.
- Install toothed belt (adjust valve timing) Mount the Toothed Belt.
- Install the ribbed belt. Refer to Ribbed Belt.
After installing the camshafts, the engine may not be started for approximately 30 minutes. The hydraulic adjusting elements must seat themselves (otherwise the valves will seat themselves on the pistons).

After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.

- Install lock carrier with attachments. Refer to Body Exterior: Removal and Installation-50.
- Place the torque support stop on the rubber buffer and tighten the nuts.
- Install front bumper cover. Refer to Body Exterior: Description and Operation-63.
- Check headlamp adjustment. Refer to Maintenance Procedures Rep. Gr. 03.

**Tightening Specifications**

<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 trim to camshaft</td>
<td>25</td>
</tr>
<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>
<tr>
<td>Torque support stop to lock carrier</td>
<td>28</td>
</tr>
</tbody>
</table>

Portions of materials contained herein have been reprinted under license from Volkswagen Group of America, Inc., License Agreement 09507VWA.

Copyright 2011 - 2013 Service Repair Solutions, Inc.