

## Removing and installing camshafts and camshaft adjuster - cylinder head (right-side)

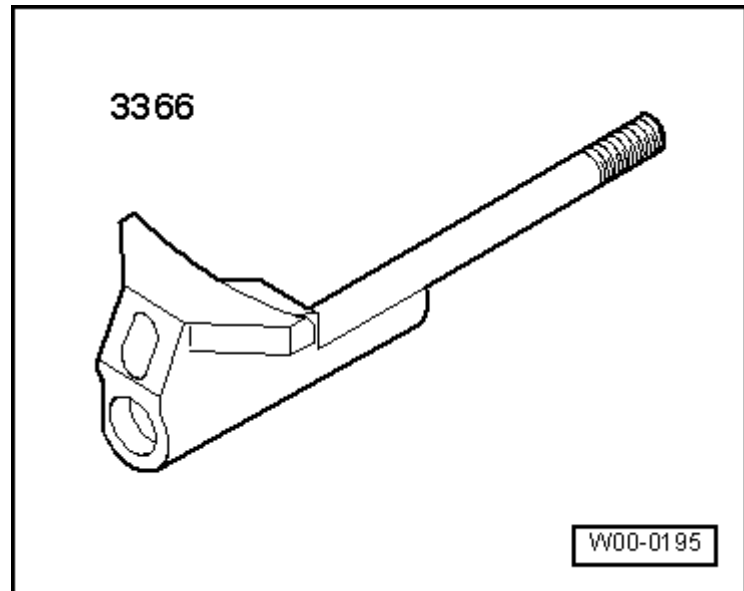


### Note

*There is a basic difference in the procedures for installing the camshaft drive chains on the left and right side cylinder heads. It is important to keep to the correct procedure.*

### Special tools and workshop equipment required

- ♦ Chain tensioner retainer -3366-

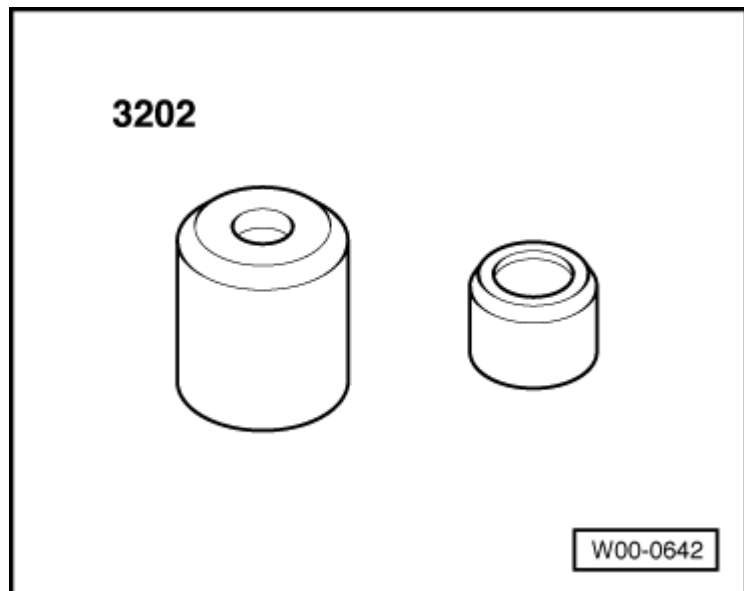


- ♦ Fitting sleeves -3202-

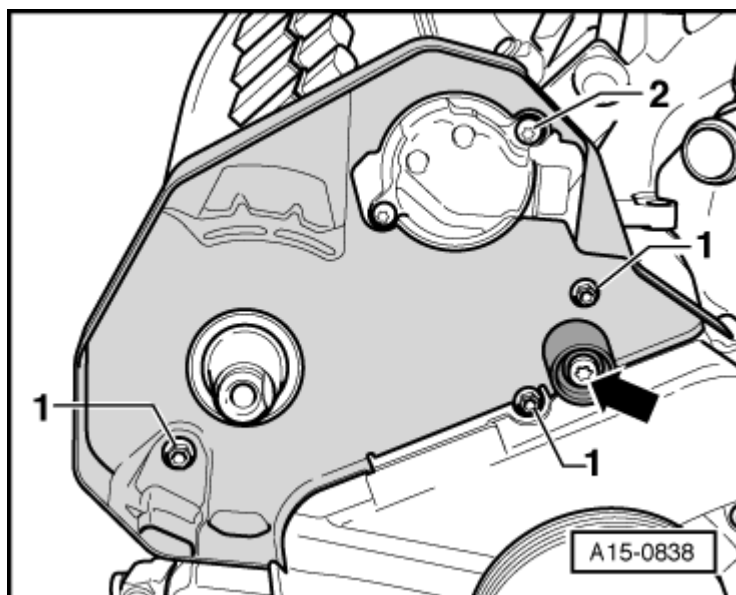
Sealant → [Parts catalogue](#)

### Removing

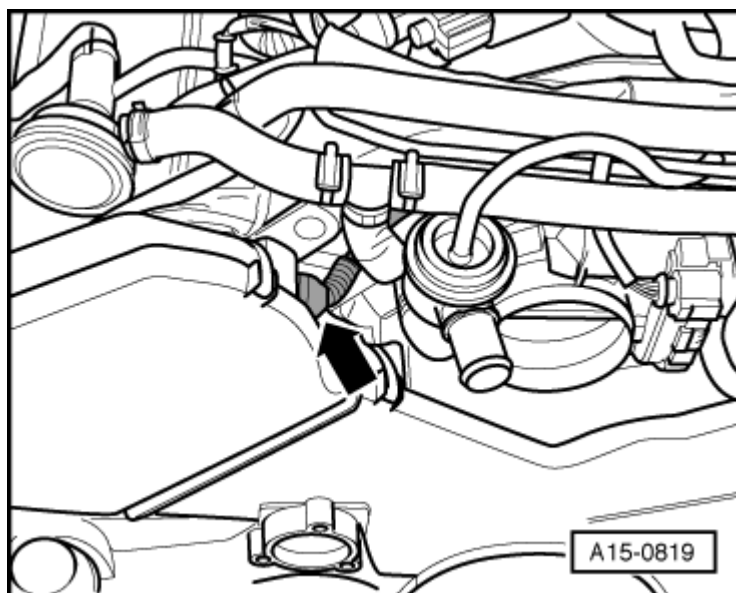
- Remove engine → [Chapter](#).
- Remove toothed belt → [Chapter](#).
- Detach camshaft sprocket.



- Unscrew idler roller -arrow-.
- Remove bolts -1- and -2- and take off toothed belt cover (rear).



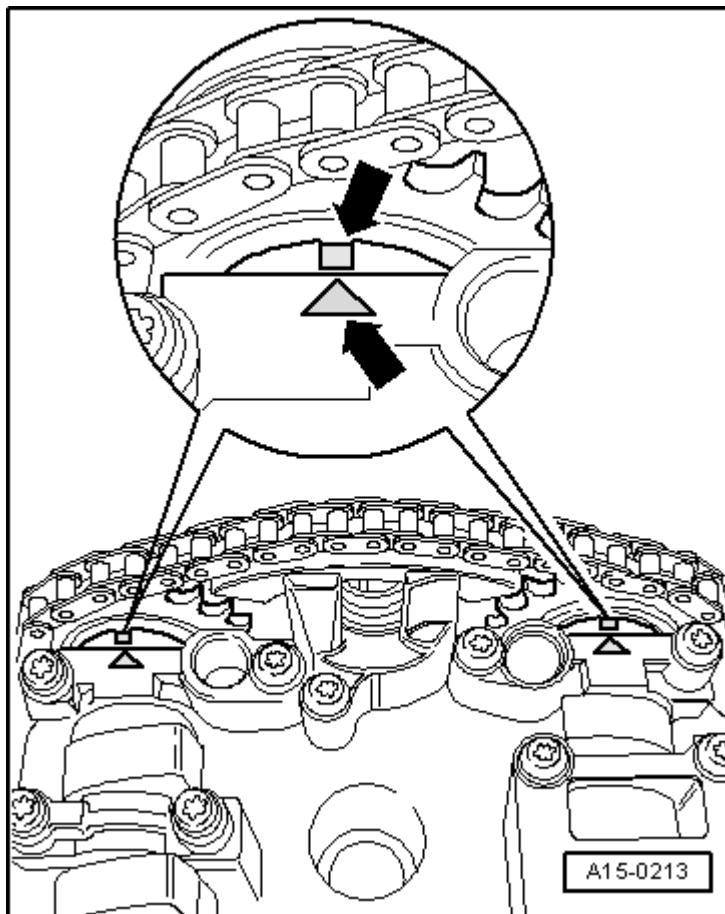
- Unplug electrical connector -arrow- at Hall sender -G40-.
- Remove housing for Hall sender.
- Remove washer and rotor for Hall sender.
- Unplug electrical connector from camshaft control valve.
- Remove cylinder head cover (right-side) → **Chapter**.
- Turn the crankshaft approx. 45° anti-clockwise at the toothed belt sprocket bolt so that all pistons are clear of TDC position.



- Check TDC position of camshafts again:
- ♦ The two marks on the camshafts must be opposite the two arrows on the bearing caps.

**If old drive chain is to be reused:**

- Clean drive chain and sprockets of camshafts opposite the two arrows on the bearing caps and mark installation position with a coloured dot.



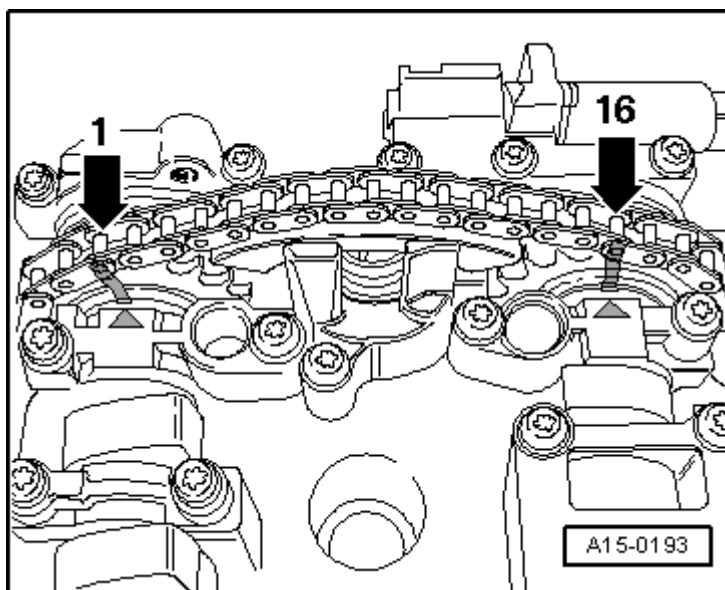
- ♦ The distance between the two arrows (and thus between the coloured markings) is 16 rollers on the chain.
- ♦ Notch on inlet camshaft has a slight inward offset with respect to chain roller -16-.



**Note**

*Do not mark chain with a centre punch or by making a notch or similar.*

**Continued:**

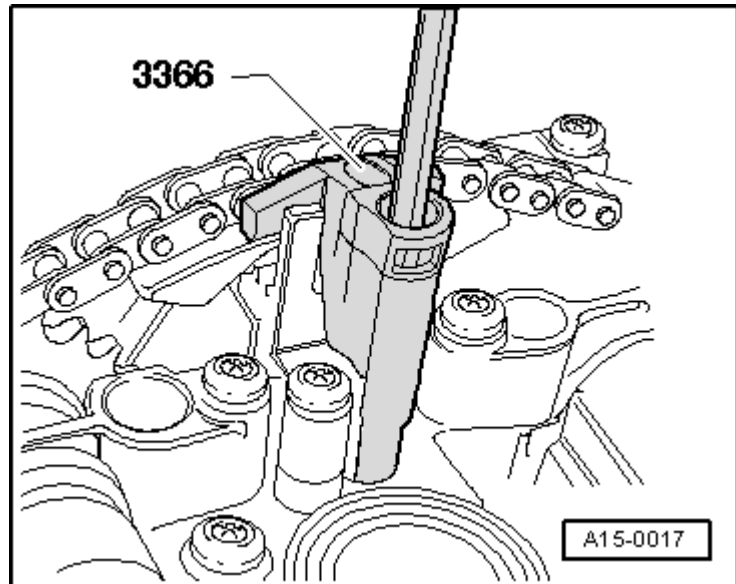


- Hold camshaft adjuster in position with chain tensioner retainer -3366-.

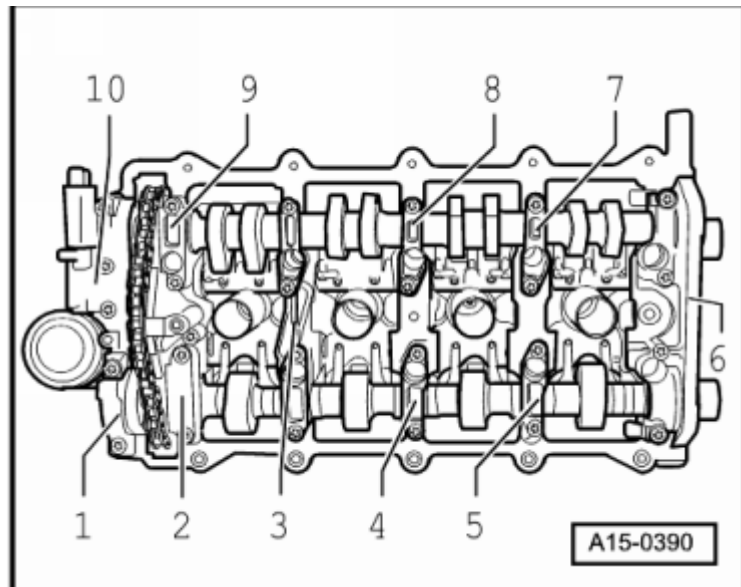


**Note**

*Over-tightening retainer for chain tensioner can damage the camshaft adjuster.*



- Mark the sequence and installation positions of all bearing caps, as shown, regardless of any existing markings on the bearing caps.
- Clean the bearing caps and then use a waterproof felt-tip pen to apply markings.
- Unscrew bolts securing camshaft adjuster -10-.
- Unbolt bearing cap 1.
- Unbolt bearing caps 2, 4, 6, 8, and 9 and place in sequence on a clean surface.
- Slacken off bearing caps 3, 5 and 7 of inlet and exhaust camshafts alternately in diagonal sequence, and remove.
- Lift out both camshafts together with camshaft adjuster.

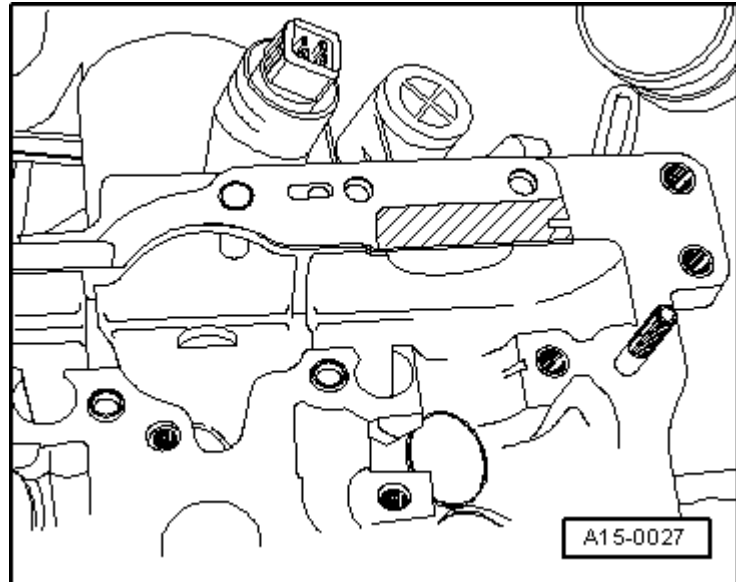


**Installing**

- Renew bolts for camshaft bearings and camshaft adjuster.
- Renew the semi-circular sealing plug.
- Remove all sealant residue from cylinder head and from bearing caps.

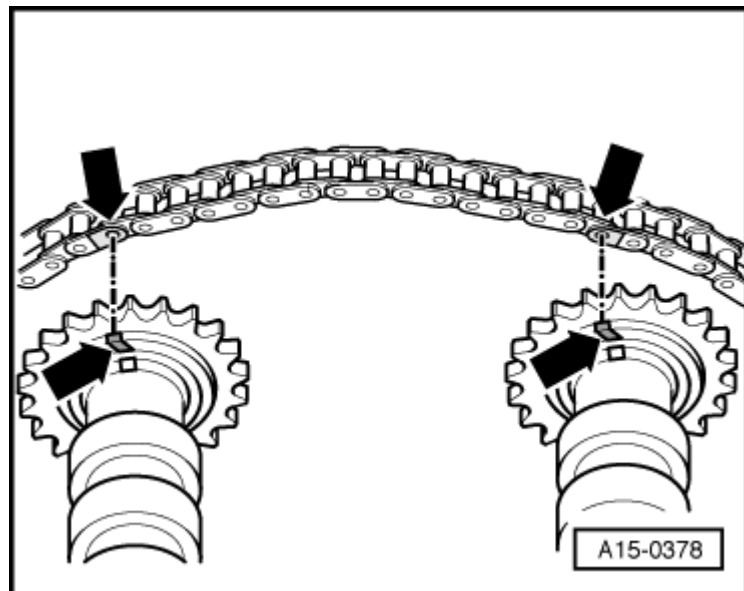
- Renew rubber/metal gasket for camshaft adjuster and apply a thin coat of sealant to the shaded area.
- ♦ Sealant → [Parts catalogue](#)
- Position drive chain on camshaft chain sprockets as follows:

**If old drive chain is being used:**



- ♦ Adjust the colour markings -arrows- so they are aligned.

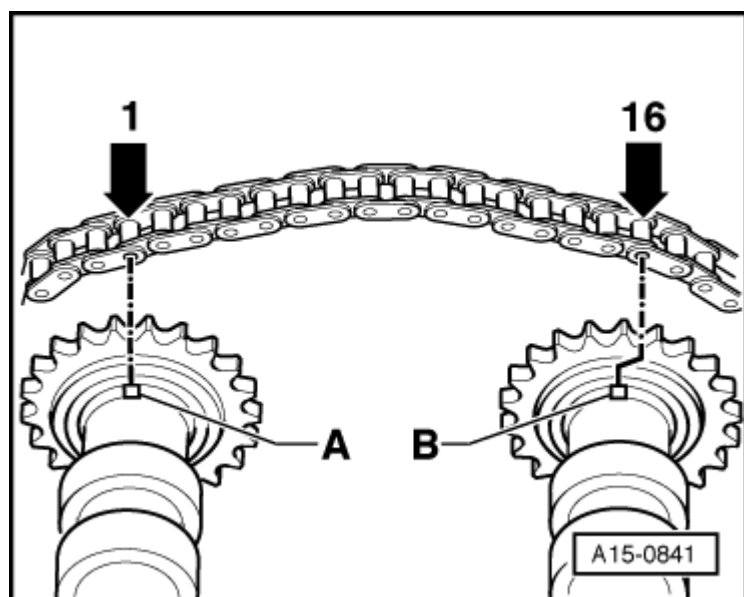
**If new drive chain is being used:**



- ♦ The distance between notches -A- and -B- on the camshafts must be 16 drive chain rollers. The illustration shows the exact positions of the 1st and 16th rollers on the sprockets.
- ♦ Notch -B- is offset slightly towards the inside in relation to chain roller -16-.

**Continued:**

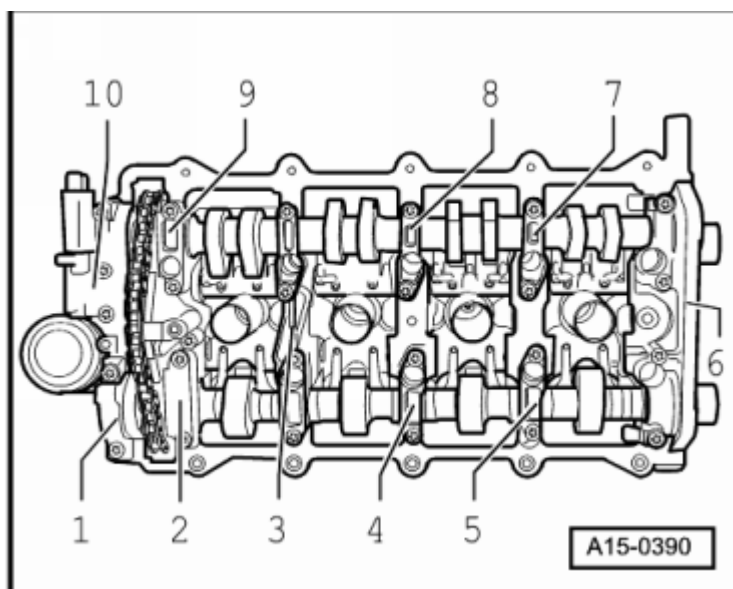
- Insert camshaft adjuster into the chain (2nd mechanic required).
- Insert camshafts with drive chain and camshaft adjuster into cylinder head.
- Oil running surfaces of both camshafts.



**Note**

*Dowel sleeves for bearing caps and camshaft adjuster must be positioned in cylinder head*

- Fit bearing caps 3, 5 and 7 as per marking.
- Tighten bearing caps 3, 5 and 7 on inlet and exhaust camshafts diagonally in alternating sequence.
- Secure camshaft adjuster -10-.
- Remove chain tensioner retainer -3366-.
- Check correct setting of camshafts:

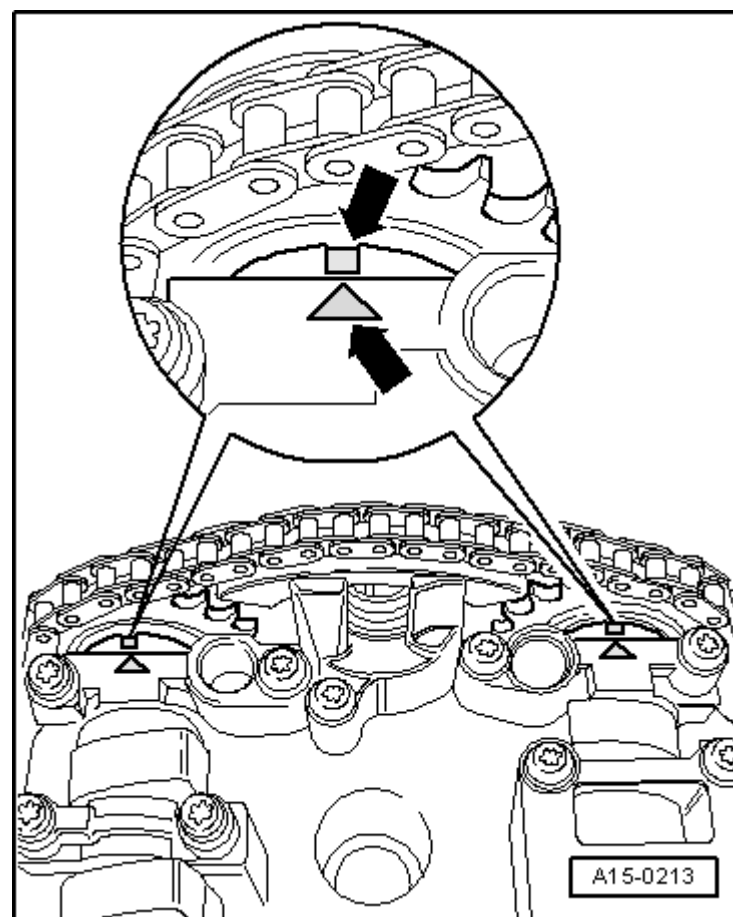


- ♦ The two markings on the camshafts must be in line with the two arrows on the bearing caps -arrows-.



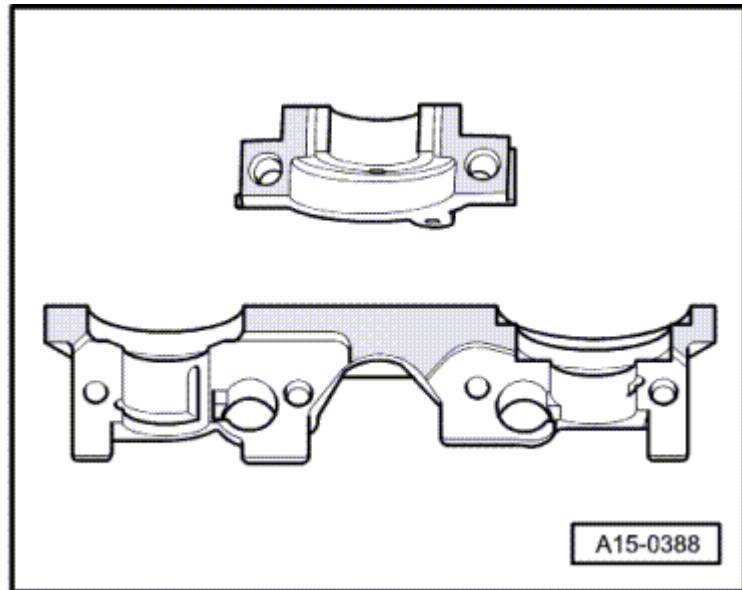
**Note**

*If necessary, turn camshaft slightly backwards or forwards so that the two marks coincide.*





- Apply a small quantity of sealant to the hatched areas on the double bearing cap and the outer bearing cap adjacent to the camshaft adjuster and fit the bearing caps.
- ♦ Sealant → [Parts catalogue](#)
- Fit the remaining bearing caps.
- Renew oil seals for inlet and exhaust camshafts; installing → [Chapter](#), renewing Hall sender oil seal → [Chapter](#).
- Drive sealing cap in carefully using fitting sleeves -3202-.
- Turn the crankshaft approx. 45° clockwise back to TDC at the toothed belt sprocket bolt and secure crankshaft with locking pin.



Perform further installation in reverse order, paying attention to the following:

- Fit toothed belt → [Anchor](#).
- Install cylinder head cover → [Chapter](#).
- Install engine → [Chapter](#).



#### Note

- ♦ *After installing camshafts, wait for approx. 30 minutes before starting 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 by hand to ensure that none of the valves make contact when the starter is operated.*

#### Tightening torques

Component		Nm
Bearing cap to cylinder head		5 + 90° <sup>1)2)</sup>
Camshaft adjuster to cylinder head		5 + 90° <sup>1)2)</sup>
Toothed belt cover (rear) to:	Cylinder head	10 <sup>3)</sup>
	Coolant pump	10
Idle roller to cylinder head		22

- <sup>1)</sup> Renew bolt
- <sup>2)</sup> 90° = one quarter turn.
- <sup>3)</sup> Install using locking fluid; for locking fluid refer to → [Parts catalogue](#).