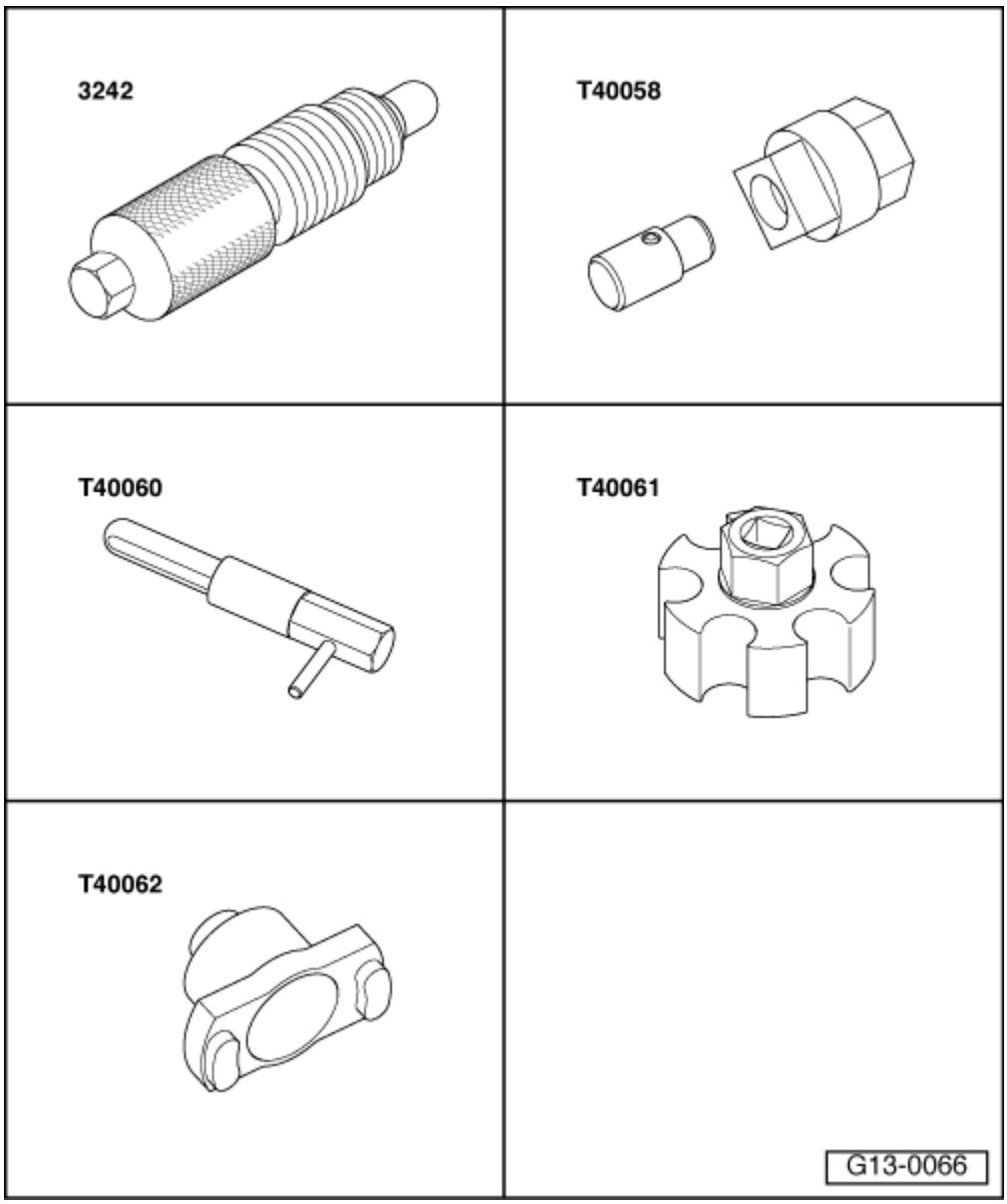
Removing camshaft timing chain from camshafts



Special tools and workshop equipment required

- Locking pin -3242-
- Adapter -T40058-
- 2x Adjustment pin -T40060-
- Adapter -T40061-
- Adapter -T40062-
- Drill bit 3.3 mm Ø (2x)

Note

When working on one cylinder head only, it is not necessary to remove the timing chain cover on the opposite cylinder head as well. In this case it is only necessary to remove the vacuum pump for brake servo or the sealing cap because the timing chain on this cylinder head stays in place.

Removing

- Engine and gearbox in vehicle

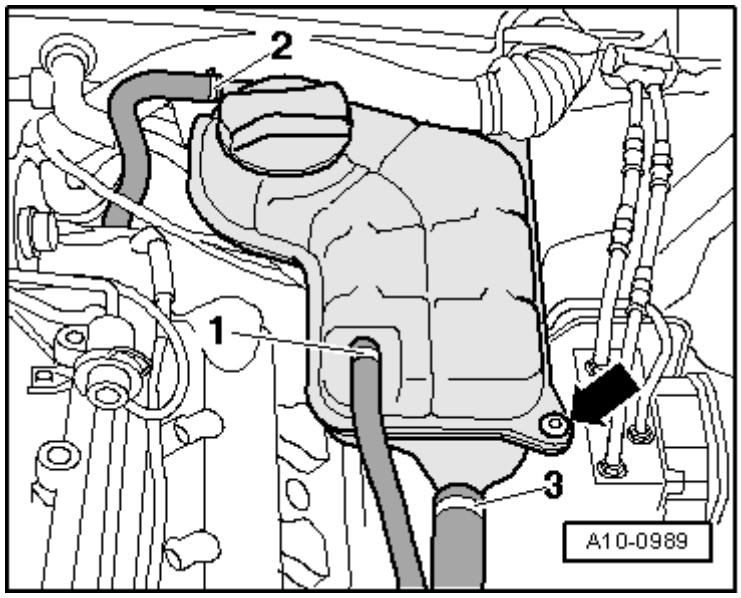
– Drain off coolant → Chapter.

– Remove coolant pipe (rear) → Chapter.

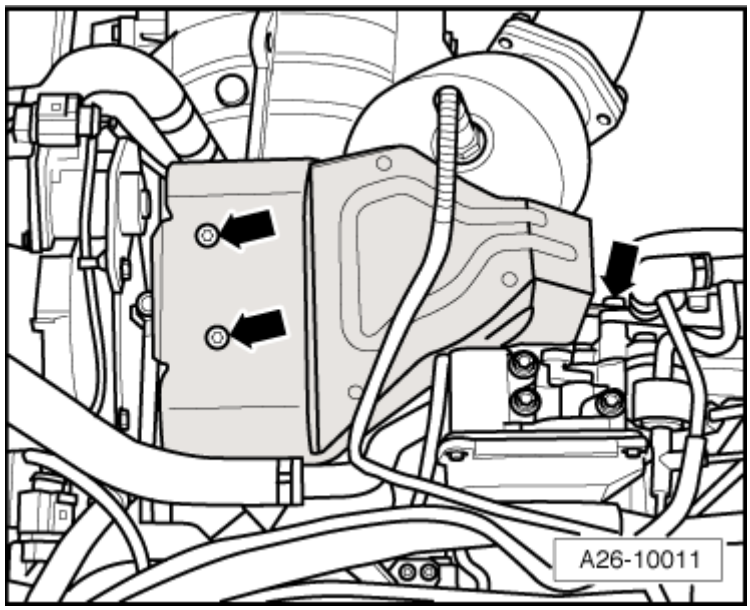
– Unbolt coolant expansion tank -arrow-.

– Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).

– Lay aside coolant expansion tank with coolant hoses -1 … 3- connected.



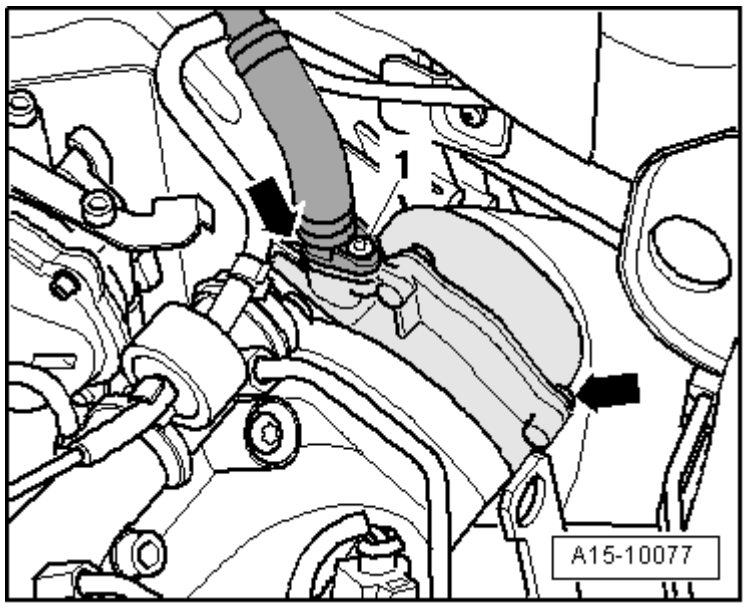
– Remove heat shield for turbocharger -arrows-.



– Unscrew bolt -1- and pull out vacuum hose at vacuum pump for brake servo together with hose connection.

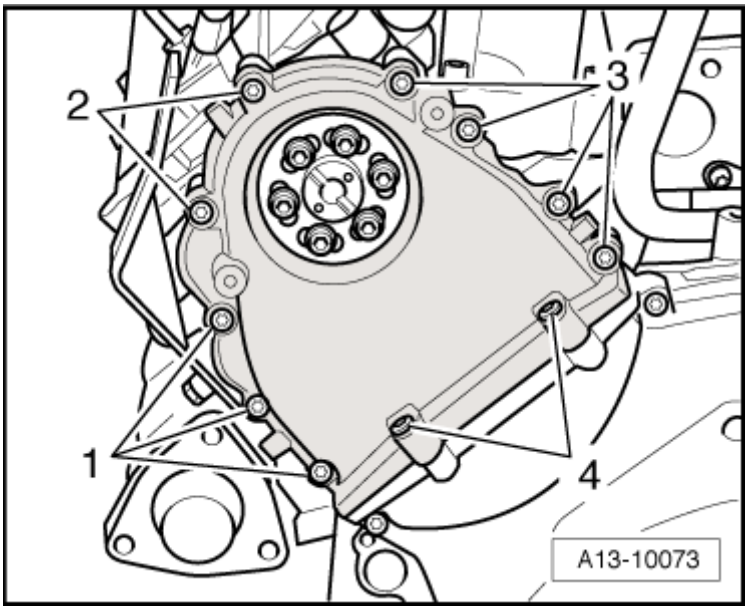
– Unscrew bolts -arrows- and detach vacuum pump for brake servo.

Note

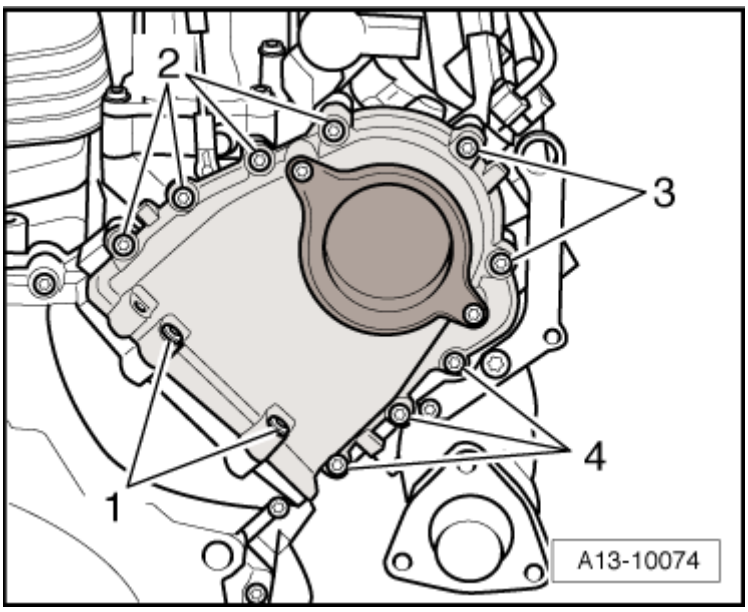


For illustration purposes, the following work on the timing chains is shown from the rear with the engine removed

– Remove bolts -1 ... 4- and detach timing chain cover (left-side).

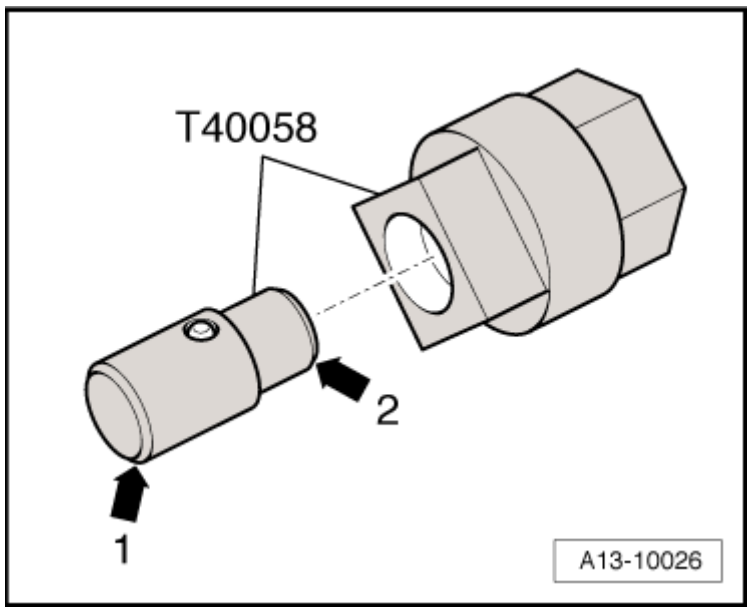


– Remove bolts -1 ... 4- and detach timing chain cover (right-side).



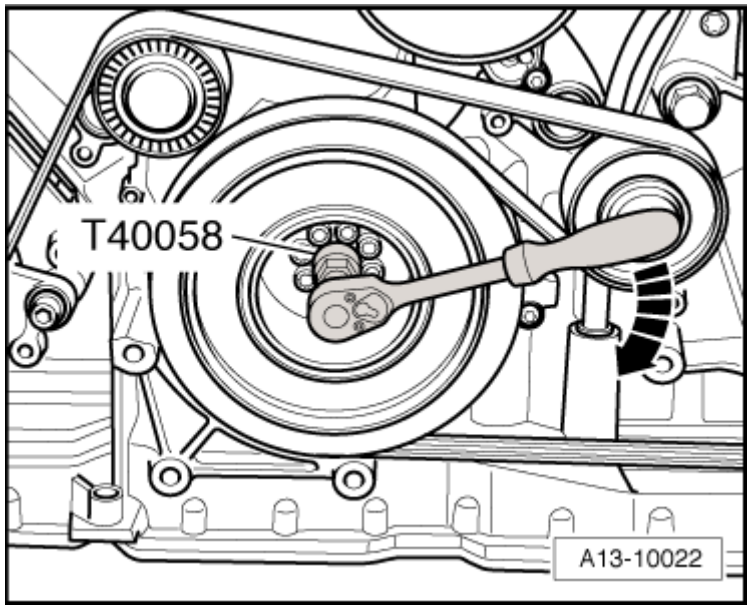
–

Insert guide pin of adapter -T40058- with the larger-diameter section - arrow 1- pointing towards the engine. The smaller-diameter section -arrow 2- faces the adapter.

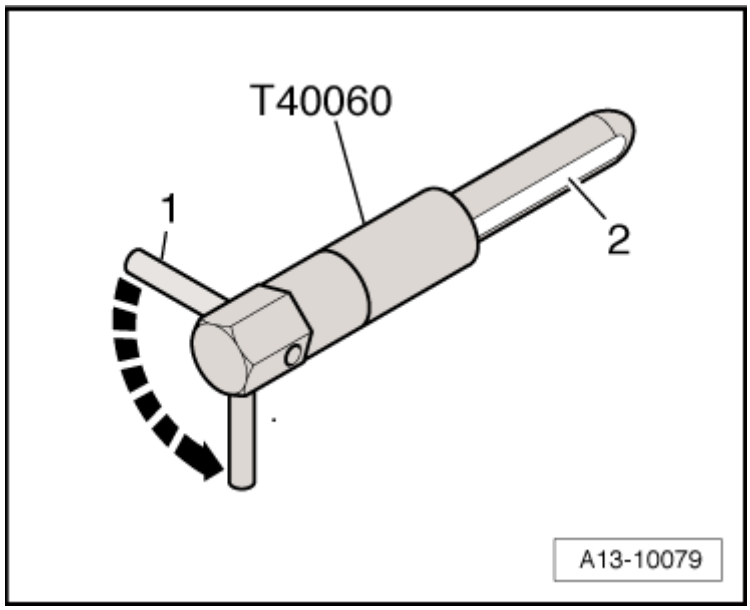


– Using adapter -T40058- turn the crankshaft in the normal direction of rotation -arrow- to TDC.

Note



- *The adjustment pin -T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and the centre of the camshaft.*
- *To obtain the correct TDC position, the side pin -1- must then be turned 90° - arrow- so it is in line with the imaginary line between the adjustment pin and the centre of the camshaft.*

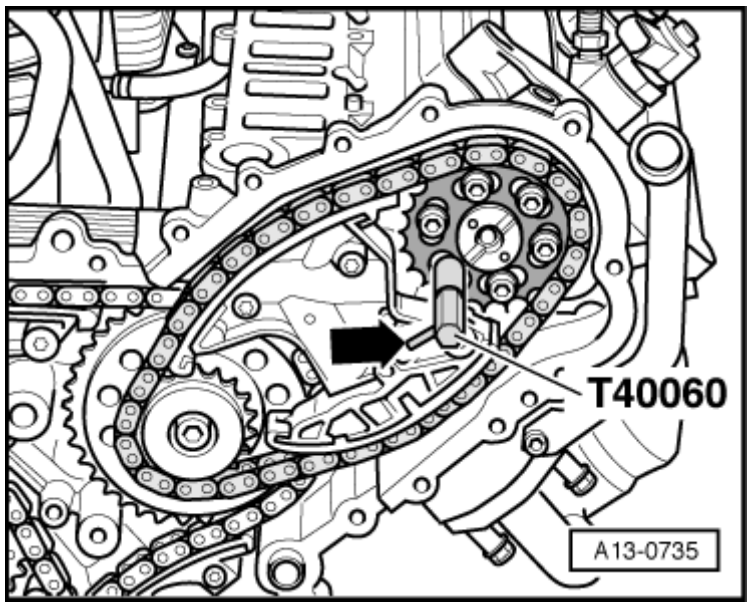


–

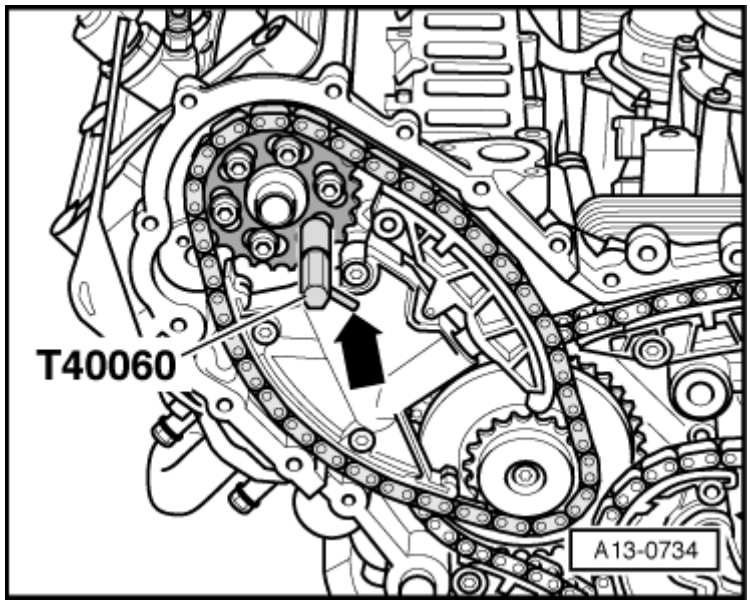
Check that camshafts on both cylinder heads are positioned at TDC.

- It should be possible to lock camshafts with adjustment pin -T40060-.
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

Cylinder bank 1 (right-side):

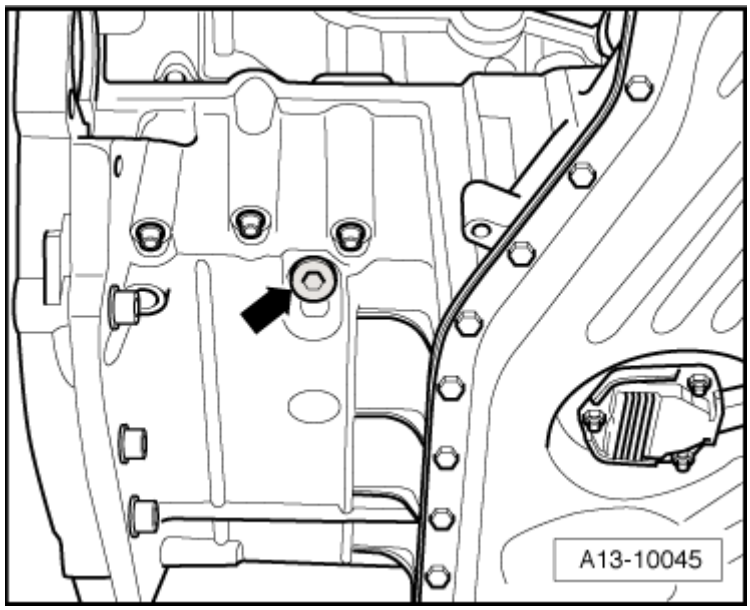


Cylinder bank 2 (left-side):



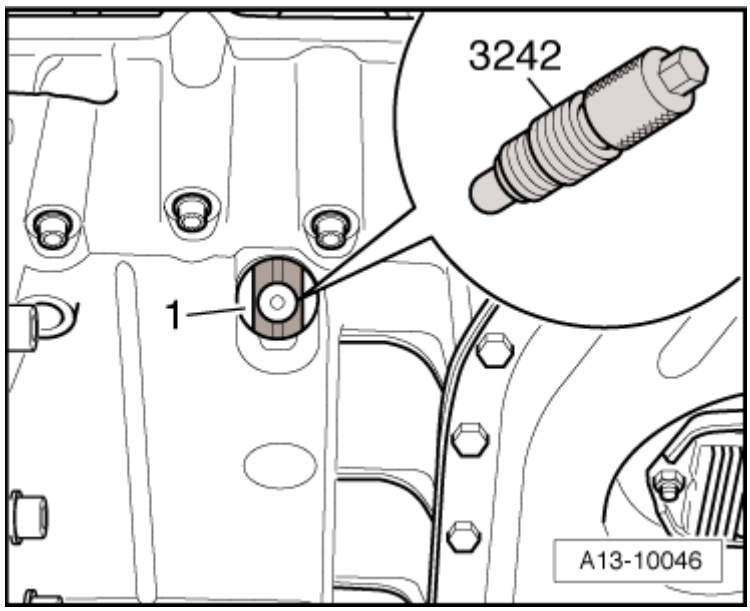
– Lay a cloth beneath sump (top section) to catch engine oil.

– Unscrew plug -arrow- from sump (top section).



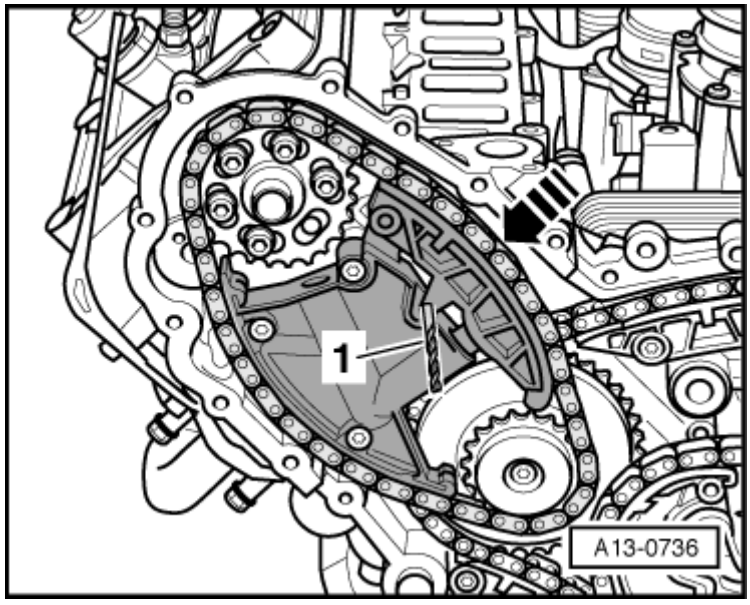
– Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1-

backwards and forwards slightly to fully centralise locking pin.



– Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.

– Press guide rail of chain tensioner for timing chain (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.

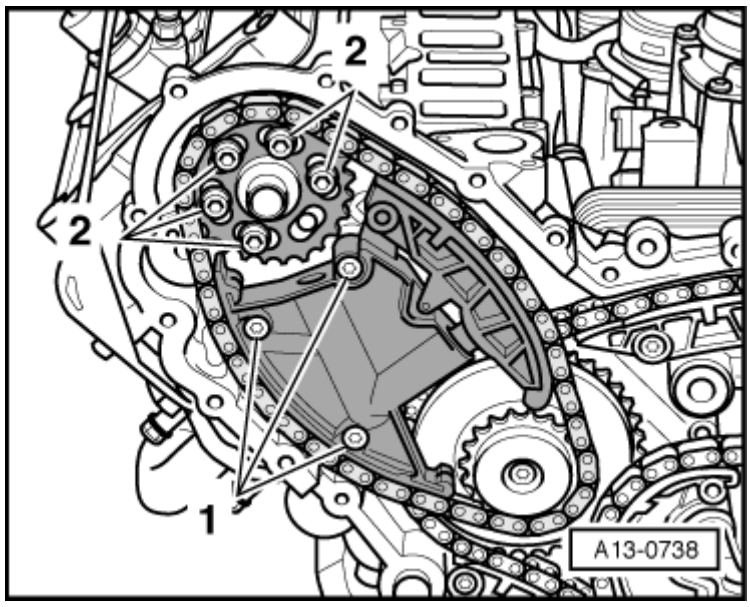


– Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.

– Remove camshaft sprocket and chain tensioner (left-side)

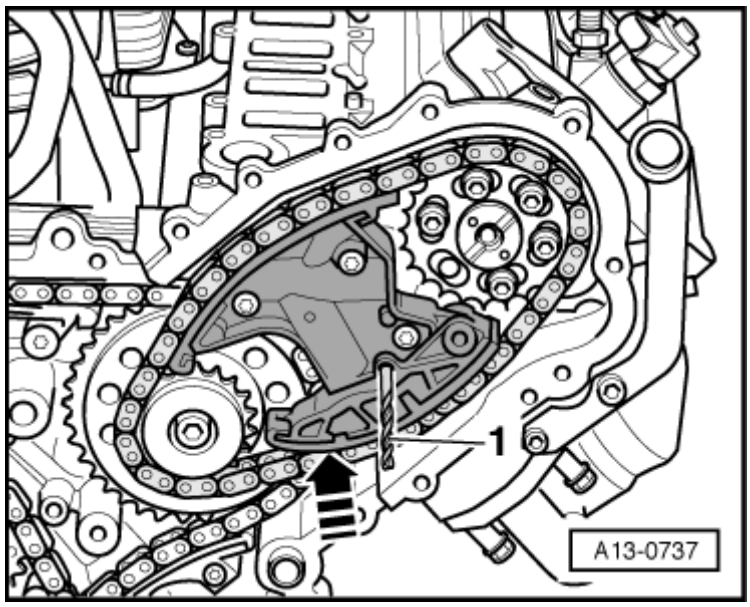
Note

Cover chain tensioner opening with a cloth or similar to stop small parts dropping in.



– Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.

– Press guide rail of chain tensioner for timing chain (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.

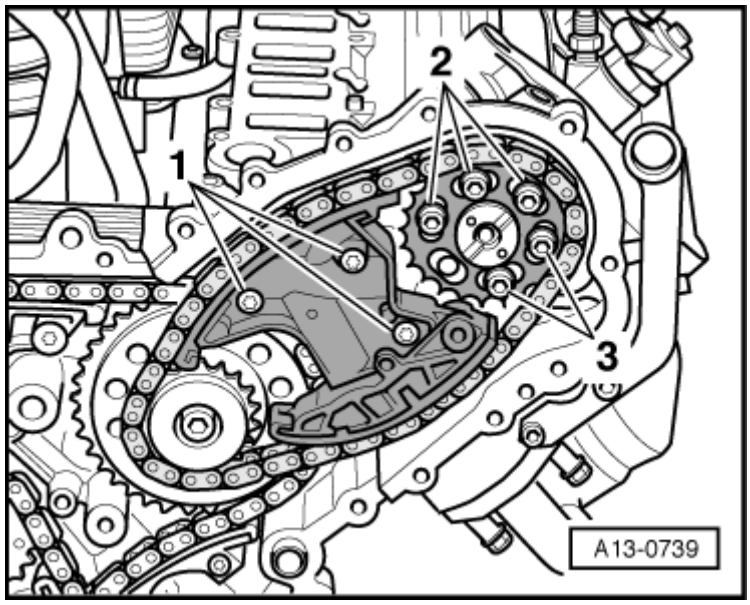


– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.

– Remove camshaft sprocket and chain tensioner (right-side).

Note

Cover chain tensioner opening with a cloth or similar to stop small parts dropping in.



Installing

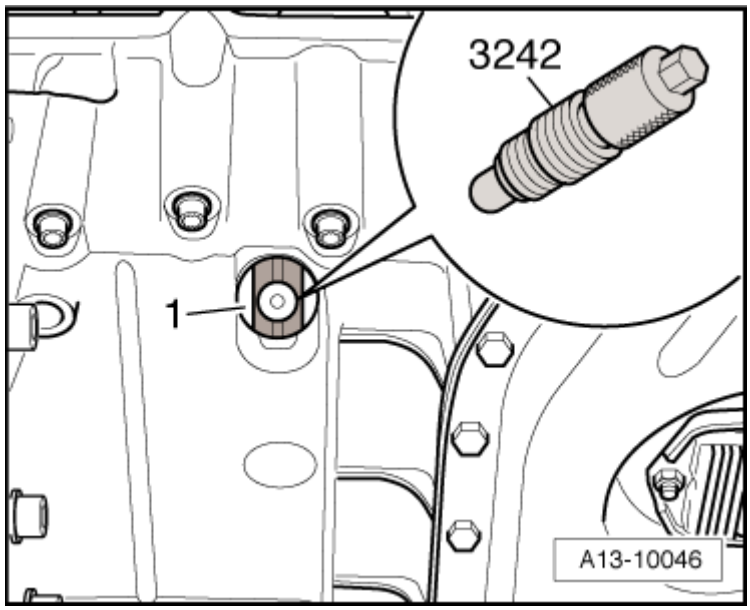
- Crankshaft -1- locked in TDC position with locking pin -3242-.

Note

- *Renew gaskets, seals and O-rings.*
- *Renew the bolts tightened with specified tightening angle.*

Caution

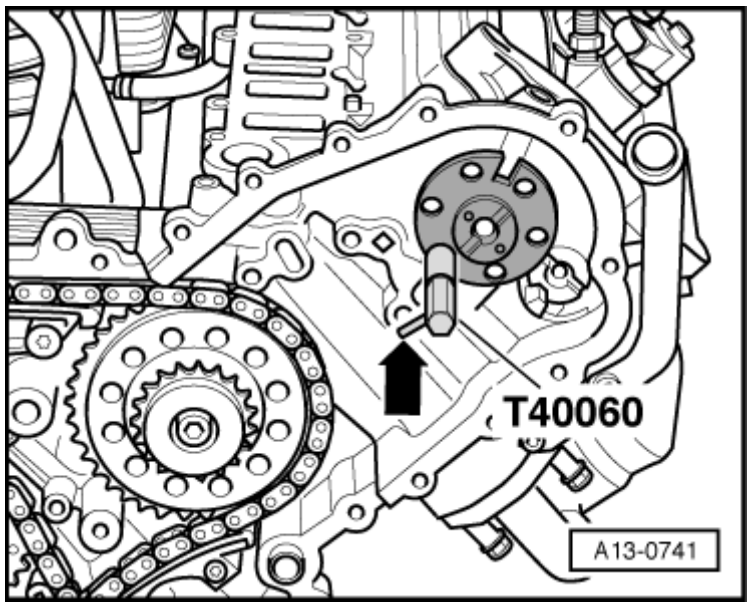
The crankshaft must not be at TDC at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.



– Check that camshafts on both cylinder heads are positioned at TDC.

- It should be possible to lock camshafts with adjustment pin -T40060-.
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

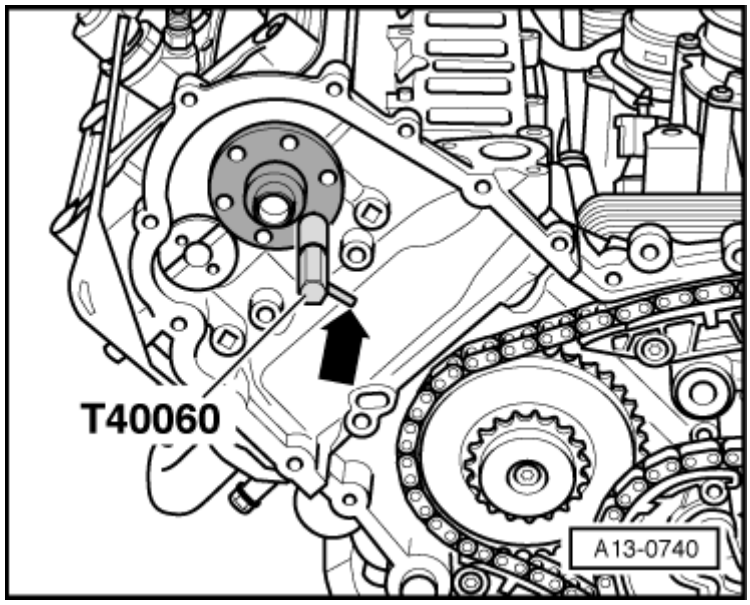
Cylinder bank 1 (right-side):



Cylinder bank 2 (left-side):

– Remove adjustment pin -T40060- from both camshafts.

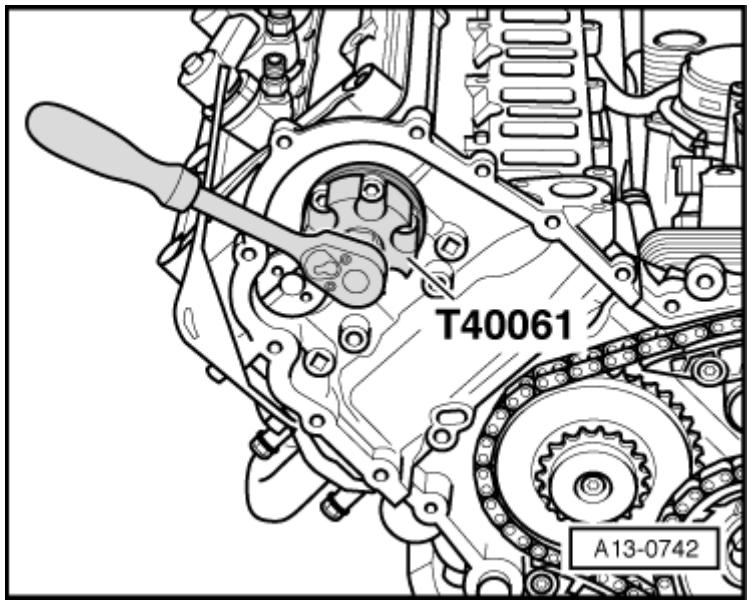
Note



If the adjustment pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter -T40061-. To do so, screw securing bolts for camshaft sprocket into camshaft.

Caution

The crankshaft must not be at TDC at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.



– Install timing chain (left-side) with camshaft sprocket and chain tensioner.

- he elongate holes in the s roc et m st e aligne centrall over the ta e holes in the camshaft.

  ighten olts -1- for chain tensioner.

  crew in two olts -2- for s roc et t o not tighten olts.

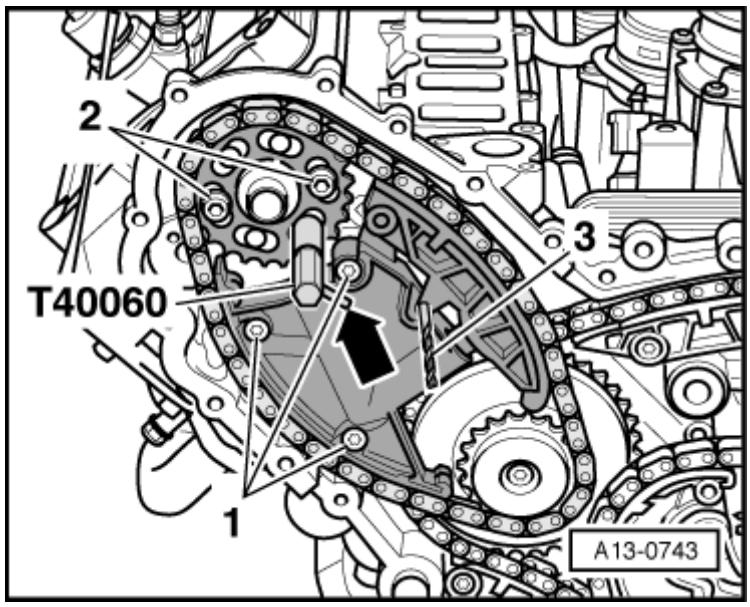
- t sho l st e ossi le to t rn the s roc et on the camshaft witho t axial movement.

  oc camshaft left-si e with a stment in - 40060-.

- he si e in -arrow- on the a stment in - 40060- m st e in line with the imaginar line etween the a stment in an the centre of the camshaft.

  P ll rill it -3- from locating hole this releases the chain tensioner left-si e .

  nstall timing chain right-si e with camshaft s roc et an chain tensioner.



- he elongate holes in the s roc et m st e aligne centrall over the ta e holes in the camshaft.

  ighten olts -1- for chain tensioner.

  crew in two olts -2- for s roc et t o not tighten olts.

- t sho l st e ossi le to t rn the s roc et on the camshaft witho t axial movement.

  oc camshaft right-si e with a stment in - 40060-.

- he si e in -arrow- on the a stment in - 40060- m st e in line with the imaginar line etween the a stment in an the centre of the camshaft.

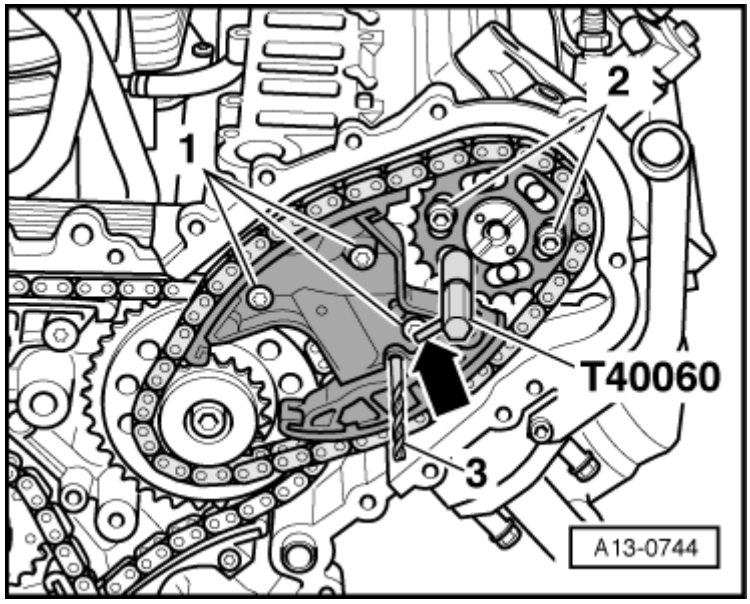
  P ll rill it -3- o t of locating hole this releases the chain tensioner right-si e .

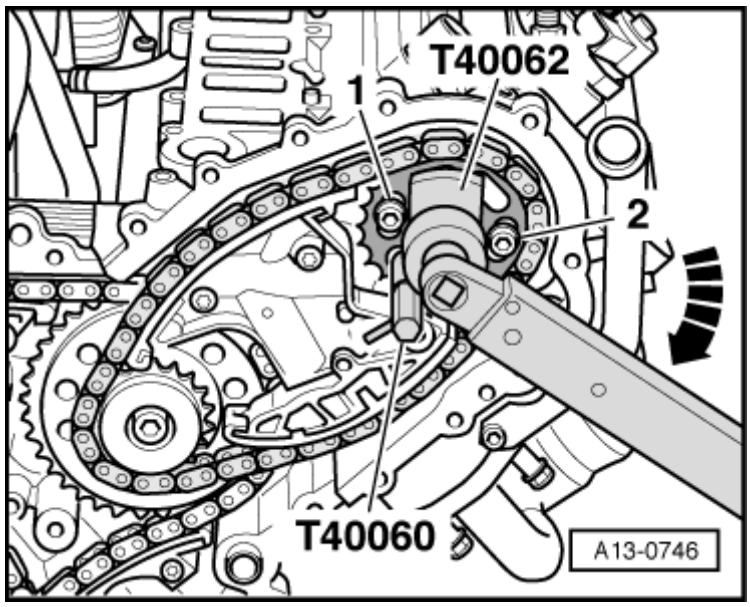
  sing a tor e wrench an a a ter - 40062- a l a tor e of 30 m to camshaft s roc et right-si e in the irection in icate -arrow- . aintain this tor e for the following ste .

  ighten olts -1- an -2-.

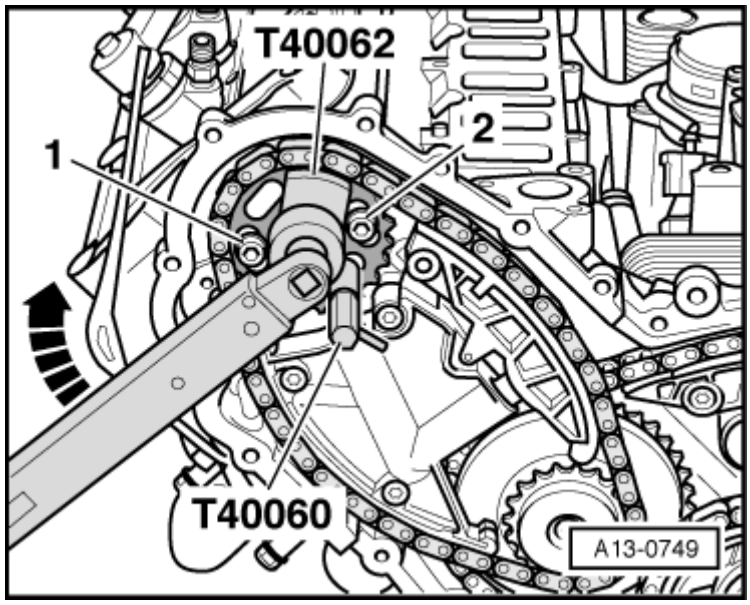
  a e off a a ter - 40062- an ll o t a stment in - 40060-.

  ighten remaining olts for s roc et right-si e .

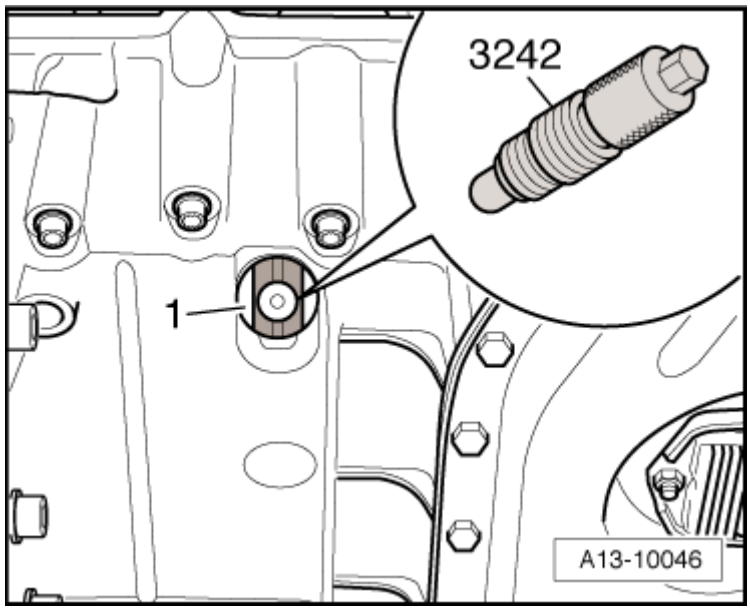




- Using a torque wrench and adapter -T40062-, apply a torque of 15 Nm to camshaft sprocket (left-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out adjustment pin -T40060-.
- Tighten remaining bolts for sprocket (left-side).

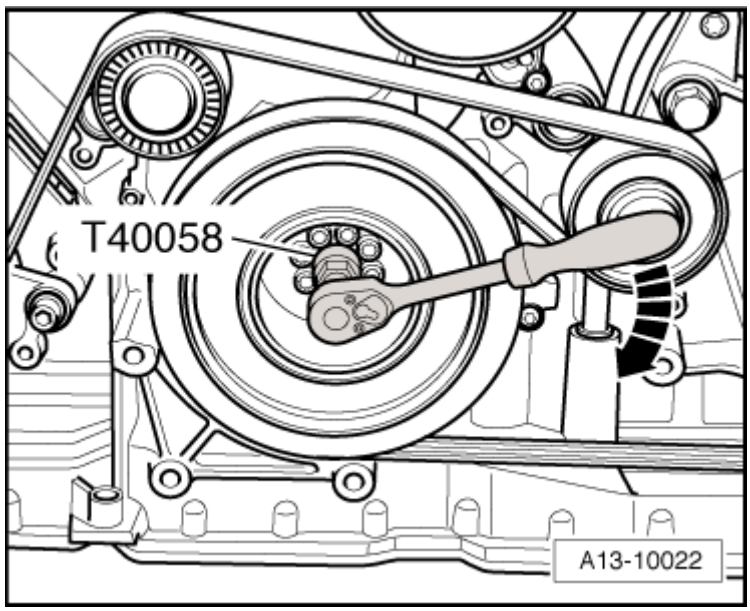


- Remove locking pin -3242-.



Checking valve timing

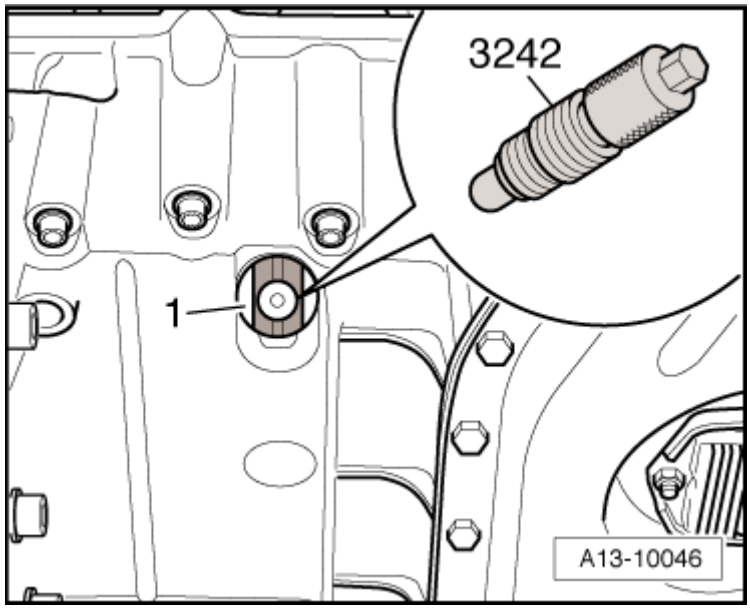
– Turn crankshaft two rotations in normal direction of rotation -arrow- until the crankshaft is just before TDC again.



– While turning in this direction, lock crankshaft -1- with locking pin -3242-. Tighten locking pin to 20 Nm.

Caution

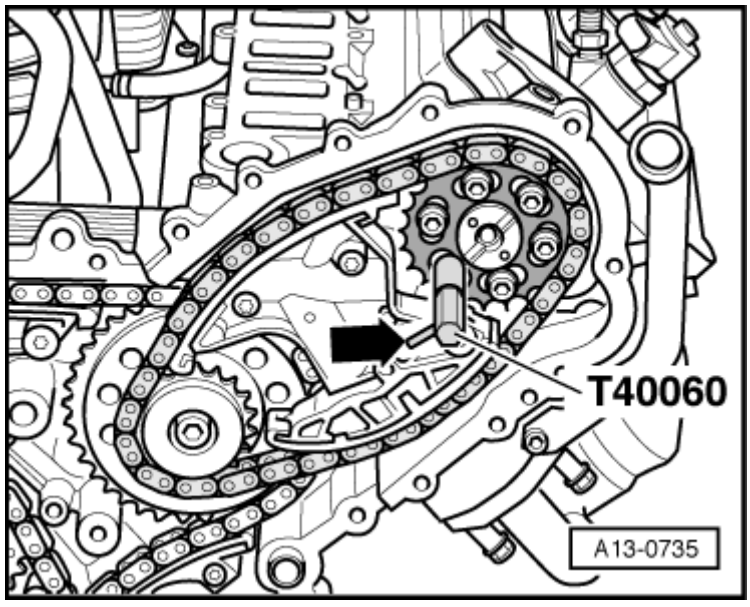
If crankshaft has been turned past „TDC“ position, turn crankshaft two further rotations until it is again positioned just before „TDC“. Then turn further in the same direction and lock crankshaft with locking pin -3242 -.



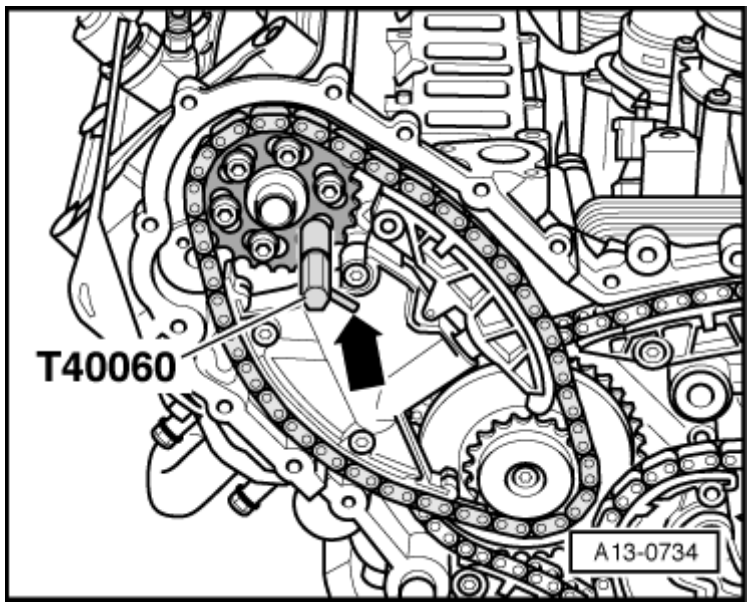
– Check that it is now possible to lock the camshafts with adjustment pin -T40060 -.

- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

Cylinder bank 1 (right-side):



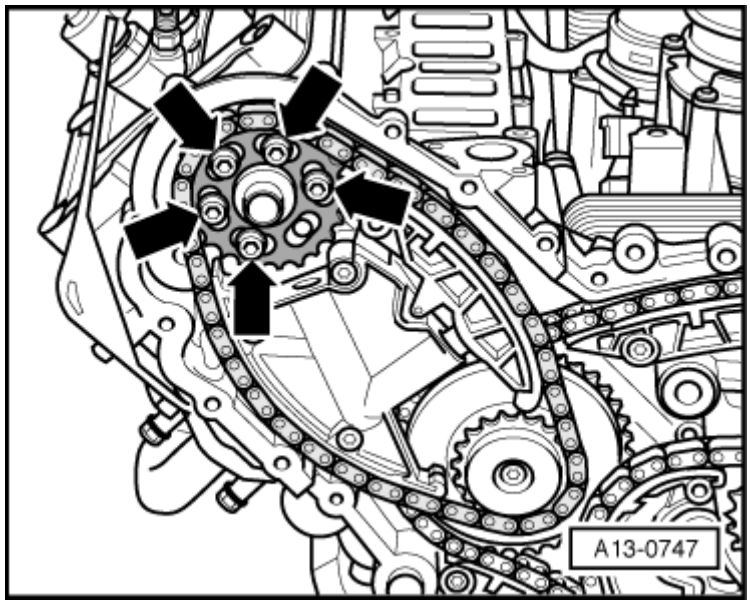
Cylinder bank 2 (left-side):



Adjusting valve timing

If the adjustment pin cannot be inserted in one of the camshafts:

– Loosen all bolts -arrows- on the relevant sprocket approx. 1 turn.



– Apply adapter -T40061- to the heads of the loosened bolts.

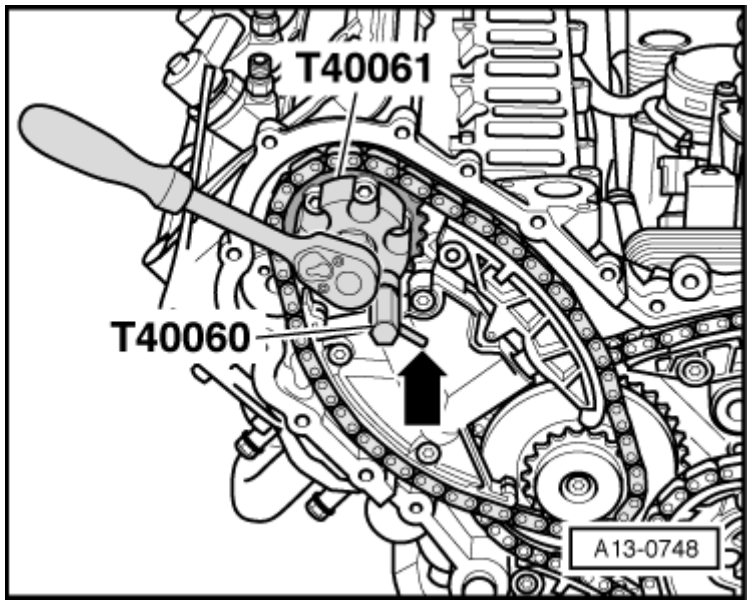
– Turn camshaft slightly backwards and forwards with adapter -T40061- until adjustment pin -T40060- can be inserted.

- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– With adapter -T40061- and adjustment pin -T40060- still in position, tighten bolts on sprocket to approx: 5 Nm.

– Remove adjustment pin -T40060- and adapter -T40061-.

– Tighten bolts on sprocket to final torque.



– Repeat this procedure on the other cylinder bank if necessary.

– Remove locking pin -3242-.

– Check valve timing once again → Anchor.

Remaining installation steps are carried out in reverse sequence; note the following:

– Screw plug -arrow- for TDC mark into top section of sump with a new seal.

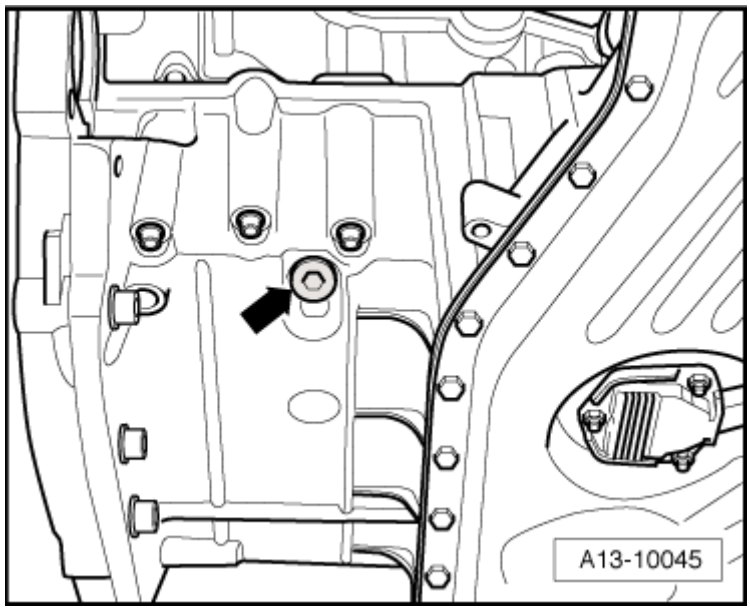
– Install timing chain covers → Anchor.

– Install coolant pipe (rear) → Chapter.

– Install vacuum pump for brake servo →Rep. gr.47.

– Fill cooling system → Anchor.

Tightening torques



Component	Nm
Chain tensioner to cylinder head	5 +90° 1)2)
Camshaft sprocket to camshaft	23
Screw plug in top section of sump	35

- 1) Renew bolts.
- 2) 90° = one quarter turn.