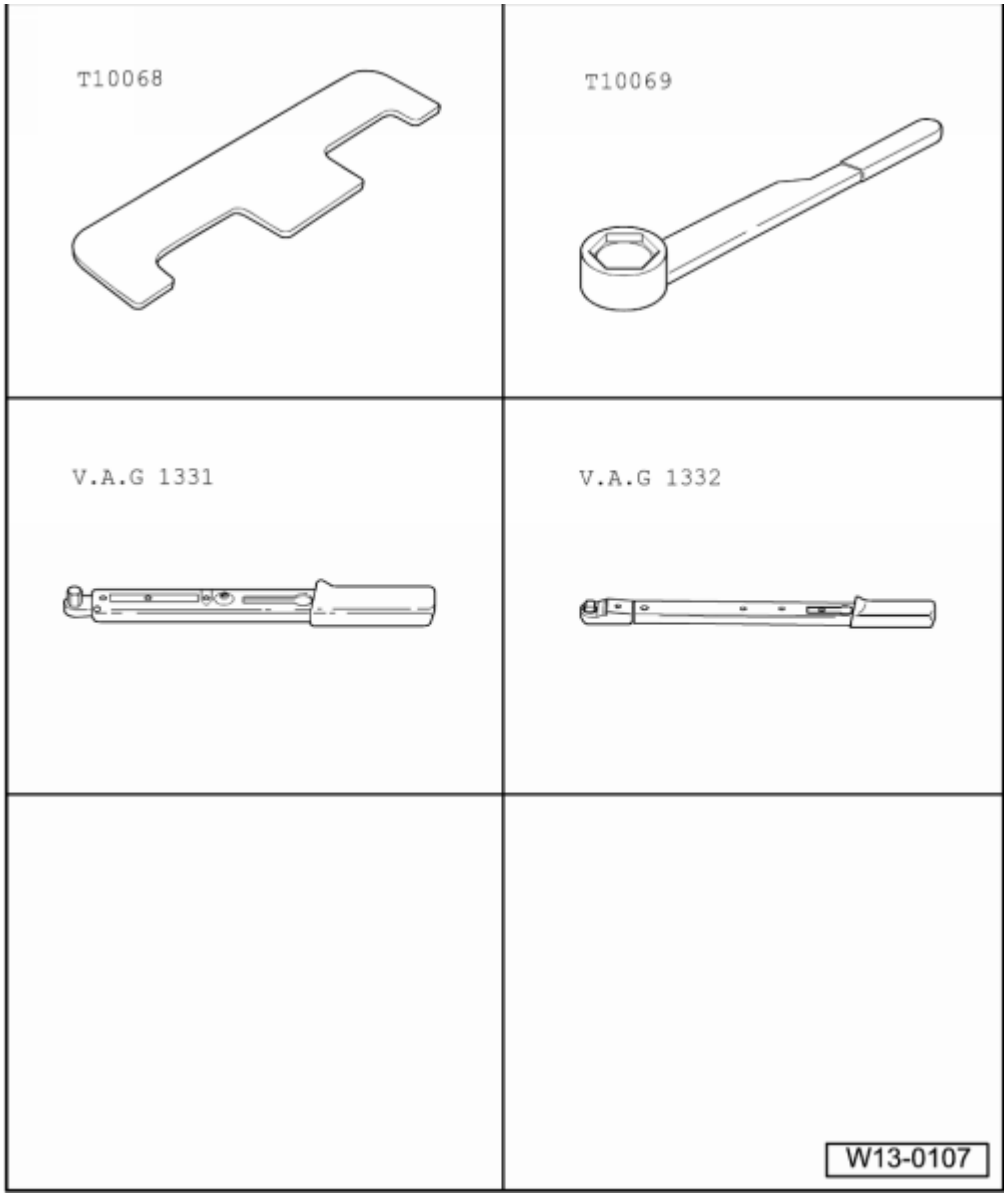
Adjusting valve timing on engine codes BDE, BFH, BJS and BML



Special tools and workshop equipment required

- Camshaft bar -T10068 A-
- Counter-hold tool -T10069-
- Torque wrench -V.A.G 1331-
- Torque wrench -V.A.G 1332-
- Sealant D 176 501

Procedure

Caution

When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:

- ***Route all the various lines (e.g. for fuel, hydraulics,***

activated charcoal filter system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.

- ***To avoid damage to lines, ensure sufficient clearance to all moving or hot components.***

Note

The following procedure is described with engine removed. You can start with adjustments at the relevant point, depending on how far the engine has been dismantled. The sump is removed and can only be fitted after installing the sealing flange.

Install roller chain and chain tensioner with tensioning plate for intermediate shaft drive:

– Adjust position of crankshaft relative to intermediate shaft. The ground down tooth of drive sprocket -B- must be flush with bearing joint (TDC cylinder 1).

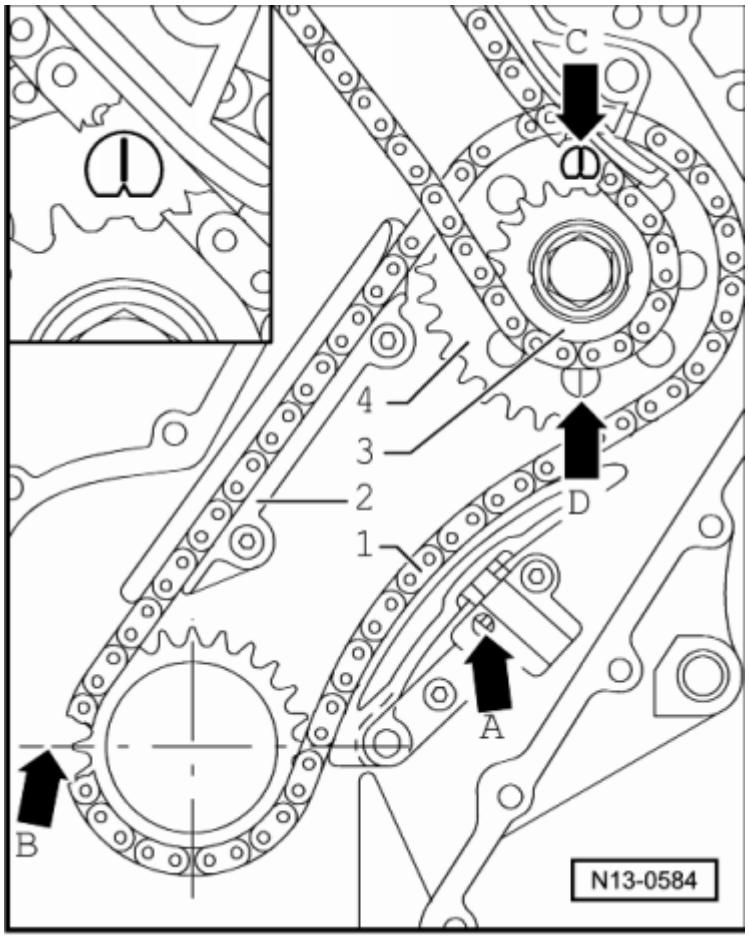
– Install both pins without collar for guide rail -2 - and tighten to 10 Nm.

Note

If roller chain has already been used, note direction of rotation marking → Fig..

– Install guide rail -2- with roller chain -1- and both sprockets -3- and -4-. Marking on roller chain sprocket -4- must align with notch -C- or -D- on intermediate shaft thrust washer.

When installing, ensure that roller chain runs completely straight in guide rail from crankshaft to intermediate shaft.



– Tighten bolts for sprockets -3- and -4- on intermediate shaft by hand.

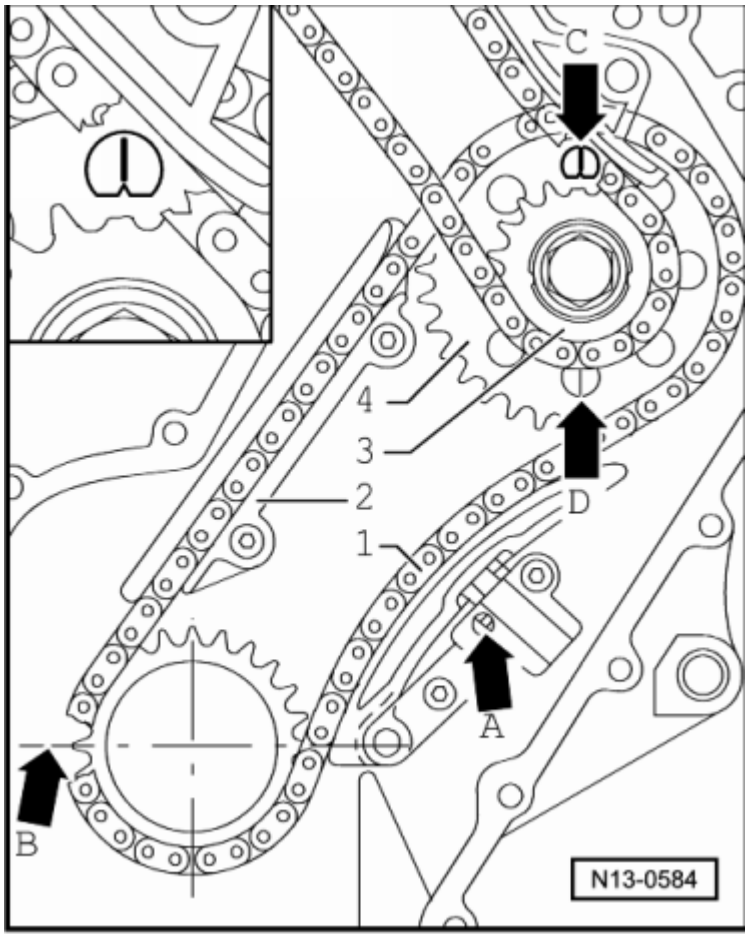
Note

Note that all sprocket securing bolts must be renewed.

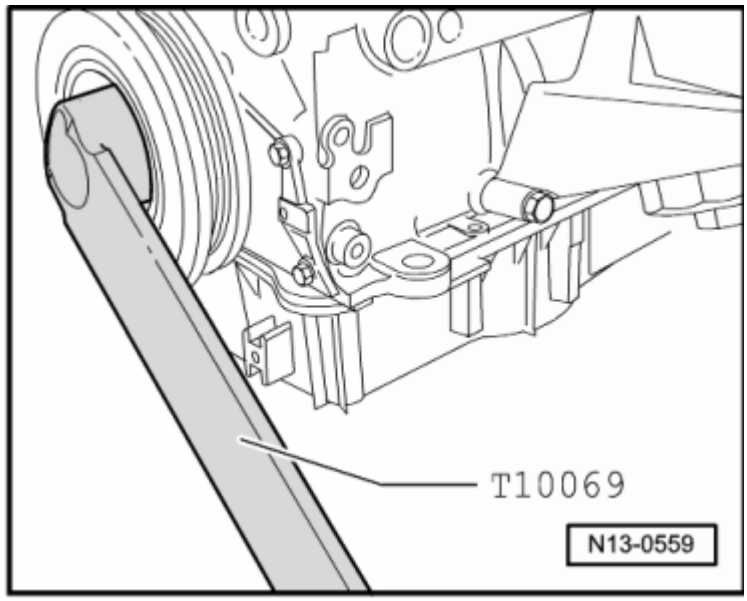
– Now install chain tensioner on opposite side.

– To do this, release chain tensioner locking tooth -A- with a small screwdriver and press tensioning plate against chain tensioner.

– Install chain tensioner in this position and tighten to 8 Nm.



– Lock vibration damper using counter-hold tool -T10069-.



– Tighten new intermediate shaft sprocket securing bolts -3- and -4- to 60 Nm + 90° (1/4 turn further), turning further can be done in several steps.

– Remove counter-hold tool -T10069-.

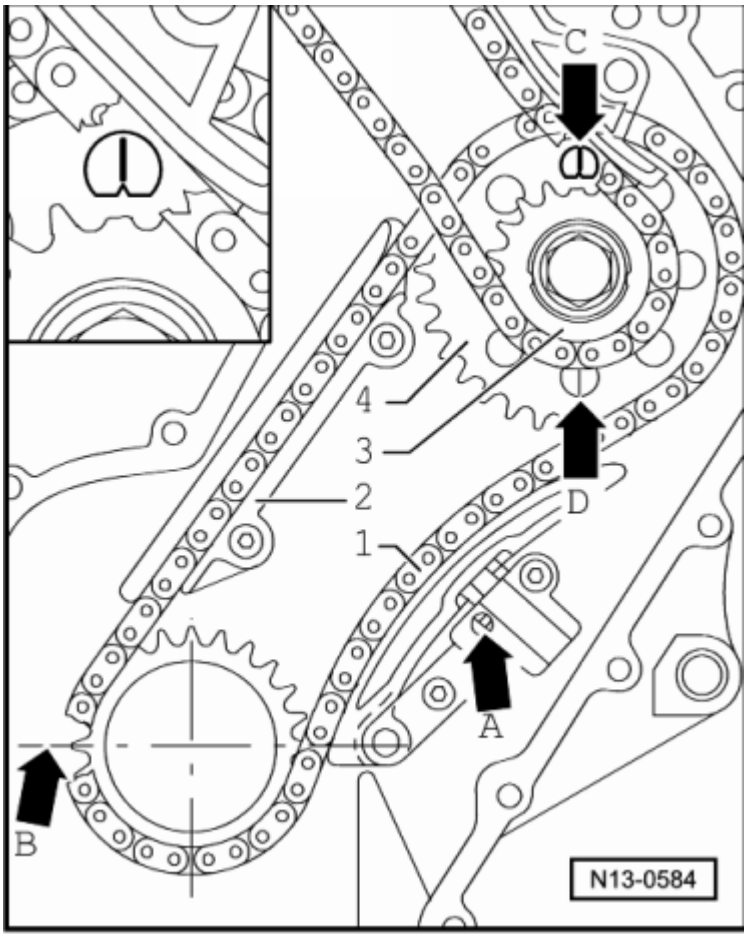
– Check again position of crankshaft -B- relative to intermediate shaft -C- or -D-.

– Set engine to No. 1 cylinder TDC again.

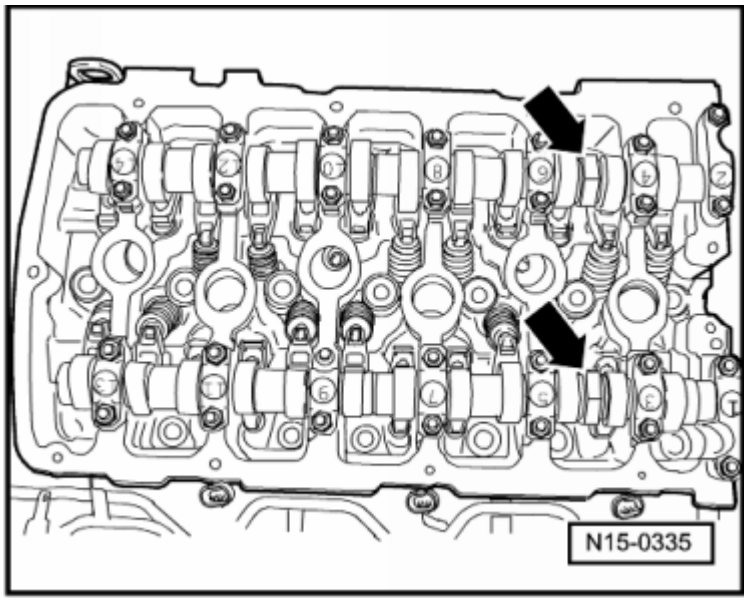
Install camshaft drive roller chain:

– Now position camshafts in cylinder head at TDC No. 1 cylinder.

Note



If necessary, turn camshafts -arrows- to proper position using 32 mm open-jaw spanner. Camshaft bar -T10068 A- must be removed while this is done.



– Camshaft bar -T10068 A- must now engage in grooves in both shafts when inserted.

Note

- *If cylinder head is removed:*
- *Installing cylinder head → Chapter.*

– Lay camshaft roller chain over intermediate shaft sprocket.

– Route chain between tensioning plate and guide rail in direction of control housing.

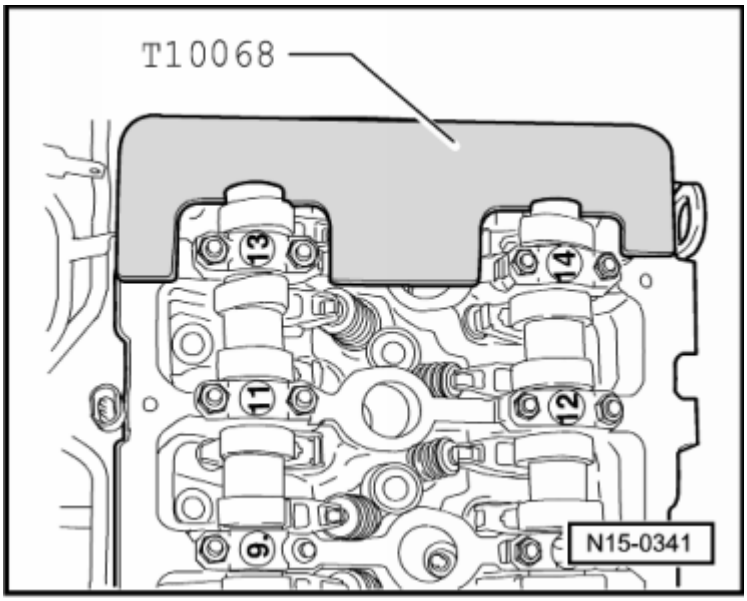
Continuation of working procedure for engine code BDE → Anchor

Continuation of working procedure for engine codes BFH, BJS and BML → Anchor

Engine code BDE only

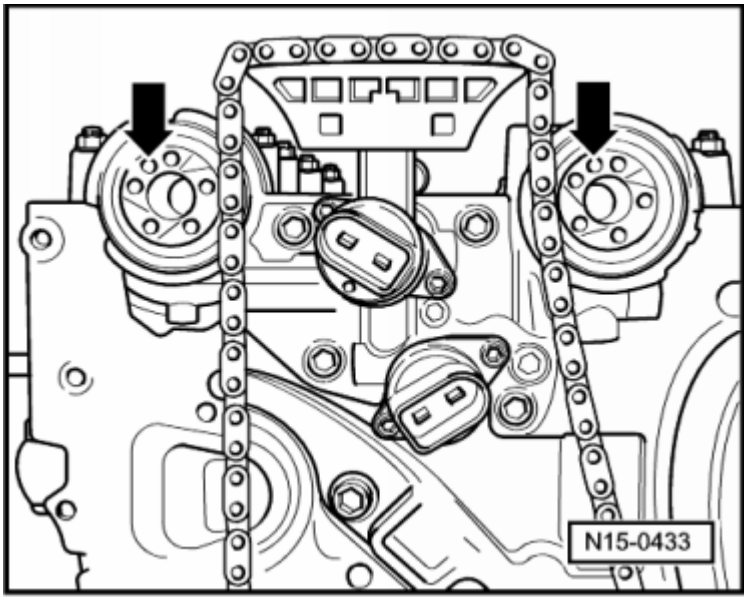
Note

The camshaft bar -T10068 A- remains engaged.

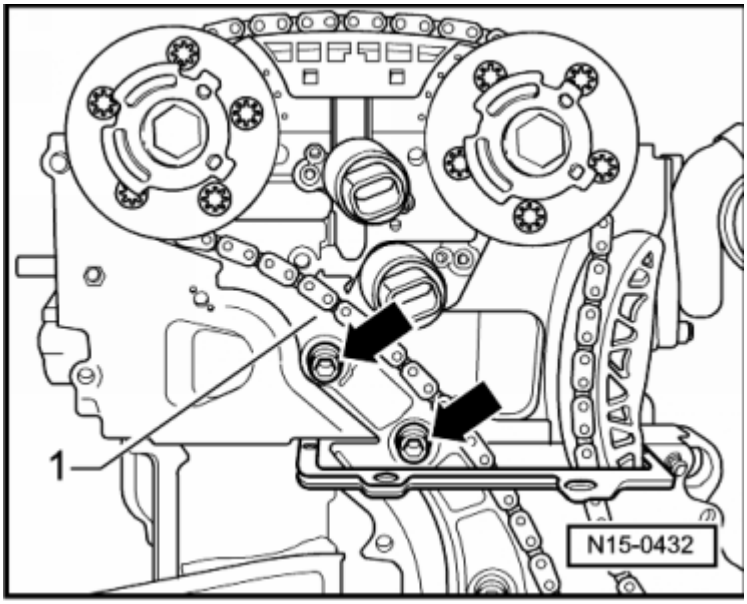


Both camshaft adjusters (marking: “24E” on inlet side and “32A” on exhaust side) can only be bolted to camshaft mounting in one position -arrows- due to a dowel pin.

– First install the inlet side camshaft adjuster with camshaft roller chain laid over, and tighten hand-tight.



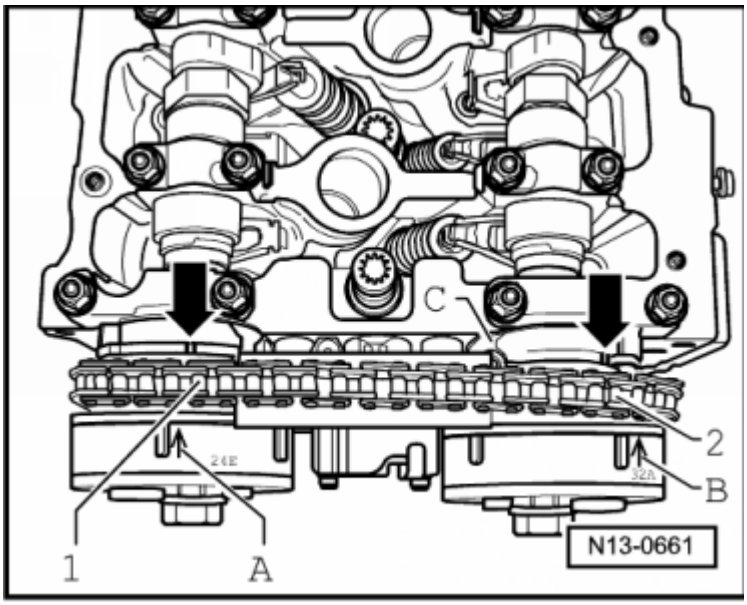
– Ensure the camshaft roller chain contacts guide rail -1- and is not “slack”.



– The marking 24E -A- on camshaft adjuster must align with notch -arrow- on control

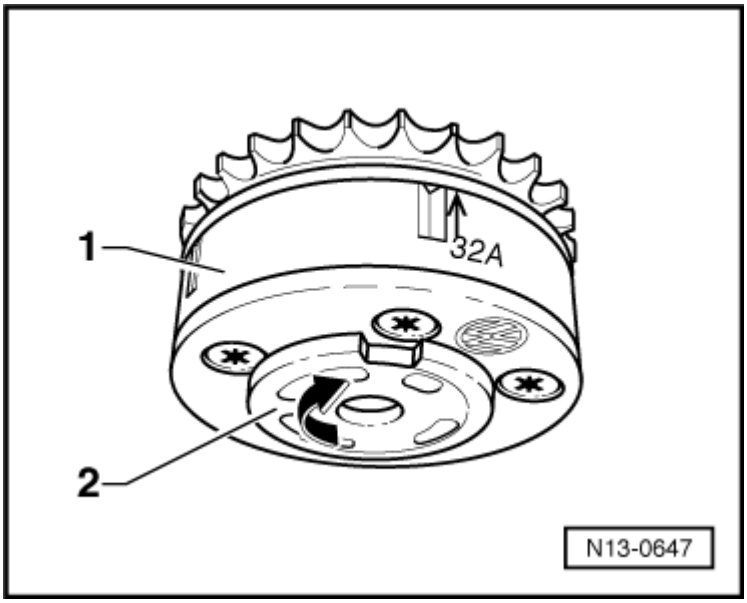
housing -C-.

– Now count exactly 16 rollers to right on timing chain starting from inlet adjuster marking “24E” and mark this roller with a coloured pen.



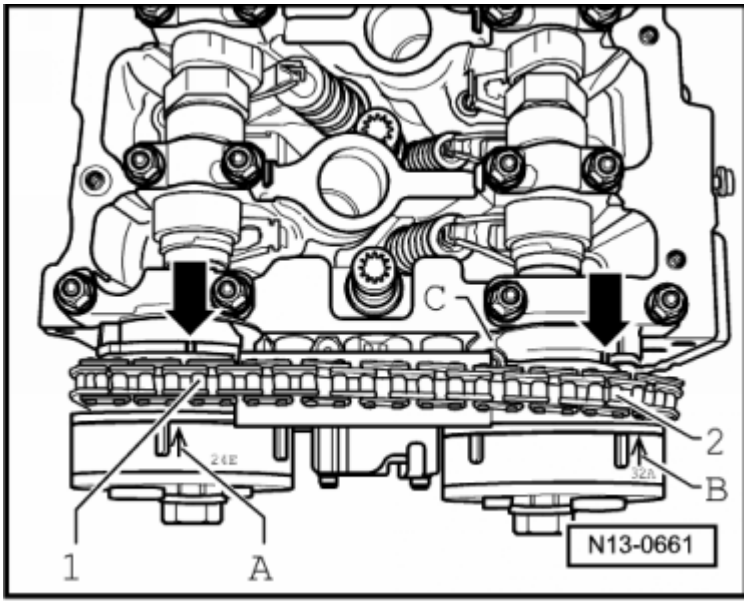
Note

The exhaust camshaft adjuster -1- can be turned in two directions relative to sender wheel -2-. Ensure now when installing that the sender wheel -2- on camshaft adjuster is turned onto stop in -direction of arrow-.



– Now insert the positioned exhaust camshaft adjuster with marking “32A” in camshaft roller chain so that the 16 rollers counted lie between markings “24E” and “32A”-1- and -2-.

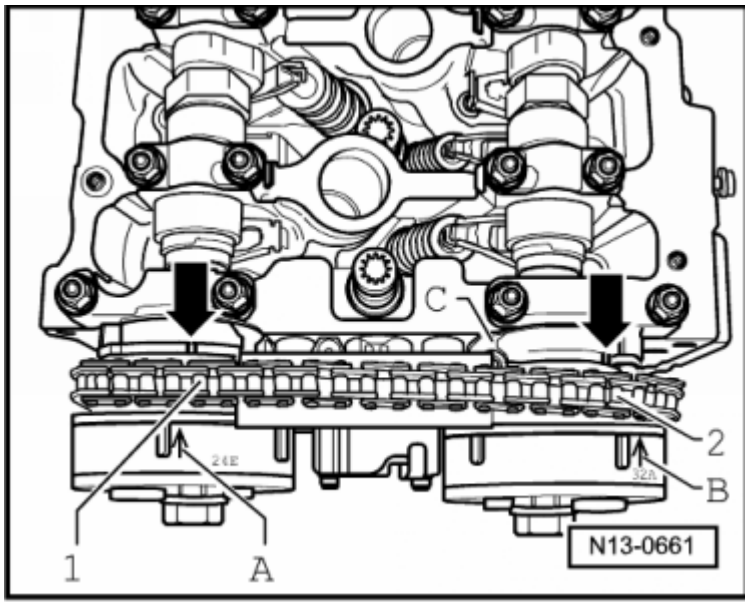
– Tighten exhaust camshaft adjuster hand-tight on camshaft.



– The marks -A- and -B- on camshaft adjusters must align with notches -arrows-

in control housing -C-.

– Then check the gap between camshaft adjusters tooth -1- and tooth -2-. It must be exactly 16 rollers of camshaft roller chain.



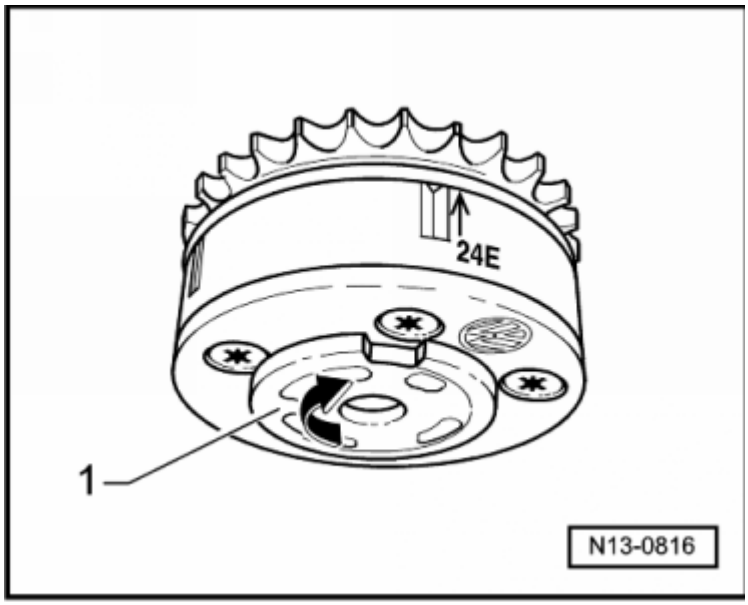
Continuation of working procedure → Anchor

Engine codes BFH, BJS and BML only

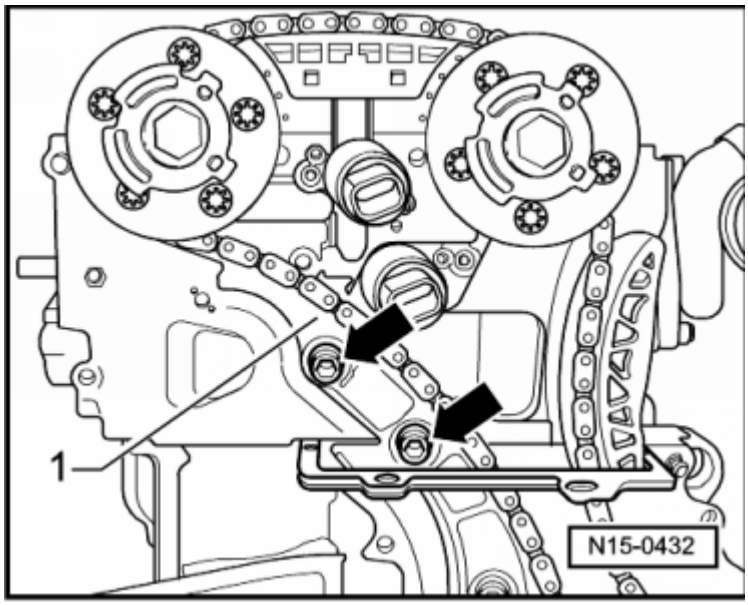
Note

- *The camshaft bar -T10068 A- remains engaged.*
- *On this version of the camshaft adjustment the exhaust and the inlet camshaft adjusters can be turned in two directions. When installing ensure that both camshaft adjusters are turned onto stop in -direction of arrow-.*
- *The gap between the inlet and exhaust camshaft adjusters, marking “24E” to “32A” is then exactly 16 rollers of the camshaft roller chain.*

– Turn sender wheel -1- on inlet camshaft adjuster onto right stop -arrow- and tighten hand-tight in this position with camshaft roller chain laid on inlet camshaft.

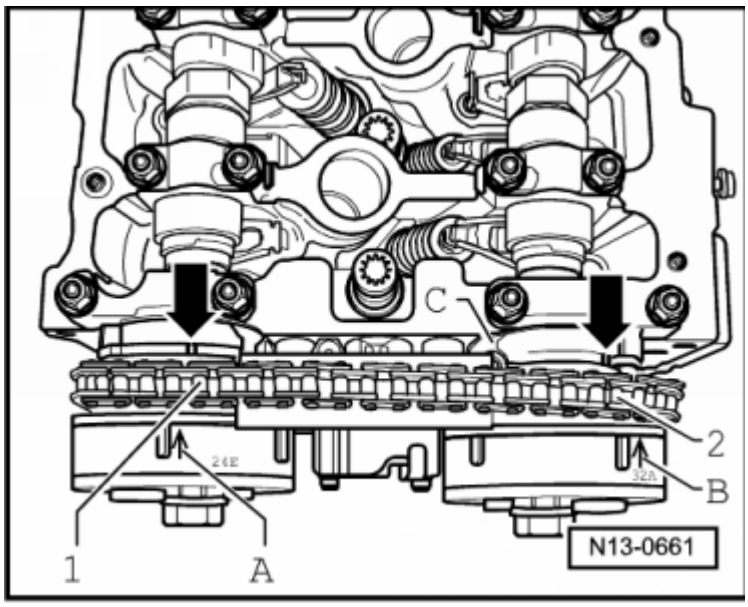


– Ensure the camshaft roller chain is “tight” against guide rail -1- and does not “sag”.

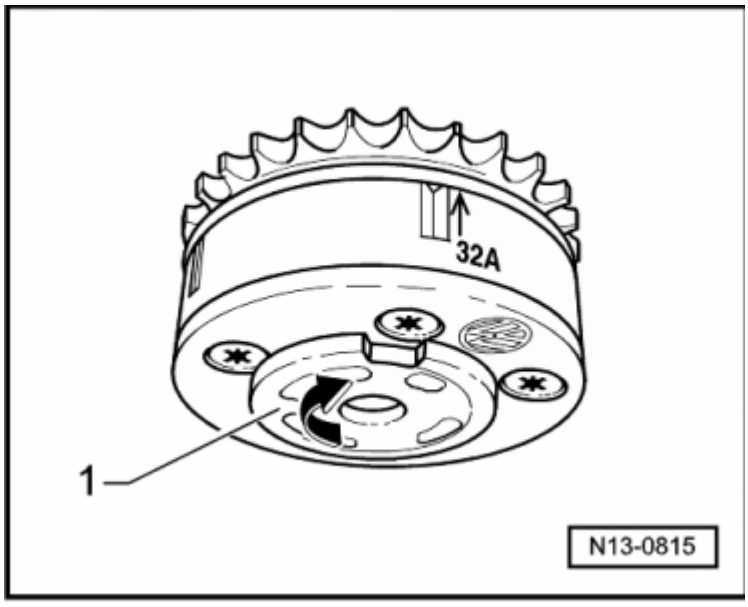


– The marking “24E”-A- on camshaft adjuster must align with notch -arrow- in control housing -C-.

– Now count exactly 16 rollers to right on timing chain starting from marking “24E” on adjuster, and mark this roller with a coloured pen.



– Now turn exhaust camshaft adjuster sender wheel -1- to right stop -arrow- and hold adjuster with sender wheel in this position.



– Now insert the positioned exhaust camshaft adjuster with marking “32A” in

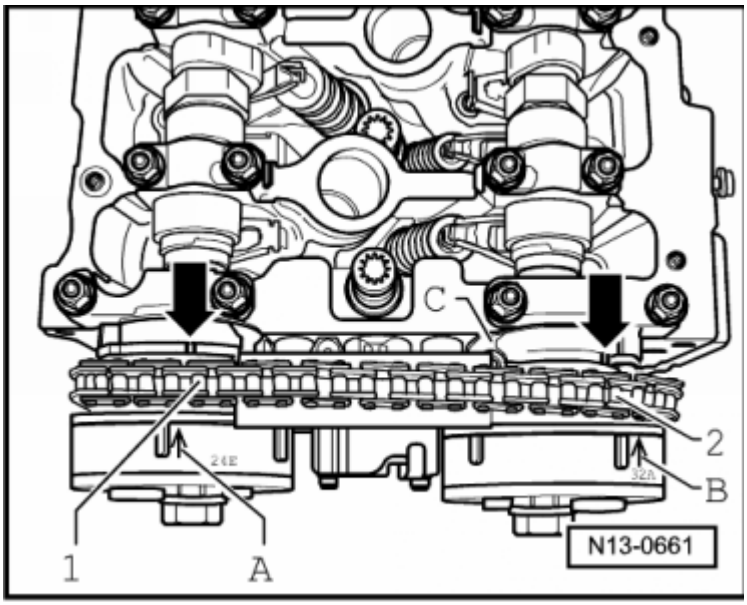
camshaft roller chain so that the 16 rollers counted lie between markings “24E” and “32A”-1- and -2-.

– Tighten exhaust camshaft adjuster hand-tight on camshaft.

Engine codes BDE, BFH, BJS and BML

– Remove camshaft bar -T10068 A-.

– Turn crankshaft two full turns in direction of engine rotation and check valve timing → Chapter.



Note

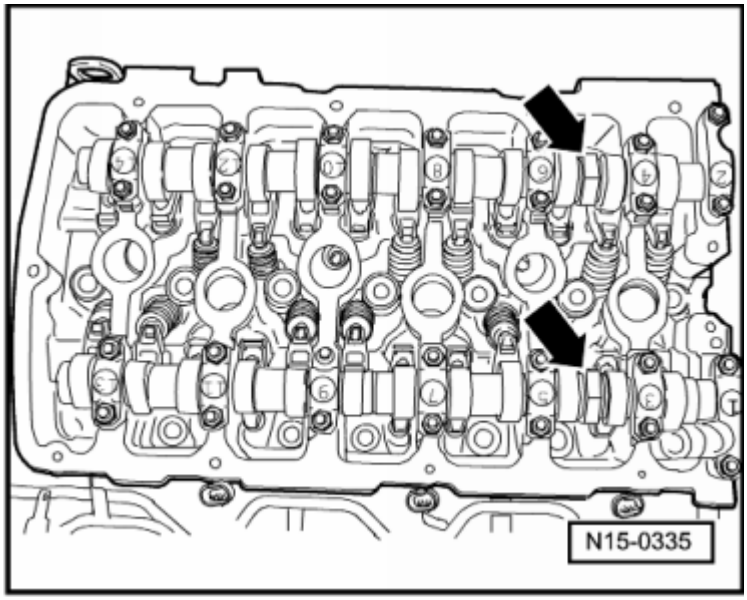
So that the camshaft roller chain does not jump a tooth when the crankshaft is turned, the tensioner plate must be pressed against the camshaft roller chain by hand instead of with chain tensioner .

If marks do not align:

– Repeat camshaft timing adjustment.

If marks align:

– Hold camshaft which is to be tightened using a 32 mm open jaw spanner -arrow-.



Note

Camshaft bar -T10068 A- must be removed while this is done.

– Tighten new securing bolts -3- for inlet and exhaust camshaft adjusters -4- and -2- to 60 Nm + 90° (1/4 turn further). Turning further can be done in several steps.

– Coat sealing surface of sealing flange with sealant “D 176 501” and install. Tighten securing bolts to 8 Nm.

– Now prepare cylinder head gasket for assembly → Fig..

– Coat sealing surface of cover with sealant “D 176 501”.

– Lubricate O-ring for sealing oil channel and insert with seal into cover.

- Install cover, insert all securing bolts and tighten lightly.
- First tighten M8 securing bolts to 23 Nm and then tighten M6 securing bolts to 8 Nm.
- Install chain tensioner for camshaft roller chain and tighten to 40 Nm.
- Turn crankshaft two full turns in direction of engine rotation and check valve timing again.
- Installing cylinder head cover gasket and intake manifold → Chapter.