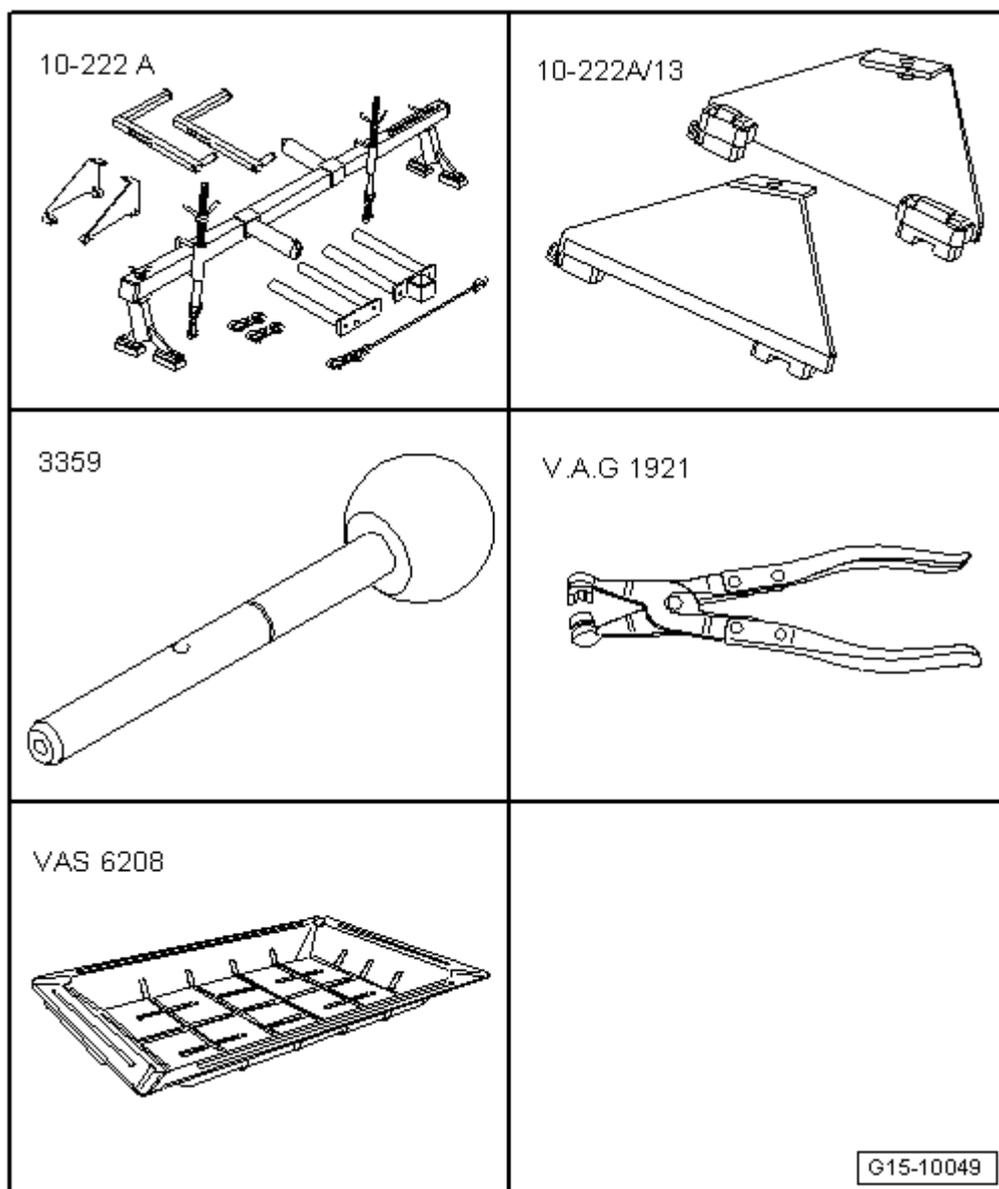
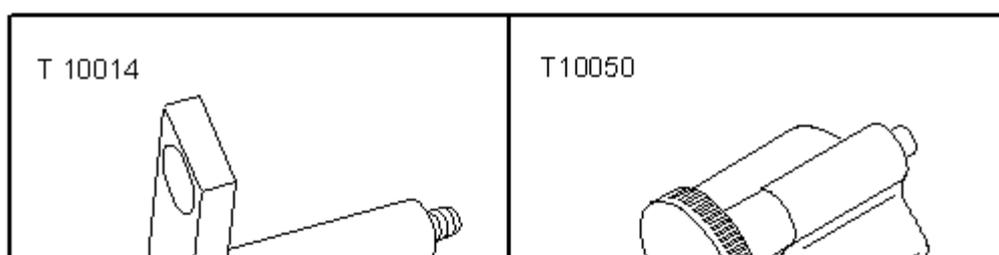


Removing and installing cylinder head



Special tools and workshop equipment required

- ◆ Support bracket -10 - 222 A-
- ◆ Adapter -10 - 222 A /13-
- ◆ Diesel injection pump locking pin -3359-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Drip tray for workshop hoist -VAS 6208-



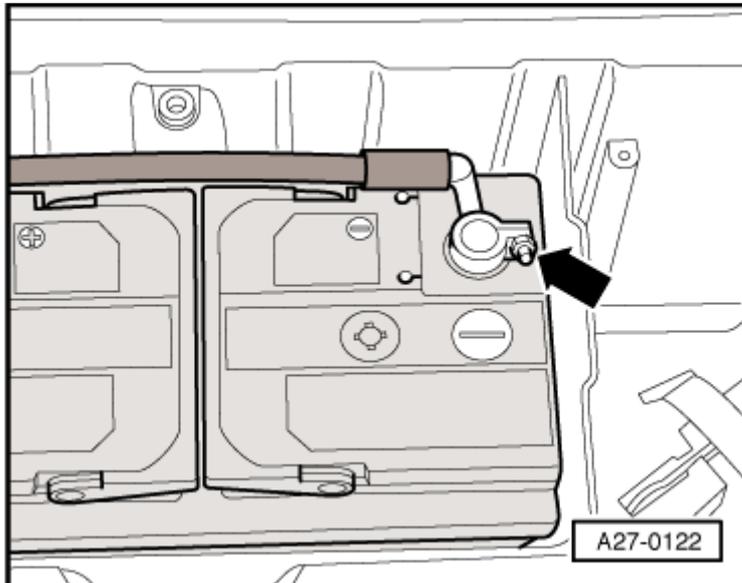
- ◆ Bracket -T10014-
- ◆ Crankshaft stop -T10050-
- ◆ Counterhold tool -T10051-
- ◆ Puller -T10052-
- ◆ Adapter -T40093/6- from engine support bracket (supplementary set) -T40093-

Removing

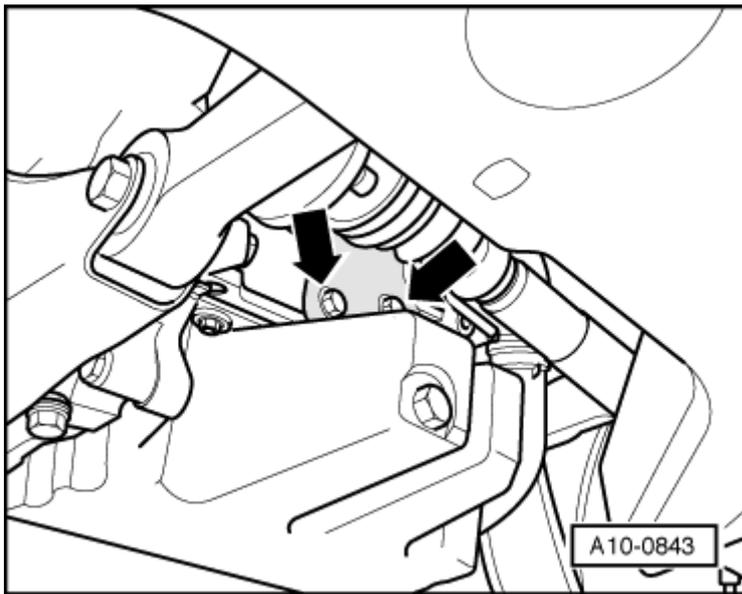
! **Caution**
Observe notes on procedure for disconnecting the battery
 → **Rep. Gr.27.**

i **Note**
The battery is located in the luggage compartment panel.

- Switch off ignition and remove ignition key.
- Disconnect earth cable -arrow- at battery.
- Remove bonnet → **Chapter.**
- Drain off coolant → **Chapter.**
- Remove catalytic converter → **Chapter.**
- Remove poly V-belt → **Chapter.**



- Unbolt heat shield for drive shaft (left-side) -arrows-.



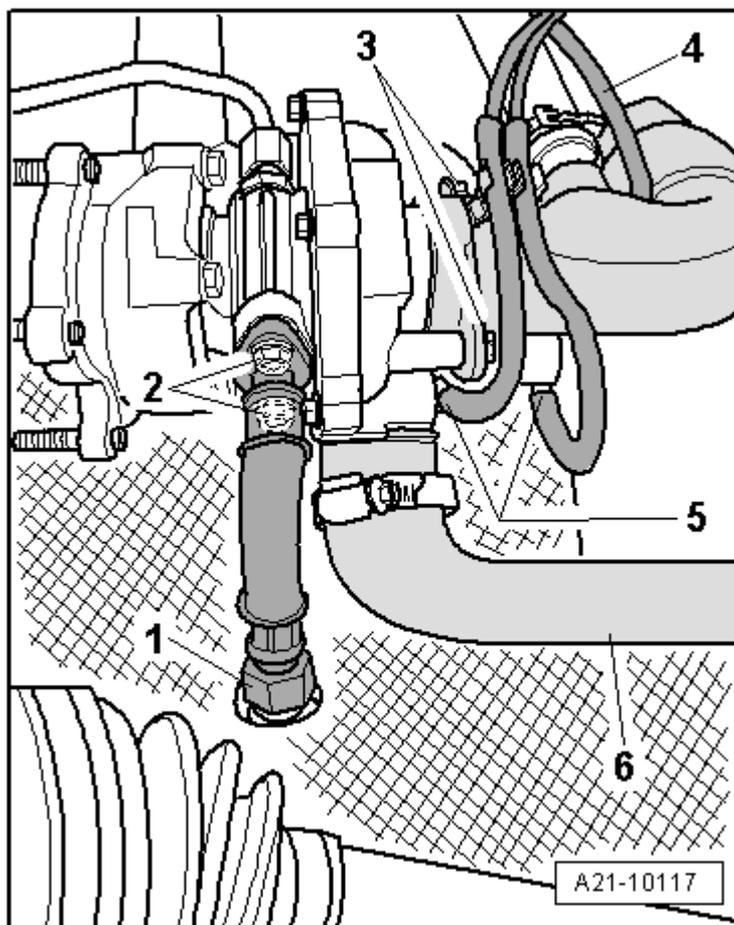
Vehicles with engine code letters AMF:

- Detach air intake hose -6- from turbocharger.
- Detach charge pressure control hose -5- at turbocharger and at vacuum unit for charge pressure control.
- Disconnect breather hose -4-.
- Unscrew bolts -3- and detach air pipe from turbocharger.



Note

- ◆ *The air pipe remains in installation position and is detached upwards at a later stage.*
- ◆ *Disregard -items 1 and 2-.*



Vehicles with engine code letters ATL, BHC:

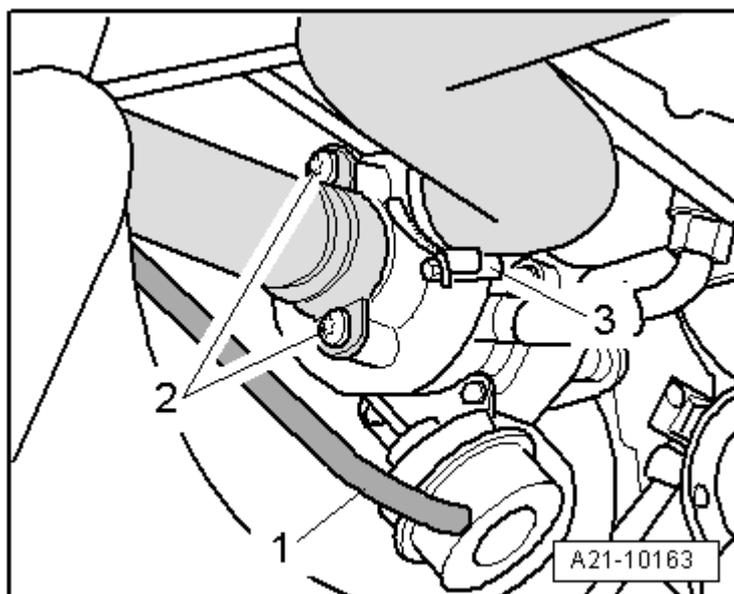
- Detach vacuum hose -1- from vacuum unit for charge pressure control and move it clear.
- Unscrew bolts -2- and detach air pipe from turbocharger.



Note

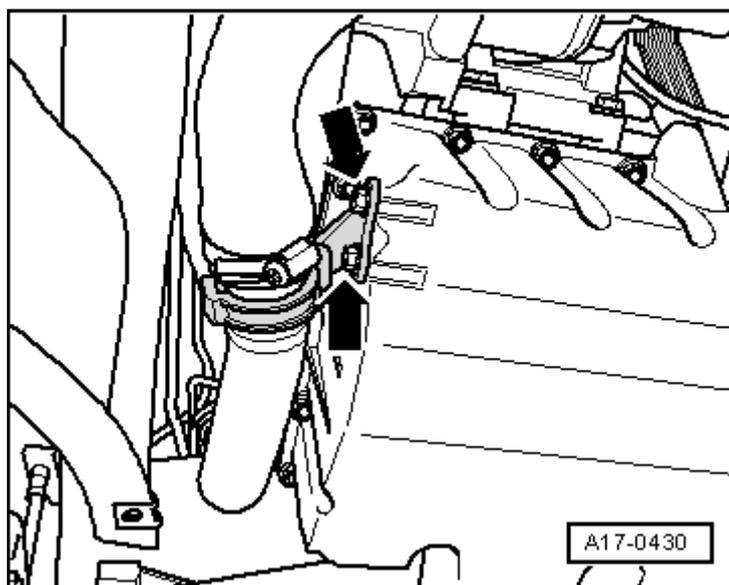
The air pipe remains in installation position and is detached upwards at a later stage.

- Detach air intake hose -3- from turbocharger.



All models:

- Unbolt bracket for air pipe from sump - arrows-.

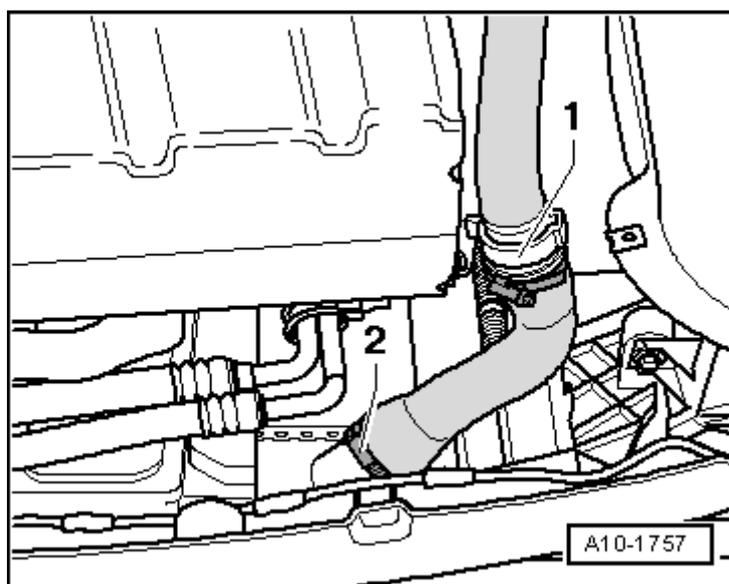


- Remove air intake hose -2- (right-side) from charge air cooler.



Note

Disregard -item 1-.

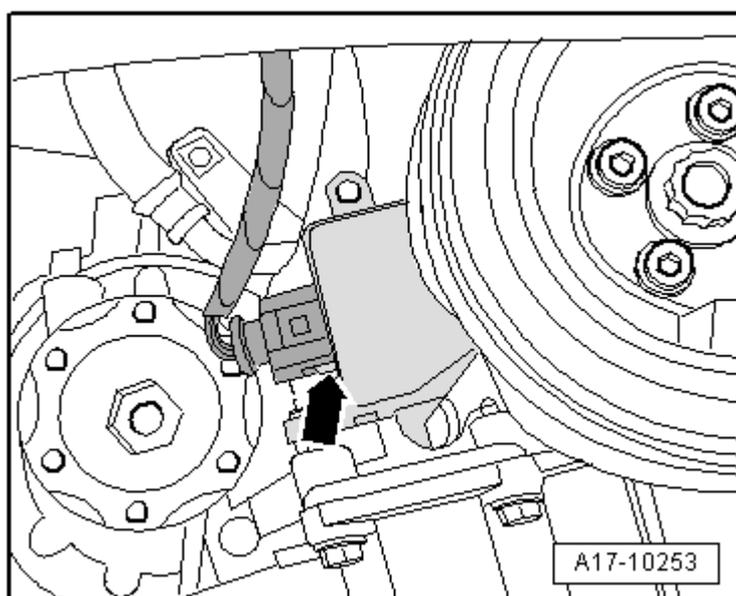


- Unplug electrical connector at oil level and oil temperature sender -G266-.
- Move wiring clear.



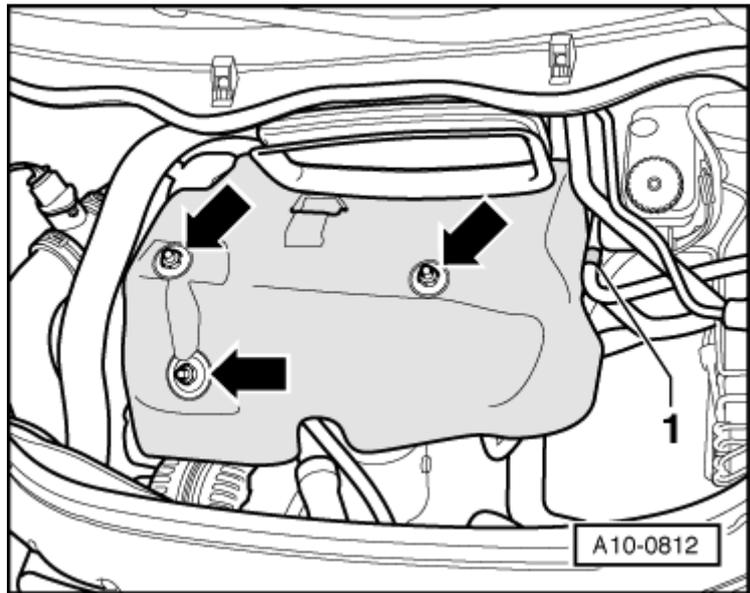
Note

Depending on version, oil level and oil temperature sender -G266- can be located at front of sump.



- If fitted, unclip bracket -1-.

- Take off engine cover panel -arrows-.
- Remove noise insulation beneath cover.

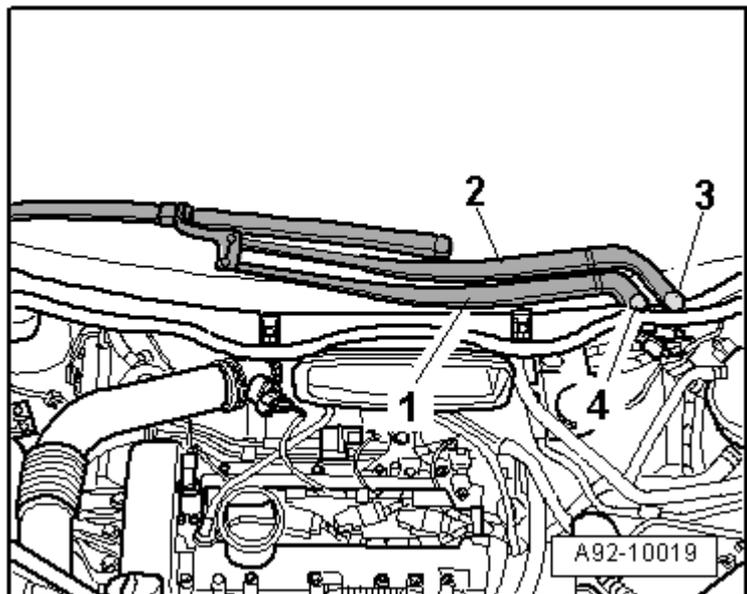


- Lever off caps -3 and 4- on two-piece wiper arm with a screwdriver.
- Slacken nuts on two-piece wiper arm a few turns.
- Release arms -1 and 2- one after the other by tilting them slightly on the wiper shafts.
- Remove nuts completely and take off two-piece wiper arm.

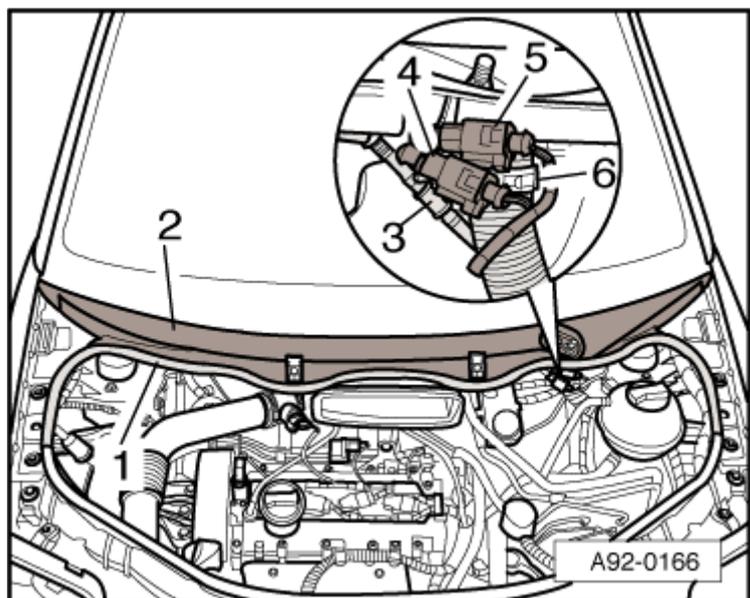


Note

Use puller (commercially available) to remove wiper arm if necessary.

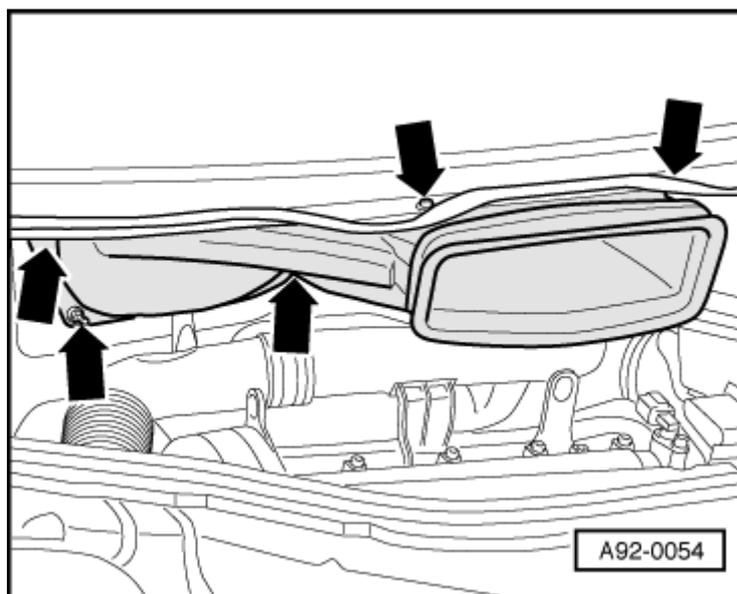


- Disconnect washer fluid hose -3-.
- If fitted, unplug electrical connectors -4 and 5- for heated washer jets.
- Open hose clip -6- using hose clip pliers - V.A.G 1921- and detach water drain hose from cowl panel grille.
- Pull off rubber seal -1- on cowl panel grille.
- Disconnect cowl panel grille -2-.



- Unscrew nuts and bolts -arrows-.

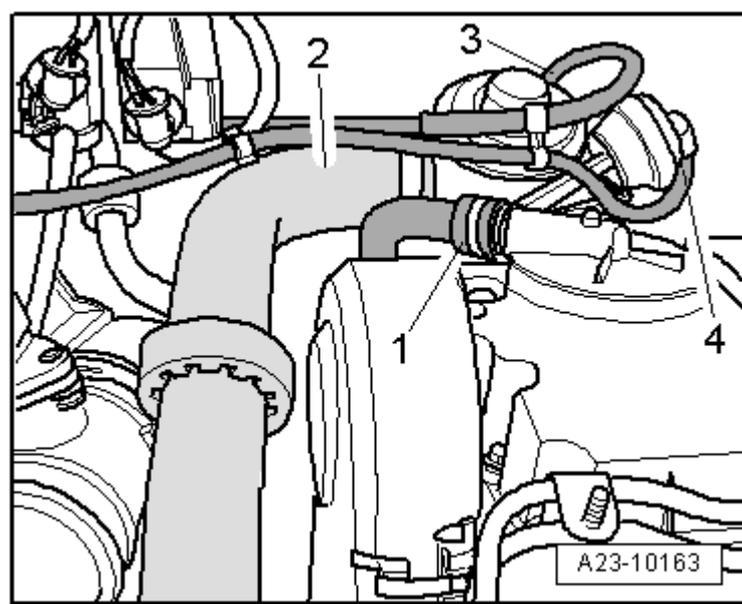
- Pull fresh air duct forwards and remove by turning it to right side of vehicle.



Vehicles with engine code letters AMF:

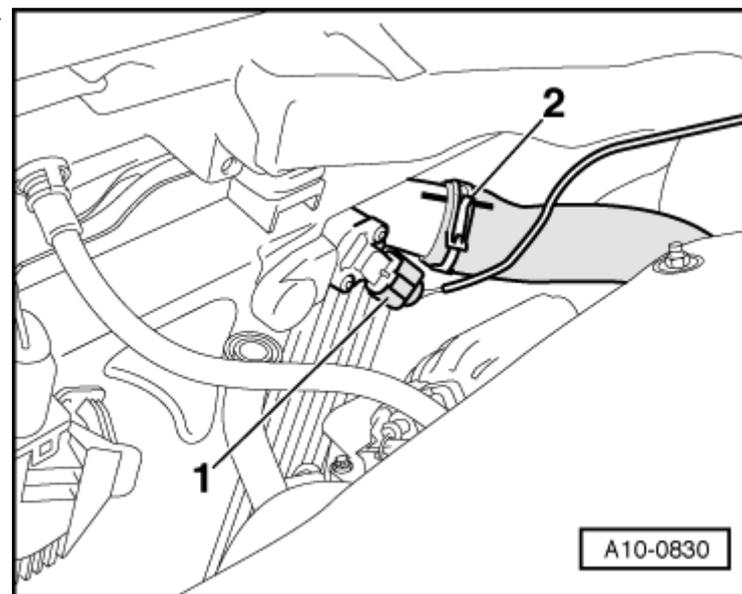
- Detach air hose -2- at mechanical exhaust recirculation valve.
- Disconnect vacuum hose -3- at mechanical exhaust gas recirculation valve.
- Disconnect vacuum hose -4- from vacuum unit for intake manifold flap.

Note
Disregard -item 1-.



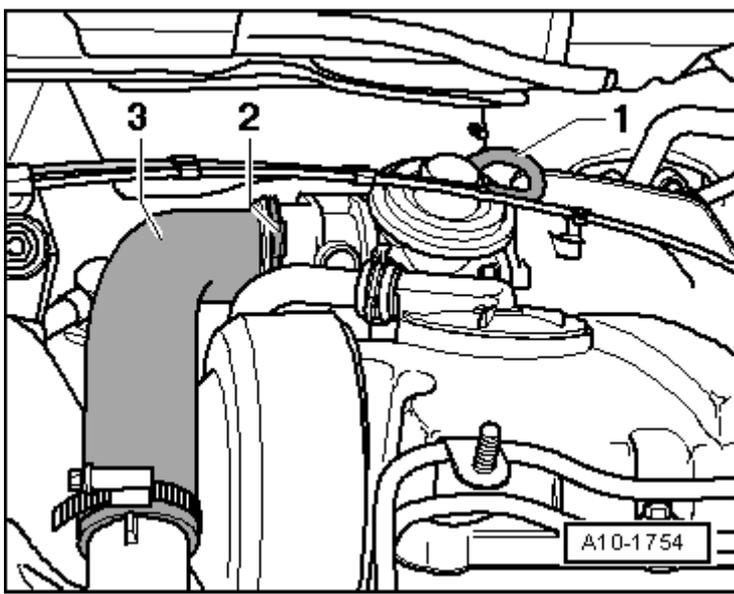
- Remove air intake hose -2- from charge air cooler.

Note
Disregard -item 1-.

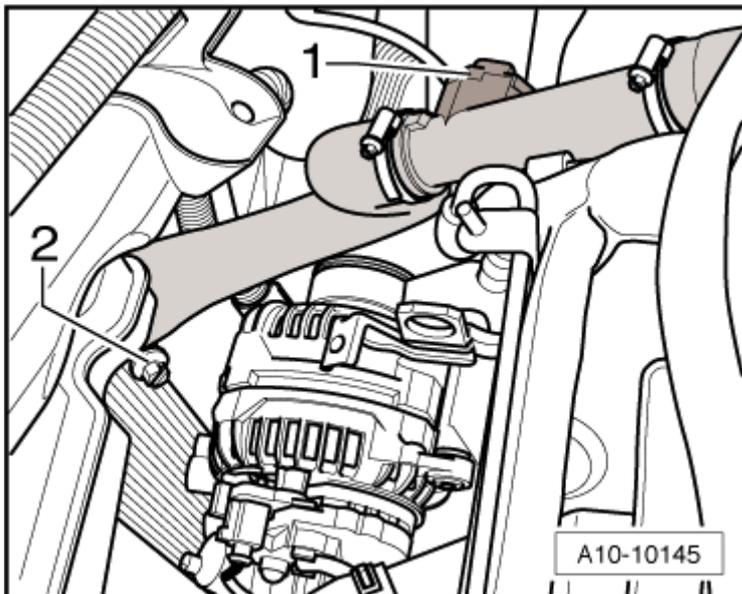


Vehicles with engine code letters ATL:

- Remove air hose -3- from intake manifold flap motor -V157- by lifting retaining clip -2- slightly.
- Disconnect vacuum hose -1- at mechanical exhaust gas recirculation valve.



- Remove air intake hose -2- from charge air cooler.
- Unplug electrical connector at charge pressure sender -G31--item 1-.

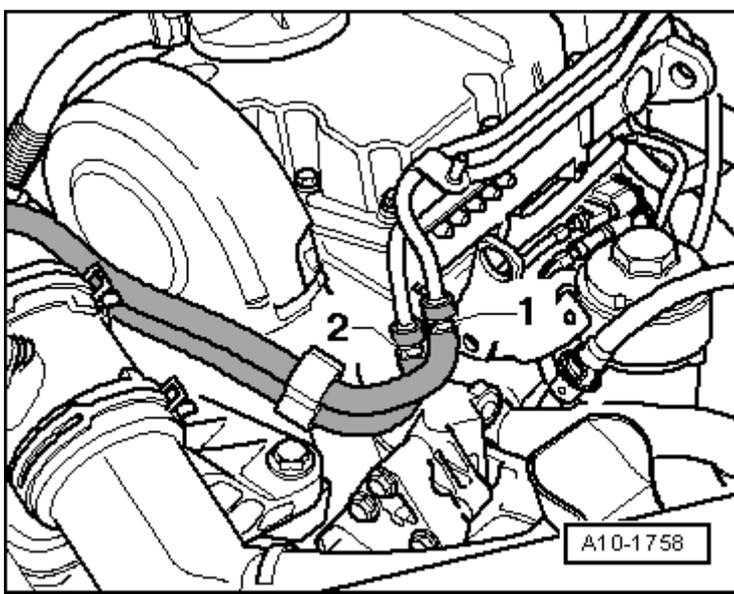


All models:

! WARNING
Risk of scalding - the temperature of the fuel and the fuel lines can be as high as 100 °C.

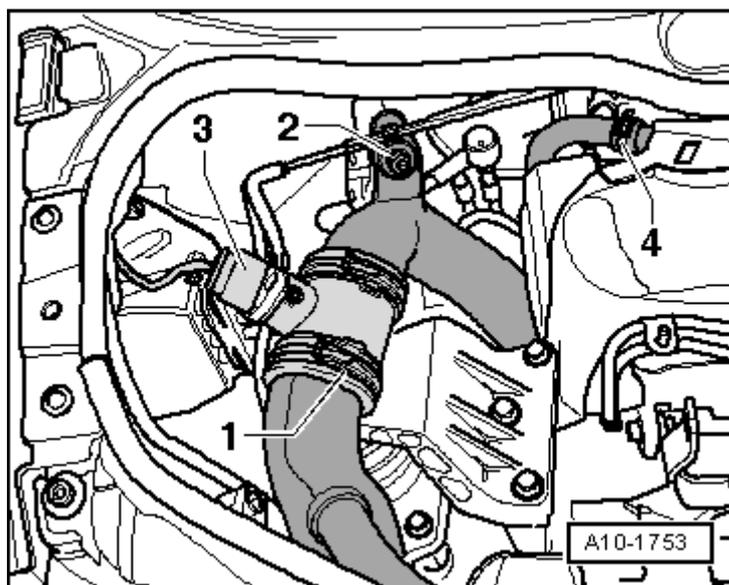
- ◆ Allow the fuel to cool down before disconnecting the lines.
- ◆ Wear protective gloves.
- ◆ Wear safety goggles.

- Mark fuel supply pipe -2- and fuel return pipe -1-.
- Move fuel lines clear.

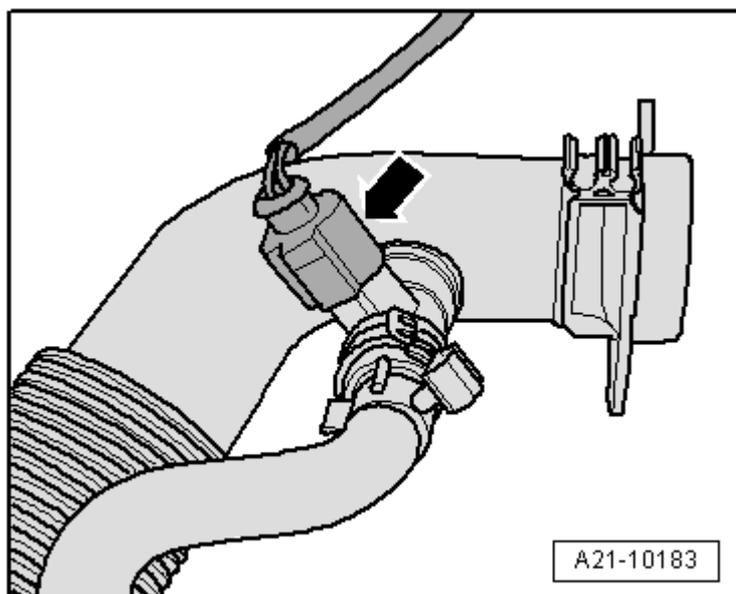


- Detach air intake hose -1- at air mass meter -G70-.

- Unplug electrical connector -3- at air mass meter -G70-.
- Remove nut -2-.
- Disconnect crankcase breather hose -4- at cylinder head cover.
- Pull air pipe out slightly together with air mass meter -G70-.

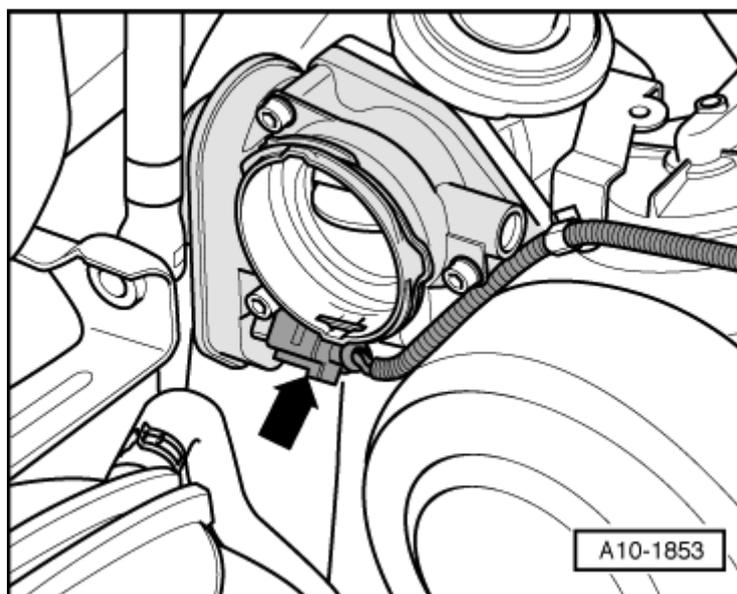


- Detach electrical connector -arrow- at heater element for crankcase breather -N79- (if fitted).
- Remove air pipe.



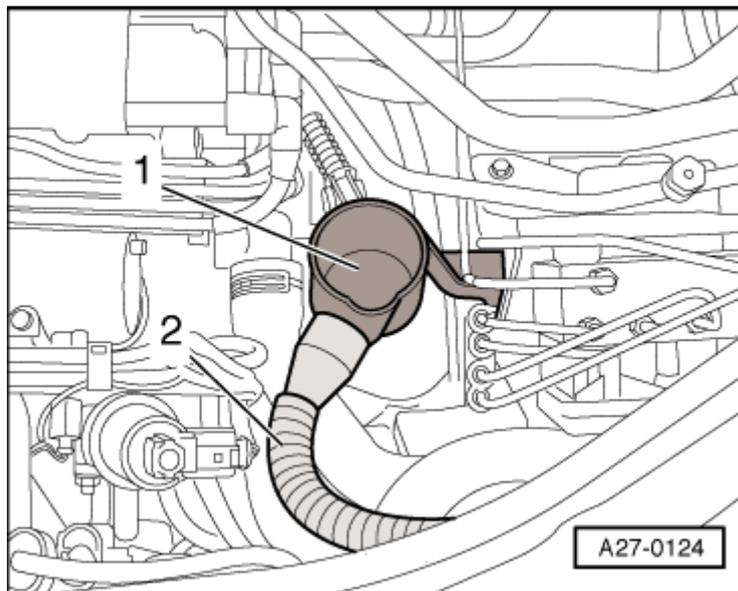
Vehicles with engine code letters ATL:

- Detach electrical connector -arrow- at intake manifold flap motor -V157-.
- Move wiring clear.

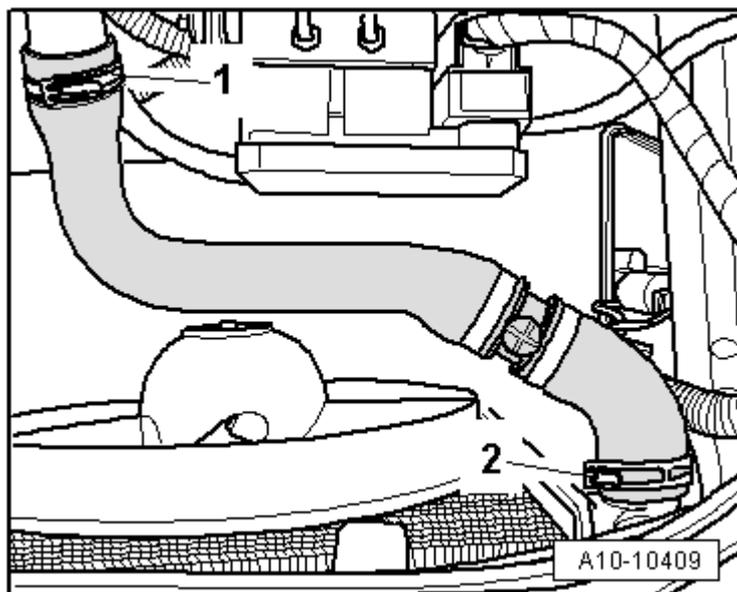


All models:

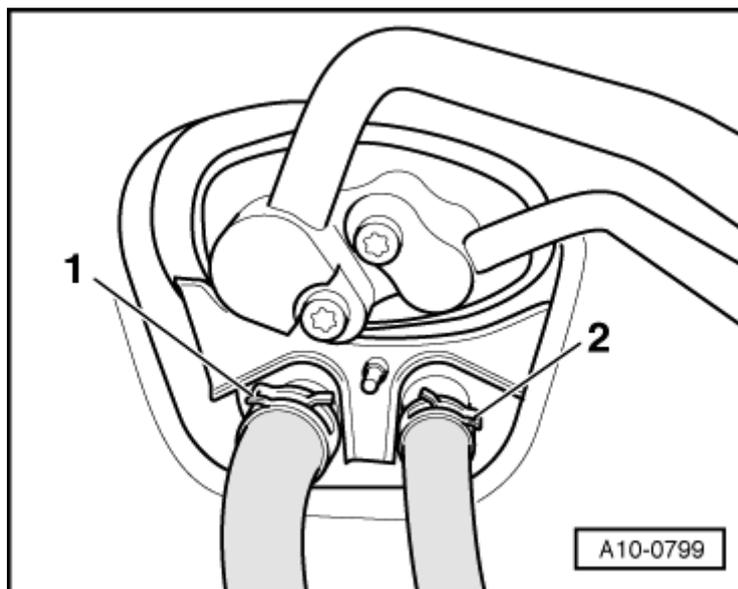
- Disconnect drain hose -2-.
- Remove water collector -1-.



- Remove top left coolant hose -items 1 and 2-.



- Mark coolant supply hose -1- and coolant return hose -2- going to heat exchanger and disconnect coolant hoses at bulkhead.



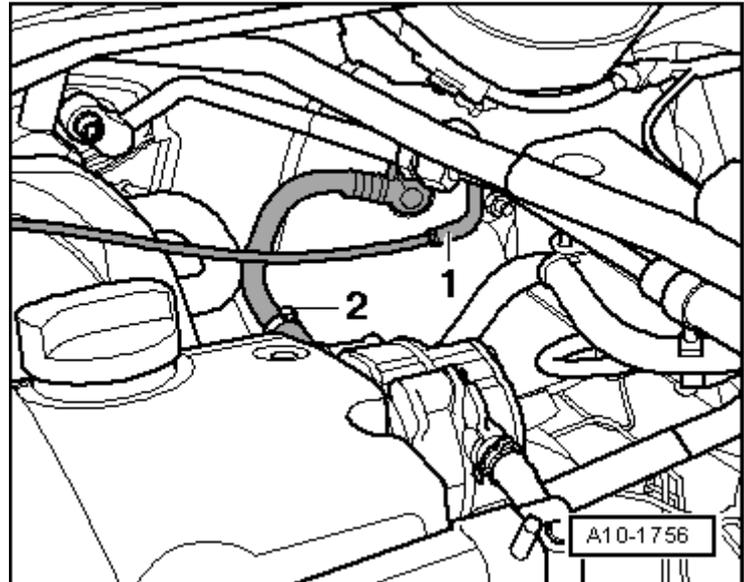
Vehicles with engine code letters ATL,

BHC:

- Unplug vacuum hose -1-.

All models:

- Detach vacuum hose -2- (going to brake servo) from tandem pump.
- Move vacuum hoses clear.

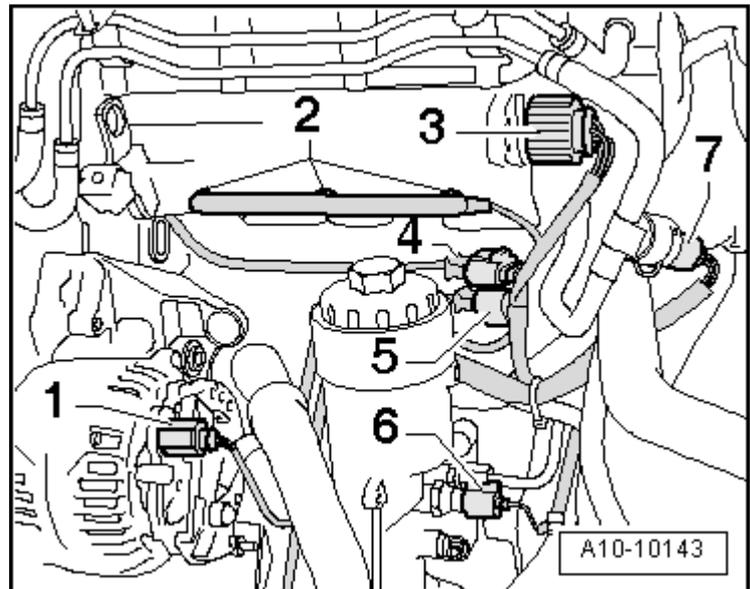


- Unplug electrical connectors -2- on glow plugs.
- Pull retaining tab and loosen knurled nut -3- at main connector for unit injectors.
- Unplug connector for Hall sender -G40- item 4-.
- Unplug electrical connector -7- at fuel temperature sender -G81-.



Note

Disregard -items 1, 5 and 6-.

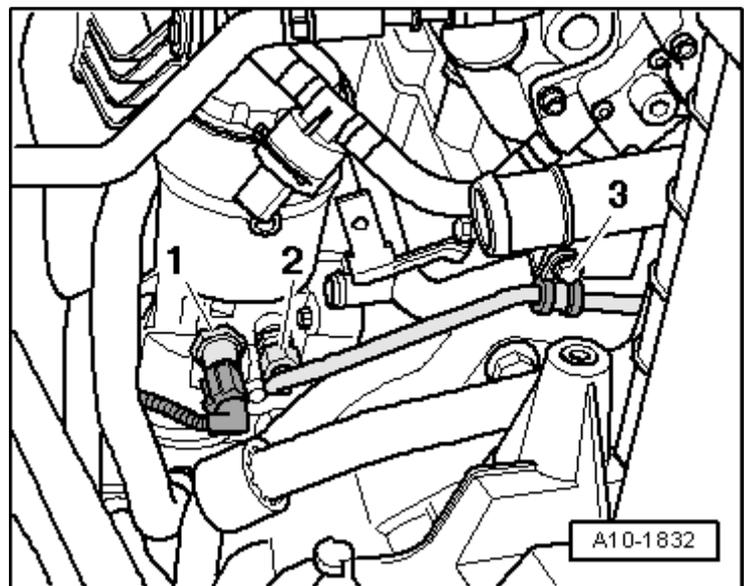


- Detach oil supply pipe -2- going to turbocharger at oil filter bracket.
- Remove bracket for oil supply pipe -3-.

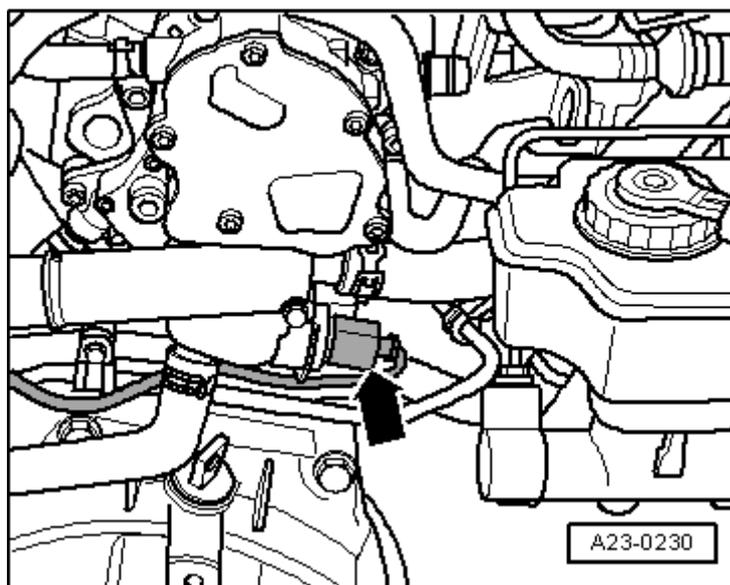


Note

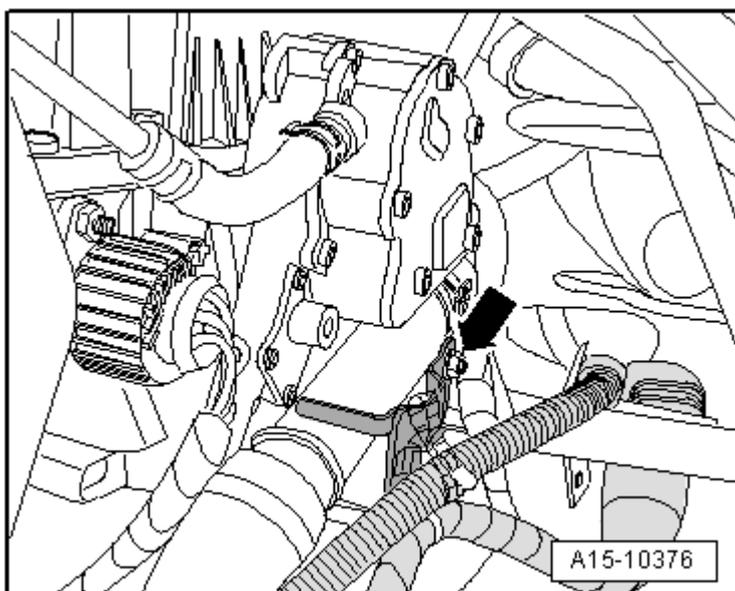
Disregard -item 1-.



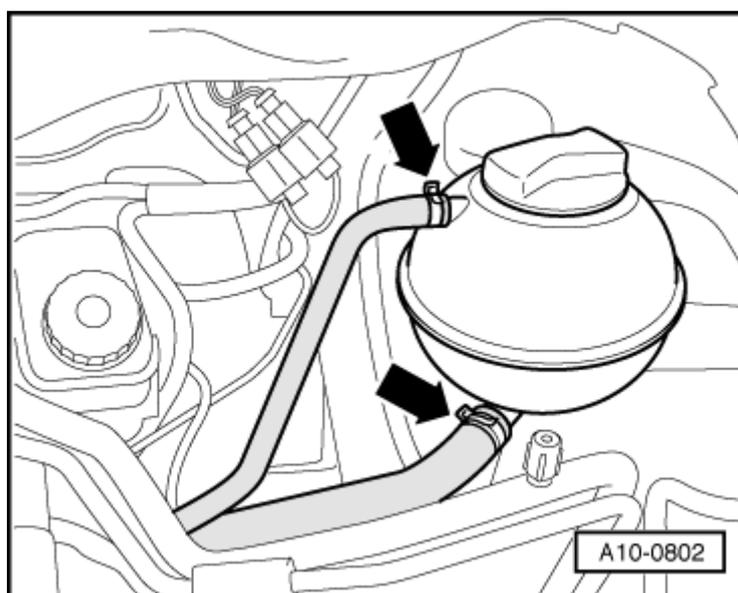
- Unplug electrical connector -arrow- at coolant temperature sender -G62-.



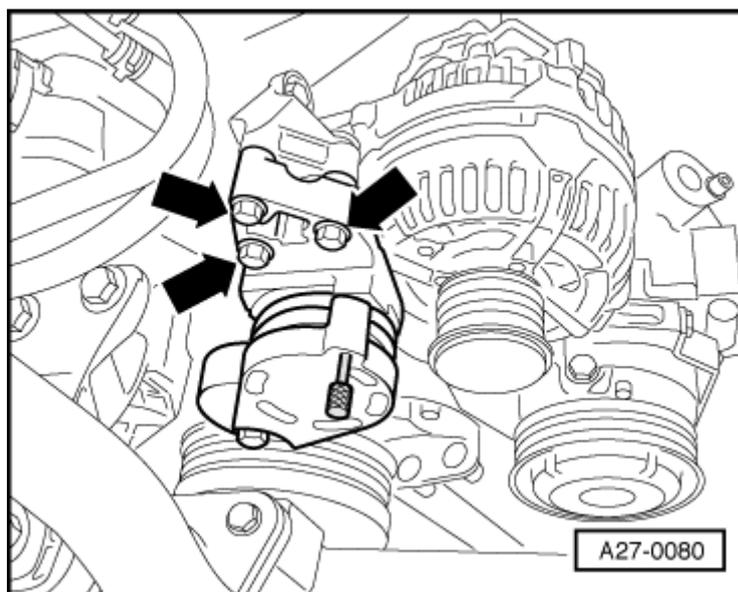
- Unbolt bracket for wiring harness from coolant connection -arrow-.
- Move electrical wiring harness clear.



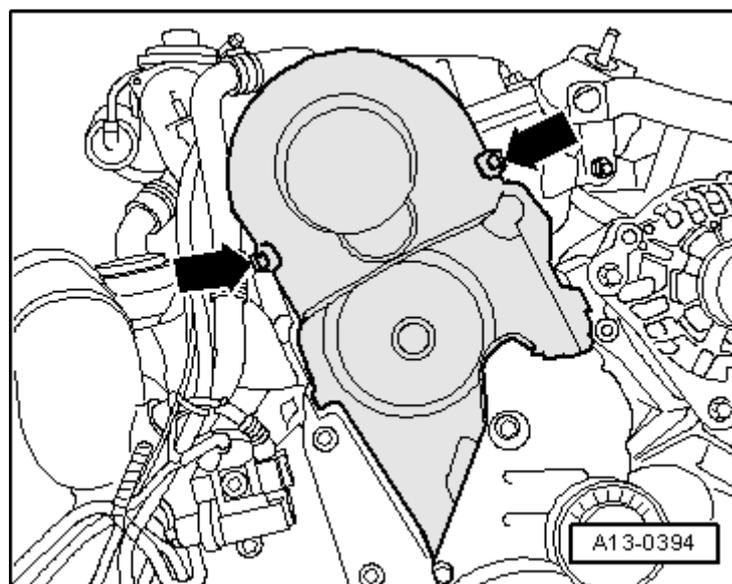
- Detach top coolant hose from coolant expansion tank -top arrow- and move clear.



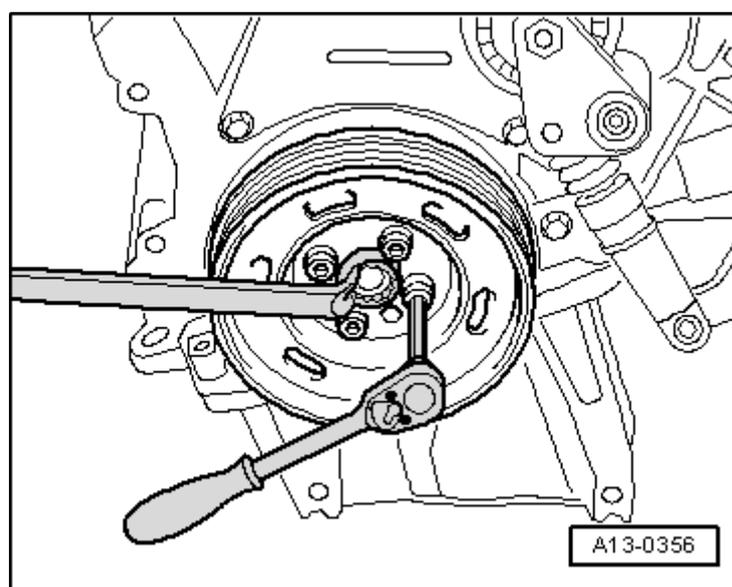
- Unscrew poly V-belt tensioner -arrows-.



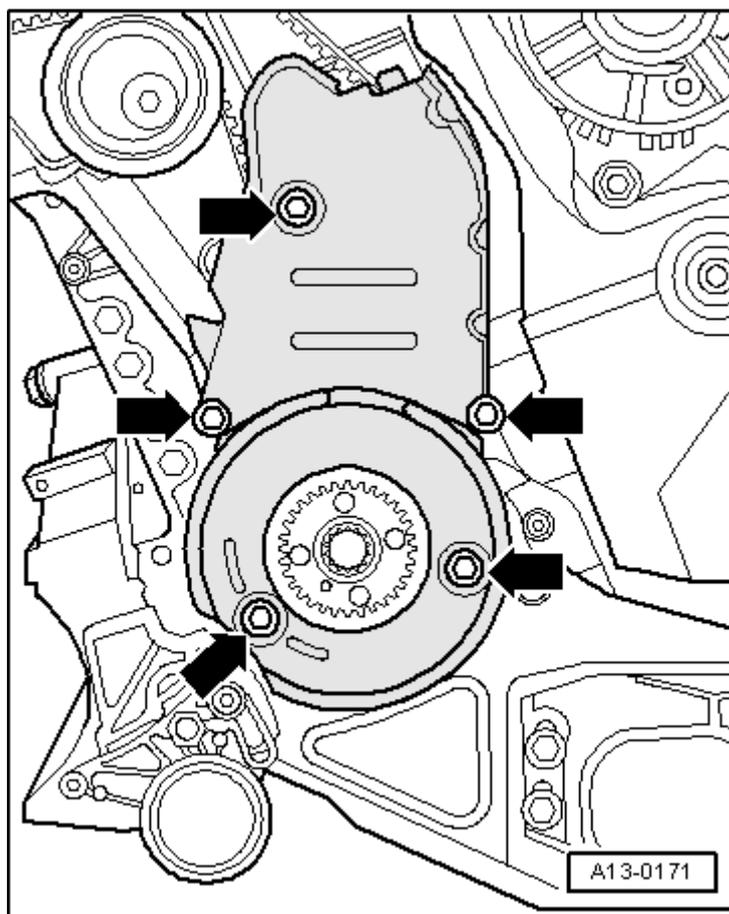
- Remove toothed belt cover (top section) - arrows-



- Unbolt vibration damper; counterhold on centre bolt with ring spanner.



- Unbolt toothed belt cover (centre and bottom) -arrows-

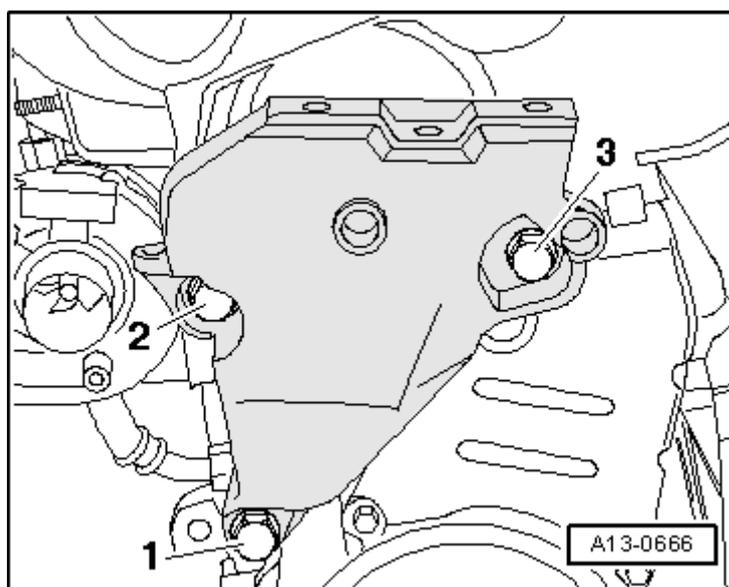


- Remove bottom bolt -1- for engine support.



Note

Bolts -2 and 3- do not have to be removed at this stage.

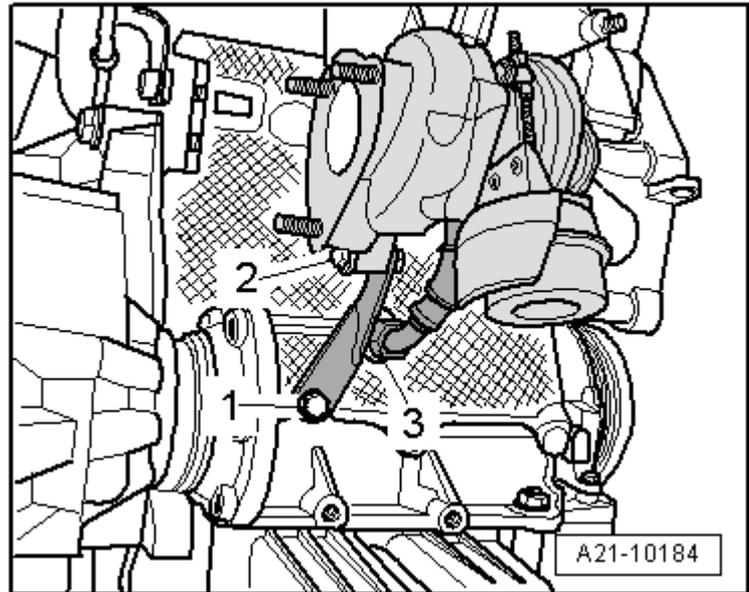


Vehicles with engine code letters ATL, BHC:

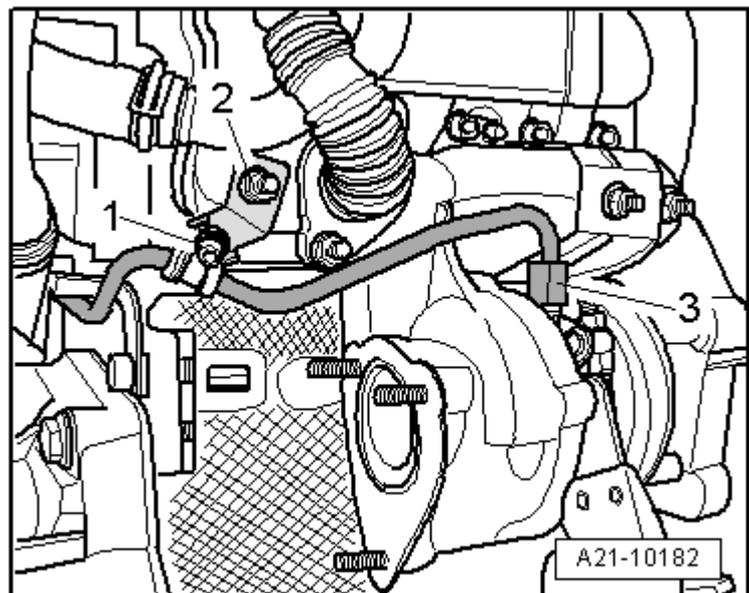
- Remove bolts -1 and 2- and detach support for turbocharger.

All models:

- Remove oil return pipe -3- at cylinder block.



- Slacken bolt -1- approx. 3 turns.
- Remove nut -2-.
- Unbolt oil supply pipe -3- from turbocharger and move clear to one side.



- Set up support bracket -10 - 222 A- with adapters -10 - 222 A /13- and adapter - T40093/6- on wing panel flanges.



Caution

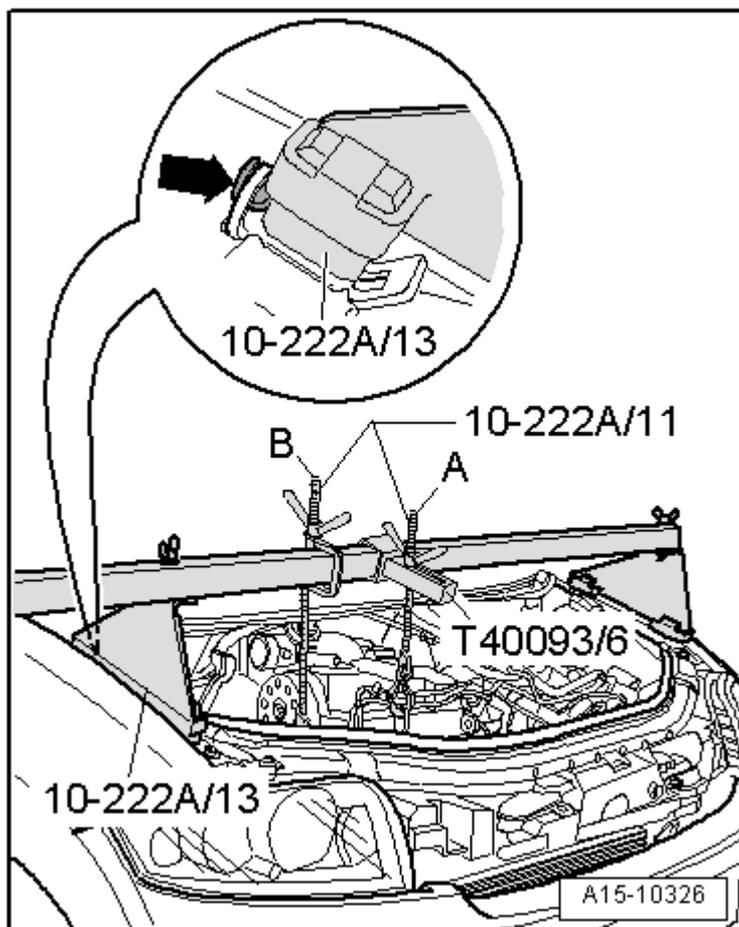
At the same time, engage adapter -10 - 222 A /13- in mountings for bonnet - arrow-.

- Remove clamping bolt in adapter - T40093/6-.
- Adapter -T40093/6- is fitted with its arm pointing upwards.
- Attach hook on spindle -10 - 222 A /11-- item A- to engine lifting eye.
- Take up weight of engine using spindle - item A- (but do not raise engine).



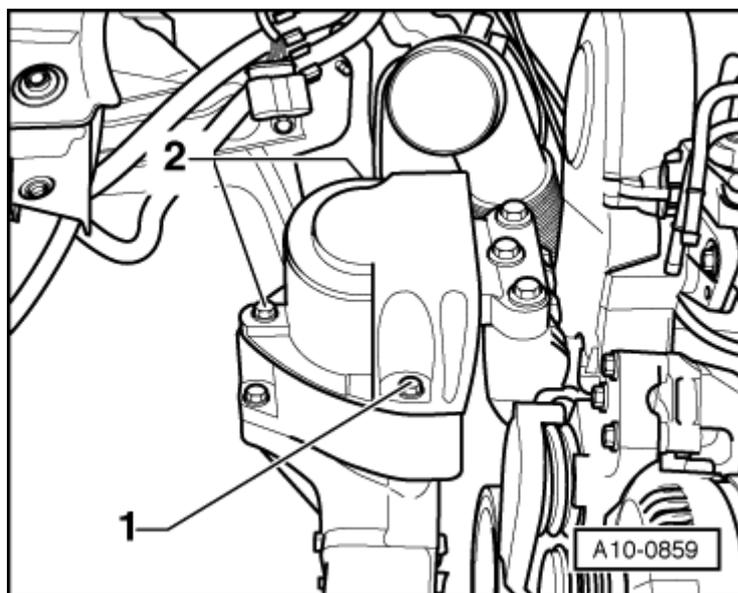
Note

The second spindle -item B- (right-side) is not used at this stage.

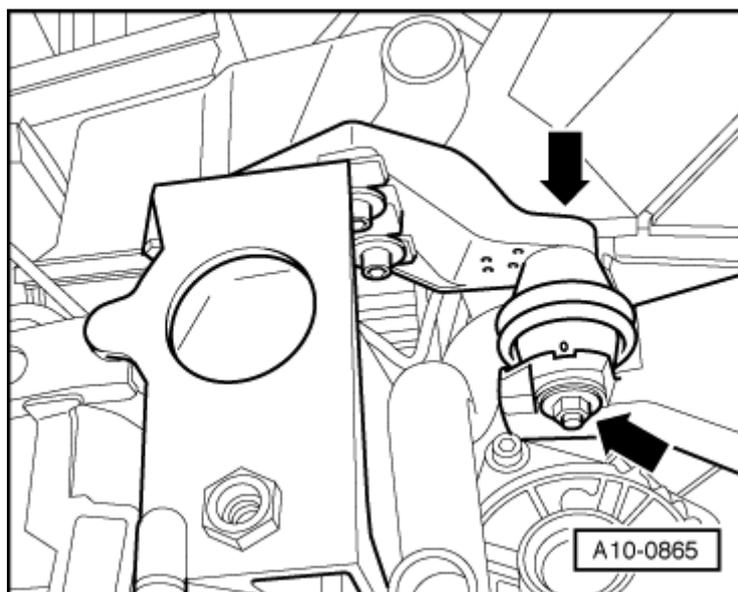


Vehicles with cover for engine mounting

- Remove cover for engine mounting by unscrewing bolts -1 and 2-



- Remove bolts -1 and 3- and detach support arm with engine mounting -2-



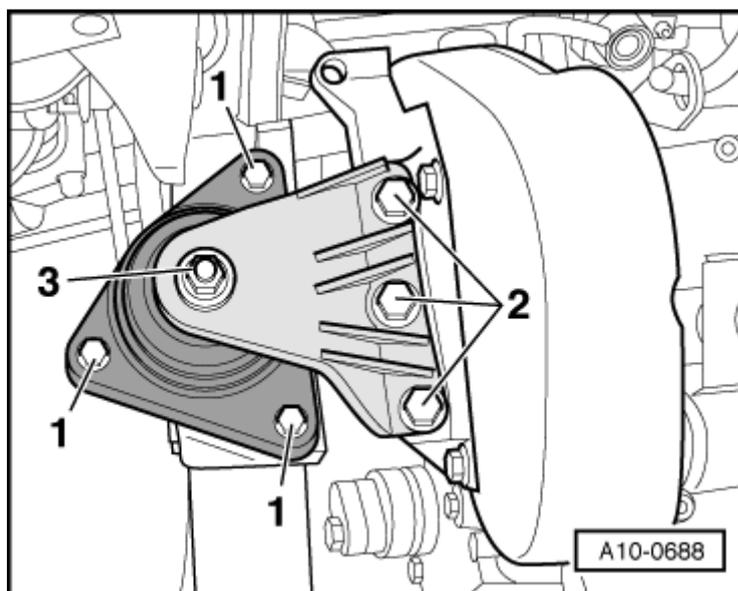
Vehicles without cover for engine mounting



Note

Do not loosen nut -3- unless renewing engine mounting.

- Remove bolts -1 and 2- and detach support arm with engine mounting.



All models:

- Remove top bolts -2 and 3- and detach engine support.



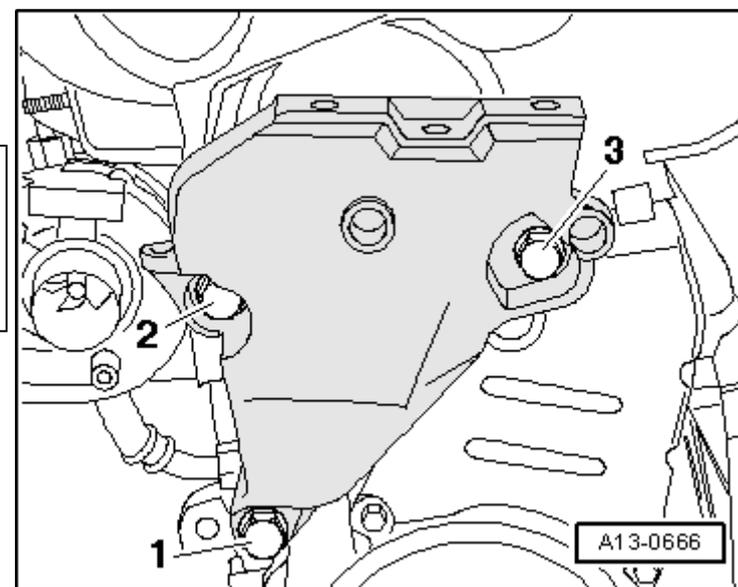
Caution

The engine must only be turned at the crankshaft, in the direction of normal engine rotation (clockwise).



Note

Turn over the engine at the central bolt on the crankshaft.



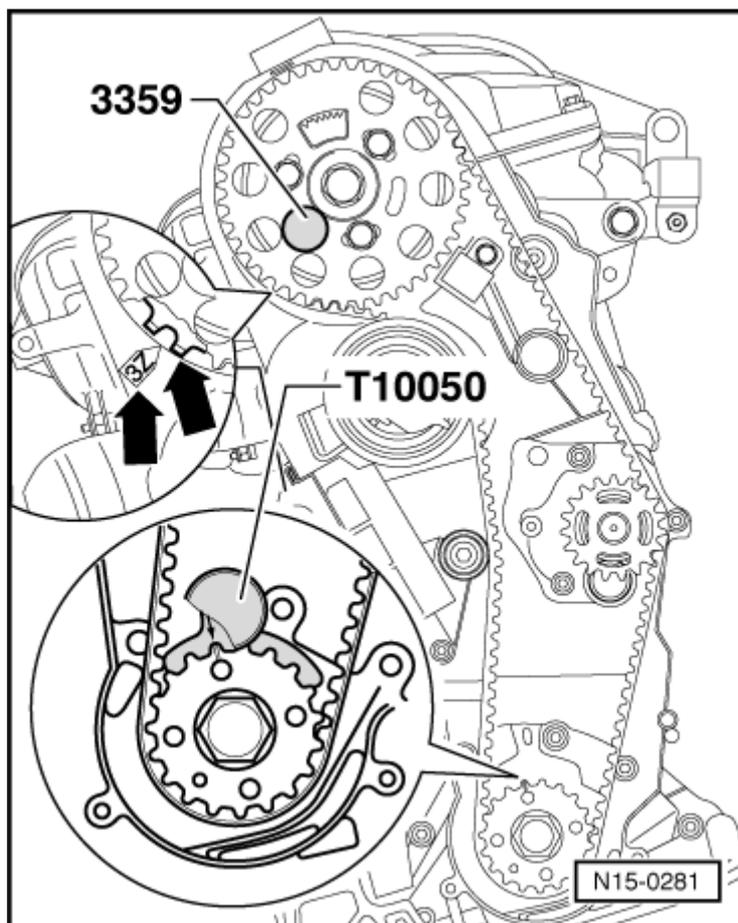
- Turn the crankshaft to "TDC".

- The space between the two lugs on sender wheel of camshaft must align with marking "3Z" on toothed belt cover (rear) -arrows-.
- Lock hub on camshaft with locking pin - 3359-.
- Lock crankshaft sprocket with crankshaft stop -T10050-.

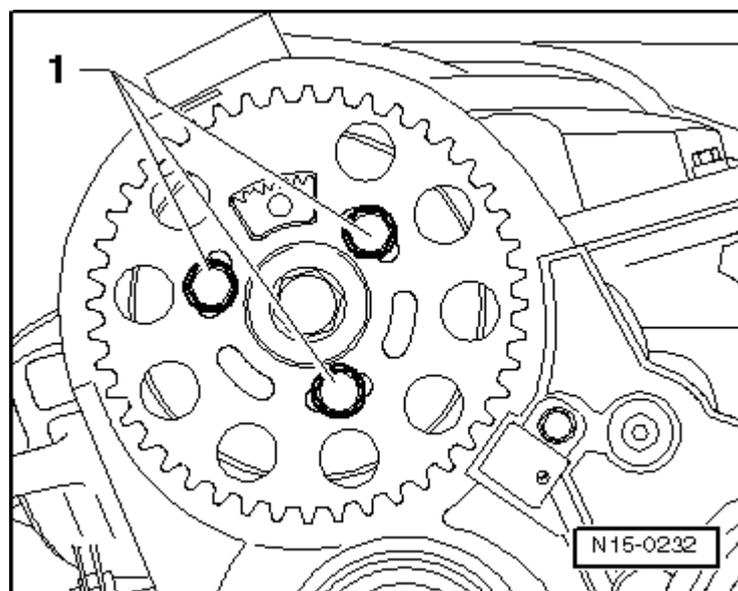
Note

The crankshaft stop can only be pushed onto the sprocket from the front face of the teeth.

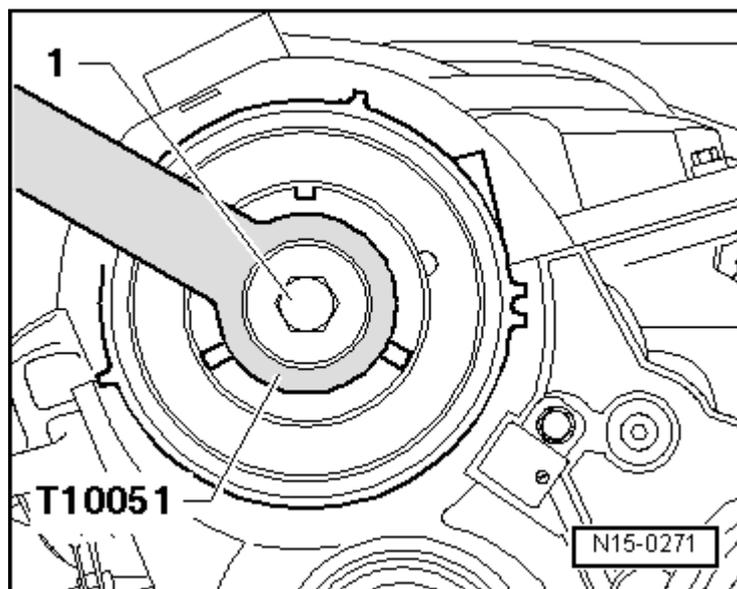
- The markings on the toothed belt sprocket and the crankshaft stop -T10050- must align. The pin of the crankshaft stop -T10050- must engage in the aperture in the sealing flange.
- Remove toothed belt: toothed belt drive with hydraulically damped tensioning roller → **Chapter**, toothed belt drive with friction-damped tensioning roller → **Chapter**.



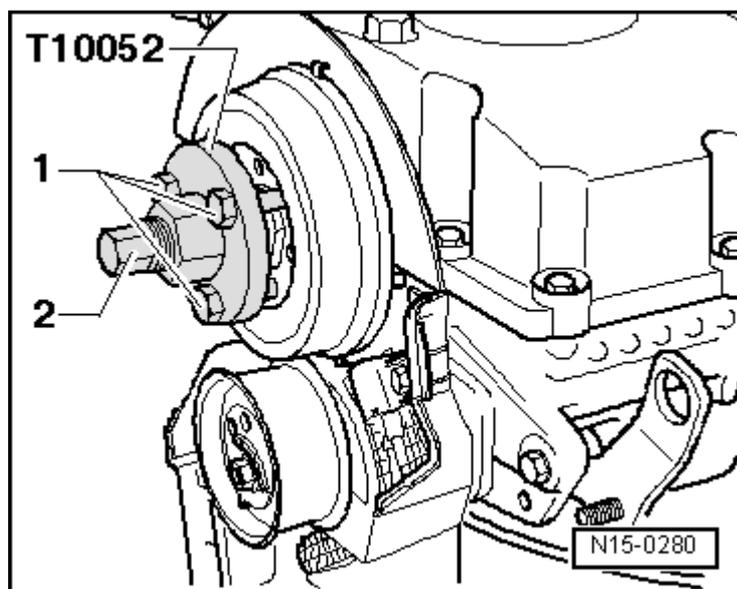
- Unscrew bolts -1- and detach camshaft sprocket from hub.



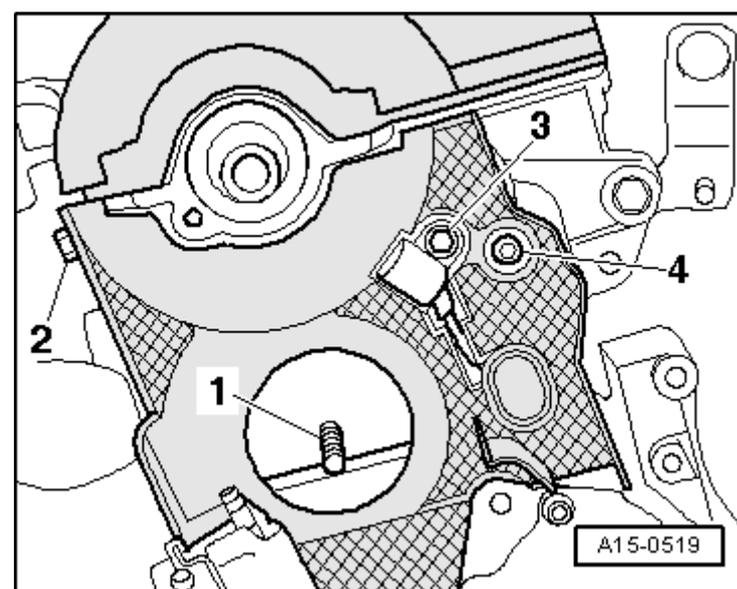
- Loosen bolt -1- for hub; use counterhold tool -T10051-.
- Then unscrew bolt approx. 2 turns.



- Fit puller -T10052- on hub and fit bolts -1-.
- Remove hub from camshaft by screwing in bolt -2- while counterholding at hexagon flats (30 mm) of puller.
- Detach hub from taper of camshaft.

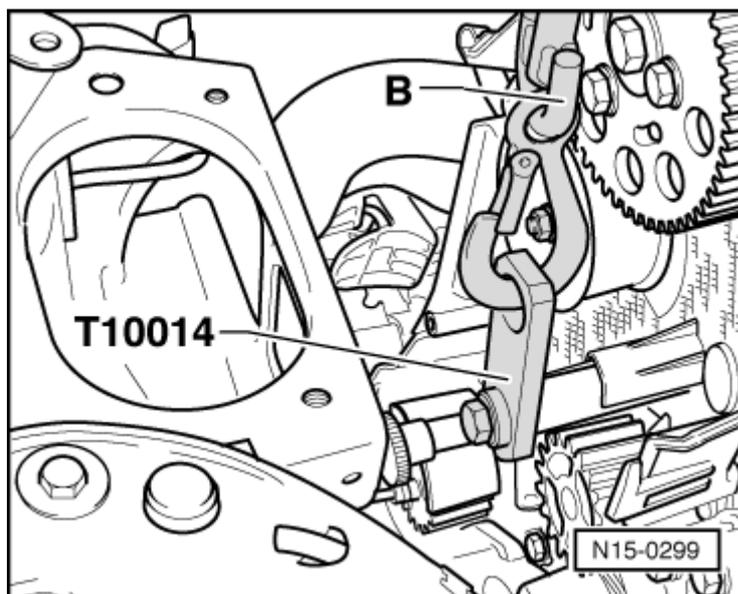


- Remove toothed belt tensioning roller.
- Remove bolts -2 ... 4-.
- Unscrew stud -1- using two M8 locknuts.

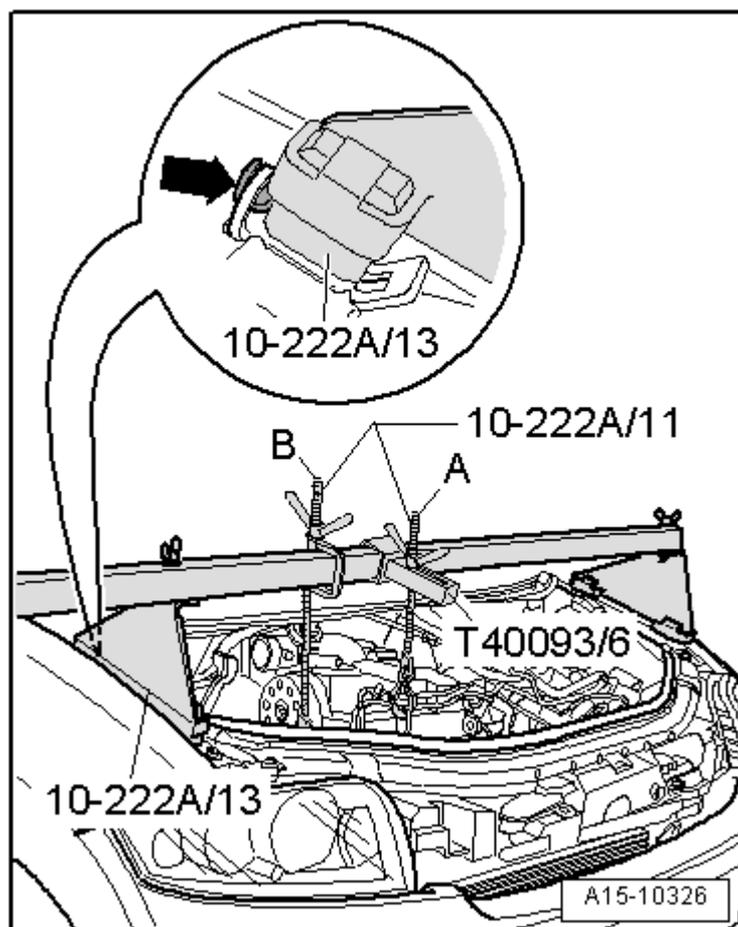


- Screw in bracket -T10014- into threaded hole above coolant pump.

- Attach free hook of spindle -10 - 222 A /11-
-item B- to bracket -T10014-.



- Lift engine via spindle -B- until spindle -
A- has no more load.
- Unhook spindle -A- and move clear to
one side.



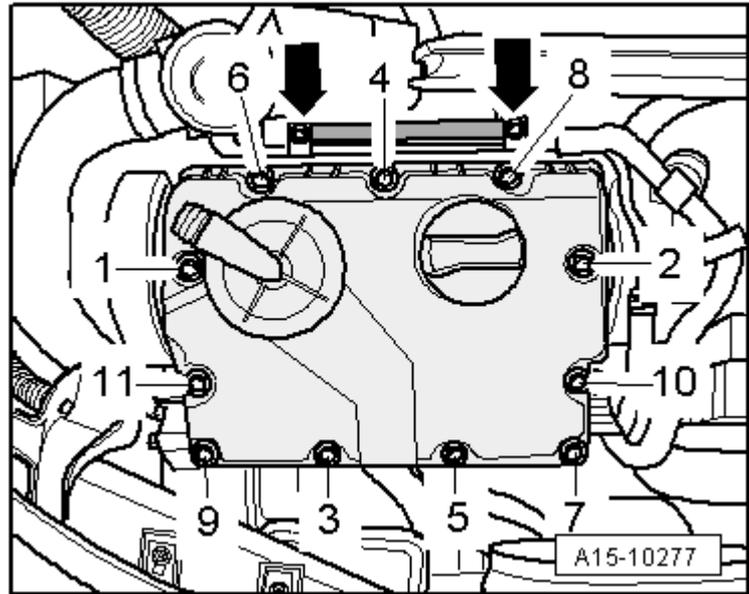
- Remove cylinder head cover bolts in the
sequence -11 ... 1-.



Note

Disregard -arrows-.

- Detach bracket with fuel pipes.
- Remove cylinder head cover.



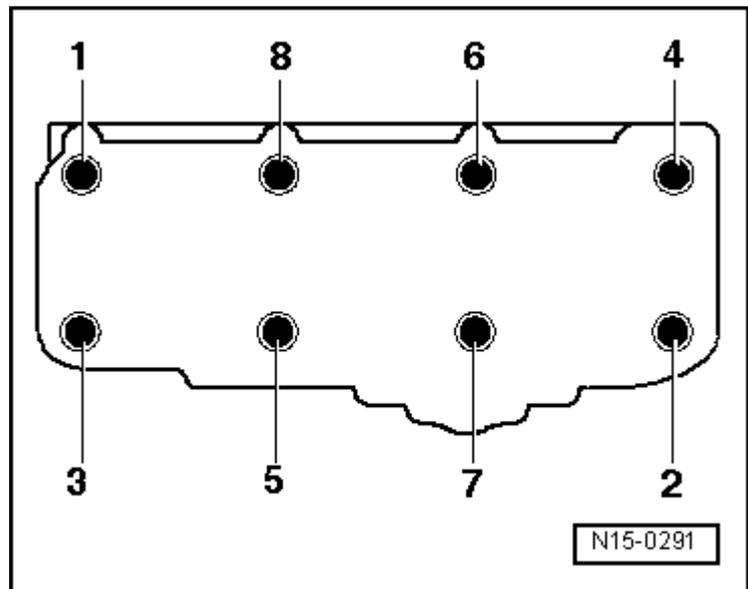
- Loosen cylinder head bolts in the sequence: -1 ... 8-
- Carefully lift off the cylinder head with the assistance of a 2nd mechanic.
- Lay cylinder head aside on a clean surface with the combustion chamber side facing upwards.

Installing



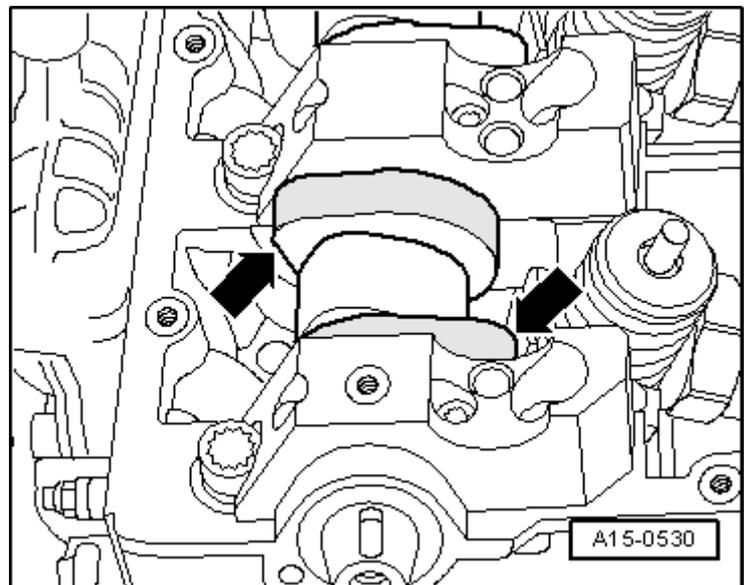
Note

- ◆ Renew the cylinder head bolts.
- ◆ Renew self-locking nuts and bolts.
- ◆ Renew bolts which are tightened to a specified angle as well as oil seals and gaskets.
- ◆ If repairing, carefully remove any remaining gasket material from the cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces.
- ◆ Carefully remove any remaining emery and abrasive material.
- ◆ No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.
- ◆ Do not remove new cylinder head gasket from packaging until it is ready to be fitted.
- ◆ Handle gasket very carefully. Damage to the silicone coating or the indented area will lead to leaks.
- ◆ Cylinder heads with cracks between the valve seats may be used without reducing engine life, provided the cracks are small and not more than 0.5 mm wide.
- ◆ The cylinder heads of diesel engines must not be machined.
- ◆ When installing a replacement cylinder

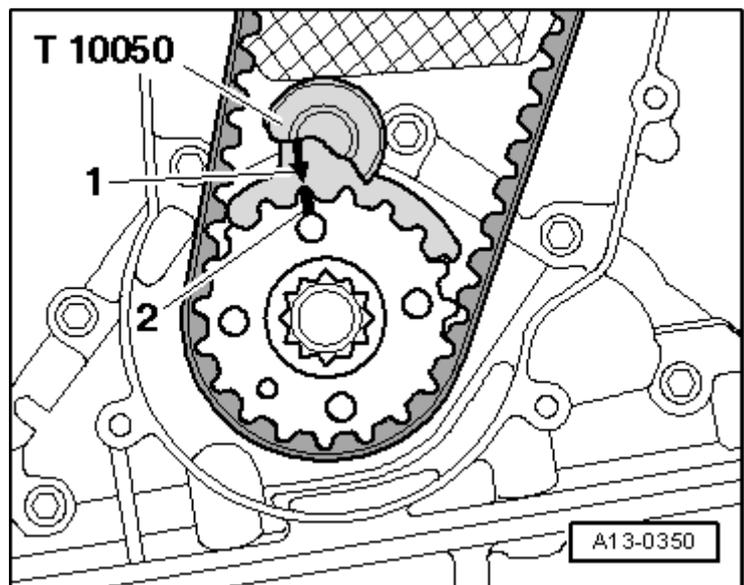


head with fitted camshaft, the contact surfaces between hydraulic tappets and cam running surfaces must be oiled after installing the cylinder head.

- ◆ The plastic protectors fitted to protect the open valves should not be removed until the cylinder head is ready to be fitted.
 - ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) → [Parts catalogue](#).
 - ◆ After fitting a new cylinder head or cylinder head gasket, change the coolant and engine oil.
 - ◆ 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.
- Check whether the camshaft and the crankshaft are positioned at “TDC”:
- The cams for cylinder 1 must point upwards evenly on camshaft -arrows-.



- The crankshaft sprocket must be locked with the crankshaft stop -T10050-.
- The markings on the toothed belt sprocket and the crankshaft stop -arrow- must align. The pin of the crankshaft stop must engage in the aperture in the sealing flange.



- Note identification markings on cylinder head gasket.

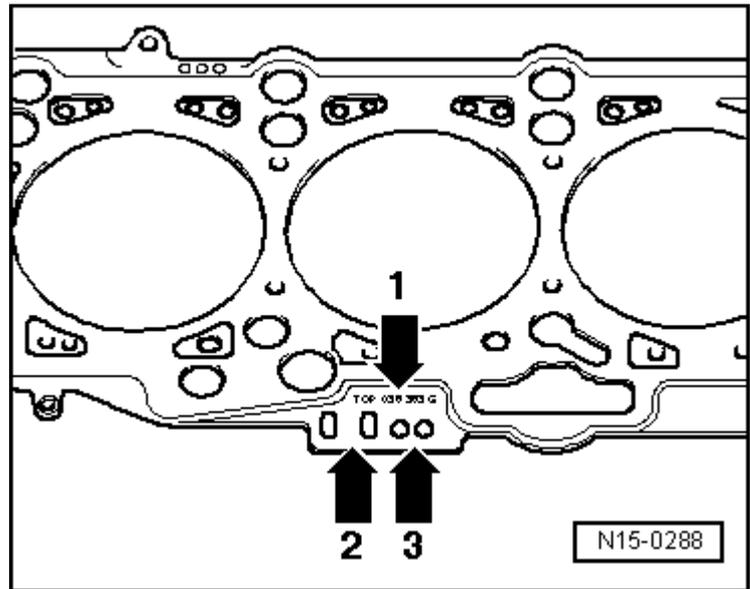
1 - Part No.

2 - Production code (can be disregarded)

3 - Holes

Note

- ◆ If the cylinder head gasket or cylinder head is renewed, be sure to install a gasket with the same identification.
- ◆ If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC" → [Chapter](#).



- Fit cylinder head gasket.
- Note position of centring sleeves in cylinder block.
- Check installation position of cylinder head gasket: the word "oben" (top) or the Part No. should face towards the cylinder head.

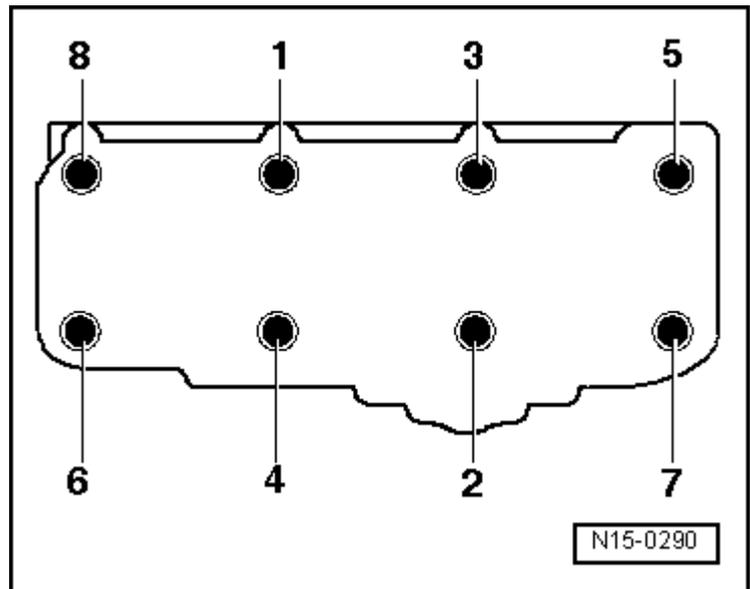
- Fit the cylinder head.
- Check that all washers for cylinder head bolts are fitted in cylinder head.
- Insert new cylinder head bolts and tighten finger-tight.

- Tighten cylinder head bolts in 4 stages in the sequence indicated:

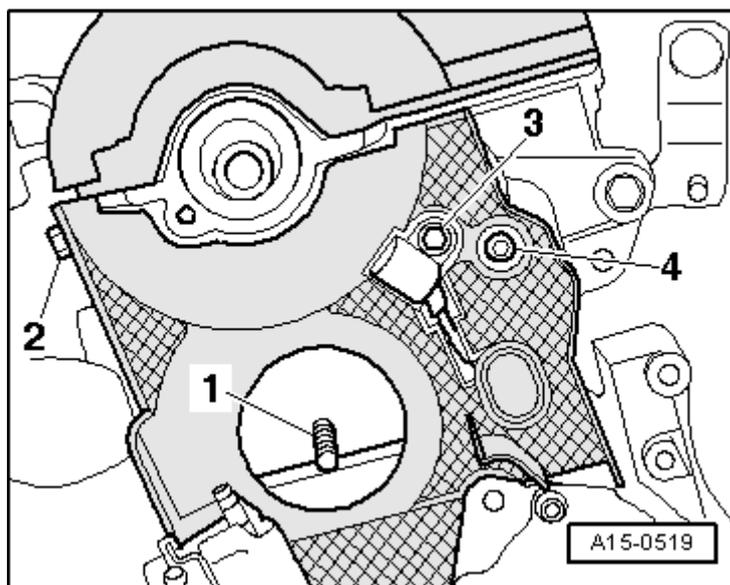
1. Tighten with torque wrench to 40 Nm.
2. Tighten with torque wrench to 60 Nm.
3. Turn 90° (1/4 turn) further using a rigid wrench.
4. Turn 90° (1/4 turn) further using a rigid wrench.

Note

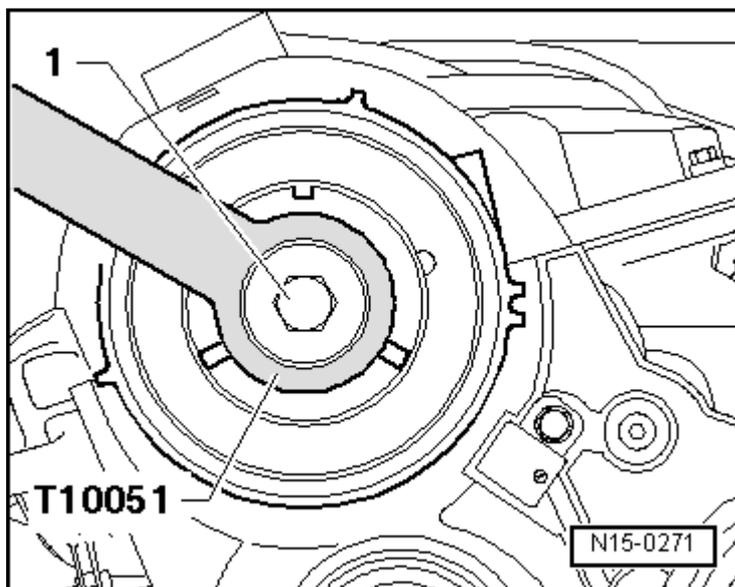
Cylinder head bolts do not have to be torqued down again later after repair work.



- Apply locking fluid to bolts -2 ... 4- and tighten; for locking fluid refer to → [Parts catalogue](#).
- Tighten stud -1- using two M8 locknuts.



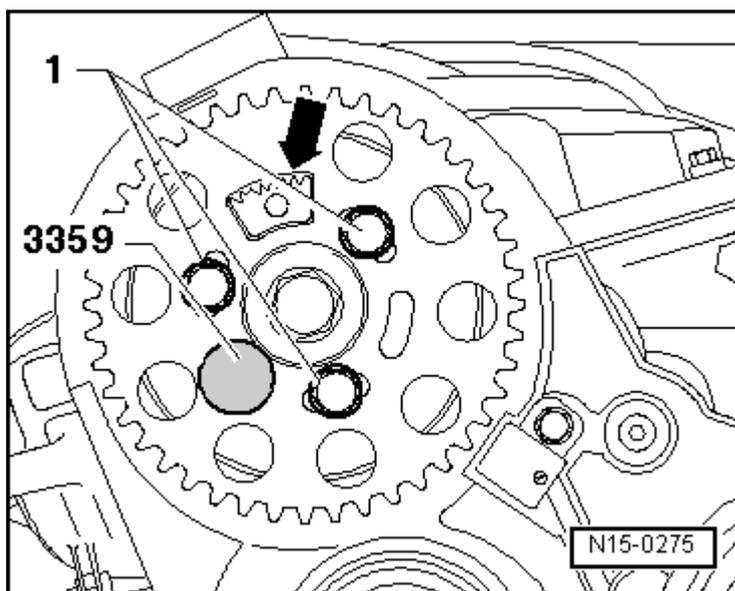
- Attach hub to camshaft.
- Tighten securing bolt -1- (use counterhold - T10051-).



- Push camshaft sprocket onto hub.
- Toothed segment -arrow- of camshaft sprocket must be at top.
- Screw in bolts -1- finger-tight.
- Lock hub on camshaft with locking pin - 3359-.

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

- Install cylinder head cover → **Chapter**.
- Install toothed belt (adjust valve timing):
toothed belt drive with hydraulically damped tensioning roller → **Anchor**,
toothed belt drive with friction-damped tensioning roller → **Anchor**.



Note

- ◆ Follow all instructions for removing and

installing toothed belt.

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do NOT use lubricant.*
- Install vibration damper → [Chapter](#).
- Install poly V-belt → [Chapter](#).
- Install engine mounting with support arm → [Chapter](#) or → [Chapter](#).
- Install catalytic converter → [Chapter](#).
- Install air pipes/hoses with plug-in connectors → [Chapter](#).
- Electrical connections and routing → [Current flow diagrams, Electrical fault finding and Fitting locations](#).
- Observe notes on procedures required after connecting battery → [Rep. Gr.27](#).
- Install windscreen wiper arm → [Rep. Gr.92](#).
- Change engine oil → [Booklet809](#).
- Fill cooling system with fresh coolant → [Chapter](#).

Tightening torques

Component		Nm
Hall sender -G40- to cylinder head		10 ¹⁾
Rear toothed belt cover to cylinder head	M6	10 ¹⁾
	M8	20 ¹⁾
Stud to cylinder head		15
Hub to camshaft		100
Engine support to cylinder block		45
Oil supply pipe to:	Oil filter bracket	22
	Turbocharger	22
Oil return pipe to:	Turbocharger	15
	Cylinder block	30
Support for turbocharger to:	Turbocharger	20
	Cylinder block	25
Bracket for wiring harness to coolant hose/pipe connection		10
Bracket for oil supply pipe to coolant hose/pipe connection		10
Air pipe to:	Turbocharger	8
	Sump	8
Drive shaft heat shield to cylinder block		33
Engine cover panel to bracket		5.5

- ¹⁾ Install using locking fluid; refer to → [Parts catalogue](#).