

Workshop Manual Audi A6 2005 ➤

4-cylinder direct petrol injection engine (2.0 ltr. 4-valve turbo), mechanics

Engine ID	BPJ	BYK							
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Edition 03.2012

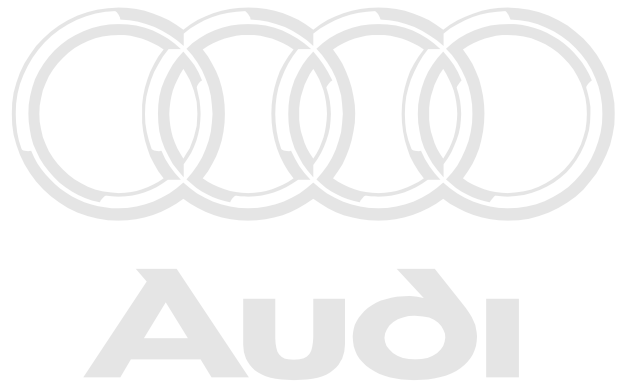


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List of Workshop Manual Repair Groups

Repair Group

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- 21 - Turbocharging/supercharging
- 26 - Exhaust system



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

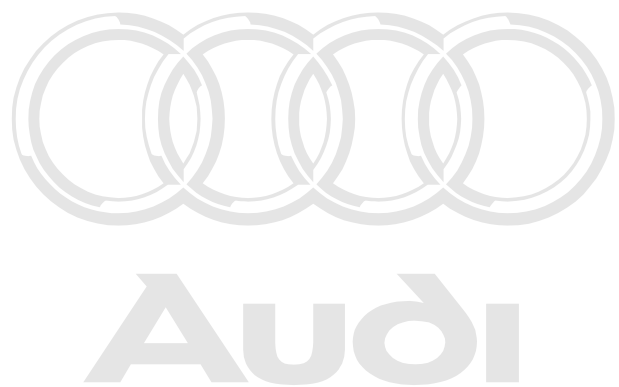
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00 – Technical data

1 Technical data

The engine number („Engine code“ and „Serial number“) can be found at the front of the joint between engine and gearbox.

Additionally there is a sticker on the toothed belt cover showing the „engine code“ and „serial number“.

The engine code is also indicated on the vehicle data stickers.



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2 Engine data

Code letters		BPJ	BYK
Capacity	ltr.	1.984	1.984
Power output	kW at rpm	125/4200	125/4200
Torque	Nm at rpm	280/1800	280/1800
Bore	Ø mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		10.5	10.5
RON		98 ¹⁾	98 ¹⁾
Injection/ignition system		FSI	FSI
Firing order		1-3-4-2	1-3-4-2
Knock control		yes	yes
Turbocharging/super-charging		yes	yes
Exhaust gas recirculation		no	no
Intake manifold change-over		no	no
Variable valve timing		yes	yes
Secondary air system		no	no
• ¹⁾ Unleaded petrol RON 95 can also be used, but results in reduced power			



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3 Safety precautions

3.1 Working on the fuel system

When working on the fuel system note the following warnings:



WARNING

The fuel system operates at extremely high pressure. This can cause injury.

- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.*
- ◆ *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

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- Procedure before opening high-pressure section of injection system ⇒ Rep. gr. 24 .

Observe the following to prevent injuries to persons and damage to the injection and ignition system:

- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ Always switch off ignition before washing engine.
- ◆ Faults are stored in engine control units if electrical connectors were unplugged and engine was started: „Generate readiness code“ in „Guided Functions“ ⇒ Vehicle diagnostic tester .



Caution

To prevent irreparable damage to the electronic components when disconnecting the battery:

- ◆ *Observe notes on procedure for disconnecting the battery.*
- ◆ *Always switch off the ignition before disconnecting the battery.*

- Disconnect battery ⇒ Rep. gr. 27 .

3.2 Procedure before opening high-pressure section of injection system



WARNING

- ◆ *The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).*
- ◆ *The fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 6 bar prior to opening the system. Procedure ⇒ Rep. gr. 24 .*

3.3 Working on the cooling system

When working on the cooling system note the following warnings:



WARNING

Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



Caution

Overheating can occur if the filler cap is not fitted properly.

- ◆ *The filler cap must engage positively and audibly when it is closed.*

3.4 Using testers and measuring instruments during a road test

Note the following if testers and measuring instruments have to be used during a road test:



WARNING

Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- ◆ *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

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3.5 Working on the exhaust system

When working on the exhaust system please note the following:



Caution

Avoid damage to flexible joint.

- ◆ *Do not bend flexible joint more than 10°.*
- ◆ *Install flexible joint so that it is not under tension.*
- ◆ *Take care not to damage wire mesh on flexible joint.*

4 General repair instructions

4.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger

Even small amounts of dirt can cause malfunctions. For this reason, please observe the following rules when working on the fuel supply system, injection system and turbocharger:

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Seal off open pipes/lines and connections immediately with clean plugs, e.g. from engine bung set -VAS 6122- .
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have not been stored in their packing (e.g. in tool boxes etc.).
- ◆ When the system is open, do not work with compressed air and do not move the vehicle.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

4.2 Checking fuel system for leaks

- Allow engine to run for several minutes at moderate rpm.
- Switch off ignition.
- Check complete fuel system for leaks.
- If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
- Road-test vehicle and accelerate with full throttle at least once.
- Then inspect high-pressure section of fuel system again for leaks.

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4.3 Foreign particles in engine

- ◆ When working on the engine, all open inlet and exhaust ports must be sealed with suitable plugs (e.g. from engine bung set -VAS 6122-) to prevent foreign particles from entering the engine.

4.4 Contact corrosion!

Contact corrosion can occur if unsuitable fasteners are used (e.g. bolts, nuts, washers, etc.).

For this reason, only fasteners with a special surface coating are used.

Additionally, all rubber and plastic parts and all adhesives are made of non-conductive materials.

Always install new parts if you are not sure whether used parts can be re-fitted ⇒ Electronic parts catalogue .

Note the following:

- ◆ We recommend using only genuine replacement parts; these have been tested and are compatible with aluminium.
- ◆ We recommend the use of Audi accessories.
- ◆ Damage caused by contact corrosion is not covered under warranty.

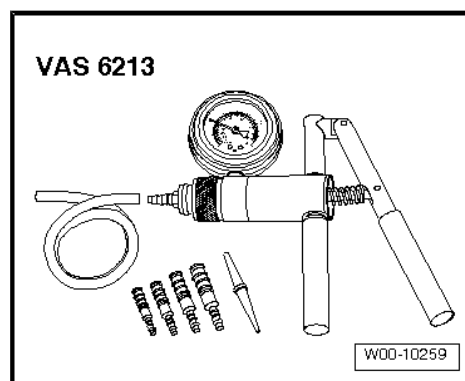
4.5 Routing and attachment of pipes, hoses and wiring

- ◆ Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter system and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.
- ◆ To prevent damaging pipes, hoses and wiring, ensure sufficient clearance from all moving or hot components in engine compartment (little space in engine compartment).

4.6 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the memory, check the vacuum lines leading to the corresponding component and also check the remaining vacuum lines in the system.
- If it is not possible to build up a vacuum with the hand vacuum pump -VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

4.7 Installing radiators, condensers and charge air coolers

Even when the radiator, condenser and charge air cooler are correctly installed, slight impressions may be visible on the fins of these components. This does not mean that the components are damaged. If the fins are only very slightly distorted, this does not justify renewal of the radiator, condenser or charge air cooler.



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10 – Removing and installing engine

1 Removing and installing engine

1.1 Removing engine



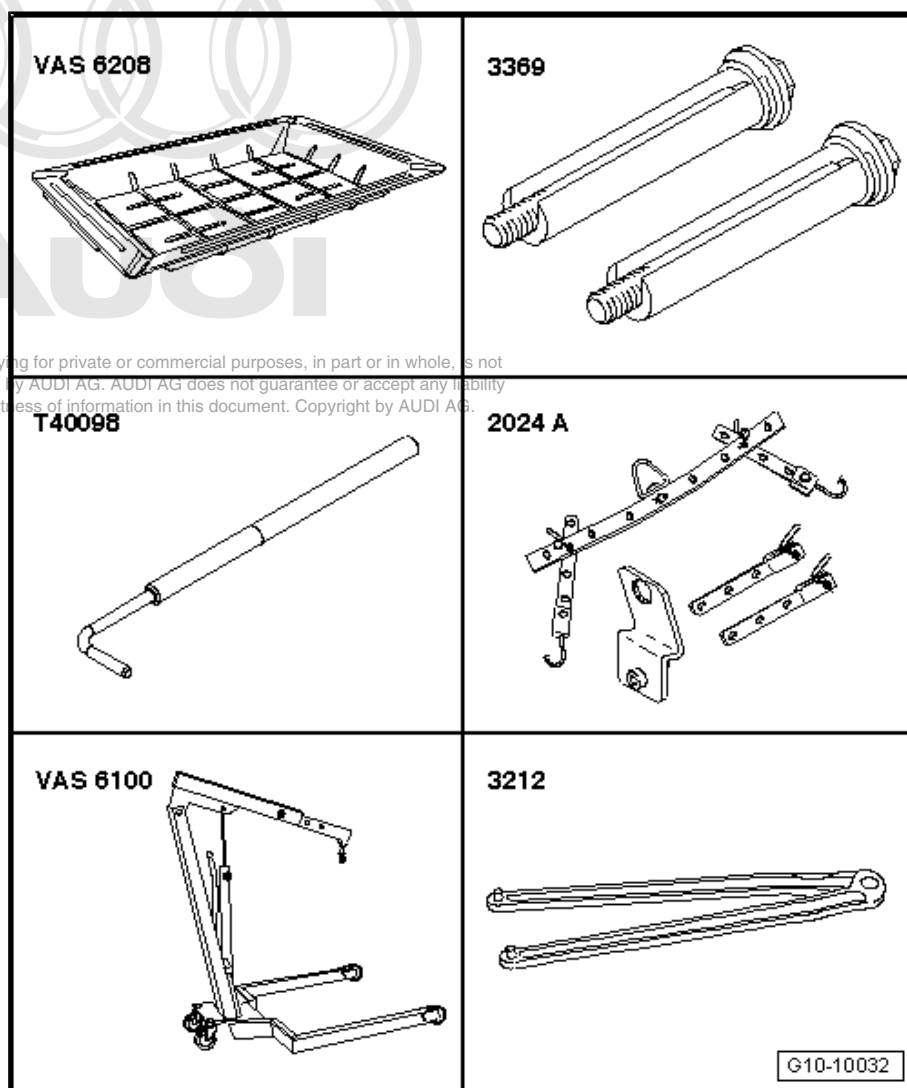
Note

- ◆ The engine is removed upwards without gearbox.
- ◆ All cable ties which are released or cut open when removing must be fitted in the same position when installing.
- ◆ Collect drained coolant in a clean container for re-use or disposal.

Special tools and workshop equipment required

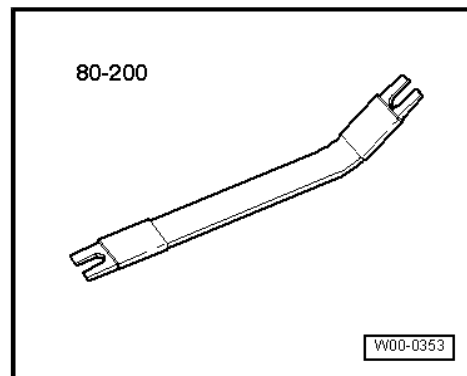
- ◆ Drip tray for workshop hoist -VAS 6208-
- ◆ Front-end service sleeves -3369-
- ◆ Locking tool -T40098-
- ◆ Lifting tackle -2024 A-
- ◆ Workshop hoist -VAS 6100-
- ◆ Pin wrench -3212-

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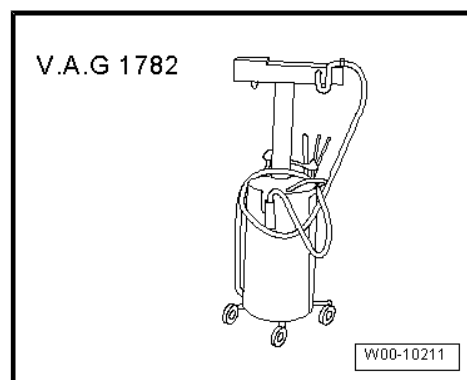


Special tools and workshop equipment required

- ◆ Removal lever -80 - 200-



- ◆ Used oil collection and extraction unit -V.A.G 1782-



Procedure

- Move selector lever to position „N“ on vehicles with automatic gearbox.



WARNING

Make sure the vehicle cannot tip over when the engine is removed.

- ◆ ***Secure the vehicle, to do so, the luggage compartment must be empty.***

The fuel system operates at extremely high pressure. This can cause injury.

- ◆ ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.***



Caution

Observe notes on procedure for disconnecting the battery → Electrical system; Rep. gr. 27 .

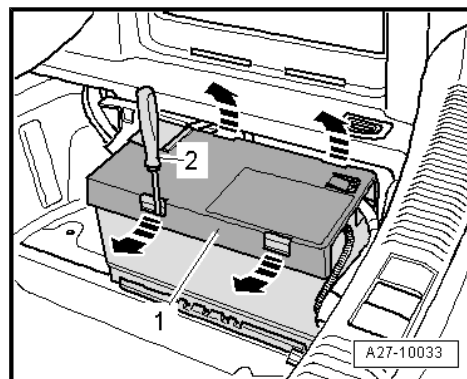


Note

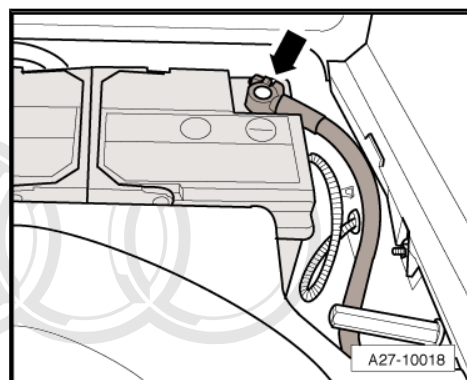
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To make sure you can still move the front wheels when the battery has been disconnected, only disconnect the battery with the ignition key inserted.

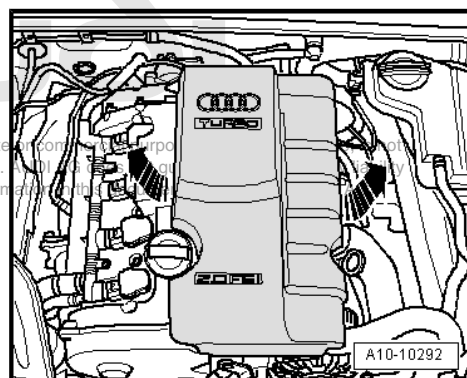
- Take out luggage compartment floor trim.
- Use screwdriver -2- to release retaining clips -arrows- and detach cover -1- for negative terminal post.



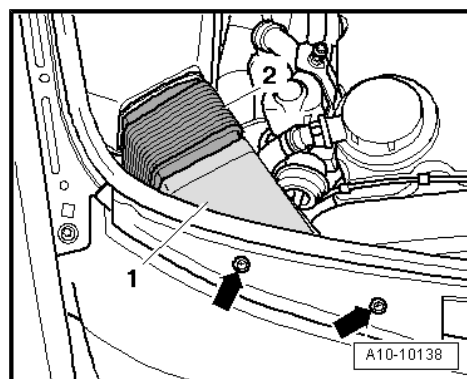
- Disconnect earth cable -arrow- at battery.



- Pull off engine cover panel -arrows-.

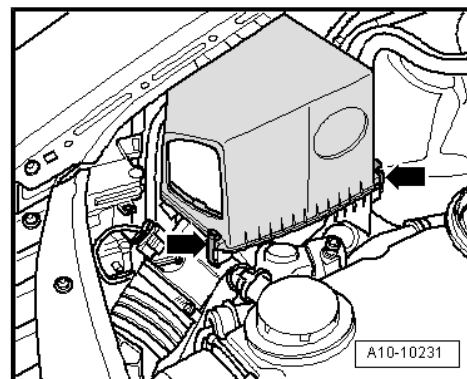


- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.

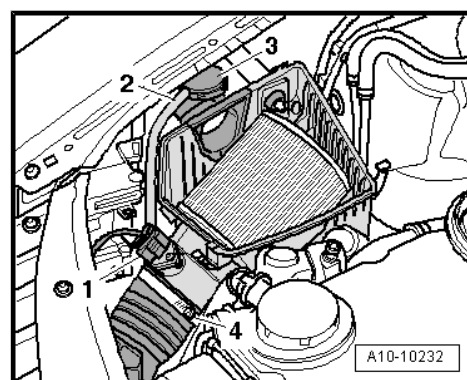


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- Release two retaining clips -arrows- and detach top section of air cleaner housing.



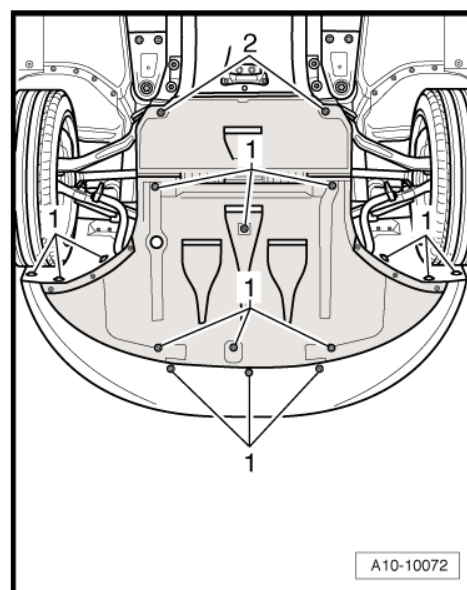
- Unplug electrical connector -1- at air mass meter -G70- .
- Loosen hose clip -4- to remove air intake hose.
- Disconnect vacuum hose -2- (if fitted).
- Lift vacuum unit -3- (if fitted) with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.

**WARNING**

Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Remove both front wheels.
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.



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- Place drip tray for workshop hoist -VAS 6208- under engine.
- Drain off coolant at coolant hose (bottom left) -arrow-.
- Disconnect coolant hose.

Vehicles with automatic gearbox:



Note

Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. gr. 37 .

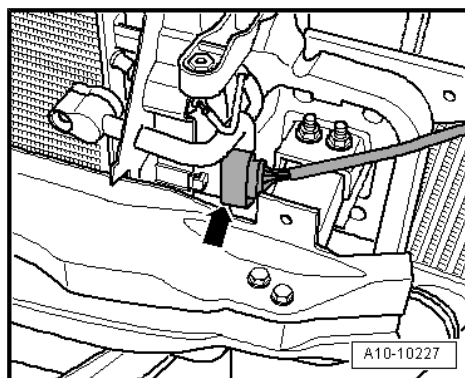
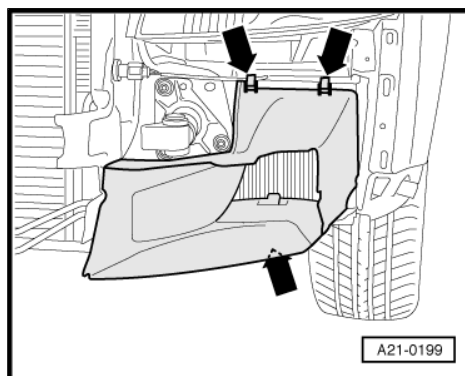
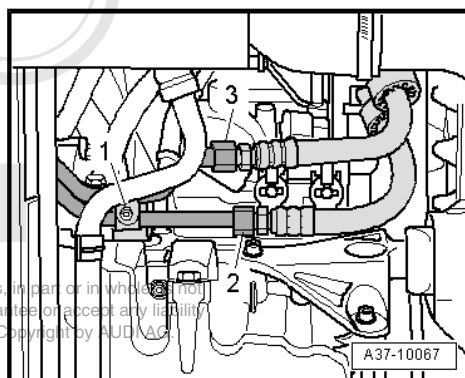
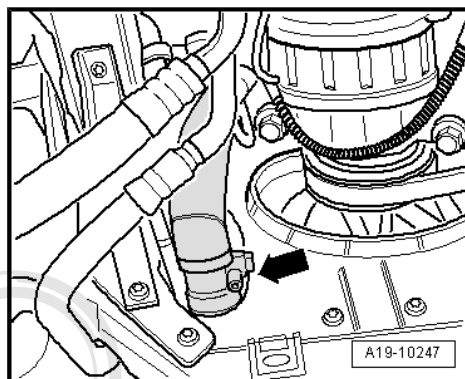
- Place used oil collection and extraction unit -V.A.G 1782- underneath.
- Detach ATF lines -2 and 3- at connections.
- Unbolt bracket -1- for ATF lines at engine.

All vehicles:

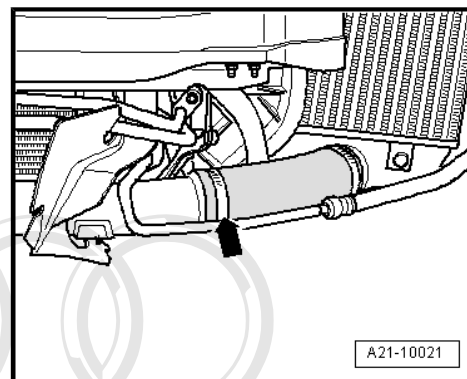
- Remove front section of wheel housing liner (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 .
- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .

- Remove air duct in front of charge air cooler (left-side) -arrows-.
- Remove headlights (left and right) ⇒ Electrical system; Rep. gr. 94 .

- Unplug electrical multi-pin connector -arrow-.



- Open hose clip -arrow- and disconnect air intake hose from air pipe.

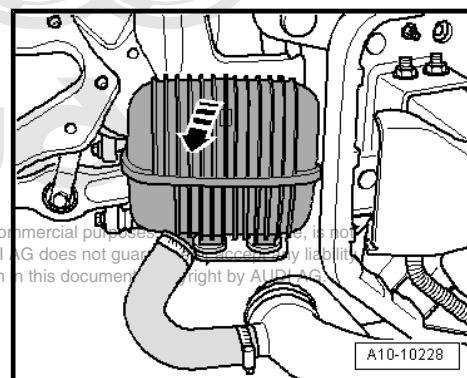


- Detach resonator from retainer -arrow-.

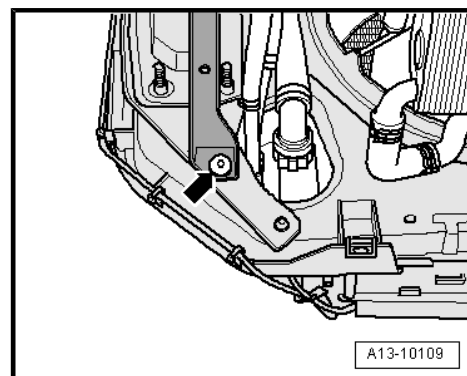
**Note**

Air intake hose remains connected.

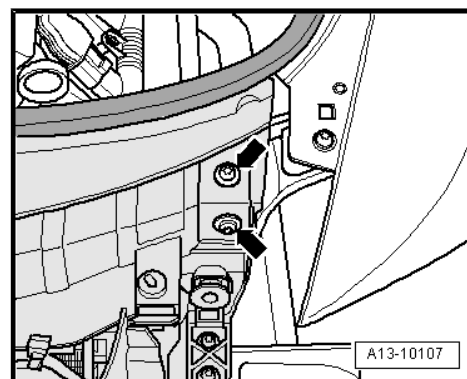
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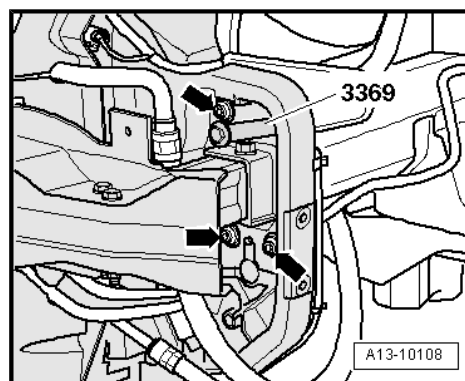
- Remove one bolt on each side at bottom of lock carrier.



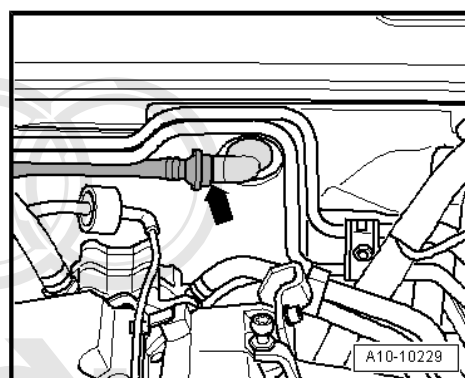
- Pull off bonnet seal at both wing panels and at lock carrier.
- Remove two bolts -arrows- on each side at top of lock carrier.



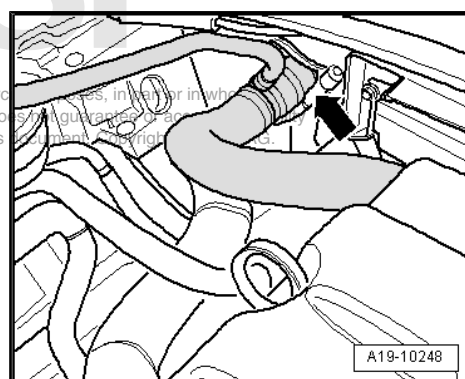
- Screw in front-end service sleeves -3369- (left and right) at holes for lock carrier securing bolts, after removing corresponding bolts.
- Remove remaining bolts (left and right) -arrows-.
- Carefully pull the lock carrier forward.



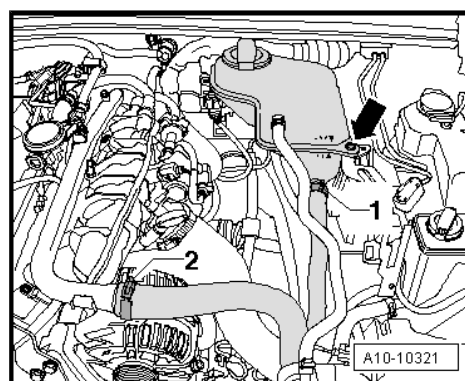
- Disconnect vacuum hose -arrow- leading to brake servo.



- Disconnect coolant hose at top left of radiator -arrow-.



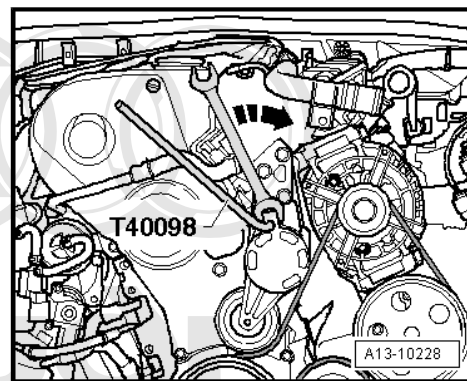
- Disconnect coolant hoses -1 and 2- and detach coolant expansion tank -arrow-.
- Unplug electrical connector for coolant shortage indicator switch -F66- at bottom of coolant expansion tank.



Note

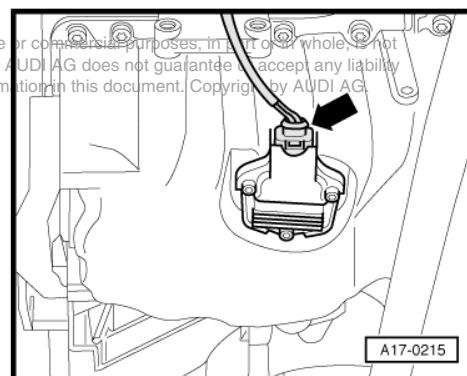
Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- To slacken poly V-belt, turn belt tensioner/damper in direction of -arrow-.
- Lock tensioner in position with locking pin -T40098-.
- Remove poly V-belt.

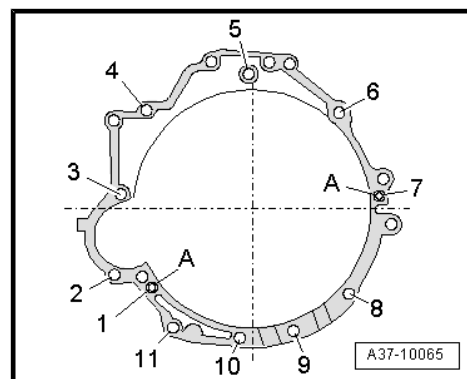


- Unplug electrical connector -arrow- at oil level and oil temperature sender -G266-.

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- Unscrew engine/gearbox bolts -4-, -5- and -6- (accessible from above); leave bolt -6- screwed in finger-tight.



- Unplug electrical connector -1- for magnetic clutch on air conditioner compressor.



WARNING

The air conditioner refrigerant circuit must not be opened.

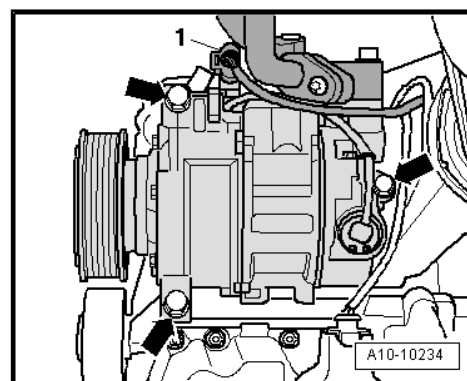
- Unscrew air conditioner compressor from bracket -arrows-.



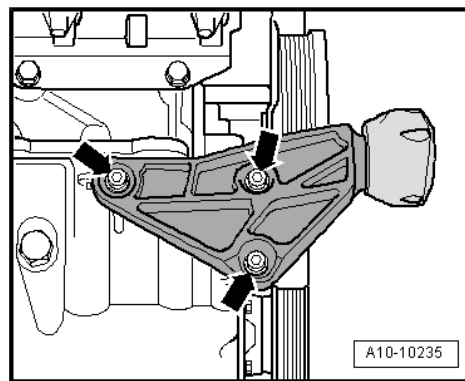
Note

To prevent damage to the condenser and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.

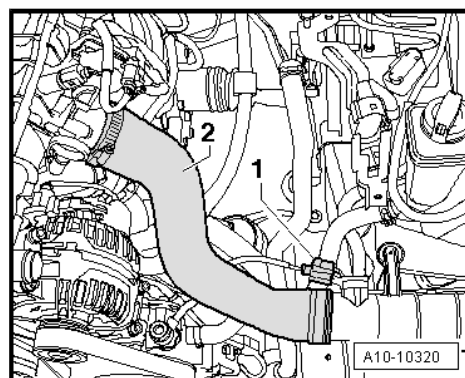
- Tie up air conditioner compressor with lines attached to left-side of vehicle.



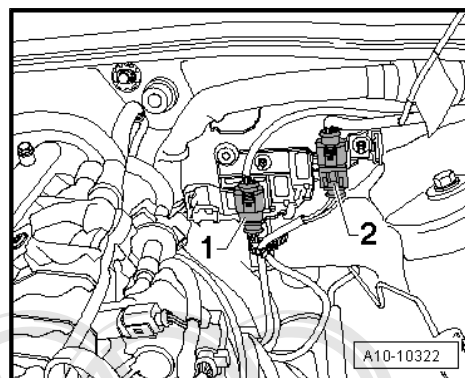
- Unscrew bolts -arrows- and remove torque reaction support from engine.



- Unplug electrical connector -1- from charge pressure sender -G31-.
- Remove charge air hose -2-.



- Detach electrical connector -1- for Lambda probe -G39- and Lambda probe heater -Z19- (black connector) from retainer.
- Detach electrical connector -2- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- (brown connector) from retainer.



Caution

Take care to keep components clean.

- ◆ *Rules for cleanliness when working on the injection system ⇒ [page 5](#).*

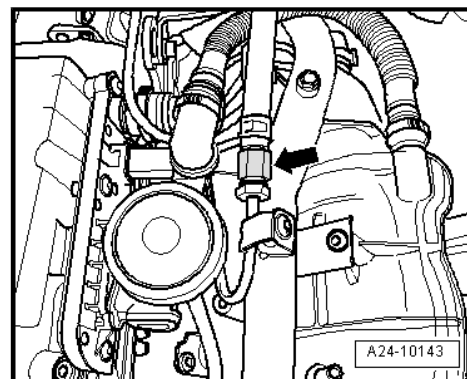


Caution

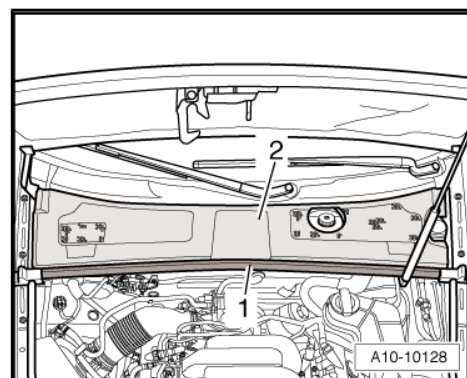
The fuel pressure must be reduced prior to opening any components in the high-pressure section of the fuel system. It is very important to observe the procedure specified in ⇒ Rep. gr. 24.

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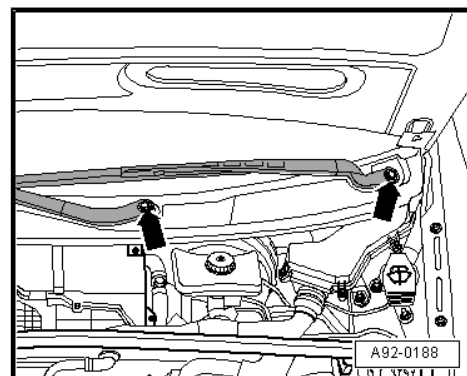
- Disconnect fuel line -arrow- (catch escaping fuel and seal off open pipes immediately).
- Disconnect coolant hoses leading to heat exchanger at rear of engine.



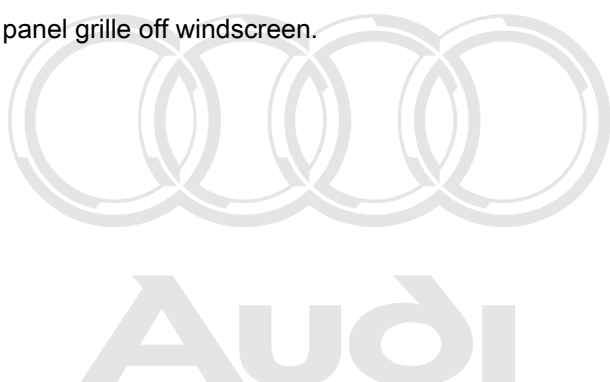
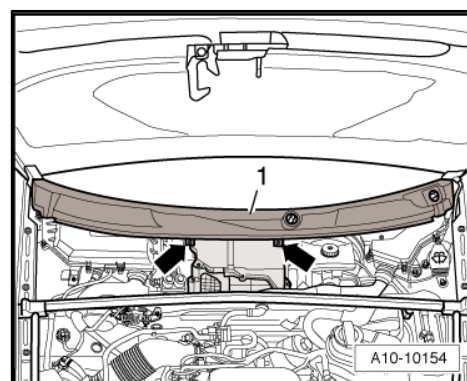
- Pull off rubber seal -1- on plenum chamber cover.
- Detach plenum chamber cover -2-.



- Lever off caps on windscreen wiper arms with a screwdriver.
- Loosen hexagon nuts -arrows- several turns.
- Loosen wiper arms from wiper shafts by tilting slightly, remove hexagon nuts and take off wiper arms.

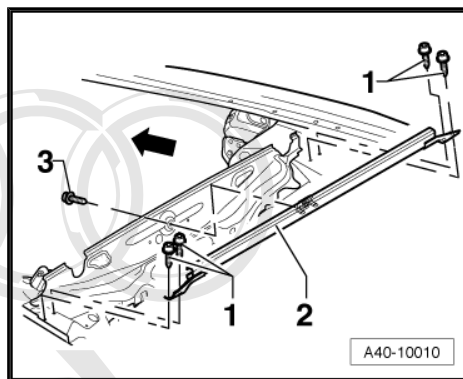


- Remove bolts -arrows- for cowl panel grille -1-.
- Pull cowl panel grille off windscreen.



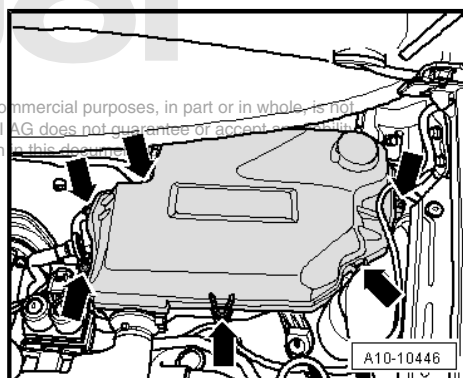
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- If fitted, unscrew bolts -1- and -3- and remove body brace -2-.

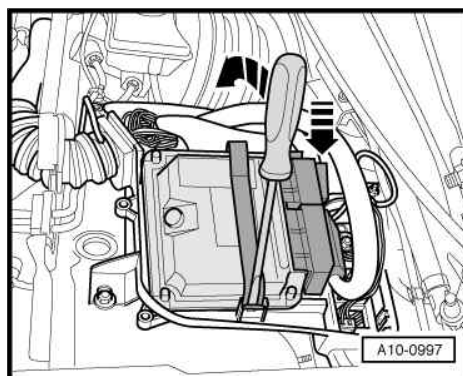


- Unscrew bolts -arrows- and take off cover for electronics box in engine compartment (left-side).

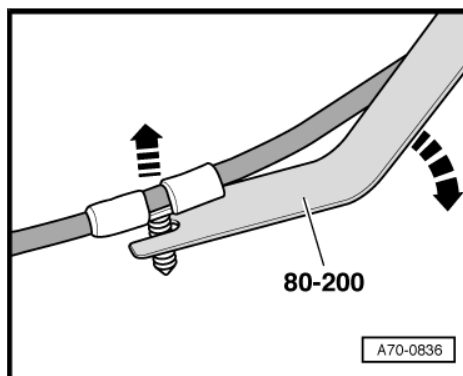
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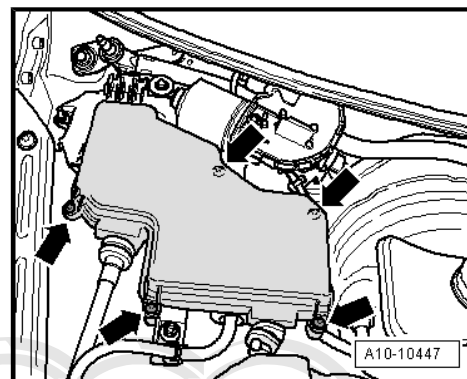
- Carefully lever off retaining strap with a screwdriver -arrow-.
- Unscrew electrical wiring.
- Unplug electrical connectors in electronics box.
- Unclip fuse holder.



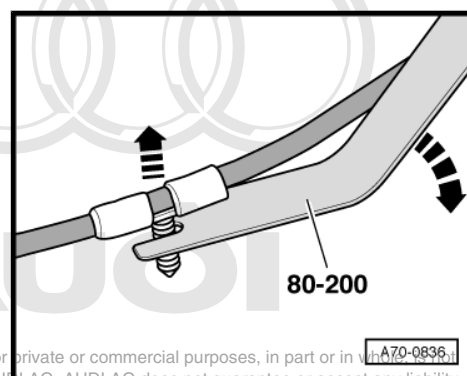
- Release electrical wiring using removal lever -80-200- and place wiring on engine with engine control unit -J623- connected.



- Unscrew bolts -arrows- and take off cover for electronics box in engine compartment (right-side).
- Unscrew electrical wiring.
- Unplug electrical connectors in electronics box.



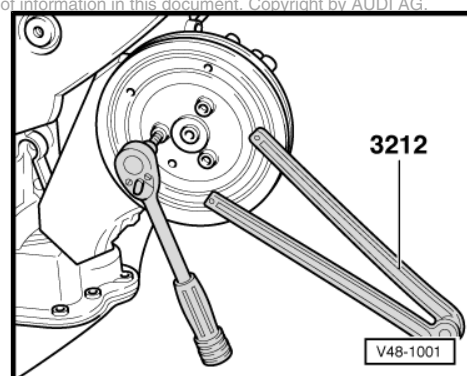
- Release electrical wiring using removal lever -80-200- .
- Place both wiring harnesses on top of engine and secure the engine control unit to prevent it falling.



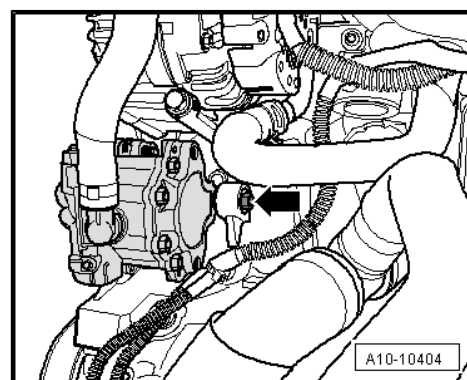
- Unbolt power steering pump pulley (brace pulley with pin wrench -3212-).

**Note**

Shown in illustration with engine removed.



- Unscrew mounting -arrow- on reverse side of power steering pump.



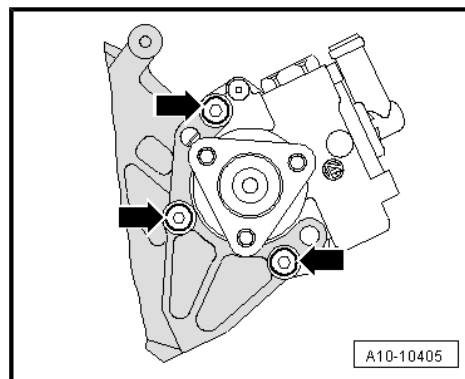
- Unscrew mountings -arrows- on front side of power steering pump.



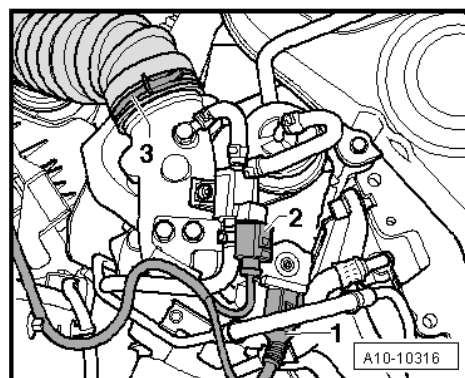
Note

Shown in illustration with engine removed.

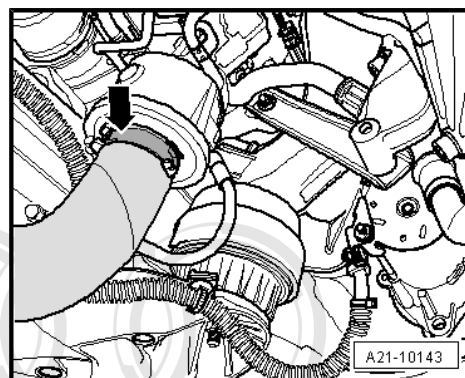
- Place power steering pump on longitudinal member with hydraulic lines attached.



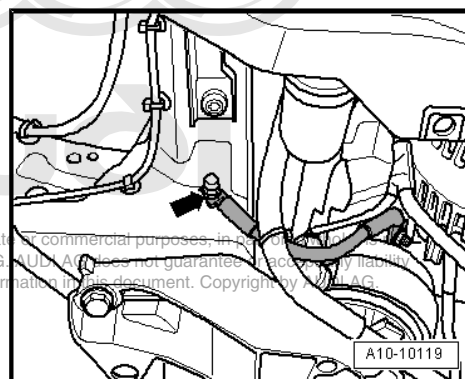
- Detach electrical connectors -1 and 2- and move wire clear.
- Detach intake hose -3- (air cleaner/turbocharger).



- Release hose clip -arrow- and disconnect air intake hose at turbocharger.

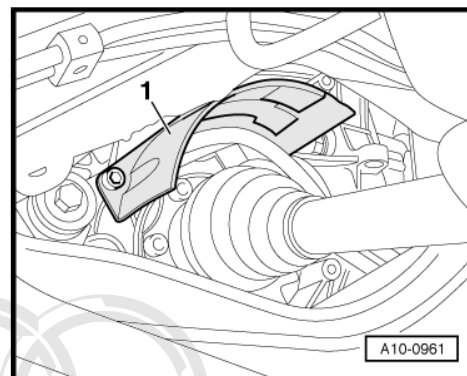


- Unbolt earth cable -arrow- at longitudinal member (right-side).



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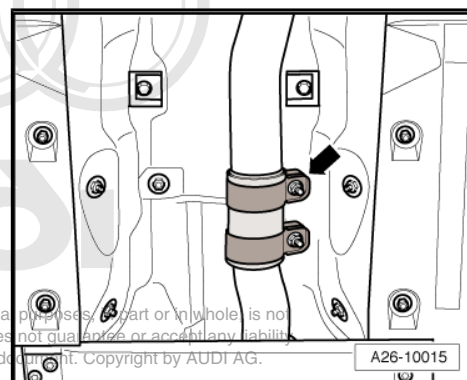
- Unbolt heat shield -1- for drive shaft (right-side).



Note

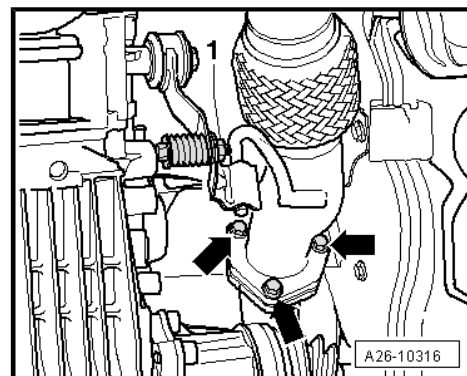
Do not bend the flexible joint (de-coupling element) in the exhaust system more than 10°; otherwise it could be damaged.

- Loosen clamp -arrow- and push to rear.

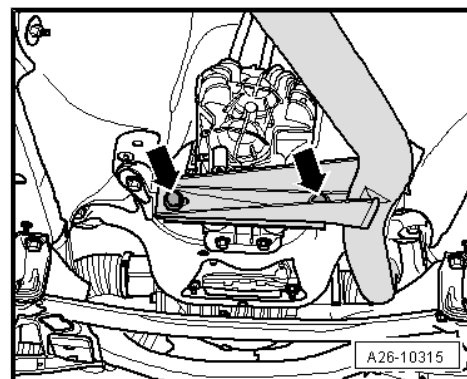


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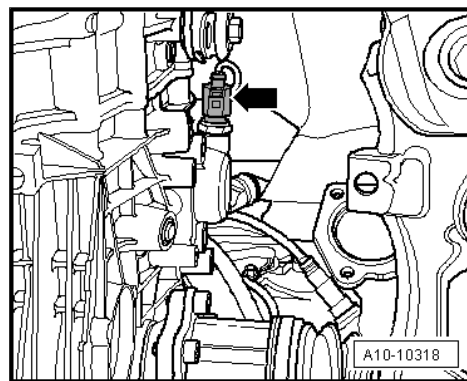
- Detach front exhaust pipe/catalytic converter -arrows-.
- Remove bolt -1- on bracket for front exhaust pipe.



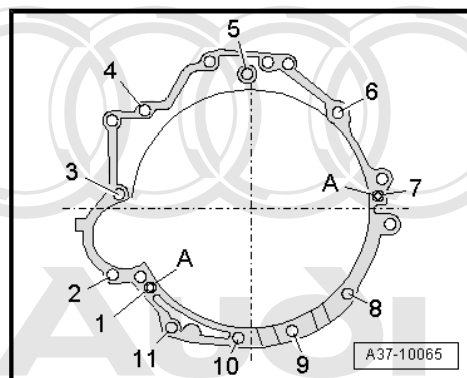
- Unscrew bolts -arrows- and remove front exhaust pipe.



- Unplug electrical connector -arrow- from reversing light switch -F4- and move wire leading to wiring harness clear.

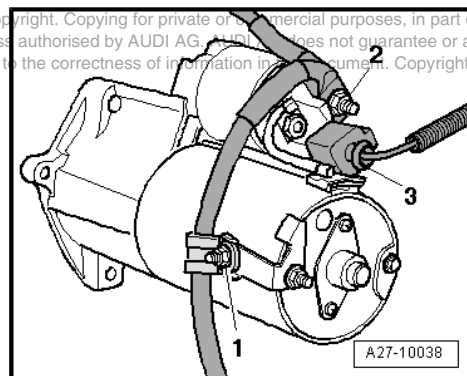


- Remove engine/gearbox bolts -1 ... 3- and -7 ... 11- accessible from below.

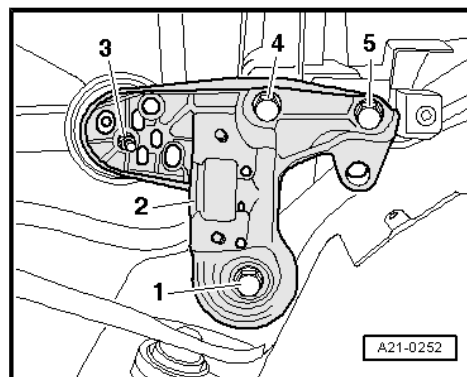


- Detach starter and swivel to one side.
- Unplug electrical connector -3-.
- Unscrew nut -1- for clamp.
- Unscrew nut -2- and detach electrical wiring.
- Detach starter.

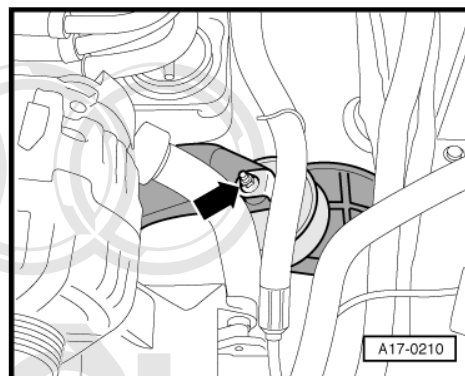
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- Remove bottom nut -3- at engine mounting (left and right).



- Slacken off top nut on left-side engine mounting several turns.



- Attach lifting tackle -2024 A- to engine and workshop hoist - VAS 6100- as shown in illustration.

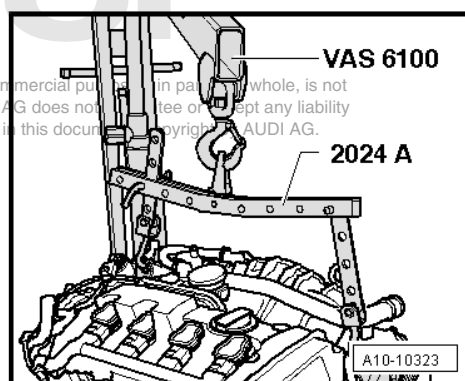
**Note**

To adjust to the centre of gravity of the assembly, the perforated rails of the support hooks must be positioned as shown.

**WARNING**

The hook attachments and locating pins on the lifting tackle must be secured with locking pins.

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- Unscrew remaining engine/gearbox bolt.

**Note**

Check that all hoses and other connections between engine and body have been detached.

- Raise engine until the studs of the engine mountings are clear.

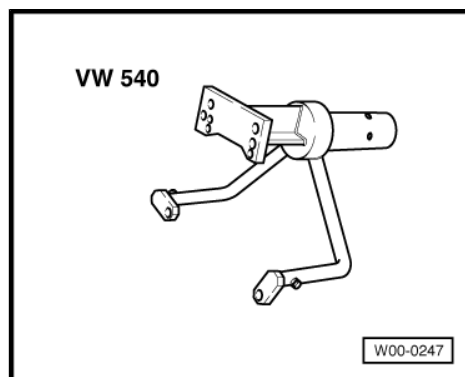
Raise trolley jack until gearbox makes contact.

- Detach engine from gearbox and lift engine forwards out of engine compartment.

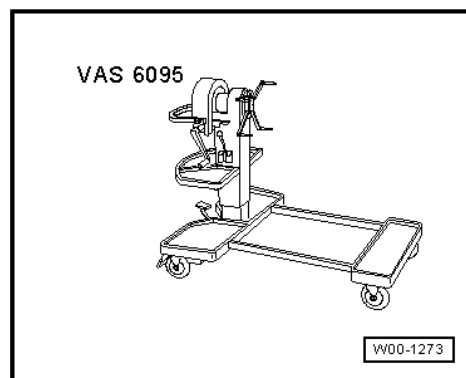
1.2 Securing engine to assembly stand

Special tools and workshop equipment required

- ◆ Engine and gearbox support -VW 540-

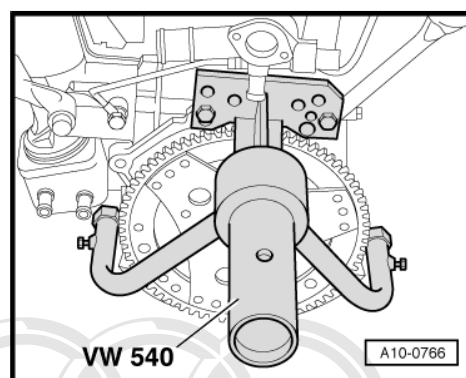


◆ Engine and gearbox support -VAS 6095-



Procedure

- Remove clutch; observe instructions for removal ⇒ Rep. gr. 30 .
- Remove dual-mass flywheel; observe instructions for removal ⇒ Rep. gr. 30 .
- Secure engine with engine and gearbox support -VW 540- to engine stand -VAS 6095- .



1.3 Installing engine



Note

- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Renew bolts which are tightened to a specified angle as well as oil seals, gaskets and O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- ◆ *Fit all cable ties in the original positions when installing.*

Vehicles with manual gearbox:

- When fitting a new clutch plate together with a used pressure plate (self-adjusting clutch), the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If this is not done, the pressure plate will operate with reduced clamping force, causing clutch slip ⇒ Rep. gr. 30 .

**Note**

- ◆ *If the clutch plate is not being replaced, it is not necessary to reset the adjuster ring.*
- ◆ *New SAC pressure plates are already pre-set accordingly, and do not have to be reset.*

- Clean the input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease to the splines. Do not lubricate guide sleeve.

For grease refer to → **Parts catalogue**

- Check that the clutch plate is properly centralised (only necessary if you have carried out other work on the clutch).
- Check clutch release bearing for wear; renew if necessary.

If the plastic ring for release bearing is loose:

- Glue plastic ring for release bearing to bearing race using adhesive.

For adhesive refer to ⇒ **Parts catalogue** .

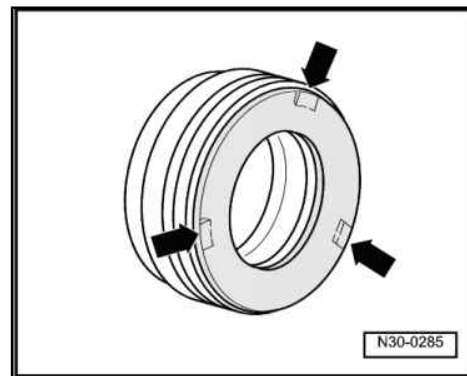
- Three square lugs -arrows- on the plastic ring engage in the recesses in the bearing race.
- The release bearing must be renewed if it has scoring deeper than 0.5 mm.
- A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox; install needle bearing if not already fitted ⇒ [page 52](#) .

Vehicles with automatic gearbox:

- Clean input shaft splines and splines of damper unit on fly-wheel; remove corrosion and apply only a very thin coating of grease -G 000 100- to the splines. Remove any excess grease.

All vehicles:

- Check whether dowel sleeves for centring the engine/gearbox assembly are fitted in the cylinder block; install dowel sleeves if necessary.



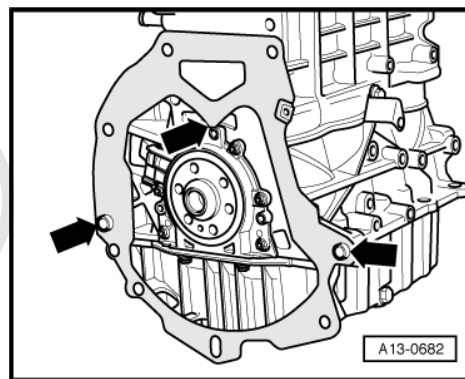
- Ensure that the intermediate plate is engaged on the sealing flange and pushed onto the dowel sleeves -arrows-.
- Push intermediate plate between engine and gearbox onto dowel sleeves.
- Attach engine to gearbox and screw in one bolt finger-tight.
- Lower engine, inserting studs of engine mountings into consoles for engine mountings as you do so.



Note

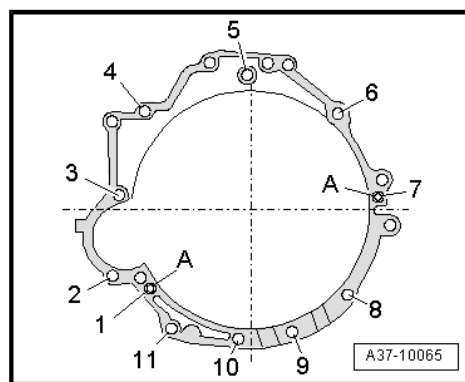
- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine oil or gearbox oil may be used, but do not use lubricant containing graphite.*
- ◆ *Do not use ~~degreased parts~~.*
- ◆ *Tolerance for tightening torques: $\pm 15\%$.*

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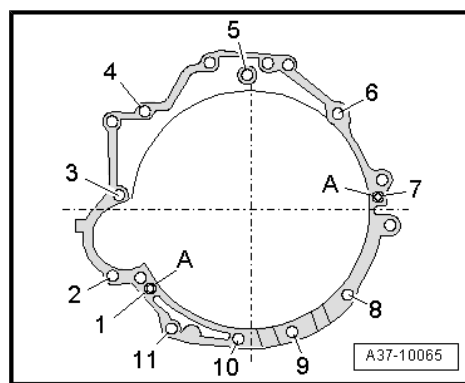
Securing engine to manual gearbox

Item	Bolt	Nm
1, 6	M12x105	65
2, 4	M12x80	65
3	M12x90	65
5, 7	M12x95	65
8	M10x50	45
9, 10, 11	M10x45	45
A	Dowel sleeves for centralising	



Securing engine to multitronic gearbox

Item	Bolt	Nm
1	M12x67	65
2	M10x70	45
3, 4, 5, 7	M12x75	65
6	M12x105	65
8	M10x60	45
9, 10, 11	M10x45	45
A	Dowel sleeves for centralising	



All vehicles:

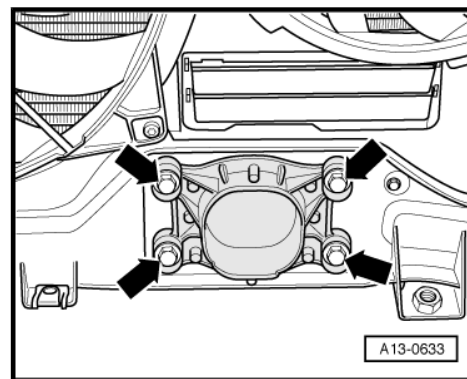
Remaining installation steps are carried out in reverse sequence; note the following:

- Install exhaust system and align free of stress ⇒ [page 188](#).
- Install air conditioner compressor ⇒ Air conditioning system; Rep. gr. 87.
- Install power steering pump ⇒ Rep. gr. 48.
- Install poly V-belt ⇒ [page 32](#).
- Install lock carrier with attachments ⇒ Rep. gr. 50.

- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install bumper cover (front) ⇒ Rep. gr. 63 .
- Secure ATF lines ⇒ Rep. gr. 37 .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe notes on procedures required after connecting battery ⇒ Rep. gr. 27 .

**Caution**

Do not use a battery charger to boost starting. There is danger of damaging the vehicle's control units.



- Check oil level ⇒ Maintenance ; Booklet 4F .
- Fill cooling system ⇒ [page 138](#) .

**Note**

- ◆ *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- ◆ *Contaminated or dirty coolant must not be used again.*
- Check fluid level of power steering ⇒ Rep. gr. 48 .
- Check ATF level ⇒ Rep. gr. 37 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .

Tightening torques**Note**

- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine oil or gearbox oil may be used, but do not use lubricant containing graphite.*
- ◆ *Do not use degreased parts.*

- ◆ ***Tolerance for tightening torques: ±15%***

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Component		Nm
Bolts/nuts	M6	9
	M8	23
	M10	40
	M12	65
Except for the following:		
Engine mounting to engine console		40
Engine mounting to engine support		23
Electrical wire to starter		16
Electrical wire to alternator		16
Drive shaft heat shield to gearbox		23
Stop for torque reaction support		28
Hose clips (9 mm wide)		3
Hose clips (13 mm wide)		5.5



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2 Overview of fitting locations

Overview of fitting locations ⇒ Rep. gr. 24

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13 – Crankshaft group

1 Dismantling and assembling engine

1.1 Poly V-belt - exploded view



Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage. Ensure that the belt is properly seated in the pulleys when installing.

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1 - Poly V-belt

- ☐ Routing of poly V-belt
⇒ [page 32](#)
- ☐ Check for wear
- ☐ Do not kink
- ☐ Removing and installing
⇒ [page 32](#)

2 - Pulley

- ☐ For poly V-belt
- ☐ Removing and installing
⇒ [page 33](#)

3 - Bolt (special type) ⇒ Parts catalogue

- ☐ Renew
- ☐ Tightening torque: 20 Nm + 90°

4 - 23 Nm

5 - Pulley for power steering pump

6 - 23 Nm

7 - Engine lifting eye

8 - Belt tensioner/damper for poly V-belt

- ☐ Pivot with open-end spanner to slacken poly V-belt
- ☐ Secure tensioner in position using locking pin - T40098-

9 - 23 Nm

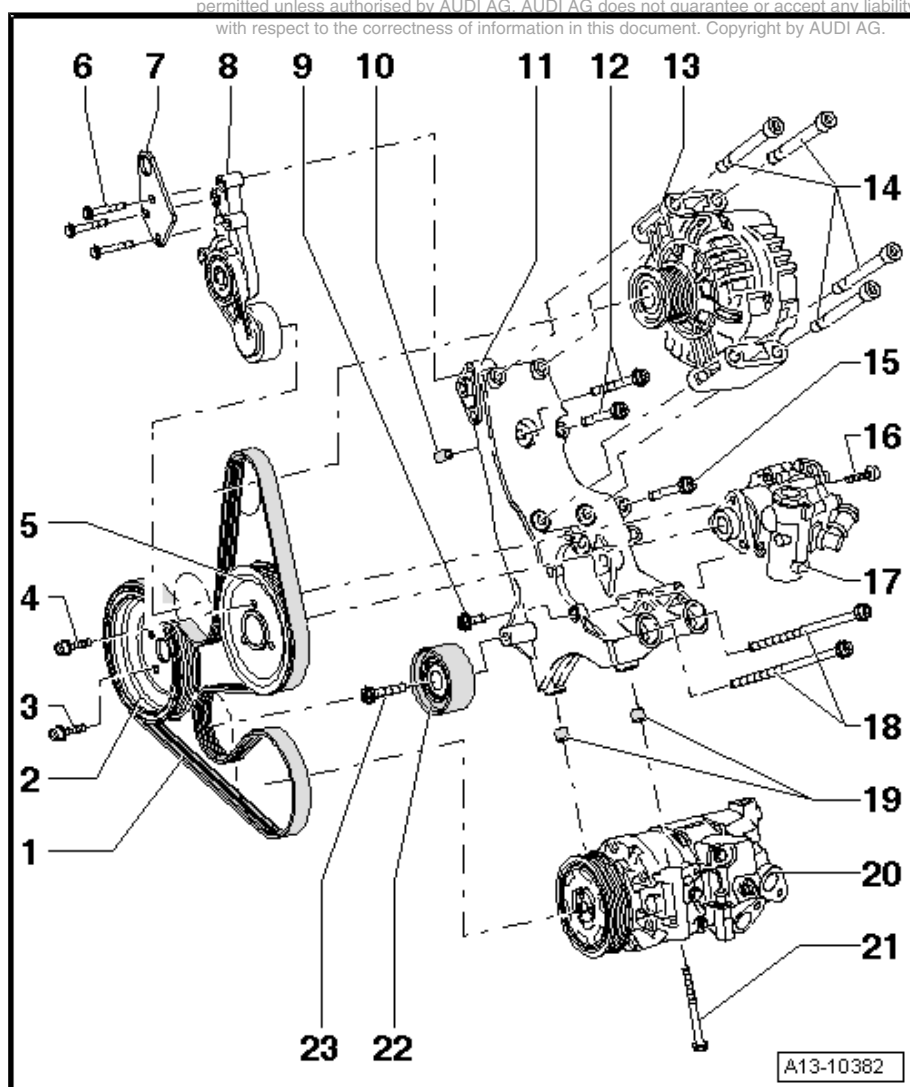
10 - Bush

11 - Bracket for ancillaries

- ☐ Removing and installing ⇒ [page 34](#)

12 - Bolt

- ☐ Apply locking fluid when fitting
- ☐ Locking fluid ⇒ Parts catalogue



- ☐ Observe correct tightening sequence ⇒ [page 31](#)

13 - Alternator

- ☐ Removing and installing: ⇒ Electrical system; Repair group 27

14 - 20 Nm

15 - Bolt

- ☐ Apply locking fluid when fitting
- ☐ Locking fluid ⇒ Parts catalogue
- ☐ Observe correct tightening sequence ⇒ [page 31](#)

16 - 23 Nm

17 - Power steering pump

- ☐ Removing and installing ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 48

18 - Bolt

- ☐ Apply locking fluid when fitting
- ☐ Locking fluid ⇒ Parts catalogue
- ☐ Observe correct tightening sequence ⇒ [page 31](#)

19 - Dowel sleeve

- ☐ 2x
- ☐ Ensure correct seating in bracket for ancillaries

20 - Air conditioner compressor

- ☐ Removing and installing ⇒ Air conditioning; Repair group 87

21 - Bolt

- ☐ Tightening torque ⇒ Air conditioning; Rep. gr. 87

22 - Idler roller for poly V-belt

- ☐ Note installation position

23 - Special bolt, 25 Nm

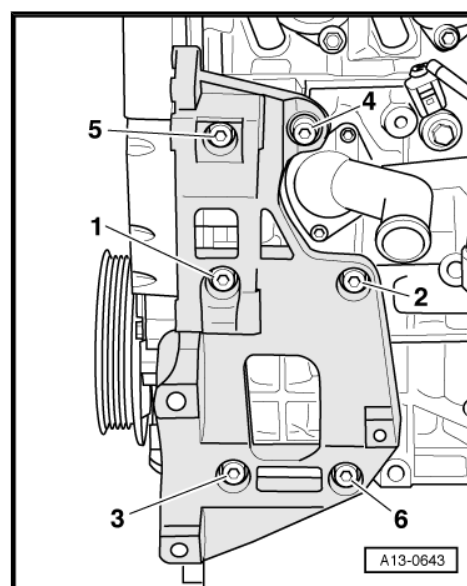
- ☐ Renew
- ☐ ⇒ Parts catalogue

Tightening sequence on bracket for ancillaries

- Apply locking fluid and tighten bolts in the sequence -1 ... 6- in 2 stages as follows.

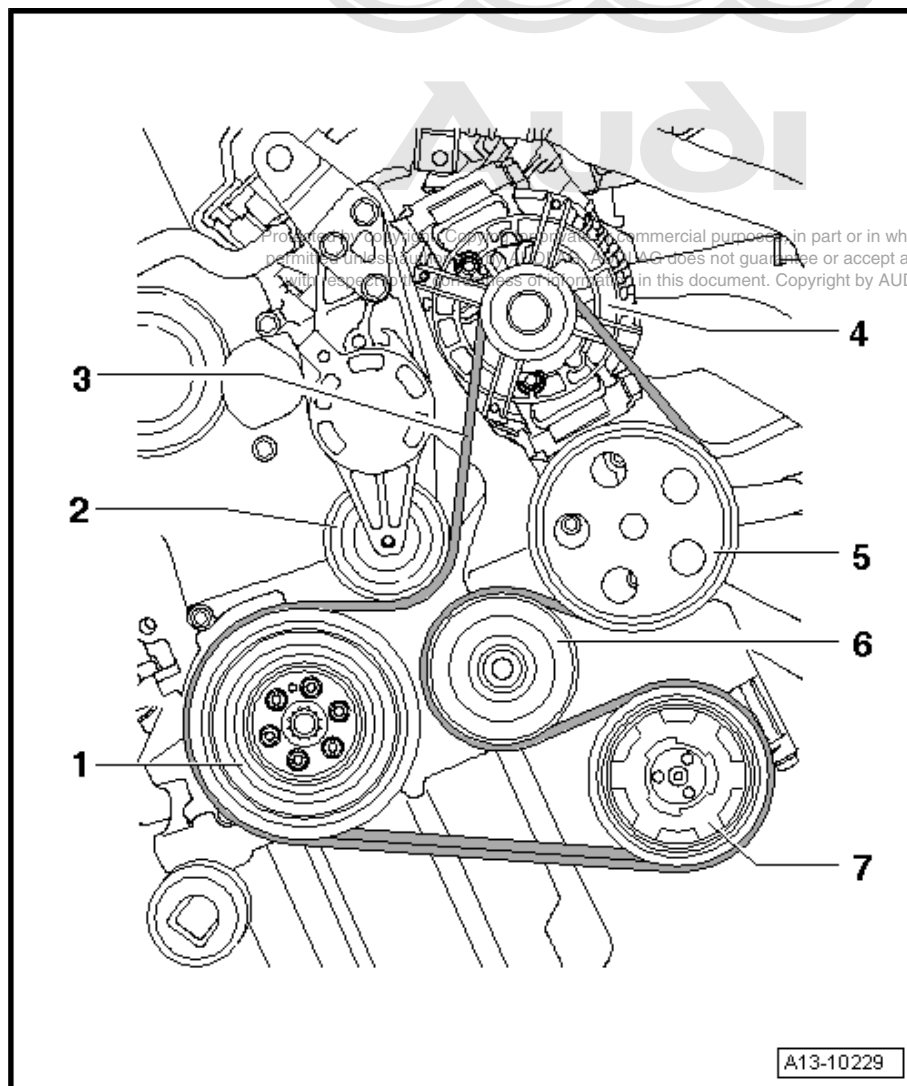
For locking fluid refer to ⇒ Parts catalogue .

1. Tighten bolts hand tight.
2. Tighten bolts to 40 Nm.



1.2 Routing of poly V-belt

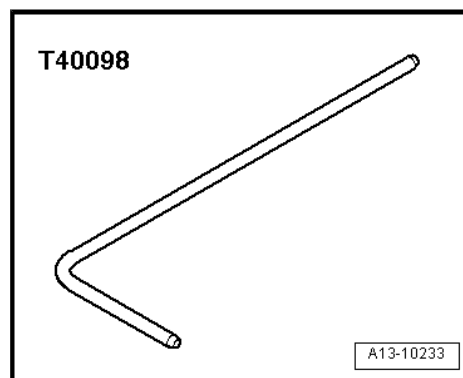
- 1 - Vibration damper
- 2 - Belt tensioner/damper for poly V-belt
- 3 - Poly V-belt
- 4 - Alternator
- 5 - Power steering pump
- 6 - Idler roller
- 7 - Air conditioner compressor



1.3 Removing and installing poly V-belt

Special tools and workshop equipment required

- ◆ Locking pin -T40098-



Removing



Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Mark direction of rotation of poly V-belt.
- To slacken poly V-belt, turn belt tensioner/damper in direction of -arrow-.
- Lock tensioner in position with locking pin -T40098-.
- Remove poly V-belt.

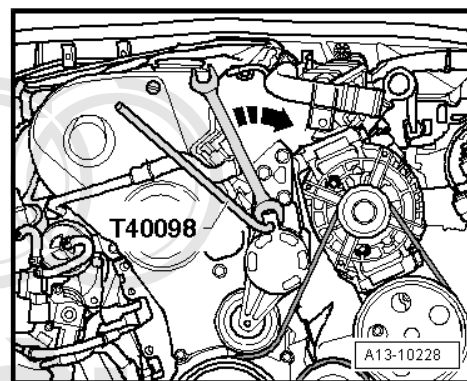
Installing



Note

Routing of poly-V belt ⇒ [page 32](#).

- Hold tensioner with ring spanner, pull out locking pin -T40098- and release pressure from tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that belt runs properly.

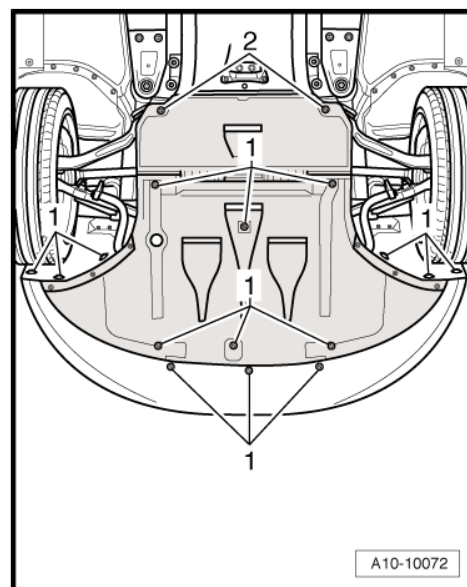


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1.4 Removing and installing crankshaft pulley

Removing

- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Move lock carrier to service position ⇒ Rep. gr. 50.
- Remove poly V-belt ⇒ [page 32](#).



- Unbolt crankshaft pulley.



Note

To loosen and tighten the crankshaft pulley, counterhold central bolt with a ring spanner.

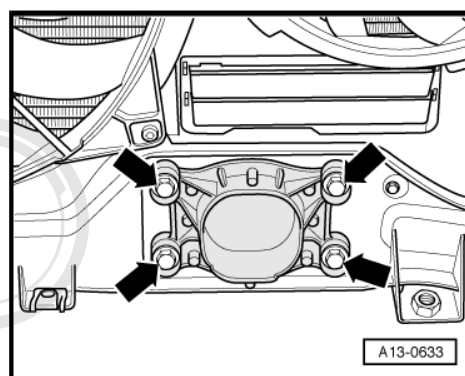
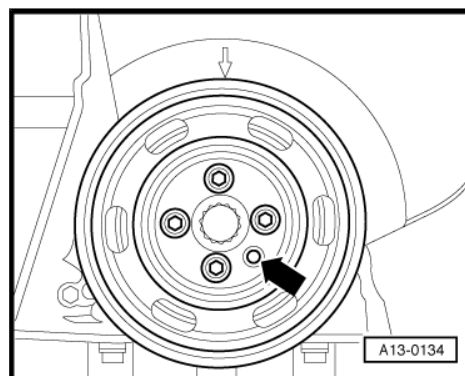
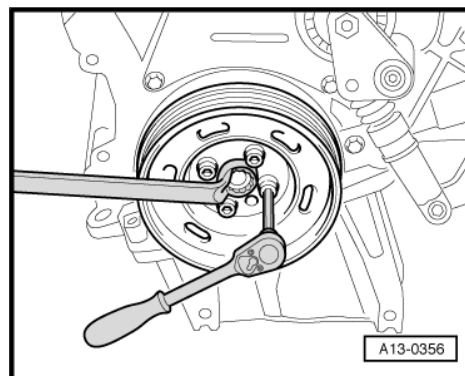
Installing

Installation is carried out in the reverse order; note the following:

- Install the crankshaft pulley with genuine bolts only: ⇒ Parts catalogue .
- ♦ Assembly is only possible in one position: The hole -arrow- in the crankshaft pulley must fit over the projection on the toothed belt sprocket.
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .

Tightening torque

Component	Nm
Stop for torque reaction support	28
Pulley to crankshaft	10 + 90° 1)2)
• 1) Renew bolt/nut • 2) 90° = a quarter of a turn	

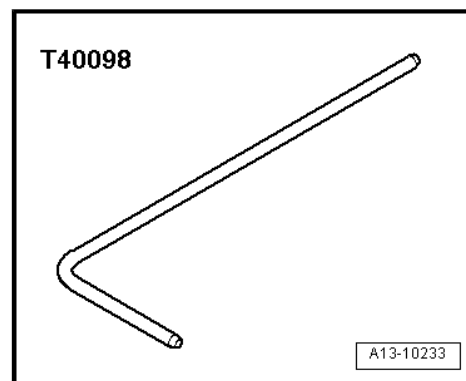


1.5 Removing and installing bracket for ancillaries

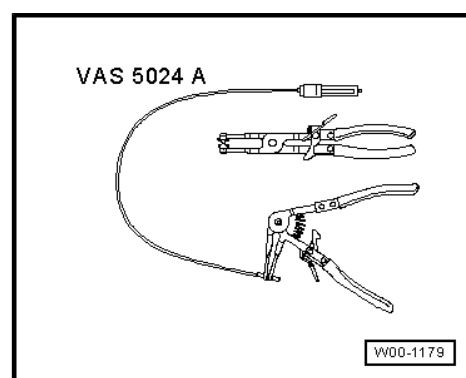
Special tools and workshop equipment required

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- ◆ Locking pin -T40098-



- ◆ Spring type clip pliers -VAS 5024 A-



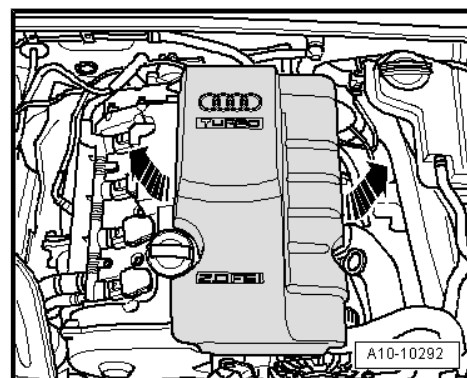
Removing

- Pull off engine cover panel -arrows-.

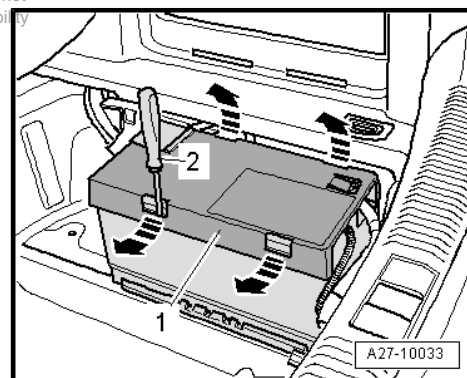


Caution

Observe notes on procedure for disconnecting the battery → Electrical system; Rep. gr. 27.



- Take out luggage compartment floor trim.
- Use screwdriver -2- to release retaining clips -arrows- and detach cover -1- for negative terminal post.



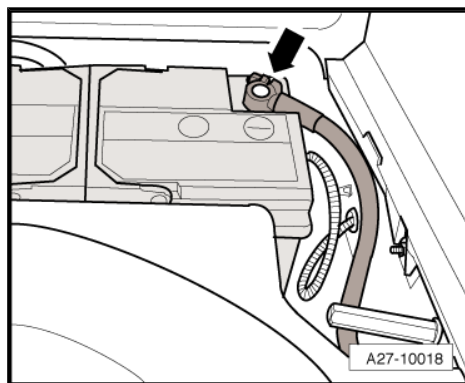
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- Disconnect earth cable -arrow- at battery.

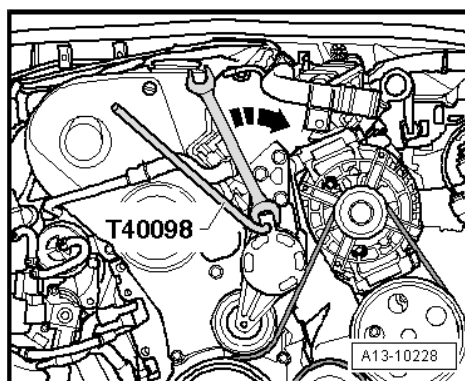


Note

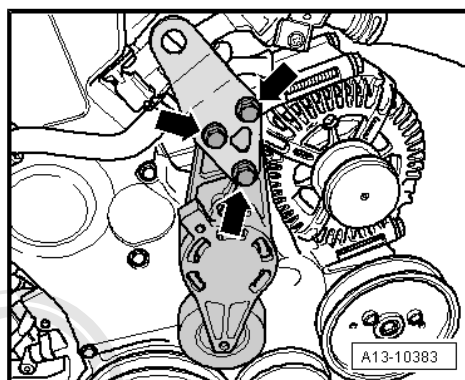
Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.



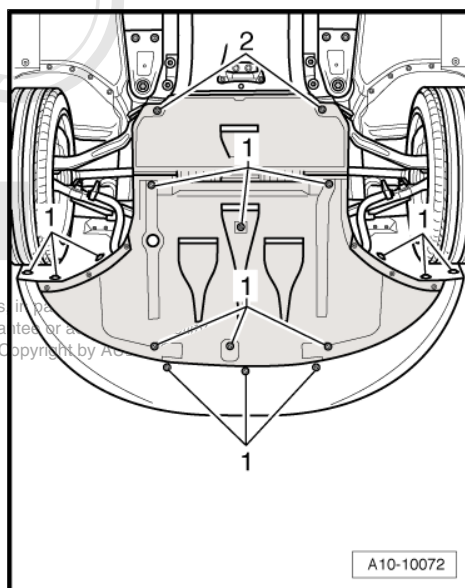
- To slacken poly V-belt, turn belt tensioner/damper in direction of -arrow-.
- Lock tensioner in position with locking pin -T40098- .
- Take off poly V-belt.



- Remove belt tensioner/damper for poly V-belt with engine lifting eye -arrows-.
- Remove alternator ⇒ Electrical system; Repair group 27 .



- Release quick-release fasteners -1- and -2- and take off noise insulation panels.



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- Unplug electrical connector -1- for magnetic clutch on air conditioner compressor.

**Caution**

The air conditioner refrigerant circuit must not be opened.

- Unscrew air conditioner compressor from bracket -arrows-.

**Note**

To prevent damage to the condenser and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.

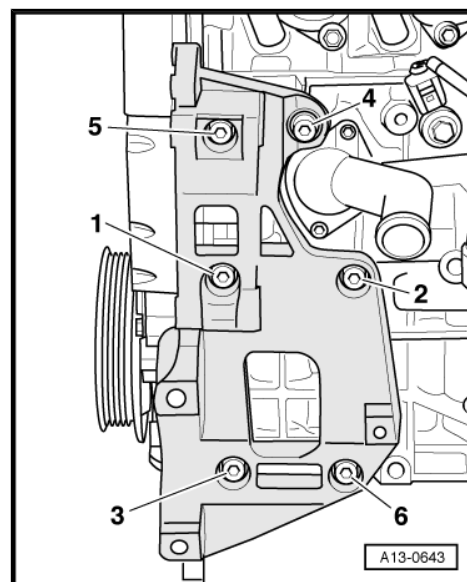
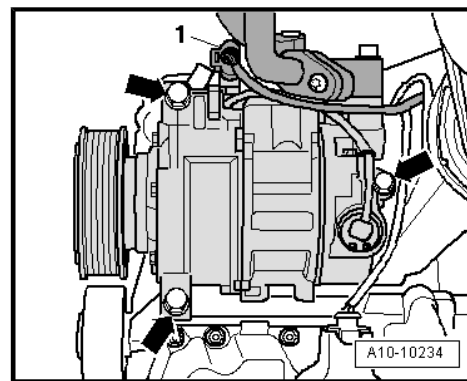
- Tie up air conditioner compressor to bottom of vehicle, with lines attached.
- Detach bracket for ancillaries: bolts -1 ... 6-.

Installing

- Tightening torques ⇒ [page 30](#)

Installation is carried out in the reverse order; note the following:

- Tightening sequence on bracket for ancillaries ⇒ [page 31](#)
- Install alternator ⇒ Electrical system; Repair group 27 .
- Install air conditioner compressor ⇒ Rep. gr. 87 ; Heating and air conditioning .
- Install poly V-belt ⇒ [page 32](#) .
- Connect battery. Procedures required ⇒ Electrical system; Repair group 27 .



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2 Sealing flanges and flywheel/drive plate - exploded view



Note

- ◆ Observe instructions for removing the clutch ⇒ Rep. gr. 30.
- ◆ 6-speed manual gearbox 02S; Repair group 30; Servicing clutch release mechanism

1 - 15 Nm

2 - Oil seal

- ☐ Renewing ⇒ [page 39](#)
- ☐ Do not lubricate with oil

3 - Sealing flange (front)

- ☐ Must be positioned on dowel sleeves
- ☐ Removing and installing ⇒ [page 42](#)

4 - Cylinder block

- ☐ Removing and installing crankshaft ⇒ [page 50](#)
- ☐ Dismantling and assembling pistons and con-rods ⇒ [page 56](#)

5 - Securing bolt for dual-mass flywheel/drive plate

- ☐ Renew
- ☐ Tightening torque for dual-mass flywheel ⇒ [page 47](#)
- ☐ Tightening torque for drive plate ⇒ [page 49](#)

6 - Dual-mass flywheel/drive plate

- ☐ Removing and installing dual-mass flywheel ⇒ [page 46](#)
- ☐ Removing and installing drive plate ⇒ [page 46](#)
- ☐ Can only be installed in one position, holes are offset

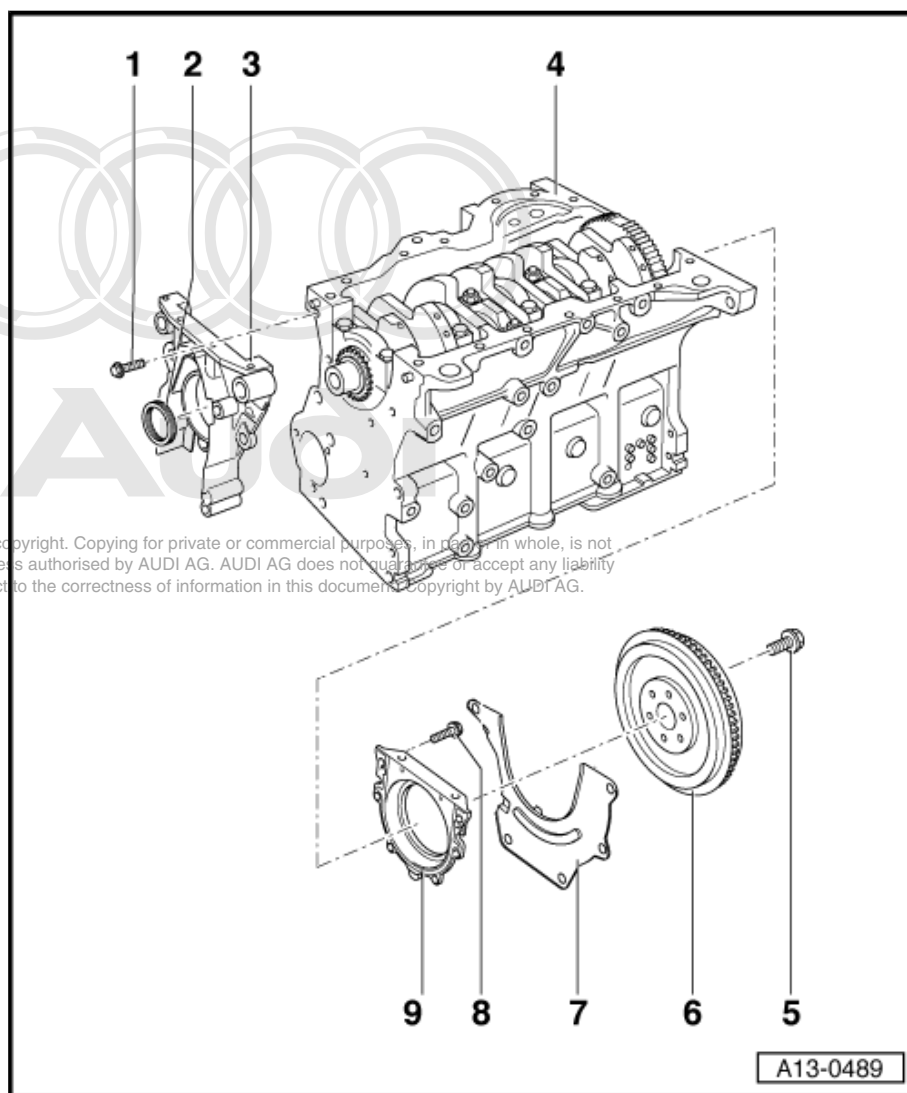
7 - Intermediate plate

- ☐ Must be positioned on dowel sleeves
- ☐ Do not damage/bend when assembling
- ☐ Is fitted onto sealing flange ⇒ [page 39](#)

8 - 15 Nm

9 - Sealing flange with oil seal (rear)

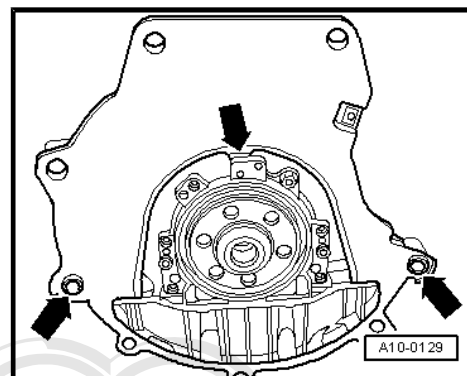
- ☐ Renew only as complete unit
- ☐ Use guide sleeve provided when fitting
- ☐ Do not lubricate/grease sealing lip of oil seal
- ☐ Before installing, remove oil residue from crankshaft journal with a clean cloth.



- ☐ Guide sleeve is not to be removed until sealing flange has been slipped onto crankshaft journal

Installing intermediate plate

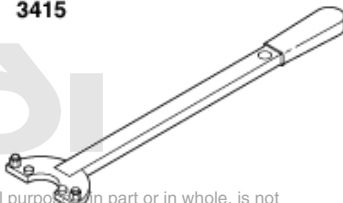
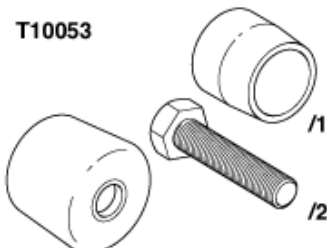
- Fit intermediate plate on sealing flange and push onto dowel sleeves -arrows-.



2.1 Renewing crankshaft oil seal - pulley end

Special tools and workshop equipment required

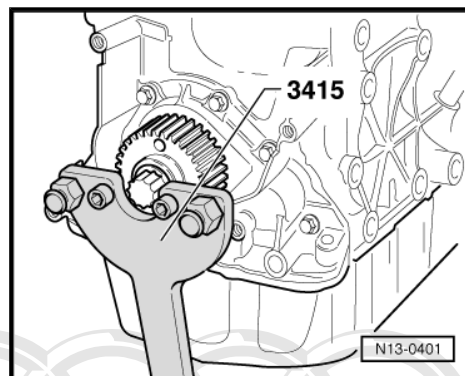
- ◆ Oil seal extractor -3203-
- ◆ Counterhold tool -3415-
- ◆ Assembly tool -T10053-
- ◆ Torque wrench -V.A.G 1331-
- ◆ Torque wrench -V.A.G 1332-

3203  Protected by copyright. Copying for private or commercial purposes in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.	3415 
T10053 	V.A.G 1331 
V.A.G 1332 	W13-0100

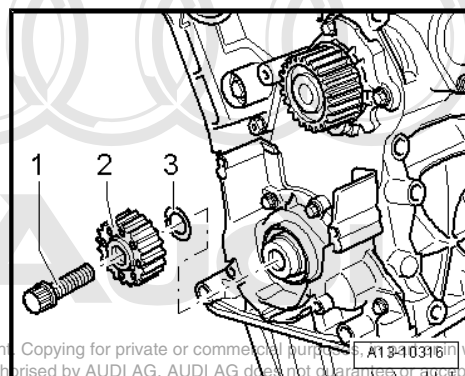
Removing

- Remove poly V-belt ⇒ [page 32](#) .
- Remove toothed belt ⇒ [page 59](#) .

- Release crankshaft sprocket (use counterhold tool -3415- to counterhold sprocket).

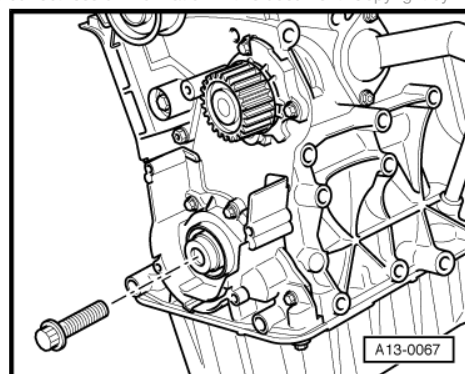


- Remove central bolt -1- for crankshaft sprocket -2- and remove sprocket together with diamond-coated washer -3-.



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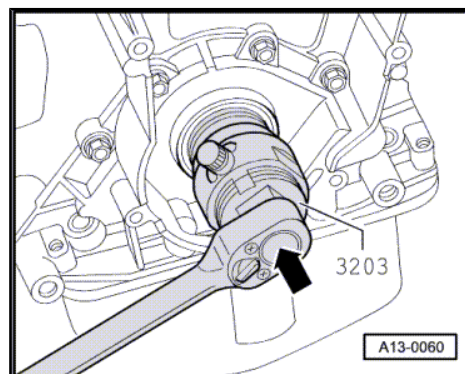
- To guide oil seal extractor, screw central bolt into crankshaft onto stop by hand.
- Unscrew inner part of oil seal extractor -3203- 9 turns (approx. 20 mm) from the outer part and lock in position with the knurled screw.



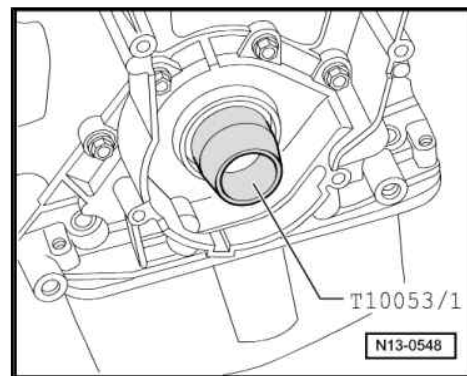
- Lubricate threaded head of oil seal extractor -3203-, place it in position and, exerting firm pressure, screw it into oil seal as far as possible.
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice. Remove oil seal with pliers.

Installing

- Clean contact surface and sealing surface.
- Remove oil residue from crankshaft journal with a clean cloth.



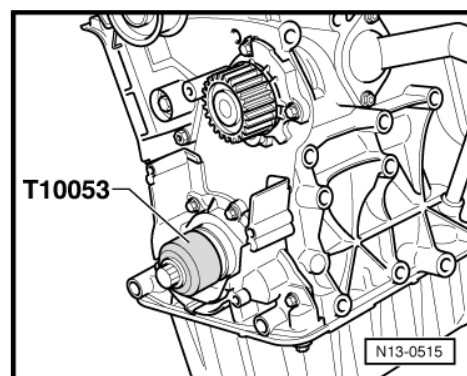
- Position guide sleeve T10053/1 from assembly tool -T10053- on crankshaft journal.
- Push oil seal over guide sleeve onto crankshaft journal.



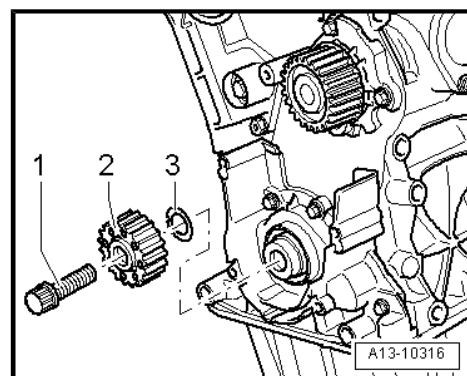
- Press in oil seal with central bolt of toothed belt sprocket and thrust sleeve of assembly tool -T10053- until flush.
- Renew central bolt for toothed belt sprocket.

i Note

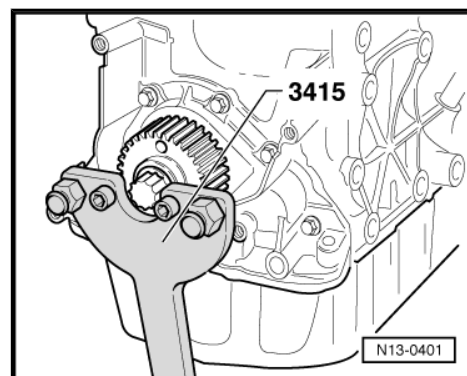
- ◆ *Contact surface between toothed belt sprocket and crankshaft must be free of oil.*
- ◆ *Do not lubricate bolt for crankshaft sprocket.*



- Install crankshaft sprocket -2- with new diamond-coated washer -3- and new central bolt -1-.



- Counterhold crankshaft sprocket using counterhold tool -3415- and secure sprocket.
- Install toothed belt (adjust valve timing) ⇒ [page 61](#) .
- Install poly V-belt ⇒ [page 32](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .

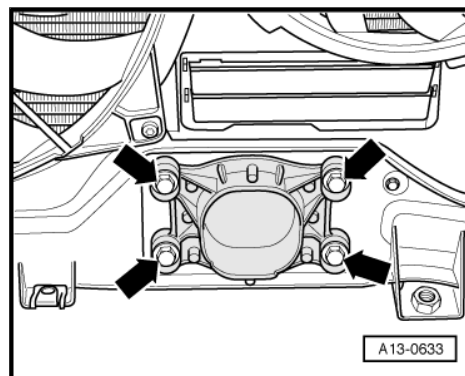


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- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .

Tightening torque

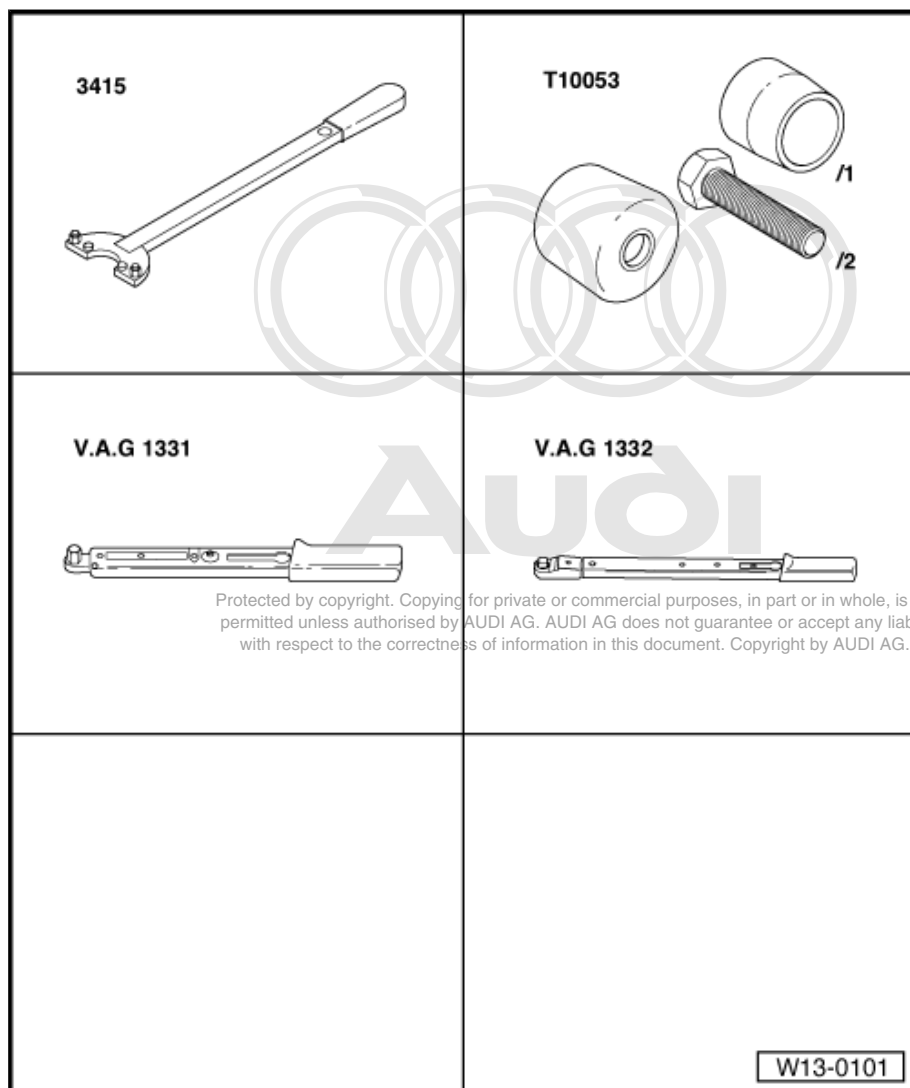
Component	Nm
Stop for torque reaction support	28
Toothed belt sprocket to crankshaft	90 + 90° 1)2)
• 1) Renew bolt • 2) 90° = a quarter of a turn	



2.2 Removing and installing sealing flange (front)

Special tools and workshop equipment required

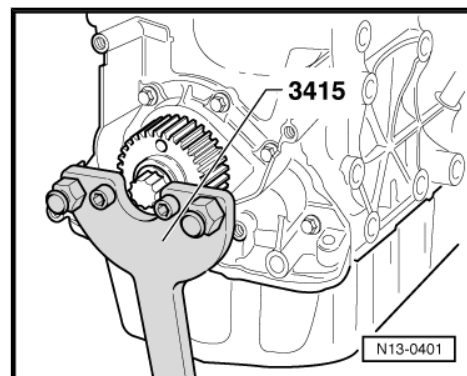
- ◆ Counterhold tool -3415-
- ◆ Assembly tool -T10053-
- ◆ Torque wrench -V.A.G 1331-
- ◆ Torque wrench -V.A.G 1332-
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Parts catalogue



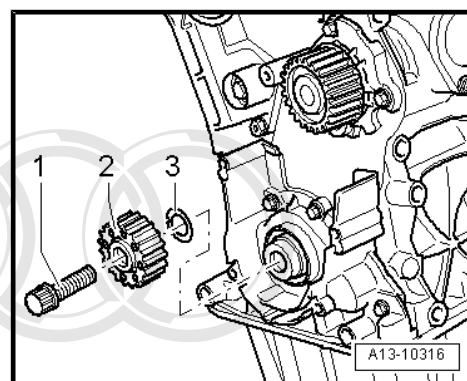
Removing

- Remove poly V-belt ⇒ [page 32](#) .

- Remove toothed belt ⇒ [page 59](#) .
- Release crankshaft sprocket (use counterhold tool -3415- to counterhold sprocket).



- Remove central bolt -1- for crankshaft sprocket -2- and remove sprocket together with diamond-coated washer -3-.



- Remove bolts -1 ... 10-.
- Lever off front sealing flange and remove.
- Drive out oil seal with flange removed.

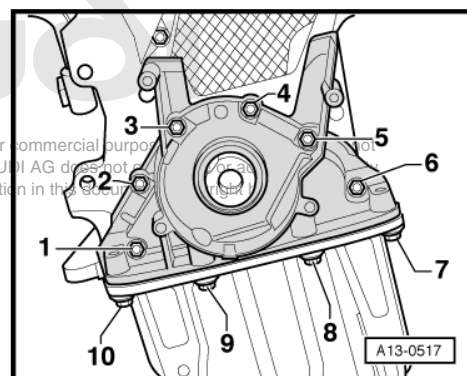
Installing



Note

Place a cloth over the exposed section of the sump.

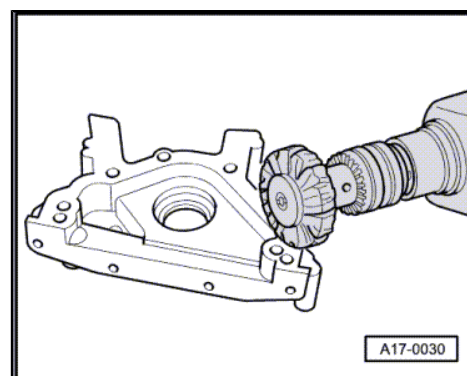
- Carefully remove any sealant residue on the cylinder block and sump.



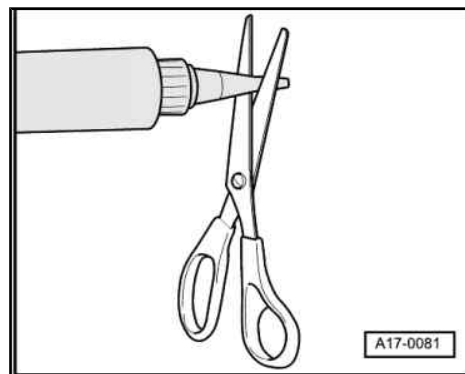
WARNING

Wear safety goggles.

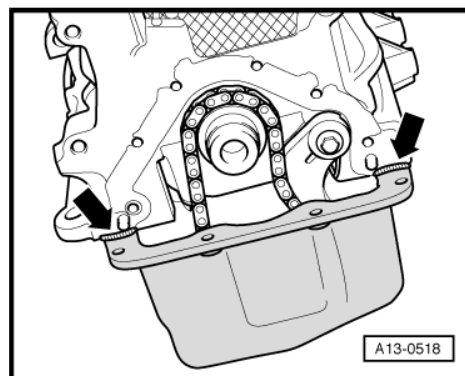
- Remove sealant residue from sealing flange with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



- Cut off tube nozzle at front marking (diameter of nozzle approx. 2 mm).



- Apply a thin bead of sealant at the edge of the joint between the cylinder block and the sump -arrows-.



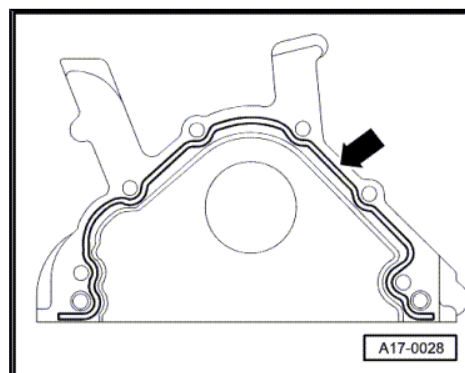
- Apply the bead of sealant onto the clean sealing surface of the sealing flange as illustrated -arrow-.
- Thickness of sealant bead: 2 ... 3 mm



Note

Sealant bead must not be wider than 3 mm, otherwise excess sealant could ingress into sump and clog strainer in oil intake pipe.

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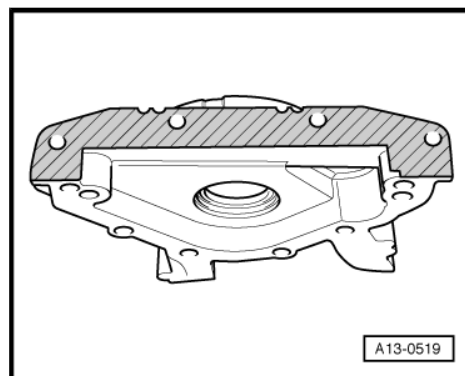
- Coat the lower sealing surface on the sealing flange lightly with sealant -hatched area-.



Note

The sealing flange must be installed within 5 minutes after applying sealant.

- Push the sealing flange carefully onto the dowel pins on the cylinder block.



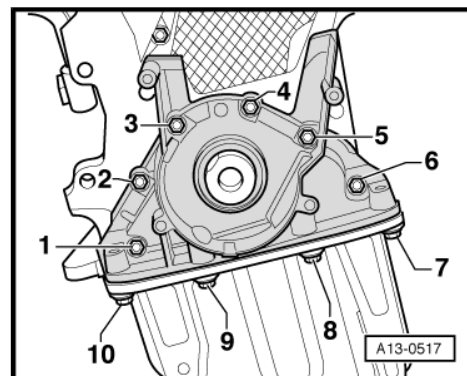
Note

Use guide sleeve -T10053/1- to attach sealing flange with oil seal fitted.

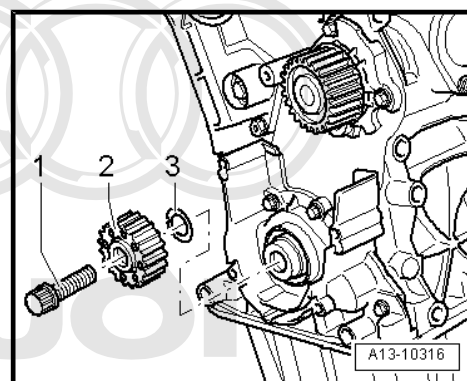
- Tighten bolts in the specified sequence:
- Tighten bolts -1 ... 6-.
- Tighten bolts -7 ... 10-.
- Install crankshaft oil seal (pulley end) ⇒ [page 40](#) .
- Renew central bolt for toothed belt sprocket.

**Note**

- ◆ *Contact surface between toothed belt sprocket and crankshaft must be free of oil.*
- ◆ *Do not lubricate bolt for crankshaft sprocket.*



- Install crankshaft sprocket -2- with new diamond-coated washer -3- and new central bolt -1-.

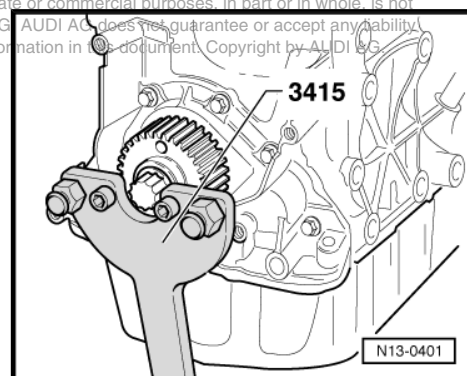


- Counterhold crankshaft sprocket using **counterhold tool -3415-** and secure sprocket.

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

Installing toothed belt and adjusting valve timing ⇒ [page 61](#) .

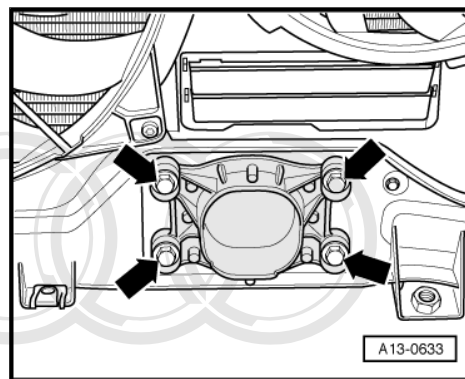
- Install crankshaft pulley ⇒ [page 33](#) .
- Install poly V-belt ⇒ [page 32](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .



- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .

Tightening torque

Component	Nm
Sealing flange to cylinder block	15
Stop for torque reaction support	28
Toothed belt sprocket to crankshaft	90 + 90° 1)2)
• 1) Renew bolt	
• 2) 90° = a quarter of a turn	



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Note

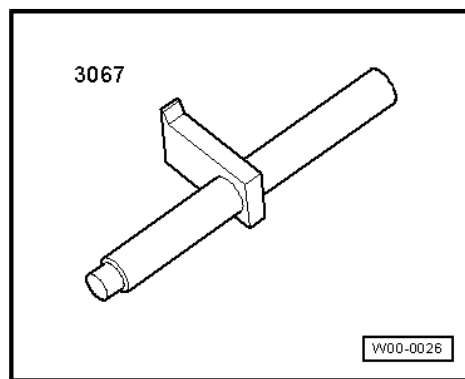
Thread and shoulder must be free of oil and grease.

2.3 Removing and installing dual mass fly-wheel/ drive plate

2.3.1 Removing and installing dual-mass fly-wheel

Special tools and workshop equipment required

- ◆ Counterhold tool -3067-



Removing

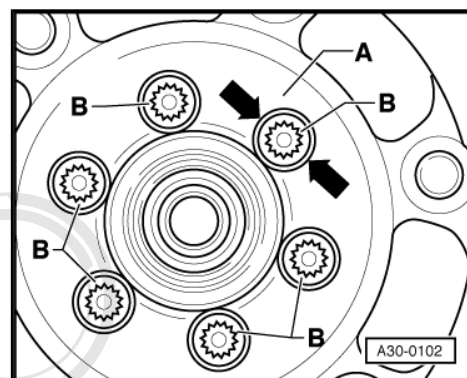
- Engine or gearbox removed.
- Remove clutch pressure plate ⇒ Rep. gr. 30 .



Caution

To prevent damage to the dual-mass flywheel when removing, the bolts -B- must not be removed with an impact wrench or similar. The bolts may only be removed by hand using conventional tools.

- Rotate the dual-mass flywheel -A- so that the bolts -B- align centrally with the holes -arrows-.
- When unscrewing bolts -B-, ensure that none of the bolt heads come into contact with the dual-mass flywheel -arrows-. The flywheel will otherwise be damaged as the bolts are screwed out further.

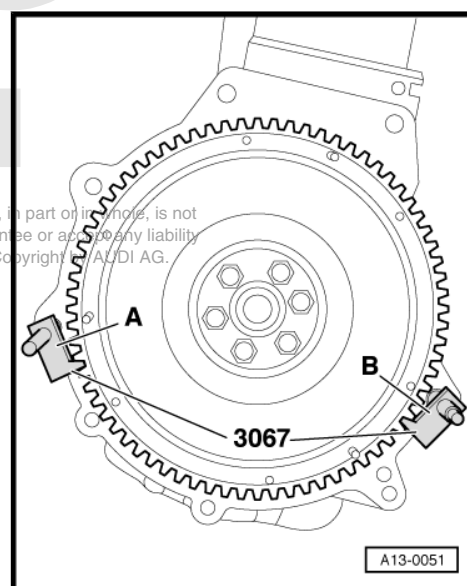


- Insert counterhold -3067- in hole on cylinder block -B-.
- Mark position of dual-mass flywheel in relation to engine.
- Unbolt dual-mass flywheel.

Installing

Installation is carried out in the reverse order; note the following:

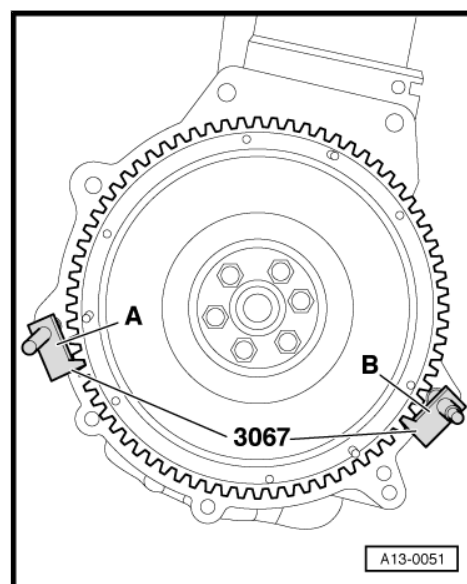
- Use new securing bolts.



- Insert counterhold -3067- in hole on cylinder block -A-.

Tightening torque

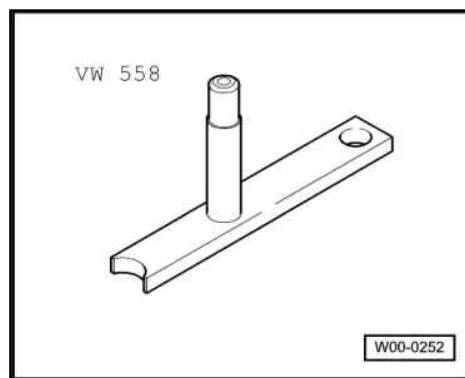
Component	Nm
Dual-mass flywheel to crankshaft	
Bolt length 22.5 mm	60 + 90° 1)2)
35.0 mm	60 + 180° 1)3)
43.0 mm	60 + 180° 1)3)
• 1) Renew bolt • 2) 90° = one quarter turn • 3) 180° = one half turn	



2.3.2 Removing and installing drive plate

Special tools and workshop equipment required

◆ Clutch counterhold tool -VW 558-

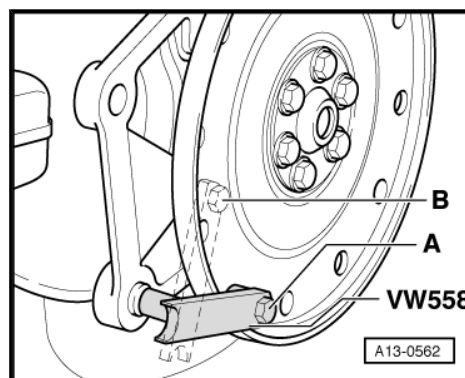


◆ M8×45 hexagon bolt and two M10 hexagon nuts

◆ Depth gauge

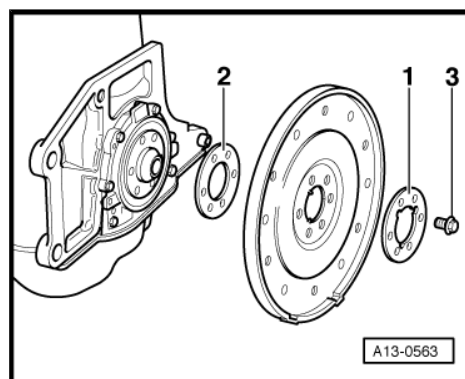
Removing

- Engine/gearbox removed.
- Mark installation position of drive plate on engine.
- Secure clutch counterhold tool -VW 558- to the drive plate using a M8×45 hexagon bolt. Fit two M10 hexagon nuts between counterhold tool and drive plate. Position of counterhold tool: -A- when loosening; -B- when tightening
- Unbolt drive plate.
- Take out shim located behind.



Installing

- Fit drive plate using washer with notches -1-.
- Fit new bolts -3- and tighten to 30 Nm.



- Measure distance -a- at three points and calculate average value.

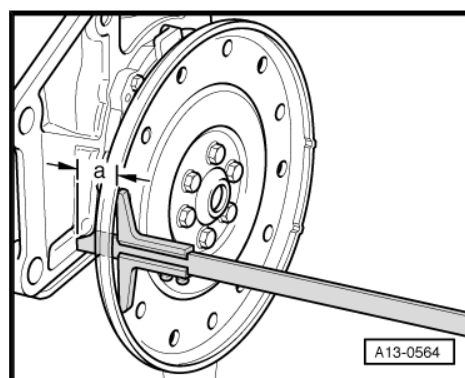
◆ Specification: 19.5 ... 21.1 mm



Note

Measurement is taken through the hole in the drive plate to the machined surface of the cylinder block. Audi AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

If specification is not obtained:



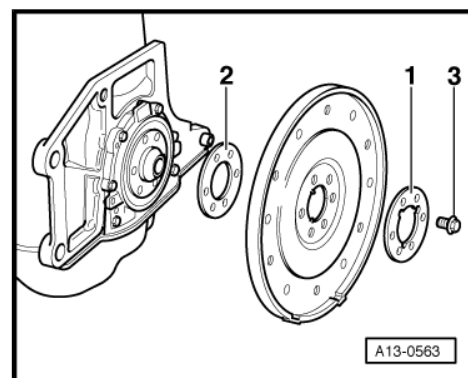
- Remove drive plate and remove or add shim -2-.
- Repeat measurement (tighten bolts on drive plate to 30 Nm).

If specification is obtained:

- Tighten bolts to specified torque.

Tightening torque

Component	Nm
Drive plate to crankshaft	60 + 90° ¹⁾ 2)
• ¹⁾ Renew bolt • ²⁾ 90° = a quarter of a turn	



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3 Crankshaft - exploded view



Note

Secure engine to repair stand using engine and gearbox support
-VW 540- when dismantling/assembling engine ⇒ [page 23](#).

1 - 65 Nm + 1/4 turn (90 °) further

- ☐ Renew
- ☐ For measuring radial clearance of crankshaft, tighten to 65 Nm but not further

2 - Bearing caps

- ☐ Bearing cap 1: Pulley end
- ☐ Bearing cap 3 with recesses for thrust washers
- ☐ Bearing shell retaining lugs (cylinder block/bearing cap) must be on the same side

3 - 10 Nm + 1/4 turn (90 °) further

- ☐ Renew
- ☐ Sender wheel must be renewed if bolts are loosened ⇒ [page 51](#)

4 - Needle bearing

- ☐ For vehicles with manual gearbox
- ☐ Extracting and driving in ⇒ [page 52](#)

5 - Sender wheel

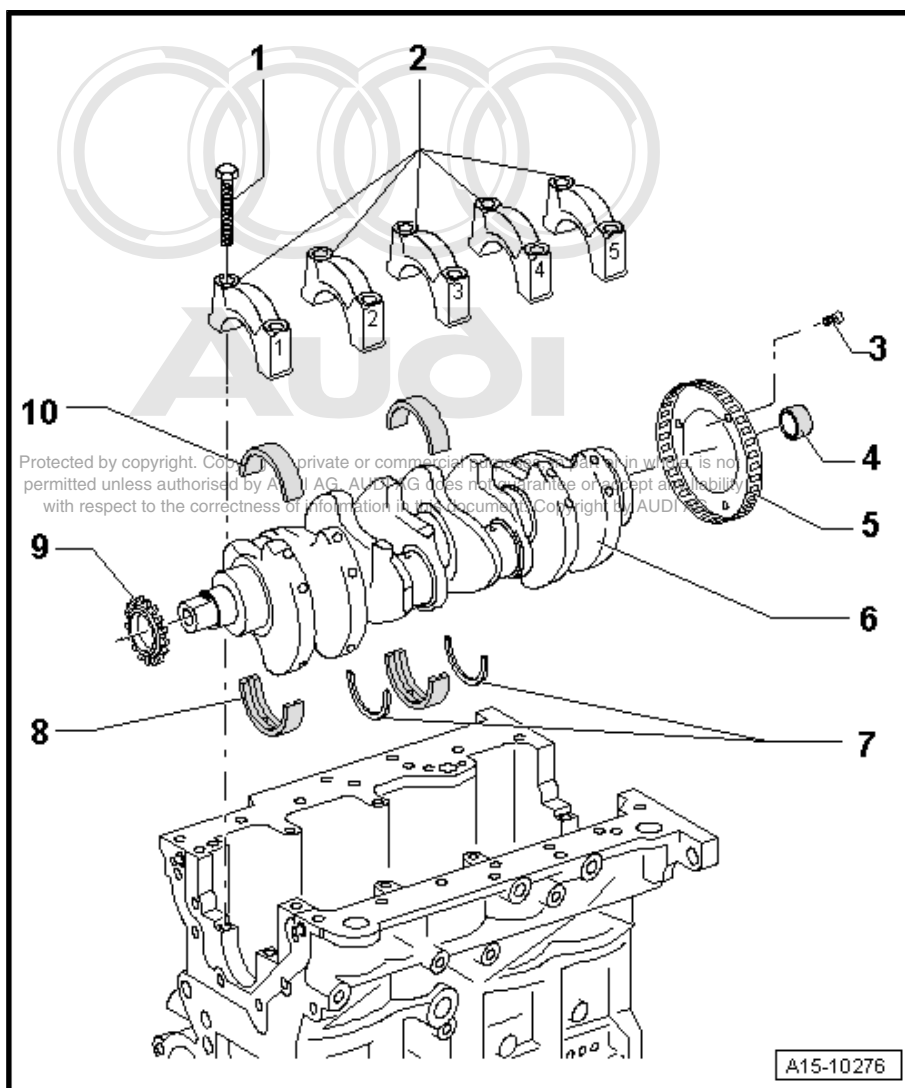
- ☐ For engine speed sender -G28-
- ☐ Can only be installed in one position, holes are offset.
- ☐ Sender wheel must be renewed if bolts are loosened
- ☐ Removing and installing ⇒ [page 51](#)

6 - Crankshaft

- ☐ Axial clearance when new: 0.07 ... 0.23 mm; wear limit: 0.30 mm
- ☐ Check radial clearance with Plastigage - (new): 0.02 ... 0.04 mm; wear limit: 0.15 mm
- ☐ Do not rotate the crankshaft when checking the radial clearance
- ☐ Crankshaft dimensions ⇒ [page 53](#)

7 - Thrust washers

- ☐ For bearing No. 3
- ☐ Note location



8 - Bearing shell for cylinder block

- ☐ With oil groove
- ☐ Do not interchange used bearing shells (mark positions)
- ☐ Inserting bearing shells for cylinder block with correct colour-coding ⇒ [page 52](#)

9 - Chain sprocket

- ☐ For oil pump chain
- ☐ Renewing ⇒ [page 54](#)

10 - Bearing shell for bearing cap

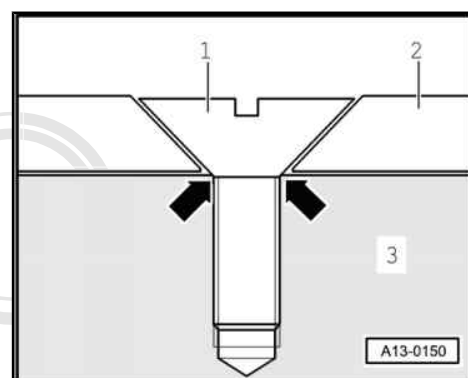
- ☐ Without oil groove
- ☐ Do not interchange used bearing shells (mark positions)
- ☐ The crankshaft bearing shells in the bearing caps are only supplied as spare parts with „yellow“ colour-coding.

Removing and installing sender wheel

- Sender wheel -2- must always be renewed after slackening off bolts -1-.

**Note**

- ◆ *If the countersunk bolts are tightened a second time, the seats for the bolt heads in the sender wheel will be deformed to such an extent that the bolt heads make contact with the crankshaft -3- -arrows- and the sender wheel beneath the bolts will be loose.*
- ◆ *Sender wheel can only be fitted in one position because holes are offset.*

**Tightening torque**

Component	Nm
Sender wheel to crankshaft	10 + 90° 1)2)
• 1) Renew bolt • 2) 90° = a quarter of a turn	

Allocation of crankshaft bearing shells for cylinder block

Bearing shells of the correct thickness are assigned to the cylinder block at the factory. Coloured dots are used to identify the thickness of the bearing shells.

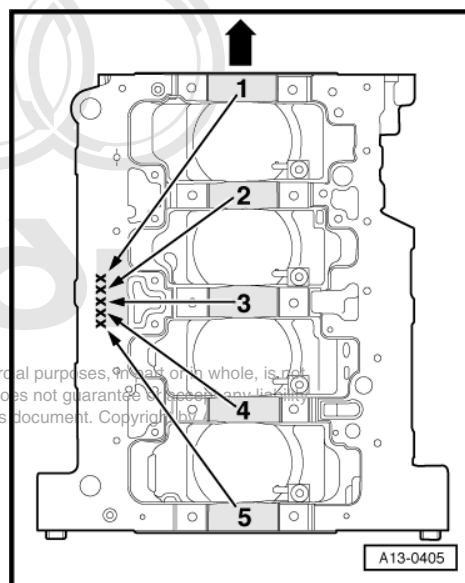


Note

Arrow points in direction of travel.

Letter codes on lower sealing surface of cylinder block indicate which bearing shell is to be fitted at each location.

Letter on cylinder block		Colour coding of bearing
S	=	Black
R	=	Red
G	=	Yellow



Note

The crankshaft bearing shells in the bearing caps are only supplied as spare parts with „yellow“ coloured markings.

3.1 Extracting and driving in needle bearing for crankshaft

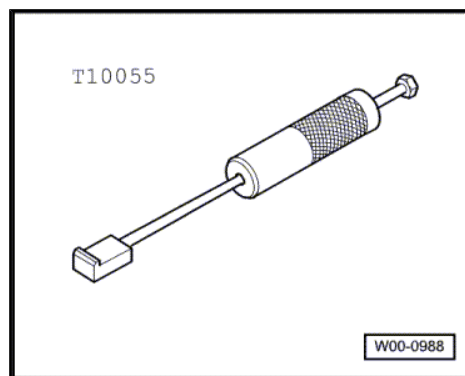


Note

A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox; insert needle bearing if not yet fitted.

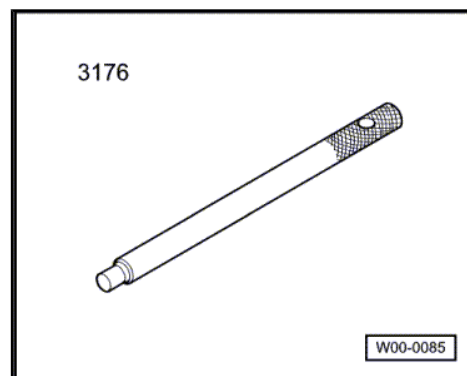
Special tools and workshop equipment required

- ◆ Puller -T10055-



- ◆ With adapter -T10055/3-

◆ Centring mandrel -3176-



◆ Or drift -VW 207 C-

◆ Puller e.g. Kukko -21/2-

Removing

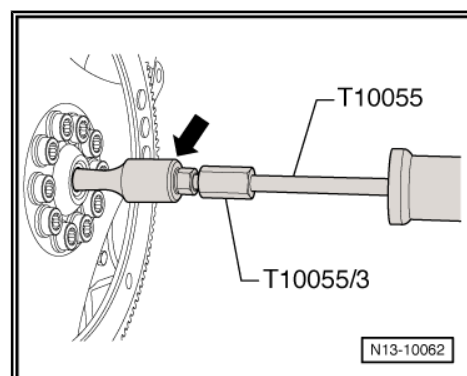
- Extract with commercially available puller e.g. Kukko -21/2- -arrow-, adapter -T10055/3- and puller -T10055- .

Installing

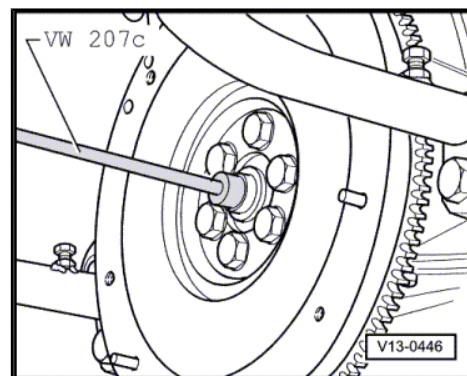


Note

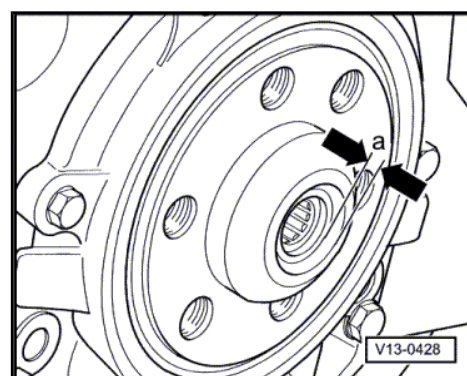
The lettering on the needle bearing must be visible when installed.



- Drive in with drift -VW 207 C- or centring mandrel -3176- .



Installation depth of -a- = 2 mm



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3.2 Crankshaft dimensions

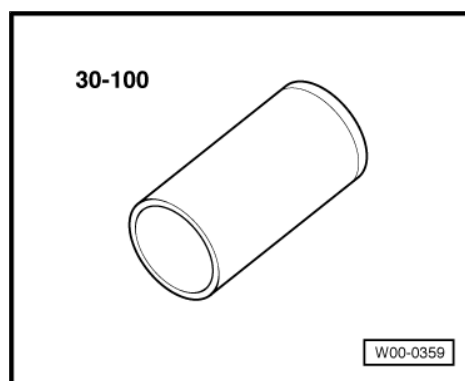
(in mm)

Honing dimension	Crankshaft main bearing journal Ø	Conrod bearing journal Ø
Basic dimension	-0.017	-0.022
	54.00	47.80
1st undersize	-0.037	-0.042
	53.75	47.55
2nd undersize	-0.017	-0.022
	53.50	47.30
3rd undersize	-0.037	-0.042
	53.25	47.05

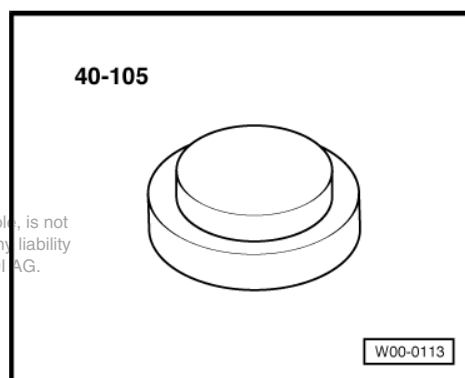
3.3 Removing and installing chain sprocket

Special tools and workshop equipment required

- ◆ Drift sleeve -30 - 100-



- ◆ Thrust plate -40 - 105-



- ◆ Two-arm puller, commercially available
- ◆ Protective gloves

Removing

- Remove sump with oil pump ⇒ [page 111](#) .
- Remove front sealing flange ⇒ [page 42](#) .

- Pull chain sprocket off crankshaft with puller -2- (Kukko 44-1 or similar). Use thrust plate -40 - 105- to protect end of crankshaft.

Installing

Installation is carried out in the reverse order; note the following:



WARNING

Wear protective gloves.

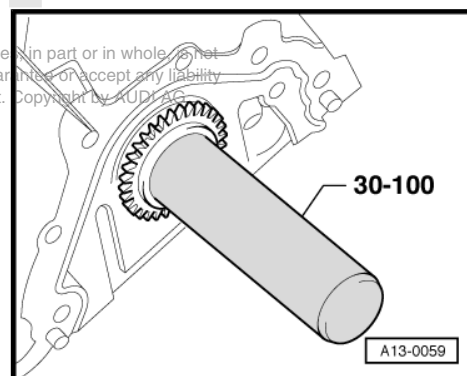
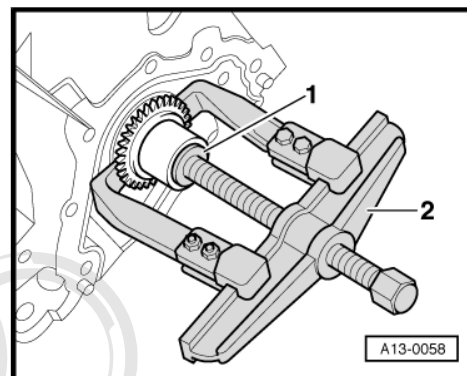
- Heat chain sprocket in oven for approx. 15 minutes to 220°C.



Note

Installation position: wide collar on sprocket facing towards engine,

- Fit chain sprocket on end of crankshaft using pliers, and press onto crankshaft as far as the stop using drift sleeve -30-100-.
- Install sump with oil pump → [page 111](#).



4 Pistons and conrods - exploded view

1 - Conrod bolt, 30 Nm + 1/4 turn (90 °) further

- ☐ Renew
- ☐ Lubricate threads and contact surface
- ☐ Use old bolts when measuring radial clearance
- ☐ To measure radial clearance, tighten to 30 Nm but do not turn further

2 - Pressure relief valve, 27 Nm

- ☐ Opening pressure: 1.6 ... 1.9 bar

3 - Oil spray jet

- ☐ For piston cooling

4 - Conrod bearing cap

- ☐ Note installation position
- ☐ Due to the cracking method used to separate the bearing caps from the conrods in manufacture, the caps only fit in one position and only on the appropriate conrod

Mark cylinder number -B-

- ☐ Installation position: Markings -A- face towards pulley end

5 - Bearing shells

- ☐ Upper bearing shell with oil hole for piston pin lubrication
- ☐ Installation position → [page 58](#)
- ☐ Do not interchange used bearing shells (mark positions)
- ☐ Axial clearance when new: 0.10 ... 0.35 mm; wear limit: 0.40 mm
- ☐ Check radial clearance with Plastigage - (new): 0.02 ... 0.06 mm; wear limit: 0.09 mm. Do not turn crankshaft when measuring radial clearance

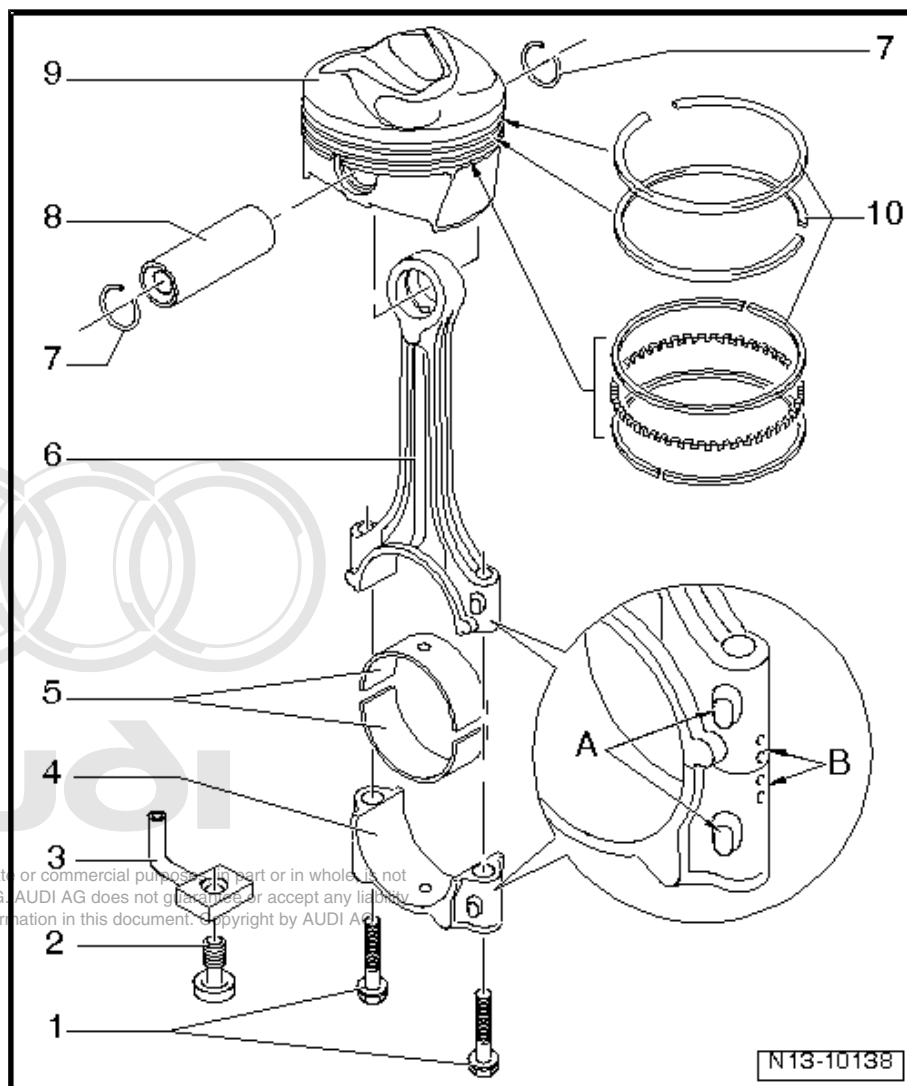
6 - Conrod

- ☐ Only renew as a complete set
- ☐ Mark cylinder number -B-
- ☐ Installation position: Markings -A- face towards pulley end
- ☐ With oil drilling for piston pin lubrication

7 - Circlip

8 - Piston pin

- ☐ If difficult to move, heat piston to approx. 60 °C
- ☐ Remove and install using drift -VW 222 A-



9 - Piston

- ☐ Checking ⇒ [page 57](#)
- ☐ Mark installation position and cylinder number
- ☐ Arrow on piston crown points to pulley end
- ☐ Install using piston ring clamp
- ☐ Piston and cylinder dimensions ⇒ [page 58](#)
- ☐ Checking cylinder bore ⇒ [page 58](#)

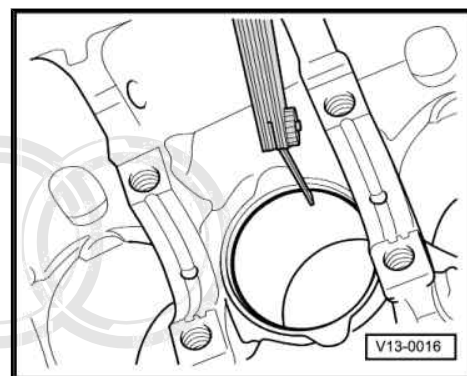
10 - Piston rings

- ☐ Offset gaps by 120 °
- ☐ Use piston ring pliers to remove and install
- ☐ „TOP“ must face towards piston crown
- ☐ Checking ring gap ⇒ [page 57](#)
- ☐ Checking ring-to-groove clearance ⇒ [page 57](#)

Checking piston ring gap

- Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder. Use a piston without rings to push ring into bore.

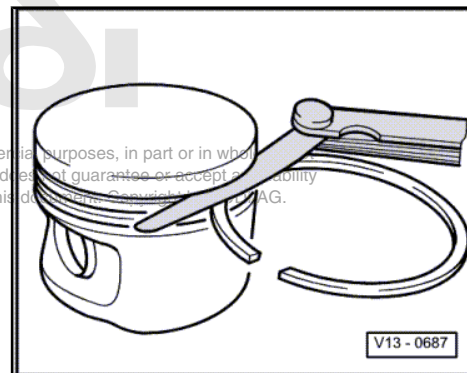
Piston ring Dimensions in mm	New	Wear limit
Compression ring	0.20 ... 0.40	0.8
Oil scraper ring	0.25 ... 0.50	0.8



Checking ring-to-groove clearance

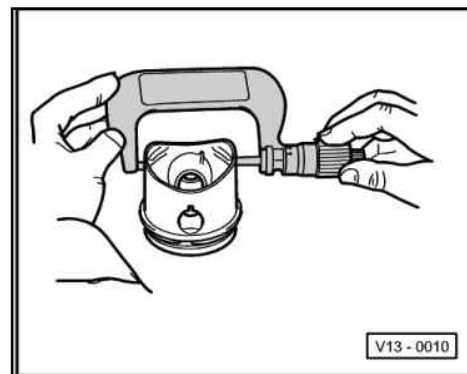
- Clean groove in piston before checking clearance.

Piston ring Dimensions in mm	New	Wear limit
Compression ring	0.06 ... 0.09	0.20
Oil scraper ring	0.03 ... 0.06	0.15

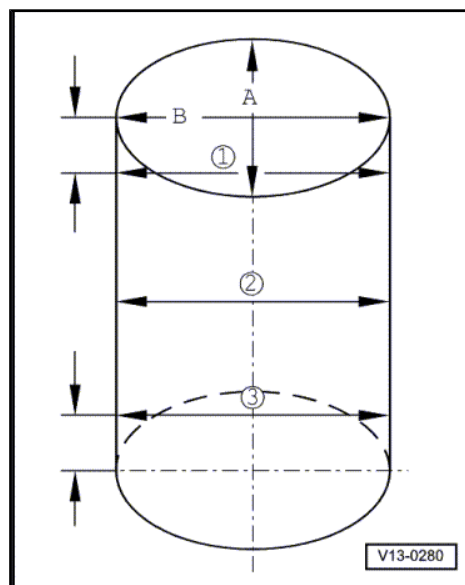


Checking piston

- Measure approx. 10 mm from the bottom edge, perpendicular to the piston pin axis.
- ♦ Deviation from nominal dimension: max. 0.04 mm



Checking cylinder bore



Special tools and workshop equipment required

- ◆ Cylinder gauge 50 ... 100 mm
- Take measurements at 3 positions in both lateral direction -A- and longitudinal direction -B-.
- ◆ Deviation from nominal dimension: max. 0.08 mm

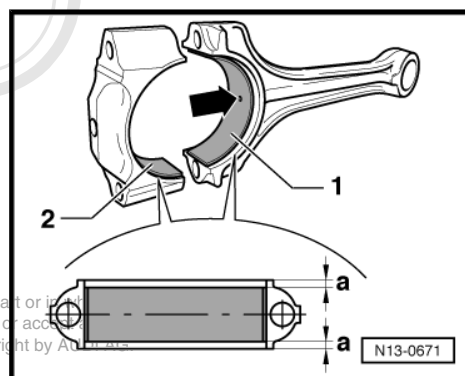
Bearing shells - installation position

Bearing shell -1- with oil drilling -arrow- for conrod.

Bearing shell -2- without oil drilling for conrod bearing cap.

- Position bearing shells in centre of conrod and conrod bearing cap when fitting.

Dimension -a- must be identical on both sides.



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4.1 Piston and cylinder dimensions

Honing dimension	Piston Ø	Cylinder bore Ø
Basic dimension mm	82.465 ¹⁾	82.51
• ¹⁾Dimensions not including graphite coating (thickness 0.02 mm). The graphite coating will wear down in service.		

15 – Cylinder head, valve gear

1 Toothed belt drive

1.1 Toothed belt drive - exploded view

Mark the rotation direction of the toothed belt with chalk or felt-tip pen before removing. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

1 - 10 Nm

2 - Toothed belt cover (top)

3 - 50 Nm + 180°

- ☐ Renew
- ☐ Use counterhold tool -3036- when loosening and tightening
⇒ [page 60](#)

4 - Camshaft sprocket

- ☐ Remove toothed belt prior to removing and installing ⇒ [page 61](#)
- ☐ Installation position fixed by Woodruff key
⇒ [Item 7 \(page 59\)](#)
- ☐ Detaching camshaft sprocket ⇒ [page 60](#)

5 - 10 Nm

- ☐ Apply locking fluid when fitting
- ☐ Locking fluid ⇒ Parts catalogue

6 - Toothed belt cover (rear)

7 - Woodruff key

- ☐ Check for firm attachment

8 - 25 Nm

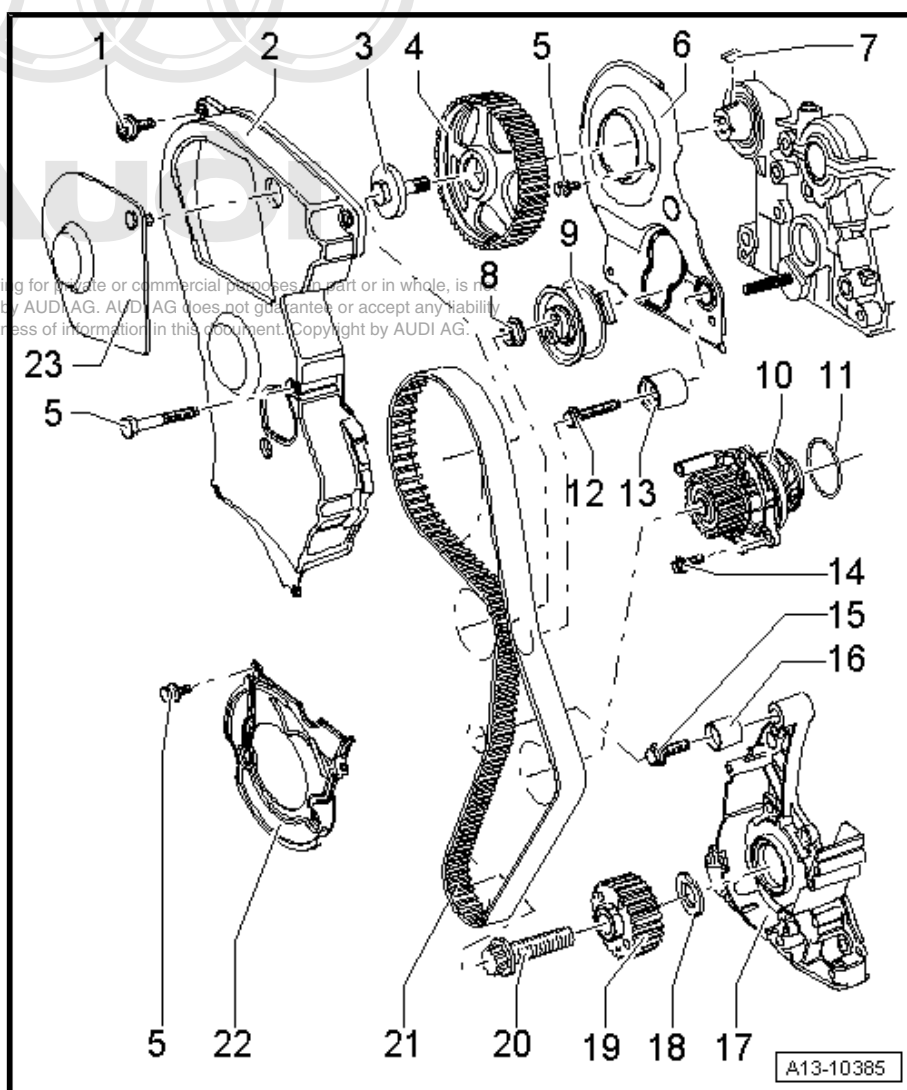
9 - Semi-automatic tensioning roller

10 - Coolant pump

- ☐ Removing and installing
⇒ [page 147](#)

11 - O-ring

- ☐ Renew



12 - 25 Nm

13 - Damper wheel

14 - 15 Nm

15 - 35 Nm

16 - Damper wheel

17 - Sealing flange

- ☐ Removing and installing ⇒ [page 42](#)

18 - Diamond-coated washer for toothed belt sprocket

- ☐ Renew washer if toothed belt sprocket is removed

19 - Crankshaft sprocket

- ☐ Contact surface between sprocket and crankshaft must be free of oil
- ☐ Can only be installed in one position

20 - 90 Nm + 90° (1/4 turn) further

- ☐ Renew
- ☐ Do not lubricate with oil
- ☐ Attaching counterhold tool 3415 ⇒ [page 61](#)

21 - Toothed belt

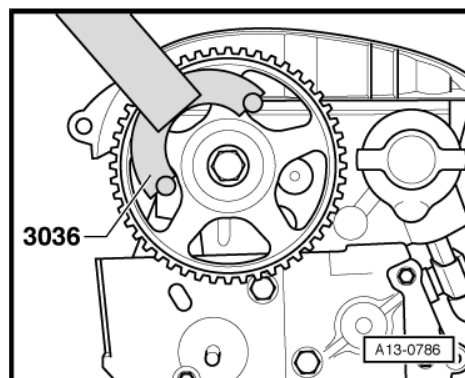
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Check for wear
- ☐ Removing ⇒ [page 61](#)
- ☐ Installing (adjusting valve timing) ⇒ [page 61](#)

22 - Toothed belt cover (bottom)

23 - Cap for toothed belt cover

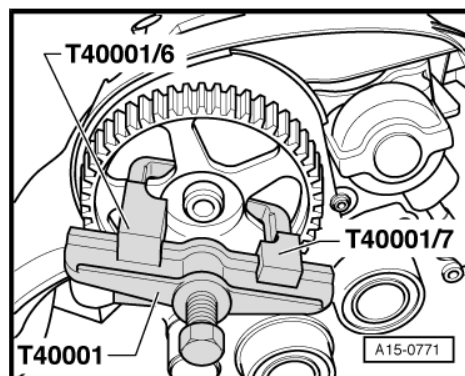
Loosening camshaft sprocket

- Use counterhold -3036- when loosening and tightening central bolt.



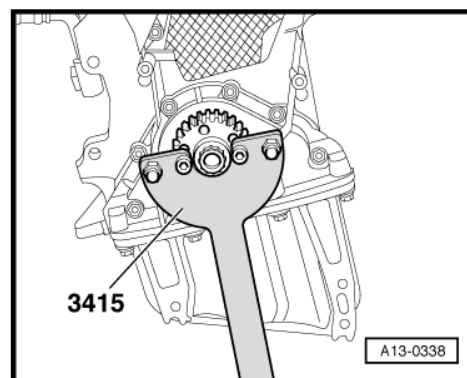
Detaching camshaft sprocket

- Use two-arm puller -T40001- with claws T40001/6 and T40001/7 to detach camshaft sprocket.



Removing and installing crankshaft sprocket

- Use counterhold -3415- when loosening and tightening central bolt.

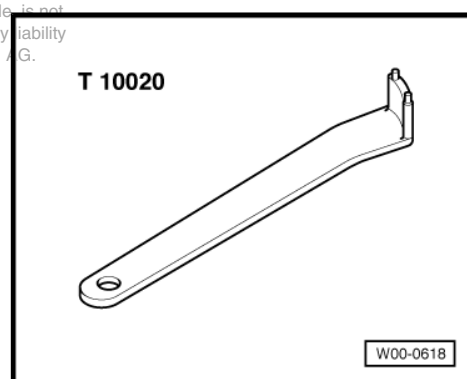


1.2 Removing and installing toothed belt

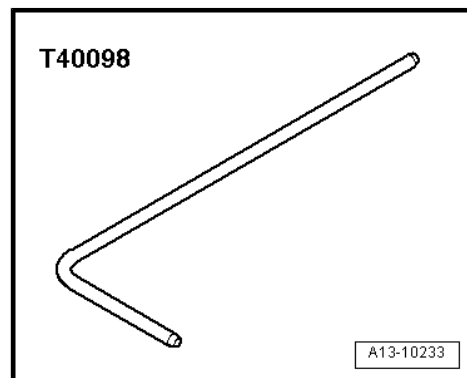
Special tools and workshop equipment required

- ◆ Pin wrench -T10020-

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- ◆ Locking pin -T40098-



Removing

- Pull off engine cover panel -arrows-.

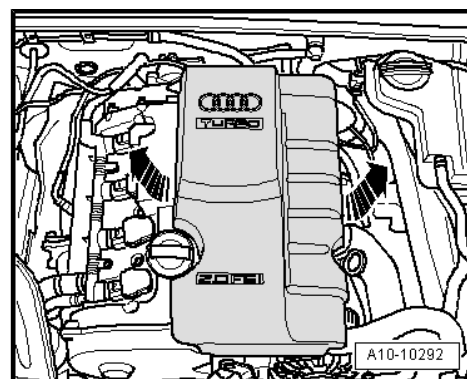


WARNING

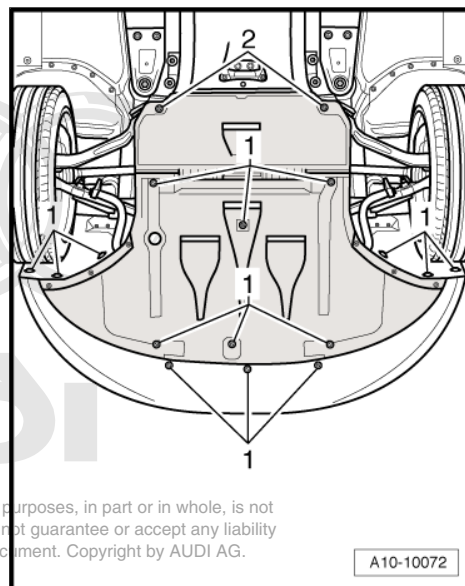
Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.



- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .
- Move lock carrier to service position ⇒ Rep. gr. 50 .



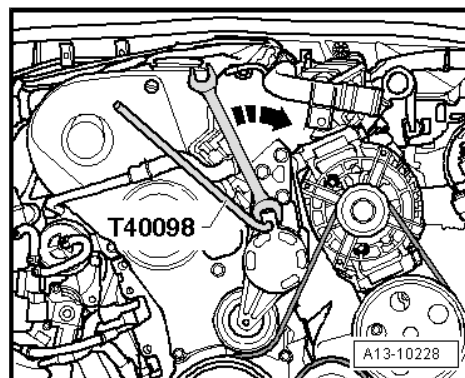
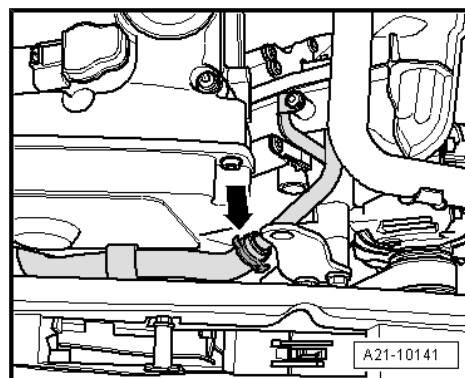
- Disconnect coolant hose -arrow-.



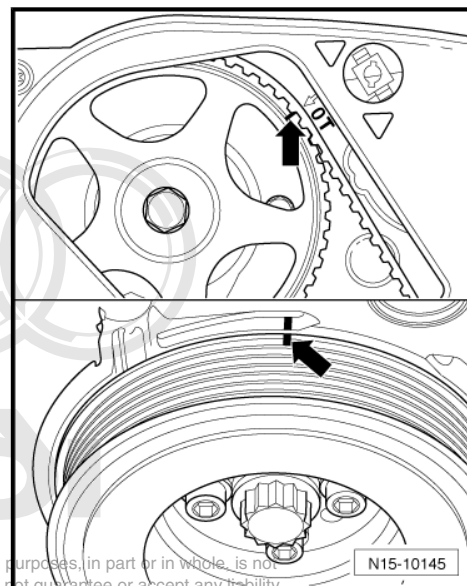
Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

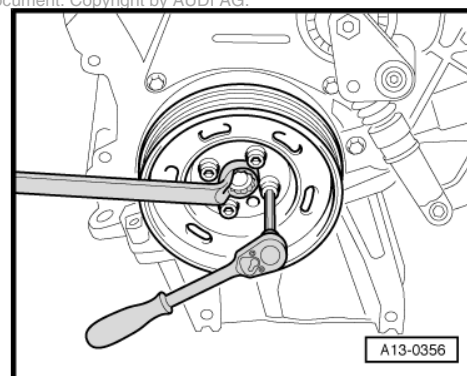
- Mark direction of rotation of poly V-belt.
- To slacken poly V-belt, turn belt tensioner/damper in direction of -arrow-.
- Lock tensioner in position with locking pin -T40098- .
- Remove poly V-belt.



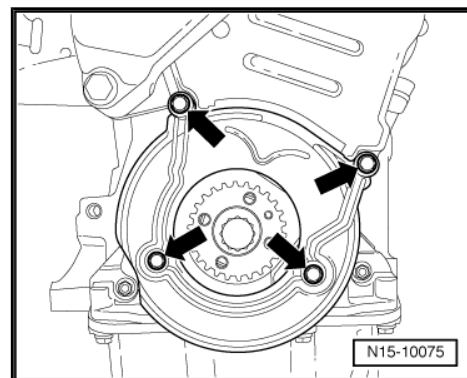
- Set camshaft sprocket to TDC marking by turning crankshaft. Marking on camshaft sprocket must align with arrow on toothed belt cover.



- Remove vibration damper / pulley.



- Unscrew bolts from toothed belt cover (bottom) -arrows-.



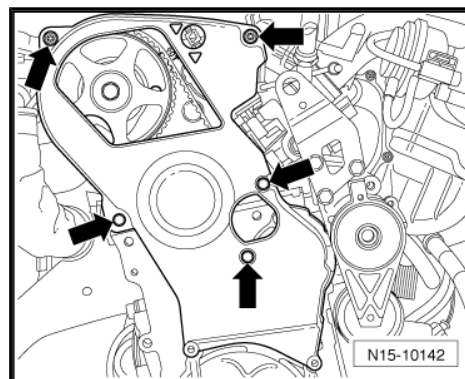
- Unscrew remaining toothed belt cover bolts -arrows- and remove toothed belt cover from engine.
- Mark direction of rotation of toothed belt.
- Loosen tensioning roller and remove toothed belt.
- Turn crankshaft back slightly.

Installing

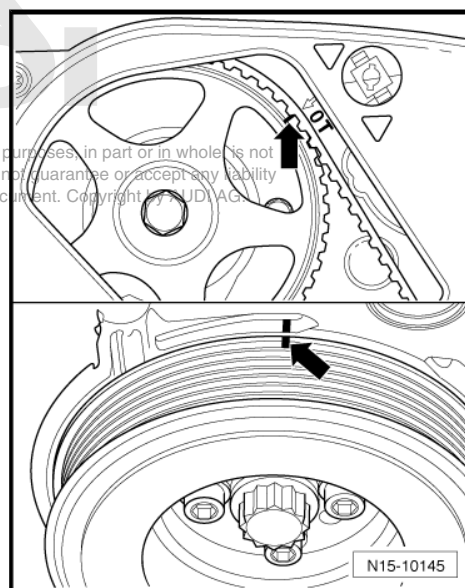


Note

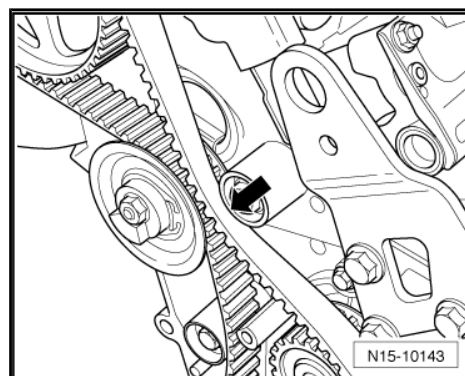
- ◆ *When turning the camshaft, the crankshaft must not be at TDC. Otherwise, there is a risk of damage to valves and piston crowns.*
- ◆ *The engine must be no more than warm to touch.*
- Fit toothed belt on crankshaft sprocket (note rotation direction).
- Secure toothed belt cover (bottom section) with the two bolts at the bottom.
- Install vibration damper / pulley with new bolts.
- Turn crankshaft and camshaft to TDC No. 1 cylinder -arrows-.



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- Fit toothed belt in the sequence: tensioning roller, camshaft sprocket, coolant pump and last onto idler roller -arrow-.



**Note**

Check tensioning roller is seated correctly in cylinder head.

- Tension toothed belt. To do so, turn hexagon key at the eccentric adjuster clockwise (direction of arrow) until the notch is above the indicator.
- Then release tension on toothed belt.
- Now tension toothed belt until the notch and the indicator are aligned.
- Tighten securing nut
- Turn crankshaft two turns in direction of engine rotation and set again to TDC. Make sure that the engine is rotated without stopping during the final 45° (1/8 turn).
- Check tension of toothed belt again. Specification: indicator and notch must align.

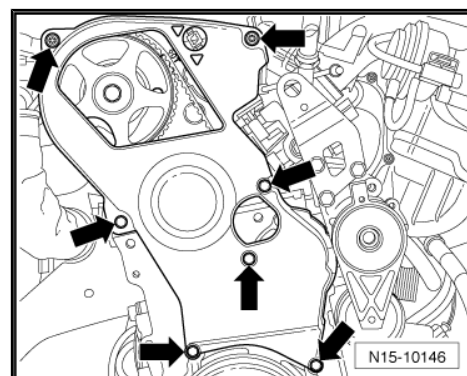
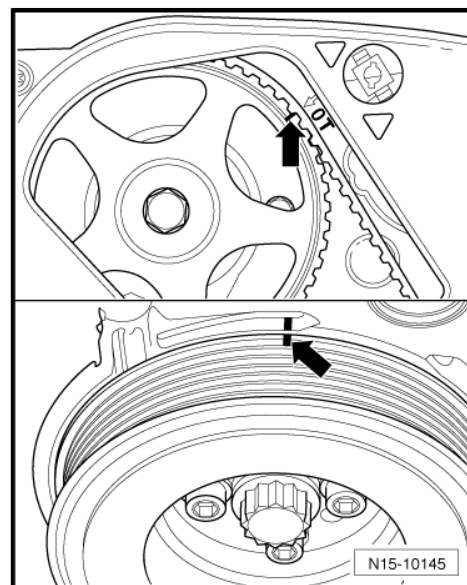
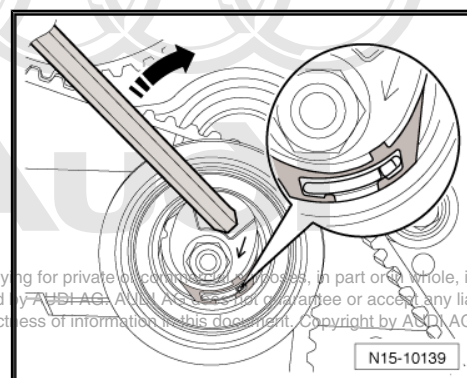
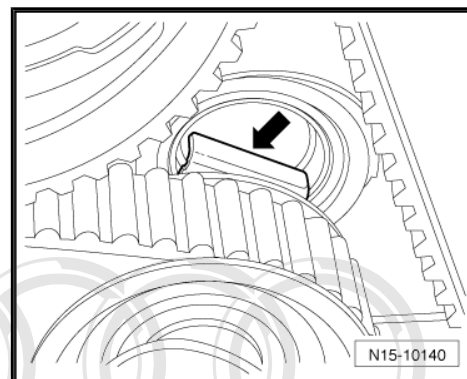
- Check valve timing again.

If the markings do not align:

- Repeat adjustment of valve timing.

If the markings align:

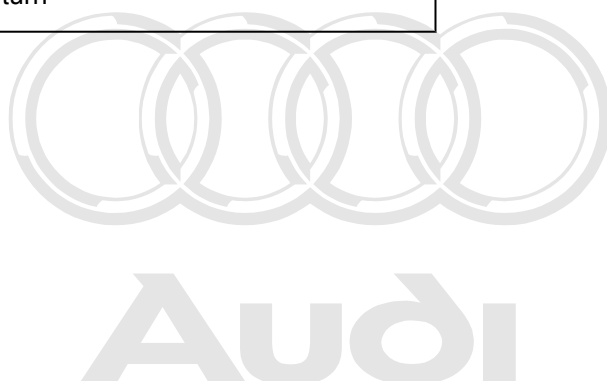
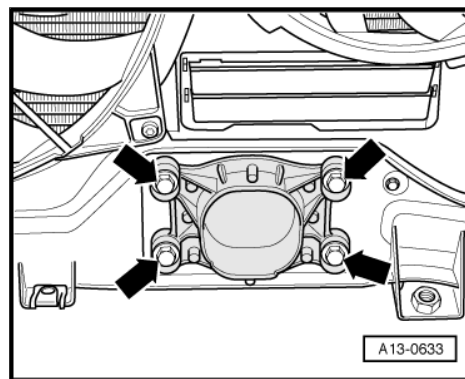
- Install toothed belt cover -arrows-.
- Install crankshaft pulley ⇒ [page 33](#) .
- Install poly V-belt ⇒ [page 32](#) .
- Fill up with coolant ⇒ [page 138](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .



- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .
- Install insulation tray.
- Fit engine cover panel.

Tightening torques

Component	Nm
Toothed belt tensioning roller to cylinder head	23
Toothed belt cover (bottom) to cylinder block	10 ¹⁾
Toothed belt cover (centre) to cylinder block	10 ¹⁾
Stop for torque reaction support	28
Pulley to crankshaft	20 + 90° ²⁾³⁾
• ¹⁾ Apply locking fluid when fitting • ²⁾ Renew bolt/nut • ³⁾ 90° = a quarter of a turn	



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2 Cylinder head

2.1 Cylinder head - exploded view



Note

- ◆ *Renew the cylinder head bolts.*
- ◆ *On assembly, renew oil seals and gaskets as well as self-locking nuts and bolts that are tightened by turning through to a specified angle.*
- ◆ *When installing an exchange cylinder head with fitted camshafts, oil the contact surfaces between the roller rocker fingers and cams.*
- ◆ *The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.*
- ◆ *When fitting a new cylinder head or cylinder head gasket, drain off all the old coolant and refill with new coolant.*

1 - Bolt

- ☐ Tightening sequence
⇒ [page 68](#)

2 - Cylinder head cover

- ☐ Removing and installing
⇒ [page 71](#)

3 - Gasket

- ☐ Renew if damaged or leaking

4 - Valve housing

5 - Oil filler cap

6 - Seal

- ☐ Renew if damaged or leaking

7 - 4 Nm

8 - Gasket for cylinder head cover

- ☐ Renew if damaged or leaking

9 - Vacuum pump

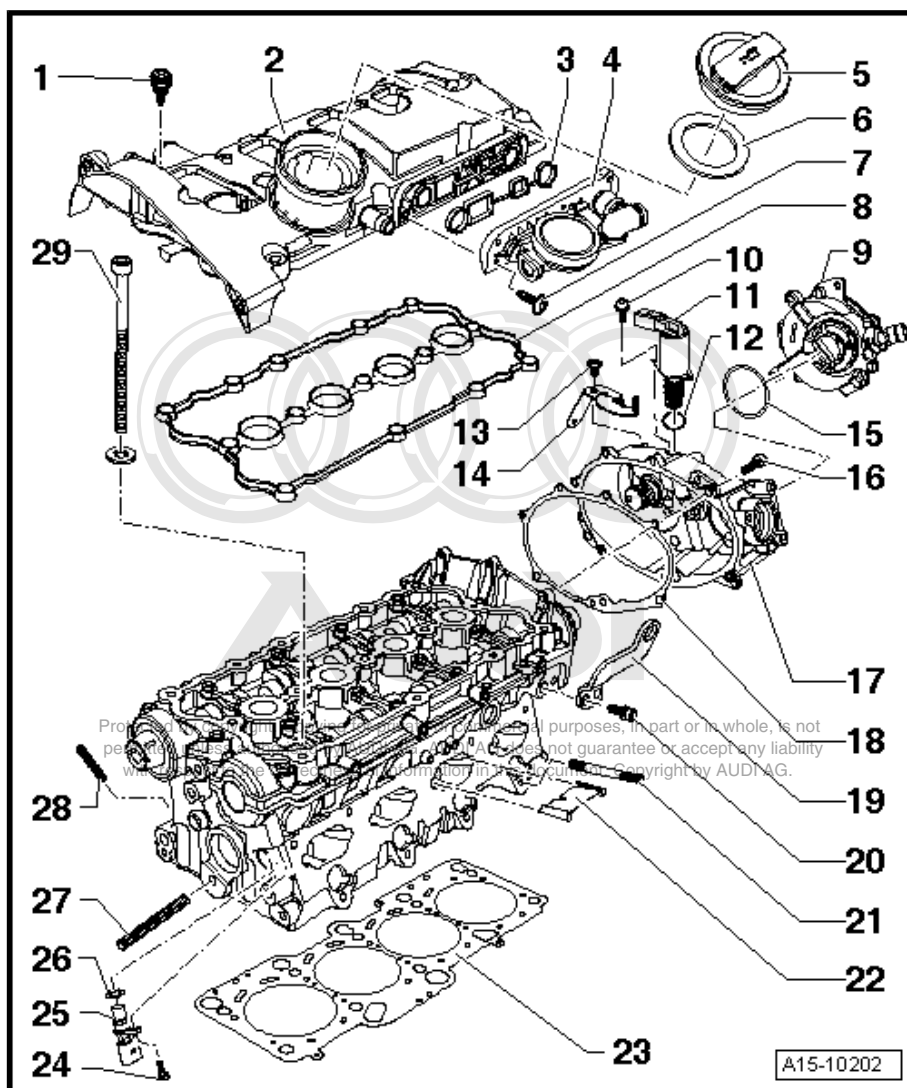
10 - 4 Nm

11 - Camshaft control valve 1 - N205-

- ☐ Removing ⇒ [page 69](#)

12 - Seal

- ☐ Renew



13 - 10 Nm

14 - Cable retainer

15 - Seal

- ☐ Renew if damaged or leaking

16 - 10 Nm

17 - Housing

18 - Gasket

- ☐ Renew

19 - Transport plate

20 - 25 Nm

21 - 10 Nm

- ☐ Stud for intake manifold

22 - Separating plate

23 - Cylinder head gasket

- ☐ Renew
- ☐ Check installation position: Part No. towards cylinder head

24 - 10 Nm

25 - Hall sender -G40-

26 - Seal

27 - 10 Nm

- ☐ Stud for tensioning roller

28 - 20 Nm

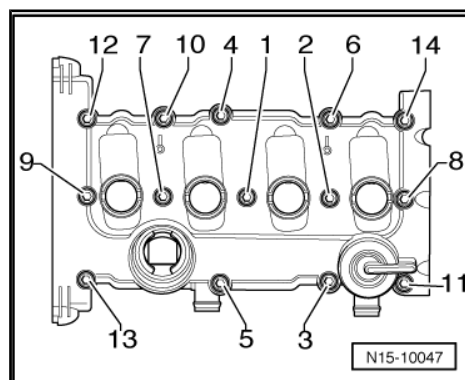
- ☐ Stud for exhaust manifold

29 - Cylinder head bolt

- ☐ Renew
- ☐ Note correct sequence when loosening ⇒ [page 80](#)
- ☐ Tightening torque ⇒ [page 69](#)

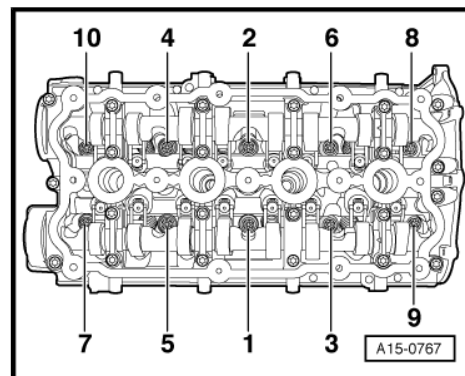
Tightening sequence for cylinder head cover

- Tighten bolts for cylinder head cover in the sequence
-1 ... 14- to 10 Nm.

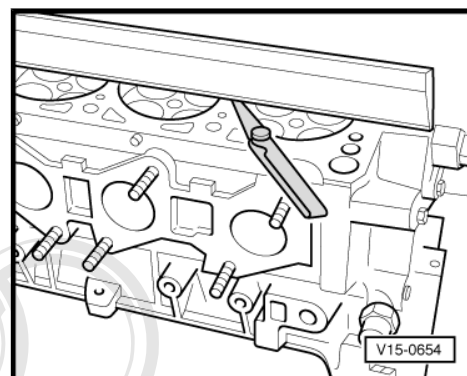


Tightening sequence for cylinder head

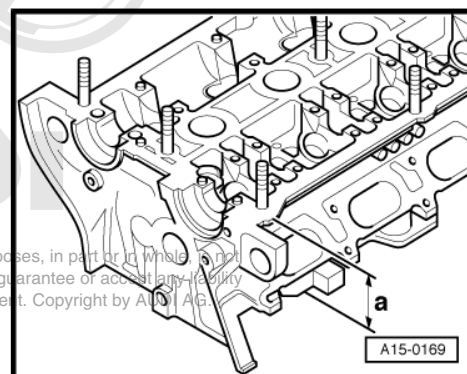
- Tighten using torque wrench:
 - ◆ 1st stage: 40 Nm
- Tighten using rigid spanner:
 - ◆ 2nd stage: turn 180° ($\frac{1}{2}$ turn) further (alternatively 2 x 90° is possible)

**Checking cylinder head for distortion**

- Use straight edge and feeler gauge to measure for distortion at several points.
- ◆ Max. permissible distortion: 0.05 mm

**Cylinder head machining limit**

- Machining of the cylinder head (surface grinding) is only permissible down to the minimum dimension a.
- ◆ Minimum dimension a = 139.20 mm

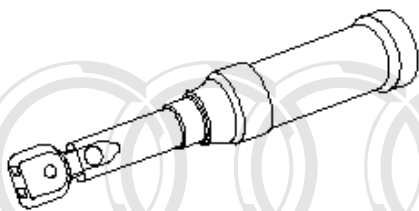
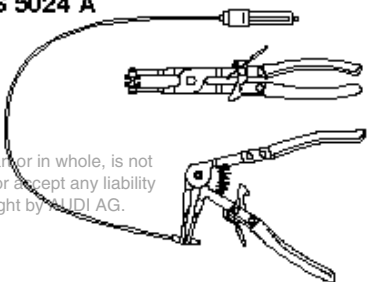


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2.2 Removing and installing camshaft control valve 1 -N205-

Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1783-
- ◆ Torx bit set -V.A.G 1766-
- ◆ Ratchet insert 1/4" -VAS 6234-
- ◆ Spring type clip pliers - VAS 5024 A-

V.A.G 1783 	V.A.G 1766 
VAS 6234 	VAS 5024 A 
	G15-10015

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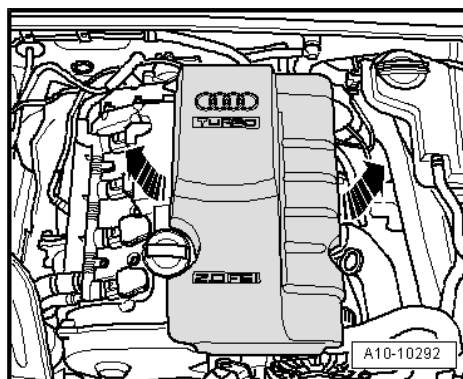
Removing



Note

Always renew seals and gaskets.

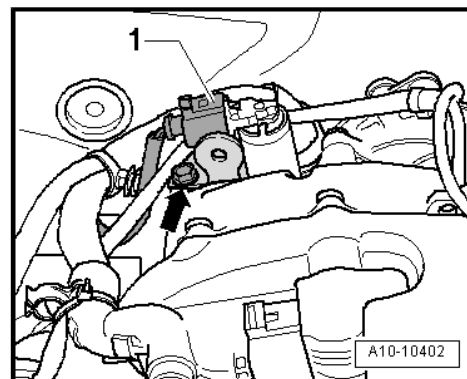
- Pull off engine cover panel -arrows-.



- Unplug electrical connector -1-.
- Detach bracket for wiring harness -arrow-.

**Note**

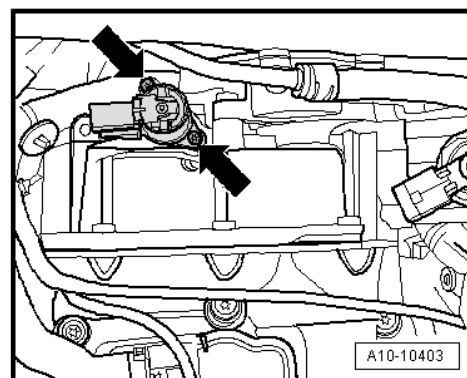
Do not pull on electrical connector when removing camshaft control valve 1 -N205-.



- Remove bolts -arrows- and take camshaft control valve 1 -N205- out of housing.

Installing**Note**

- ◆ *Make sure the camshaft control valve 1 -N205- and the housing are free from any kind of dirt.*
- ◆ *Do not remove camshaft control valve 1 -N205- from packaging until you are ready to install it.*

**Caution**

- ◆ *Do not expose the camshaft control valve 1 -N205- to shock impacts.*

- Lubricate the seal with engine oil.
- Carefully fit camshaft control valve 1 -N205- into housing and press in by hand as far as the stop (exert pressure in line with axis of valve).
- Screw in and tighten bolts using torque wrench -V.A.G 1783- and ratchet insert 1/4" -VAS 6234- and Torx bit T20 and bit holder from Torx bit set -V.A.G 1766-.

Further assembly is basically carried out in reverse order of dismantling.

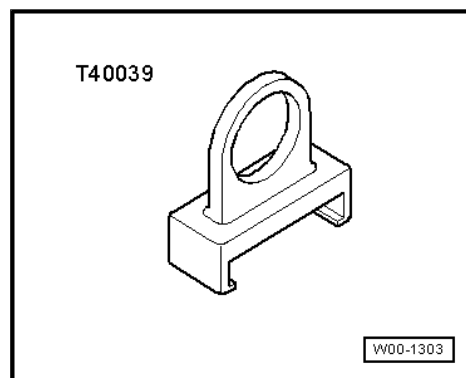
Tightening torque

Component	Nm
Camshaft control valve 1 -N205-	4

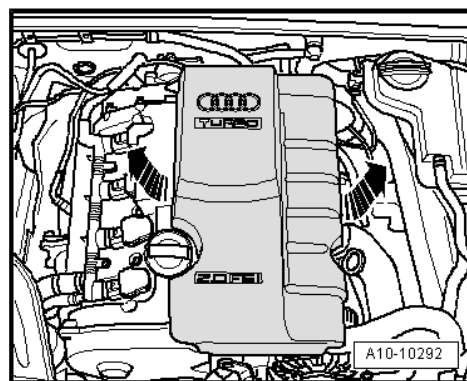
2.3 Removing and installing cylinder head cover

Removing**Special tools and workshop equipment required**

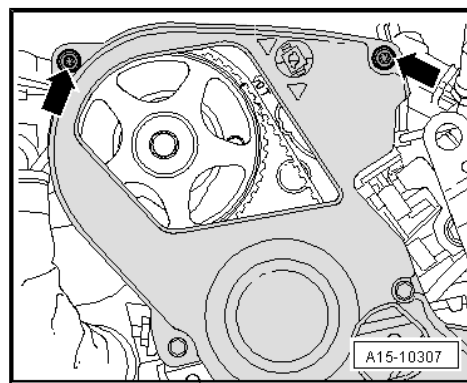
◆ Puller -T40039-



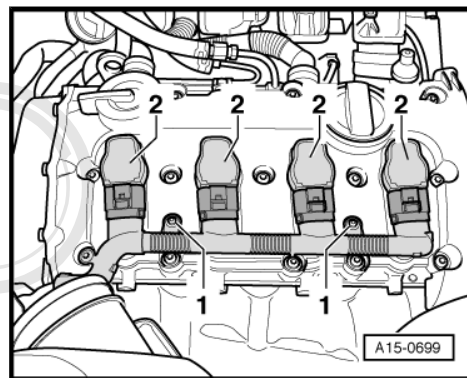
- Pull off engine cover panel -arrows-.



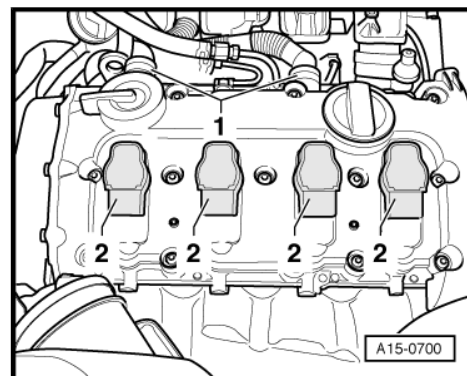
- Unscrew bolts -arrows-.



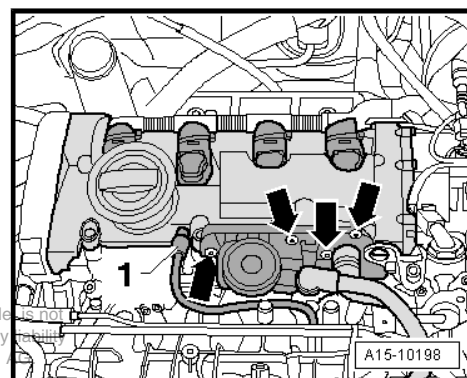
- Remove bolts -1-.
- Unplug electrical connectors -2- from ignition coils and move wiring clear.



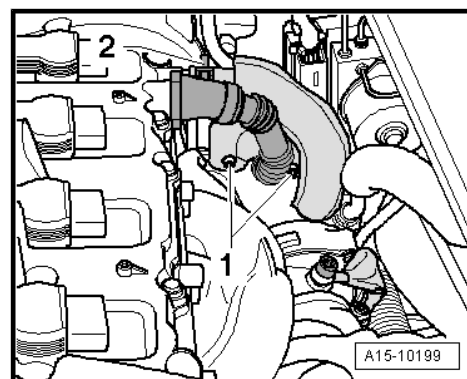
- Remove ignition coils with output stages -2- using puller - T40039- .



- Disconnect ACF pipe from cylinder head cover -1-.
- Detach valve housing from cylinder head cover -arrows-.



- Unscrew crankcase breather line from turbocharger -1-.
- Disconnect ACF line going to turbocharger from cylinder head cover -2-.
- Loosen cylinder head cover working from outside to inside.
- Remove cylinder head cover.



Installing

Installation is carried out in the reverse order; note the following:



Note

Renew cylinder head cover gaskets if damaged.

- Tightening sequence for cylinder head cover ⇒ [page 68](#)
- Make sure toothed belt cover (top) is correctly fitted.

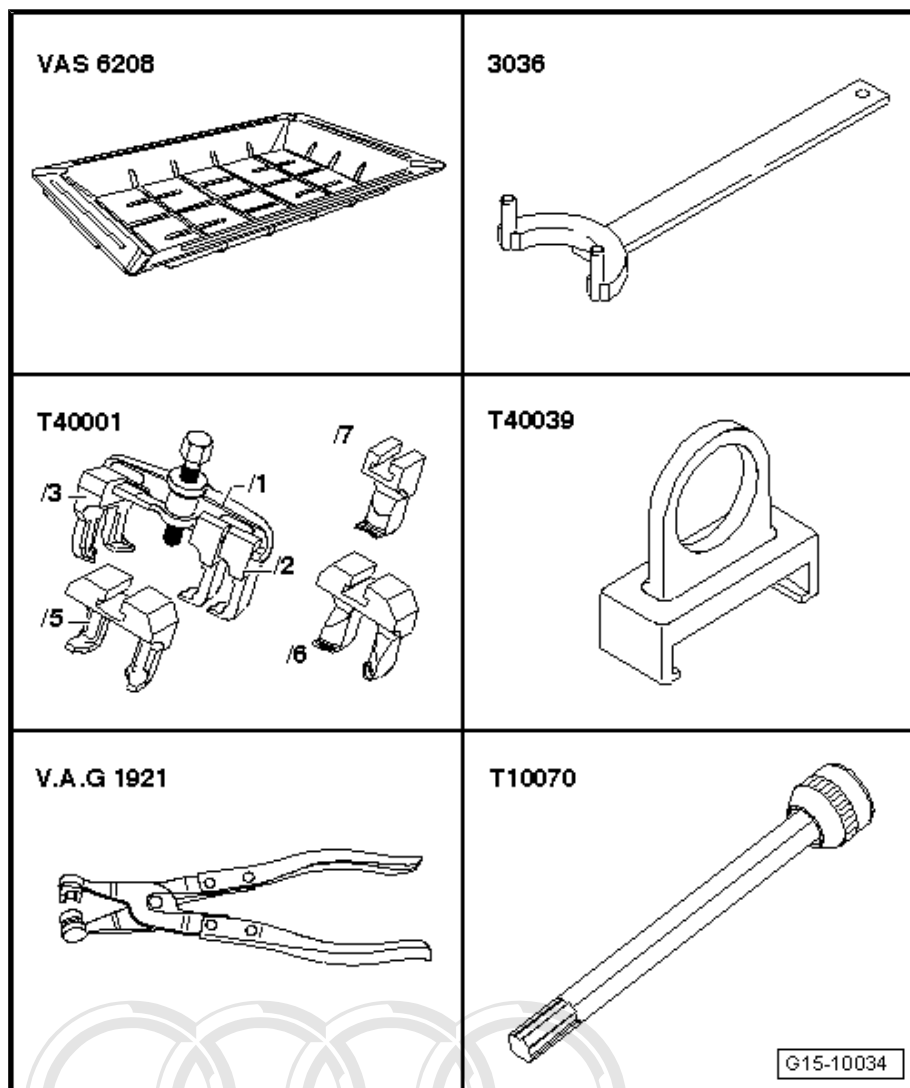
Tightening torques

Component	Nm
Cylinder head cover to cylinder head	10
Toothed belt cover to cylinder block	10 ¹⁾
• ¹⁾ Apply locking fluid when fitting	

2.4 Removing and installing cylinder head

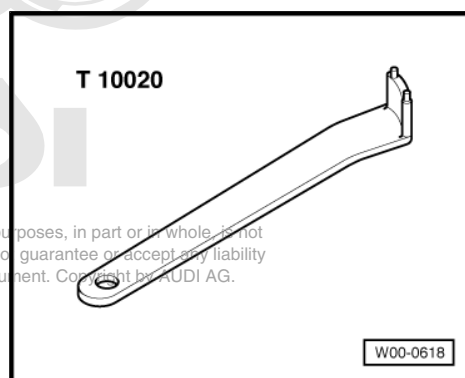
Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist -VAS 6208-
- ◆ Counterhold tool -3036-
- ◆ Two-arm puller -T40001-
- ◆ Puller -T40039-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Special wrench (Polydrive) -T10070-



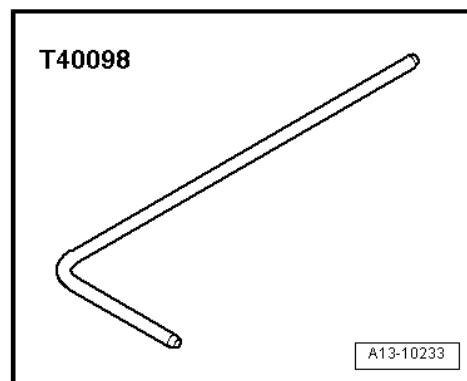
Special tools and workshop equipment required

- ◆ Pin wrench -T10020-



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◆ Locking pin -T40098-



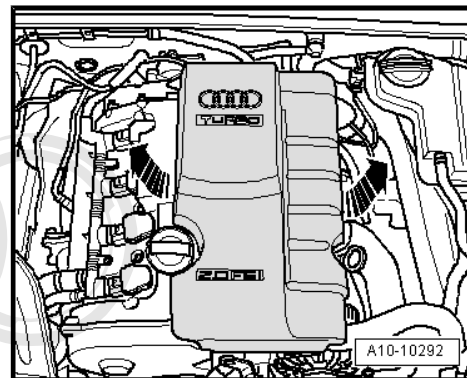
Removing

- Engine in vehicle.

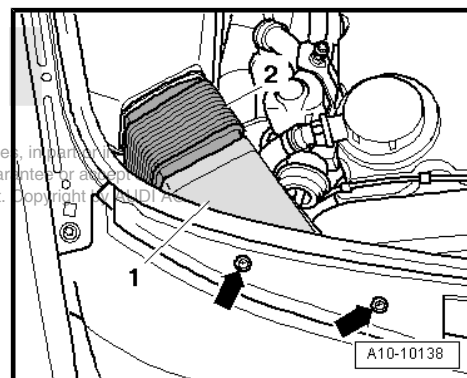


Note

- ◆ *All cable ties which are released or cut open when removing must be refitted in the same position when installing.*
- ◆ *If engine oil is contaminated, change the oil ⇒ Maintenance ; Booklet 4F .*
- ◆ *Before applying sealant, check information: ⇒ Parts catalogue .*
- Obtain code on vehicles with coded radio / radio and navigation system (RNS).
- Pull off engine cover panel -arrows-.

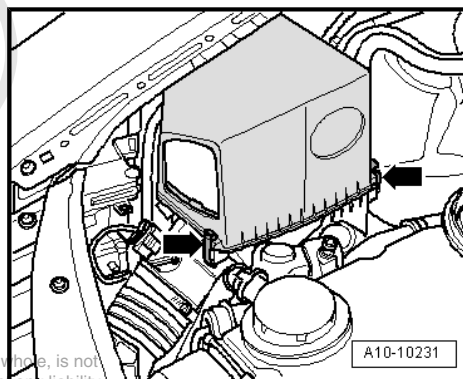


- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.

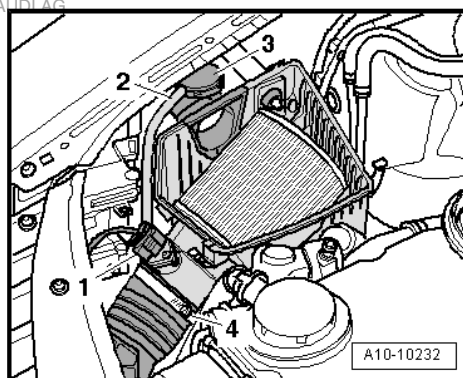


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- Release two retaining clips -arrows- and detach top section of air cleaner housing.



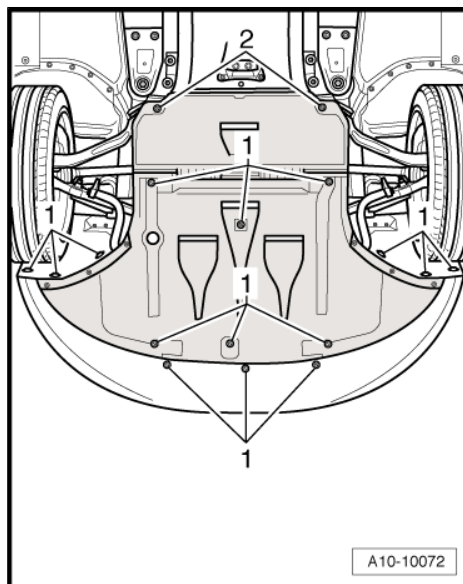
- Unplug electrical connector -1- at air mass meter -G70- .
- Loosen hose clip -4- to remove air intake hose.
- Disconnect vacuum hose -2- (if fitted).
- Lift vacuum unit -3- (if fitted) with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.


WARNING

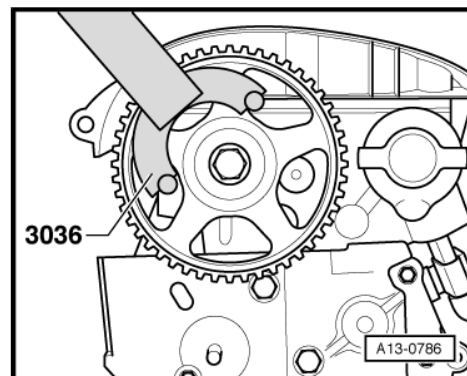
Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

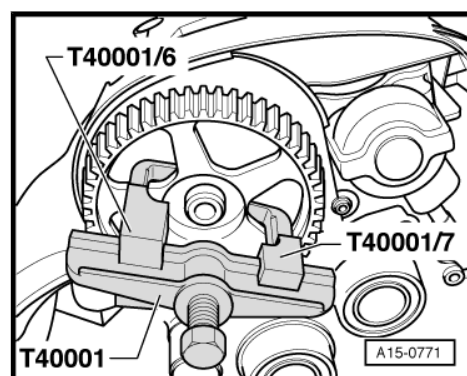
- Open filler cap on coolant expansion tank.
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .
- Remove toothed belt ⇒ [page 61](#) .



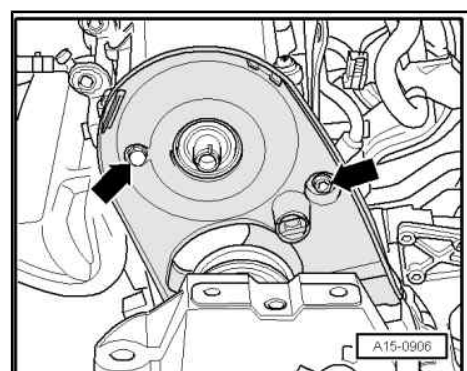
- Loosen camshaft sprocket bolt using counterhold -3036- .



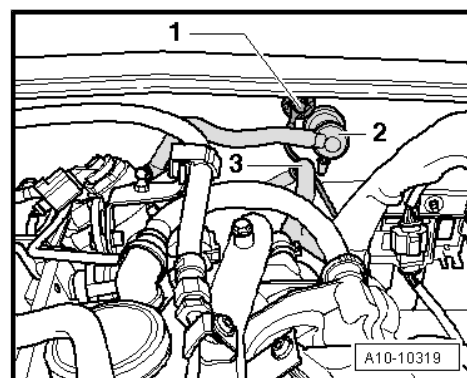
- Pull off camshaft sprocket using two-arm puller -T40001- with claw -T40001/6- and claw -T40001/7- .



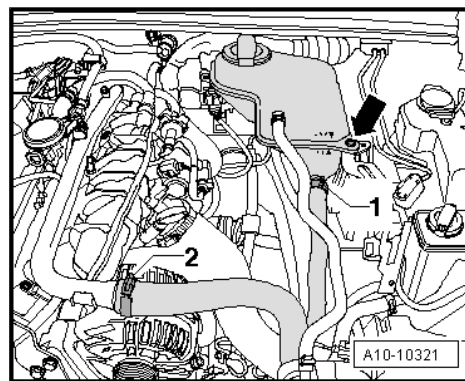
- Unbolt toothed belt cover (rear) from cylinder head -arrows-.



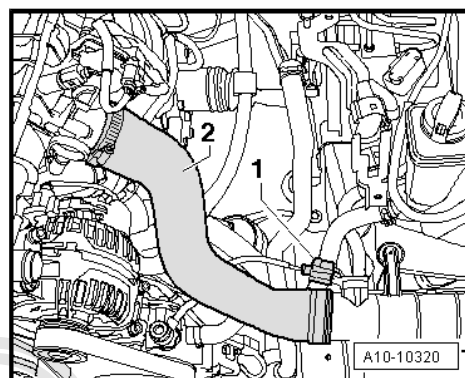
- Unscrew earth cable -1-.
- Disconnect vacuum hose going to brake servo at bulkhead -2-.
- Disconnect ACF hose -3-.



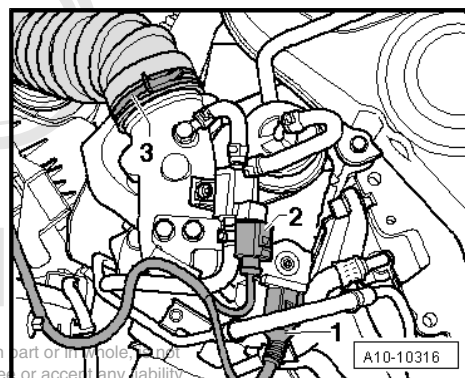
- Disconnect coolant hoses -1 and 2- and detach coolant expansion tank -arrow-.
- Unplug electrical connector for coolant shortage indicator switch -F66- at bottom of coolant expansion tank.



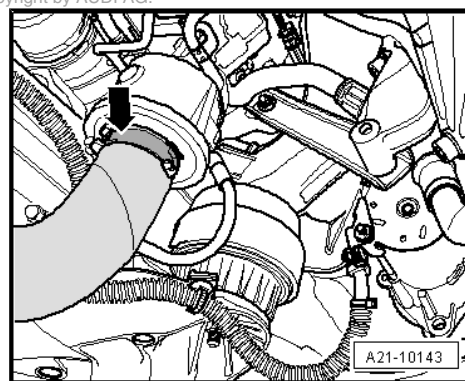
- Unplug electrical connector from charge pressure sender - G31- -1-.
- Remove charge air hose -2-.



- Detach electrical connectors -1 and 2- and move wire clear.

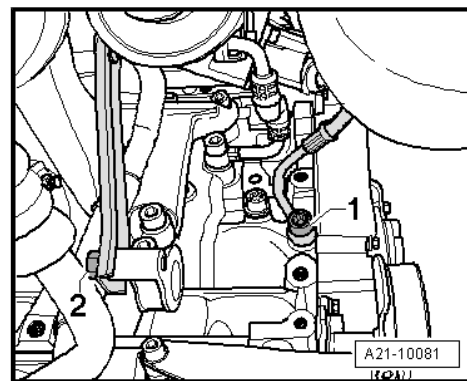


- Release hose clip -arrow- and disconnect air intake hose at turbocharger.

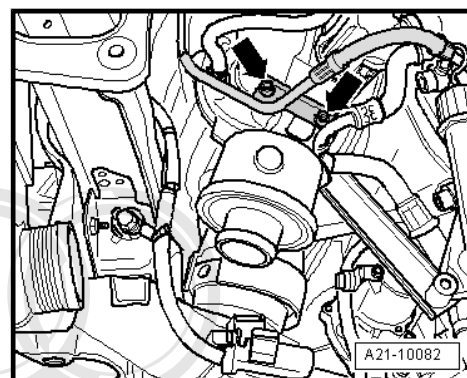


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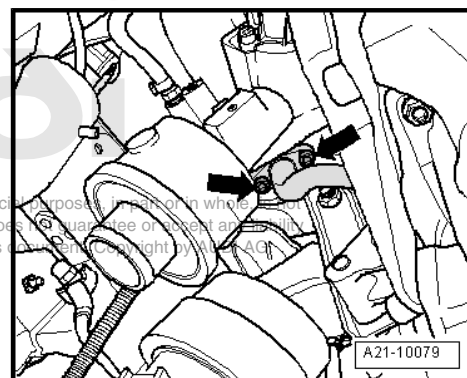
- Unscrew oil supply line for turbocharger at cylinder block -1-.
- Unscrew bolt -2- of support for turbocharger.



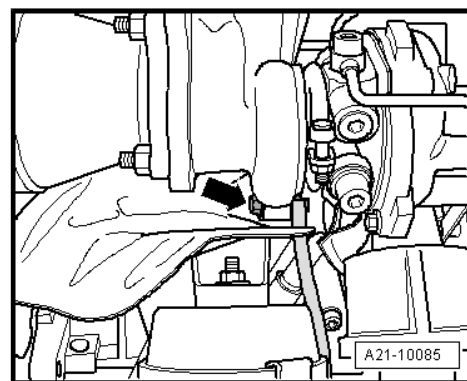
- Remove oil supply line for turbocharger -arrows-.



- Remove oil return line -arrows- at turbocharger.



- Loosen bolt -arrow- of support for turbocharger 2 turns.
- Remove intake manifold ⇒ Motronic direct injection and ignition system (4-cylinder); Rep. Gr. 24; Servicing injection system .
- Remove catalytic converter ⇒ [page 186](#) .
- Remove cylinder head cover ⇒ [page 71](#) .



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- Loosen cylinder head bolts, keeping to sequence shown.



Note

Check that all hoses, pipes and wiring connections between engine, gearbox and body have been detached.

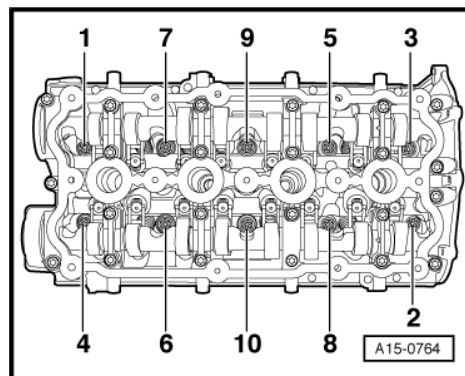
- Remove cylinder head.

Installing cylinder head



Note

- ◆ *Renew the cylinder head bolts.*
- ◆ *On assembly, renew oil seals and gaskets as well as self-locking nuts and bolts that are tightened by turning through to a specified angle.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- ◆ *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.*
- ◆ *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.*
- ◆ *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.*
- ◆ *For high-temperature paste refer to ⇒ Parts catalogue*



WARNING

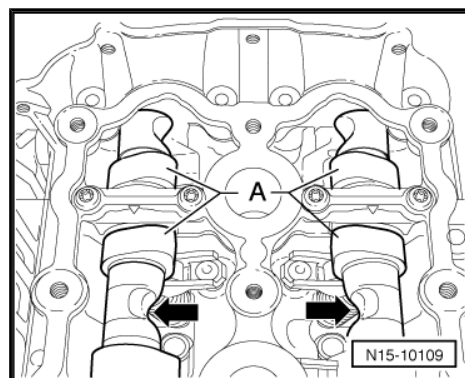
The engine must only be turned at the crankshaft, in the direction of normal engine rotation (clockwise).



Note

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

- Align mark on camshaft sprocket with mark on toothed belt cover. The indentations -arrows- face each other.
- If crankshaft has been rotated: set No. 1 cylinder piston to top dead centre and then turn crankshaft back slightly.

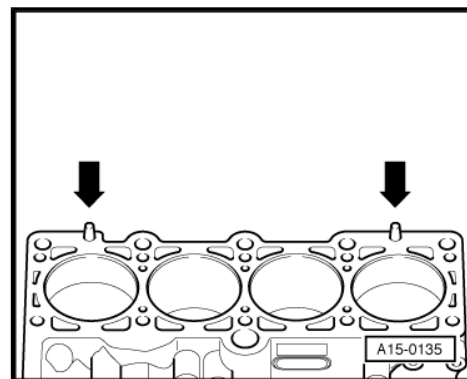


- Place cylinder head gasket in position.
- ◆ Note position of centring pins in cylinder block -arrows-.
- ◆ Note installation position of cylinder head gasket. Part No. should be legible from inlet side.
- Fit cylinder head.
- Insert and hand-tighten cylinder head bolts.
- Tighten bolts for cylinder head ⇒ [page 69](#) .

**Note**

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

- Install cylinder head cover ⇒ [page 73](#) .
- Install toothed belt ⇒ [page 61](#) .
- Install poly V-belt ⇒ [page 32](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Install intake manifold ⇒ Motronic direct injection and ignition system (4-cylinder); Rep. Gr. 24; Servicing injection system .
- Connect battery ⇒ Electrical system; Rep. Gr. 27
- Bleed fuel system ⇒ Motronic direct injection and ignition system (4-cylinder); Rep. Gr. 24; Servicing fuel injection system .
- Check oil level.
- Fill cooling system with fresh coolant ⇒ [page 138](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .

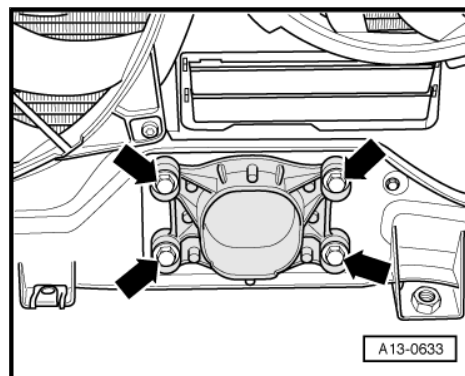


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- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .


WARNING

Never use battery charging equipment for boost starting. There is danger of damaging the vehicle's control units.


Tightening torques

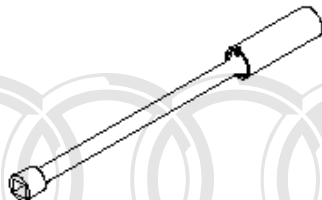
Component		Nm
Bolts/nuts	M6	10
	M8	23
Except for the following:		
Front exhaust pipe to turbocharger		30 ¹⁾³⁾
Cylinder head cover to cylinder head		10
Toothed belt cover to cylinder block		10 ²⁾
Stop for torque reaction support		28
Battery cable clamp to battery terminal		6
• ¹⁾ Renew bolt/nut • ²⁾ Install using locking fluid ⇒ Parts catalogue • ³⁾ Coat exhaust manifold studs and Lambda probe threads with high-temperature paste; for high-temperature paste refer to ⇒ Parts catalogue		

3 Checking compression

Special tools and workshop equipment required

- ◆ Compression tester -V.A.G 1763-
- ◆ Spark plug socket and extension -3122 B-
- ◆ Puller -T40039-
- ◆ Spring type clip pliers -VAS 5024 A-

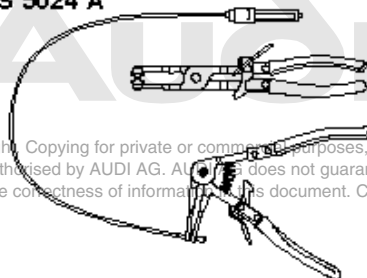
3122 B



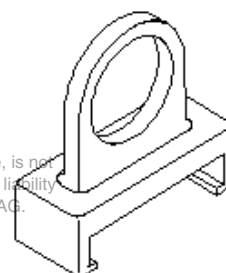
V.A.G 1763



VAS 5024 A



T40039



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G15-10002

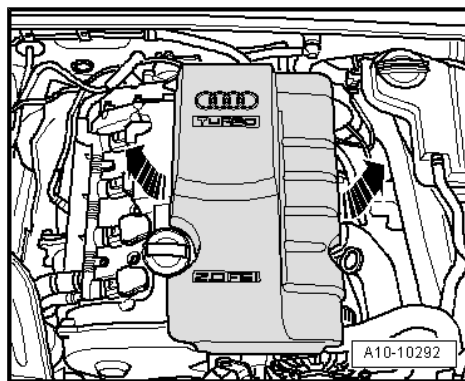
Test sequence



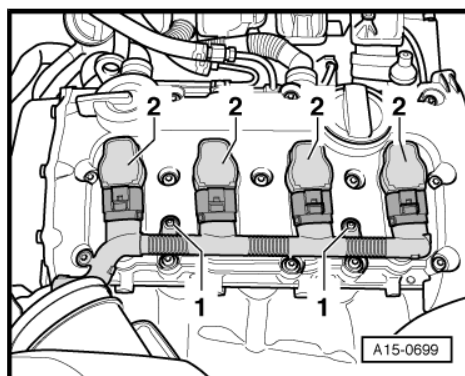
Note

- ◆ Engine oil temperature at least 30 °C
- ◆ Battery voltage at least 12.7 V

- Pull off engine cover panel -arrows-.



- Remove bolts -1-.
- Unplug electrical connectors -2- from ignition coils and move wiring clear.



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- Remove ignition coils with output stages -2- using special tool -T40039- .
- Remove spark plugs with spark plug socket -3122 B- .
- Unplug 8-pin connector for injectors ⇒ Rep. gr. 24 .
- Check compression pressure with compression tester -V.A.G 1763- and adapter -V.A.G 1763/6- .

**Note**

Using the compression tester ⇒ Operating instructions .

- Operate starter until pressure reading on tester no longer rises.

Compression pressure:

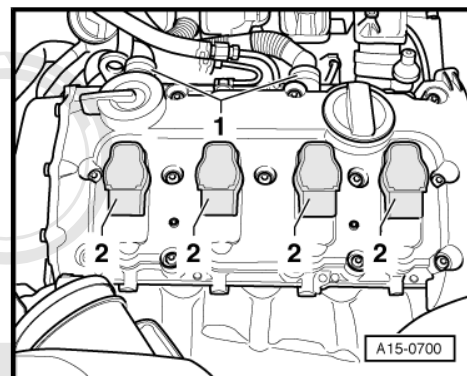
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New pressure in bar	Wear limit in bar	Permissible difference between cylinders in bar
11.0 ... 14.0	7.0	3.0 (maximum)

- Install spark plugs ⇒ Maintenance ; Booklet 803 .
- Install ignition coils ⇒ Rep. gr. 28 .
- Read out fault memory of engine control unit ⇒ vehicle diagnostic, testing and information system VAS 5051 in the function "Guided Fault Finding" .

**Note**

Faults will have been stored in the memory because connectors have been unplugged. Interrogate and, if necessary, erase fault memory after completing the check.



4 Valve gear



Note

- ◆ *Cylinder head and retaining frame must be renewed together.*
- ◆ *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 to ensure that none of the valves make contact when the starter is operated.*
- ◆ *Always fit new seals and gaskets.*

4.1 Valve gear - exploded view

1 - 50 Nm + 180°

- ☐ Renew

2 - Camshaft sprocket

3 - Oil seal

- ☐ Renewing ⇒ [page 103](#)

4 - Cylinder head

5 - Valve guide

- ☐ Checking ⇒ [page 102](#)

6 - Valve stem oil seal

- ☐ Renewing with cylinder head installed
⇒ [page 94](#)
- ☐ Renewing with cylinder head removed
⇒ [page 98](#)

7 - Valve spring

8 - Upper valve spring plate

9 - Cotters

10 - Hydraulic valve clearance compensation element

- ☐ Do not interchange
- ☐ Lubricate contact surface

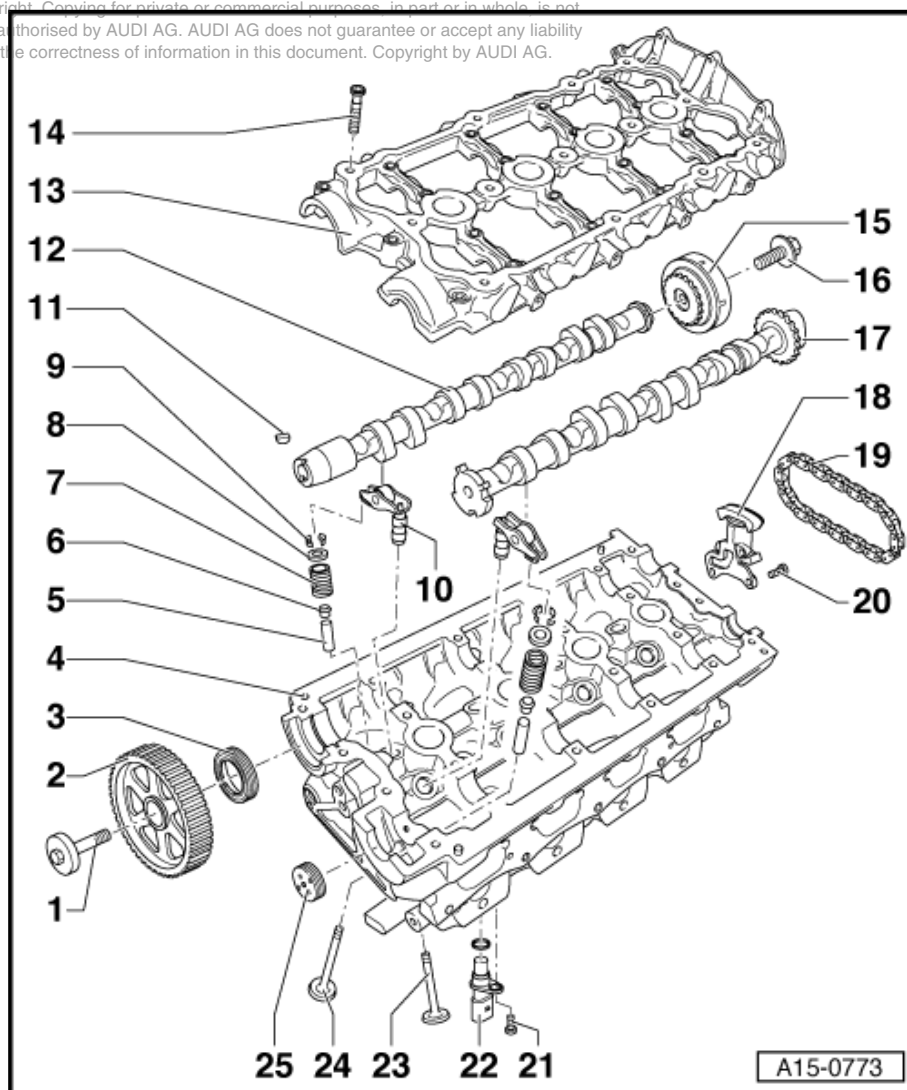
11 - Parallel key

- ☐ Check for firm attachment

12 - Exhaust camshaft

- ☐ Check radial clearance with Plastigage (rocker

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fingers not installed).
Wear limit: 0.1 mm

- ☐ Runout: max. 0.035 mm

13 - Retaining frame

- ☐ With integrated camshaft bearings
- ☐ Clean sealing surface; machining not permitted
- ☐ Remove old sealant residues

14 - Bolt

- ☐ Renew
- ☐ Tightening sequence [⇒ page 88](#)

15 - Camshaft adjuster

16 - 20 Nm + turn 45° further

- ☐ Renew

17 - Inlet camshaft

- ☐ Check radial clearance with Plastigage (rocker fingers not installed). Wear limit: 0.1 mm
- ☐ Runout: max. 0.035 mm

18 - Chain tensioner

- ☐ Remove [⇒ page 88](#) Removing and installing camshaft adjuster
- ☐ Before removing, lock in place using locking pin -T10115-

19 - Drive chain

- ☐ Check for wear

20 - 10 Nm

21 - 10 Nm

22 - Phase sensor

23 - Exhaust valve

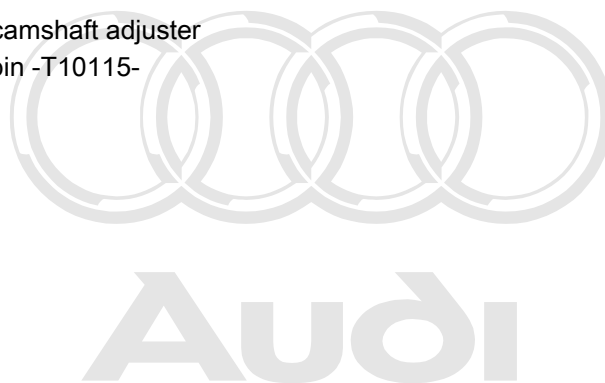
- ☐ Do not machine, only grinding-in is permitted
- ☐ Valve dimensions [⇒ page 88](#)
- ☐ Checking valve guides [⇒ page 102](#)

24 - Inlet valve

- ☐ Do not machine, only grinding-in is permitted
- ☐ Valve dimensions [⇒ page 88](#)
- ☐ Checking valve guides [⇒ page 102](#)

25 - Sealing cap

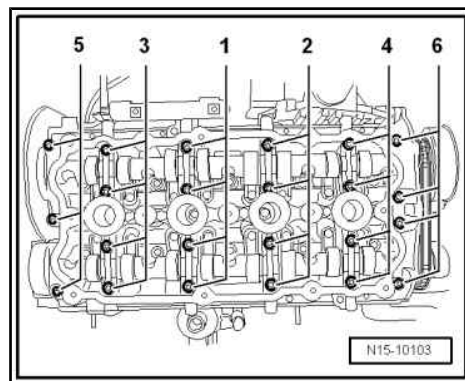
- ☐ Renew
- ☐ Removing sealing cap with retaining frame installed: pierce on one side with an awl and pry out
- ☐ Installing: press in 1 ... 2 mm deep without sealant using thrust piece -3334-



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Tightening sequence for retaining frame

- Renew bolts.
- Tighten bolts in the sequence -1 ... 6- in 3 stages as follows:
 1. Tighten bolts hand tight.
 - The retaining frame should make contact with the cylinder head over the full surface.
 2. Tighten bolts to 8 Nm.
 3. Turn bolts 90° further.



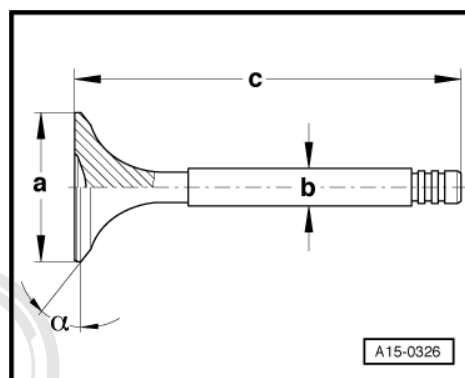
Valve dimensions



Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
Ø a	mm	33.85 ± 0.10	28.0 ± 0.1
Ø b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	104.0 ± 0.2	101.9 ± 0.2
α	°	45	45

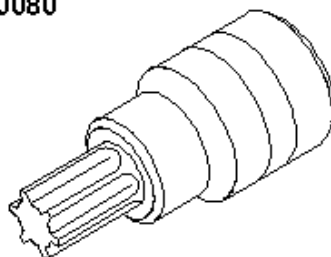
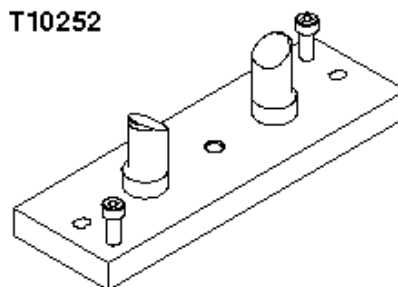
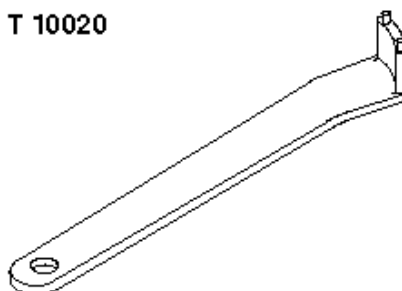


4.2 Removing and installing camshaft adjuster

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Special tools and workshop equipment required

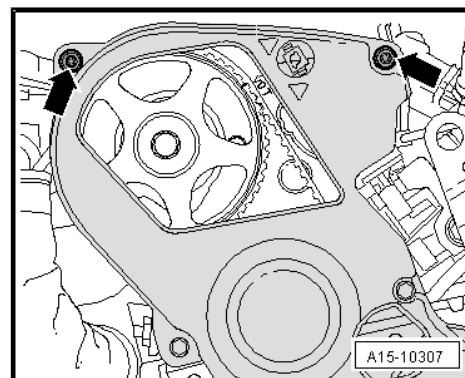
- ◆ Special wrench, long reach -T40080-
- ◆ Camshaft clamp -T10252-
- ◆ Pin wrench -T10020-
- ◆ Locking pin -T10115-

T40080**T10252****T 10020****T10115**

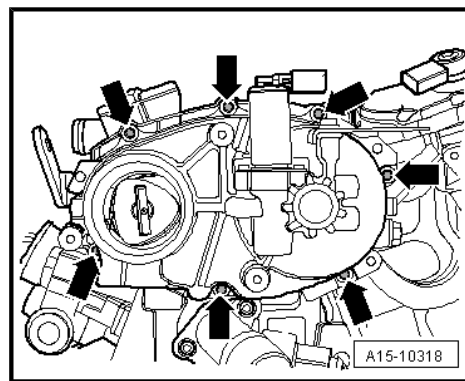
G15-10004

Removing

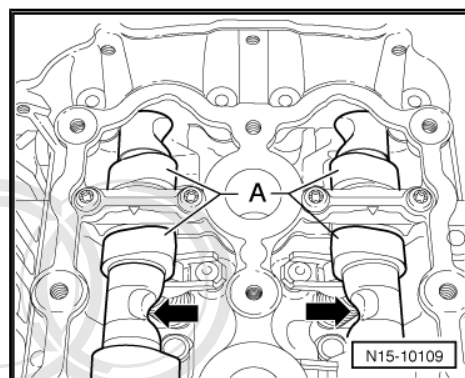
- Remove high-pressure pump ⇒ Rep. gr. 24 .
- Remove bolts -arrows-.
- Remove cylinder head cover ⇒ [page 71](#) .
- Remove vacuum pump.



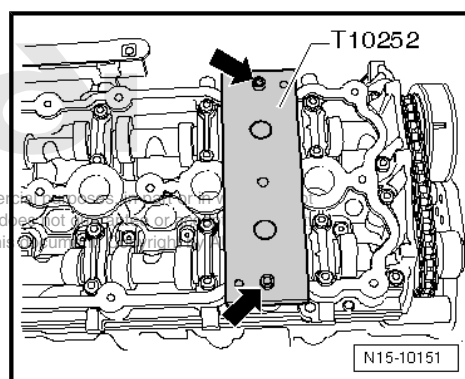
- Remove housing for camshaft adjuster -arrows-.



- Align mark on camshaft sprocket with mark on toothed belt cover. The indentations -arrows- face each other.



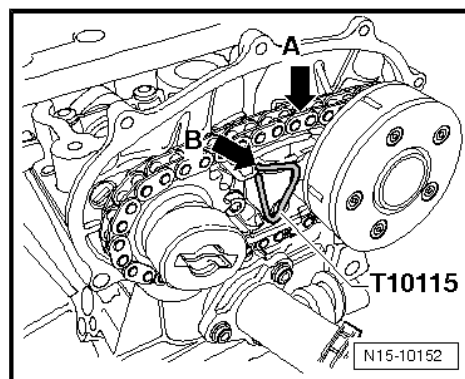
- Fit camshaft clamp -T10252- as shown and secure -arrows-.
- Loosen securing bolt from camshaft adjuster using special wrench -T40080- .



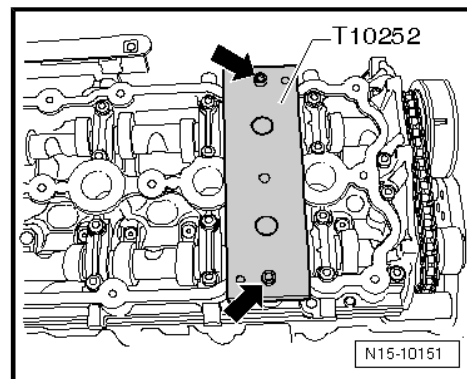
- Compress chain tensioner -arrow A- and lock with locking pin -T10115- -arrow B-.
- Remove securing bolt from camshaft adjuster and remove camshaft adjuster together with chain.

Installing

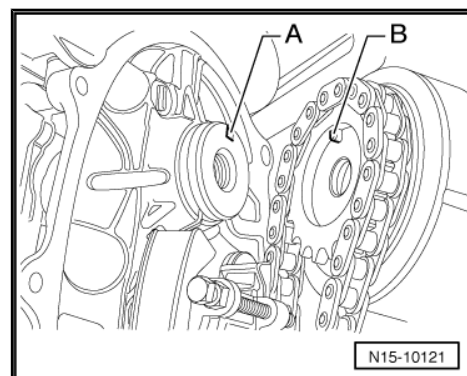
- Tightening torques
 - ⇒ „4.1 Valve gear - exploded view“, page 86
 - ⇒ „2.1 Cylinder head - exploded view“, page 67



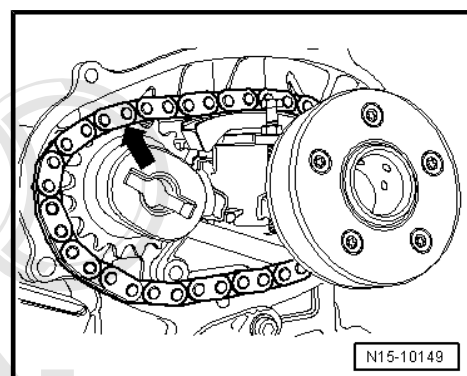
- The camshafts must be secured with camshaft clamp - T10252- .
- Fit chain onto camshaft adjuster.



- Hold camshaft adjuster in front of exhaust camshaft so that notch -A- is aligned with pin -B-.



- Lay chain over inlet camshaft sprocket starting at top -arrow- without changing its position.



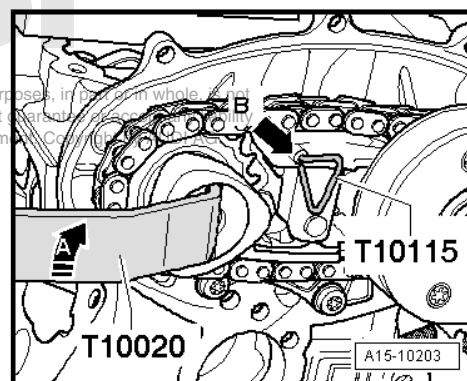
- Turn inlet camshaft slowly in direction of arrow -A- using pin wrench -T10020- until camshaft adjuster fits onto camshaft.



Note

If it is not possible to fit the pin into the notch: remove chain and fit chain again.

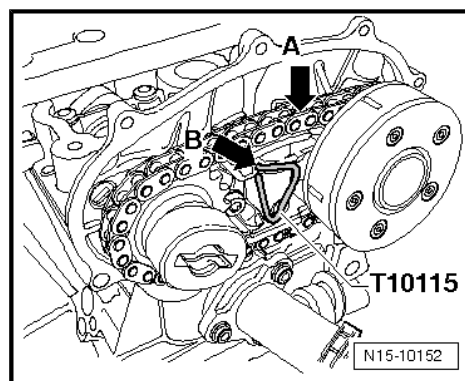
- Renew securing bolt for camshaft adjuster.
- Tighten securing bolt for camshaft adjuster. Use special wrench -T40080- for this purpose.



- Remove locking pin -T10115- -arrow B-.

Further assembly is basically carried out in reverse order of dismantling.

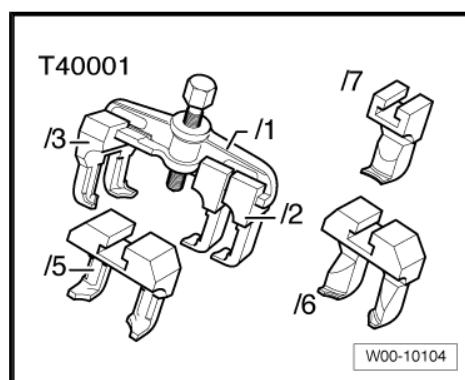
- Install intake manifold ⇒ Rep. gr. 24 .
- Install high-pressure pump ⇒ Rep. gr. 24 .
- Install vacuum pump ⇒ Rep. gr. 47 .



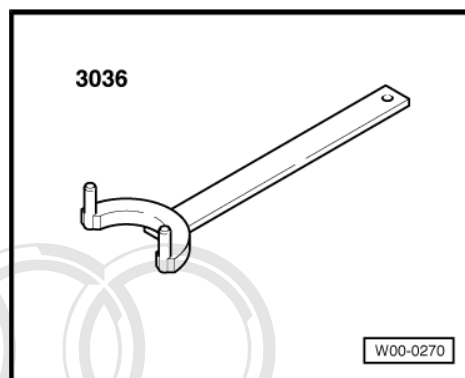
4.3 Removing and installing camshafts

Special tools and workshop equipment required

- ◆ Two-arm puller -T40001-



- ◆ Counterhold tool -3036-



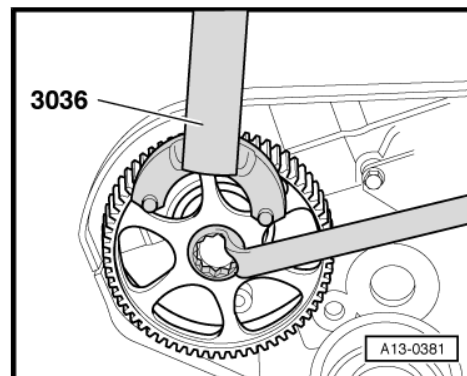
Removing



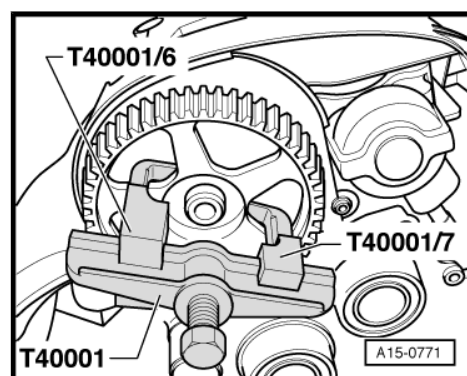
Note

- ◆ *Sealing surfaces at bottom of retaining frame and top of cylinder head may not be machined.*
- ◆ *The camshaft bearings are integrated into the cylinder head and retaining frame. **Toothed belt must be slackened before removing retaining frame.***
- ◆ *Renew camshaft oil seal and sealing cap if retaining frame has been unfastened.*
- Remove cylinder head cover ⇒ [page 71](#) .
- Remove camshaft adjuster ⇒ [page 88](#) .
- Remove toothed belt ⇒ [page 61](#) .

- Loosen camshaft sprocket using counterhold -3036- .



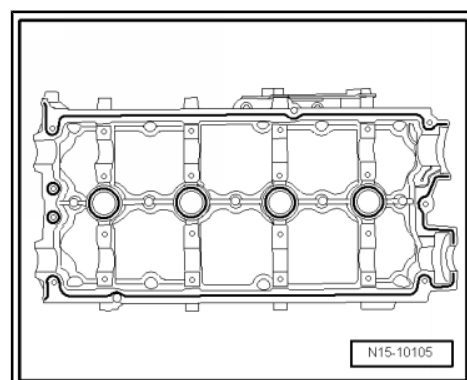
- Use puller -T40001- , claw -T40001/6- and claw -T40001/7- to pull off camshaft sprocket.
- Detach toothed belt cover (rear) from cylinder head.
- Loosen retaining frame bolts evenly working from outside inwards and remove retaining frame.
- Carefully lift out the camshafts and place them down on a clean surface.



- Remove old sealant from groove in retaining frame and from sealing surfaces.
- Make sure dirt and remnants of sealant do not drop into cylinder head.

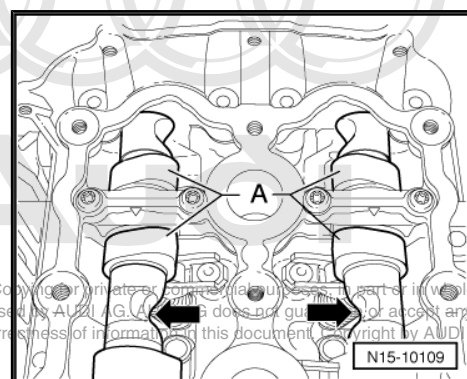
Installing

- Tightening torques
 - ⇒ „4.1 Valve gear - exploded view“, page 86
 - ⇒ „2.1 Cylinder head - exploded view“, page 67



Note

- ◆ The sealing surfaces must be free of oil and grease.
- ◆ Pistons must not be at TDC.
- ◆ Ensure that all roller rocker fingers contact the valve ends correctly.
- Lubricate running surfaces of the camshafts with oil.
- Insert camshafts carefully in the camshaft bearings of cylinder head. Cams -A- of cylinder 4 must face each other.
- Apply an even, slightly projecting sealant bead into the clean groove of the retaining frame.



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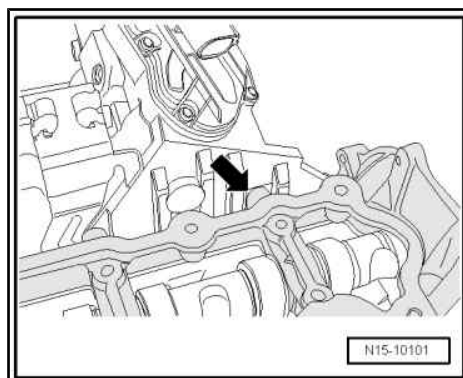
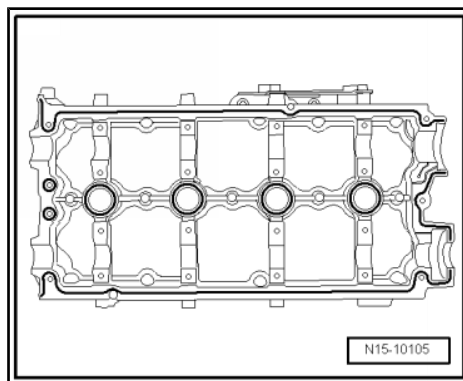
For sealant refer to ⇒ Parts catalogue .



Note

- ◆ Do not apply the sealant thicker than prescribed.
- ◆ No time should be allowed to elapse when fitting and securing retaining frame, as sealant starts to harden as soon as sealing surfaces make contact.
- ◆ Note the use-by date of the sealant.

- Fit retaining frame so that it goes past the exhaust gas recirculation valve -N18- -arrow-.
- Tighten bolts securing retaining frame; tightening sequence ⇒ [page 88](#) .
- Drive in cap ⇒ [Item 25 \(page 87\)](#) approx. 1 ... 2 mm deep using thrust piece -3334- .
- Install camshaft oil seal ⇒ [page 103](#) .
- Install toothed belt cover (rear).
- Insert parallel key into camshaft.



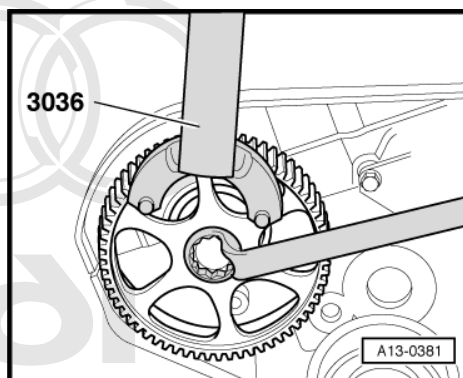
- Install camshaft sprocket. To tighten bolt, hold camshaft sprocket in position using counterhold tool -3036- .



Note

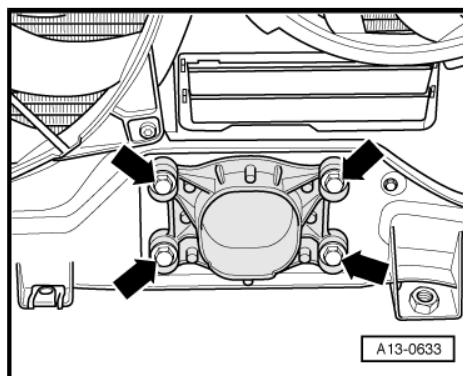
- ◆ When turning the camshaft, the pistons must not be at TDC. This could otherwise result in damage to valves and pistons.
- ◆ Make sure parallel key is correctly seated.

- Install toothed belt ⇒ [page 61](#) .
- Install camshaft adjuster ⇒ [page 88](#) .
- Install cylinder head cover ⇒ [page 71](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .



- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 405 .

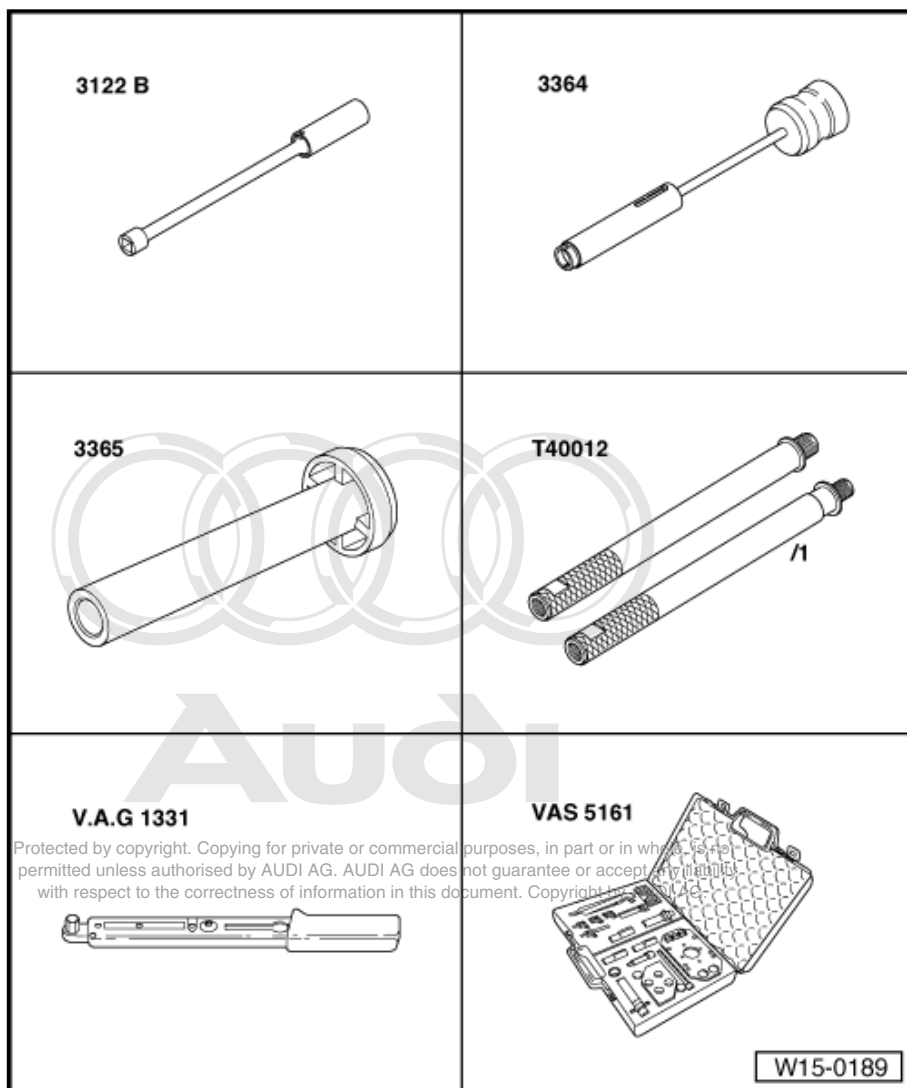
Further assembly is basically carried out in reverse order of dismantling.



4.4 Renewing valve stem oil seals with cylinder head installed

Special tools and workshop equipment required

- ◆ Spark plug socket and extension -3122 B-
- ◆ Valve stem seal puller -3364-
- ◆ Valve stem seal fitting tool -3365-
- ◆ Adapters -T40012-
- ◆ Torque wrench -V.A.G 1331-
- ◆ Removal and installation device -VAS 5161-
- ◆ Guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B-



Removing valve stem oil seals

- Remove camshafts ⇒ [page 92](#) .

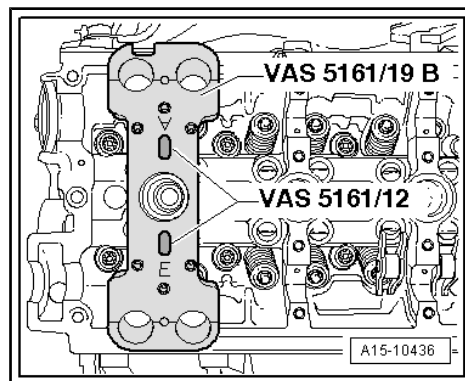


Note

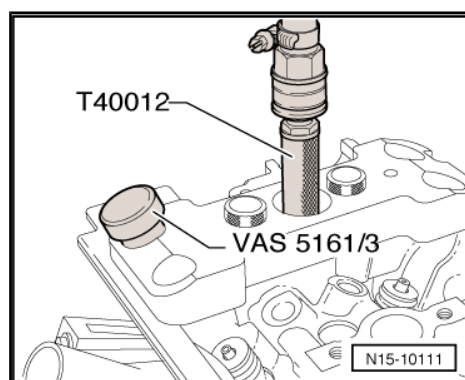
In order to renew the valve stem oil seals of exhaust valves of cylinder 3 and cylinder 4, the exhaust gas recirculation valve - N18- must also be removed.

- Remove roller rocker fingers and place onto a clean surface. When doing so, make sure that roller rocker fingers are not interchanged.
- Remove spark plugs with spark plug socket -3122 B- .

- Secure guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- to cylinder head with knurled screws -VAS 5161/12- as shown.
- Set piston of appropriate cylinder to „bottom dead centre“.

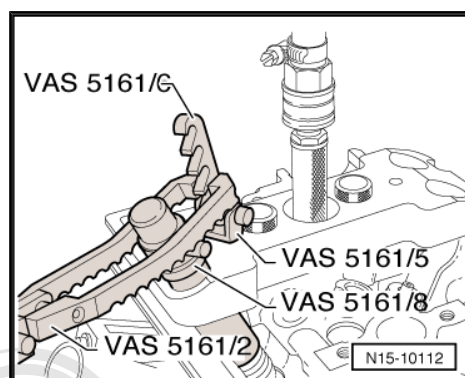


- Screw adapter -T40012- into spark plug thread.
- Connect to compressed air supply of at least 6 bar.
- Knock loose sticking valve cotters using punch -VAS 5161/3- and a plastic-headed hammer.



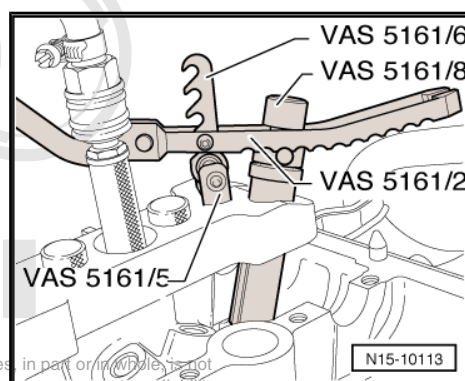
For inlet side

- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into centre thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- .
- Insert assembly cartridge -VAS 5161/8- into guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- .
- Engage pressure fork -VAS 5161/2- on snap-in device -VAS 5161/6- .



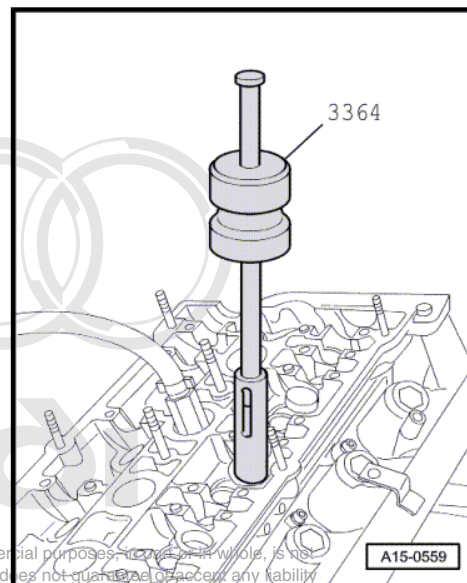
For exhaust side

- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into outer thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- .
- Press down assembly cartridge -VAS 5161/8- and at the same time, turn knurled screw of assembly cartridge -VAS 5161/8- clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork -VAS 5161/2- .
- Take out assembly cartridge -VAS 5161/8- .

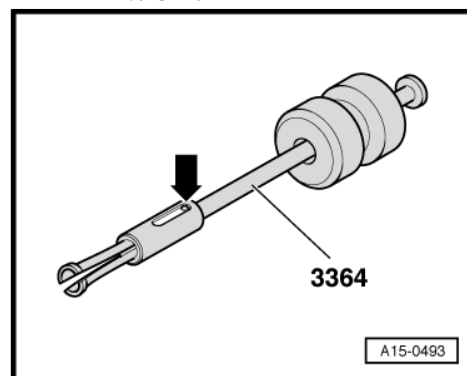


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- Pull off valve stem oil seal with valve stem seal puller -3364- .

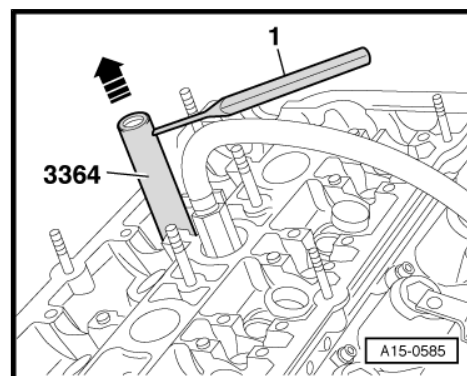


- If valve stem seal puller -3364- cannot be used on account of restricted space, knock out pin -arrow- with a punch and remove the impact extractor attachment.

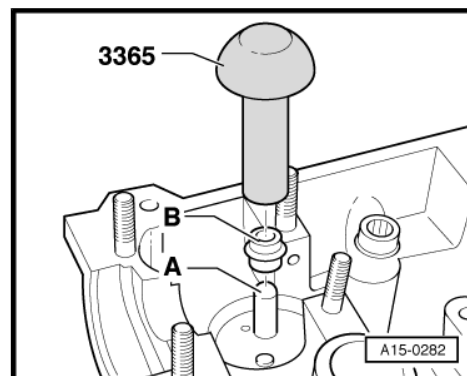


- Position lower part of valve stem seal puller -3364- on valve stem oil seal.
- Insert a punch -1- through hole in lower section of puller.
- Apply assembly lever to puller and pull out valve stem oil seal -arrow-.

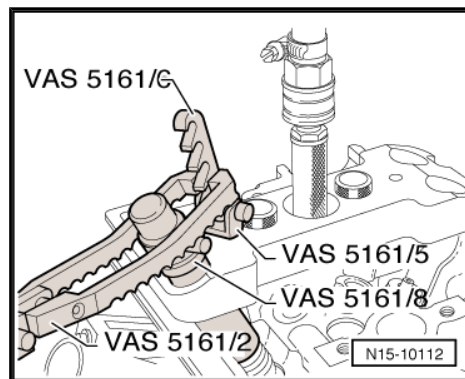
Installing valve stem oil seals



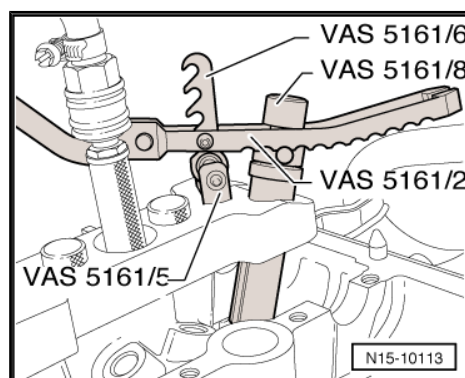
- To prevent damage to the new valve stem seals -B-, attach plastic sleeve -A- to valve stem.
- Lubricate sealing lip of valve stem oil seal -B-, place it in the valve stem seal fitting tool -3365- and push carefully onto valve guide.
- Remove plastic sleeve -A-.
- Insert valve spring and valve spring plate.
- Set up removal and installation device for valve cotters -VAS 5161- as shown.



Inlet side



Exhaust side

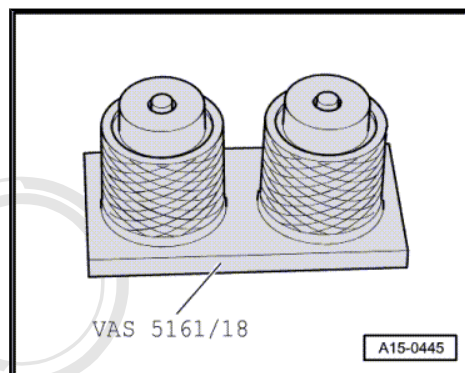


Note

- ◆ If valve cotters have been removed from assembly cartridge, they need to be put into insertion device -VAS 5161/18- first.
- ◆ Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.
- Use pressure fork -VAS 5161/8- to press down assembly cartridge -VAS 5161/2- , then turn knurled screw of assembly cartridge back and forth while pulling upwards.
- Release pressure fork -VAS 5161/2- with knurled screw in pulled position.
- Detach removal and installation device for valve cotters -VAS 5161- .

The remaining installation steps are carried out in the reverse sequence. Note the following points:

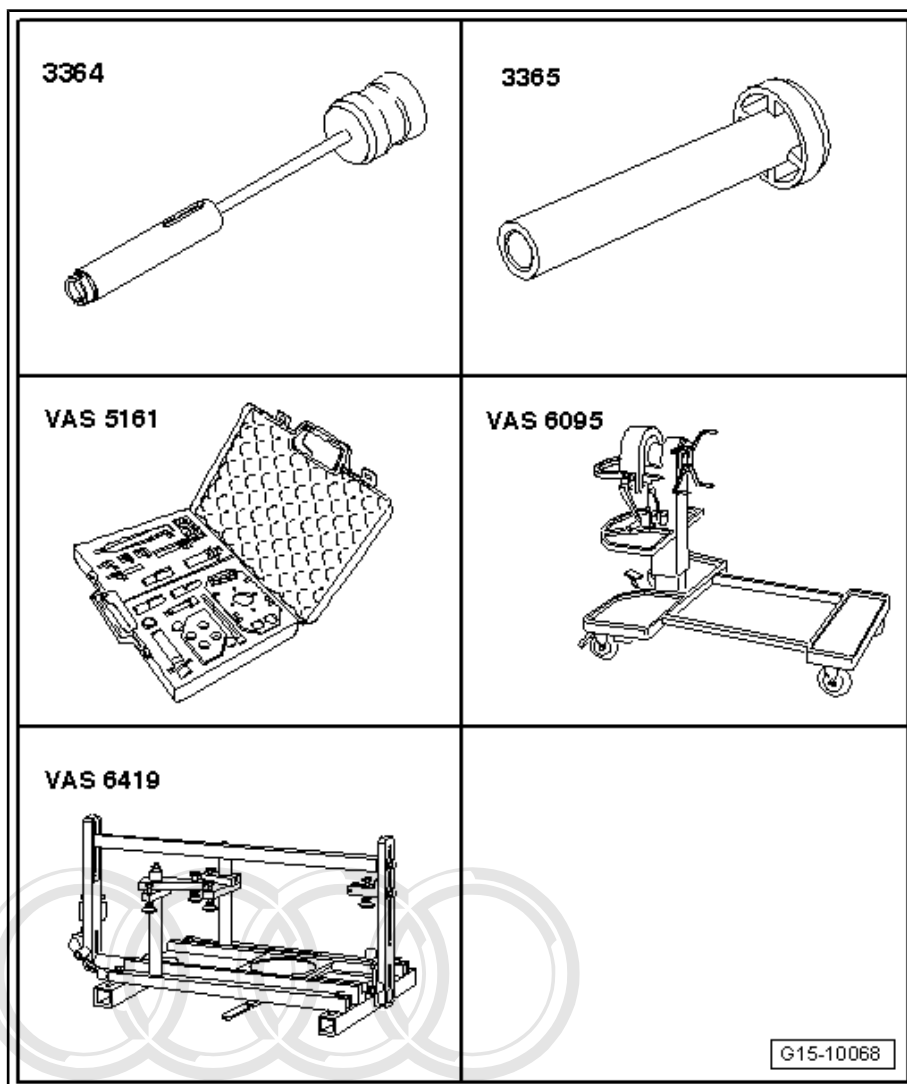
- Install camshafts ⇒ [page 92](#).



4.5 Renewing valve stem oil seals with cylinder head removed

Special tools and workshop equipment required

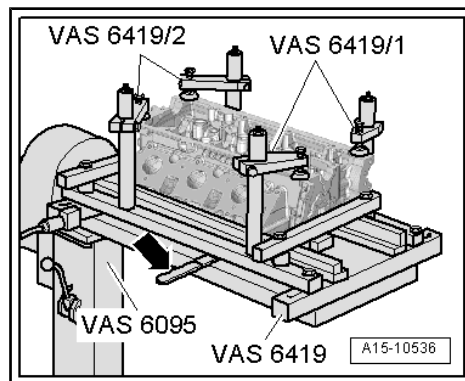
- ◆ Valve stem seal puller -3364-
- ◆ Valve stem seal fitting tool -3365-
- ◆ Removal and installation device for valve cotters -VAS 5161-
- ◆ Guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B-
- ◆ Engine and gearbox support -VAS 6095-
- ◆ Cylinder head tensioning device -VAS 6419-



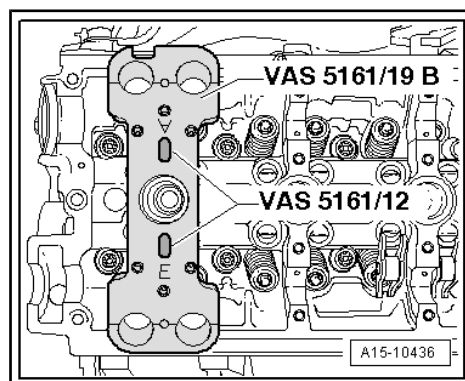
Procedure

- Remove camshafts ⇒ [page 92](#) .
- Mark original positions of roller rocker fingers and hydraulic compensation elements for reinstallation.
- Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
- Insert cylinder head tensioning device -VAS 6419- into engine and gearbox support -VAS 6095- .
- Secure cylinder head in cylinder head tensioning device, as shown in illustration.
- Connect cylinder head tensioning device to compressed air.

- Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.

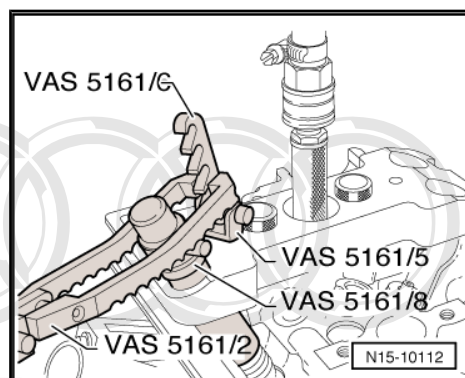


- Secure guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- to cylinder head with knurled screws -VAS 5161/12- as shown.
- Set piston of appropriate cylinder to „bottom dead centre“.
- Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



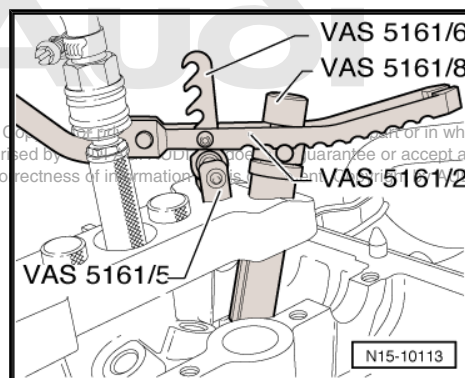
For inlet side

- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into centre thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- .
- Insert assembly cartridge -VAS 5161/8- into guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- .
- Engage pressure fork -VAS 5161/2- on snap-in device -VAS 5161/6- .



For exhaust side

- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into outer thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine -VAS 5161/19B- .
- Press down assembly cartridge -VAS 5161/8- and at the same time, turn knurled screw of assembly cartridge -VAS 5161/8- clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork -VAS 5161/2- .
- Take out assembly cartridge -VAS 5161/8- .



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- Pull off valve stem oil seal with valve stem seal puller -3364- .

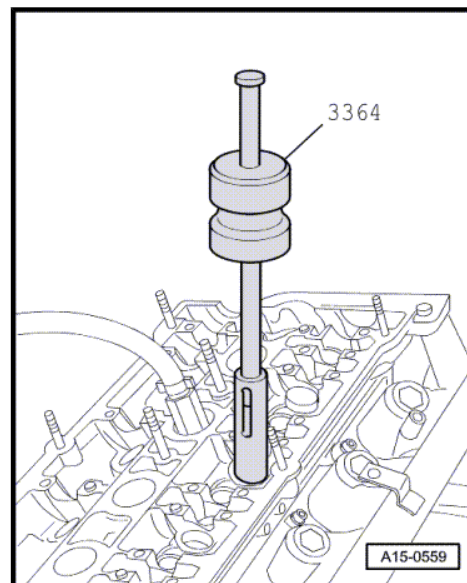
Installing valve stem oil seals



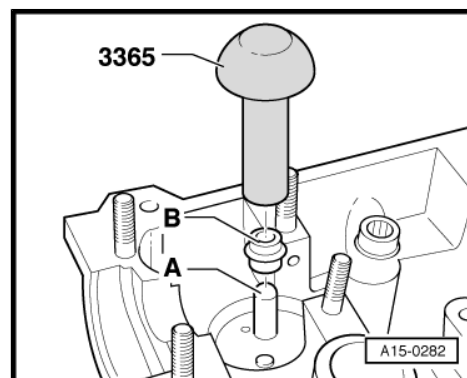
Caution

Make sure valve stem oil seals are not damaged when installing.

- ◆ *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*

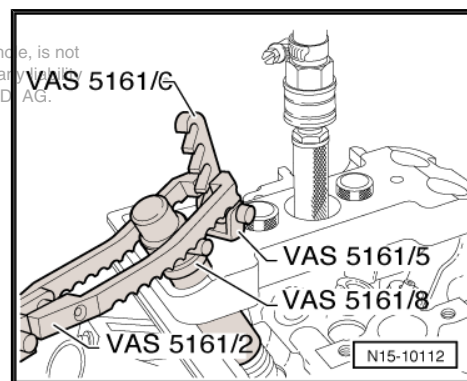


- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool -3365- .
- Take off plastic sleeve.
- Insert valve spring and valve spring plate.
- Set up removal and installation device for valve cotters -VAS 5161- as shown.

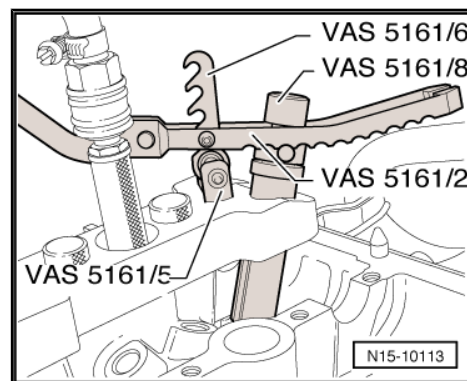


Inlet side

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Exhaust side





Note

- ◆ If valve cotters have been removed from assembly cartridge, they need to be put into insertion device -VAS 5161/18- first.
- ◆ Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.
- Use pressure fork -VAS 5161/8- to press down assembly cartridge -VAS 5161/2- , then turn knurled screw of assembly cartridge back and forth while pulling upwards.
- Release pressure fork -VAS 5161/2- with knurled screw in pulled position.
- Detach removal and installation device for valve cotters -VAS 5161- .

Further assembly is basically carried out in reverse order of dismantling. Note the following:

- Install camshafts ⇒ [page 92](#) .

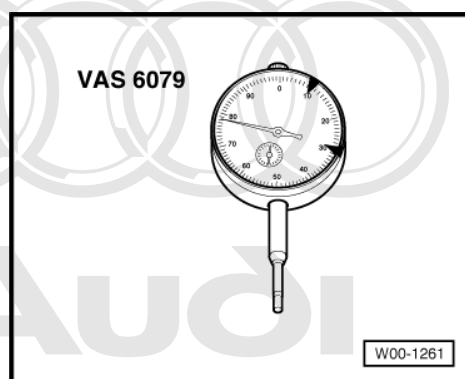
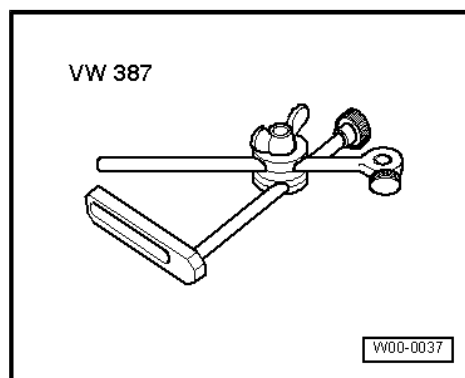
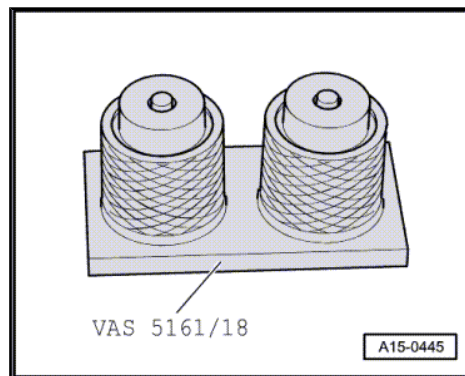
4.6 Checking valve guides

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-

Dial gauge -VAS 6079-

Test sequence



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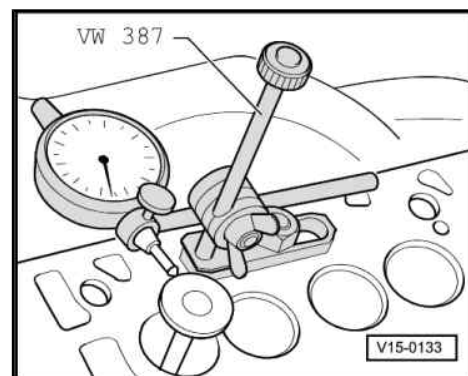
- Insert valve into guide. Valve stem end must be flush with guide. Only insert inlet valve into inlet guide and exhaust valve into exhaust guide, as the stem diameters are different.
- Measure the amount of sideways play.

Wear limit

Inlet valve guide	Exhaust valve guide
0.80 mm	0.80 mm

**Note**

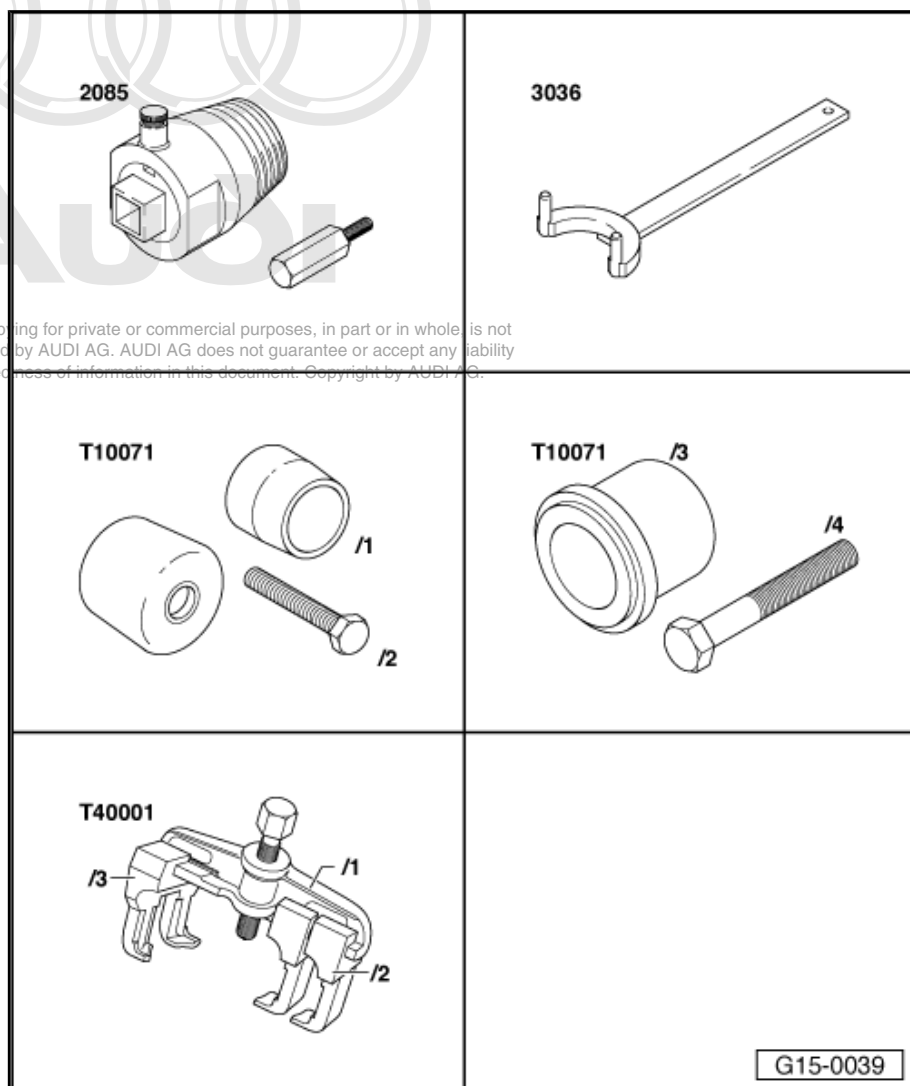
- ◆ If the wear limit is exceeded, repeat the measurement with new valves. Renew valve guide if wear limit is still exceeded.
- ◆ If the valve has to be renewed as part of a repair, use a new valve for the measurement.



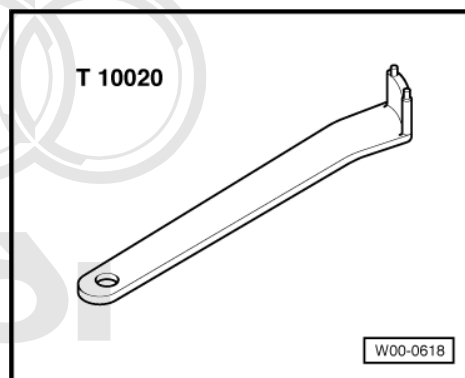
4.7 Renewing exhaust camshaft oil seal

Special tools and workshop equipment required

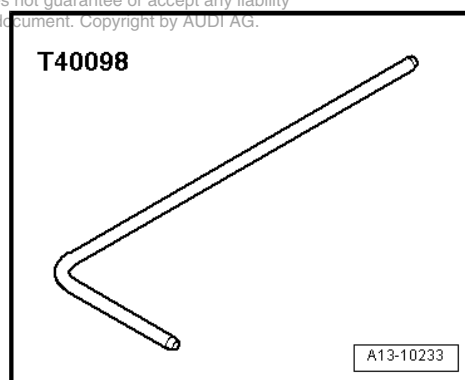
- ◆ Oil seal extractor -2085-
- ◆ Assembly tool -3066-
- ◆ Assembly tool -T10071-
- ◆ Puller -T40001-

**Special tools and workshop equipment required**

◆ Pin wrench -T10020-



◆ Locking pin -T40098-



Removing

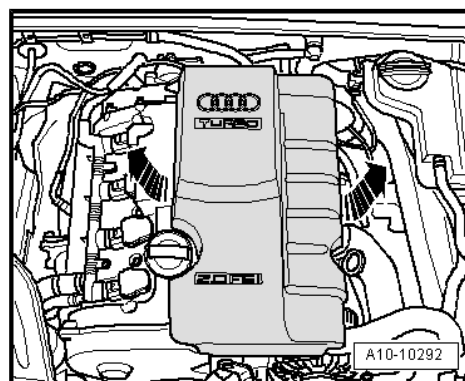
- Pull off engine cover panel -arrows-.



WARNING

Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



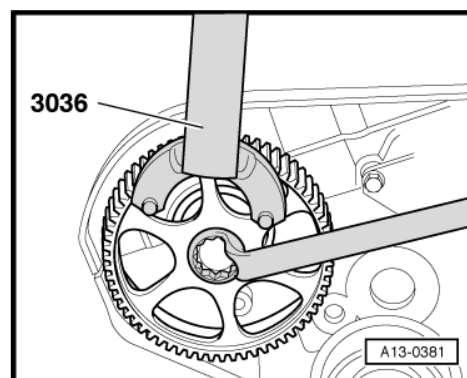
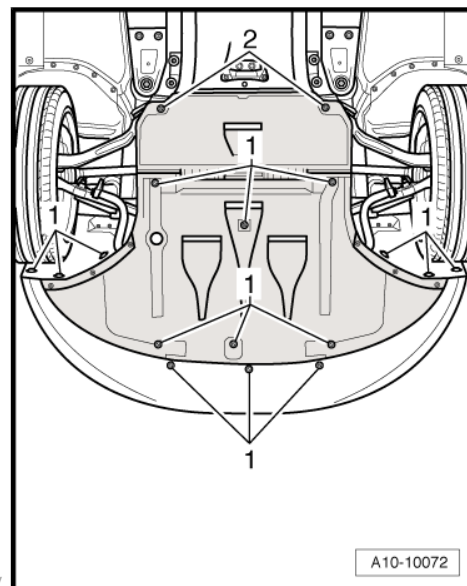
- Open filler cap on coolant expansion tank.

- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .
- Remove toothed belt ⇒ [page 61](#) .

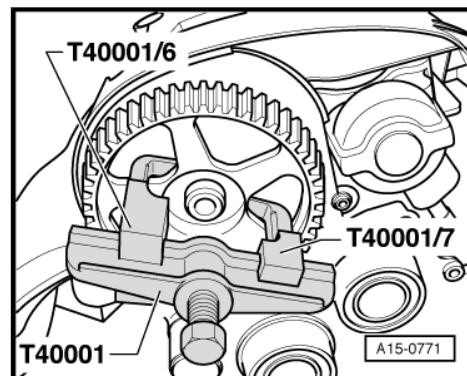


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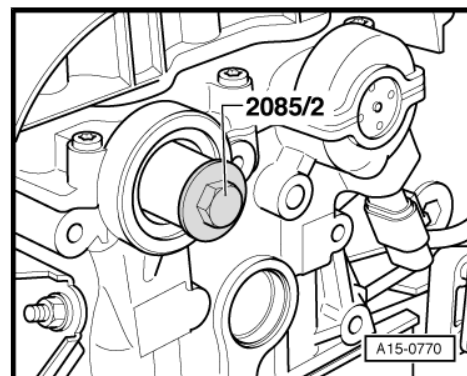
- Loosen camshaft sprocket (apply counterhold tool -3036-).



- Detach the camshaft sprocket using puller -T40001- and claws T40001/6 and T40001/7.



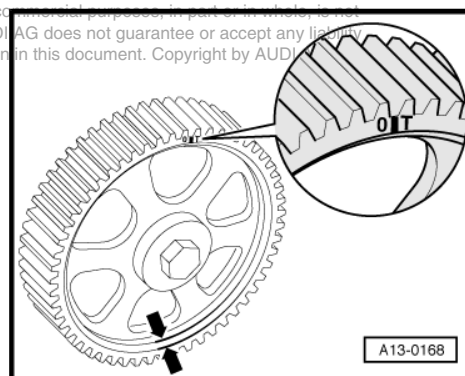
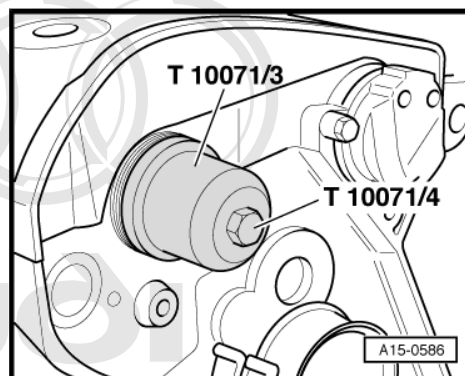
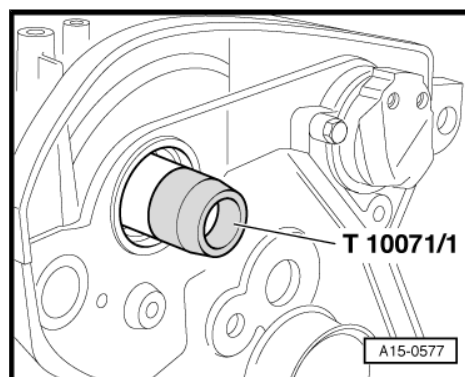
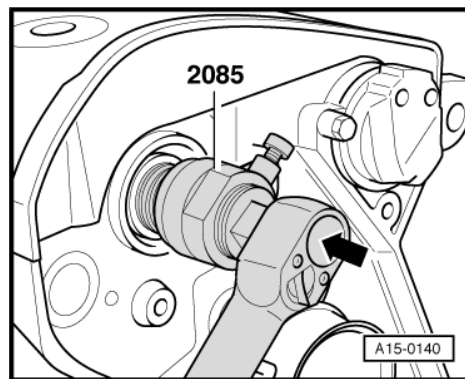
- To guide oil seal extractor, screw special tool 2085/2 from oil seal extractor -2085- by hand into camshaft as far as it will go.
- Unscrew inner part of oil seal extractor -2085- two turns (approx. 3 mm) from the outer part and lock in position with the knurled screw.



- Lubricate threaded head of oil seal extractor -2085- , place it in position and, exerting firm pressure, screw it into oil seal as far as possible.
- Loosen knurled screw and turn inner section against camshaft until oil seal is pulled out.
- Clamp flats of oil seal extractor in vice. Remove oil seal with pliers.

Installing

- Tightening torques
⇒ „4.1 Valve gear - exploded view“, page 86
- Do not lubricate sealing lip of oil seal.
- Fit guide sleeve -T10071/1- from assembly tool -T10071- onto camshaft journal.
- Push oil seal over guide sleeve onto shaft.
- Detach guide sleeve.
- Press in oil seal all the way using guide sleeve -T10071/3- and bolt -T10071/4- from assembly tool -T10071- .
- Install camshaft sprocket.
- ◆ Check installation position: The thinner web of the camshaft sprocket faces outwards -arrows- and the marking for No. 1 cylinder TDC is visible.



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- Fit securing bolt of camshaft sprocket (use counterhold -3036-).

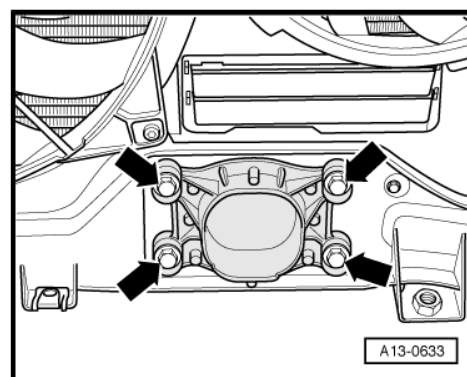
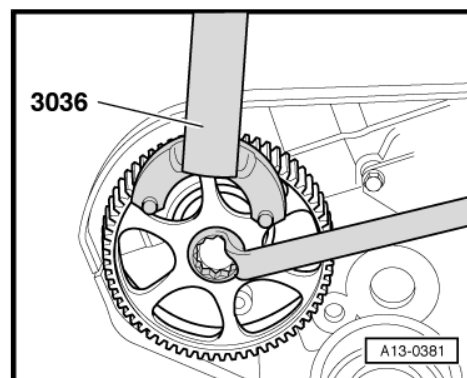
**Note**

If a piston is at TDC the valves could strike the piston when turning the camshaft. Pistons must therefore not be at TDC This could otherwise result in damage to valves and pistons.

- Install toothed belt ⇒ [page 61](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .

Tightening torque

Component	Nm
Camshaft sprocket to camshaft	50 Nm + 180° ¹⁾ 2)
Stop for torque reaction support	28
• ¹⁾ Renew bolt • ²⁾ 180° = half a turn	



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17 – Lubrication

1 Removing and installing parts of lubrication system



If large quantities of metal shavings or other particles are found in the engine oil when repairing the engine (possibly caused by partial seizure of crankshaft and conrod bearings), clean the oil passages thoroughly and renew the oil cooler to prevent further damage occurring later.

Checking oil pressure ⇒ page 126

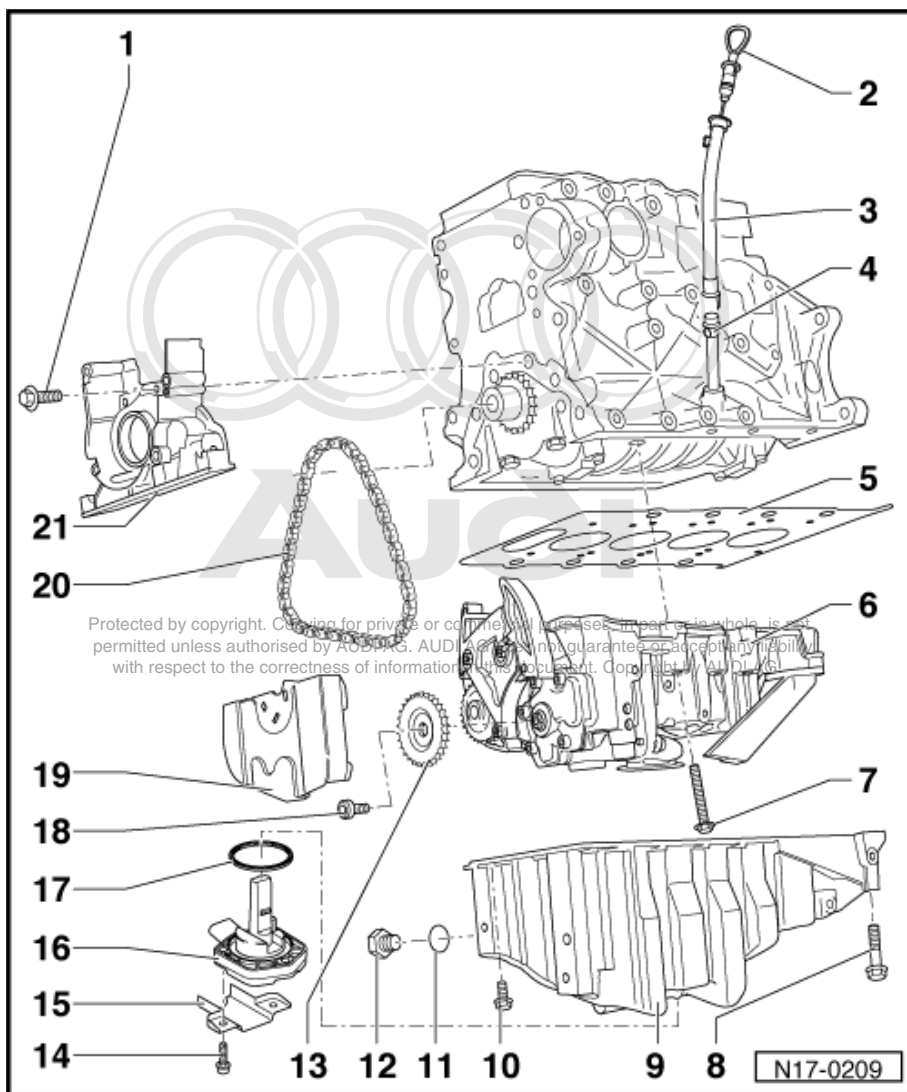
Viscosity grades and oil specifications: ⇒ Maintenance ; Booklet 4F

For oil capacities refer to ⇒ Maintenance tables .

1.1 Part I: Sump - exploded view

Part II: Balance shaft assembly, oil pump ⇒ [page 109](#)

- 1 - 15 Nm
- 2 - Oil dipstick
 - ☐ The oil level must not be above max. mark.
- 3 - Guide
- 4 - Guide tube
- 5 - Spacer plate
- 6 - Balance shaft assembly with oil pump
 - ☐ With pressure relief valve (12 bar)
 - ☐ Removing and installing
⇒ [page 118](#)
- 7 - Bolt
 - ☐ Renew
 - ☐ Note different bolt lengths ⇒ [page 111](#)
 - ☐ Tightening sequence
⇒ [page 111](#)
- 8 - Bolt
 - ☐ Tightening sequence
⇒ [page 109](#)
- 9 - Sump
 - ☐ Clean sealing surface before installing
 - ☐ Removing and installing
⇒ [page 111](#)
- 10 - Bolt
 - ☐ Renew
 - ☐ Tightening sequence



⇒ [page 109](#)

11 - Seal

- ☐ Attached to ⇒ [Item 12 \(page 109\)](#)

12 - Oil drain plug, 30 Nm

- ☐ With attached seal
- ☐ Renew

13 - Chain sprocket

14 - 10 Nm

15 - Protective cap

16 - Oil level and oil temperature sender -G266-

17 - Seal

- ☐ Renew
- ☐ Lubricate before installing

18 - 20 Nm + turn 90° further

- ☐ Renew

19 - Chain guard

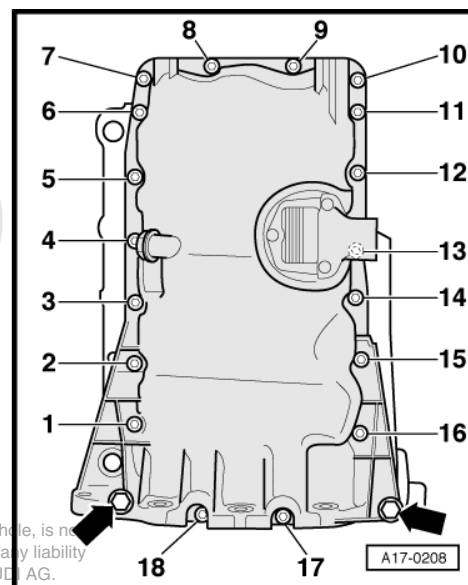
20 - Chain

21 - Sealing flange

- ☐ Must be positioned on dowel sleeves
- ☐ Renewing crankshaft oil seal on pulley end ⇒ [page 39](#)

Tightening sequence for sump

1. Pre-tighten bolts -1 ... 18- to 5 Nm in diagonal sequence.
2. Tighten bolts securing sump to gearbox to 45 Nm.
3. Tighten bolts M10 -arrows- to 40 Nm.
4. Tighten bolts -1 ... 18- to 15 Nm in diagonal sequence.



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1.2 Part II: Balance shaft assembly with oil pump - exploded view

Part I: Sump, balance shaft assembly ⇒ [page 108](#)

1 - Chain guard

2 - Chain

- ☐ Before removing, mark running direction (fitting position) with paint

3 - Dowel sleeve

4 - Spacer plate

5 - Balance shaft assembly with oil pump

- ☐ Before installing, check that the two dowel sleeves for centring oil pump/cylinder block are fitted
- ☐ Removing and installing ⇒ [page 118](#)

6 - 9 Nm

7 - Cover

- ☐ Prevents foam build-up in engine oil

8 - 40 Nm

9 - 8 Nm

10 - Oil intake pipe

- ☐ Clean strainer if dirty

11 - O-ring

- ☐ Renew

12 - Bolt

- ☐ Renew
- ☐ Note different bolt lengths ⇒ [page 111](#)
- ☐ Tightening sequence ⇒ [page 111](#)

13 - Bolt

- ☐ Renew
- ☐ With seal
- ☐ Note different bolt lengths ⇒ [page 111](#)
- ☐ Tightening sequence ⇒ [page 111](#)

14 - Outer rotor

- ☐ Check contact surfaces for scores
- ☐ Marking must be visible

15 - Inner rotor

- ☐ Check contact surfaces for scores

16 - Oil pump cover

17 - Chain sprocket

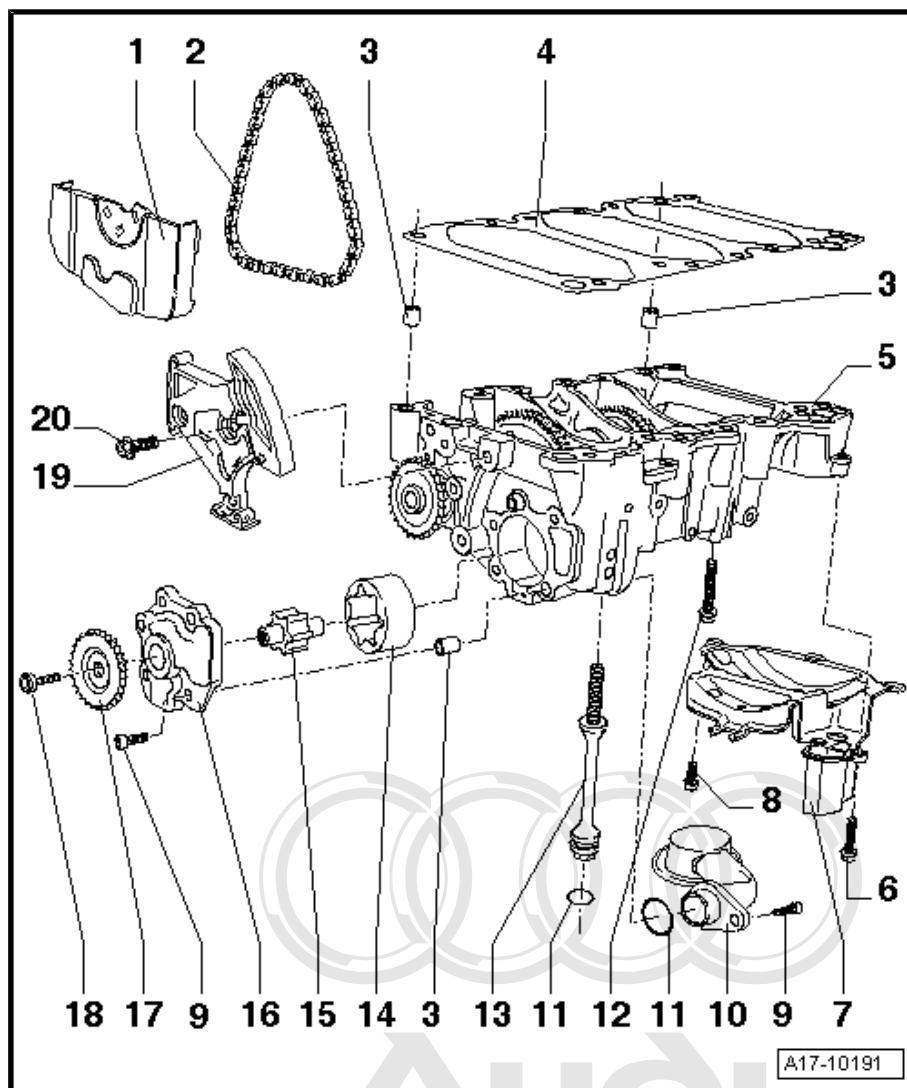
18 - 20 Nm + turn 90° further

- ☐ Renew

19 - Chain tensioner with tensioning rail

- ☐ Pre-tensioning before installing ⇒ [page 122](#)

20 - 15 Nm



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Tightening sequence for balance shaft assembly

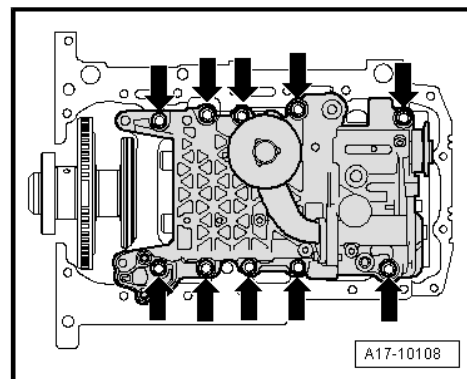


Note

Note different bolt lengths ⇒ [page 111](#).

– Tighten bolts -arrows- in 3 stages as follows, working from the inside outwards:

1. Tighten bolts hand-tight.
2. Tighten bolts to 15 Nm.
3. Turn bolts 90° further.



Positions of bolts for balance shaft assembly

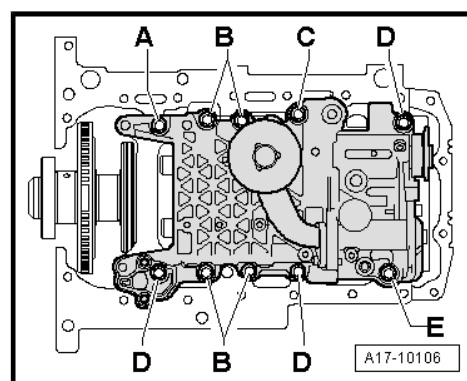
A - Hexagon collared bolt M7x40

B - Hexagon collared bolt M7x70

C - Hexagon collared bolt M7x90

D - Hexagon collared bolt M7x55

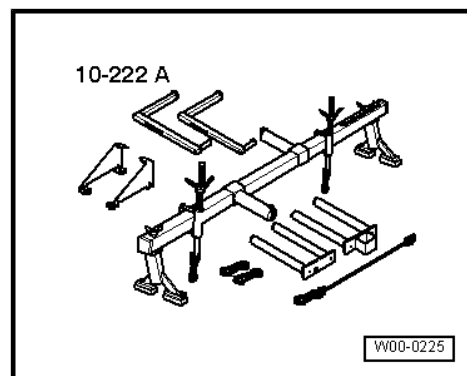
E - Screw plug with O-ring



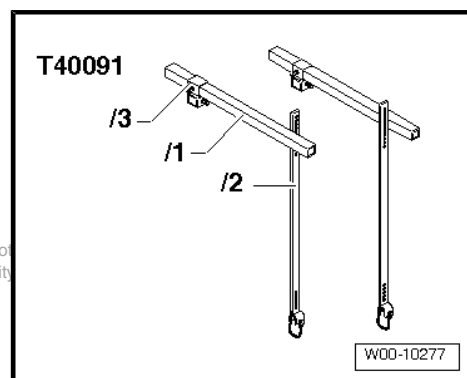
1.3 Removing and installing sump

Special tools and workshop equipment required

- ◆ Support bracket -10-222 A- with adapters for Audi A6 2005 ▶

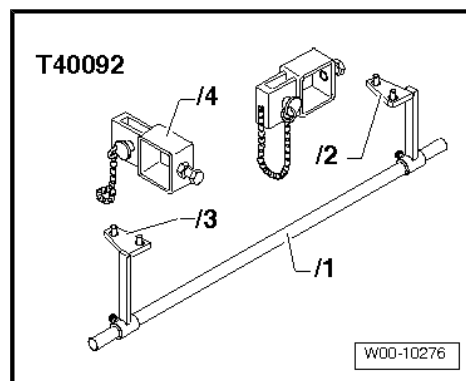


- ◆ Engine support bracket (basic set) -T40091-

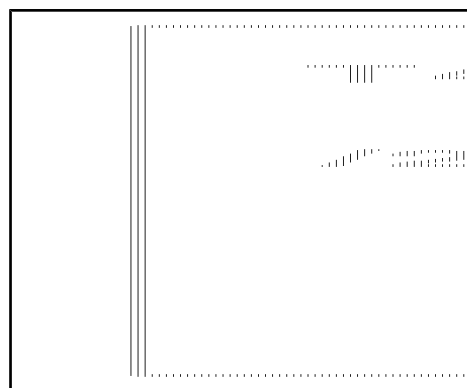


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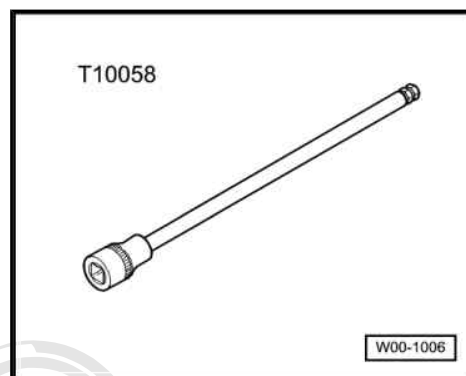
- ◆ Engine support bracket (supplementary set) -T40092-



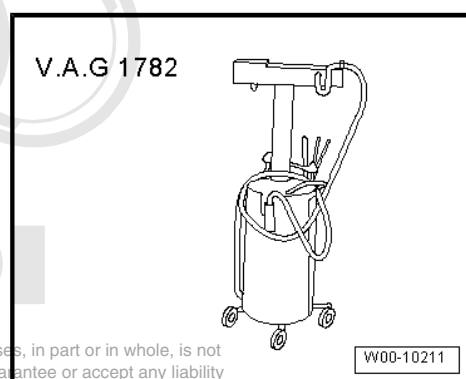
- ◆ Engine support bracket (supplementary set) -T40093-



- ◆ Allen key, long reach -T10058-



- ◆ Used oil collection and extraction unit -V.A.G 1782-



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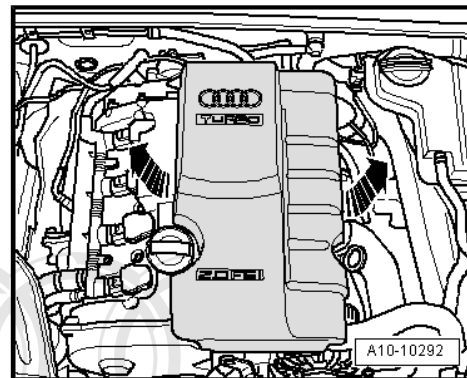
Removing



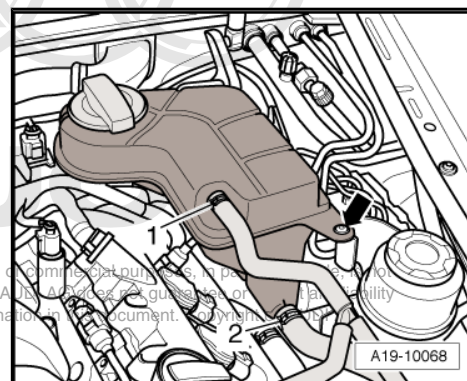
Note

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

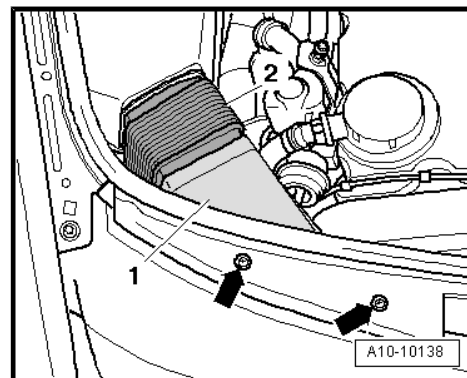
- Pull off engine cover panel -arrows-.



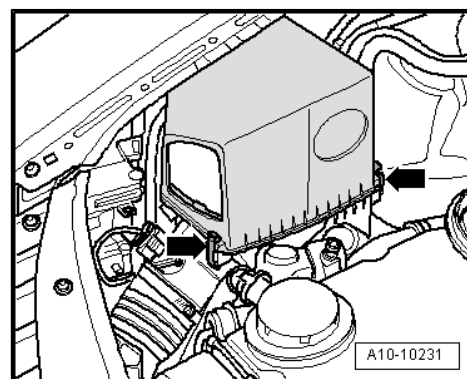
- Unbolt coolant expansion tank -arrow-.
- Unplug electrical connector for coolant shortage indicator switch -F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.



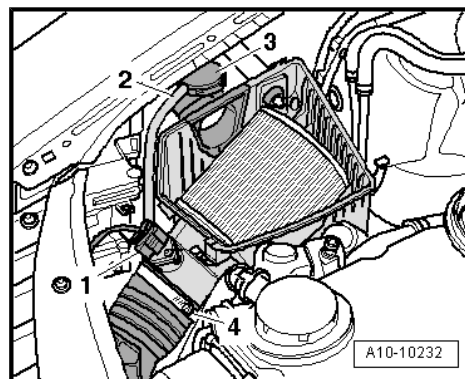
- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.



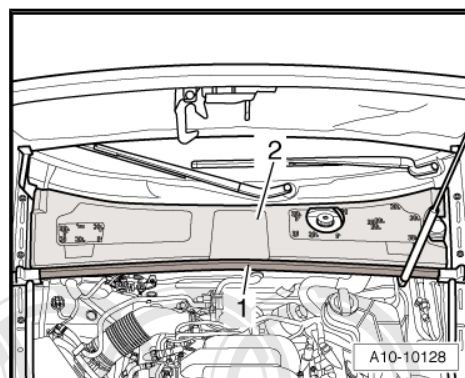
- Release two retaining clips -arrows- and detach top section of air cleaner housing.



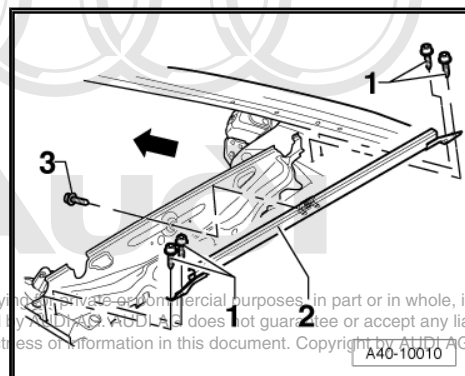
- Unplug electrical connector -1- at air mass meter -G70- .
- Loosen hose clip -4- to remove air intake hose.
- Disconnect vacuum hose -2- (if fitted).
- Lift vacuum unit -3- (if fitted) with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.



- Pull off rubber seal -1- on plenum chamber cover.
- Detach plenum chamber cover -2-.

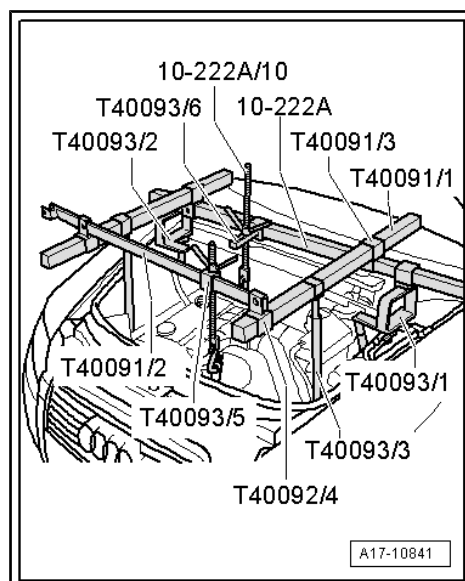


- If fitted, unscrew bolts -1- and -3- and remove body brace -2-.

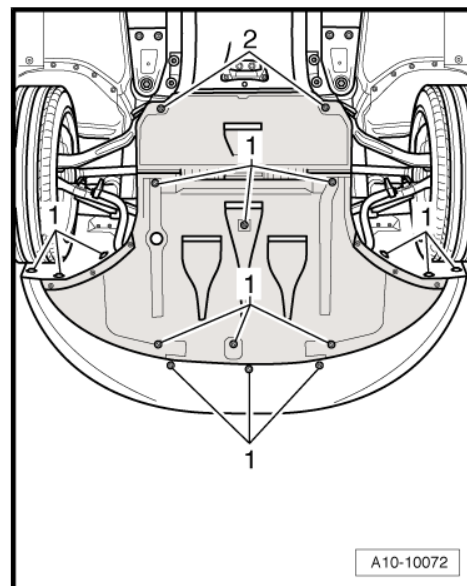


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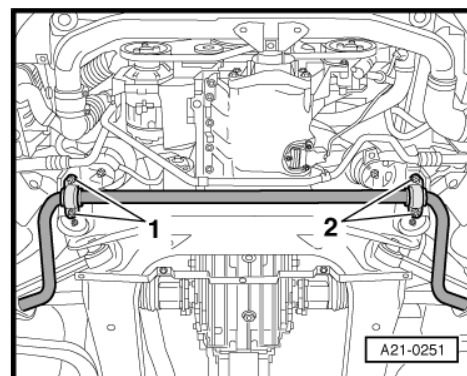
- Attach support bracket -10-222 A- with engine support basic set -T40091- , engine support supplement set -T40092- and engine support supplement set -T40093- to suspension turrets and longitudinal members, as shown in illustration.
- Attach both spindles at both engine lifting eyes and tension both spindles evenly.
- Remove poly V-belt ⇒ [page 32](#) .



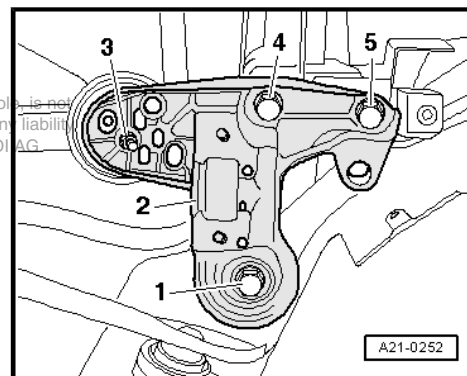
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.



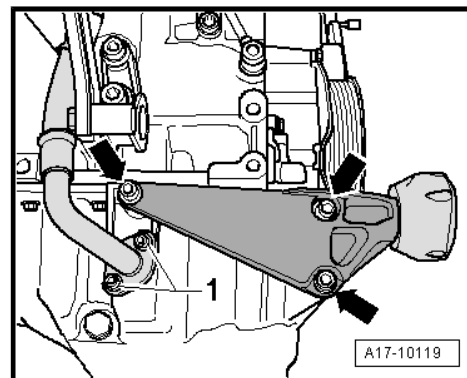
- Unbolt anti-roll bar mountings -1- and -2-.



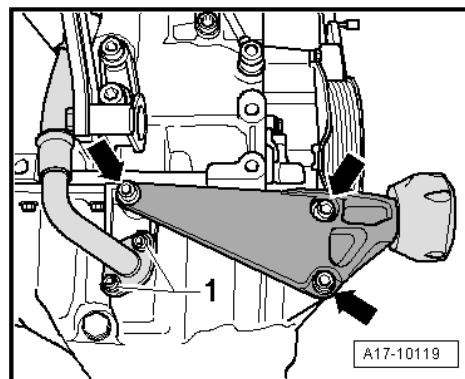
- Remove bottom nut -3- at engine mounting (left and right).
- Unscrew bolts -4- and -5- on console for engine mounting (left and right).
- Unscrew front bolt -1- on left and right for subframe and remove console for engine mounting -2- (left and right).
- Place used oil collection and extraction unit -V.A.G 1782- under engine and drain engine oil.



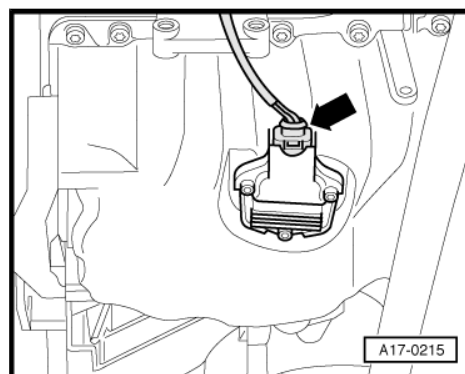
- Unscrew bolts -arrows- and remove torque reaction support from sump.
- Lift the engine evenly a short distance with both spindles.



- Unscrew oil return line -1- from turbocharger at sump.



- Unplug electrical connector -arrow- at oil level and oil temperature sender -G266- .



- Unplug electrical connector -1- for magnetic clutch on air conditioner compressor.



Caution

The air conditioner refrigerant circuit must not be opened.

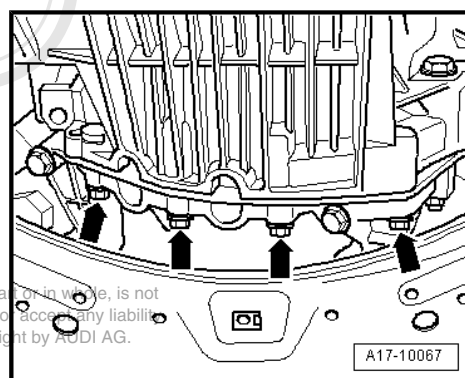
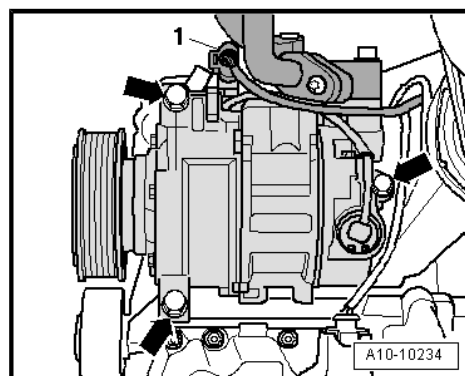
- Unscrew air conditioner compressor from bracket -arrows-.



Note

To prevent damage to the condenser and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.

- Tie up air conditioner compressor to bottom of vehicle, with lines attached.
- Unscrew gearbox/sump bolts -arrows-.



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- Unscrew M10 bolts -arrows-.
- Slacken bolts -1 ... 18- in diagonal sequence.
- Take off sump; if necessary loosen it by striking lightly with a rubber hammer.

Installing

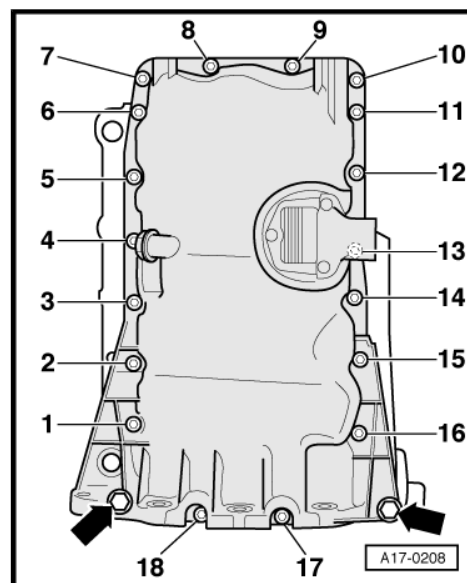
Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „1.1 Part I: Sump - exploded view“, page 108



Note

- ◆ *Renew seal.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- ◆ *Fit all cable ties in the original positions when installing.*



- Remove sealant residue from sump and cylinder block with rotating plastic brush or similar.



WARNING

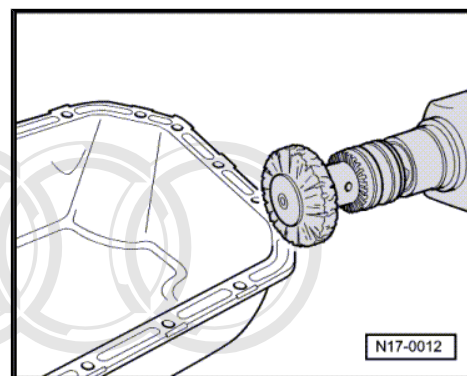
Wear safety goggles.

- Clean sealing surfaces; they must be free of oil and grease.

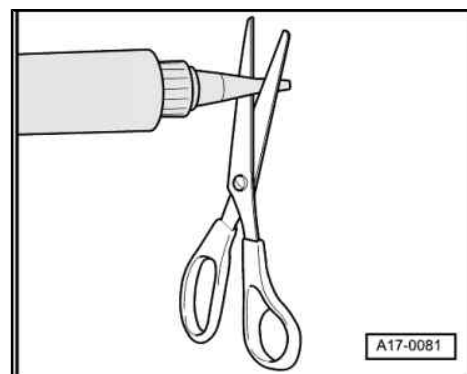


Note

- ◆ *Sealant bead must not be wider than 3 mm, otherwise excess sealant could ingress into sump and clog strainer in oil intake pipe.*
- ◆ *Take particular care when applying sealant bead in area of rear sealing flange -arrows-.*
- ◆ *The sump must be installed within 5 minutes after applying sealant.*

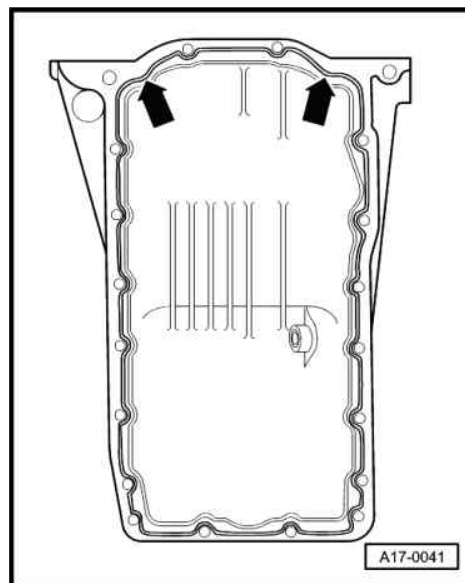


- Cut off tube nozzle at front marking (diameter of nozzle approx. 2 mm).



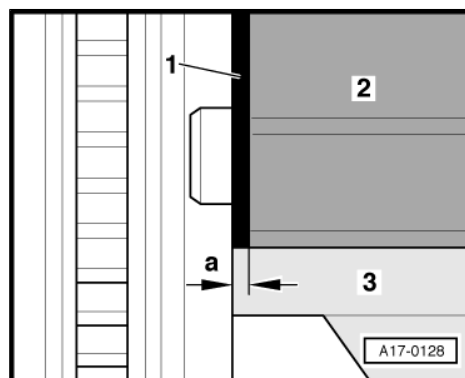
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- Apply bead of sealant onto the clean sealing surface of the sump as shown in the illustration.
- Thickness of sealant bead: 2 ... 3 mm



Note

- ◆ When installing the sump -3- with the engine removed from the vehicle, make sure that it is positioned flush with the intermediate plate -1- at the flywheel end. In other words, the sump should protrude by 0.8 mm (distance -a-) from cylinder block -2-.
- ◆ After fitting sump assembly, the sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.



- Immediately fit sump and tighten bolts; tightening sequence ⇒ [page 109](#) .
- Install subframe ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install anti-roll bar ⇒ Running gear, front-wheel drive and four-wheel drive; Rep. gr. 40 .
- Install air conditioner compressor ⇒ Rep. gr. 87 ; Heating and air conditioning .
- Install poly V-belt ⇒ [page 32](#) .
- Fill up with engine oil and check oil level.

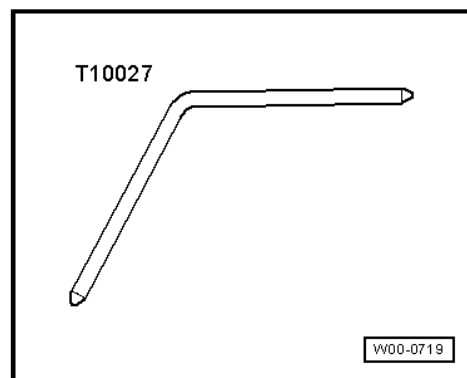
Further assembly is basically carried out in reverse order of dismantling.

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1.4 Removing and installing balance shaft assembly with oil pump

Special tools and workshop equipment required

◆ Locking pin -T10027-



Removing

- Remove sump → [page 111](#) .



WARNING

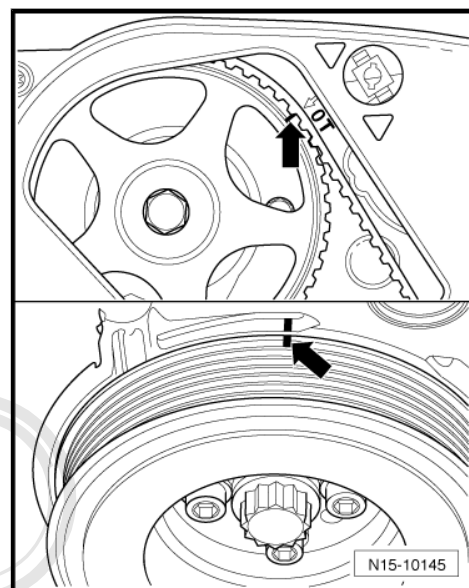
The engine must only be turned at the crankshaft, in the direction of normal engine rotation (clockwise).



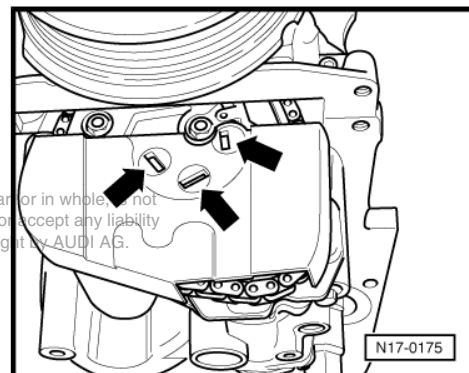
Note

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

- Set camshaft sprocket to TDC marking by turning crankshaft. Marking on camshaft sprocket must align with arrow on toothed belt cover.

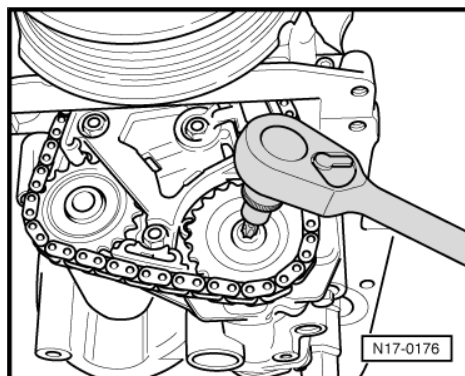


- Pull off chain guard. Retaining tabs can be released with a small screwdriver (insert in openings -arrows-).

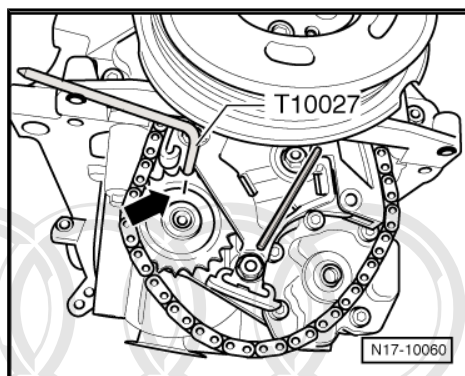


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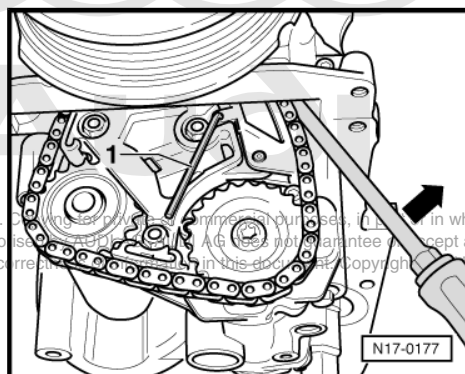
- Loosen bolt on oil pump chain sprocket. Counterhold on central bolt of vibration damper.



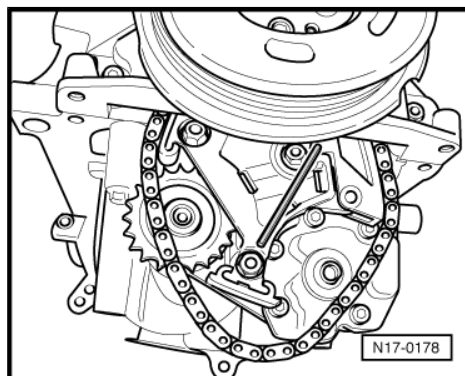
- Use locking pin -T10027- to lock chain sprocket of balance shaft.



- Use screwdriver to slacken chain rail -arrow- and lock it in position using a 3 mm Allen key -1-.

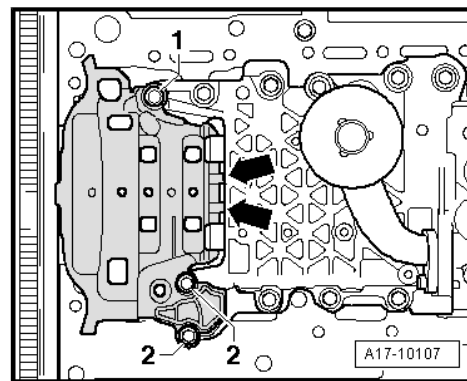


- Detach oil pump chain sprocket and disengage chain at balance shaft drive.



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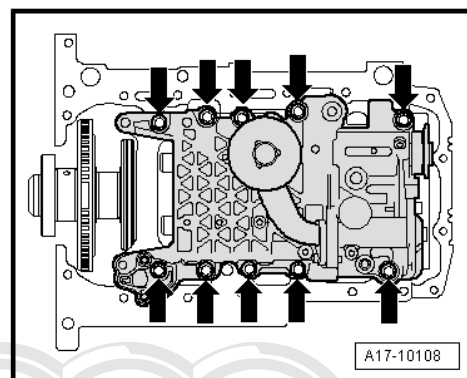
- Unscrew bolts and -1 and 2- and remove baffle plate.



- Loosen bolts -arrows- on balance shaft assembly, working from outside inwards, and then remove balance shaft assembly.

Installing

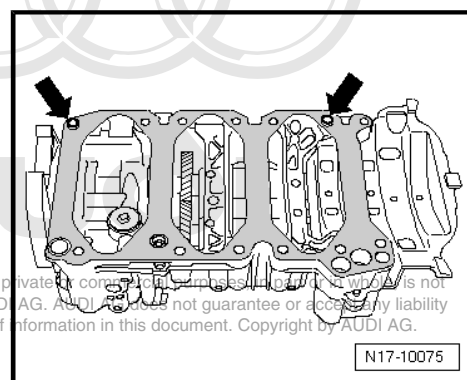
- Chain tensioner must be pre-tensioned [⇒ page 122](#).
- Tightening torques
[⇒ „1.1 Part I: Sump - exploded view“, page 108](#),
[⇒ „1.2 Part II: Balance shaft assembly with oil pump - exploded view“, page 109](#).
- Renew all bolts on balance shaft assembly; note different bolt lengths [⇒ page 111](#).
- Renew seal on bolt for balance shaft assembly [⇒ Item 13 \(page 110\)](#).
- Fit intermediate plate onto dowel sleeves on balance shaft assembly as shown -arrows-.
- Install balance shaft assembly with oil pump and intermediate plate. Tighten securing bolts [⇒ page 111](#).



Note

Note different bolt lengths [⇒ page 111](#).

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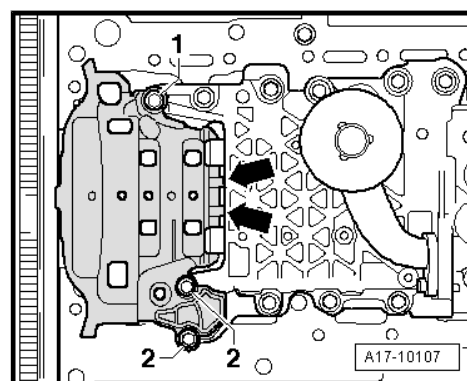


- Install baffle plate. To do so, insert pins in balance shaft assembly -arrows- and tighten bolt -1- and bolts -2- to specified torque [⇒ Item 8 \(page 110\)](#), [⇒ Item 6 \(page 110\)](#).

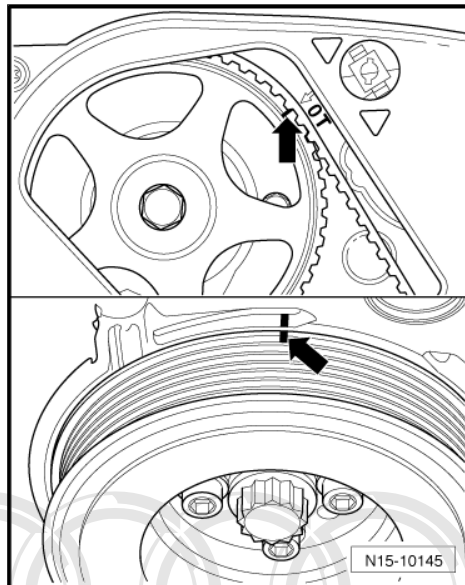


Note

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



- Rotate engine to TDC of No. 1 cylinder by turning central bolt of crankshaft sprocket in normal direction of rotation. Marking on camshaft sprocket and marking on crankshaft must be aligned to TDC of cylinder No. 1 -arrows-.



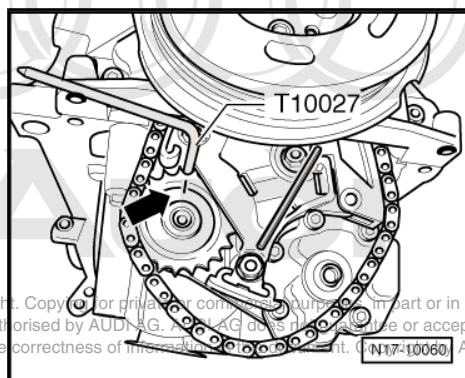
- Marking on chain sprocket of balance shaft -arrow- must be positioned opposite the locating hole. Use locking pin -T10027- to lock chain sprocket in this position. Place chain on chain sprocket of balance shaft.
- Install oil pump chain sprocket with new bolt and hand-tighten the bolt.



Note

The oil pump chain sprocket can only be installed correctly in one position. When installing, you may ONLY turn the oil pump.

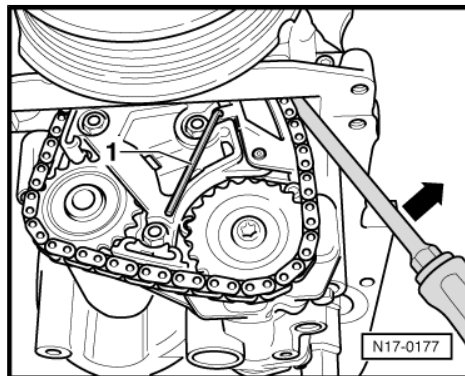
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- Remove locking pin -T10027- and Allen key -1-. Secure oil pump chain sprocket. Counterhold on central bolt of vibration damper.

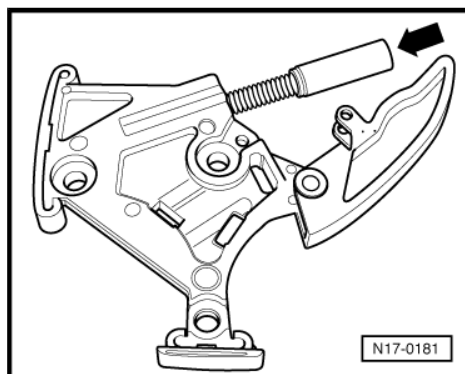
Further assembly is basically carried out in reverse order of dismantling.

- Install sump ⇒ [page 111](#) .

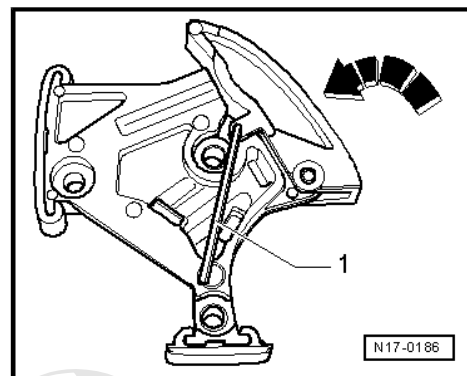


1.4.1 Pre-tensioning chain tensioner

- Pre-tension the piston by hand -arrow-.



- Press chain rail in direction of arrow and lock in position using a 3 mm Allen key -1-.



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2 Oil filter bracket - exploded view

1 - Pipe

- ☐ For crankcase breather

2 - Oil pressure switch -F1-

- ☐ 1.4 bar - black
- ☐ Checking ⇒ [page 126](#)
- ☐ Tightening torque 21 Nm

3 - 15 Nm

- ☐ With earth wire for oil pressure switch

4 - Bracket

5 - 15 Nm

6 - Oil cooler

- ☐ See note ⇒ [page 108](#)
- ☐ Ensure clearance from surrounding components
- ☐ Diagram of coolant hose connections ⇒ [page 135](#)
- ☐ Removing and installing ⇒ [page 128](#)

7 - Gasket

- ☐ Renew
- ☐ Lubricate lightly with oil
- ☐ Installation position ⇒ [page 125](#)

8 - 15 Nm

9 - Seal

- ☐ Renew

10 - Screw plug

11 - Oil filter housing

- ☐ Remove and install using oil filter tool -3417- or 36 mm socket, e.g. socket, 36 mm -T10125-
- ☐ Draining ⇒ [page 125](#)

12 - Oil filter element

- ☐ Observe change intervals ⇒ Maintenance ; Booklet 4F

13 - Baffle plate

- ☐ Installation position ⇒ [page 125](#)

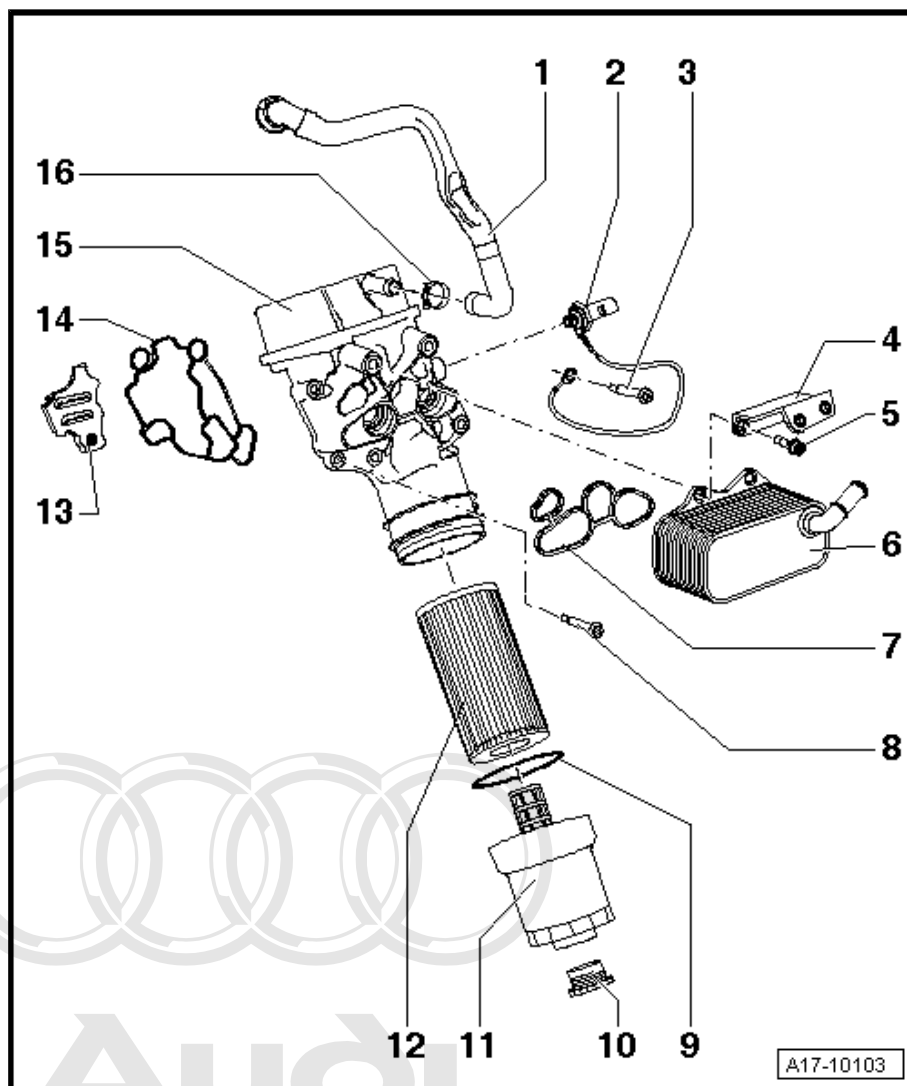
14 - Gasket

- ☐ Renew

15 - Oil filter bracket

- ☐ Removing and installing ⇒ [page 130](#)

16 - Spring-type clip

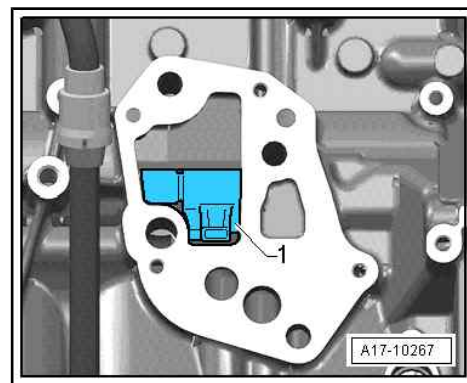
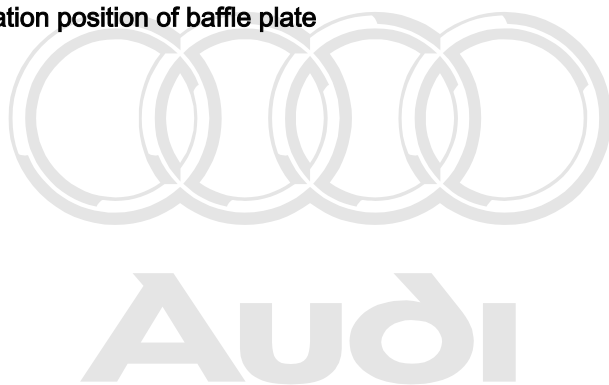


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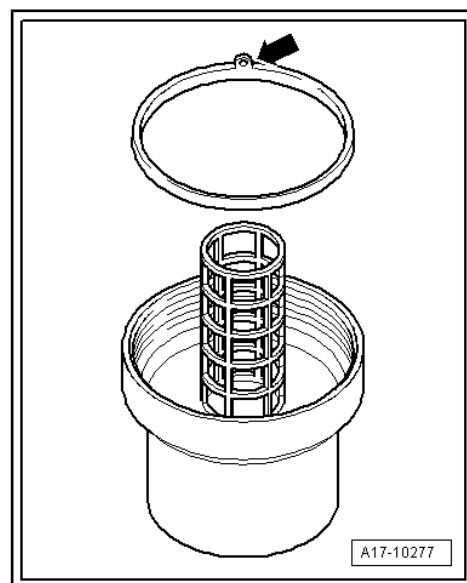
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Installation position of baffle plate



Installation position of seal

- Note position of service tab on seal - arrow.
- Flat side of seal must face outwards.



2.1 Draining oil filter housing

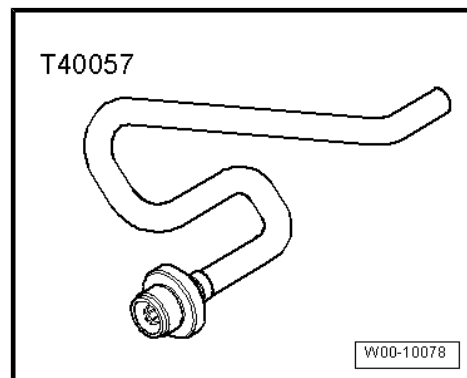


Note

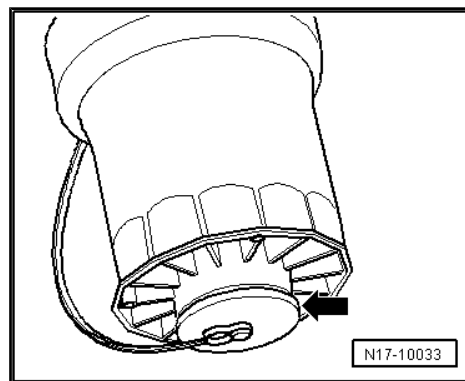
A valve in the oil filter housing will be opened when the oil drain adapter -T40057- is screwed in. The valve will be closed again as soon as the oil drain adapter -T40057- is unscrewed.

Special tools and workshop equipment required

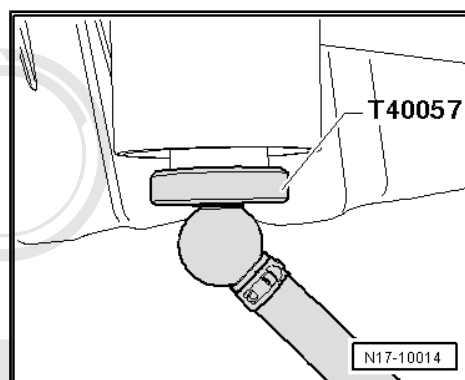
- ◆ Oil drain adapter -T40057-



- Unscrew dust cap from oil filter housing -arrow-.

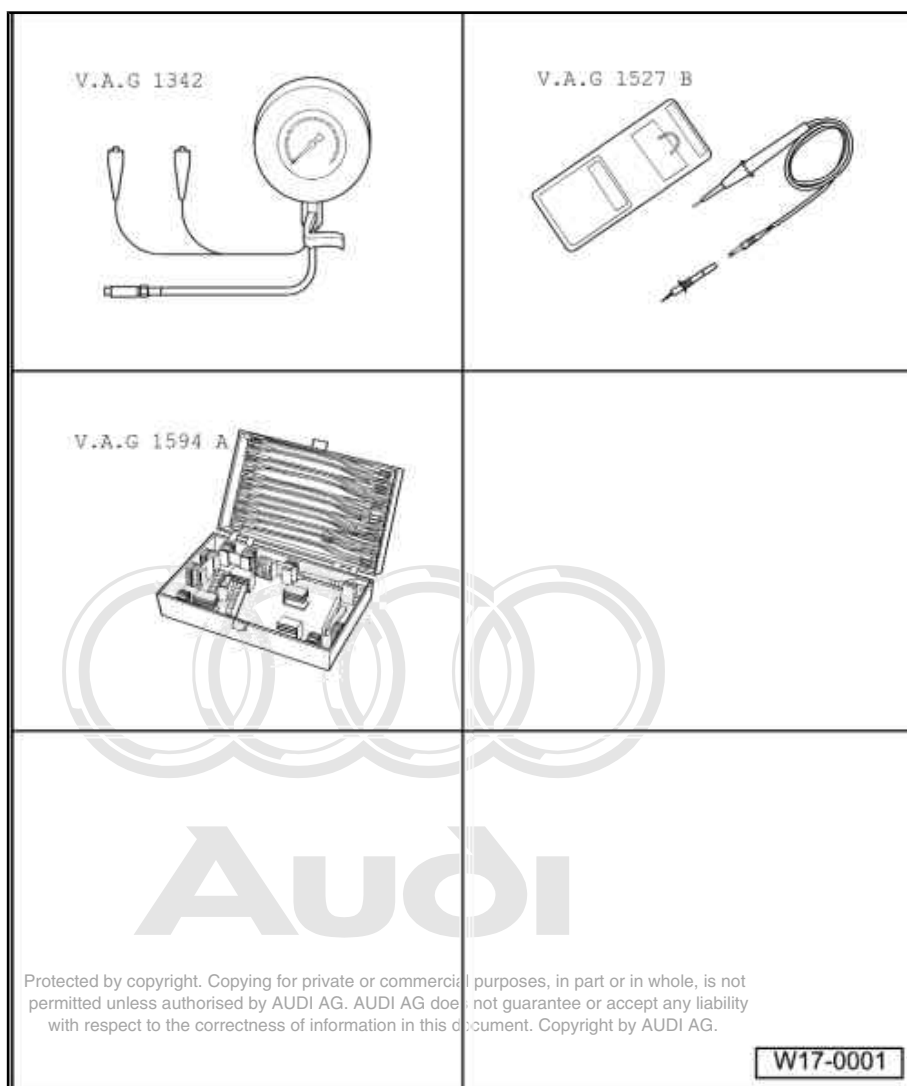


- Direct hose of oil drain adapter -T40057- into a drip tray and screw oil drain adapter -T40057- into oil filter housing.
- Drain engine oil



2.2 Checking oil pressure and oil pressure switch

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Special tools and workshop equipment required

- ◆ Oil pressure tester -V.A.G 1342-
- ◆ Voltage tester -V.A.G 1527 B-
- ◆ Auxiliary measuring set -V.A.G 1594 C-

Test requirements

- Engine oil level OK, checking ⇒ Maintenance ; Booklet 4F .
- Oil pressure warning lamp must light up for approx. 3 seconds when ignition is switched on.
- In vehicles with auto-check system, the „OK“ display must light up (select symbol).
- Engine oil temperature at least 80°C (radiator fan must have run once).



Note

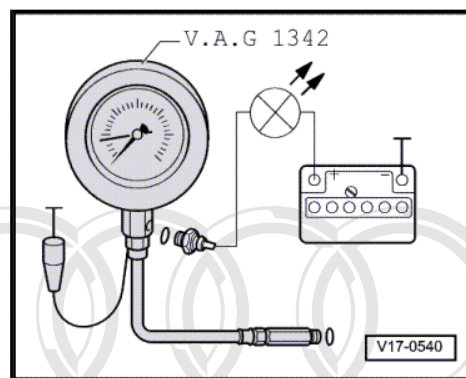
Functional check and servicing the visual and acoustic oil pressure warning: Current flow diagrams, ⇒ Vehicle diagnostic tester; „Function and component selection“.

Test sequence

- Remove the oil pressure switch -F1- -A- and screw it onto tester.
- Screw tester into oil filter bracket in place of the oil pressure switch.
- Connect brown wire of tester to earth (-).
- Connect voltage tester -V.A.G 1527 B- with adapter leads from auxiliary measuring set -V.A.G 1594 C- to battery positive (+) and oil pressure switch -F1- -B-. LED must not light up.
- If the LED lights up, renew 1.4 bar oil pressure switch.

If the LED does not light up:

- Start engine and run at increased speed: at 1.2 ... 1.6 bar pressure the LED should light up, otherwise oil pressure switch -F1- must be renewed.
- Increase engine speed further. At 2,000 rpm and an oil temperature of 80 °C the oil pressure should be between 2.7 ... 4.5 bar.



Assembling

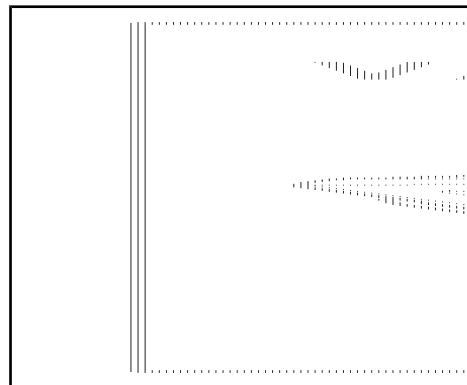
- Tightening torques
⇒ „2 Oil filter bracket - exploded view“, page 124
- Install oil pressure switch.

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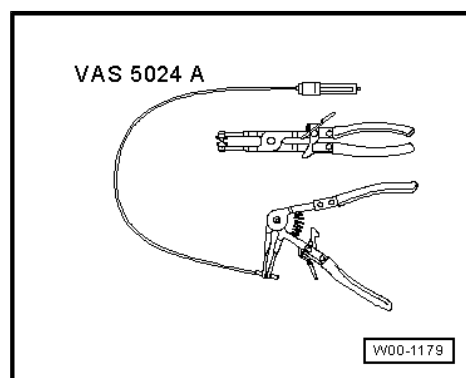
2.3 Removing and installing engine oil cooler

Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Spring type clip pliers -VAS 5024 A-



Removing

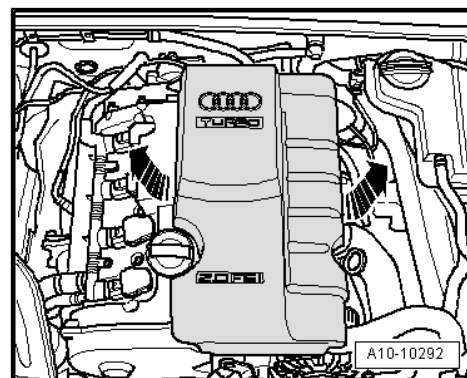


WARNING

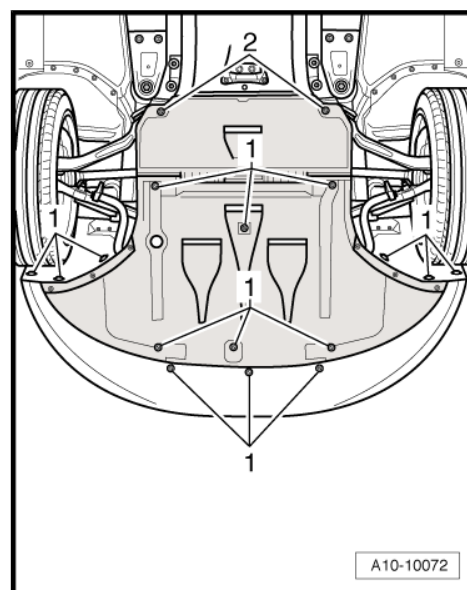
Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

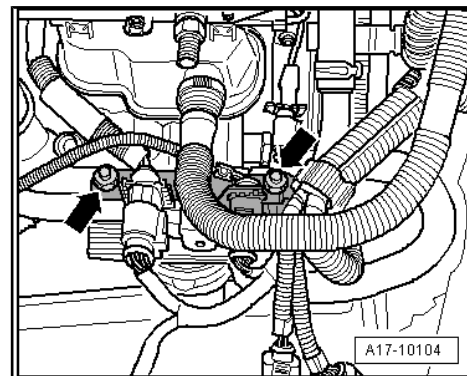
- Open filler cap on coolant expansion tank.
- Pull off engine cover panel -arrows-.



- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#).
- Remove intake manifold and fuel rail ⇒ Motronic direct injection and ignition system (4-cylinder); Repair group 24; Servicing injection system.

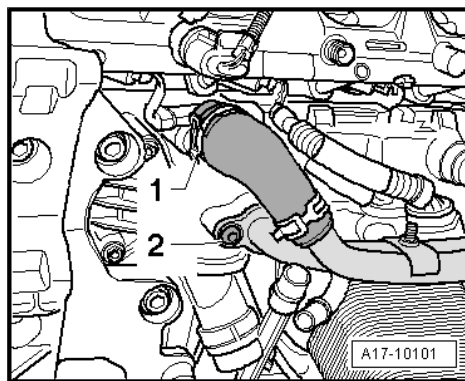


- Unbolt bracket for connectors -arrows- from coolant pipe.

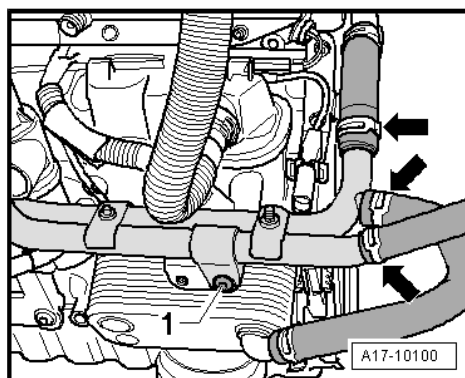


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- Disconnect coolant hose -1-.
- Remove bolt -2-.



- Detach coolant hoses -arrows- from coolant pipe.
- Unscrew bolt -1- and detach coolant pipe.



- Remove oil cooler -arrows-.

Installing

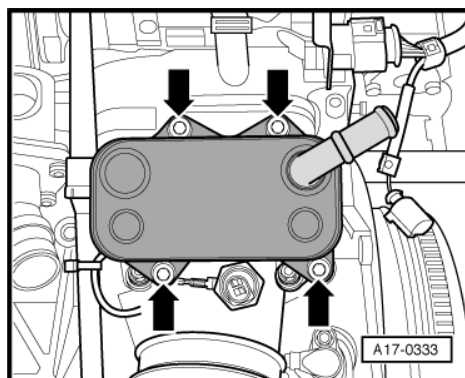
Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „2 Oil filter bracket - exploded view“, page 124



Note

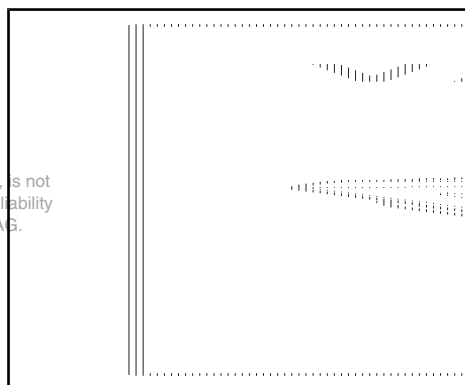
- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- Fill up with coolant ⇒ [page 138](#) .



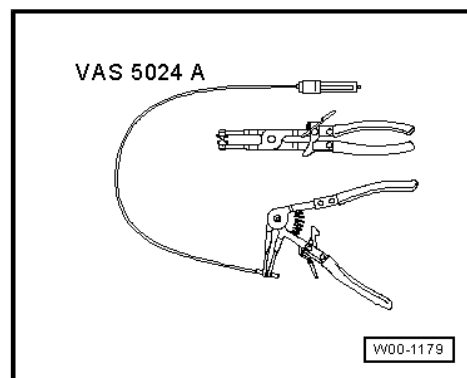
2.4 Removing and installing oil filter bracket

Special tools and workshop equipment required

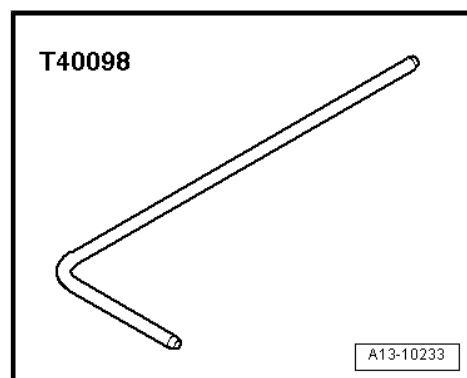
- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Spring type clip pliers -VAS 5024 A-



- ◆ Locking pin -T40098-



Removing



WARNING

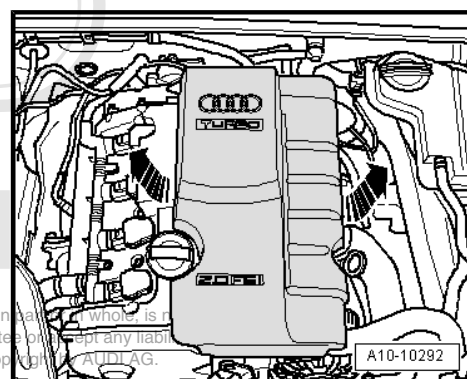
Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.

Removing

- Pull off engine cover panel -arrows-.



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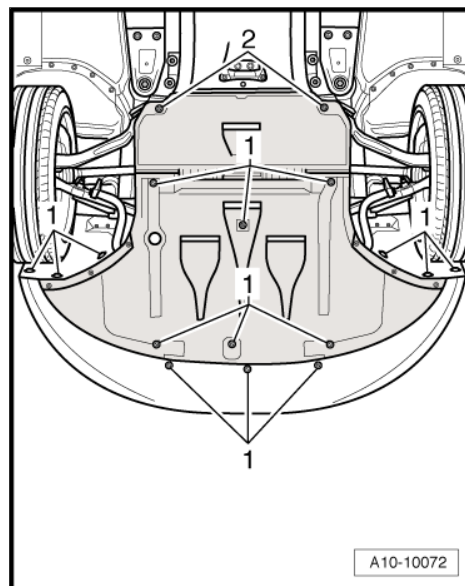
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .



Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

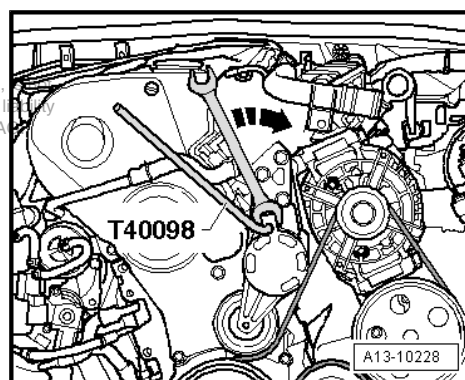
- Mark direction of rotation of poly V-belt.



- To slacken poly V-belt, turn belt tensioner/damper in direction of -arrow-.

- Lock tensioner in position with locking pin -T40098-

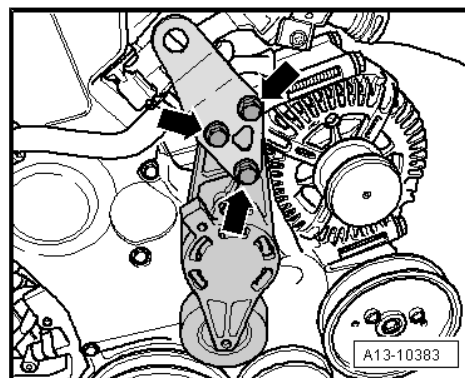
- Remove poly V-belt.



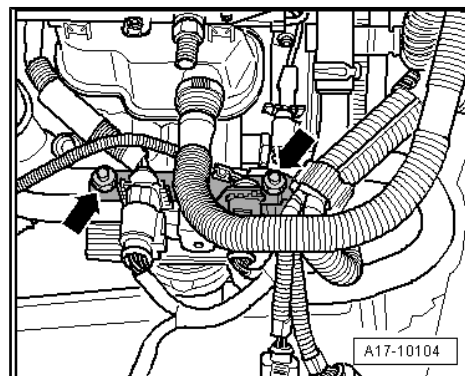
- Remove belt tensioner/damper for poly V-belt with engine lifting eye -arrows-.

- Remove alternator ⇒ Electrical system; Repair group 27 .

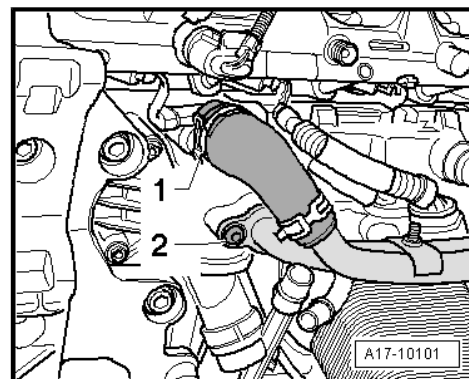
- Remove intake manifold and fuel rail ⇒ Motronic direct injection and ignition system (4-cylinder); Repair group 24; Servicing injection system .



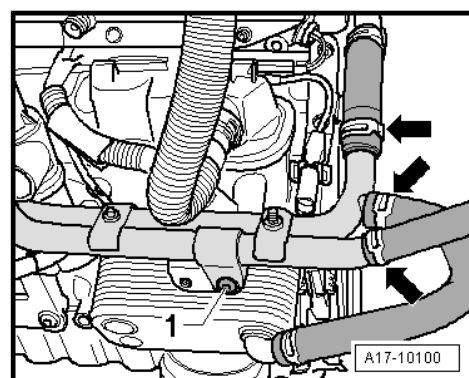
- Unbolt bracket for connectors -arrows- from coolant pipe.



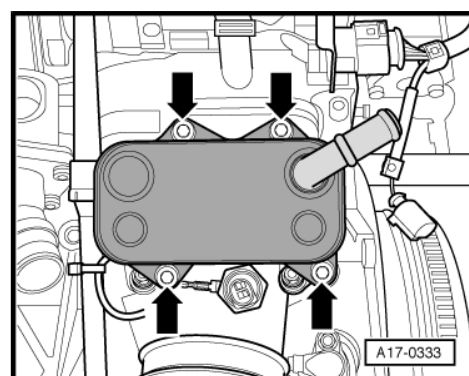
- Disconnect coolant hose -1-.
- Remove bolt -2-.



- Detach coolant hoses -arrows- from coolant pipe.
- Unscrew bolt -1- and detach coolant pipe.



- Remove oil cooler -arrows-.



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- Detach pipe -1- for crankcase breather system.
- Unscrew earth cable -2- for oil pressure switch.
- Unscrew bolts -arrows- and remove oil filter bracket.

Installing

Installation is carried out in the reverse order; note the following:

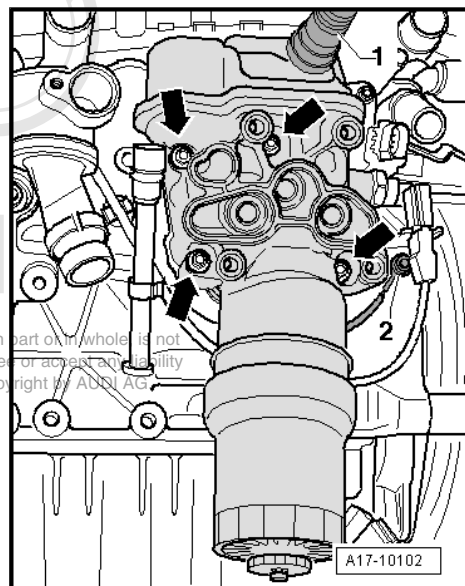
- Tightening torques
⇒ „2 Oil filter bracket - exploded view“, page 124



Note

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- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- Install baffle plate ⇒ [Item 13 \(page 124\)](#) .
- Install poly V-belt ⇒ [page 32](#) .
- Fill up with coolant ⇒ [page 138](#) .



19 – Cooling

1 Removing and installing parts of cooling system



WARNING

Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

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Note

- ◆ *The cooling system is under pressure when the engine is hot. If necessary, relieve pressure before commencing repair work.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- ◆ *Hose clip pliers -V.A.G 1921- or spring-type clip pliers -VAS 5024 A- are recommended for use in installing spring-type clips.*
- ◆ *Renew gaskets and seals.*
- ◆ *The arrow markings on coolant pipes and on ends of hoses must align.*

1.1 Connection diagram for coolant hoses (vehicles without auxiliary heater)

1 - Radiator

- ☐ Removing and installing
⇒ [page 152](#)
- ☐ If renewed, refill system
with fresh coolant

2 - Coolant hose (bottom)

3 - Return hose from turbo-charger

- ☐ With bypass thermostat
in hose

4 - Coolant pump

- ☐ Removing and installing
⇒ [page 147](#)

5 - Turbocharger

- ☐ Removing and installing
⇒ [page 166](#)

6 - Thermostat

- ☐ Removing and installing
⇒ [page 143](#)
- ☐ With hose connection
- ☐ Starts to open at approx.
87°C

7 - Engine oil cooler

- ☐ Removing and installing
⇒ [page 128](#)

8 - Cylinder head/cylinder block

- ☐ If renewed, refill system
with fresh coolant

9 - Coolant connecting pipe

10 - Non-return valve

11 - Pump/valve unit

- ☐ Removing, installing and checking ⇒ Rep. gr. 87

12 - Heat exchanger (for heating system)

- ☐ If renewed, refill system with fresh coolant

13 - Bleeder screw

- ☐ Tightening torque 20 Nm

14 - Bleeder screw

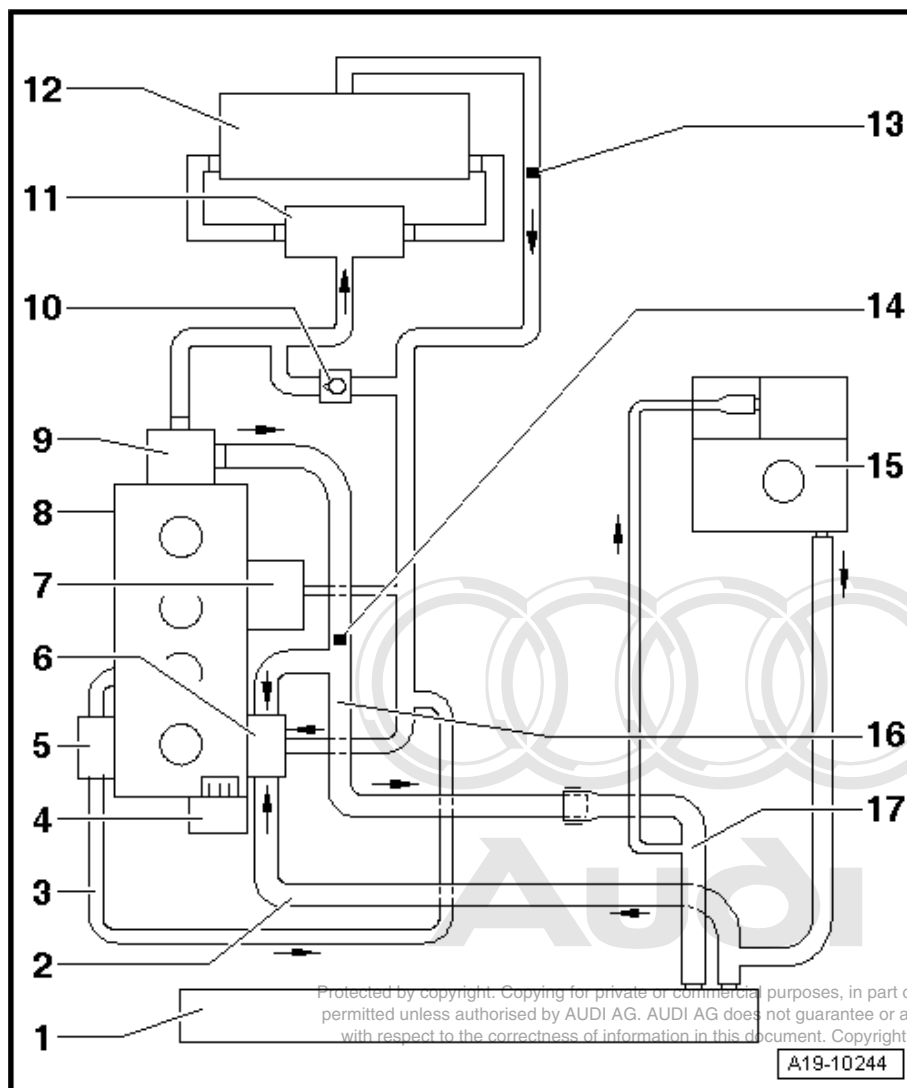
- ☐ Tightening torque 20 Nm

15 - Expansion tank

- ☐ With filler cap
- ☐ Checking pressure relief valve in filler cap ⇒ [page 158](#)

16 - Coolant pipe

17 - Coolant hose (top)



1.2 Connection diagram for coolant hoses (vehicles with auxiliary heater)

1 - Radiator

- ☐ Removing and installing
⇒ [page 152](#)
- ☐ If renewed, refill system
with fresh coolant

2 - Coolant hose (bottom)

3 - Return hose from turbo-charger

- ☐ With bypass thermostats
in hose

4 - Coolant pump

- ☐ Removing and installing
⇒ [page 147](#)

5 - Turbocharger

- ☐ Removing and installing
⇒ [page 166](#)

6 - Thermostat

- ☐ Removing and installing
⇒ [page 143](#)
- ☐ Starts to open at approx.
87°C

7 - Engine oil cooler

- ☐ Removing and installing
⇒ [page 128](#)

8 - Cylinder head/cylinder block

- ☐ If renewed, refill system
with fresh coolant

9 - Coolant connecting pipe

10 - Non-return valve

11 - Pump/valve unit

- ☐ Removing, installing and checking ⇒ Rep. gr. 87

12 - Heat exchanger (for heating system)

- ☐ If renewed, refill system with fresh coolant

13 - Bleeder screw

- ☐ Tightening torque 20 Nm

14 - Bleeder screw

- ☐ Tightening torque 20 Nm

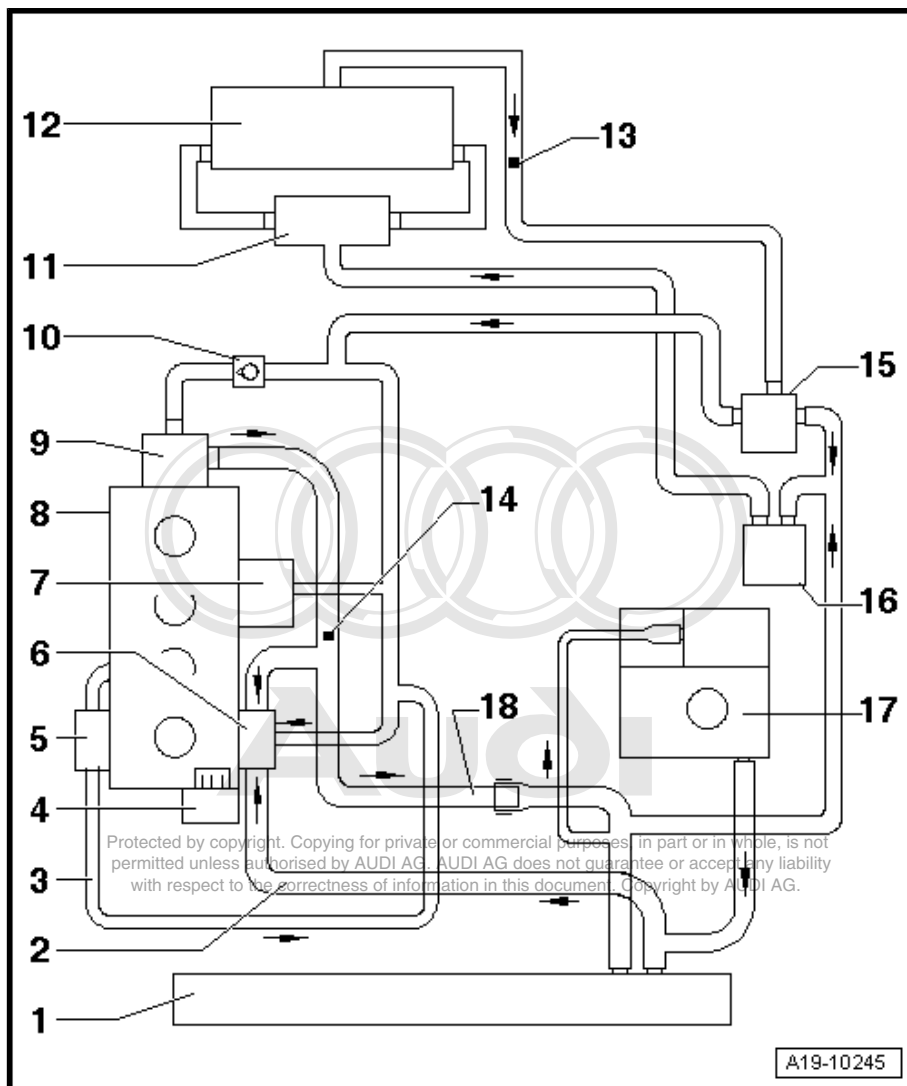
15 - Heater coolant shut-off valve -N279-

16 - Auxiliary heater

17 - Expansion tank

- ☐ With filler cap
- ☐ Checking pressure relief valve in filler cap ⇒ [page 158](#)

18 - Coolant pipe

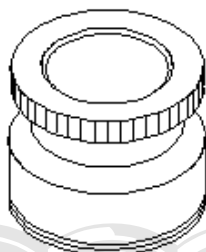


1.3 Draining and filling cooling system

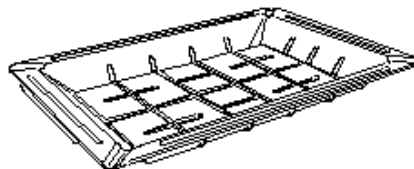
Special tools and workshop equipment required

- ◆ Adapter for cooling system tester -V.A.G 1274/8-
- ◆ Pipe -V.A.G 1274/10-
- ◆ Drip tray for workshop hoist -VAS 6208-
- ◆ Hose clip pliers - V.A.G 1921-
- ◆ Cooling system charge unit -VAS 6096-
- ◆ Refractometer -T10007-

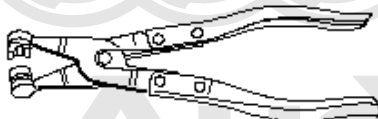
V.A.G 1274/8



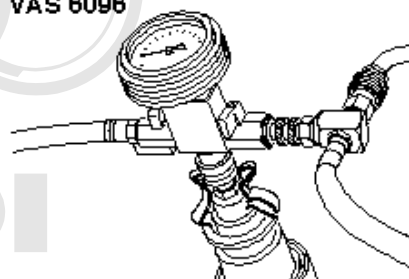
VAS 6208



V.A.G 1921

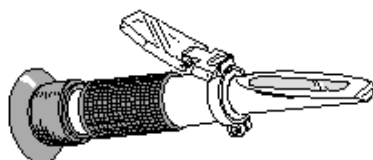


VAS 6096



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T10007



V.A.G 1274/10



G19-10016

Draining



Note

Collect drained coolant in a clean container for re-use or disposal.



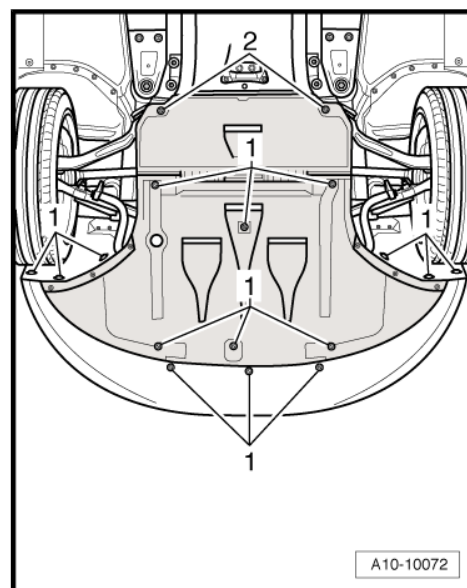
WARNING

Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.

- Release quick-release fasteners -1- and -2- and take off noise insulation panels.



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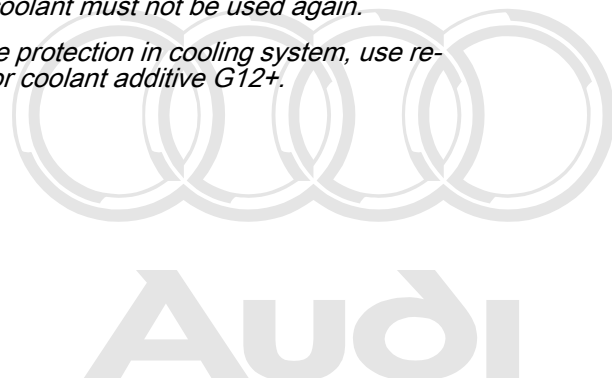
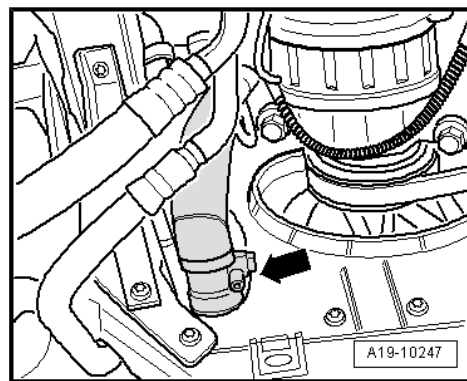
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Drain off coolant at coolant hose (bottom left) -arrow-.

Filling



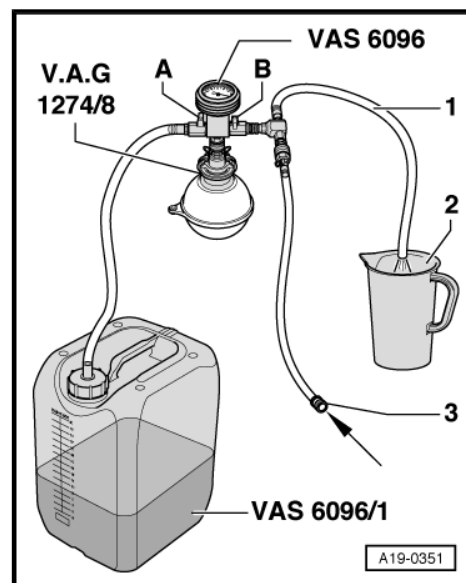
Note

- ◆ *The cooling system is filled all year round with a mixture of water and radiator antifreeze/anti-corrosion agent.*
- ◆ *Only use coolant additive G 12+ in accordance with TL - VW 774 F-. Other coolant additives could seriously impair in particular the anti-corrosion properties. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- ◆ *Coolant additive G12+ can be mixed with additives G11 and G12.*
- ◆ *G 12+ and coolant additives marked "meeting specification TL -VW 774- F" prevent frost and corrosion damage as well as scaling. Such additives also raise the boiling point of the coolant. For these reasons the cooling system must be filled all year round with the correct antifreeze and anticorrosion additive.*
- ◆ *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- ◆ *Frost protection is required down to about -25 °C (in countries with arctic climate: down to about -35 °C).*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The antifreeze concentration must be at least 40 %.*
- ◆ *If greater frost protection is required in very cold climates, the amount of G 12+ can be increased, but only up to 60 % (this gives frost protection to about -40 °C), as otherwise frost protection is reduced again, as is cooling effectiveness.*
- ◆ *Use only clean tap water for mixing coolant.*
- ◆ *If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block are renewed, do not reuse old coolant.*
- ◆ *Contaminated or dirty coolant must not be used again.*
- ◆ *For checking anti-freeze protection in cooling system, use refractometer -T10007- for coolant additive G12+.*



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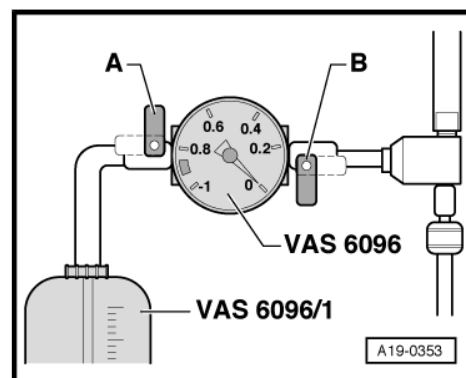
- Fill reservoir of cooling system charge unit -VAS 6096- with 8 litres of premixed coolant (according to recommended ratio):
 - ◆ G12+ (40%) and water (60%) for frost protection to -25 °C
 - ◆ G12+ (50%) and water (50%) for frost protection to -35 °C
 - ◆ G12+ (60%) and water (40%) for frost protection to -40 °C
- Screw adapter for cooling system tester -V.A.G 1274/8- onto coolant expansion tank.
- Fit cooling system charge unit -VAS 6096- onto adapter for cooling system tester -V.A.G 1274/8- .
- Run vent hose -1- into a small container -2-. (The vented air draws along a small amount of coolant, which should be collected.)
- Close the two valves -A- and -B- (levers at right angles to direction of flow).
- Connect hose -3- to compressed air.
- Pressure: 6 ... 10 bar



- Open valve -B- (lever in direction of flow).

The suction jet pump generates a partial vacuum in the cooling system.

- The needle on the gauge should move into the green zone.
- Additionally open valve -A- briefly (lever in direction of flow) so that the hose of cooling system charge unit -VAS 6096- is filled with coolant.
- Close valve -A- again.
- Leave valve -B- open for another 2 minutes.



The suction jet pump will continue generating a vacuum in the cooling system.

- The needle on the gauge should remain in the green zone.
- Close valve -B-.
- The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.

If the needle does not reach the green zone, repeat the process.

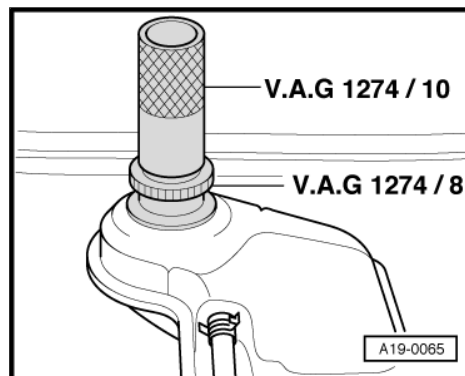
If the vacuum level drops, there is a leak in the cooling system.

- Detach compressed air hose.
- Open valve -A-.

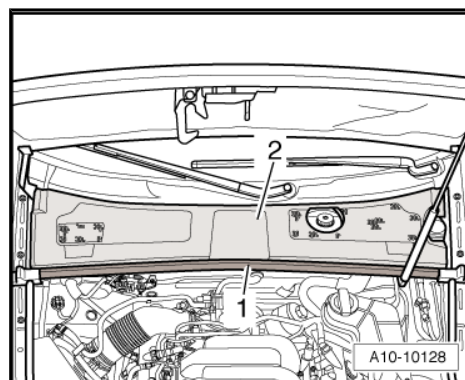
The vacuum in the cooling system causes the coolant to be drawn out of the cooling system charge unit -VAS 6096- the cooling system is then filled.

- Detach cooling system charge unit -VAS 6096- from expansion tank.

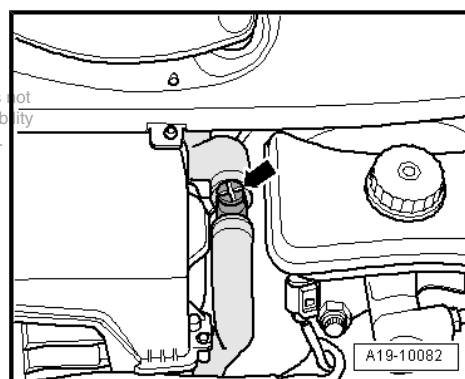
- Fit pipe -V.A.G 1274/10- onto adapter for cooling system tester -V.A.G 1274/8- .



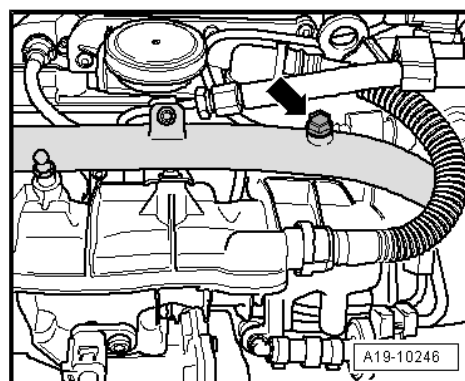
- Pull off rubber seal -1- on plenum chamber cover.
- Detach plenum chamber cover -2-.



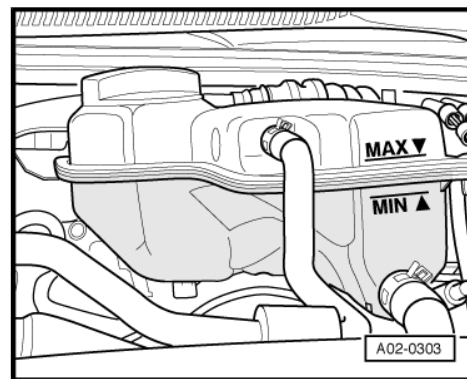
- Open bleeder screw -arrow-.
- Top up the coolant until it emerges from the bleeder hole in the coolant hose without bubbles.
- Close bleeder screw.



- Open bleeder screw -arrow- at coolant pipe.
- Top up the coolant until it emerges from the bleeder hole in the coolant pipe without bubbles.
- Close bleeder screw.
- On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
- Tighten filler cap on expansion tank.
- Start engine.
- Set heater/air conditioner on both sides to „HI“.
- Run the engine for 3 minutes at 2000 rpm.
- Allow the engine to run at idling speed until the two large coolant hoses at main radiator become warm.
- Run the engine for 1 minute at 2000 rpm.
- Switch off ignition and allow engine to cool down.



- Check coolant level.
- The coolant level must be at the MAX marking when the engine is cold.
- The coolant level can be above the MAX marking when the engine is warm.



1.4 Thermostat - exploded view

1 - O-ring

- ☐ Renew

2 - Thermostat

- ☐ With hose connection
- ☐ Removing and installing
⇒ [page 143](#)
- ☐ Starts to open at approx.
87°C

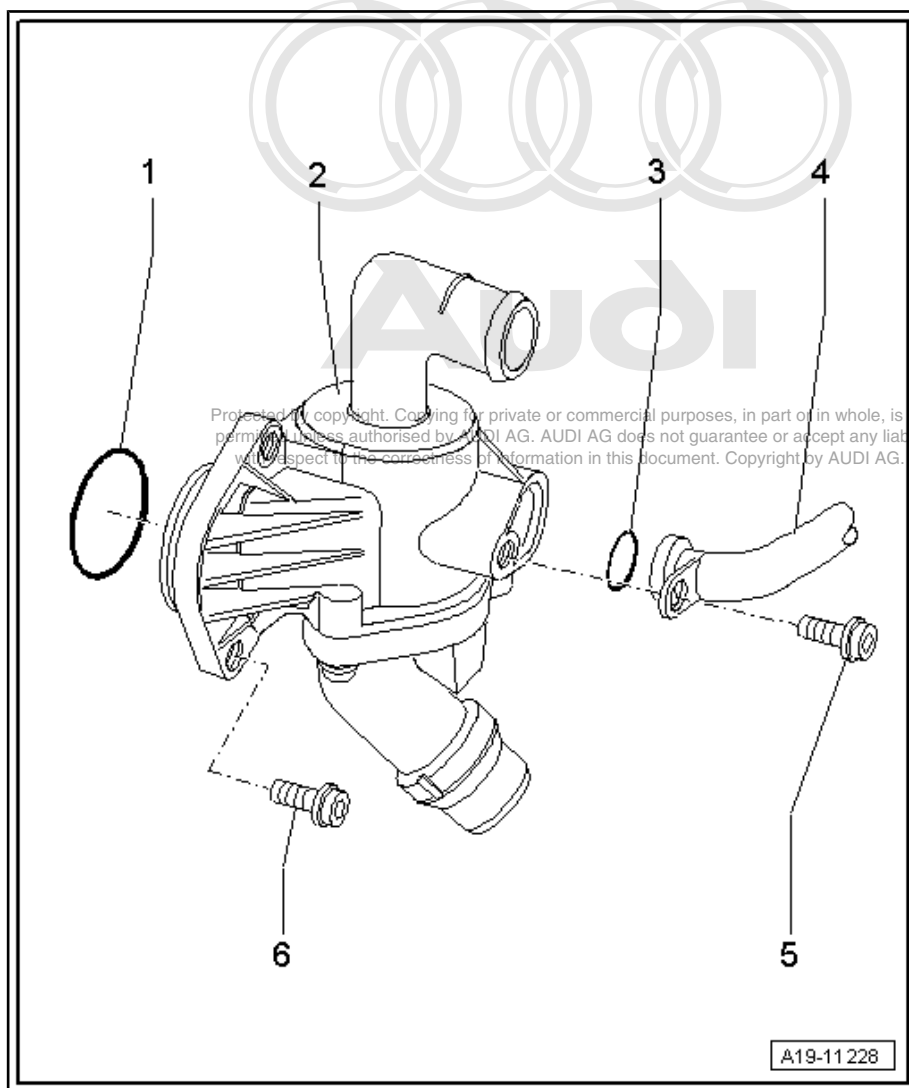
3 - O-ring

- ☐ Renew

4 - Coolant pipe (bottom)

5 - 10 Nm

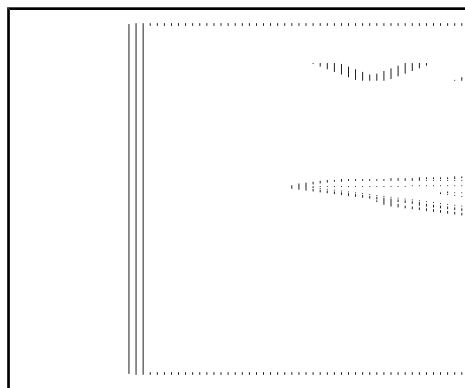
6 - 15 Nm



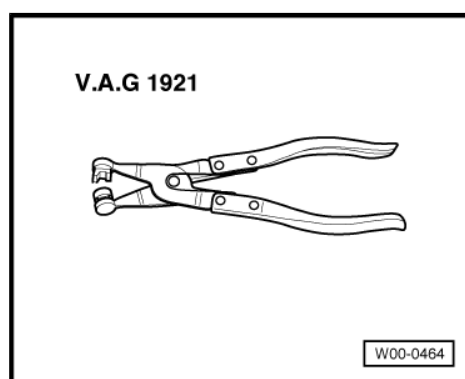
1.5 Removing and installing thermostat

Special tools and workshop equipment required

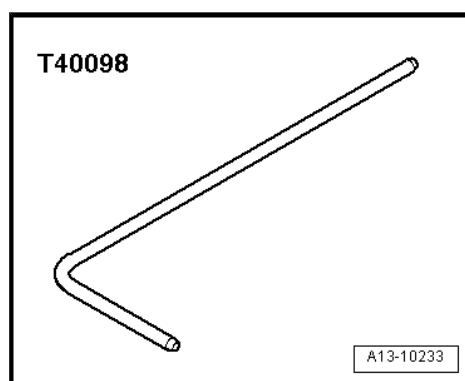
- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Hose clip pliers -V.A.G 1921-



- ◆ Locking pin -T40098-



Removing

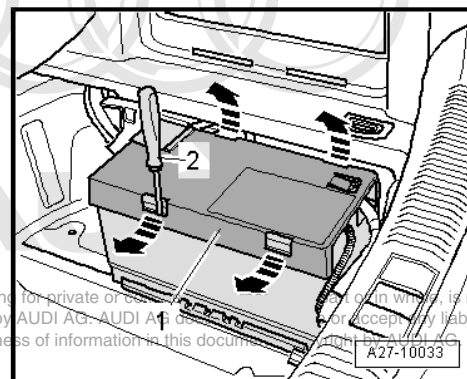
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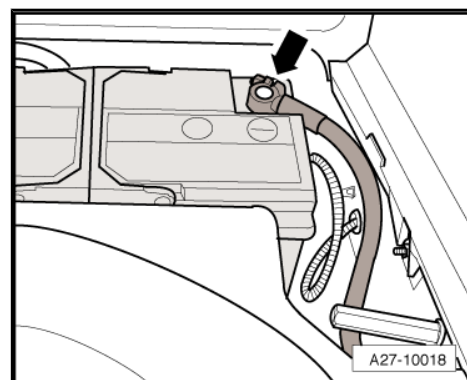
WARNING

Observe notes on procedure for disconnecting battery ⇒ Electrical system; Repair group 27.

- Take out luggage compartment floor trim.
- Use screwdriver -2- to release retaining clips -arrows- and detach cover -1- for negative terminal post.



- Disconnect earth cable -arrow- at battery.

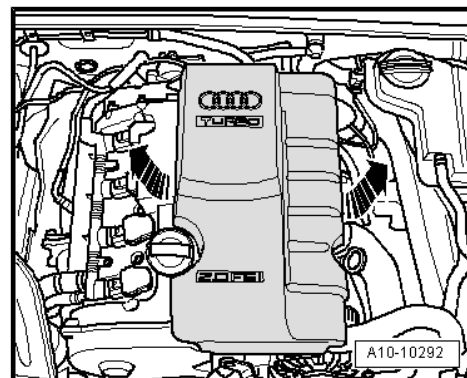


- Pull off engine cover panel -arrows-.

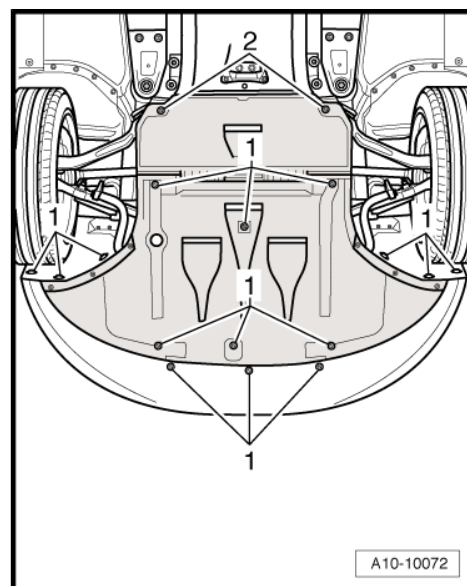
**WARNING**

Hot steam/hot coolant can escape - risk of scalding.

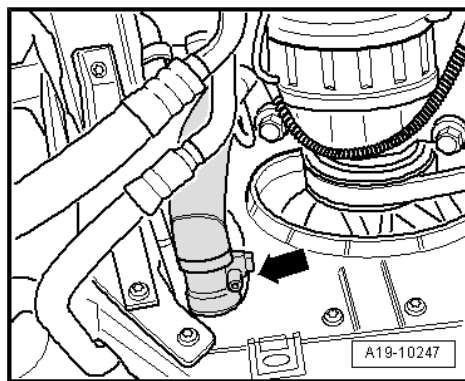
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



- Open filler cap on coolant expansion tank.
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Drain off coolant at coolant hose (bottom left) -arrow-.



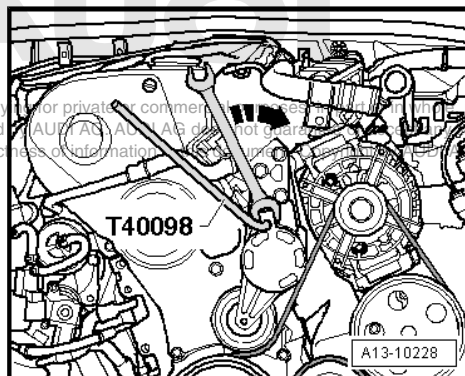
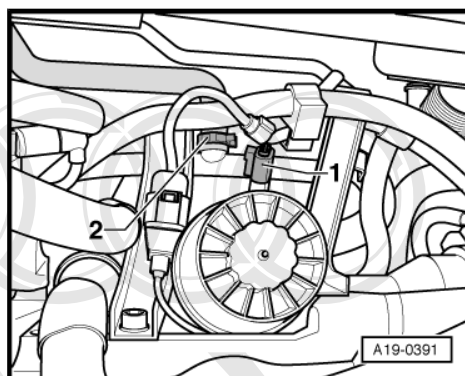
- Unplug electrical connector -1- from oil pressure sender.
- Also disconnect bottom coolant hose at coolant pipe -2-, and drain off remaining coolant.



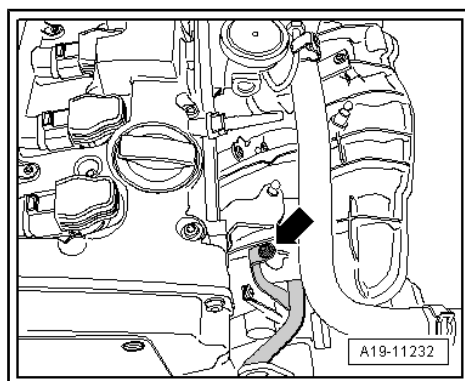
Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Mark direction of rotation of poly V-belt.
- To slacken poly V-belt, turn belt tensioner/damper in direction of -arrow-.
- Lock tensioner in position with locking pin -T40098-.
- Remove poly V-belt.
- Remove alternator ⇒ Rep. gr. 27 .
- Remove coolant pipes (at side) ⇒ [page 149](#) .



- Unbolt coolant pipe -arrow- from intake manifold and place on one side.



- Pull out retaining clip and disconnect coolant hose -1-.
- Remove bolts -2 and 3- and detach thermostat.

Installing

- Tightening torques
⇒ „1.4 Thermostat - exploded view“, page 143

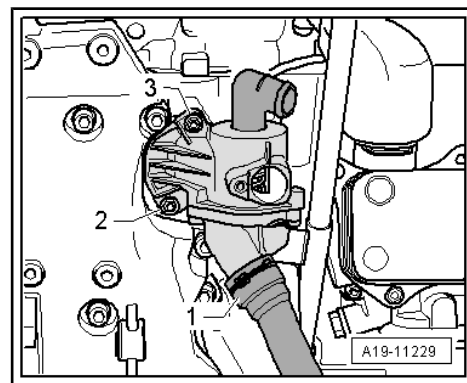
Installation is carried out in the reverse order; note the following:



Note

Renew O-ring.

- Clean and smoothen sealing surface for O-ring.
- Coat new O ring with coolant G12+.
- Install coolant pipes (at side) ⇒ [page 149](#) .
- Install alternator ⇒ Electrical system; Repair group 27 .
- Install poly V-belt ⇒ [page 32](#) .
- Connect battery. Procedures required ⇒ Electrical system; Repair group 27 . Fill up with coolant ⇒ [page 138](#) .

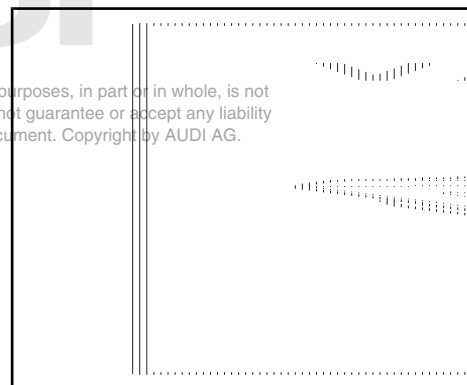


1.6 Removing and installing coolant pump

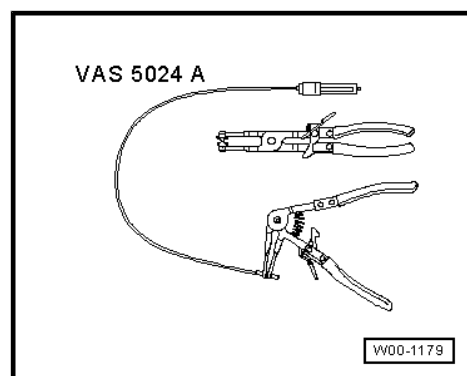
Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist -VAS 6208-

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- ◆ Spring type clip pliers -VAS 5024 A-



Removing



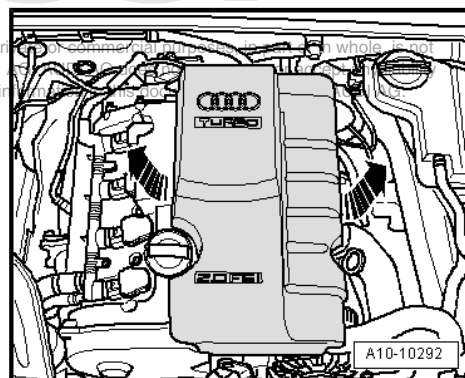
WARNING

Hot steam/hot coolant can escape - risk of scalding.

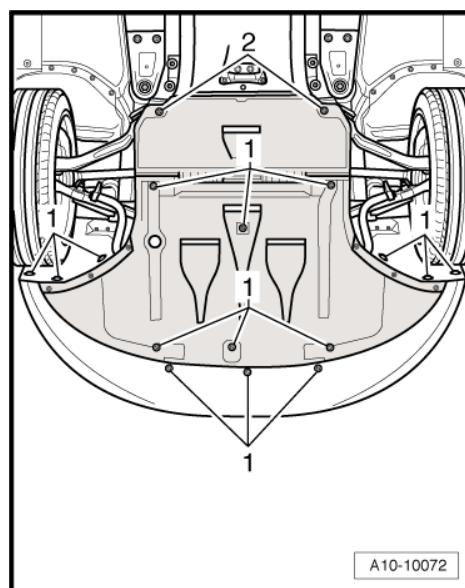
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Pull off engine cover panel -arrows-.

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- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .
- Remove toothed belt ⇒ [page 61](#) .

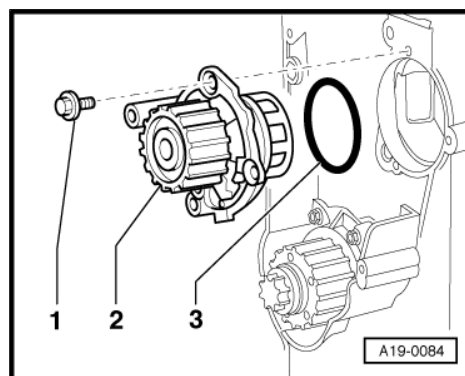


- Unscrew coolant pump securing bolts -1- and remove coolant pump -2-.
- Remove O-ring -3-.

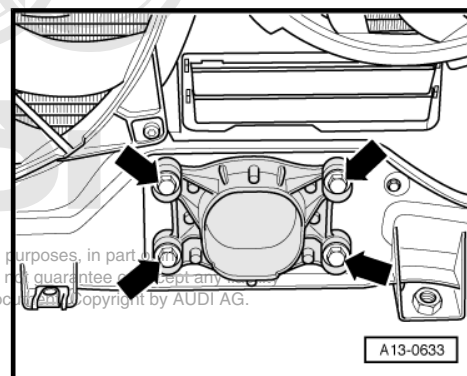
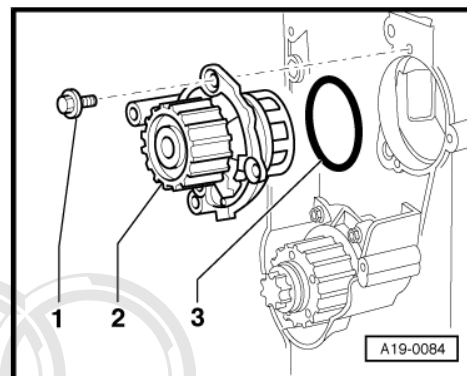
Installing

Installation is carried out in the reverse order; note the following:

- Clean and smoothen sealing surface for O-ring.



- Coat new O-ring -3- with coolant G12+.
- Fit coolant pump -2-.
- Installation position: Sealing plug in housing faces downwards.
- Tighten bolts -1- for coolant pump to 15 Nm.
- Install toothed belt ⇒ [page 61](#) .
- Install poly V-belt ⇒ [page 32](#) .
- Fill up with coolant ⇒ [page 138](#) .
- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .



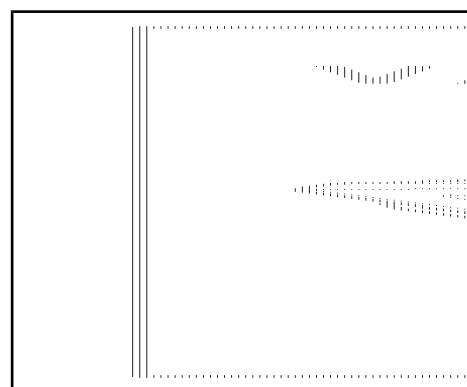
Tightening torques

Component	Nm
Coolant pump to cylinder block	15
Toothed belt cover to cylinder block	10 ¹⁾
• ¹⁾ Apply locking fluid when fitting	

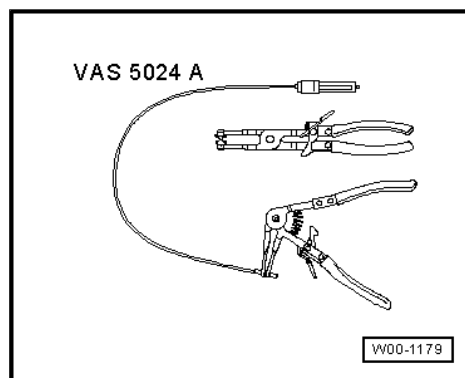
1.7 Removing and installing coolant pipes (at side)

Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Spring type clip pliers -VAS 5024 A-



Removing



WARNING

Hot steam/hot coolant can escape - risk of scalding.

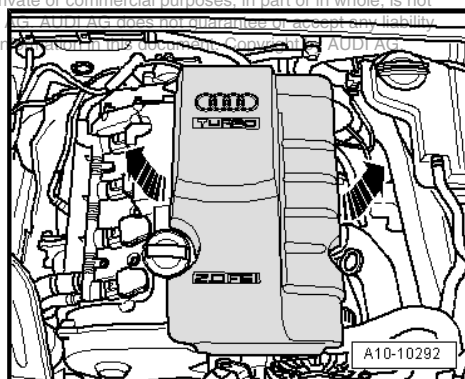
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.

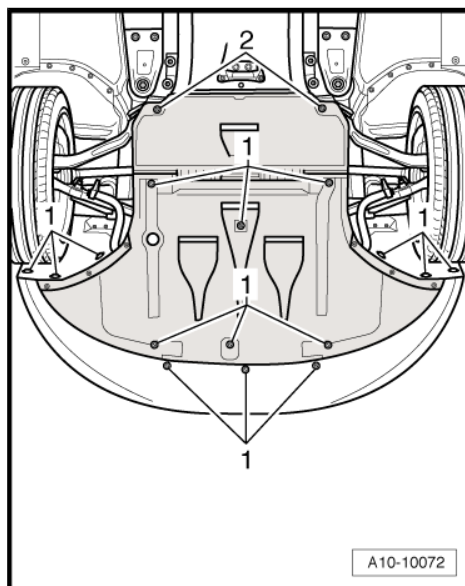
Removing

- Pull off engine cover panel -arrows-.

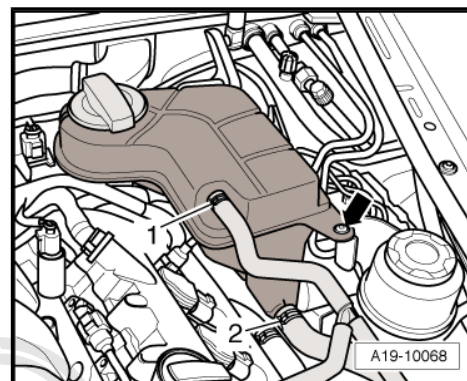
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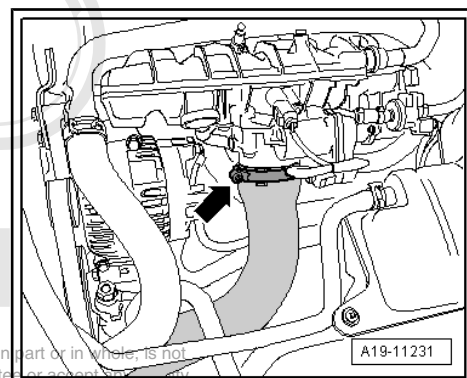
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .



- Disconnect coolant hoses -1 and 2- from coolant expansion tank.
- Unbolt coolant expansion tank -arrow-.
- Unplug electrical connector for coolant shortage indicator switch -F66- at bottom of coolant expansion tank and take out switch.

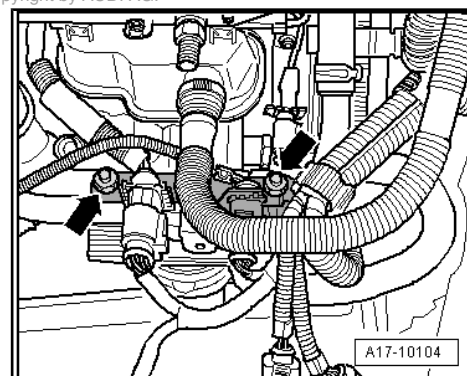


- Detach charge air hose -arrow- from intake manifold.



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- Unbolt bracket for connectors -arrows- from coolant pipe.
- Detach wiring harness from coolant pipes.



- Disconnect coolant hoses -arrows-.
- Remove bolts -1 ... 3- and detach coolant pipes.

Installing

Installation is carried out in the reverse order; note the following:

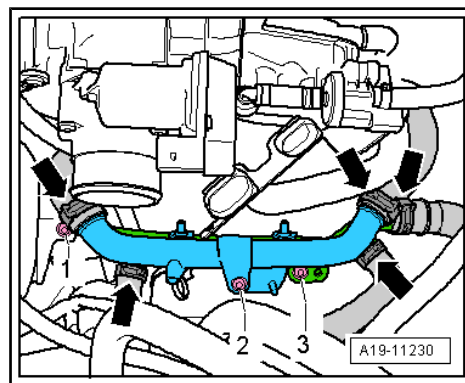


Note

- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- Before installing, clean and smoothen sealing surface for O-ring.
- Lubricate new O-ring with G12+ and slide onto coolant pipe.
- Fill up with coolant ⇒ [page 138](#) .

Tightening torques

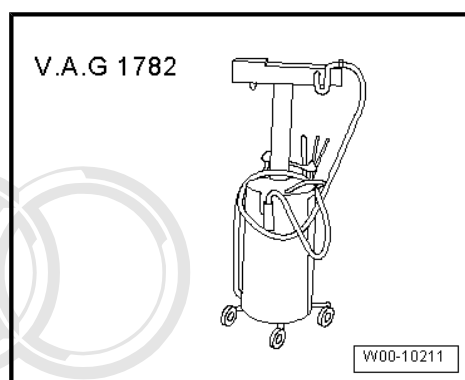
Component	Nm
Coolant pipe to cylinder block	10
Coolant pipe to thermostat housing	10



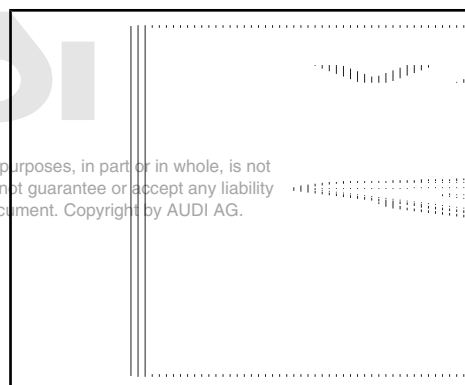
1.8 Removing and installing radiator

Special tools and workshop equipment required

- ◆ Used oil collection and extraction unit -V.A.G 1782- (only for vehicles with automatic gearbox)



- ◆ Drip tray for workshop hoist -VAS 6208-



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Removing



Note

Collect drained coolant in a clean container for re-use or disposal.

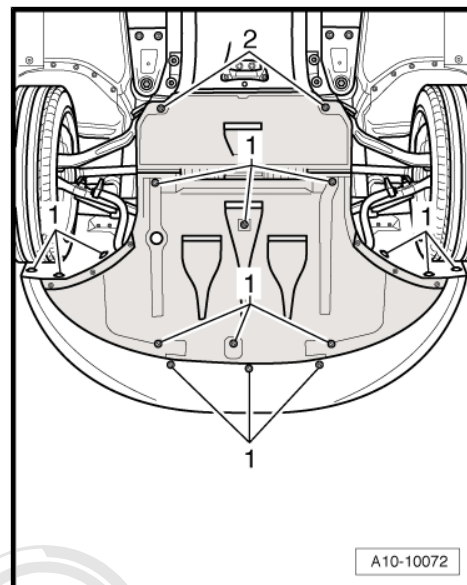


WARNING

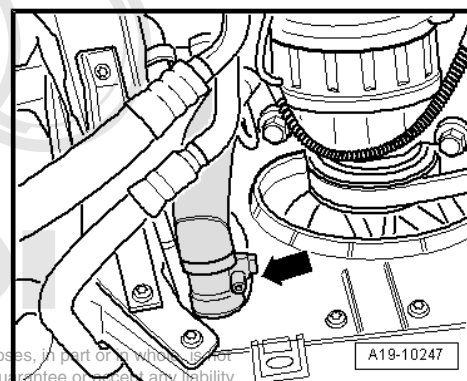
Hot steam/hot coolant can escape - risk of scalding.

- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Move lock carrier to service position ⇒ Rep. gr. 50 .

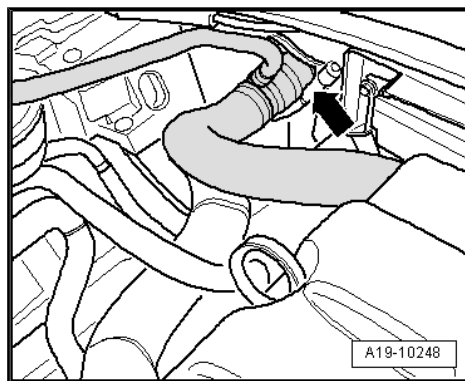


- Place drip tray for workshop hoist -VAS 6208- under engine.
- Drain off coolant at coolant hose (bottom left) -arrow-.
- Disconnect coolant hose.



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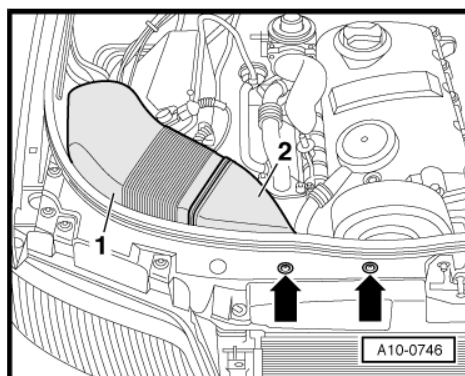
- Disconnect coolant hose at top left of radiator -arrow-.



- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.

Vehicles with automatic gearbox:

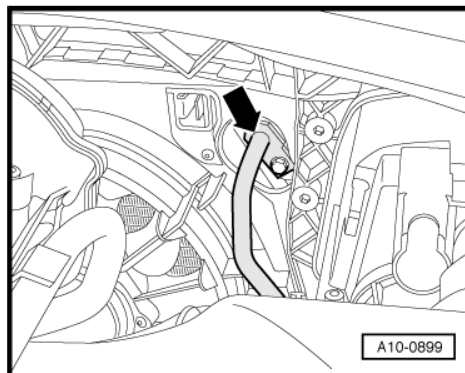
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Note

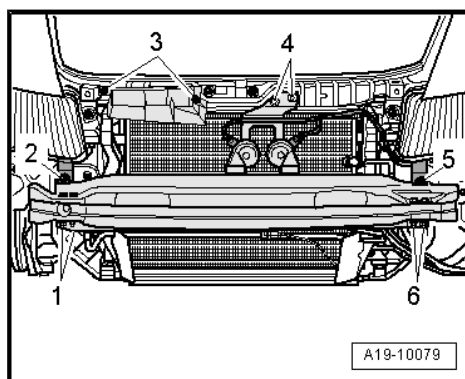
Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. gr. 37.

- Place used oil collection and extraction unit -V.A.G 1782- underneath.
- Remove ATF lines (top -arrow- and bottom) from radiator: ⇒ Rep. gr. 37.
- Tie ATF lines up onto longitudinal member to prevent fluid escaping.

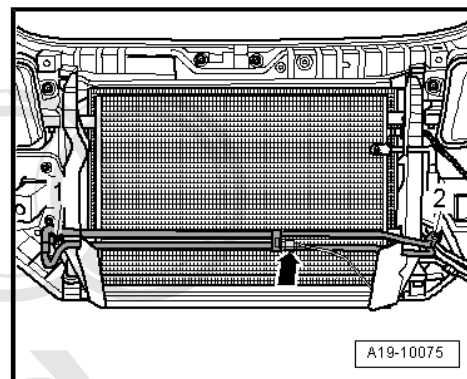


All vehicles:

- Unscrew bolts -3- and detach air duct.
- Unscrew bolts -4- and remove bracket for horns; electrical wiring remains attached.
- Unbolt brackets -2- and -5- for headlights.
- Unscrew nuts -1- and -6- and remove bumper.



- Unclip ambient temperature sensor -G17- -arrow- from bracket.
- Unscrew bolts -1- and -2- for power steering cooling pipe; the hydraulic hoses remain attached.

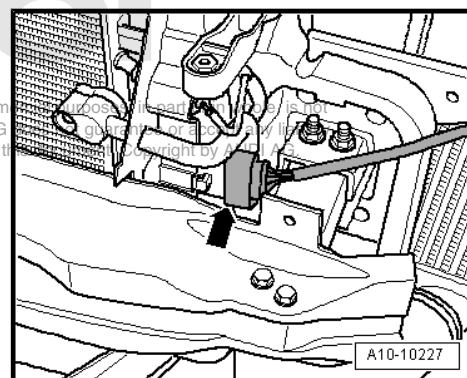


- Unplug electrical multi-pin connector -arrow-.
- Detach air ducts (left and right) from radiator.

**Caution**

The air conditioner refrigerant circuit must not be opened.

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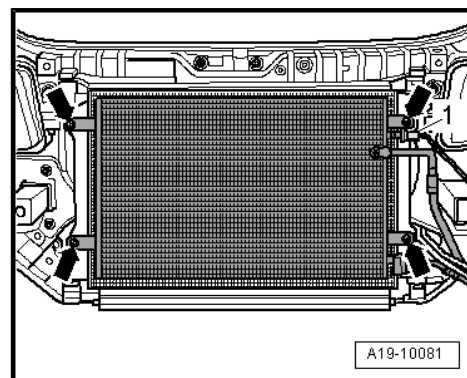


- Unplug electrical connector -1-.
- Remove bolts -arrows-.

**Note**

To prevent damage to the air conditioner compressor and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.

- Pivot condenser downwards with pipes/hoses attached.



- Release two retaining pins for radiator and pull out upwards -arrows-.
- Swivel radiator forwards and lift off.

Installing

Installation is carried out in the reverse order; note the following:



Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Parts catalogue*.

- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Fill up with coolant ⇒ [page 138](#) .



Note

The coolant in the entire system must be changed if the radiator is renewed.

Vehicles with automatic gearbox:

- Secure ATF lines ⇒ Rep. gr. 37 .
- Check ATF level ⇒ Rep. gr. 37 .

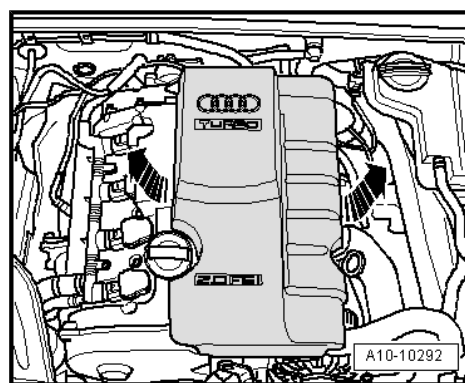
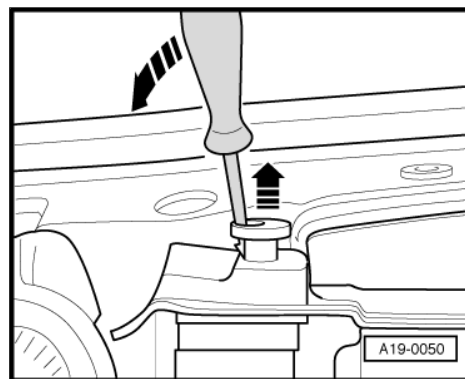
Tightening torques

Component	Nm
Condenser to lock carrier	6
Power steering cooling pipe to lock carrier	9
Bracket for horns to lock carrier	8

1.9 Removing and installing radiator cowl

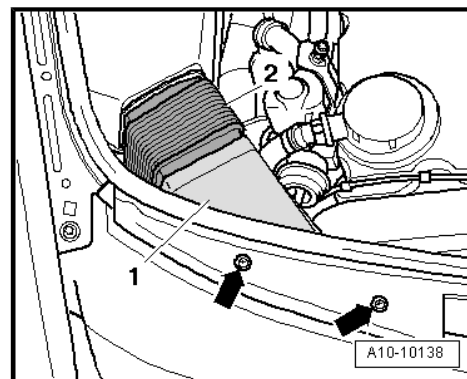
Removing

- Pull off engine cover panel -arrows-.



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- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.
- Move lock carrier to service position ⇒ Rep. gr. 50 .

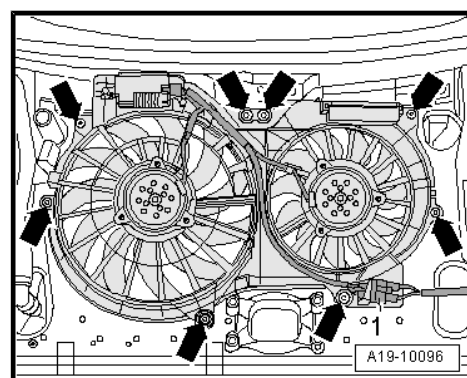


- Unplug electrical connector -1- for radiator fan.
- Unscrew bolts -arrows- and lift out radiator cowl.

Installing

Installation is carried out in the reverse order; note the following:

- Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .

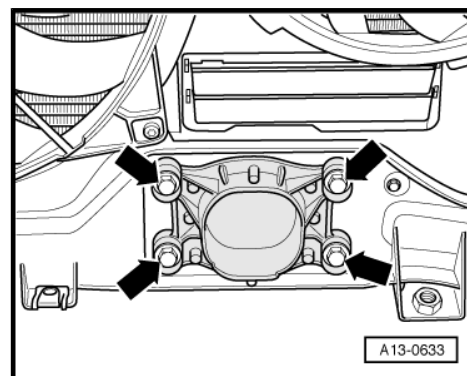


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- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .

Tightening torques

Component		Nm
Radiator cowl to	M6	11
Lock carrier	Panel bolt	2
Stop for torque reaction support		28



1.10 Removing and installing radiator fan

Removing

- Remove radiator cowl ⇒ [page 156](#) .
- Move wiring clear.

- Remove bolts -1 ... 8-.
- Remove radiator fan with control unit.

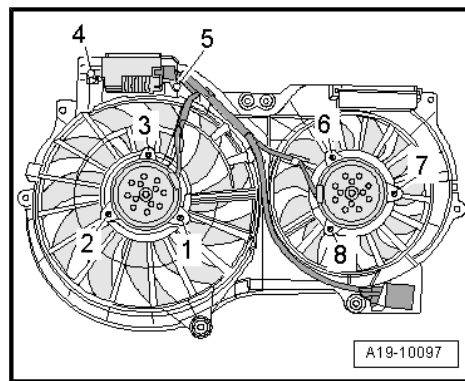
Installing

Installation is carried out in the reverse order; note the following:

- Install radiator cowl ⇒ [page 156](#) .

Tightening torque

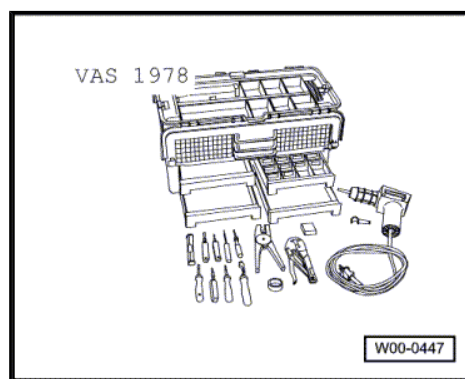
Component		Nm
Radiator fan to radiator cowl	Single fan	3
	Dual fan	4.5



1.11 Renewing radiator fan motor

Special tools and workshop equipment required

- ◆ Wiring harness repair set -VAS 1978-



Procedure



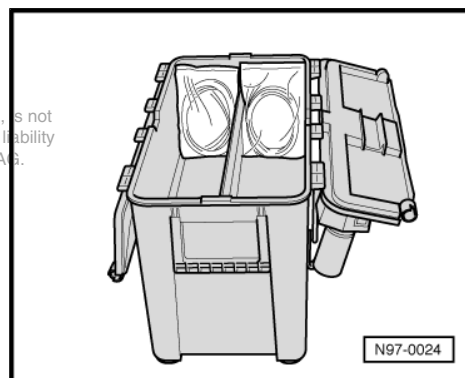
Note

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- ◆ *Replacement radiator fan control units and radiator fan motors are supplied without connectors.*
- ◆ *Perform repairs on wiring harness and connectors only with wiring harness repair set -VAS 1978- .*

Detailed instructions for using wiring harness repair set -VAS 1978- are given in the manual supplied with the repair set.

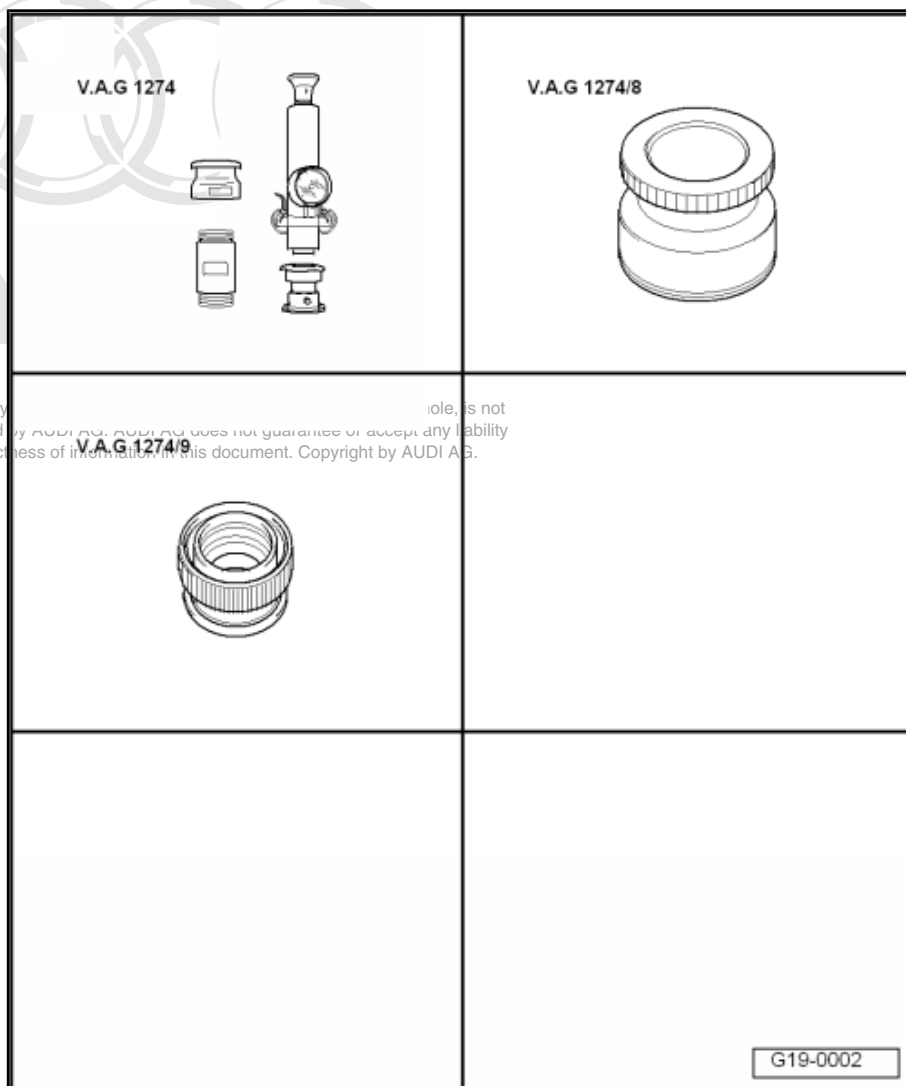
The repairing of open circuits and defective connectors is also explained by way of examples.



1.12 Checking cooling system for leaks

Special tools and workshop equipment required

- ◆ Cooling system tester - V.A.G 1274-
- ◆ Adapter for cooling system tester -V.A.G 1274/8-
- ◆ Adapter for cooling system tester -V.A.G 1274/9-



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Test condition

- Engine must be warm.

Test sequence**WARNING**

Hot steam/hot coolant can escape - risk of scalding.

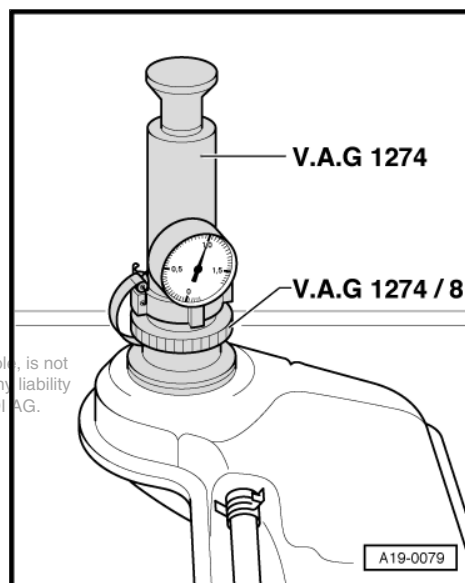
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.

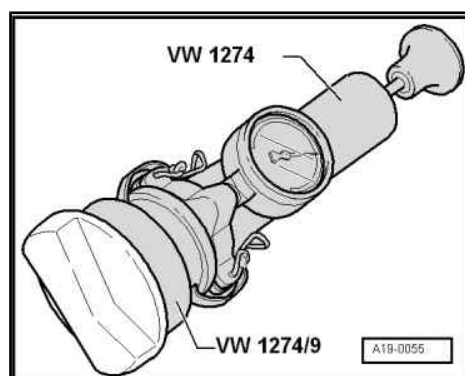
- Fit cooling system tester -V.A.G 1274- with adapter for cooling system tester -V.A.G 1274/8- on coolant expansion tank.
- Using hand pump on tester, build up a pressure of approx. 1.0 bar.
- If this pressure is not maintained, locate and rectify leaks.

Checking pressure relief valve in filler cap

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- Fit cooling system tester -V.A.G 1274- with adapter for cooling system tester -V.A.G 1274/9- on filler cap.
- Operate hand pump.
- ◆ The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

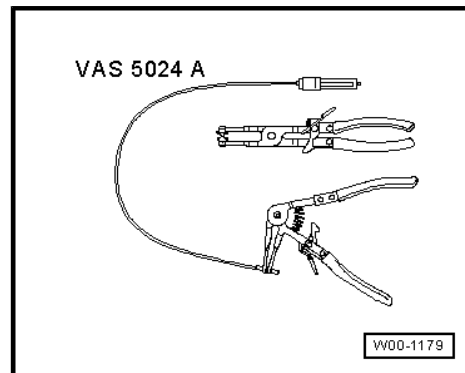


21 – Turbocharging/supercharging

1 Turbocharger

Note

- ◆ Observe the rules for cleanliness ⇒ [page 5](#) .
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment).
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly. However (applies only to plug-in connectors); the seal and the sealing surface of plug-in connectors should be lubricated lightly with oil ⇒ [page 161](#) .
- ◆ Charge air system must be free of leaks.
- ◆ Renew self-locking nuts.
- ◆ Hose clip pliers -VAS 5024A- or spring-type clip pliers -V.A.G 1921- are recommended for installing spring-type hose clips.
- ◆ Fill turbocharger with engine oil at connection for oil supply line.
- ◆ After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.



Fitting hose connections with plug-in connectors ⇒ [page 161](#) .

1.1 Fitting hose connections with plug-in connectors



Caution

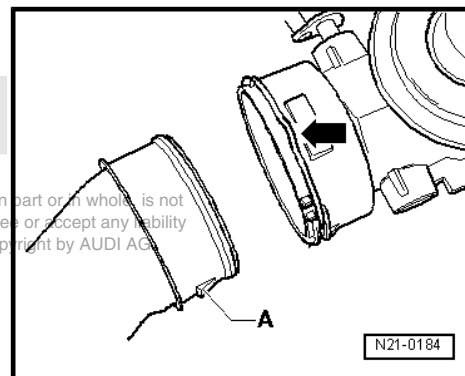
The seal in the plug-in connector can be damaged if the securing clip is in the locked position when fitting the connector. This can cause leakage. Note assembly instructions.

Removing:

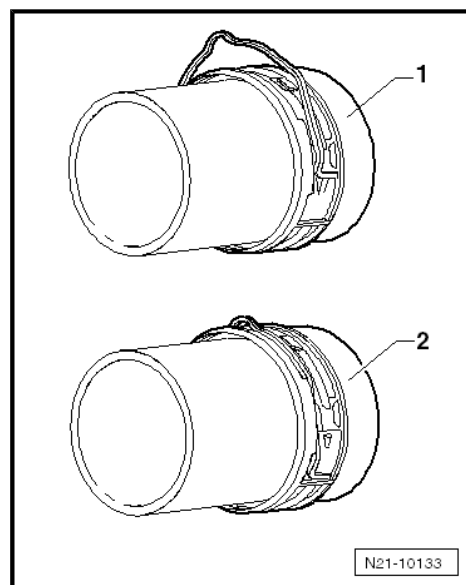
- Release plug-in connector by pulling out retaining clip -arrow-. Disconnect pipe/hose (do not use tools of any kind).

Installing

- When renewing seal, fit seal in groove on charge air hose. Make sure that the seal is correctly seated in the groove all round the complete circumference and that it is not twisted.
- Lubricate sealing surface and seal with oil.



- Move securing clip to released position -1-.
- Push charge air hose into connector as far as stop.
- Move securing clip to locked position -2- and press charge air hose in once again.
- Then pull hose to check that it is fitted correctly and that plug-in connector is locked.



1.2 Turbocharger - exploded view

Part I

Part II ⇒ [page 163](#)

Part III ⇒ [page 164](#)

Part IV ⇒ [page 165](#)



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- 1 - Crankcase breather hose
- 2 - ACF line
- 3 - Vacuum unit for turbocharger

- ☐ Removing and installing
⇒ [page 173](#)
- ☐ Adjusting ⇒ [page 173](#)

4 - Seal

- ☐ Renew

5 - Nipple

6 - Hose

7 - 8 Nm

8 - Hose

9 - 3 Nm

10 - Charge pressure control solenoid valve -N75-

11 - Hose

12 - 7 Nm

13 - Bracket

14 - 7 Nm

15 - Turbocharger air recirculation valve -N249-

- ☐ Note installation position
⇒ [page 163](#)

16 - Seal

- ☐ Renew

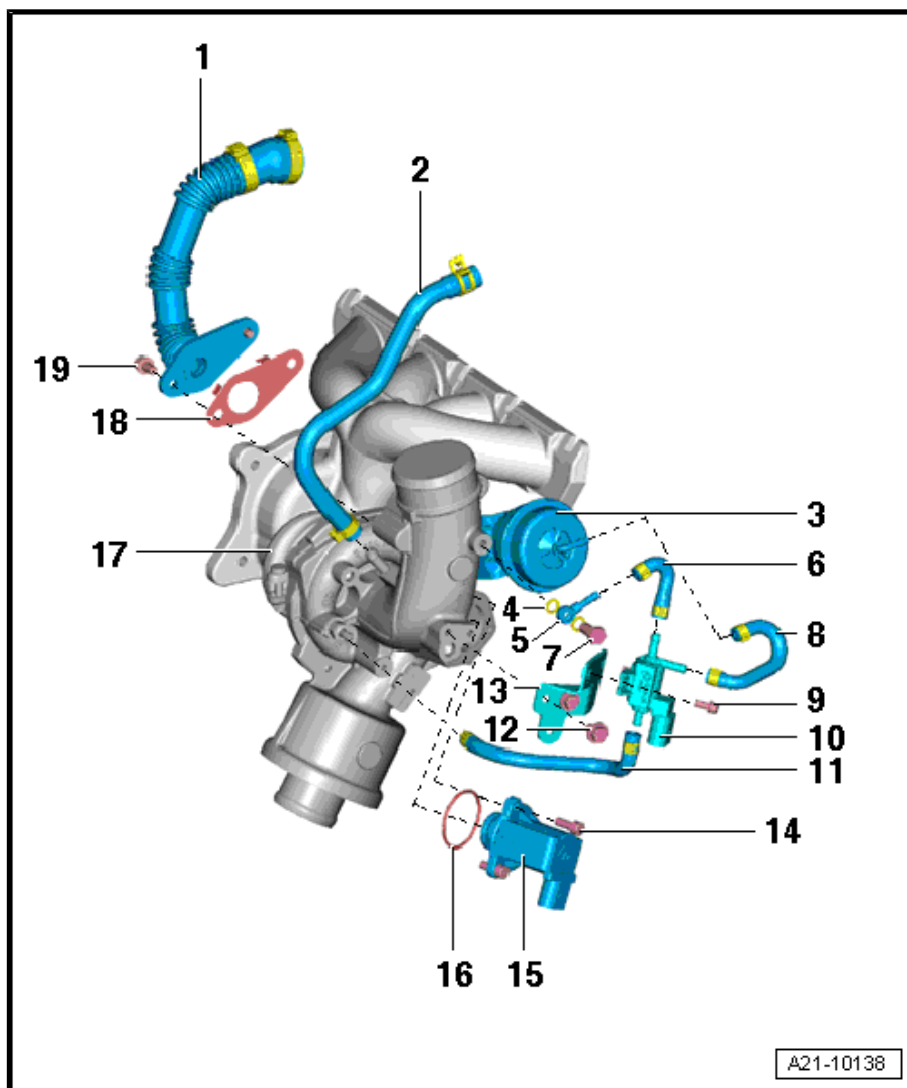
17 - Turbocharger

- ☐ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ☐ Removing and installing ⇒ [page 166](#)

18 - Gasket

- ☐ Renew

19 - 9 Nm



A21-10138

Fitting location of turbocharger air recirculation valve -N249-

- Heed installation position -arrows-

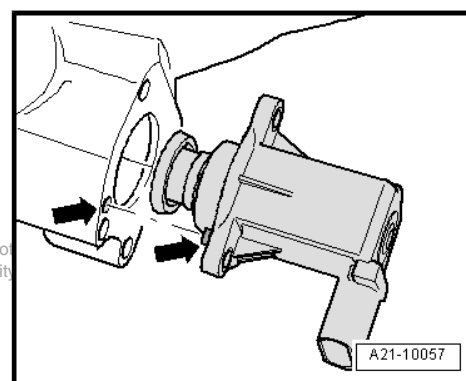
Part II

Part I ⇒ [page 162](#)

Part III ⇒ [page 164](#)

Part IV ⇒ [page 165](#)

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A21-10057

1 - Turbocharger

- ☐ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ☐ Removing and installing
⇒ [page 166](#)

2 - Seal

- ☐ Renew

3 - 35 Nm

4 - 9 Nm

5 - Coolant supply line

6 - 35 Nm

7 - 23 Nm

8 - Seal

- ☐ Renew

9 - 9 Nm

10 - Gasket

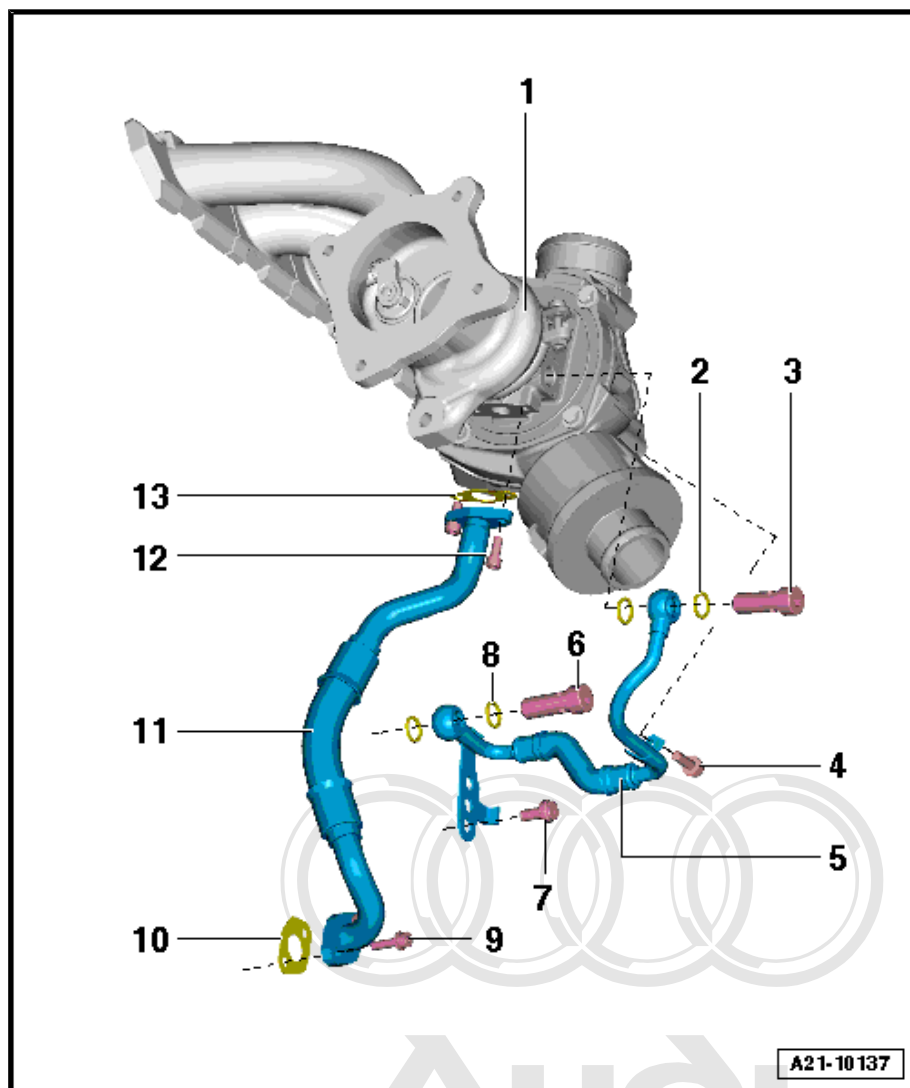
- ☐ Renew

11 - Oil return line

12 - 9 Nm

13 - Gasket

- ☐ Renew



Part III

Part I ⇒ [page 162](#)

Part II ⇒ [page 163](#)

Part IV ⇒ [page 165](#)

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1 - Gasket

- ☐ Renew

2 - 21 Nm

- ☐ Renew
- ☐ Coat studs of exhaust manifold with high-temperature paste
- ☐ High-temperature paste
⇒ Parts catalogue

3 - 35 Nm**4 - Seal**

- ☐ Renew

5 - Coolant return hose/pipe**6 - 9 Nm****7 - Turbocharger**

- ☐ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ☐ Removing and installing
⇒ [page 166](#)

8 - 30 Nm**9 - Seal**

- ☐ Renew

10 - Oil supply line**11 - 9 Nm****12 - 30 Nm****13 - Seal**

- ☐ Renew

14 - 23 Nm**15 - Bracket****16 - Support****17 - 30 Nm**

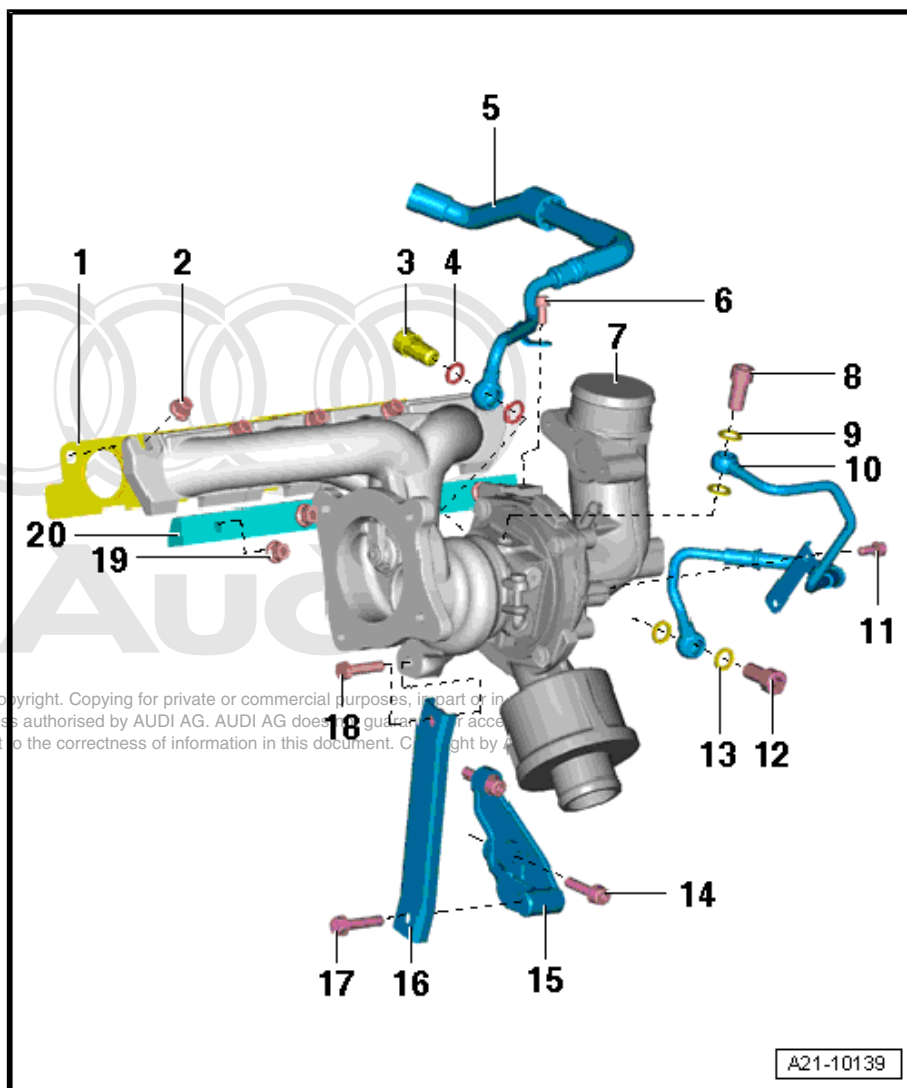
- ☐ Lubricate bolts with high-temperature paste
- ☐ High-temperature paste ⇒ Parts catalogue

18 - 30 Nm

- ☐ Lubricate bolts with high-temperature paste
- ☐ High-temperature paste ⇒ Parts catalogue

19 - 30 Nm

- ☐ Do not open when removing turbocharger
- ☐ Renew
- ☐ Coat studs of exhaust manifold with high-temperature paste
- ☐ High-temperature paste ⇒ Parts catalogue

20 - Fastening strip**Part IV**

Part I ⇒ [page 162](#)

Part II ⇒ [page 163](#)

Part III ⇒ [page 164](#)

1 - Turbocharger

- ☐ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ☐ Removing and installing ⇒ [page 166](#)

2 - Vacuum unit for turbocharger

- ☐ Checking ⇒ [page 171](#)
- ☐ Removing and installing ⇒ [page 173](#)
- ☐ Adjusting ⇒ [page 173](#)

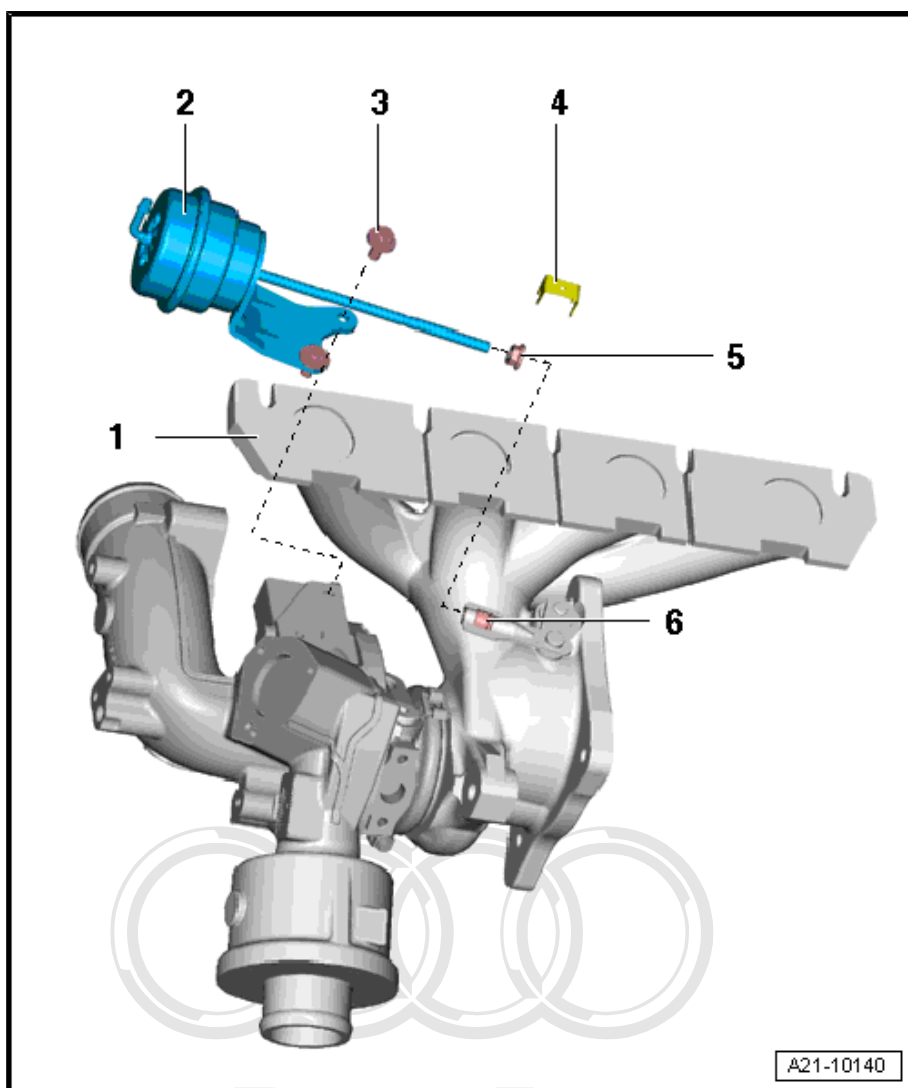
3 - 10 Nm

4 - Locking plate

5 - 9 Nm

- ☐ Secure with sealing paint
- ☐ Sealing paint ⇒ Parts catalogue

6 - Knurled nut



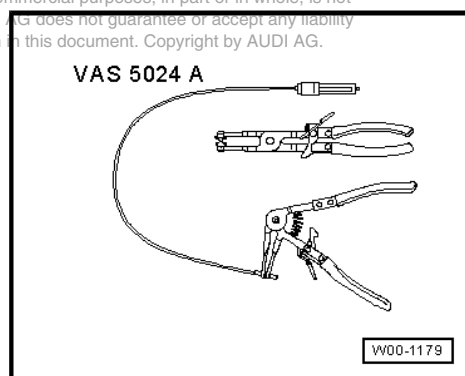
A21-10140

1.3 Removing and installing turbocharger

Special tools and workshop equipment required

- ◆ Spring type clip pliers -VAS 5024 A-

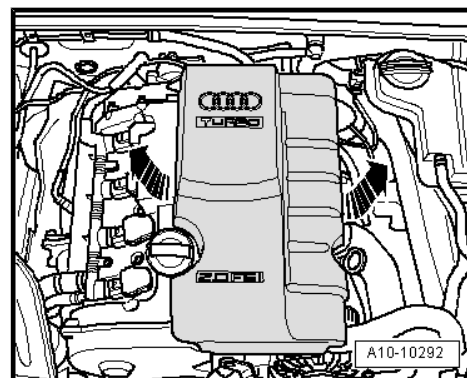
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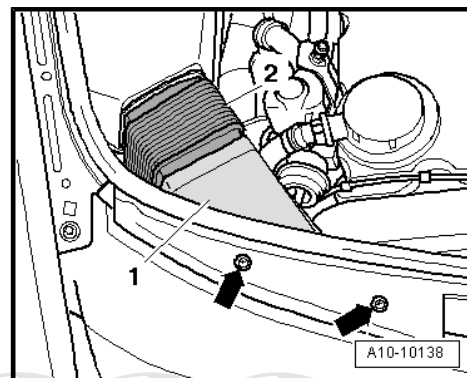
W00-1179

Removing

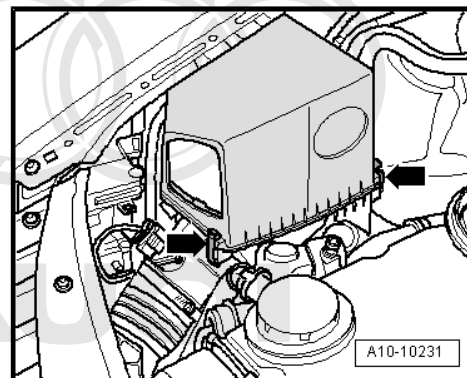
- Pull off engine cover panel -arrows-.



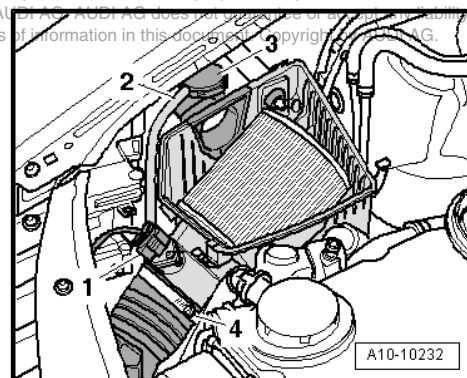
- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.



- Release two retaining clips -arrows- and detach top section of air cleaner housing.



- Unplug electrical connector -1- at air mass meter -G70-.
- Loosen hose clip -4- to remove air intake hose.
- Disconnect vacuum hose -2- (if fitted).
- Lift vacuum unit -3- (if fitted) with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.



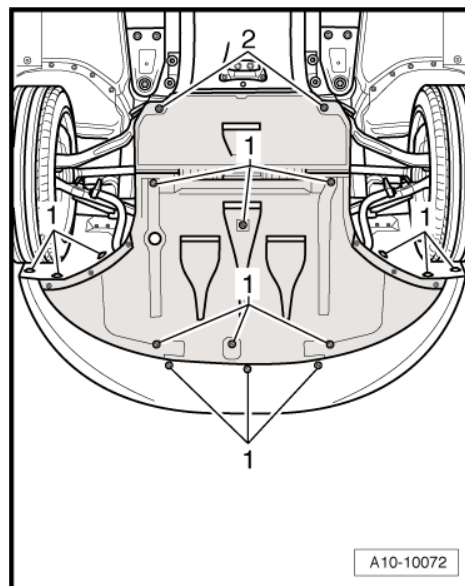
WARNING

Hot steam/hot coolant can escape - risk of scalding.

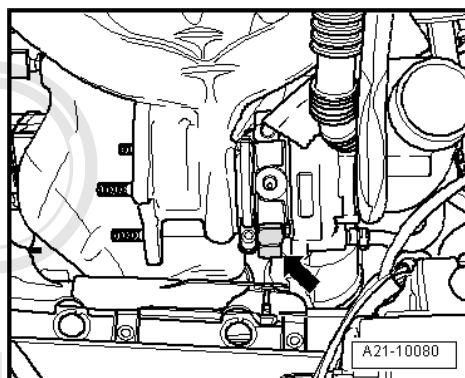
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

- Open filler cap on coolant expansion tank.

- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Drain off coolant ⇒ [page 138](#) .
- Remove catalytic converter ⇒ [page 186](#) .

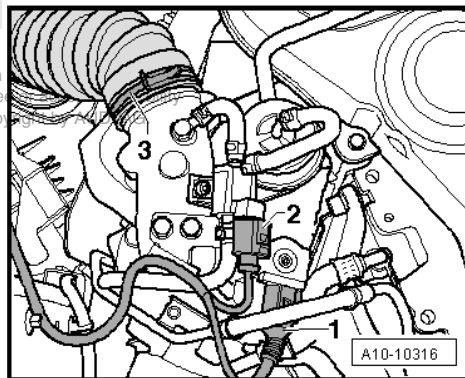


- Unbolt coolant supply line at turbocharger -arrow-.

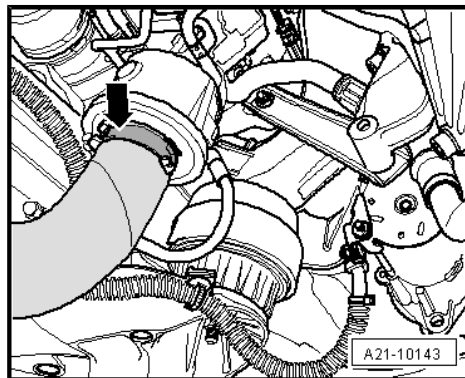


- Detach electrical connectors -1 and 2- and move wire clear.

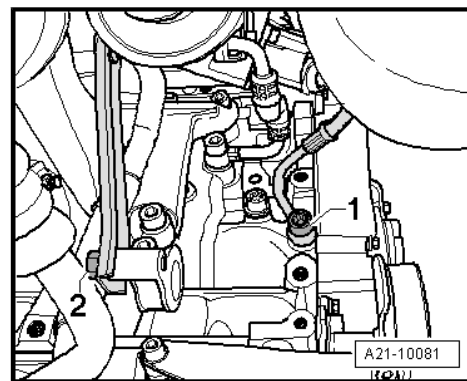
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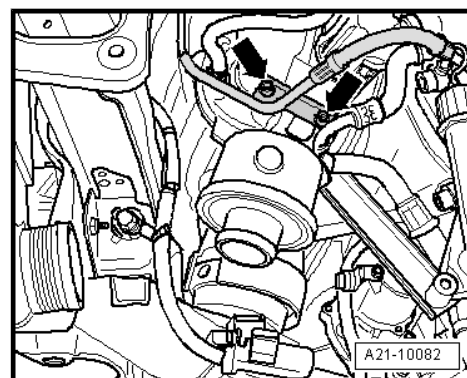
- Release hose clip -arrow- and disconnect air intake hose at turbocharger.



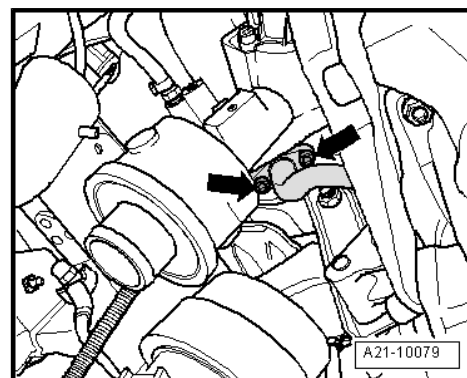
- Unscrew oil supply line for turbocharger at cylinder block -1-.
- Unscrew bolt -2- of support for turbocharger.



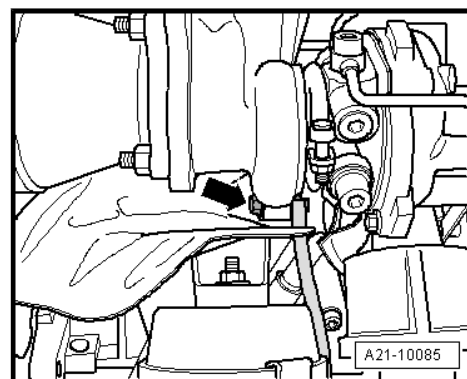
- Remove oil supply line for turbocharger -arrows-.



- Remove oil return line -arrows- at turbocharger.

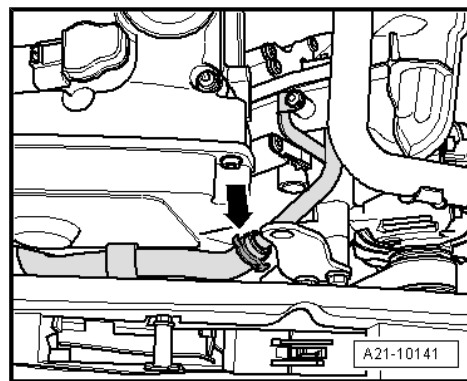


- Loosen bolt -arrow- of support for turbocharger 2 turns.

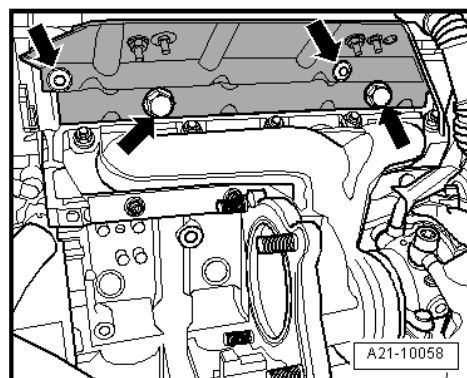


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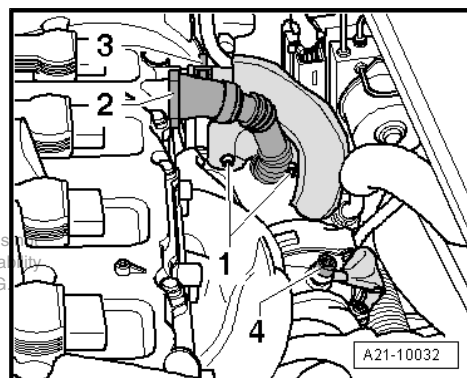
- Disconnect coolant hose -arrow-.



- Remove heat shield -arrows-.



- Unscrew crankcase breather line from turbocharger -1-.
- Disconnect crankcase breather line from cylinder head cover -2- and remove.
- Disconnect breather hose -3- (leading to turbocharger) from cylinder head cover.
- Unscrew oil supply line from turbocharger -4-.



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- Unscrew top nuts -arrows-.



Note

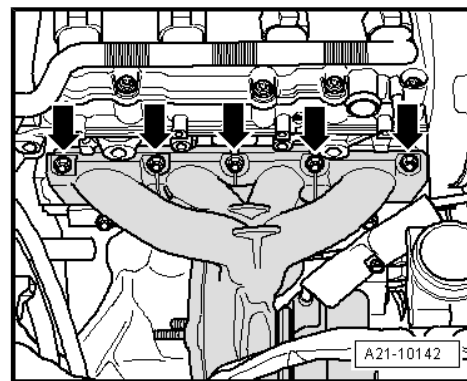
The nuts on the fastening strip (bottom) do not have to be loosened.

- Lift out turbocharger/exhaust manifold.

Installing

Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „1.2 Turbocharger - exploded view“, page 162



Note

- ◆ *Renew seals, gaskets and self-locking nuts.*
- ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Install exhaust system and align it free of stress
⇒ [page 188](#) .
- Fill up with coolant ⇒ [page 138](#) .
- Check oil level ⇒ Maintenance ; Booklet 4F .



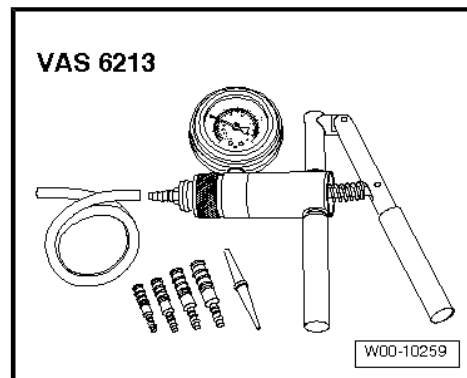
Note

After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.

1.4 Checking vacuum unit for turbocharger

Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-



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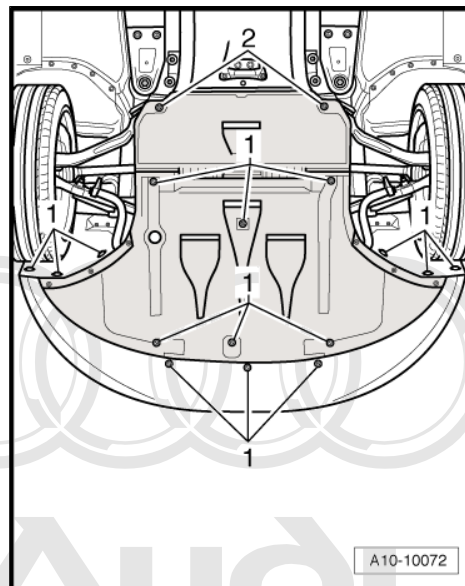
Test condition:

- ◆ Hose from turbocharger via charge pressure control solenoid valve -N75- to vacuum unit must not be blocked.

- ◆ Charge pressure control solenoid valve -N75- OK.

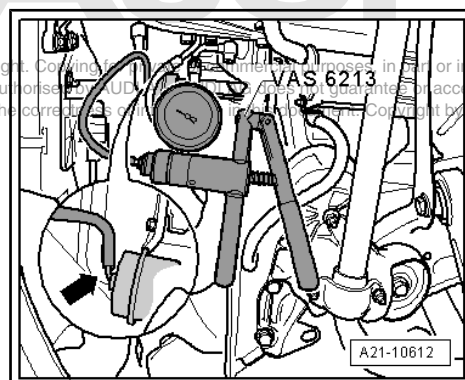
Procedure:

- Release quick-release fasteners -1- and -2- and take off noise insulation panels.



- Connect hand vacuum pump -VAS 6213- to vacuum unit -arrow-.

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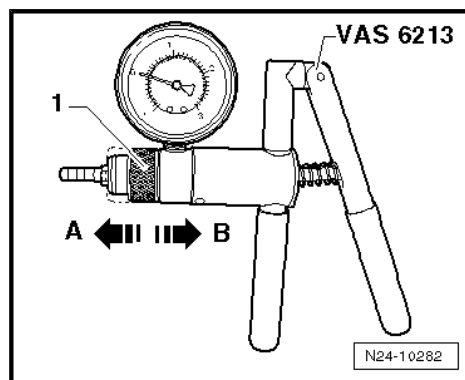


- Move adjuster ring -1- on hand vacuum pump -VAS 6213- to position -B- to select „pressure“.



Caution

The pressure must not exceed 750 mbar. The vacuum unit could be damaged if the pressure is exceeded.



- Operate hand vacuum pump -VAS 6213- several times and at the same time observe linkage.

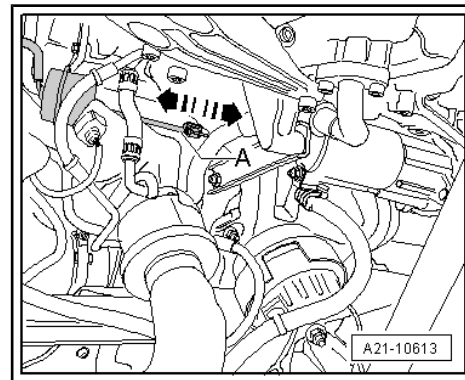
The linkage -A- should start to move at a pressure of approx. 300 mbar and be at its limit stop at a pressure of approx. 700 mbar.

The linkage should travel approx. 10 mm.



Note

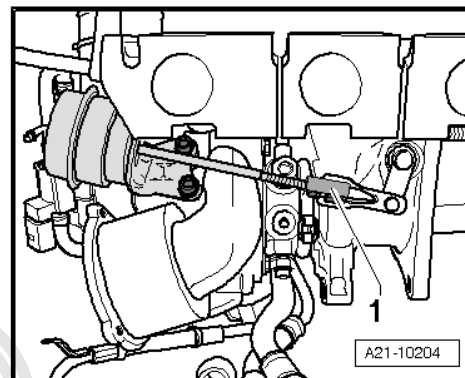
If it is not possible to build up pressure with hand vacuum pump -VAS 6213- or if the pressure drops again immediately, check hand vacuum pump -VAS 6213- and connecting hoses for leaks. If no fault is found: renew vacuum unit ⇒ [page 173](#).



1.5 Removing and installing vacuum unit for turbocharger

Removing

- Remove turbocharger ⇒ [page 166](#).
- Detach locking plate -1- on turbocharger linkage.

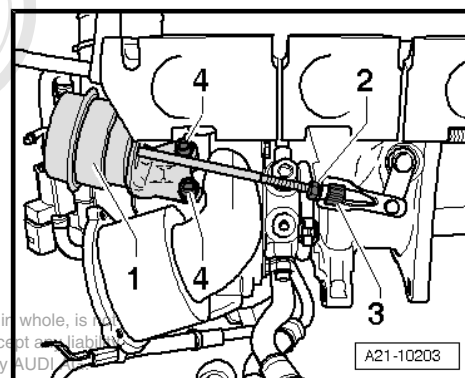


- Slacken lock nut -2-.
- Disconnect linkage from turbocharger -3-.
- Detach vacuum unit -1- from turbocharger -4-.

Installing

Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „1.2 Turbocharger - exploded view“, [page 162](#)
- Adjust vacuum unit for turbocharger ⇒ [page 173](#)
- Install turbocharger ⇒ [page 166](#).

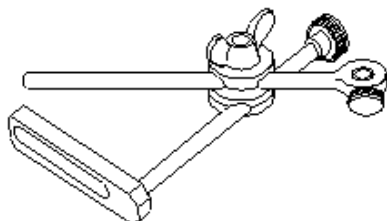
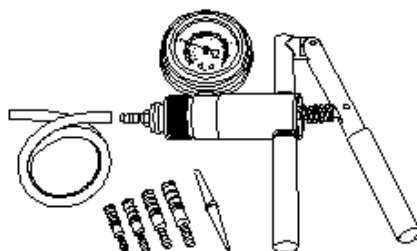
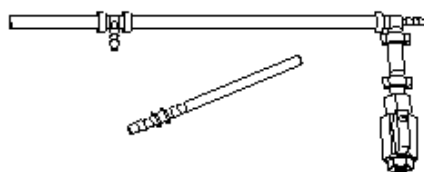
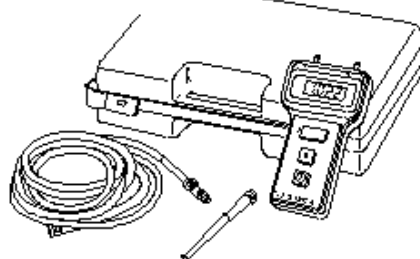


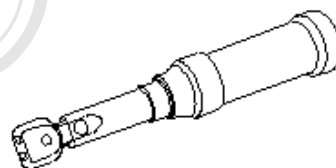
1.6 Adjusting vacuum unit for turbocharger

Turbocharger removed

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-
- ◆ Hand vacuum pump -VAS 6213-
- ◆ Pressure control valve - VAS 6342-
- ◆ Turbocharger tester -V.A.G 1397A-
- ◆ Dial gauge set, 4 pieces - VAS 6341-
- ◆ Torque wrench -V.A.G 1783-

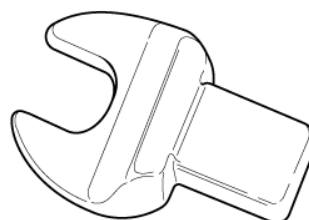
VW 387

VAS 6213

VAS 6342

V.A.G 1397 A

VAS 6341

V.A.G 1783


G21-10000

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- ◆ Open-end spanner insert AF 10 -V.A.G 1783/1-

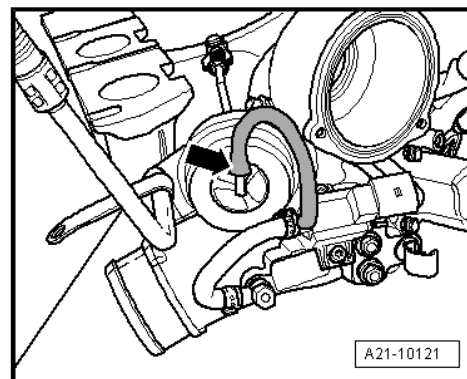
V.A.G 1783/1


W00-10097

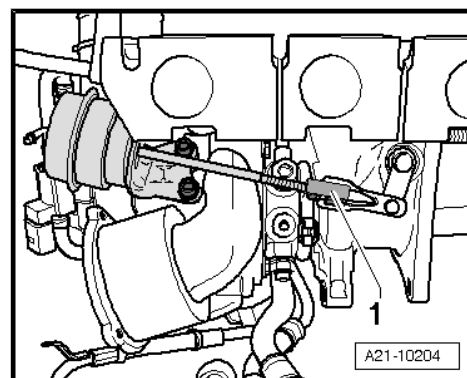
Adjusting

- Tightening torques ⇒ [page 165](#)

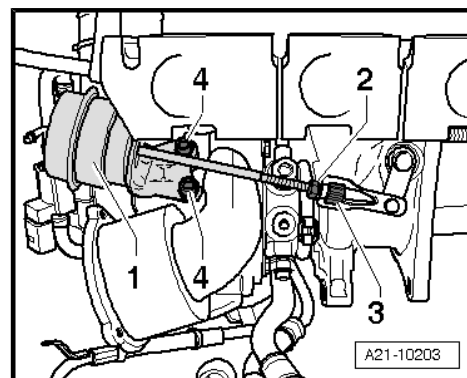
- Disconnect hose -arrow- at vacuum unit on turbocharger.



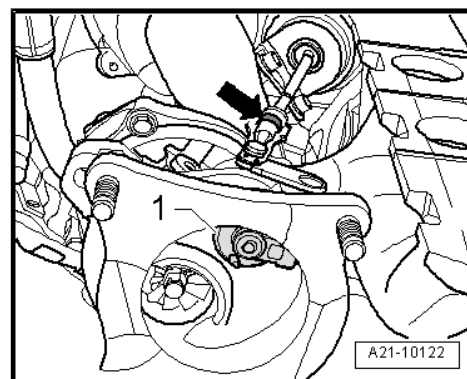
- Detach locking plate -1- on turbocharger linkage.



- Loosen lock nut -2-.

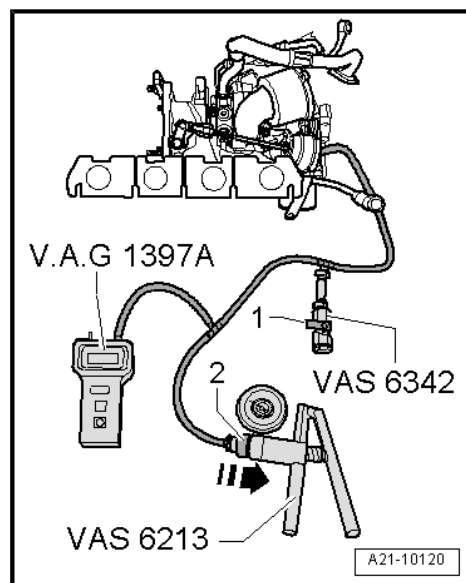


- Pre-adjust bypass flap -1- at knurled nut -arrow- so that bypass flap can still just be turned by hand.
- Hand-tighten lock nut.



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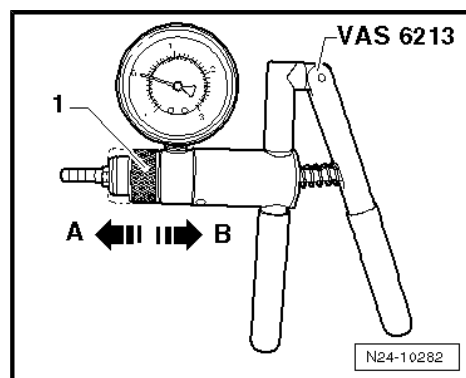
- Connect up hand vacuum pump -VAS 6213- , turbocharger tester -V.A.G 1397A- (connection II) and pressure control valve -VAS 6342- as shown in illustration.
- Close pressure control valve -VAS 6342- at lever -1-.



- Move adjuster ring -1- on hand vacuum pump -VAS 6213- to position -B- to select „pressure“.
- Switch on turbocharger tester -V.A.G 1397A- and set sliding switch to position II.



Audi



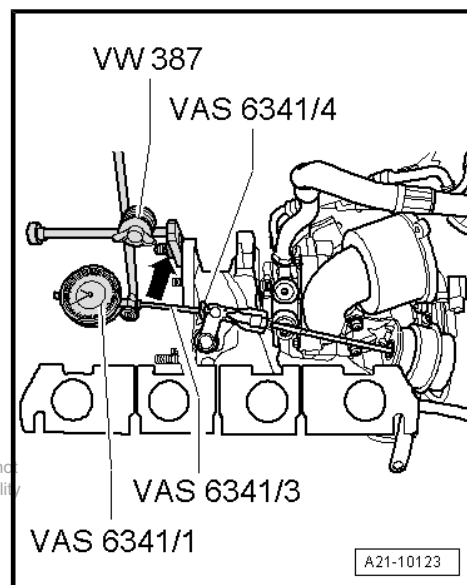
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- Secure universal dial gauge bracket -VW 387- to turbocharger -arrow-.

**Note**

The dial gauge values (mm) listed here include the 1 mm preload that is initially set on the gauge.

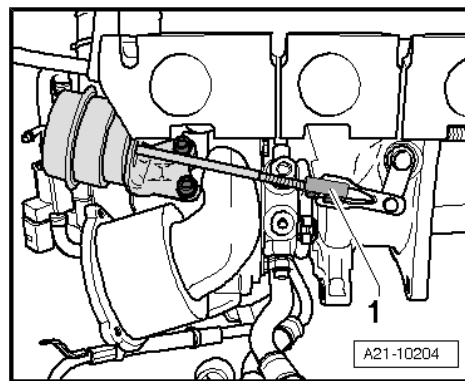
- Attach dial gauge -VAS 6341/1- with extension, 30 mm -VAS 6341/3- and flat probe -VAS 6341/4- to universal dial gauge bracket -VW 387-.
- With pressure at 0 bar, set dial gauge -VAS 6341/1- to 1 mm preload.
- Set scale of dial gauge -VAS 6341/1- to 0.
- **Make sure that dial gauge can move freely.**
- Operate hand vacuum pump -VAS 6213- until turbocharger tester -V.A.G 1397A- indicates 350 +/- 5 mbar.
- The dial gauge should now indicate a value between 4.1 mm and 4.3 mm. If not, turn knurled nut until this value is indicated.
- Hand-tighten lock nut.
- Repeat measurement.
- Vent system via pressure control valve -VAS 6342- so that pressure reading drops to 0 mbar.
- Set dial gauge -VAS 6341/1- to 0.

**Note**

The following measurements must be performed in continuous sequence. Do not allow the pressure to drop to 0 between measurements.

- Operate hand vacuum pump -VAS 6213- until turbocharger tester -V.A.G 1397A- indicates 350 +/- 5 mbar.
- Read off and note value indicated on dial gauge -VAS 6341/1-.
- Operate hand vacuum pump -VAS 6213- until turbocharger tester -V.A.G 1397A- indicates 650 to 700 mbar.
- Vent system via pressure control valve -VAS 6342- so that pressure reading drops to 350 +/- 5 mbar.
- Read off and note value indicated on dial gauge -VAS 6341/1-.
- Add values 1 and 2 together and divide by 2.
- The result (mean value) should be 5 +/- 0.25 mm.
- If the result (mean value) is not 5 +/- 0.25 mm, correct the setting accordingly, tighten the lock nut hand-tight and repeat the measurement.
- If the result (mean value) is 5 +/- 0.25 mm, tighten the lock nut and secure with sealing paint. For sealing paint refer to => Parts catalogue.

- Secure locking plate -1- on linkage of vacuum unit.



1.7 Charge air cooling - exploded view

1 - Air hose

- ☐ To lock carrier and turbocharger
- ☐ Must be free of oil and grease when installing

2 - Charge air cooler

- ☐ Removing and installing
⇒ [page 179](#)

3 - Hose clip (reinforced), 5.5 Nm

4 - Air hose

- ☐ To intake manifold
- ☐ Must be free of oil and grease when installing

5 - Seal

- ☐ Renew if damaged or leaking

6 - O-ring

- ☐ Renew

7 - Charge pressure sender - G31-

- ☐ Removing and installing
⇒ [page 180](#)

8 - 5 Nm

- ☐ Only in charge air cooler (left-side)

9 - Mountings

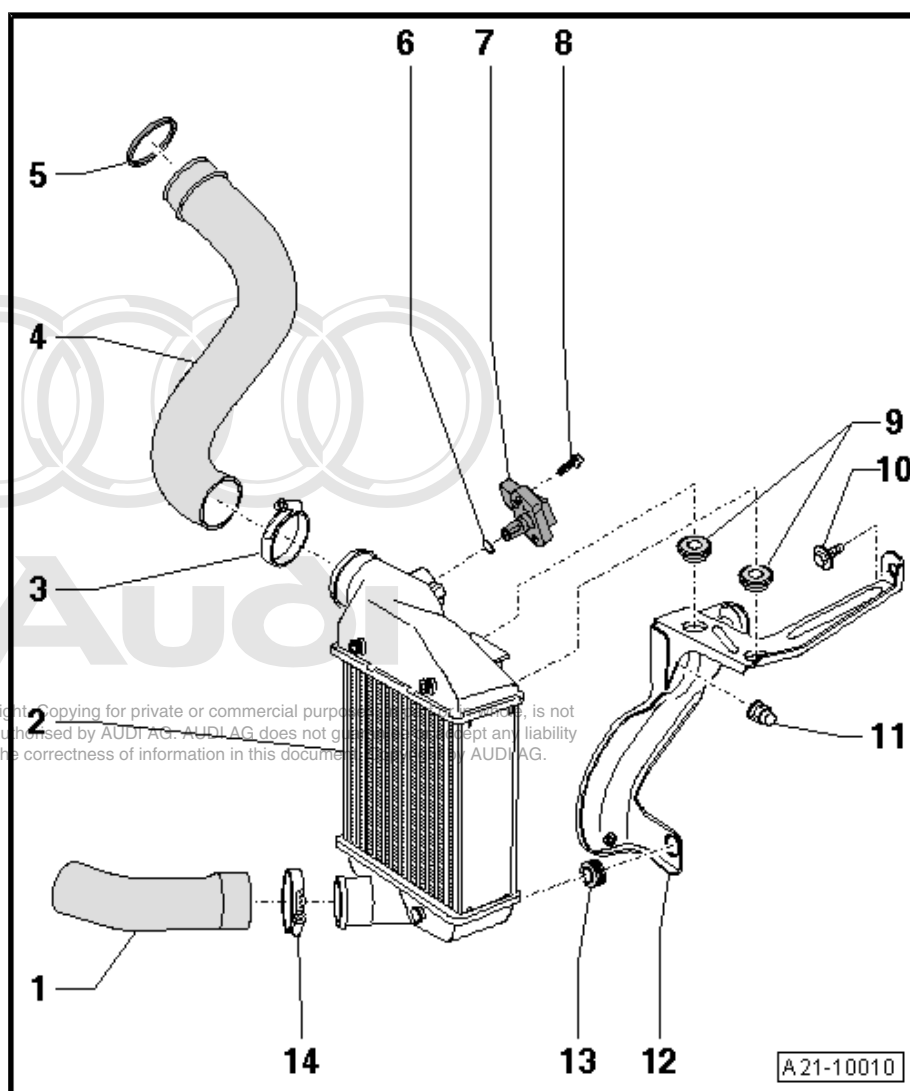
10 - 22 Nm

11 - 22 Nm

12 - Bracket for charge air cooler

13 - Rubber grommet

14 - Hose clip (reinforced), 5.5 Nm



1.8 Removing and installing charge air cooler

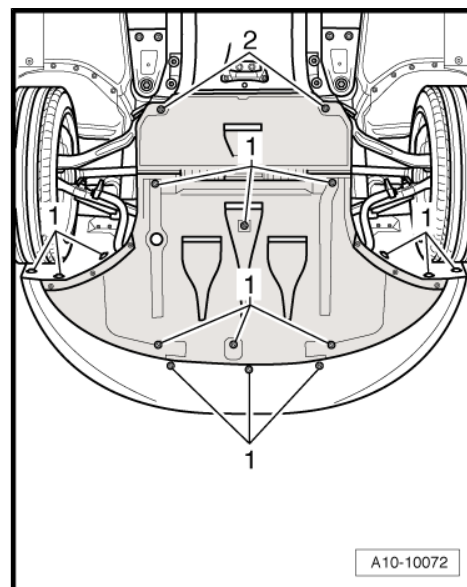


Note

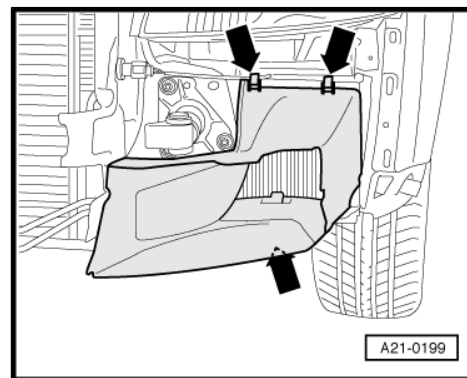
Check all hoses and pipes for correct fitting and leakage before carrying out tests or repairs.

Removing

- Release quick-release fasteners -1- and -2- and take off noise insulation panels.
- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Remove left headlight ⇒ Electrical system; Rep. gr. 94 .



- Remove air duct in front of charge air cooler -arrows-.



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- Unplug electrical connector -1- at charge pressure sender - G31- .
- Open hose clips -arrows- and disconnect air intake hoses.
- Detach charge air cooler by pulling upwards.

Installing

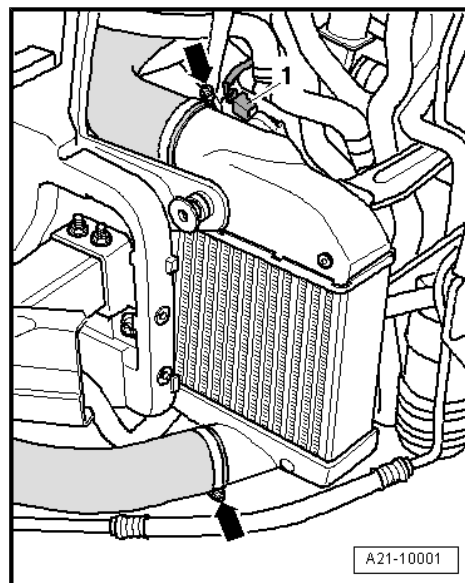
Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „1.7 Charge air cooling - exploded view“, page 178



Note

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Install headlight ⇒ Electrical system; Rep. gr. 94
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .



1.9 Removing and installing charge pressure sender -G31-

Removing

- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Remove left headlight ⇒ Electrical system; Rep. gr. 94 .
- Unplug electrical connector -1- at charge pressure sender - G31- .
- Remove bolts -2- and pull charge pressure sender -G31- out of charge air cooler.

Installing

Installation is carried out in the reverse order; note the following:

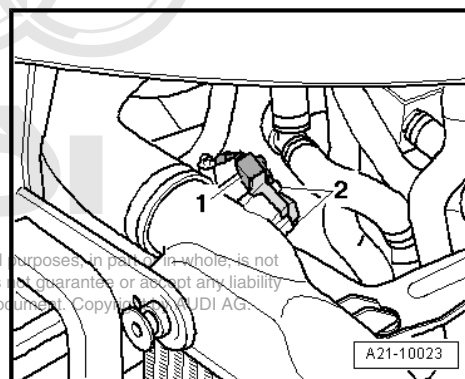
- Tightening torques
⇒ „1.7 Charge air cooling - exploded view“, page 178



Note

Renew O-ring.

- Install headlight ⇒ Electrical system; Rep. gr. 94
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 .
- Check headlight adjustment ⇒ Maintenance ; Booklet 4F .



26 – Exhaust system

1 Removing and installing parts of exhaust system

Note

- ◆ *The flexible joint (de-coupling element) in the front exhaust pipe must not be bent more than 10° – otherwise it can be damaged.*
- ◆ *Renew gaskets and self-locking nuts.*
- ◆ *After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.*
- ◆ *The exhaust manifold and the turbocharger are one component; removing and installing ⇒ [page 166](#).*

1.1 Silencers - exploded view

1 - Clamp (front)

- ☐ Installation position: bolt connection facing to the left.
- ☐ Installation position of bolts ⇒ [page 183](#)
- ☐ Before tightening, align exhaust system so it is free of stress ⇒ [page 188](#)
- ☐ Tighten bolt connections evenly

2 - 23 Nm

- ☐ Renew

3 - Front exhaust pipe

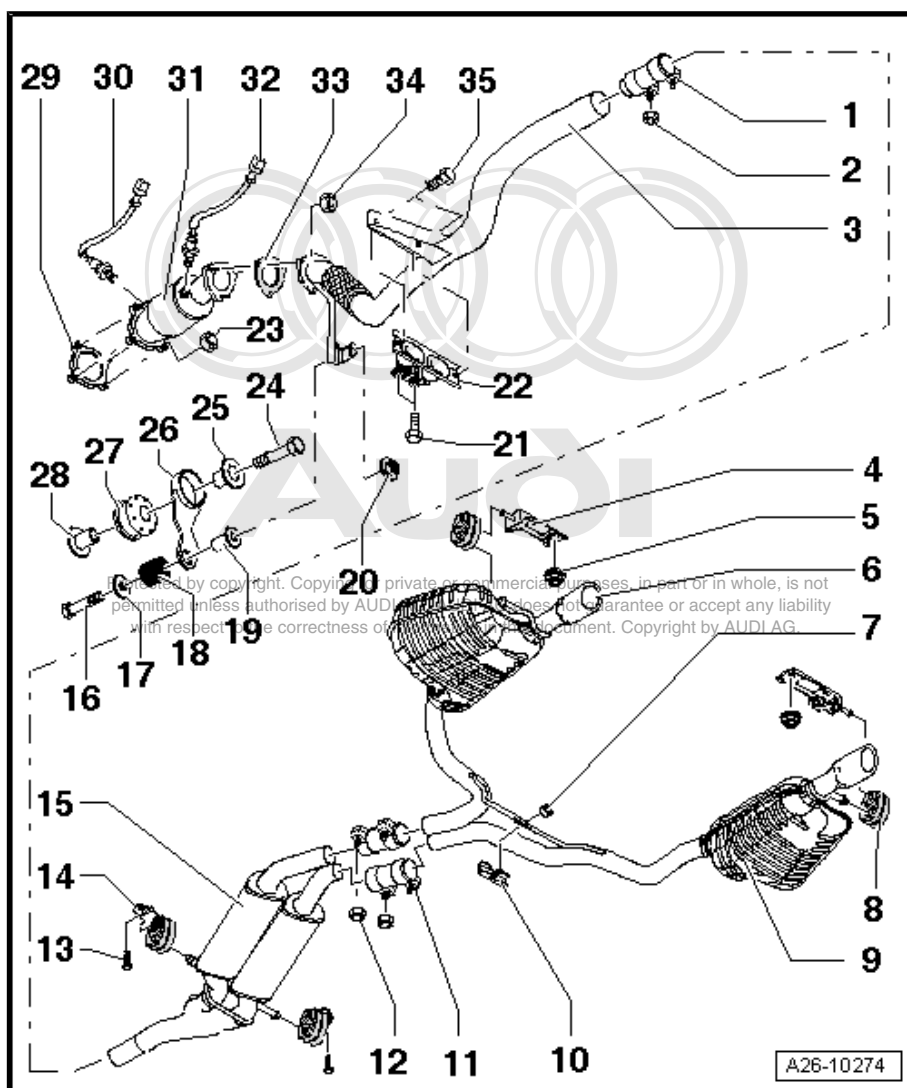
- ☐ With flexible joint
- ☐ Do not bend flexible joint more than 10° – otherwise it can be damaged
- ☐ Removing and installing ⇒ [page 185](#)

4 - Mounting

5 - 23 Nm

6 - Rear silencer

- ☐ For left side of vehicle
- ☐ Combined in one unit with centre silencer as original equipment. Can be renewed individually for repair purposes
- ☐ Cutting point ⇒ [page 184](#)





- ☐ Align exhaust system so it is free of stress ⇒ [page 188](#)

7 - 23 Nm

8 - Rubber mounting

- ☐ Renew if damaged
- ☐ Check preload ⇒ [page 188](#)

9 - Rear silencer

- ☐ For right side of vehicle
- ☐ Combined in one unit with centre silencer as original equipment. Can be renewed individually for repair purposes
- ☐ Cutting point ⇒ [page 184](#)
- ☐ Align exhaust system so it is free of stress ⇒ [page 188](#)

10 - Bracket

11 - Clamps (rear)

- ☐ For separate replacement of centre and rear silencers
- ☐ Before tightening, align exhaust system so it is free of stress ⇒ [page 188](#)
- ☐ Installation position: bolted connections facing outwards
- ☐ Installation position of bolts ⇒ [page 183](#)
- ☐ Tighten bolt connections evenly

12 - 23 Nm

- ☐ Renew

13 - 23 Nm

14 - Mounting

15 - Centre silencer

- ☐ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes
- ☐ Cutting point ⇒ [page 184](#)
- ☐ Align exhaust system so it is free of stress ⇒ [page 188](#)

16 - Bolt

17 - Washer

18 - Compression spring

19 - ~~Spacer sleeve~~

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20 - 25 Nm

- ☐ Renew

21 - 23 Nm

22 - Mounting

23 - 30 Nm

- ☐ Renew

24 - Bolt

25 - Spacer sleeve

26 - Bracket

27 - Buffer

28 - Spacer sleeve

29 - Gasket

- ☐ Renew

30 - Lambda probe -G39- and Lambda probe heater -Z19- (black connector)

- ☐ Tightening torque: 55 Nm
- ☐ Grease only the threads with high-temperature paste. The paste must not penetrate into the slots on the probe body.
- ☐ High-temperature paste ⇒ Parts catalogue
- ☐ Removing and installing ⇒ Rep. gr. 24

31 - Catalytic converter

- ☐ Protect against knocks and impact
- ☐ Removing and installing ⇒ [page 186](#)

32 - Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- (brown connector)

- ☐ Tightening torque: 55 Nm
- ☐ Grease only the threads with high-temperature paste. The paste must not penetrate into the slots on the probe body.
- ☐ High-temperature paste ⇒ Parts catalogue
- ☐ Removing and installing ⇒ Rep. gr. 24

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33 - Gasket

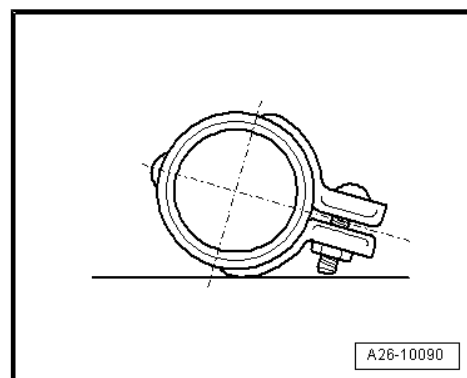
- ☐ Renew

34 - 25 Nm

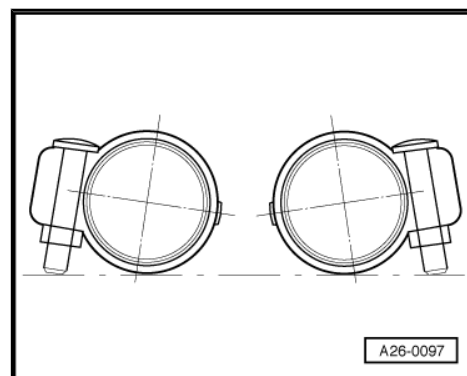
- ☐ Renew

35 - 23 Nm**Installation position of front clamp**

- Install clamp so that ends of bolts do not protrude beyond bottom of clamp.
- Bolt connection faces to right.

**Installation position of rear clamps**

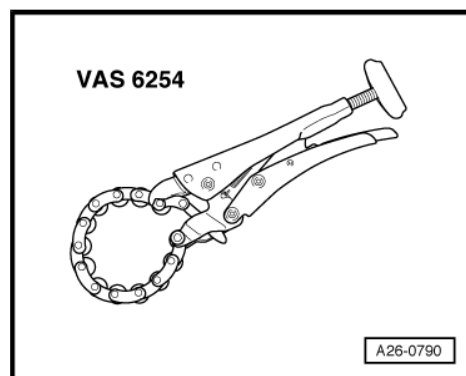
- Fit clamps so that ends of bolts do not protrude beyond bottom of clamp.
- Bolted connections face outwards.

**1.2 Separating centre and rear silencers**

- ◆ The connecting pipe can be cut through at the cutting location in order to renew the centre and rear silencers separately.
- ◆ The cutting point is marked by an indentation on the circumference of the exhaust pipe.

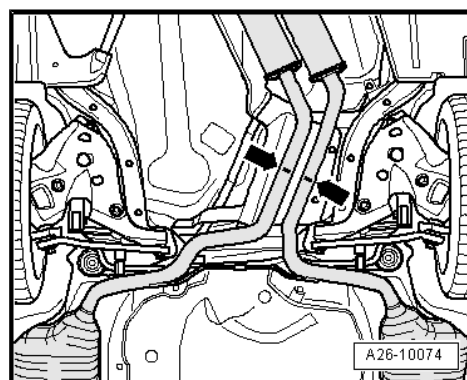
Special tools and workshop equipment required

- ◆ Chain pipe cutter -VAS 6254-

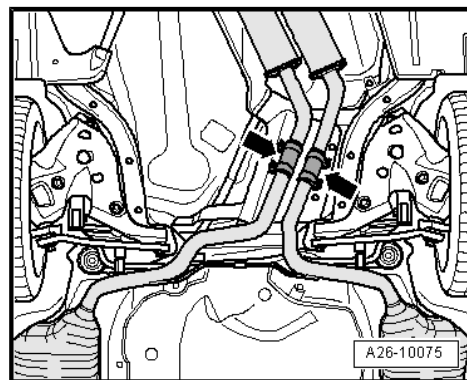


Procedure

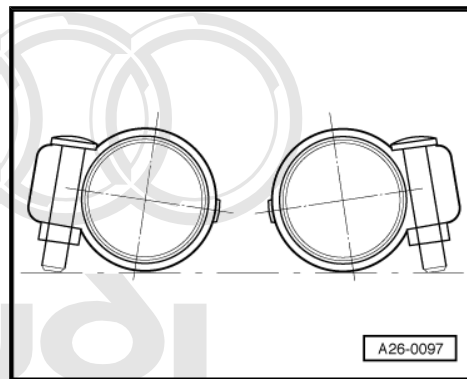
- Cut through exhaust pipes at a right angle at cutting point -arrows- using chain pipe cutter -VAS 6254- .



- When reassembling, position the clamps -1- and -2- centrally over the cutting point.



- Fit clamps so that ends of bolts do not protrude beyond bottom of clamp.
- Bolted connections face outwards.
- Align exhaust system so it is free of stress ⇒ [page 188](#) .
- Tighten bolted connections on clamps evenly.



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1.3 Removing and installing front exhaust pipe

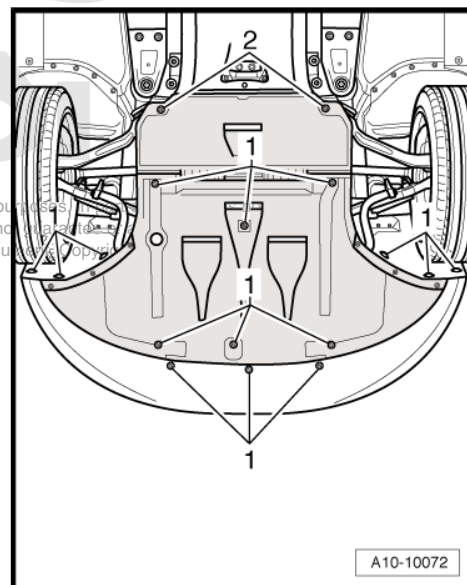
Removing



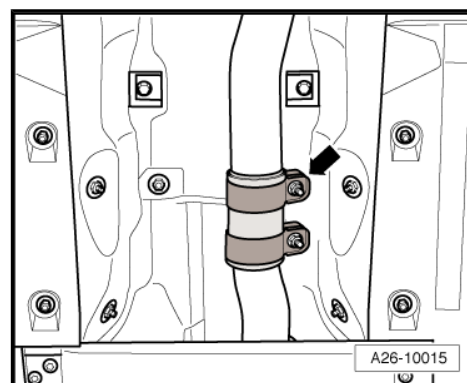
Note

- ◆ Do not bend the flexible joint (de-coupling element) in the exhaust system more than 10°; otherwise it could be damaged.
- ◆ Release quick-release fasteners -1- and -2- and take off noise insulation panels.

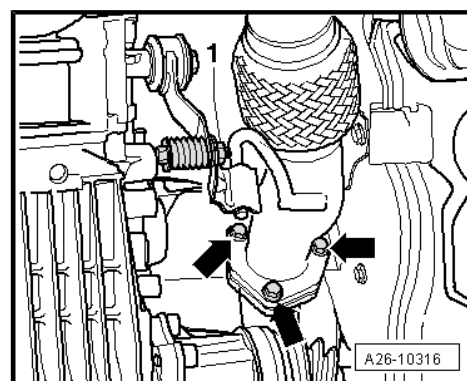
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- Loosen clamp -arrow- and push to rear.



- Detach front exhaust pipe/catalytic converter -arrows-.
- Remove bolt -1- on bracket for front exhaust pipe.

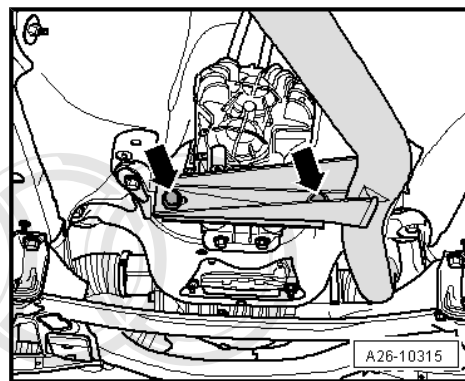


- Unscrew bolts -arrows- and remove front exhaust pipe.

Installing

Installation is carried out in the reverse order; note the following:

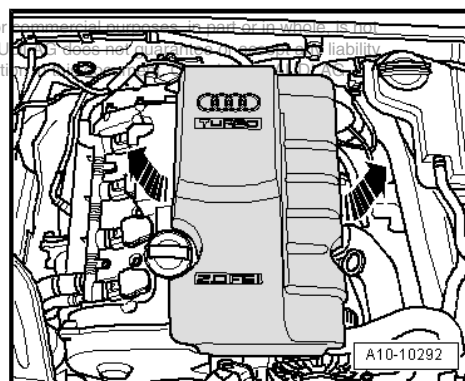
- Tightening torques
⇒ „1.1 Silencers - exploded view“, page 181



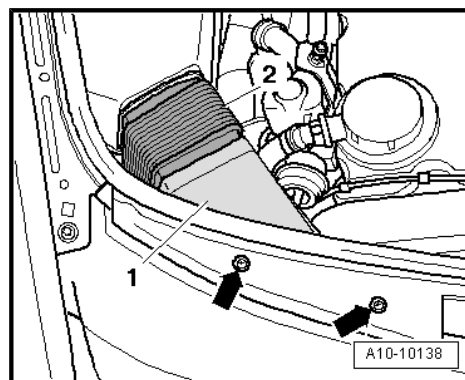
1.4 Removing and installing catalytic converter

Removing

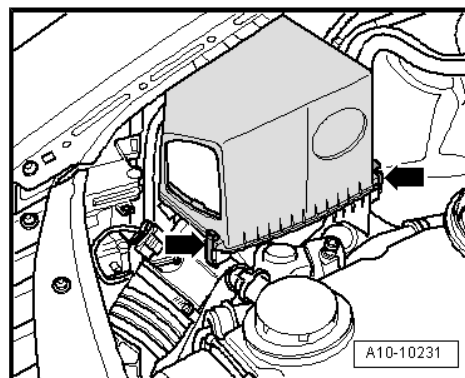
- Pull off engine cover panel -arrows-. Protected by copyright. Copying for private or commercial use without the express written permission of Audi AG is prohibited. Audi AG does not accept any liability with respect to the correctness of information.



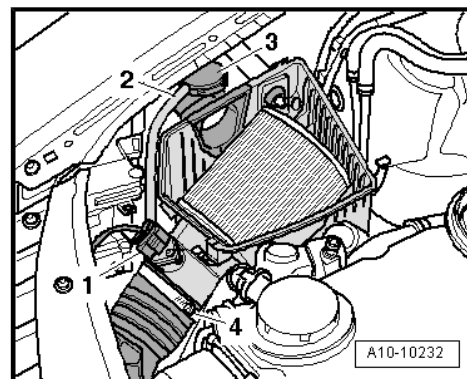
- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.



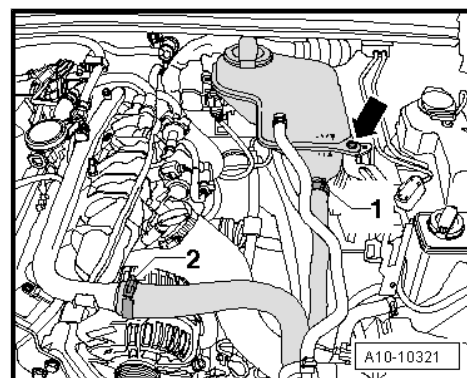
- Release two retaining clips -arrows- and detach top section of air cleaner housing.



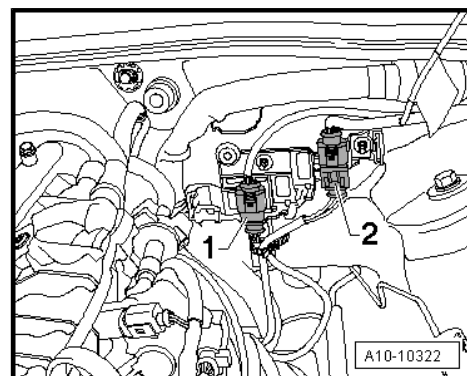
- Unplug electrical connector -1- at air mass meter -G70- .
- Loosen hose clip -4- to remove air intake hose.
- Disconnect vacuum hose -2- (if fitted).
- Lift vacuum unit -3- (if fitted) with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.



- Detach coolant expansion tank -arrow- and lay it aside with hoses connected.



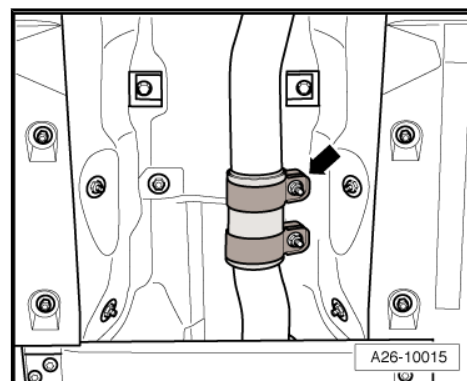
- Detach electrical connector -1- for Lambda probe -G39- and Lambda probe heater -Z19- (black connector) from retainer.
- Detach electrical connector -2- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- (brown connector) from retainer.



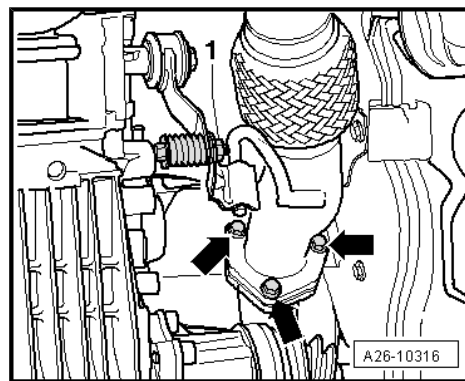
Note

Do not bend the flexible joint (de-coupling element) in the exhaust system more than 10°; otherwise it could be damaged.

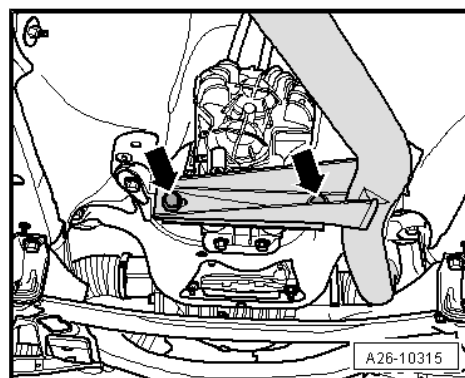
- Loosen clamp -arrow- and push to rear.



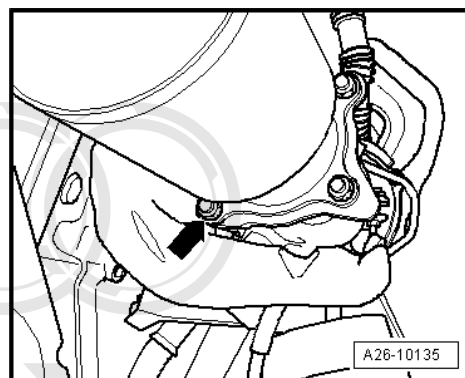
- Detach front exhaust pipe/catalytic converter -arrows-.
- Remove bolt -1- on bracket for front exhaust pipe.



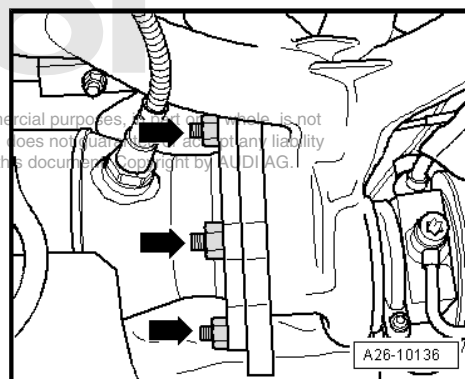
- Unscrew bolts -arrows- and remove front exhaust pipe.



- Unscrew nut -arrow- securing catalytic converter and turbo-charger from below.



- Unscrew nuts -arrows- securing catalytic converter and turbo-charger from above.
- Lift out catalytic converter.



Installing

Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „1.1 Silencers - exploded view“, page 181



Note

Renew gaskets and self-locking nuts.

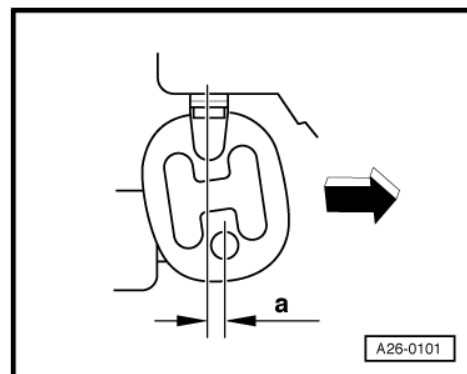
- Align the exhaust system so it is free of stress ⇒ page 188 .

1.5 Stress-free alignment of exhaust system

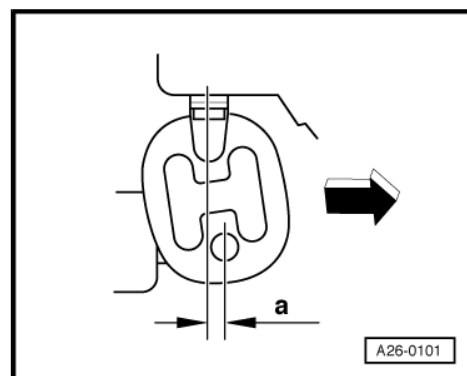
- The exhaust system must be aligned when it is cool.

Vehicles without clamps between centre silencer and rear silencer

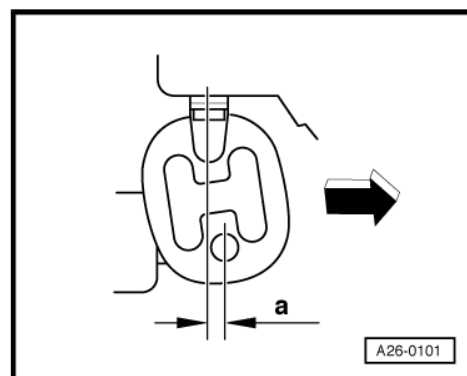
- The exhaust system must be aligned when it is cool.
- Loosen bolt connections of front clamp $\Rightarrow$ [Item 1 \(page 181\)](#).
- Push exhaust system towards front of vehicle -arrow- so that rubber mounting (right-side) for centre silencer is preloaded by $-a- = 9 \dots 11 \text{ mm}$.
- Tighten bolt connections on front clamp $\Rightarrow$ [Item 1 \(page 181\)](#) evenly.
- Align tailpipes $\Rightarrow$ [page 189](#).

**Vehicles with clamps between centre silencer and rear silencer**

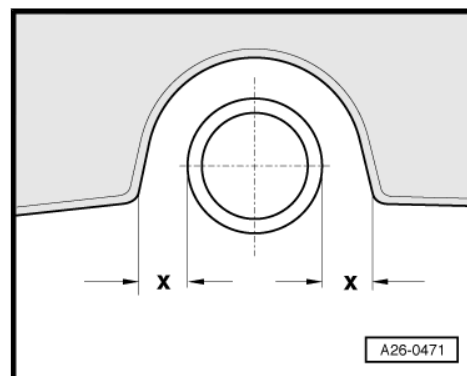
- On vehicles with clamps fitted between centre silencer and rear silencers, it is also necessary to align the rear silencer.
- Loosen bolts for front clamp $\Rightarrow$ [Item 1 \(page 181\)](#) and rear clamps $\Rightarrow$ [Item 11 \(page 182\)](#).
- Push front section of exhaust system towards front of vehicle -arrow-, so that rubber mounting (right-side) for centre silencer is preloaded by $-a- = 9 \dots 11 \text{ mm}$.
- Tighten bolts on front clamp $\Rightarrow$ [Item 1 \(page 181\)](#) evenly to 23 Nm.



- Push rear section of exhaust system towards front of vehicle -arrow- until rear rubber mountings for rear silencers are preloaded by $-a- = 13 \dots 17 \text{ mm}$.
- Align rear silencers so they are horizontal.
- Tighten bolt connections on rear clamps $\Rightarrow$ [Item 11 \(page 182\)](#) evenly.
- Align tailpipes $\Rightarrow$ [page 189](#).

**Aligning tailpipes**

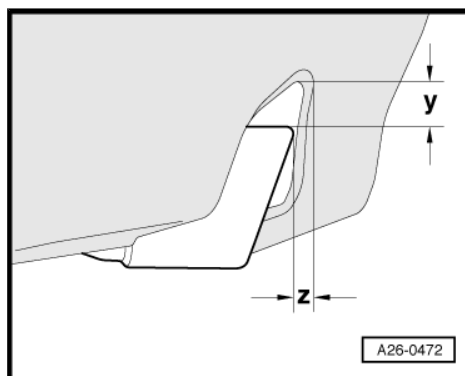
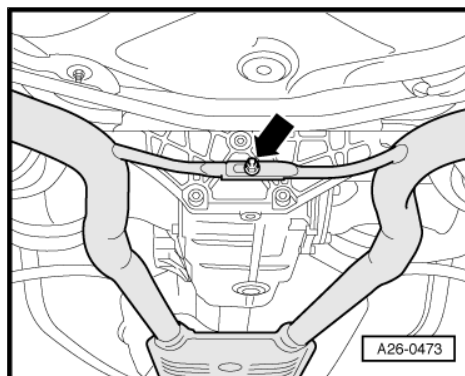
- Check clearance between tailpipes and bumper on both sides.
- Dimension $-x-$ (left-side) = dimension $-x-$ (right-side)



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If necessary, correct dimension x as follows:

- Slacken nut -arrow- on brace between exhaust pipes.
 - Adjust the distance between the rear silencers.
 - Tighten nut.
-
- Check distances -y- and -z- between tailpipes and bumper.
 - Dimension -y- = more than 20 mm.
 - Dimension -z- = 10 ... 16 mm.
 - If necessary, check whether the exhaust system is aligned free of stress ⇒ [page 188](#) .



1.6 Checking exhaust system for leaks

- Start engine and run at idling speed.
- Plug the tailpipe (e. g. with rags or stopper) and leave plugged until the check is complete.
- Listen for noise at connection points (cylinder head/exhaust manifold, exhaust manifold/front exhaust pipe, etc.) to locate any leaks.
- Rectify any leaks that are found.

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