



## Workshop Manual

Audi A1 2011 ➤

Audi A1 Sportback 2012 ➤

4-cylinder direct injection engine (1.4 ltr. 4-valve TFSI  
EA111)

|           |          |          |  |  |  |  |  |  |
|-----------|----------|----------|--|--|--|--|--|--|
| Engine ID | CAX<br>A | CNV<br>A |  |  |  |  |  |  |
|-----------|----------|----------|--|--|--|--|--|--|

Edition 09.2019



## List of Workshop Manual Repair Groups

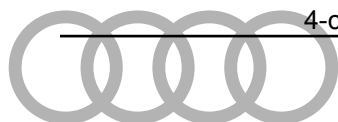
### Repair Group

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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.



## Contents

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## 00 – Technical data

### 1 Identification

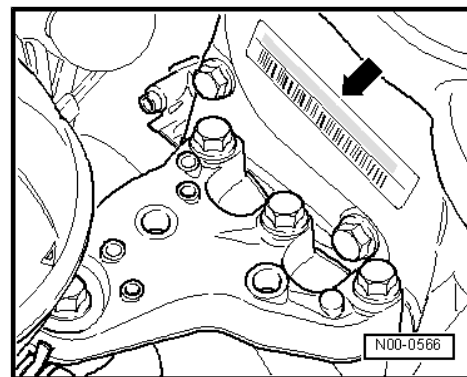
(ARL006647; Edition 09.2019)

⇒ **"1.1 Engine number/engine data", page 1**

#### 1.1 Engine number/engine data

##### Engine number

- ◆ There is a sticker on the timing chain cover indicating the "Engine code" and "Serial number" -arrow-.
- ◆ Engine codes starting with the letter "C" have four letters (previously three letters).
- ◆ The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped onto the cylinder block together with the serial number.
- ◆ The 4th character indicates the power output and torque of the engine and is determined by the engine control unit.



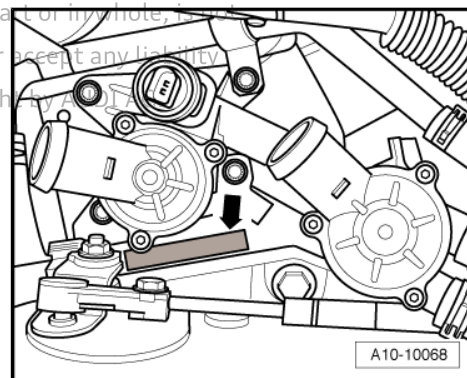
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- ◆ *The four-letter engine code is found on the type plate (certain countries only), vehicle data sticker and engine control unit.*
- ◆ *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 819*
- ◆ *If the sticker is missing, use a mirror and a torch to read off the "Engine code" and the "Serial number":*
- ◆ *Read off the engine code and serial number on the left-side of the cylinder block -arrow-.*





## 2 Safety precautions

⇒ [“2.1 Safety precautions when working on the fuel supply system”, page 2](#)

⇒ [“2.2 Safety precautions when working on vehicles with start/stop system”, page 2](#)

⇒ [“2.3 Safety precautions when using testers and measuring instruments during a road test”, page 2](#)

⇒ [“2.4 Safety precautions when working on the cooling system”, page 3](#)

⇒ [“2.5 Safety precautions when working on the ignition system”, page 3](#)

### 2.1 Safety precautions when working on the fuel supply system

#### Risk of injury - fuel system operates under high pressure

The fuel system is pressurised. There is a risk of injury as fuel may spray out.

Before opening the fuel system:

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap a clean cloth around connection and open connection carefully).



#### Risk of fire due to escaping fuel

If the battery is connected, the door contact switch activates the fuel pump when the driver's door is opened. Escaping fuel may ignite, causing a fire.

- Before opening the fuel system, disconnect power supply to fuel pump.

### 2.2 Safety precautions when working on vehicles with start/stop system

#### Risk of injury - engine may start unexpectedly

The engine can start unexpectedly if the vehicle's start/stop system is activated. A message in the instrument cluster indicates whether the start/stop system is activated.

- To deactivate the start/stop system, switch off the ignition.

### 2.3 Safety precautions when using testers and measuring instruments during a road test

#### Risk of injury if test equipment is not secured

If an accident occurs and the front passenger's airbag is triggered, test equipment which is not secured adequately may be catapulted through the vehicle with potentially serious consequences.



- Secure test equipment on the rear seat with a strap.

Or:

- Have a second mechanic operate test equipment on the rear seat.

## 2.4 Safety precautions when working on the cooling system

### Risk of scalding as hot coolant can escape

The cooling system is under pressure when the engine is hot. Risk of scalding due to hot steam and hot coolant.

- Put on protective gloves.
  - Put on safety goggles.
  - Cover filler cap on expansion tank with a cloth and open carefully to release pressure.
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## 2.5 Safety precautions when working on the ignition system

### Risk of injury due to electric shock

When the engine is running, there are high voltage levels in the ignition system. There is a risk of electric shock when touching the ignition system!

- Never touch or disconnect ignition wiring when the engine is running or being turned at cranking speed.



### Risk of damage to components

Washing the engine or connecting/disconnecting electrical wiring may result in components being damaged if the engine is running.

- Switch off ignition before connecting/disconnecting electrical wiring.
- Switch off ignition before cleaning engine.



## 3 Repair instructions

⇒ [“3.1 Rules for cleanliness”, page 4](#)

⇒ [“3.2 General notes”, page 4](#)

⇒ [“3.3 General repair instructions”, page 5](#)

⇒ [“3.4 Foreign particles in engine”, page 5](#)

⇒ [“3.5 Contact corrosion”, page 5](#)

⇒ [“3.6 Routing and attachment of pipes, hoses and wiring”, page 6](#)

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⇒ [“3.9 Identification plates”, page 6](#)

⇒ [“3.10 Use of impact wrenches”, page 7](#)

⇒ [“3.11 Checking vacuum system”, page 7](#)

### 3.1 Rules for cleanliness

Even small quantities of dirt can lead to defects. For this reason, please observe the following rules when working on the fuel supply system, injection system and turbocharger:

- ◆ Clean connections and surrounding area thoroughly with engine cleaner or brake cleaner and dry cleaned area before loosening.
- ◆ Immediately seal open lines and connections with clean plugs, for example from engine bung set - VAS 6122- .
- ◆ After removal, place parts on a clean surface and cover them. Only use 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 been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ Do not work with compressed air when the system is open. If possible, do not move vehicle.
- ◆ Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

### 3.2 General notes

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.



- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- ◆ The vehicles are fitted with a crash fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system ⇒ [page 2](#) .

### 3.3 General repair instructions

- ◆ Clean tools and workbench etc. before working on the injection system.
- ◆ If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.
- ◆ Position high-pressure pipes so they are free of stress. Tighten all unions lightly to start with before tightening to final torque.
- ◆ Never attempt to bend high-pressure fuel lines to shape.
- ◆ When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other components must always be removed and installed by hand without using tools or other equipment.
- ◆ All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.

### 3.4 Foreign particles in engine

- ◆ When performing assembly work on the engine, all open passages in the intake and exhaust systems must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122- ) to prevent foreign particles from entering the engine.
- ◆ In the event of mechanical damage to one of the cylinder banks, the intake and exhaust systems and combustion chambers of the opposite cylinder bank must always be examined for foreign particles to prevent further damage occurring later.



#### Note

*If the turbocharger has suffered mechanical damage  
⇒ [page 197](#)*

### 3.5 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 fitted.

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 .



#### Please note:

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

### 3.6 Routing and attachment of pipes, hoses and wiring

- ◆ Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter 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.
- ◆ Because of the limited space in the engine compartment, it is important to ensure that there is adequate clearance to any moving or hot components to avoid damage to lines and wiring.

### 3.7 Installing radiators and condensers

Even when the radiator and condenser 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 or the condenser.

### 3.8 Nuts, bolts

- ◆ Loosen bolts in reverse sequence to specified tightening sequence.
- ◆ Bolts and nuts used to secure covers and housings must be tightened in steps according to the specified tightening sequence and method.
- ◆ Bolts and nuts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- ◆ Always renew self-locking bolts and nuts.
- ◆ Unless otherwise specified, use a wire brush to clean the threads of bolts which are secured with locking fluid. Then install bolts with locking fluid; for locking fluid refer to ⇒ Electronic parts catalogue .
- ◆ Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned using a thread tap or similar. Otherwise there is a danger of the bolts shearing off the next time they are removed.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.

### 3.9 Identification plates

When renewing vehicle components, the identification plates on the old parts that have a replacement part number (see ⇒ Electronic parts catalogue ) must be attached to the new parts due to approval regulations.



### 3.10 Use of impact wrenches

**In general, it is permitted to use an impact wrench to unscrew bolts and nuts. An exception to this is when work is performed inside an open high-voltage battery. For this work, it is not permitted to use an impact wrench.**

An impact wrench may be used to screw in bolts and nuts when performing repair work if the following requirements are observed. In general, electric and compressed-air impact wrenches should be used.

#### Requirements:

- Only screw in bolts with locking fluid or self-locking nuts at low speed.
- Use a suitable impact wrench with variable speed and adjustable torque range.
- Use suitable bits when working in the vicinity of sensitive surfaces, e.g. plastic-coated bits for aluminium rims.
- When working in the vicinity of natural gas systems, observe the information in the Workshop Manual "Natural gas engines - General information".

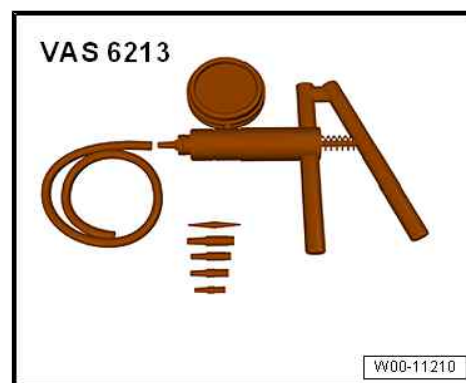
#### Use:

- Fit bolts/nuts by hand.
- Only use an impact wrench to screw in bolts/nuts until the head of the bolt/nut makes contact and then continue tightening with a torque wrench.
- Clean threaded pins before unscrewing the bolt/nut.

### 3.11 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
  - ◆ Porous or leaking lines



- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If an entry is stored in the event memory, check all vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.
- If it is not possible to build up pressure with the hand vacuum pump - VAS 6213- or if the pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

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## 10 – Removing and installing engine

### 1 Removing and installing engine

⇒ [“1.1 Removing engine”, page 9](#)

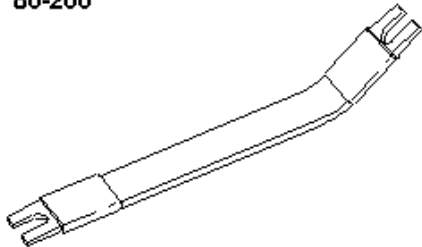
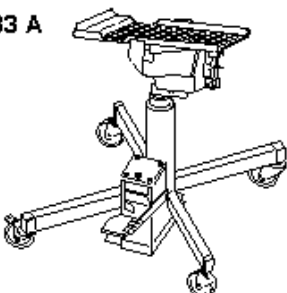
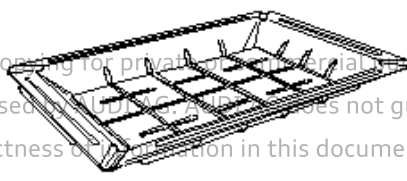
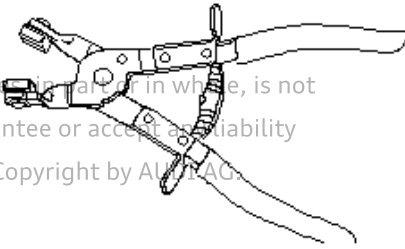
⇒ [“1.2 Separating engine and gearbox”, page 22](#)

⇒ [“1.3 Securing engine to engine and gearbox support”, page 25](#)

⇒ [“1.4 Installing engine”, page 27](#)

#### 1.1 Removing engine

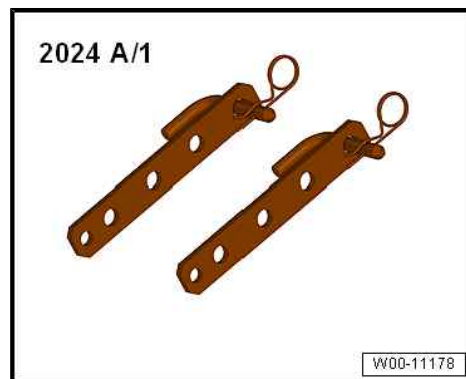
Special tools and workshop equipment required

|                                                                                                            |                                                                                                                               |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <p><b>80-200</b></p>     | <p><b>V.A.G 1383 A</b></p>                |
| <p><b>VAS 5085</b></p>  | <p><b>VAS 6122</b></p>                   |
| <p><b>VAS 6208</b></p>  | <p><b>VAS 6362</b></p>  <p>G13-10035</p> |

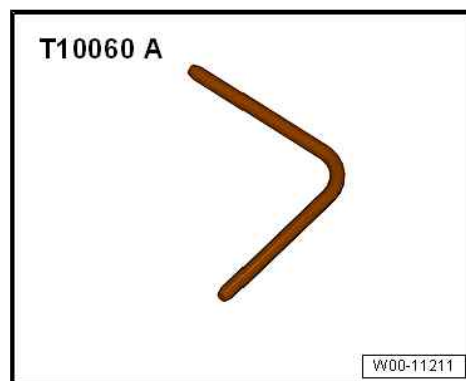
- ◆ Removal lever - 80 - 200-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Stepladder - VAS 5085-
- ◆ Engine bung set - VAS 6122-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clip pliers - VAS 6362-



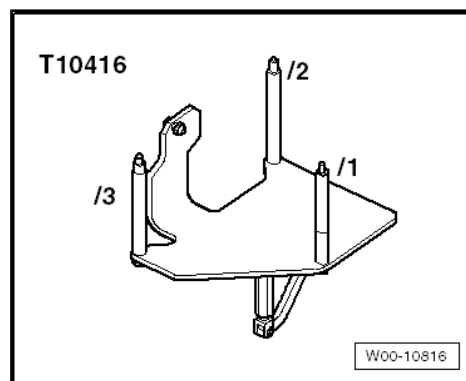
- ◆ Hook -2024 A /1- of lifting tackle - 2024 A-



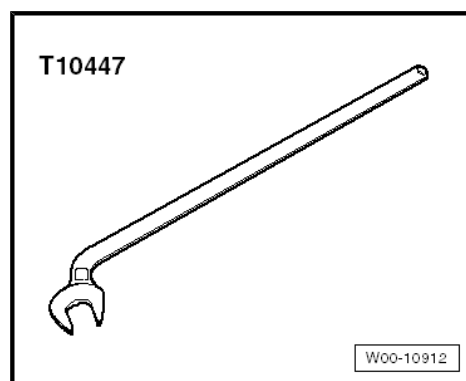
- ◆ Locking pin - T10060 A-



- ◆ Engine support -T10416- with adapters -T10416/1- , -  
T10416/2- , -T10416/3-



- ◆ Open-end spanner, 16 mm - T10447- for vehicles without air  
conditioning



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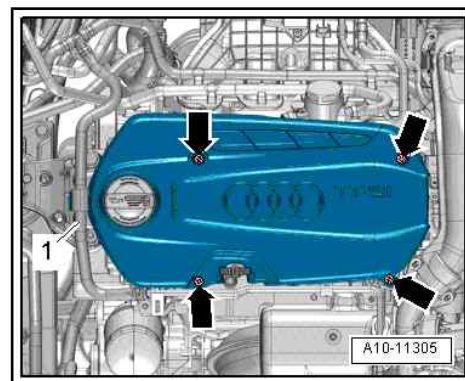


## Procedure



### Note

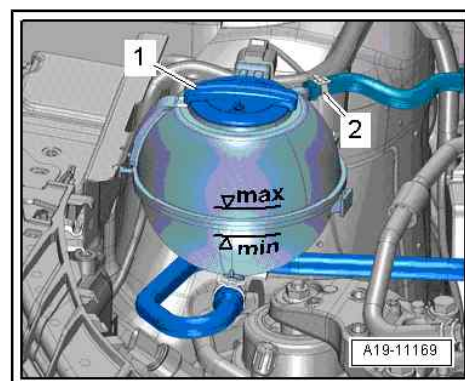
- ◆ *The engine is removed from underneath together with the gearbox.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Move coolant hose -1- clear.
- Unscrew bolts -arrows- and detach engine cover panel.



### WARNING

*Risk of scalding due to hot steam and hot coolant.*

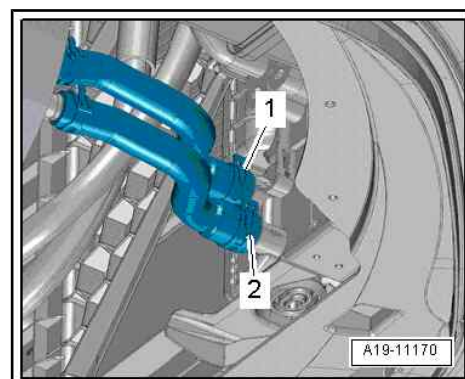
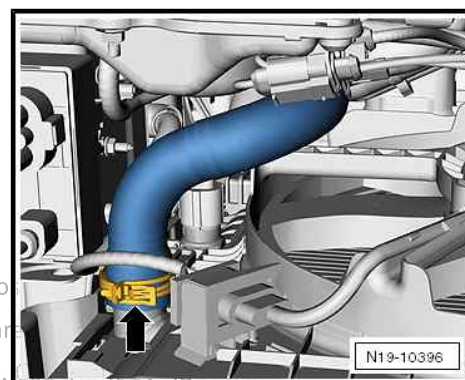
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*
- Open filler cap -1- on coolant expansion tank.
- Release hose clip -2- and detach coolant hose.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove wheel housing liners (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .



### Note

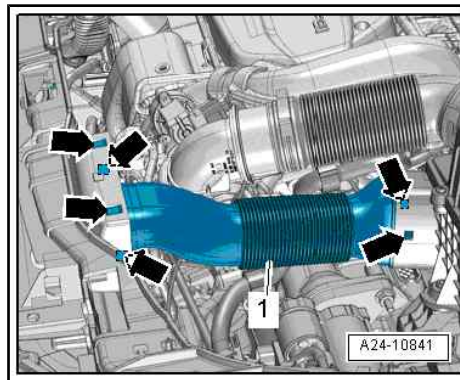
*Collect drained coolant in a clean container for re-use or disposal.*

- Place drip tray for workshop hoist - VAS 6208- beneath engine.
- Release hose clip -arrow-, disconnect coolant hose (bottom left) from radiator and drain off coolant.
- Release hose clips -1 and 2-, disconnect coolant hoses (bottom right) from water radiator for charge air cooling circuit and drain off remaining coolant.





- Release fasteners -arrows- and detach air duct -1-.



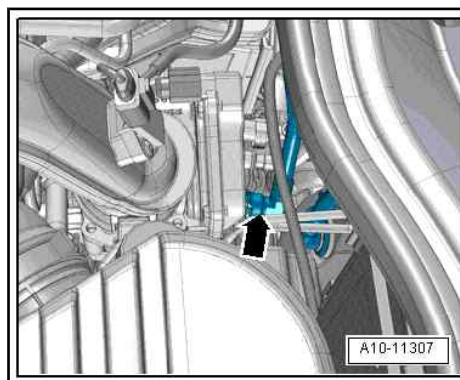
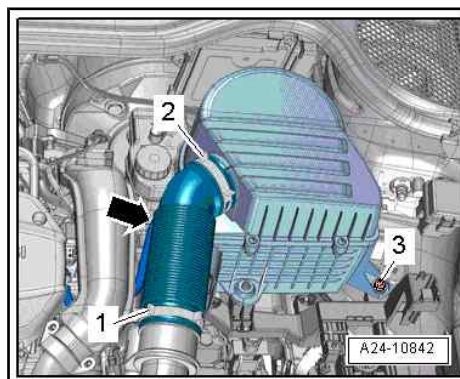
- Release hose clip -1- and detach air hose from intake connecting pipe.
- Detach vacuum hose -arrow- from air hose.
- Unscrew bolt -3- and detach air cleaner housing.



#### Note

Disregard -item 2-.

- Disconnect earth wire from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Press release tabs and detach vacuum hose -arrow-.



- Press release tabs and disconnect vacuum hose -1- from activated charcoal filter.

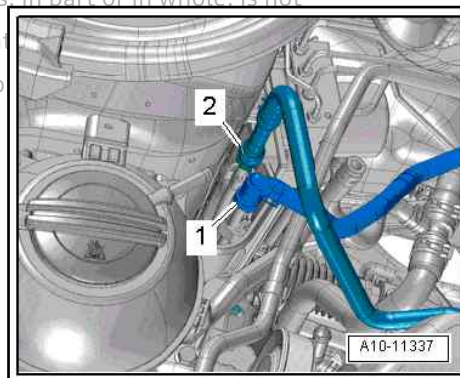


#### WARNING

**The fuel system is pressurised.**

**Risk of injury as fuel may spray out.**

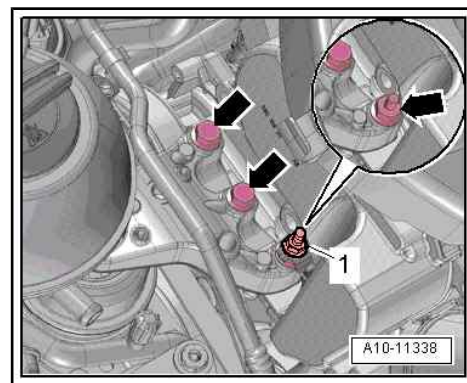
- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap a clean cloth around connection and open connection carefully).



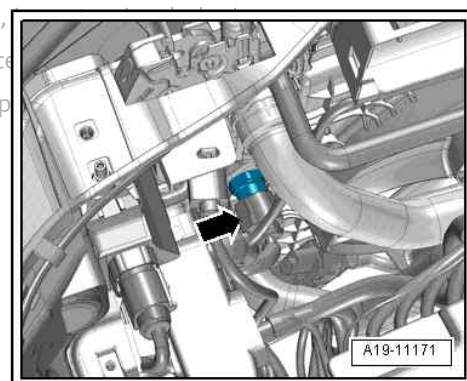
- Disconnect fuel supply line -2- (pull release ring).
- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



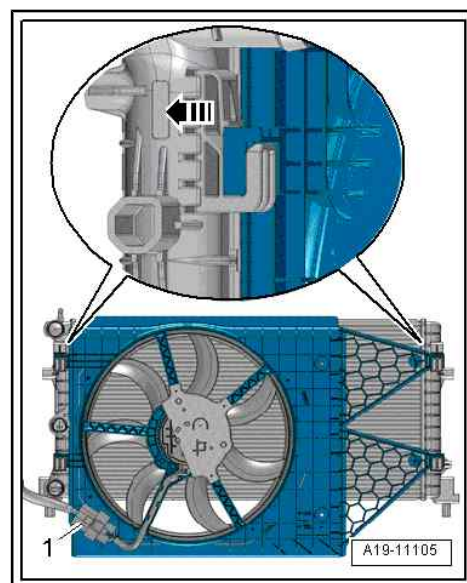
- Remove nut -1- and move earth wire clear.
- Loosen bolts -arrows- for support arm of engine mounting approx. 2 turns.



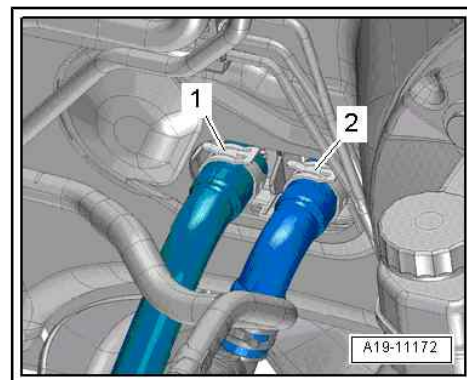
- Unplug electrical connector -arrow- at radiator outlet coolant temperature sender - G83-



- Unplug electrical connector -1- for radiator fan.
- Press locking tabs (left and right) for radiator cowl -arrow- simultaneously.
- Lift radiator cowl off radiator and detach it downwards.

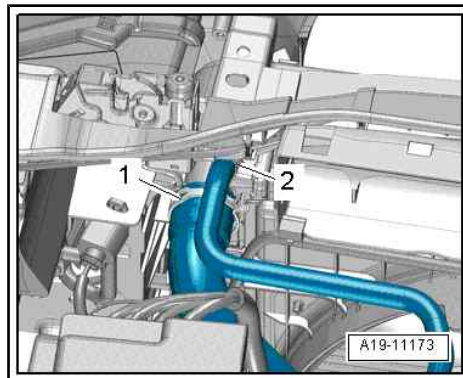


- Release hose clips -1 and 2- and disconnect coolant hoses from heat exchanger.





- Release hose clips -1 and 2- and detach coolant hoses (top left) from radiator.



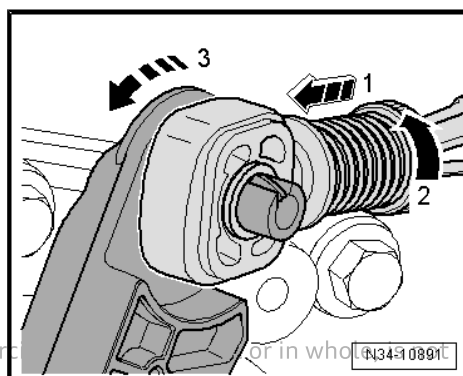
#### Vehicles with manual gearbox:



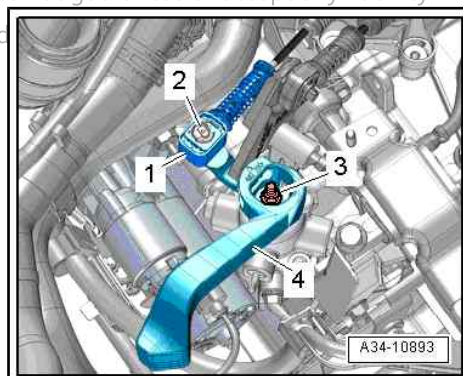
#### Note

*To prevent damage to gate selector cable, cable end-piece must be detached from gate selector cable before removing.*

- Pull locking device forwards onto stop -arrow 1- and lock by turning anti-clockwise -arrow 2-.
- Press gate relay lever towards front -arrow 3-.



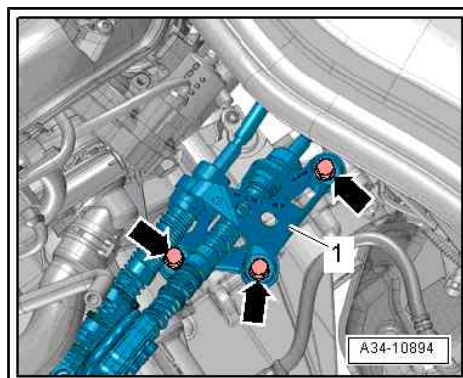
- Detach securing clip -2-.
- Detach gear selector cable -1- from gearbox selector lever -4-.



#### Note

*Disregard -item 3-.*

- Remove bolts -arrows-, detach cable support bracket -1- and place to one side with selector cables attached.





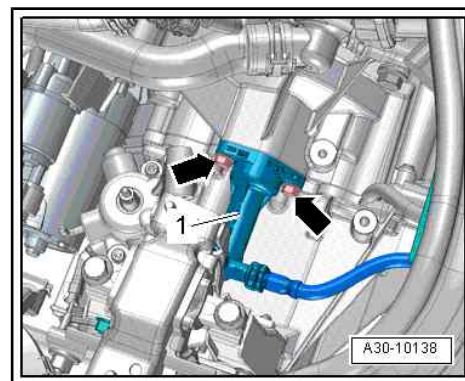
- Remove bolts -arrows-, detach clutch slave cylinder -1- and place to one side; do not open pipes.



#### Caution

*Risk of irreparable damage to clutch slave cylinder.*

- ◆ *Do not operate clutch pedal with slave cylinder removed.*



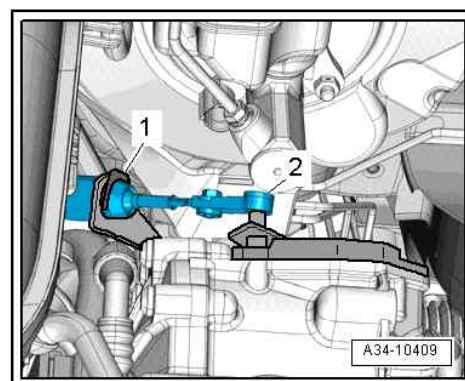
#### Vehicles with dual clutch gearbox:

- Use removal lever - 80 - 200- to prise selector lever cable -2- off gearbox selector lever.
- Pull off retaining clip -1-, detach selector lever cable and move clear to one side.



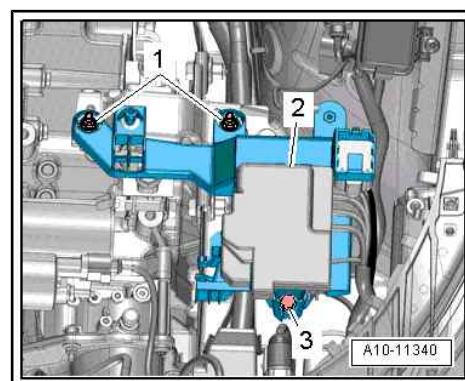
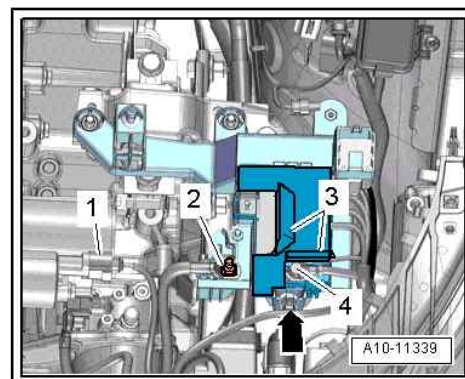
#### Note

*Take care not to bend or kink selector lever cable.*



#### All vehicles (continued):

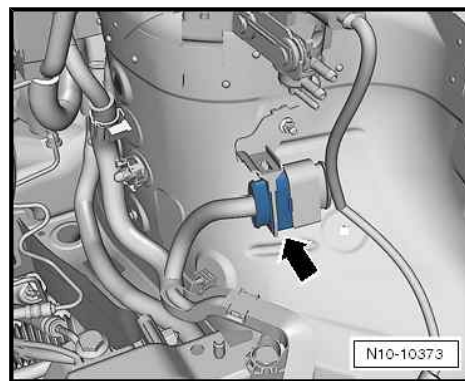
- Unplug electrical connector -1- at starter.
- Open covers -3-.
- Unscrew nut -2- and move clear electrical wiring going to starter.
- Release catches and detach retaining clip for electrical wiring.
- Unscrew nut -4- and move electrical wiring clear -arrow-.
- Unscrew nut -1- and bolt -3-, and push electronics box -2- to the side.
- Remove engine control unit ⇒ [page 265](#) .



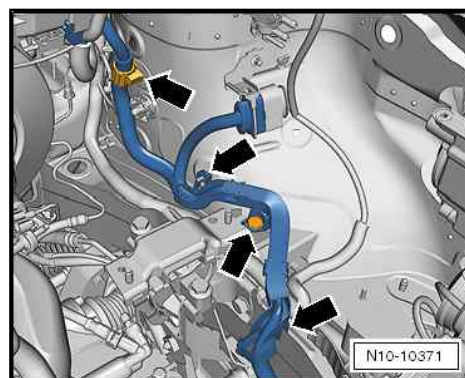
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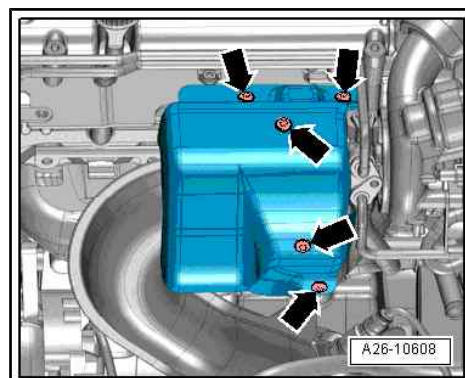
- Unplug electrical connector -arrow-.



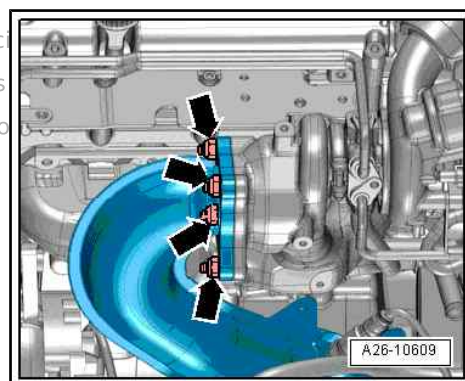
- Move engine wiring harness clear -arrows- and lay on top of engine.



- Remove bolts -arrows- and detach heat shield for turbocharger.



- Remove nuts -arrows- for catalytic converter.
- Move clear electrical wiring harness leading to alternator at catalytic converter.





- Unscrew bolts -1- and 3- and remove.
- Disconnect coolant line -2- and push it to one side.



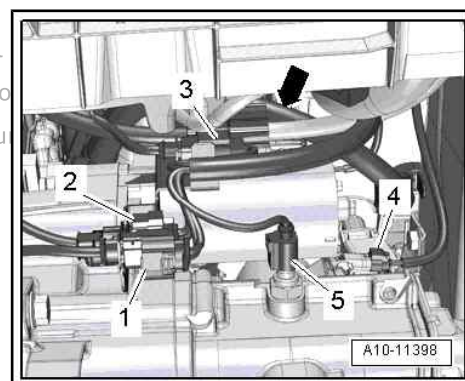
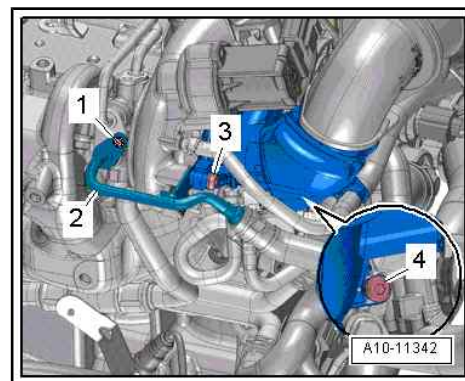
#### Note

Disregard -item 4-.



#### Vehicles with manual gearbox:

- Unplug electrical connectors and remove from bracket:
- 1 - For Lambda probe - G39-
- 2 - For Lambda probe after catalytic converter - G130-
- 3 - To alternator - C-
- Unplug electrical connectors:
- 4 - At gearbox neutral position sender - G701-
- 5 - At reversing light switch - F4-
- Remove electrical wiring -arrow- from bracket and move clear.



#### Vehicles with dual clutch gearbox:

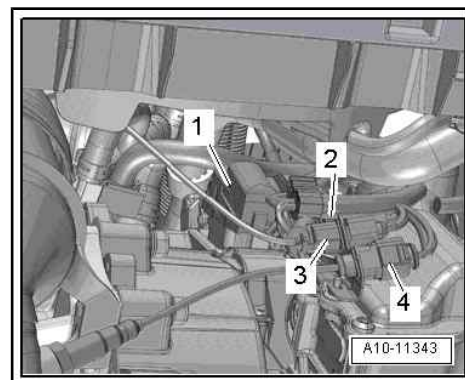
- Detach electrical connectors -3, 4- from bracket and unplug.



#### Caution

*Risk of serious damage to gearbox components.*

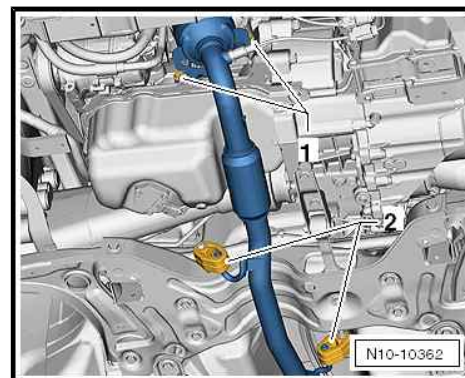
- ◆ **Do NOT touch connector contacts in gearbox connector with your hands. Static discharge could damage the control unit and the mechatronic unit irreparably.**



- Touch vehicle earth with bare hands to eliminate any static charge.
- Unplug electrical connector -1- for mechatronic unit for dual clutch gearbox - J743- .
- Detach electrical connector -2- from bracket.

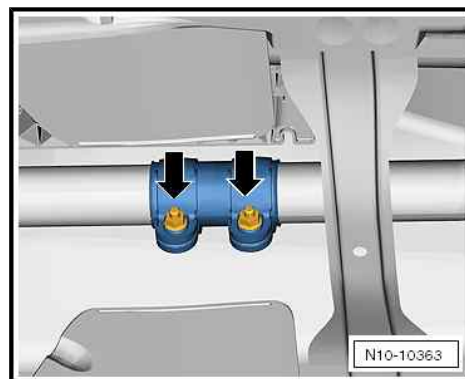
#### All vehicles (continued):

- Remove bolts -1-.
- Press mountings -2- for exhaust system off pins.





- Unscrew nuts -arrows- and push clamp towards rear.
- Detach catalytic converter and centre silencer from underneath.



#### Vehicles without air conditioner:

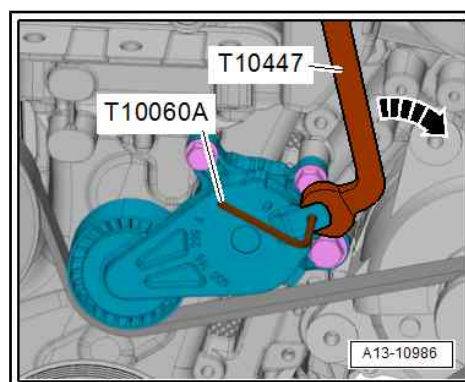


##### Caution

*Running a used poly V-belt in the opposite direction could cause irreparable damage.*

- ◆ *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*

- Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using open-end spanner, 16 mm - T10447- .
- Lock tensioner with locking pin - T10060 A- .
- Take off poly V-belt.



#### Vehicles with air conditioner:

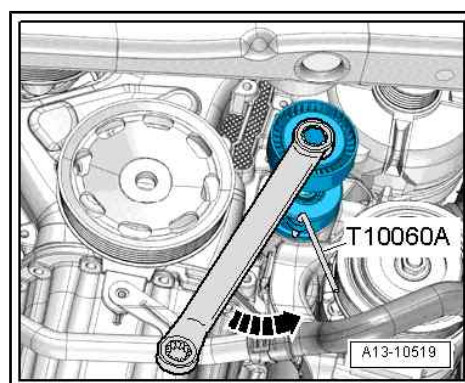


##### Caution

*Running a used poly V-belt in the opposite direction could cause irreparable damage.*

- ◆ *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*

- To slacken poly V-belt turn tensioner in anti-clockwise direction -arrow-.
- Lock tensioner with locking pin - T10060 A- .
- Take off poly V-belt.



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- Unplug electrical connector -1- for air conditioner compressor regulating valve - N280- at air conditioner compressor.



#### WARNING

*Risk of injury caused by refrigerant.*

- ◆ *The air conditioner refrigerant circuit must not be opened.*

- Remove bolts -arrows- for air conditioner compressor.



#### Caution

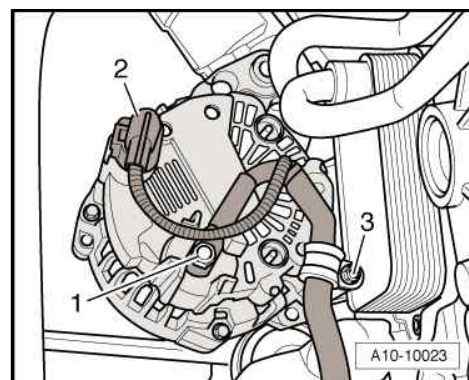
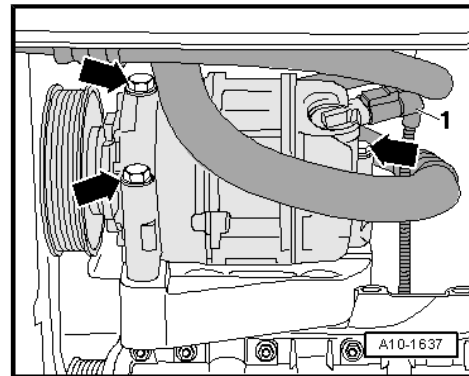
*Risk of damage to refrigerant lines and hoses*

- ◆ *Do NOT stretch, kink or bend refrigerant lines and hoses.*

- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).

#### All vehicles (continued):

- Unplug electrical connector -2-.
- Remove nut -1- and move electrical wiring clear.
- Unbolt retaining clamp -3- from alternator and move clear electrical wiring harness.

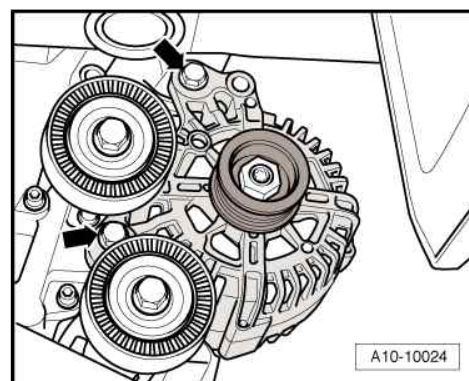


- Unscrew bolts -arrows- and remove alternator.



#### Note

- ◆ *If alternator sticks in its bracket, screw securing bolt back in again down to the last 2 turns.*
- ◆ *Tap carefully on bolt heads with flat side of hammer to release bushes of alternator mountings.*
- Unbolt drive shaft (left and right) from gearbox flange shafts  
⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



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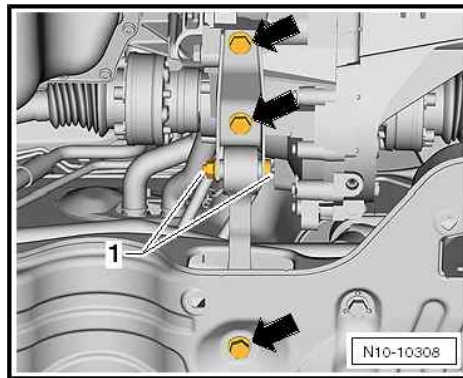
- Remove bolts -arrows- and detach pendulum support.



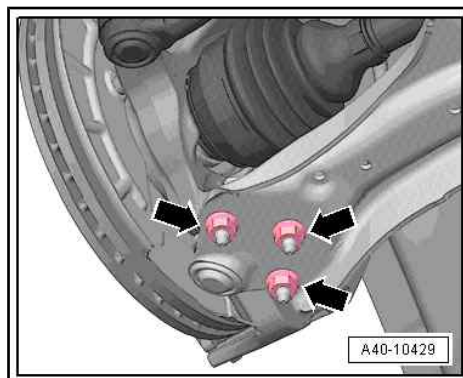
#### WARNING

*Risk of accident.*

- ◆ **Do NOT loosen bolted connection -1-.**



- Remove nuts -arrows- for swivel joint on both sides.
- If fitted, loosen nut on bracket for front left vehicle level sender -G78- .
- Detach swivel joints from wishbones.

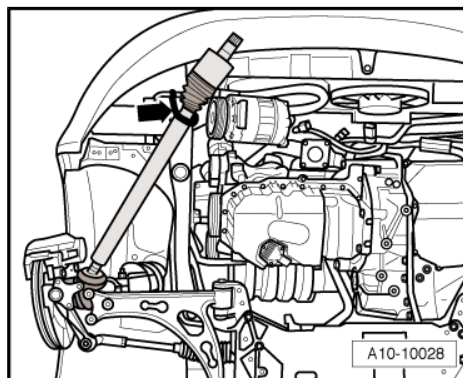


- Pivot drive shaft (right-side) forwards; to do so, push engine/ gearbox assembly slightly forwards.
- Tie up drive shaft to longitudinal member -arrow-.



#### Note

*Take care not to damage the surface coating of the drive shaft.*



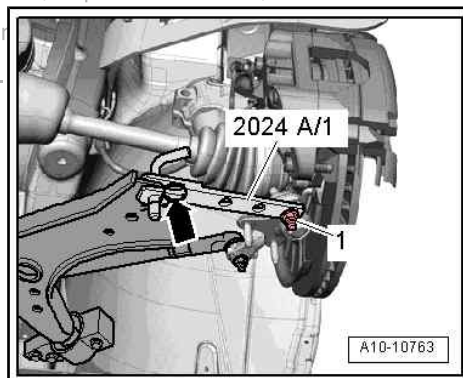
- Swivel suspension strut (left-side) outwards and support with support bracket -2024 A /1- , as shown in illustration.



#### WARNING

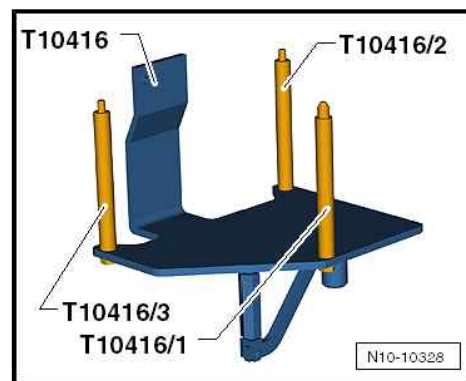
*Accident risk from loose components of support bracket.*

- ◆ **Secure retaining pin and swivel joint with locking pin -arrow- and nut -1-.**



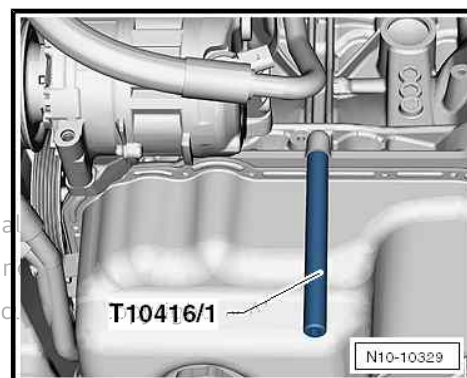


Use engine support -T10416- with adapters -T10416/1- , -T10416/2- and -T10416/3- to lower engine/gearbox assembly.



- Screw adapter -T10416/1- into hole on cylinder block as far as stop, as shown in illustration.
- Bring engine support -T10416- with adapters -T10416/2- and -T10416/3- into position on cylinder block.

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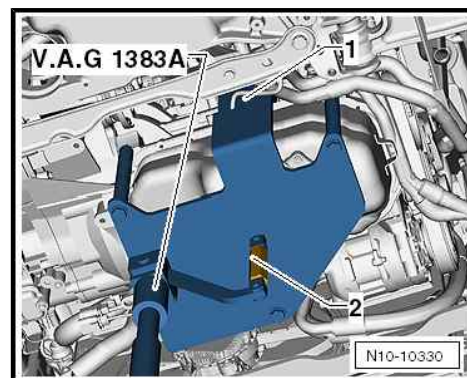


- Screw in bolt -1- by hand until it makes contact.
- Tighten all bolts on engine support to 20 Nm.
- Attach engine and gearbox jack - V.A.G 1383 A- to engine support -T10416- .

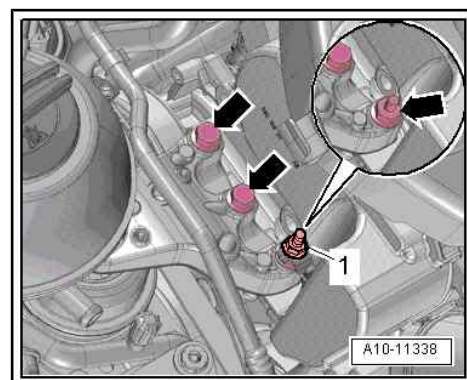


#### Note

- ◆ *The adjusting nut -2- is used to set the correct angle between the pin on the engine support -T10416- and the engine and gearbox jack - V.A.G 1383 A- .*
- ◆ *To unscrew bolts for assembly mounting use stepladder - VAS 5085- .*



- Remove bolts -arrows- for support arm of engine mounting.





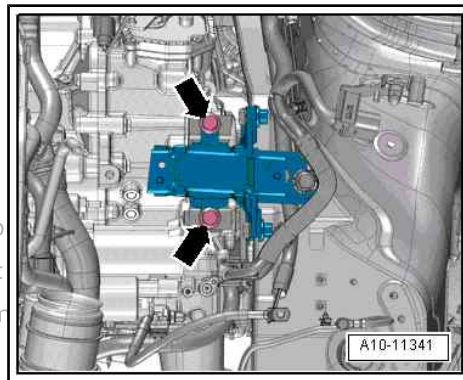
- Remove bolts -arrows- securing gearbox mounting -1-.



#### Caution

***Danger of damage to hydraulic lines, vacuum lines or electrical wiring and to engine compartment.***

- ◆ ***Check that all hydraulic lines, vacuum lines and electrical wiring between engine, gearbox, subframe and body have been detached.***
- ◆ ***Carefully guide engine/gearbox assembly out of engine compartment when lowering.***



- Pull engine/gearbox assembly as far forward as possible, and lower gradually.

## 1.2 Separating engine and gearbox

⇒ **"1.2.1 Separating engine and gearbox - vehicles with manual gearbox", page 22**

⇒ **"1.2.2 Separating engine and gearbox - vehicles with dual clutch gearbox", page 23**

### 1.2.1 Separating engine and gearbox - vehicles with manual gearbox

Special tools and workshop equipment required

- ◆ Shackle - 10 - 222 A /12-

10-222 A/12



W00-11341

- ◆ Workshop hoist - VAS 6100-

VAS 6100



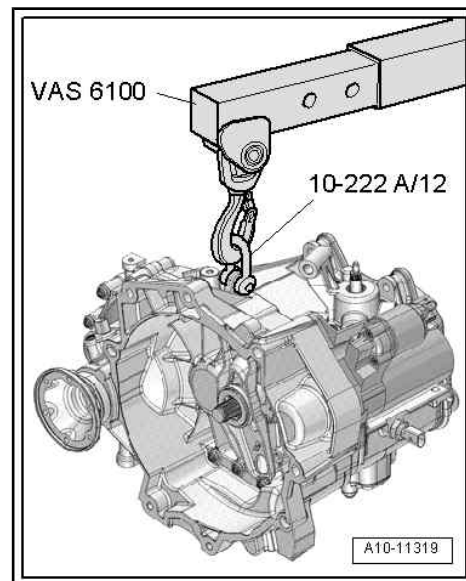
W00-11307

#### Procedure

- Engine/gearbox assembly removed and attached to engine support -T10416- .
- Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .



- Fit shackle - 10 - 222 A /12- on gearbox, as shown in illustration.
- Hook workshop hoist - VAS 6100- into shackle.



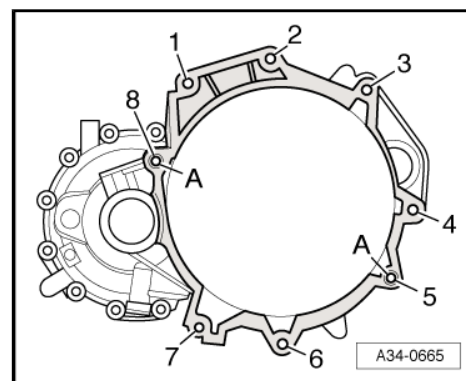
- Remove bolts -1, 3- securing gearbox to engine.



#### Note

*Disregard -items 2, 4, A-.*

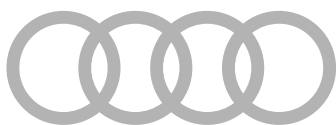
- Detach gearbox from engine.



## 1.2.2 Separating engine and gearbox - vehicles with dual clutch gearbox

### Special tools and workshop equipment required

- ◆ Shackle - 10 - 222 A /12-





◆ Workshop hoist - VAS 6100-



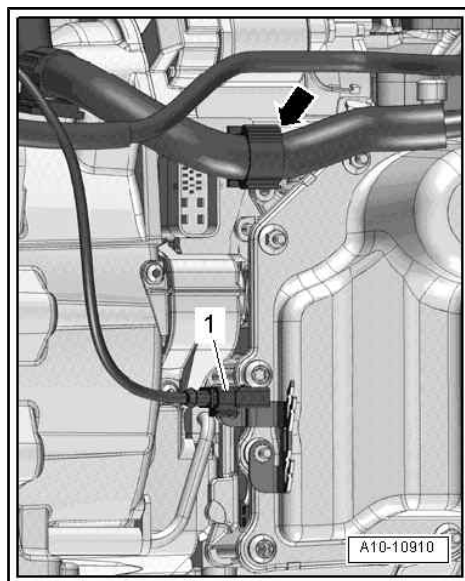
**Procedure**

- Engine/gearbox assembly removed and attached to engine support -T10416- .
- Move electrical wiring harness clear -arrow-.

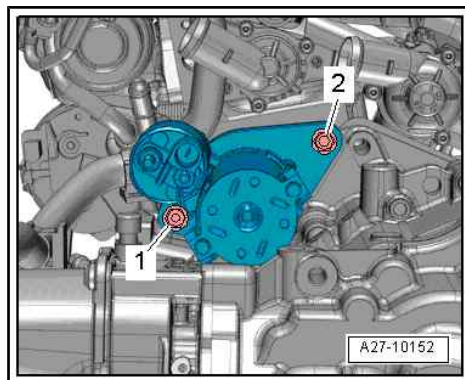


**Note**

*Disregard -item 1-.*



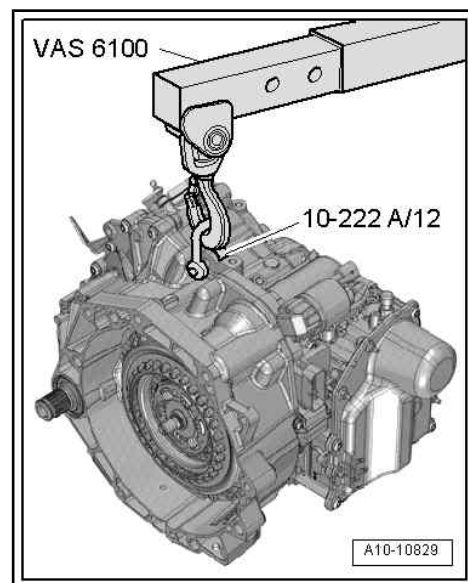
- Unscrew bolts -1 and 2- and detach starter from gearbox.



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- Secure gearbox to workshop hoist - 10 - 222 A /12- using shackle - VAS 6100- .



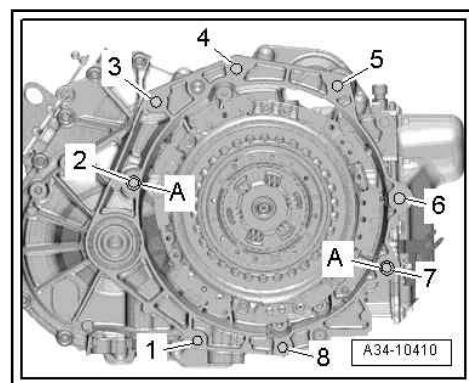
- Remove bolts -1 ... 8- securing gearbox to engine.



#### Note

*Disregard -item A-.*

- Detach gearbox from engine.



### 1.3 Securing engine to engine and gearbox support

Special tools and workshop equipment required

- ◆ Lifting tackle - 2024A-



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◆ Engine and gearbox support - VAS 6095A-



◆ Workshop hoist - VAS 6100-



Procedure

- Gearbox detached from engine ⇒ [page 22](#) .
- Remove flywheel ⇒ [page 59](#) .
- To transport engine, engage lifting tackle - 2024 A- on engine and workshop hoist - VAS 6100- .



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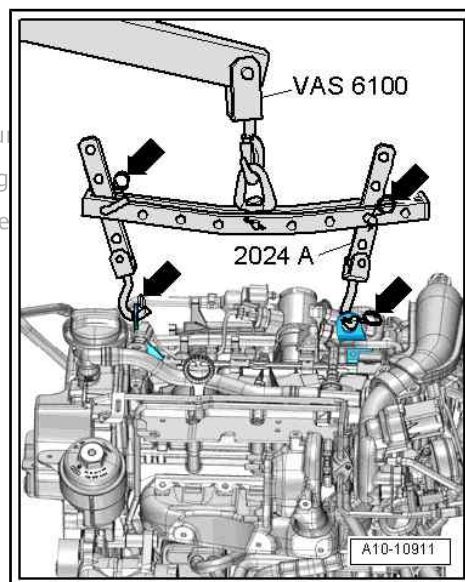
To adjust to the centre of gravity of the assembly, the perforated rails of the support hooks must be positioned as shown.



**WARNING**

*Accident risk from loose components of support bracket.*

- ◆ *The support hooks and retaining pins on the support bracket must be secured with locking pins -arrows-.*

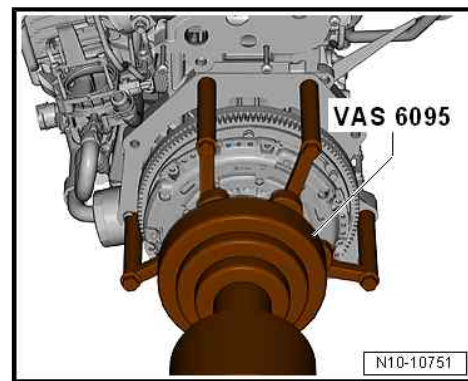




- Secure engine to engine and gearbox support - VAS 6095A-  
using universal support - VAS 6095/1- .

#### Tightening torque

| Component  |     | Nm |
|------------|-----|----|
| Bolts/nuts | M6  | 10 |
|            | M8  | 20 |
|            | M10 | 45 |
|            | M12 | 65 |



## 1.4 Installing engine

### Tightening torques



#### Note

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

| Component  |     | Nm |
|------------|-----|----|
| Bolts/nuts | M6  | 9  |
|            | M7  | 15 |
|            | M8  | 22 |
|            | M10 | 40 |
|            | M12 | 65 |

- ◆ Assembly mountings  
⇒ ["2.1 Exploded view - assembly mountings", page 31](#)
- ◆ Securing gearbox to engine ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox

#### Procedure

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

- Engine attached to engine support - T10416-

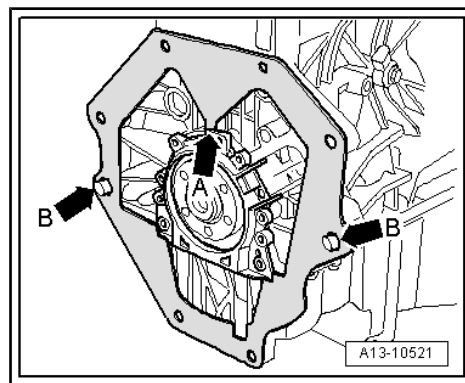


#### Note

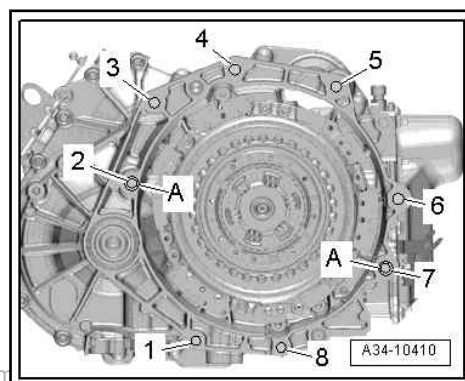
- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *Fit all cable ties in the original positions when installing.*



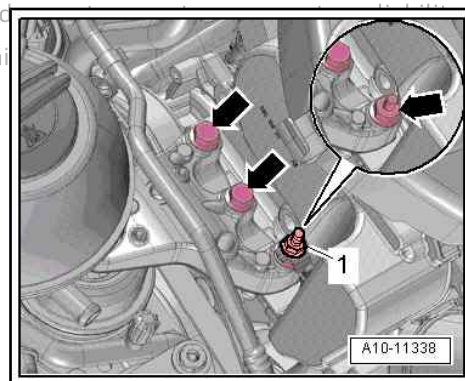
- Ensure that intermediate plate is engaged on sealing flange -arrow A- and pushed onto dowel sleeves -arrows B-.



- If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.
- Install needle bearing if not fitted in crankshaft ⇒ [page 71](#) .
- Install flywheel ⇒ [page 59](#) .
- Secure gearbox to engine.
- Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Exploded view - starter .
- Guide engine/gearbox assembly into body.



- Initially hand-tighten bolts -arrows- for support arm of engine mounting until they make contact.





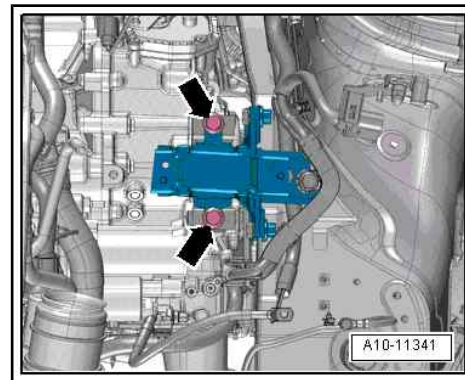
- Initially screw in bolts -arrows- for gearbox mounting by hand until they make contact.



#### Note

*The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ [page 31](#) .*

- Remove engine bracket - T10416- from engine.
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .
- Install pendulum support ⇒ [page 39](#) .
- Install wishbone and swivel joint ⇒ Running gear, axles, steering; Rep. gr. 40 ; Lower wishbone, swivel joint; Exploded view - lower wishbone, swivel joint .
- Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit .
- Install poly V-belt ⇒ [page 44](#) .
- Install catalytic converter ⇒ [page 274](#) .
- Install coolant pipe ⇒ [page 195](#) .
- Install engine control unit ⇒ [page 265](#) .
- Install electronics box ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes .
- Install clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .
- Install cables with cable support bracket or selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector cables .
- Install radiator cowl ⇒ [page 192](#) .
- Install support arm of engine mounting ⇒ [page 31](#) .
- Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Install air cleaner housing ⇒ [page 233](#) .
- Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
- Check oil level ⇒ Maintenance ; Booklet 819 .





### Caution

*Risk of irreparable damage to control units because of excessive voltage.*

◆ *Never use battery charging equipment for boost starting.*



### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .
- Install engine cover panel ⇒ [page 40](#) .
- After renewing engine, misfire adaption must be reset. To do so, select 01 - Reset adaptions misfires in Guided Functions mode of ⇒ Vehicle diagnostic tester.



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## 2 Assembly mountings

⇒ "2.1 Exploded view - assembly mountings", page 31

⇒ "2.2 Removing and installing engine mountings", page 32

⇒ "2.3 Removing and installing gearbox mounting", page 35

⇒ "2.4 Removing and installing pendulum support", page 39

### 2.1 Exploded view - assembly mountings

#### 1 - Bolt

- ☐ Gearbox mounting to body
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

#### 2 - Engine mounting

- ☐ Removing and installing ⇒ page 32

#### 3 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°

#### 4 - Support arm

#### 5 - Nut

- ☐ Do not loosen unless renewing engine mounting -item 2-
- ☐ Renew
- ☐ 40 Nm +90°

#### 6 - Threaded pin

- ☐ Renew
- ☐ 30 Nm +90°

#### 7 - Bolt

- ☐ Renew
- ☐ 30 Nm +90°

#### 8 - Pendulum support

- ☐ Removing and installing ⇒ page 39

#### 9 - Bolt

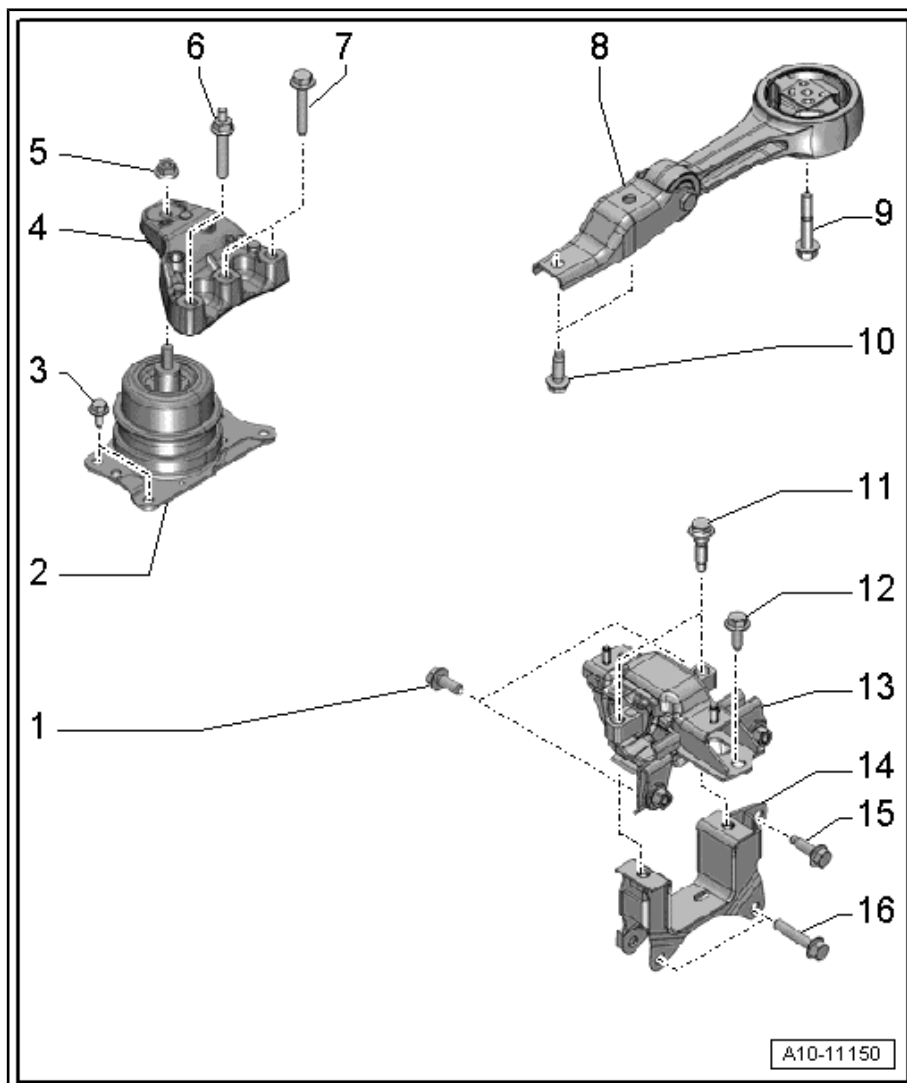
- ☐ Pendulum support to subframe
- ☐ Renew after removing
- ☐ 40 Nm +90°

#### 10 - Bolt

- ☐ Pendulum support to gearbox
- ☐ Renew after removing
- ☐ 30 Nm +90°

#### 11 - Bolt

- ☐ Gearbox mounting to gearbox support
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings



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## 12 - Bolt

- ☐ Gearbox mounting to body
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

## 13 - Gearbox mounting

- ☐ Removing and installing ⇒ [page 35](#)

## 14 - Gearbox support

## 15 - Bolt

- ☐ Gearbox support to gearbox
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

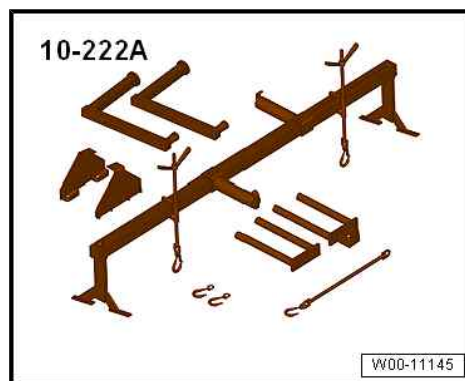
## 16 - Bolt

- ☐ Gearbox support to gearbox
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

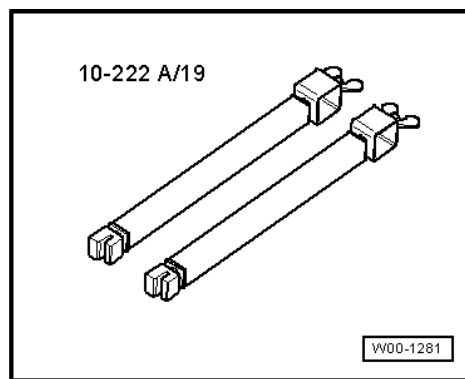
## 2.2 Removing and installing engine mountings

### Special tools and workshop equipment required

- ◆ Support bracket - 10 - 222 A-

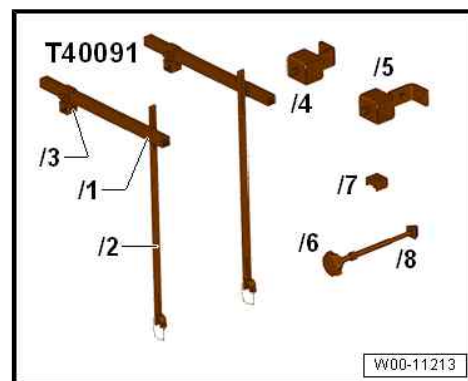


- ◆ Adapters - 10 - 222 A /19-



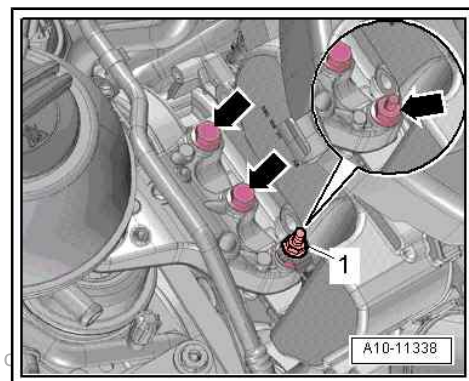
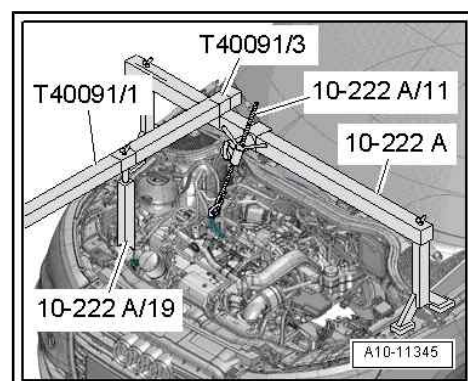
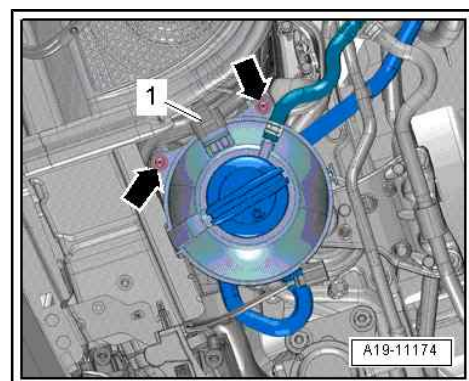


◆ Engine support basic set - T40091-



**Removing**

- Remove engine cover panel ➔ [page 40](#) .
- Remove bolts -arrows-.
- Detach electrical connector -1- for coolant shortage indicator switch - F66- and move coolant expansion tank to side.
- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (right-side), as shown in illustration.
- Attach hook of spindle - 10 - 222 A /11- to engine lifting eye.
- Apply light tension to spindle.
- Remove nut -1- and move earth wire clear.
- Remove bolts -arrows- for support arm of engine mounting.



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## WARNING

*Risk of accident.*

- ◆ *Do not loosen nut -1- unless renewing engine mounting.*

- Remove bolts -arrows- and detach engine mounting.

## Installing

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



## Note

*Renew bolts tightened with specified tightening angle.*

- Fit engine mounting on longitudinal member.
- The positioning holes -arrows- must align. If necessary, check with suitable drill bit.



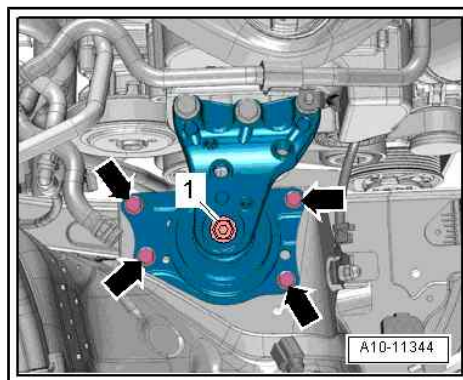
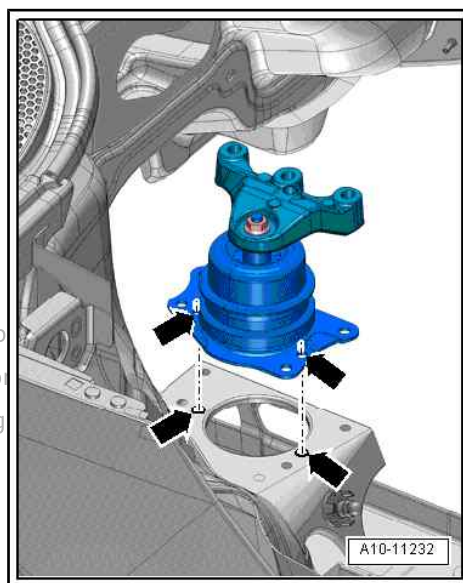
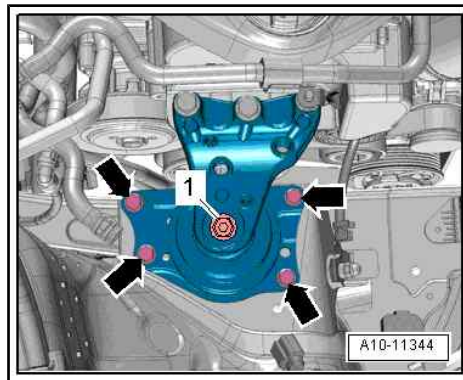
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- Initially screw in bolts -arrows- by hand until they make contact.
- Tighten bolts.



## Note

*Disregard -item 1-.*





- Initially hand-tighten bolts -arrows- for support arm of engine mounting until they make contact.
- The support arm must not turn when you tighten the bolts.
- Tighten bolts.



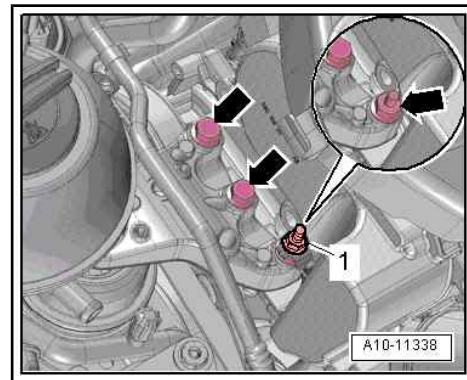
#### Note

Disregard -item 1-.

- Install engine cover panel ➔ [page 40](#) .

#### Tightening torques

- ◆ ➔ ["2.1 Exploded view - assembly mountings", page 31](#)



## 2.3 Removing and installing gearbox mounting

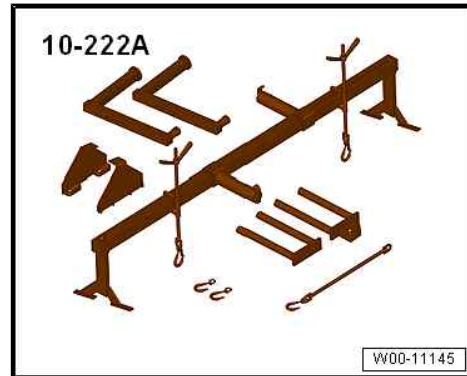
➔ ["2.3.1 Removing and installing gearbox mounting - vehicles with manual gearbox", page 35](#)

➔ ["2.3.2 Removing and installing gearbox mounting - vehicles with dual clutch gearbox", page 37](#)

### 2.3.1 Removing and installing gearbox mounting - vehicles with manual gearbox

#### Special tools and workshop equipment required

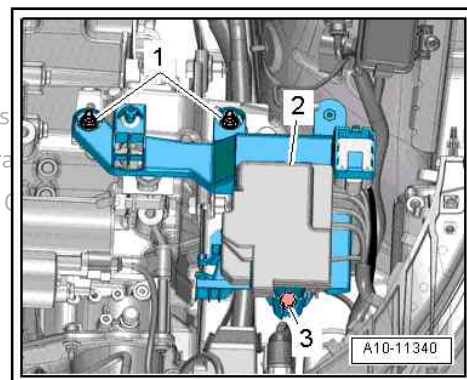
- ◆ Support bracket - 10 - 222 A-



#### Removing

- Remove air cleaner housing ➔ [page 233](#) .
- Remove engine cover panel ➔ [page 40](#) .
- Unscrew nuts -1- and bolt -3-, and push electronics box -2- to the side.

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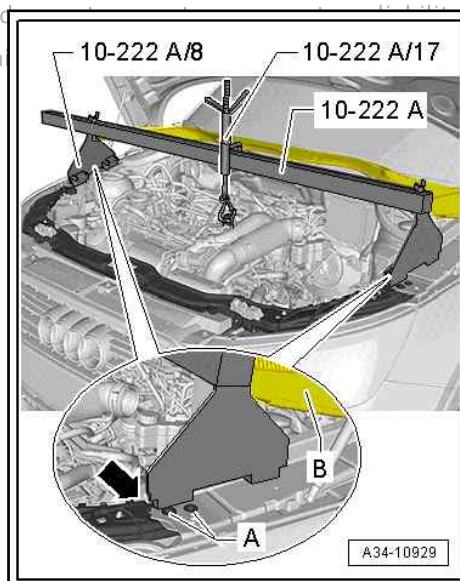
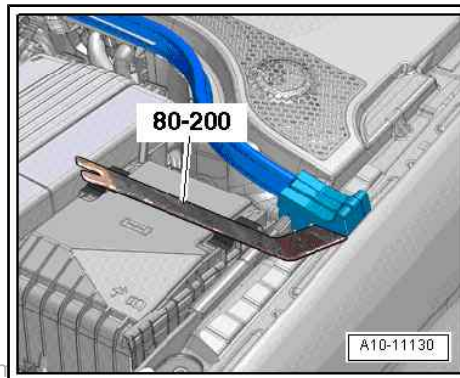


- Lever off clip of sealing element with removal lever - 80 - 200- and detach sealing elements (left and right).

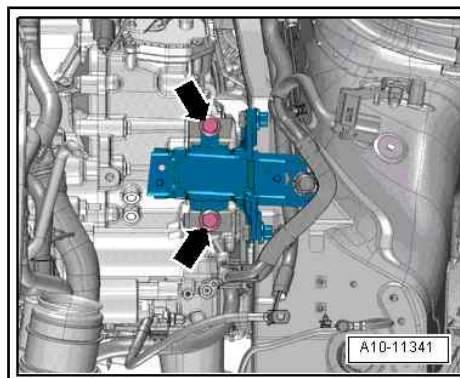


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- Position support bracket - 10 - 222 A- on bolted flanges of wing panels as shown in illustration.
- Position both adapters - 10 - 222 A /8- behind lock carrier connection -arrow- and adjacent to bolts -A-.
- Plenum chamber cover -B- then rests on adapters - 10 - 222 A /8- .
- Hook spindle of lifting tackle onto left-side engine lifting eye.
- Take up weight of engine with the spindle, but do not lift.



- Remove bolts -arrows- securing gearbox mounting.





- Remove bolts -arrows A, B, C- and detach gearbox mounting.

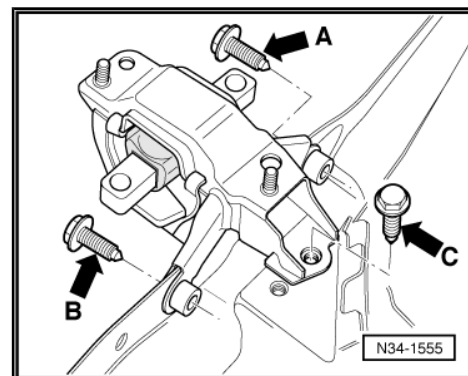
### Installing

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



#### Note

- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *Lightly lubricate rubber bushes on gearbox mounting (left-side) and top area of gearbox support with assembly lubricant  
⇒ Electronic parts catalogue .*



- Install air cleaner housing ⇒ [page 233](#) .
- Install engine cover panel ⇒ [page 40](#) .

### Tightening torques

- ◆ Gearbox mounting: tightening torque and sequence ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings
- ◆ Electronics box ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes

## 2.3.2 Removing and installing gearbox mounting - vehicles with dual clutch gearbox

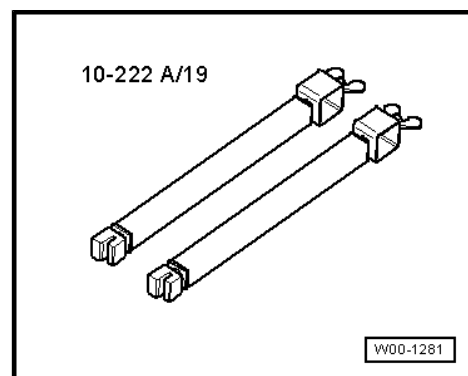
### Special tools and workshop equipment required

- ◆ Support bracket - 10 - 222 A-

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- ◆ Adapters - 10 - 222 A /19-



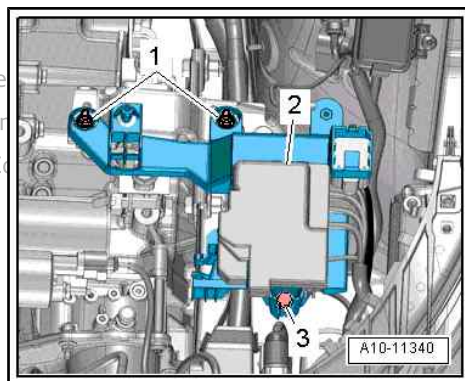
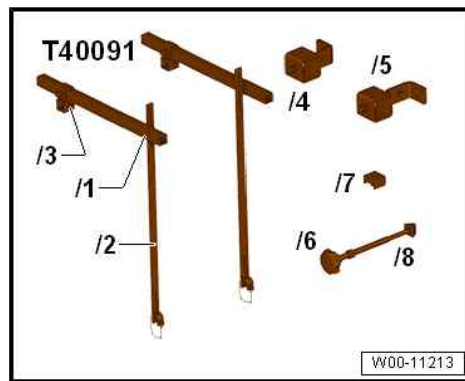


♦ Engine support basic set - T40091-

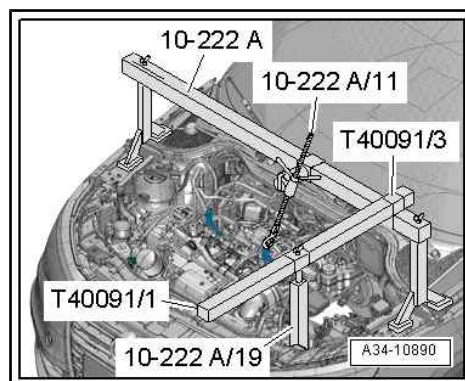


### Removing

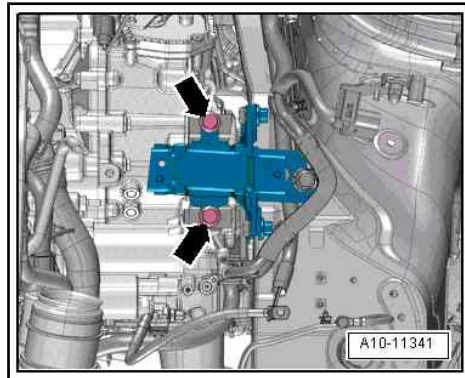
- Remove air cleaner housing ➔ [page 233](#).
- Remove engine cover panel ➔ [page 40](#).
- Unscrew nut -1- and bolt -3-, and push electronics box -2- to the side.



- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (left-side), as shown in illustration.
- Attach hook of spindle - 10 - 222 A /11- to engine lifting eye (left-side).
- Take up weight of engine with the spindle, but do not lift.



- Remove bolts -arrows- securing gearbox mounting.
- Lower engine/gearbox assembly slightly using spindle of support bracket - 10 - 222 A- .





- Remove bolts -arrows A, B, C- and detach gearbox mounting.

### Installing

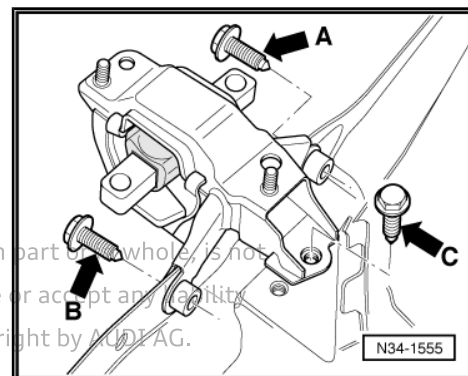
Installation is carried out in reverse order; note the following:



#### Note

*Renew bolts tightened with specified tightening angle.*

- Secure gearbox mounting to body; observe tightening torque and sequence.
- Lift gearbox with spindle of support bracket up to support arm of gearbox mounting and tighten bolts securing gearbox mounting to gearbox support.
- Install air cleaner housing ➔ [page 233](#) .
- Install engine cover panel ➔ [page 40](#) .



### Tightening torques

- ◆ Gearbox mounting: tightening torque and sequence ➔ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings
- ◆ Electronics box ➔ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes

## 2.4 Removing and installing pendulum support

### Removing

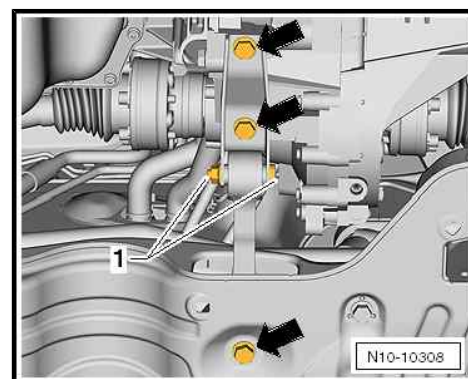
- Remove noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



#### WARNING

*Risk of accident.*

- ◆ **Do NOT loosen bolted connection -1-.**



- Remove bolts -arrows- and detach pendulum support.

### Installing

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



#### Note

*Renew bolts tightened with specified tightening angle.*

- Secure pendulum support first to gearbox and then to sub-frame.

### Tightening torques

- ◆ ➔ ["2.1 Exploded view - assembly mountings", page 31](#)
- ◆ ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



### 3 Engine cover panel

⇒ **“3.1 Removing and installing engine cover panel”, page 40**

#### 3.1 Removing and installing engine cover panel

##### Removing

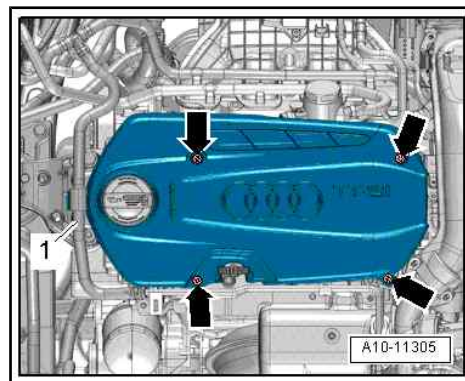
- Disengage coolant hose -1- at engine cover panel.
- Unscrew bolts -arrows- and detach engine cover panel.

##### Installing

- Position engine cover panel, paying attention to oil filler neck and dipstick.

##### Tightening torques

| Location applied   | Tightening torque |
|--------------------|-------------------|
| Engine cover panel | 10 Nm             |



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## 13 – Crankshaft group

### 1 Cylinder block (pulley end)

⇒ [“1.1 Exploded view - poly V-belt drive”, page 41](#)

⇒ [“1.2 Removing and installing poly V-belt”, page 44](#)

⇒ [“1.3 Removing and installing tensioner for poly V-belt”, page 47](#)

⇒ [“1.4 Removing and installing bracket for ancillaries”, page 50](#)

⇒ [“1.5 Removing and installing pulley”, page 51](#)

⇒ [“1.6 Renewing crankshaft oil seal \(pulley end\)”, page 55](#)

#### 1.1 Exploded view - poly V-belt drive

⇒ [“1.1.1 Exploded view - poly V-belt drive, vehicles without air conditioning”, page 41](#)

⇒ [“1.1.2 Exploded view - poly V-belt drive, vehicles with air conditioning”, page 43](#)

##### 1.1.1 Exploded view - poly V-belt drive, vehicles without air conditioning

###### 1 - Poly V-belt

- ☐ Check for wear
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Removing and installing  
⇒ [page 44](#)
- ☐ Do not kink
- ☐ When installing, make sure it is properly seated on pulleys

###### 2 - Bolt

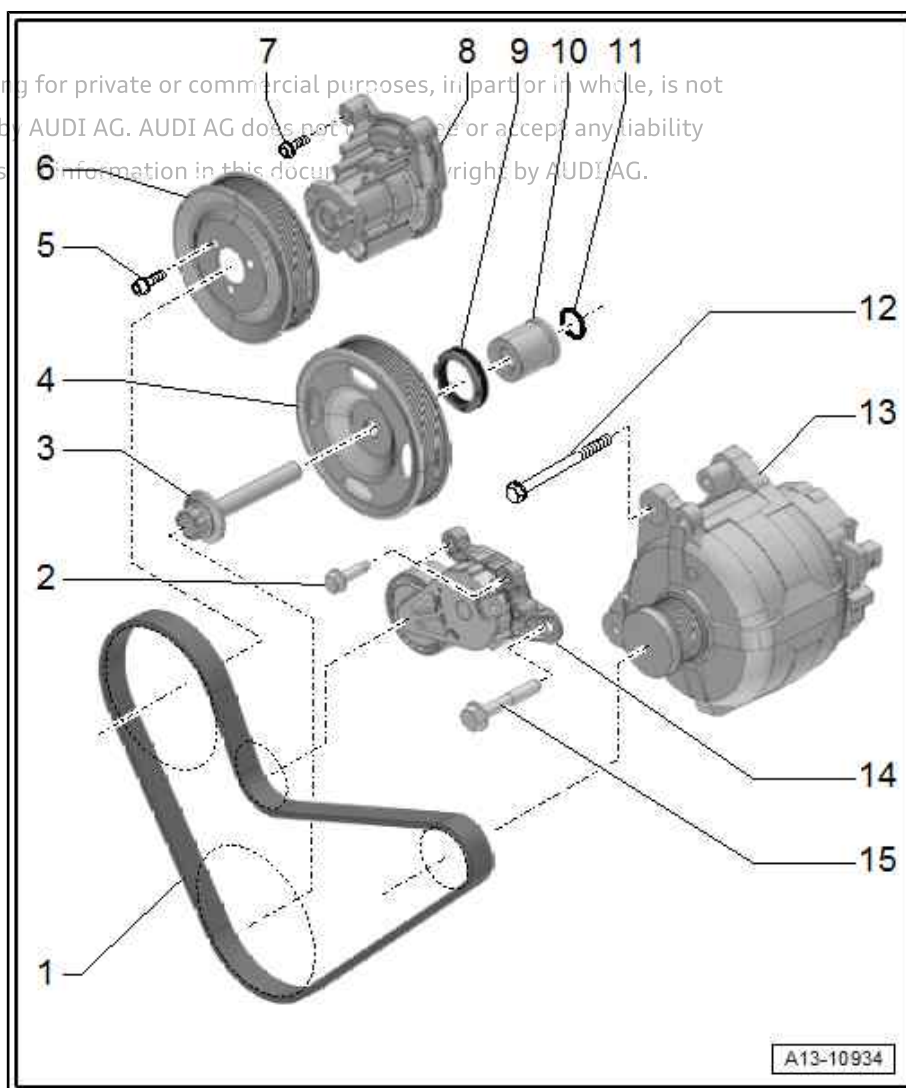
- ☐ 23 Nm

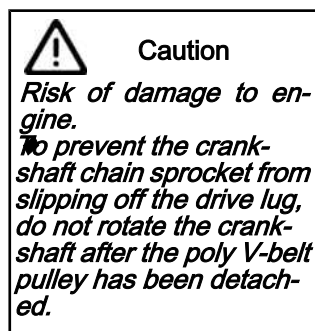
###### 3 - Bolt

- ☐ With washer
- ☐ Renew
- ☐ Lubricate thread with oil before fitting
- ☐ Contact surface must be free of oil and grease
- ☐ 150 Nm +180°

###### 4 - Poly V-belt pulley

- ☐ For crankshaft





- ☐ Removing and installing ⇒ [page 51](#)
- ☐ Contact surfaces must be free of oil and grease

#### 5 - Bolt

- ☐ Tightening torque ⇒ [Item 8 \(page 169\)](#)

#### 6 - Poly V-belt pulley

- ☐ For coolant pump
- ☐ Removing and installing ⇒ [page 174](#)

#### 7 - Bolt

- ☐ Tightening torque ⇒ [Item 7 \(page 169\)](#)

#### 8 - Coolant pump

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

#### 9 - Oil seal

- ☐ For crankshaft (pulley end)
- ☐ Renewing ⇒ [page 55](#)

#### 10 - Bearing bush

- ☐ Contact surfaces must be free of oil and grease

#### 11 - O-ring

- ☐ Renew

#### 12 - Bolt

- ☐ Tightening torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

#### 13 - Alternator

- ☐ Removing and installing ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator

#### 14 - Tensioner

- ☐ For poly V-belt
- ☐ Lock in position with locking pin - T10060 A- .

#### 15 - Bolt

- ☐ 40 Nm

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## 1.1.2 Exploded view - poly V-belt drive, vehicles with air conditioning

### 1 - Poly V-belt

- ☐ Check for wear
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Removing and installing ⇒ [page 46](#)
- ☐ Do not kink
- ☐ When installing, make sure it is properly seated on pulleys

### 2 - Bolt

- ☐ With washer
- ☐ Renew
- ☐ Lubricate thread with oil before fitting
- ☐ Contact surface must be free of oil and grease
- ☐ 150 Nm +180°

### 3 - Poly V-belt pulley

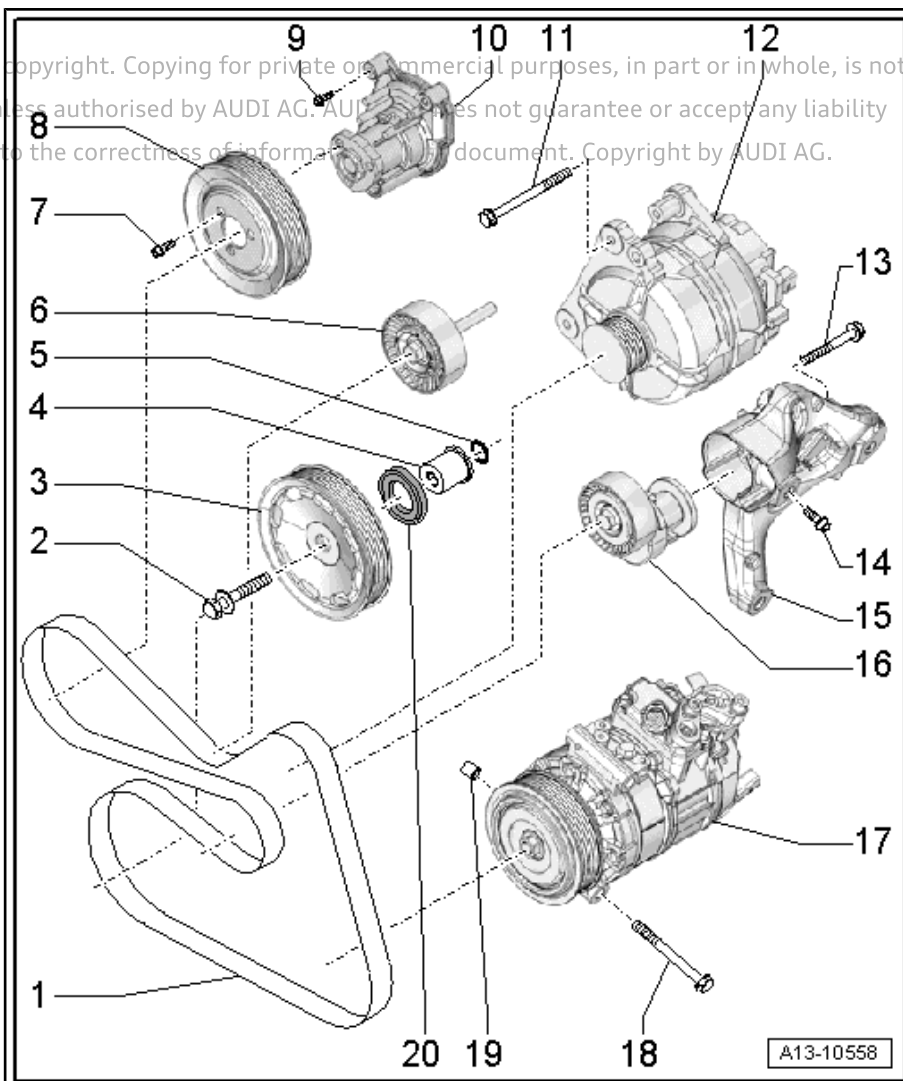
- ☐ For crankshaft



#### Caution

*Risk of damage to engine.*

*To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.*



- ☐ Removing and installing ⇒ [page 51](#)
- ☐ Contact surfaces must be free of oil and grease

### 4 - Bearing bush

- ☐ Contact surfaces must be free of oil and grease

### 5 - O-ring

- ☐ Renew

### 6 - Idler roller

- ☐ For poly V-belt
- ☐ Removing and installing ⇒ [page 48](#)
- ☐ 40 Nm

### 7 - Bolt

- ☐ Tightening torque ⇒ [Item 8 \(page 169\)](#)

### 8 - Poly V-belt pulley

- ☐ For coolant pump
- ☐ Removing and installing ⇒ [page 174](#)



## 9 - Bolt

- ☐ Tightening torque ⇒ [Item 7 \(page 169\)](#)

## 10 - Coolant pump

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

## 11 - Bolt

- ☐ Tightening torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

## 12 - Alternator

- ☐ Removing and installing ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator

## 13 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°

## 14 - Bolt

- ☐ 25 Nm

## 15 - Bracket

- ☐ For air conditioner compressor
- ☐ Removing and installing ⇒ [page 50](#)

## 16 - Tensioner

- ☐ For poly V-belt
- ☐ Lock in position with locking pin - T10060 A- .

## 17 - Air conditioner compressor

- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

## 18 - Bolt

- ☐ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

## 19 - Dowel sleeve

## 20 - Oil seal

- ☐ For crankshaft (pulley end)
- ☐ Renewing ⇒ [page 55](#)

## 1.2 Removing and installing poly V-belt

⇒ [“1.2.1 Removing and installing poly V-belt - vehicles without air conditioning”, page 44](#)

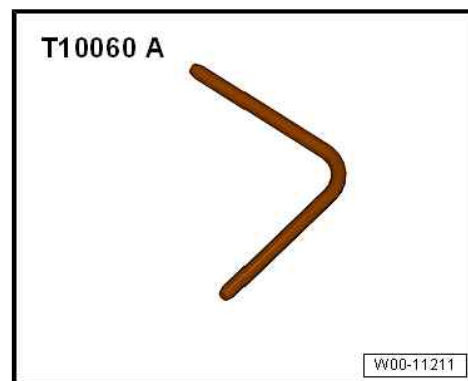
⇒ [“1.2.2 Removing and installing poly V-belt - vehicles with air conditioning”, page 46](#)

### 1.2.1 Removing and installing poly V-belt - vehicles without air conditioning

Special tools and workshop equipment required



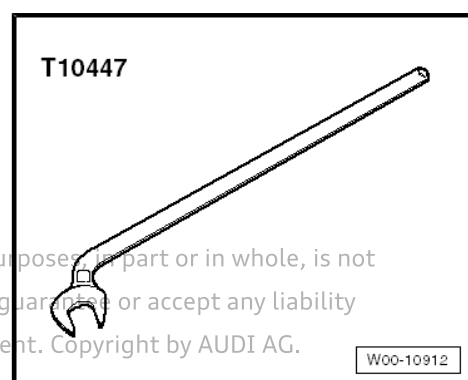
◆ Locking pin - T10060 A-



◆ Open-end spanner 16 mm - T10447-



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## Removing

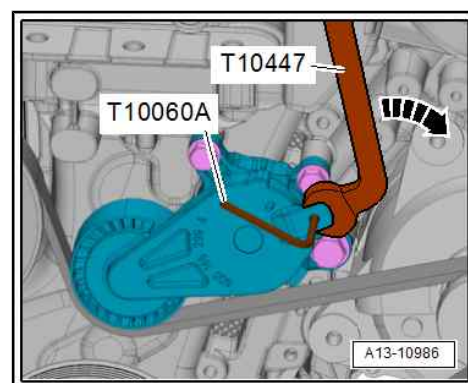


### Caution

*Running a used poly V-belt in the opposite direction could cause irreparable damage.*

- ◆ *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*

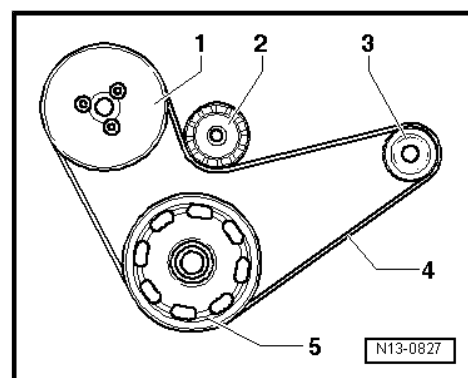
- Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using open-end spanner, 16 mm - T10447- .
- Lock tensioner with locking pin - T10060 A- .
- Take off poly V-belt.



## Installing

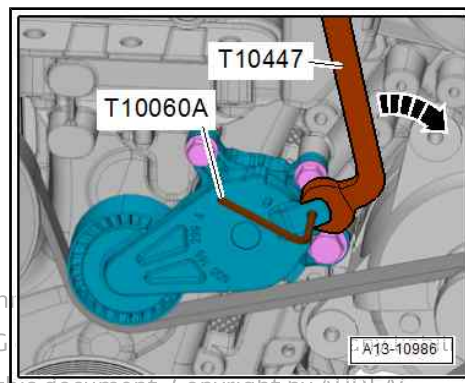
Installation is carried out in reverse order; note the following:

- Fit poly V-belt onto pulleys as shown in illustration.
- 1 - Coolant pump
  - 2 - Tensioner
  - 3 - Alternator
  - 4 - Poly V-belt
  - 5 - Crankshaft





- Hold tensioner with open-end spanner, 16 mm - T10447- and remove locking pin - T10060 A- .
- Release tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that poly V-belt runs properly.

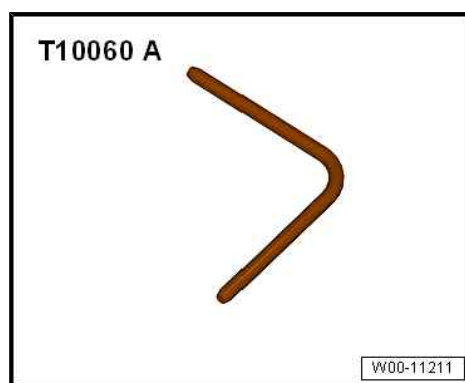


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## 1.2.2 Removing and installing poly V-belt - vehicles with air conditioning

### Special tools and workshop equipment required

- ◆ Locking pin - T10060 A-



### Removing

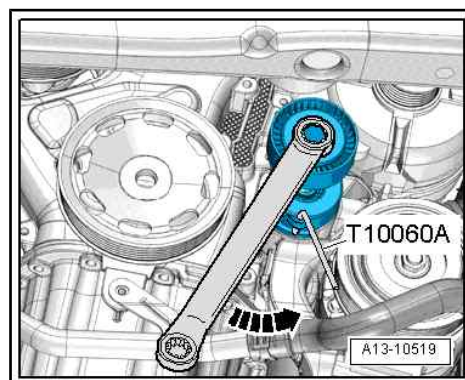
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



#### Caution

**Running a used poly V-belt in the opposite direction could cause irreparable damage.**

- ◆ **Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.**



- To slacken poly V-belt turn tensioner in anti-clockwise direction -arrow-.
- Lock tensioner with locking pin - T10060 A- .
- Take off poly V-belt.

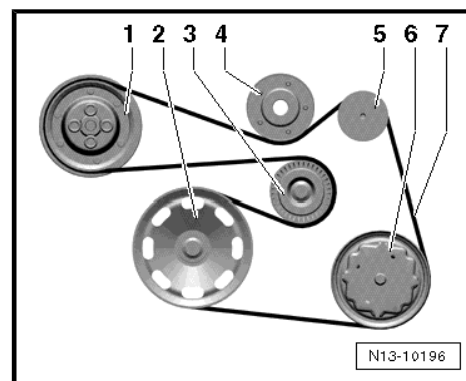
### Installing

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



- Fit poly V-belt onto pulleys as shown in illustration.

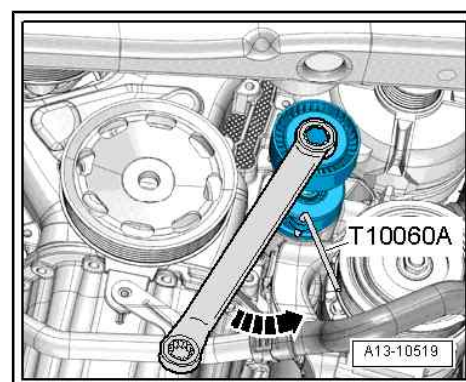
- 1 - Coolant pump
- 2 - Crankshaft
- 3 - Tensioner
- 4 - Idler roller
- 5 - Alternator
- 6 - Air conditioner compressor
- 7 - Poly V-belt



- Hold tensioner with ring spanner and remove locking pin - T10060 A- .
- Release tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that poly V-belt runs properly.

#### Tightening torques

- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



## 1.3 Removing and installing tensioner for poly V-belt

⇒ ["1.3.1 Removing and installing tensioner for poly V-belt - vehicles without air conditioning", page 47](#)

⇒ ["1.3.2 Removing and installing tensioner for poly V-belt - vehicles with air conditioning", page 48](#)

⇒ ["1.3.3 Removing and installing idler roller for poly V-belt - vehicles with air conditioning", page 48](#)

### 1.3.1 Removing and installing tensioner for poly V-belt - vehicles without air conditioning

#### Removing

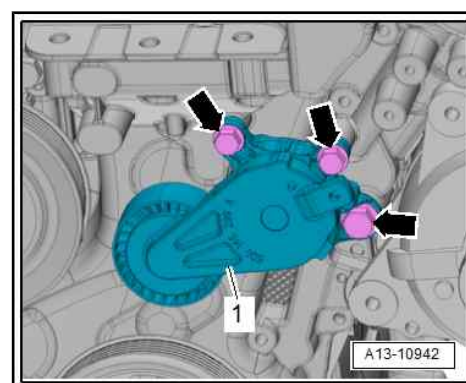
- Remove poly V-belt ⇒ [page 44](#) .
- Remove bolts -arrows- and take off tensioner -1-.

#### Installing

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

#### Tightening torques

- ◆ ⇒ ["1.1.1 Exploded view - poly V-belt drive, vehicles without air conditioning", page 41](#)



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### 1.3.2 Removing and installing tensioner for poly V-belt - vehicles with air conditioning

#### Removing

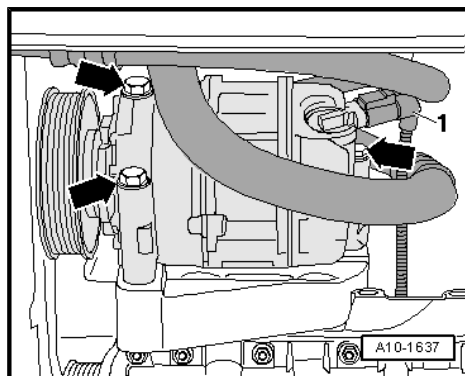
- Remove poly V-belt ➔ [page 46](#) .
- Unplug electrical connector -1- for air conditioner compressor regulating valve - N280- .



#### WARNING

*Risk of injury caused by refrigerant.*

- ◆ *The air conditioner refrigerant circuit must not be opened.*



- Remove bolts -arrows- for air conditioner compressor.



#### Caution

*Risk of damage to refrigerant lines and hoses*

- ◆ *Do NOT stretch, kink or bend refrigerant lines and hoses.*

- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).
- Remove bolt -arrow- and take off tensioner -1-.

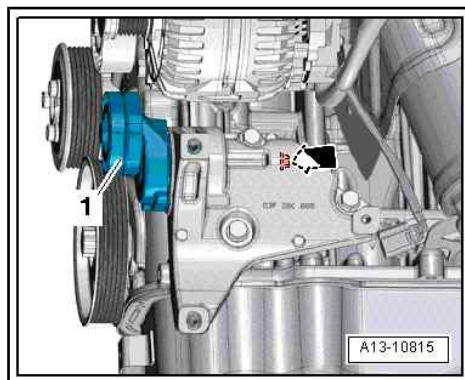
#### Installing

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

- Install poly V-belt ➔ [page 46](#) .

#### Tightening torques

- ◆ ➔ ["1.1.2 Exploded view - poly V-belt drive, vehicles with air conditioning", page 43](#)
- ◆ ➔ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit



### 1.3.3 Removing and installing idler roller for poly V-belt - vehicles with air conditioning

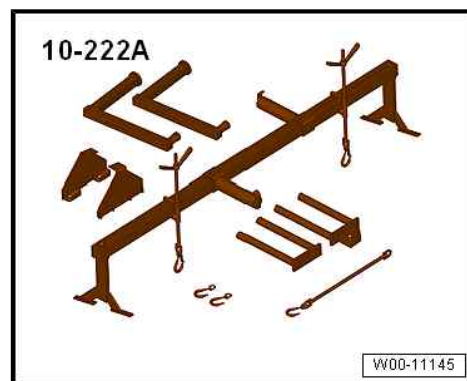
#### Special tools and workshop equipment required



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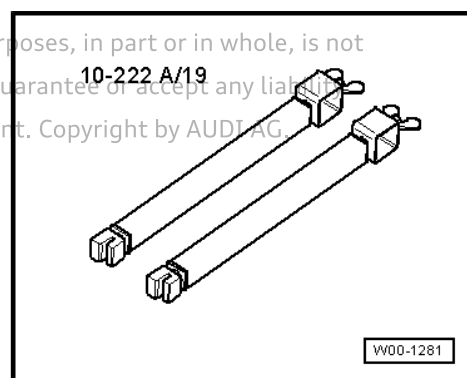


◆ Support bracket - 10 - 222 A-

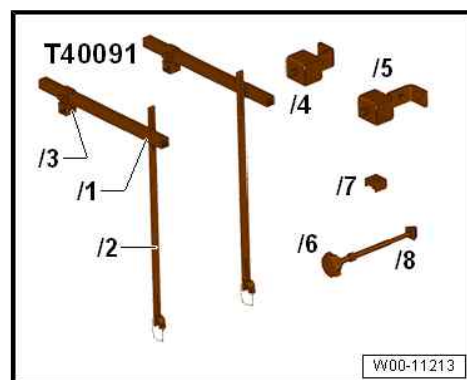


◆ Adapters - 10 - 222 A /19-

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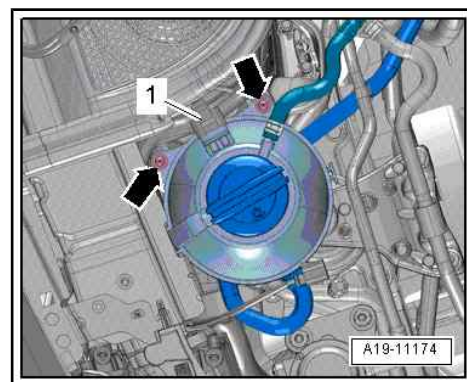


◆ Engine support basic set - T40091-



**Removing**

- Remove poly V-belt ➔ [page 46](#) .
- Remove engine cover panel ➔ [page 40](#) .
- Remove bolts -arrows-.
- Detach electrical connector -1- for coolant shortage indicator switch - F66- and move coolant expansion tank to side.



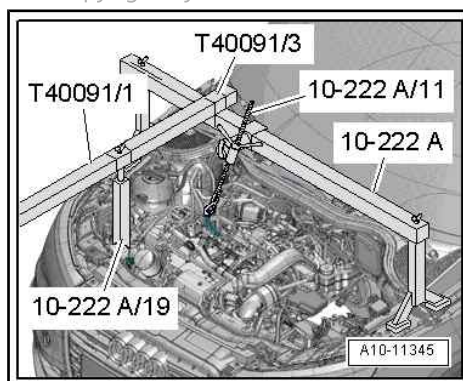
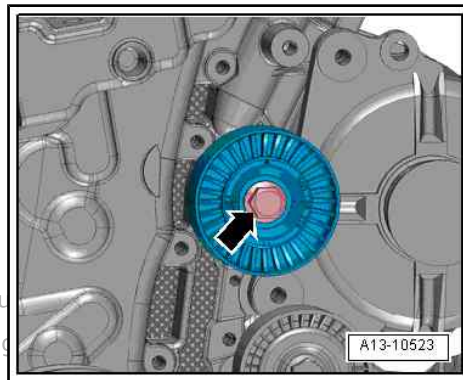


- Loosen bolt -1- and unscrew as far as possible.



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- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (right-side), as shown in illustration.
- Attach hook of spindle - 10 - 222 A /11- to engine lifting eye.
- Apply light tension to spindle.

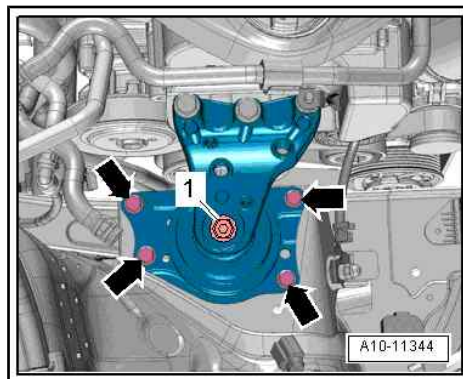


#### WARNING

*Risk of accident.*

- ◆ *Do not loosen nut -1- unless renewing engine mounting.*

- Remove bolts -arrows-.
- Turn spindle until idler roller for poly V-belt with bolt -arrow- can be removed.



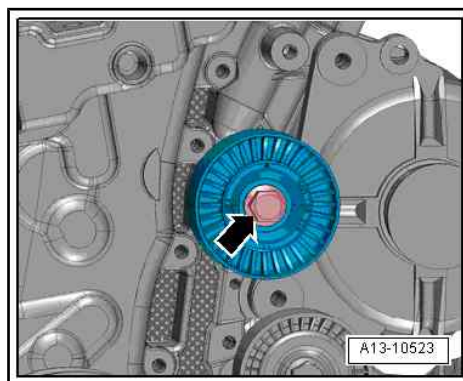
#### Installing

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

- Install poly V-belt ➔ [page 46](#) .

#### Tightening torques

- ◆ ➔ [“1.1.2 Exploded view - poly V-belt drive, vehicles with air conditioning”, page 43](#)
- ◆ ➔ [“2.1 Exploded view - assembly mountings”, page 31](#)



## 1.4 Removing and installing bracket for ancillaries

#### Removing

- Remove poly V-belt ➔ [page 46](#) .



- Unplug electrical connector -1- for air conditioner compressor regulating valve - N280- .



#### WARNING

*Risk of injury caused by refrigerant.*

- ◆ *The air conditioner refrigerant circuit must not be opened.*

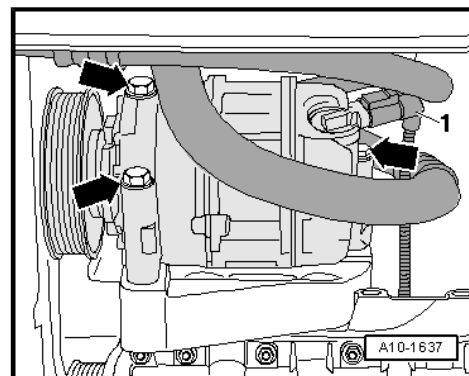
- Remove bolts -arrows- for air conditioner compressor.



#### Caution

*Risk of damage to refrigerant lines and hoses*

- ◆ *Do NOT stretch, kink or bend refrigerant lines and hoses.*



- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).
- Unscrew bolts -1- and detach bracket for air conditioner compressor.

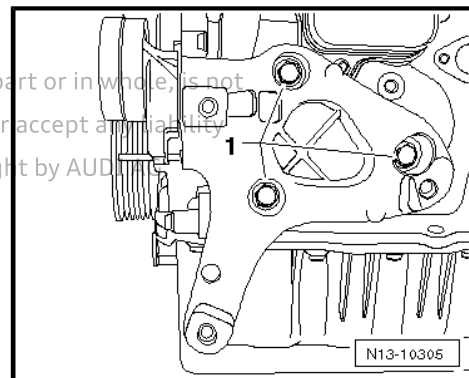
#### Installing

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

- Install poly V-belt ⇒ [page 46](#) .

#### Tightening torques

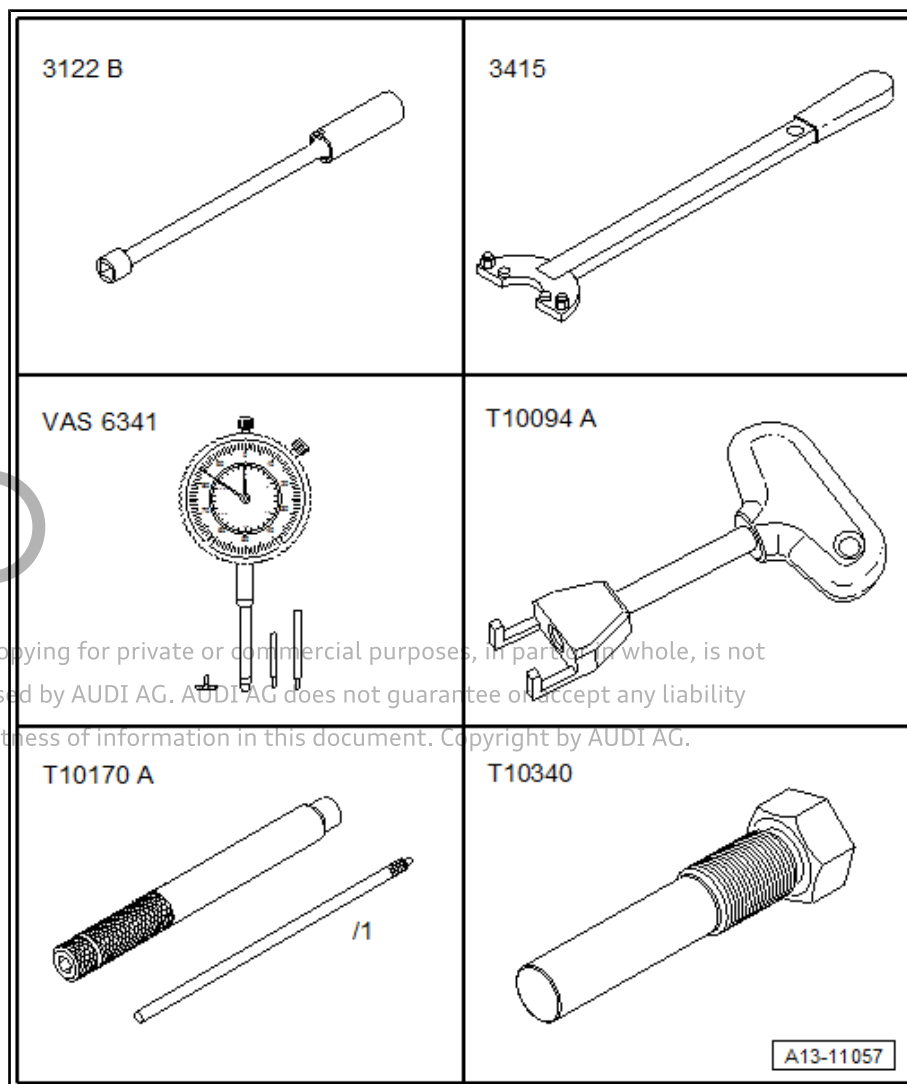
- ◆ ⇒ [“1.1.2 Exploded view - poly V-belt drive, vehicles with air conditioning”, page 43](#)
- ◆ ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit



## 1.5 Removing and installing pulley



### Special tools and workshop equipment required



- ◆ Spark plug spanner - 3122 B-
- ◆ Counterhold tool - 3415- with pins -3415/1-
- ◆ Dial gauge set, 4-part - VAS 6341-
- ◆ Puller - T10094 A-
- ◆ Adapter for dial gauge - T10170 A-
- ◆ Locking pin - T10340-

### Removing



#### Note

- ◆ Use locking pin - 3415- in addition to counterhold tool - T10340- to prevent slipping and to make sure the tightening torque for the crankshaft pulley bolt is maintained.
- ◆ The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.

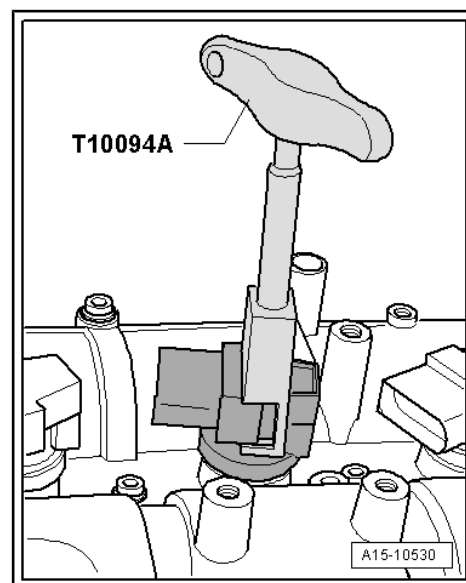


### Caution

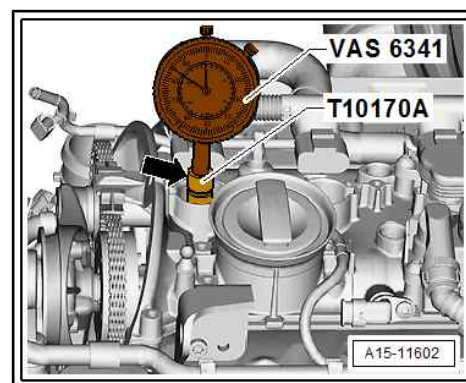
*Risk of damage to engine.*

- ◆ **Locking pin - T10340- must be screwed in with crankshaft at "TDC" position.**

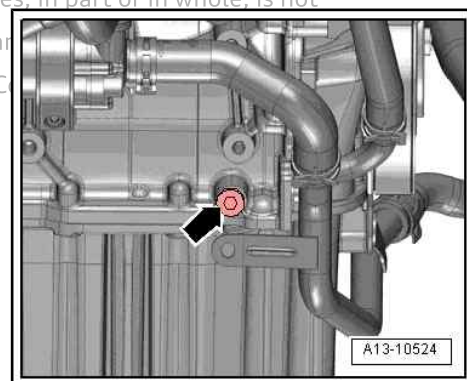
- Remove poly V-belt ➔ [page 44](#) .
- Remove engine cover panel ➔ [page 40](#) .
- Apply puller - T10094 A- to ignition coil for cylinder 1, pull out ignition coil and at the same time unplug electrical connector at ignition coil for cylinder 1.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .



- Screw adapter for dial gauge - T10170 A- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6341- with extension -T10170 A/1- as far as the stop and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to "TDC".
- "TDC" = maximum measured value on dial gauge.



- Unscrew plug -arrow- for "TDC" hole on cylinder block.
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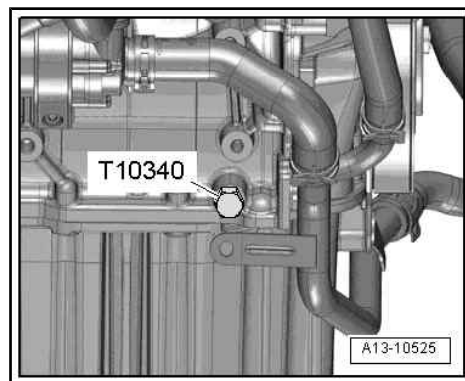


- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



#### Note

*The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.*

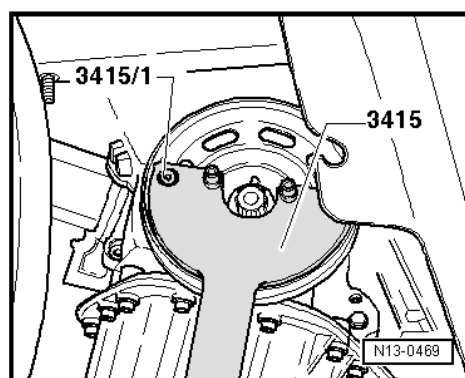


#### Caution

**Risk of damage to engine.**

- ◆ *To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.*

- Loosen bolt for poly V-belt pulley using counterhold tool - 3415- with pin -3415/1-.
- Remove bolt and take off poly V-belt pulley.



#### Installing



#### Note

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- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *All contact surfaces between bolt, poly V-belt pulley, bearing bush and chain sprocket must be free of oil and grease.*
- Fit poly V-belt pulley, lubricate threads of bolt for poly V-belt pulley with oil and screw in by hand until bolt makes contact.



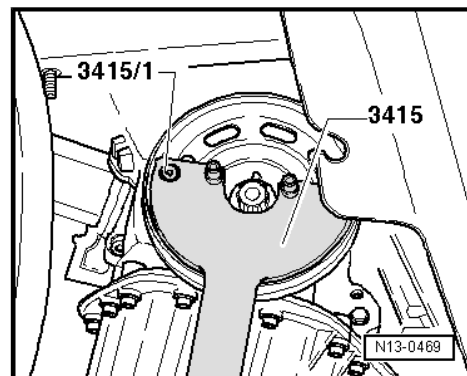
#### Caution

**Risk of damage to engine.**

- ◆ *Use dial gauge to check "TDC" position of crankshaft. Crankshaft must only be brought into contact with locking pin - T10340- from "TDC" position.*
- ◆ *Also use counterhold tool - 3415- and pin -3415/1- to counterhold poly V-belt pulley when tightening bolt.*



- Turn crankshaft in direction of engine rotation until it makes contact with locking pin - T10340- .
- Tighten bolt for poly V-belt pulley (counterhold with counterhold tool - 3415- and pin -3415/1- ).



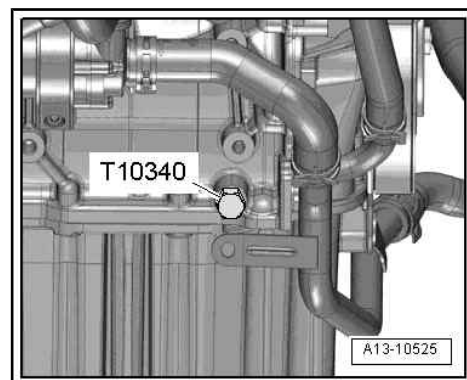
- Remove locking pin - T10340- .

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

- Install spark plug ⇒ Maintenance ; Booklet 819 .
- Tighten plug for “TDC” drilling ⇒ [page 71](#) .
- Install engine cover panel ⇒ [page 40](#) .
- Install poly V-belt ⇒ [page 44](#) .

#### Tightening torques

- ◆ ⇒ [“1.1 Exploded view - poly V-belt drive”, page 41](#)



## 1.6 Renewing crankshaft oil seal (pulley end)

### Special tools and workshop equipment required

- ◆ Oil seal extractor - 3203-



- ◆ Assembly tool - T10053-

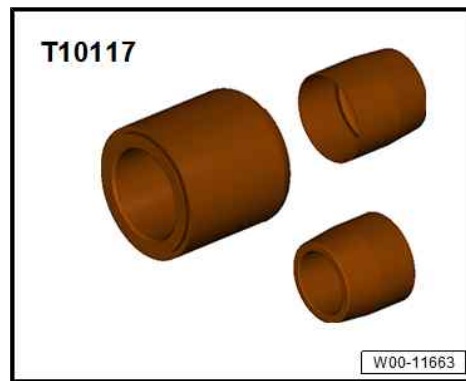


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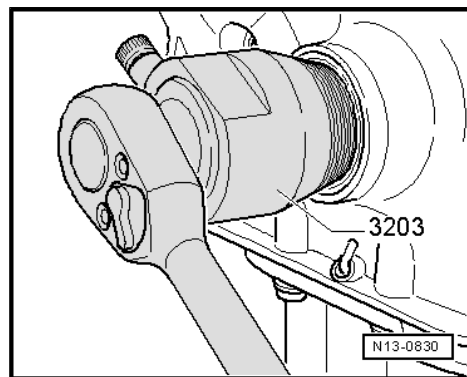


◆ Assembly tool - T10117-



**Procedure**

- Remove poly V-belt pulley for crankshaft ⇒ [page 51](#) .
- Adjust inner part of oil seal extractor - 3203- so that it is level with the outer part and lock in position with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.
- Remove bearing bush and O-ring from crankshaft journal.
- Clean contact surfaces for crankshaft chain sprocket and bush.
- Clean contact surface and sealing surface for oil seal.



**Note**

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*Fit new O-ring.*

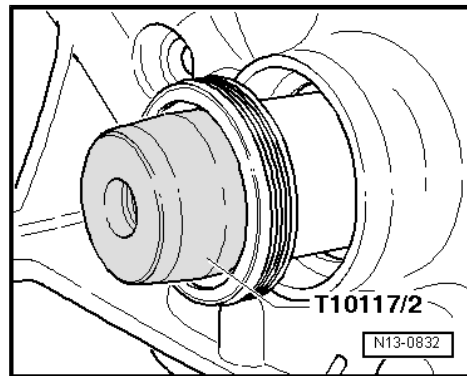
- Push bush with O-ring onto crankshaft journal.



**Note**

*Do not lubricate sealing lip and outer rim of oil seal before pressing in.*

- Apply guide sleeve -T10117/2- to bearing bush and slide oil seal over guide sleeve.
- Take off guide sleeve.

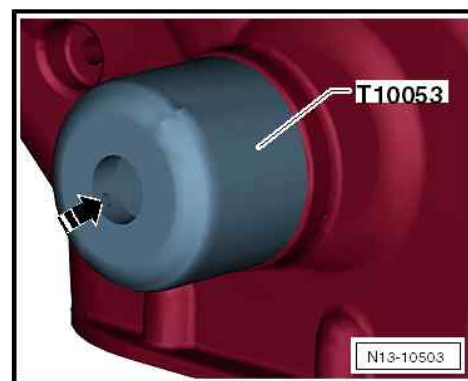




- Drive in oil seal carefully as far as stop using assembly tool - T10053- and a hammer -arrow-.

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

- Install poly V-belt pulley for crankshaft ⇒ [page 51](#) .



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## 2 Cylinder block (gearbox end)

⇒ ["2.1 Exploded view - cylinder block \(gearbox end\)", page 58](#)

⇒ ["2.2 Removing and installing flywheel", page 59](#)

⇒ ["2.3 Removing and installing sealing flange \(gearbox end\)", page 60](#)

### 2.1 Exploded view - cylinder block (gearbox end)



#### Note

When performing assembly work, secure engine to engine and gearbox support ⇒ [page 25](#).

#### 1 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°

#### 2 - Flywheel

- ☐ Different versions available ⇒ Electronic parts catalogue
- ☐ Can only be installed in one position (holes are off-set)
- ☐ Removing and installing ⇒ [page 59](#)

#### 3 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Removing and installing ⇒ ["2.3 Removing and installing sealing flange \(gearbox end\)", page 60](#)

#### 4 - Bolt

- ☐ Renew
- ☐ 12 Nm

#### 5 - Intermediate plate

- ☐ Must be positioned on dowel sleeves
- ☐ Do not damage or bend when assembling
- ☐ Installing ⇒ [page 59](#)

#### 6 - Engine speed sender - G28-

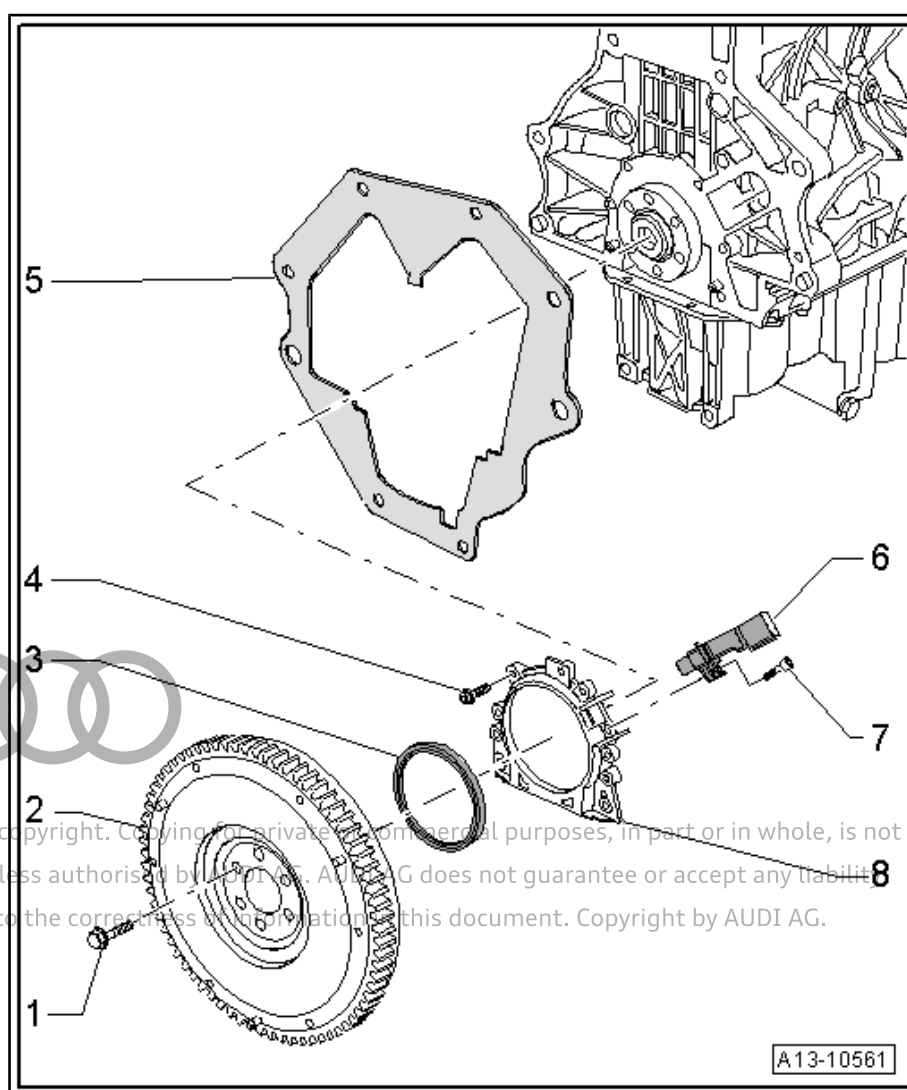
- ☐ Exploded view ⇒ [page 280](#)

#### 7 - Bolt

- ☐ Tightening torque ⇒ [Item 10 \(page 281\)](#)

#### 8 - Sealing flange

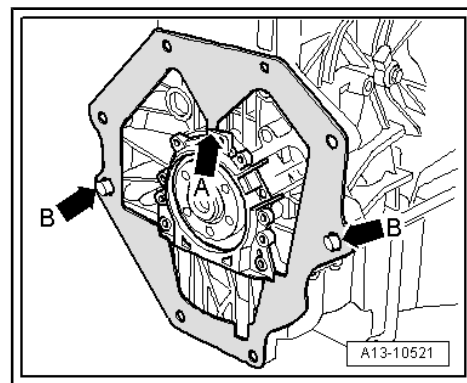
- ☐ With oil seal
- ☐ Renewing ⇒ [page 60](#)





### Installing intermediate plate

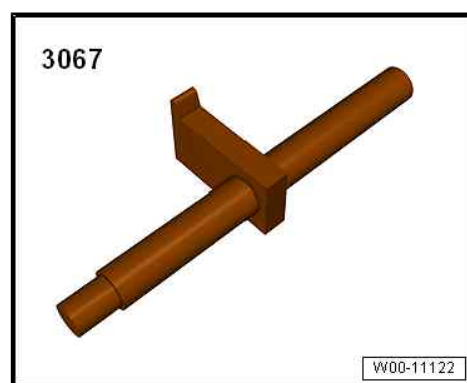
- Engage intermediate plate on sealing flange -arrow A- and push onto dowel sleeves -arrows B-.



## 2.2 Removing and installing flywheel

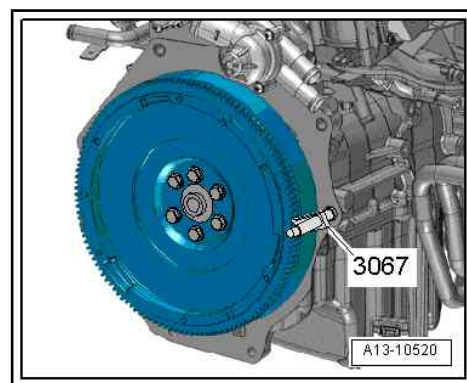
### Special tools and workshop equipment required

- ◆ Counterhold tool - 3067-



### Removing

- Gearbox removed
- Insert counterhold tool - 3067- to slacken bolts.



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#### Vehicles with dual-mass flywheel:

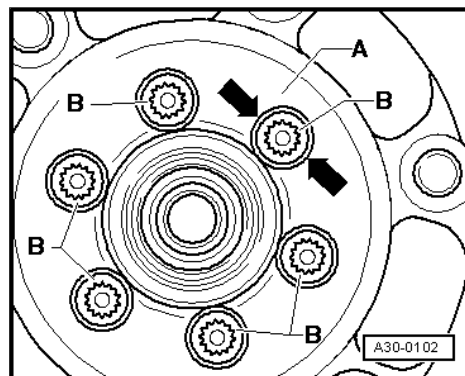


##### Caution

***Make sure dual-mass flywheel is not damaged on removal.***

- ◆ ***Remove bolts -B- using normal hand tools (do not use pneumatic wrench or impact driver, etc.). The bolts may only be removed by hand using conventional tools.***

- Rotate the dual-mass flywheel -A- so that the bolts align centrally with the holes -arrows-.
- When unscrewing the bolts, make sure that the bolt heads do not come into contact with the dual-mass flywheel; the flywheel will otherwise be damaged as the bolts are screwed out.



#### All vehicles (continued):

- Remove bolts and take off flywheel.

#### Installing

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



##### Note

- ◆ *Renew bolts for flywheel.*
- ◆ *Can only be installed in one position (holes are off-set)*
- Fit counterhold tool - 3067- the other way round to tighten bolts.

#### Tightening torques

- ◆ ⇒ ["2.1 Exploded view - cylinder block \(gearbox end\)", page 58](#)

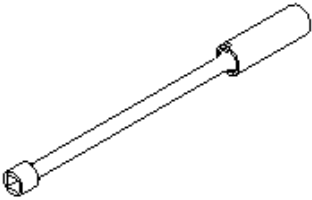
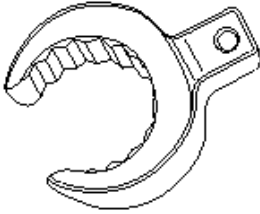
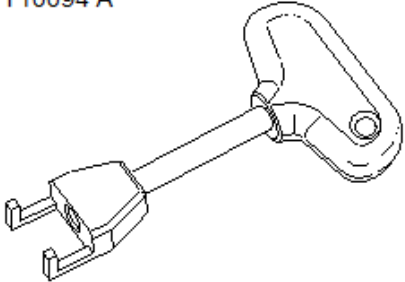
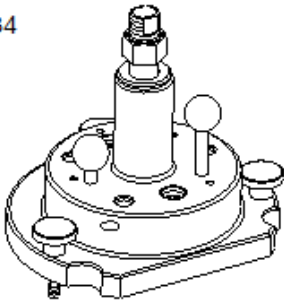
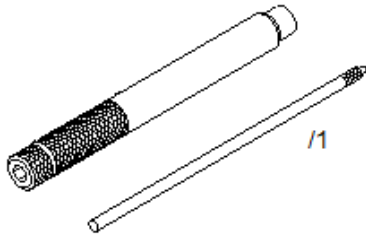
## 2.3 Removing and installing sealing flange (gearbox end)



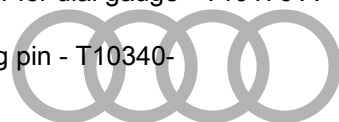
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# Special tools and workshop equipment required

|                                                                                                   |                                                                                                                       |
|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <p>3122 B</p>    | <p>V.A.G 1332/11</p>               |
| <p>VAS 6341</p>  | <p>T10094 A</p>                    |
| <p>T10134</p>   | <p>T10170 A</p>  <p>A13-11058</p> |

- ◆ Spark plug spanner - 3122 B-
- ◆ Open ring spanner - V.A.G 1332/11-
- ◆ Dial gauge set, 4-part - VAS 6341-
- ◆ Puller - T10094 A-
- ◆ Assembly tool - T10134-
- ◆ Adapter for dial gauge - T10170 A-
- ◆ Locking pin - T10340-

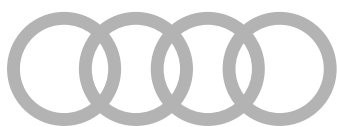


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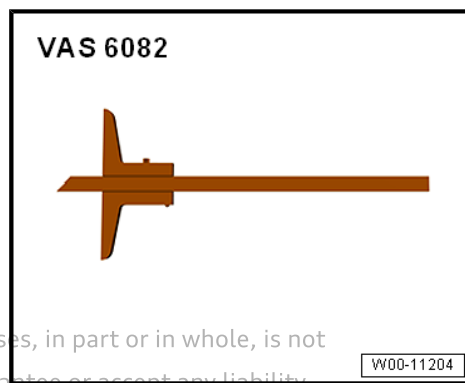




◆ Depth gauge - VAS 6082-



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- ◆ Feeler gauge
- ◆ Bolt, M6x35 (3x)

**Pressing sealing flange with sender wheel off crankshaft**

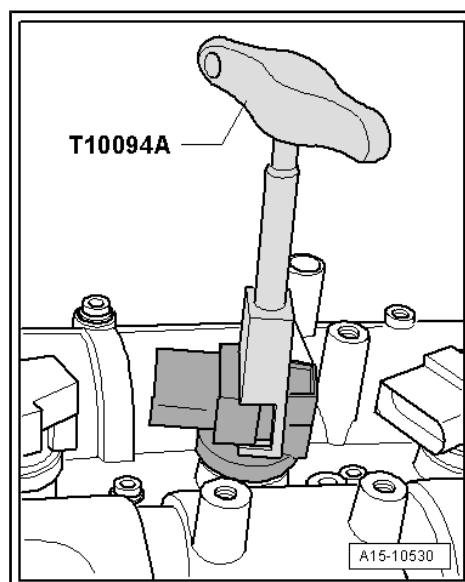
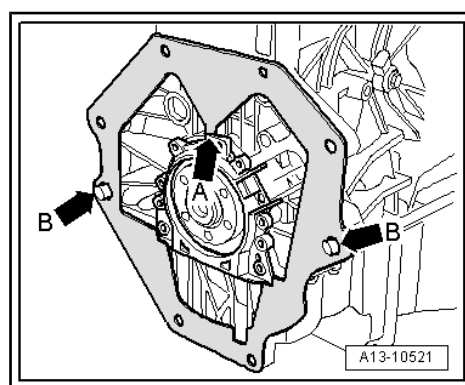
- Gearbox removed



**Note**

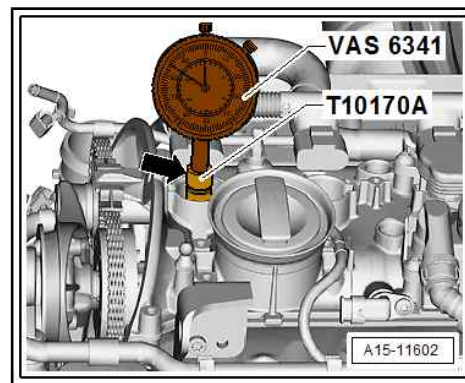
*For illustration purposes, the procedure is shown with the engine removed.*

- Remove flywheel ⇒ [page 59](#) .
- Press intermediate plate off dowel sleeves -arrows B- and detach from top of sealing flange -arrow A-
- Remove engine cover panel ⇒ [page 40](#) .
- Apply puller - T10094 A- to ignition coil for cylinder 1, pull out ignition coil and at the same time unplug electrical connector at ignition coil for cylinder 1.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .





- Screw adapter for dial gauge - T10170 A- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6341- with extension -T10170 A/1- and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to “TDC”.
- “TDC” = maximum measured value on dial gauge.

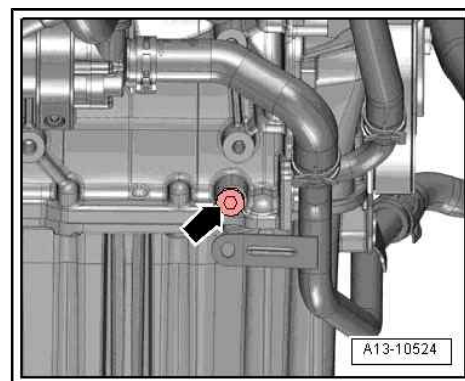


#### Caution

*Risk of damage to engine.*

- ◆ *Locking pin - T10340- must be screwed in with crankshaft at “TDC” position.*

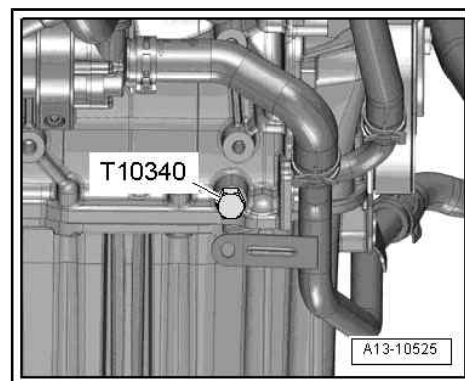
- Unscrew plug -arrow- for “TDC” hole on cylinder block.
- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



#### Note

*The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.*

- Remove sump ➔ [page 147](#) .
- Remove engine speed sender - G28- ➔ [page 282](#) .



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- Remove bolts for sealing flange.



#### Note

*The sealing flange is pressed off the crankshaft together with the sender wheel.*

- To press off, screw 3 bolts M6x35 -arrows- alternately into sealing flange not more than  $\frac{1}{2}$  turn at a time.
- Take off sealing flange with sender wheel.

#### Pressing in sealing flange with sender wheel



#### Note

- ♦ *The sealing flange with PTFE oil seal is fitted with a sealing lip support ring. This support ring acts as an assembly sleeve and must not be removed before installation.*
- ♦ *Sealing flange and sender wheel must not be separated or rotated out of position after removal from packaging.*
- ♦ *The sender wheel is held in its installation position by a locating pin on the assembly tool - T10134- .*
- ♦ *The sealing flange and oil seal are one unit and can only be replaced together with the sender wheel.*
- ♦ *The assembly tool - T10134- is held in the correct position relative to the crankshaft by a guide pin which is inserted into a hole in the crankshaft.*

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Construction of assembly tool - T10134- : AUDI AG does not guarantee or accept any liability

A - Tensioning flats

B - Nut

C - Assembly housing

D - Locating pin

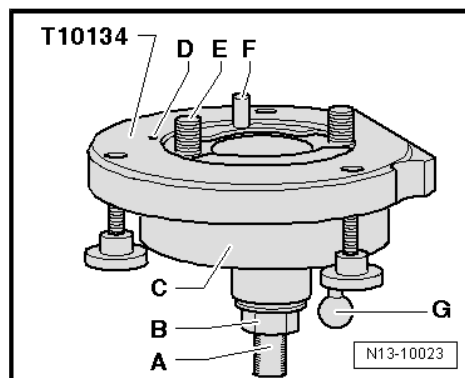
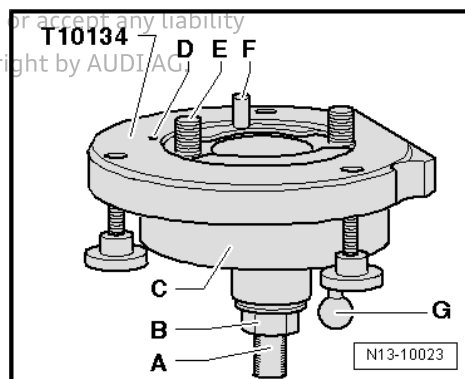
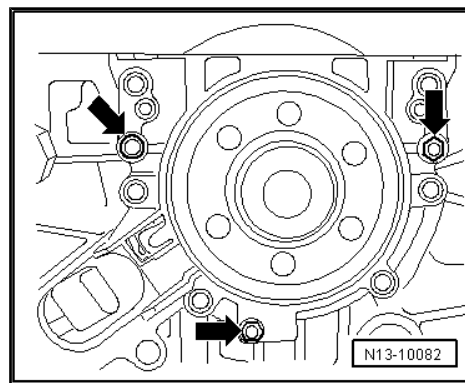
E - Hexagon socket-head bolt

F - Guide pin for diesel engines (black handle)

G - Guide pin for petrol engines (red handle)

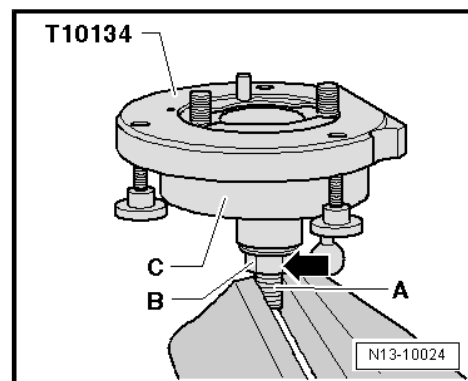
**A - Fitting oil seal with sender wheel onto assembly tool - T10134- :**

- Unscrew nut -B- until it is just in front of tightening flats -A- on threaded spindle.





- Clamp assembly tool - T10134- in a vice on tightening flats -A- of threaded spindle.
- Press the assembly housing -C- downwards so that it lies on the nut -B- -arrow-.
- Inner part of assembly device and assembly housing must align (be level) with each other.

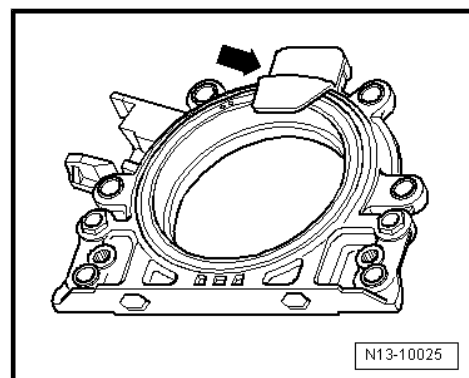


- Remove the securing clip -arrow- from new sealing flange.

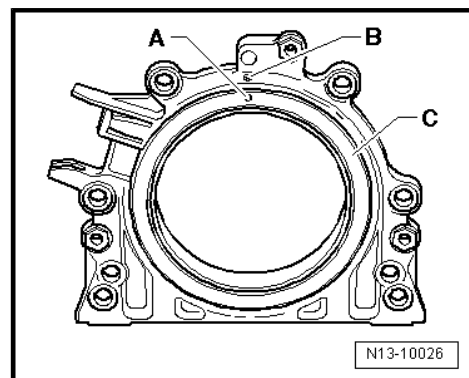


#### Note

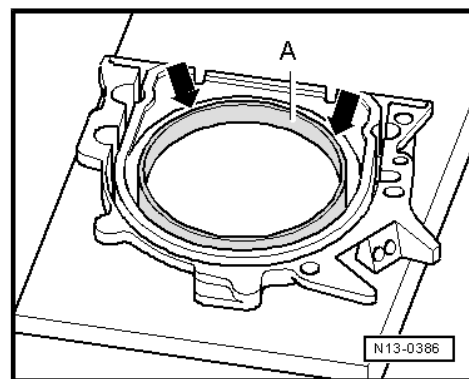
*The sender wheel must not be taken out of the sealing flange or rotated out of position.*



- The locating hole -A- on the sender wheel -C- must align with the marking -B- on the sealing flange.



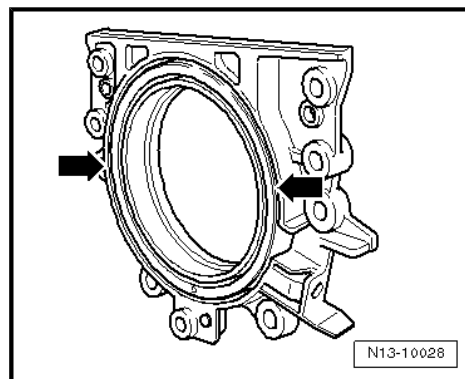
- Place sealing flange (with front side downwards) on a clean flat surface.
- Press the sealing lip support ring -A- downwards in direction of -arrows- until it lies against the flat surface.



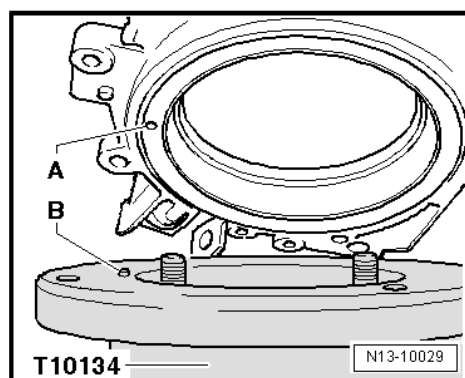
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- The upper edge of the sender wheel and the front edge of the sealing flange must align -arrows-.



- Place front side of sealing flange on assembly tool - T10134- , so that locating pin -B- can be inserted in hole -A- in sender wheel.
- Ensure the sealing flange lies flat on the assembly tool.

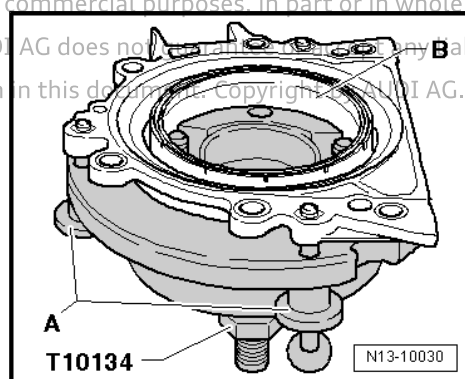


- Press the sealing flange and sealing lip support ring -B- onto the surface of the assembly tool - T10134- while tightening the 3 knurled screws -A- so that the locating pin will not slip out of the hole in the sender wheel.



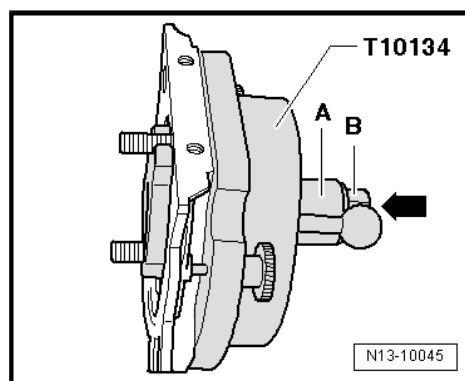
#### Note

Ensure that the sender wheel remains fixed on the assembly tool when installing the sealing flange.



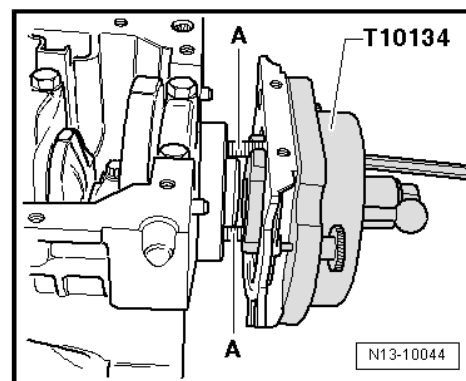
#### B - Installing assembly tool - T10134- with sealing flange on crankshaft flange:

- Crankshaft flange must be free of oil and grease.
- Engine is at "TDC" position.
- Screw nut -B- to end of threaded spindle.
- Press threaded spindle of assembly tool - T10134- in direction of -arrow- until nut -B- makes contact with assembly housing -A-.
- Position flat edge of assembly housing towards sealing surface for sump on cylinder block.

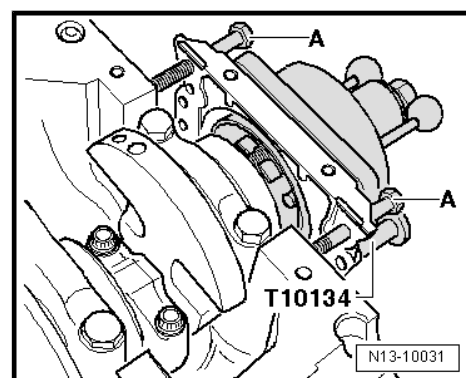




- Secure assembly tool - T10134- to crankshaft flange by screwing hexagon socket head bolts -A- approx. 5 threads into crankshaft flange.



- Screw two bolts M6×35 mm -item A- into cylinder block to guide sealing flange.



### C - Securing assembly tool - T10134- onto crankshaft flange:

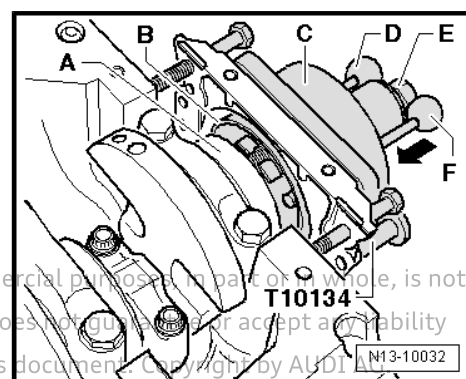
- Press the assembly housing -C- by hand in the direction of the -arrow- until the sealing lip support ring -B- lies on the surface of the crankshaft flange -A-.
- Press the guide pin for petrol engines (red handle) -F- into aperture in crankshaft. This ensures that sender wheel reaches its final installation position.



#### Note

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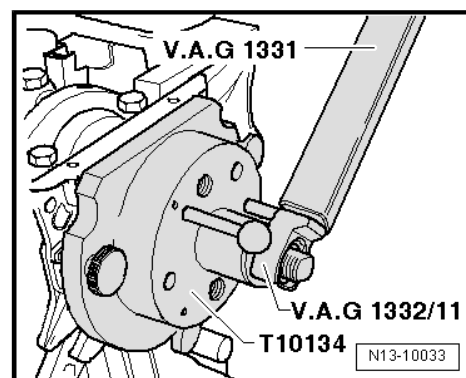
*The guide pin for diesel engines (black handle) -D- must not be inserted into threaded hole in crankshaft.*



- Tighten the two hexagon socket head bolts on assembly tool hand-tight.
- Screw nut -E- onto threaded spindle by hand until it lies against the assembly housing -C-.

### D - Pressing sender wheel onto crankshaft flange with assembly tool - T10134- :

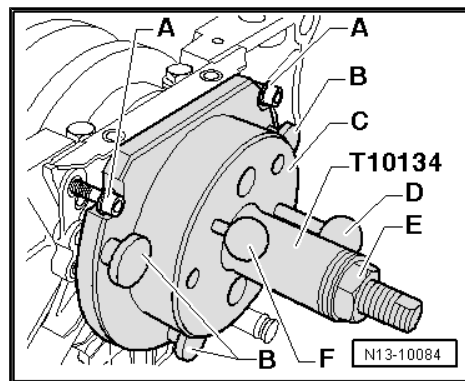
- Tighten nut on assembly tool - T10134- to 35 Nm.
- A small air gap must be present between cylinder block and sealing flange after tightening nut to 35 Nm.





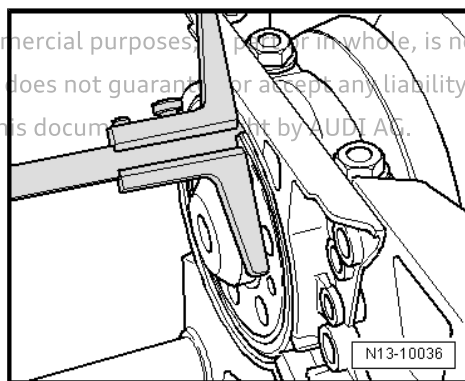
### E - Checking installation position of sender wheel on crankshaft:

- Screw nut -E- to end of threaded spindle.
- Remove both bolts -A- from cylinder block.
- Unscrew the three knurled screws -B- from sealing flange.
- Remove hexagon socket head bolts and detach assembly tool - T10134- .
- Detach sealing lip support ring.

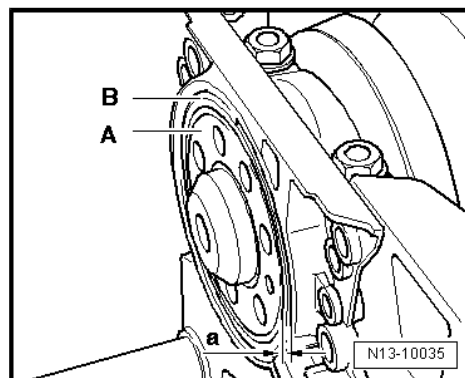


- Apply depth gauge - VAS 6082- to crankshaft flange.

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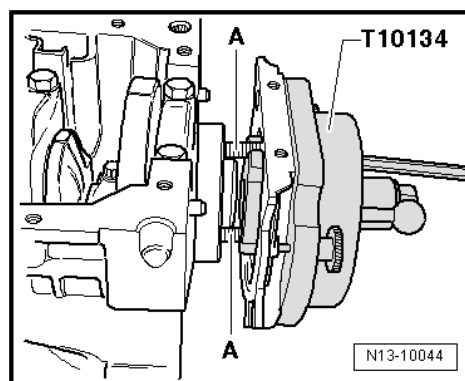


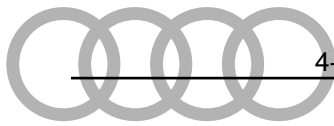
- Measure distance -a- between crankshaft flange -A- and sender wheel -B-.
- Specification: Distance -a- = 0.5 mm.
- Press sender wheel in further if distance is too small  
⇒ [page 68](#) .
- If reading matches specification, continue with assembly  
⇒ [page 69](#) .



### F - Pressing sender wheel in further:

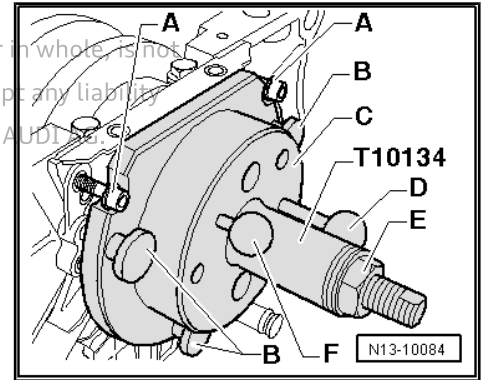
- Secure assembly tool - T10134- to crankshaft flange by tightening hexagon socket head bolts -A- hand-tight.
- Slide assembly tool - T10134- onto sealing flange by hand.





- Screw nut -E- onto threaded spindle by hand until it lies against the assembly housing -C-

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- Tighten nut on assembly tool - T10134- to 40 Nm.
- Check installation position of sender wheel on crankshaft again ⇒ [page 68](#) .
- Tighten nut on assembly tool - T10134- to 45 Nm if distance is too small.
- Check installation position of sender wheel on crankshaft again ⇒ [page 68](#) .

#### Assembling:



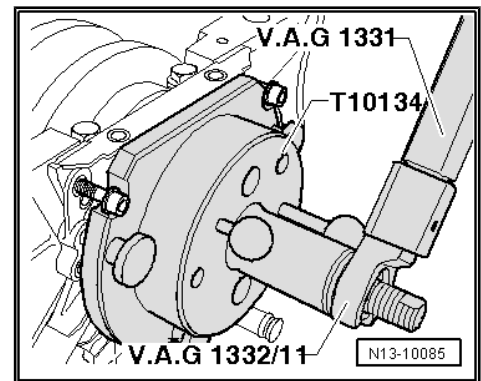
#### Note

*Renew sealing flange bolts.*

- Tighten bolts for sealing flange in diagonal sequence.
- Install sump ⇒ [page 147](#) .
- Install intermediate plate ⇒ [page 59](#) .
- Install engine cover panel ⇒ [page 40](#) .
- Install flywheel ⇒ [page 59](#) .
- After renewing sender wheel, misfire adaption must be reset. To do so, select [01 - Reset adaptions misfires] in [Guided Functions] mode of ⇒ Vehicle diagnostic tester.

#### Tightening torques

- ◆ ⇒ [“2.1 Exploded view - cylinder block \(gearbox end\)”, page 58](#)
- ◆ ⇒ [Fig. ““Plug for TDC drilling - tightening torque””, page 71](#)
- ◆ Engine speed sender - G28-  
⇒ [“1.1 Exploded view - ignition system”, page 280](#)





## 3 Crankshaft

⇒ [“3.1 Exploded view - crankshaft”, page 70](#) or commercial purposes, in part or in whole, is not

⇒ [“3.2 Crankshaft dimensions”, page 71](#) AG. AUDI AG does not guarantee or accept any liability

⇒ [“3.3 Renewing needle bearing in crankshaft”, page 71](#) document. Copyright by AUDI AG.

⇒ [“3.4 Measuring axial clearance of crankshaft”, page 73](#)

⇒ [“3.5 Measuring radial clearance of crankshaft”, page 74](#)

### 3.1 Exploded view - crankshaft

#### 1 - Bearing shell

- ☐ For cylinder block (with oil groove)
- ☐ Renew used bearing shells
- ☐ Note location

#### 2 - Chain sprocket

- ☐ For drive chain for oil pump and camshaft timing chain
- ☐ Push-fitted onto crankshaft
- ☐ To remove or install  
⇒ [“2.2 Removing and installing camshaft timing chain”, page 85](#) and  
⇒ [“1.4.2 Removing and installing oil pump”, page 151](#)
- ☐ Installation position  
⇒ [page 71](#)
- ☐ Contact surfaces must be free of oil and grease

#### 3 - Bearing shell

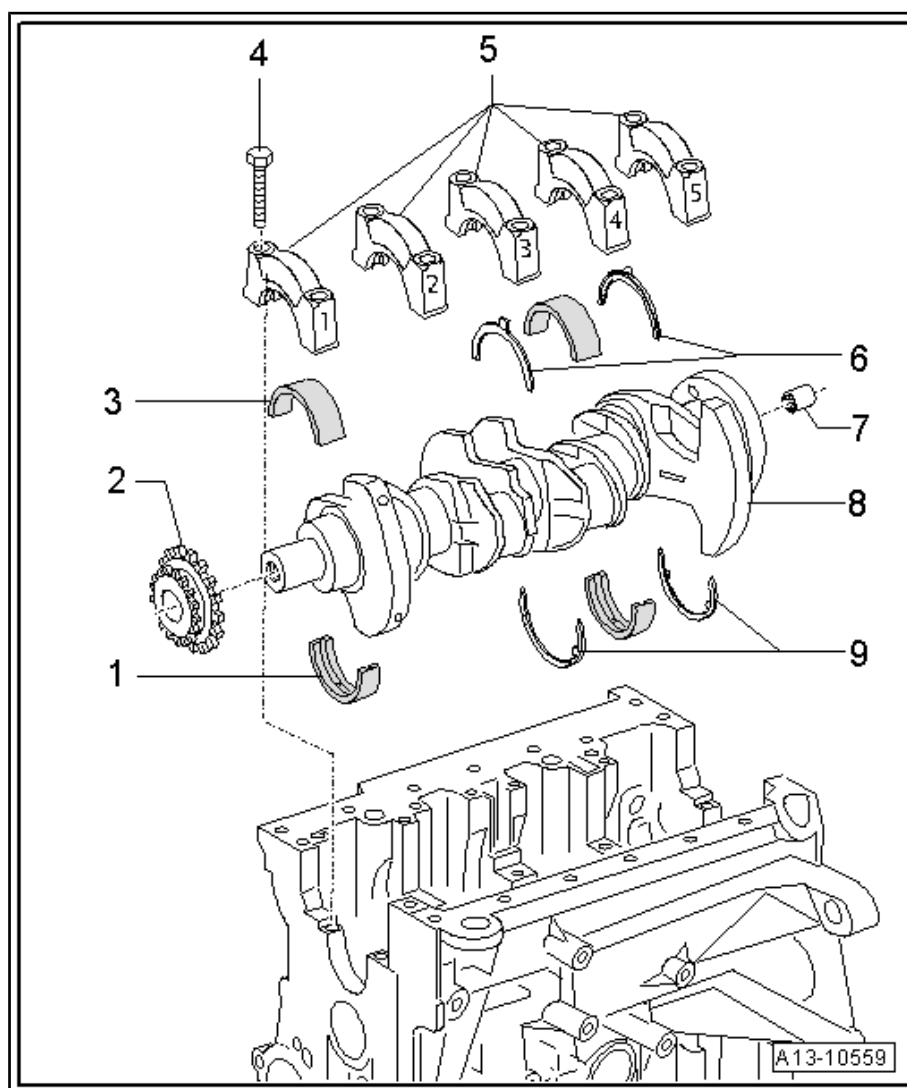
- ☐ For bearing cap (without oil groove)
- ☐ Renew used bearing shells
- ☐ Bearing shells in bearing caps are only supplied as spare parts with “yellow” colour-coding.
- ☐ Note location

#### 4 - Bolt

- ☐ Renew
- ☐ Use old bolts when measuring radial clearance
- ☐ 50 Nm +90°

#### 5 - Bearing caps

- ☐ Mark used bearing caps for re-installation
- ☐ Bearing cap 3 with recesses for thrust washers
- ☐ Installation position: retaining lugs on bearing shells in cylinder block and bearing caps must be on the same side





## 6 - Thrust washers

- ☐ For bearing cap 3
- ☐ Note location

## 7 - Needle bearing

- ☐ Only fitted on vehicles with dual clutch gearbox
- ☐ Extracting and driving in ➔ [page 71](#)

## 8 - Crankshaft

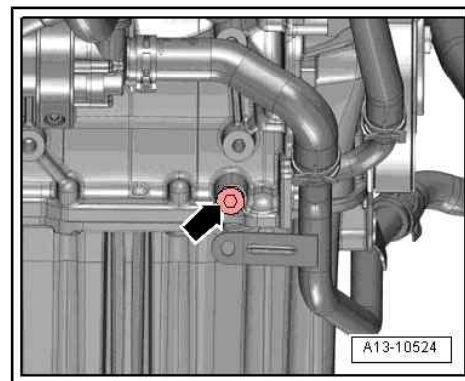
- ☐ Measuring axial clearance ➔ [page 73](#)
- ☐ Measuring radial clearance ➔ [page 74](#)
- ☐ Crankshaft dimensions ➔ [page 71](#)

## 9 - Thrust washers

- ☐ Only fitted on 3rd crankshaft bearing
- ☐ Installation position: oil grooves face toward crank webs

## Plug for "TDC" drilling - tightening torque

- Renew seal on plug for "TDC" drilling.
- Tighten plug -arrow- in cylinder block to 30 Nm.



## Installation position of chain sprocket

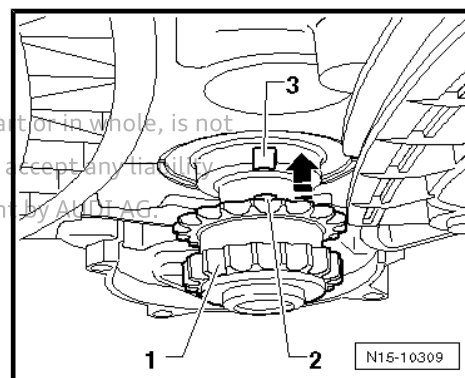
- Drive lug -2- on chain sprocket -1- must engage in groove -3- on crankshaft.

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**Note**

Disregard -arrow-.



## 3.2 Crankshaft dimensions

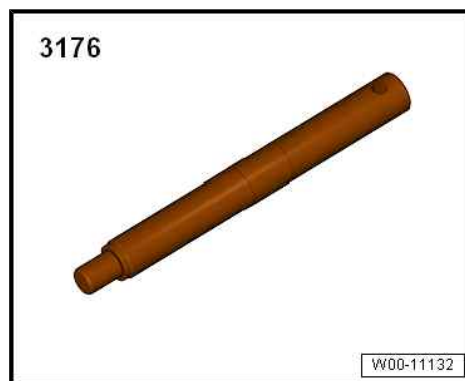
| Honing dimension    | Main bearing journal Ø mm | Conrod journal Ø mm       |
|---------------------|---------------------------|---------------------------|
| Basic dimension     | 54.000 - 0.022<br>- 0.037 | 47.800 - 0.022<br>- 0.037 |
| Repair under-size I | 53.750 - 0.022<br>- 0.037 | 47.550 - 0.022<br>- 0.037 |
| Repair over-size II | —                         | 47.300 - 0.022<br>- 0.037 |

## 3.3 Renewing needle bearing in crankshaft

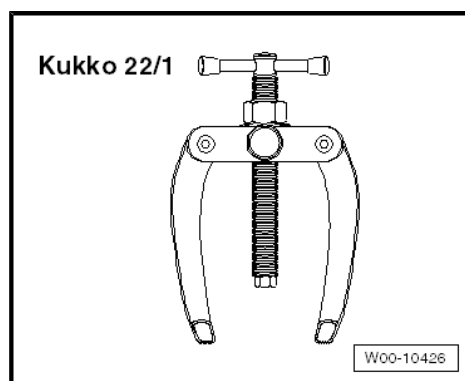
Special tools and workshop equipment required



◆ Centring mandrel - 3176-



◆ Counter-support - 22/1-

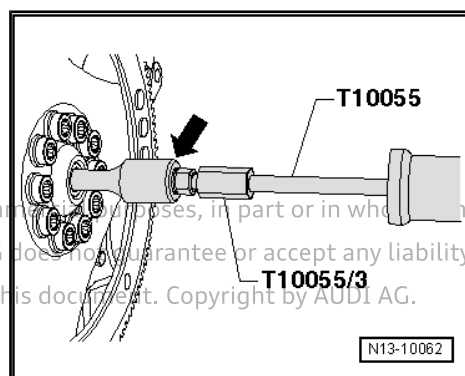


◆ Internal puller Kukko 21/2



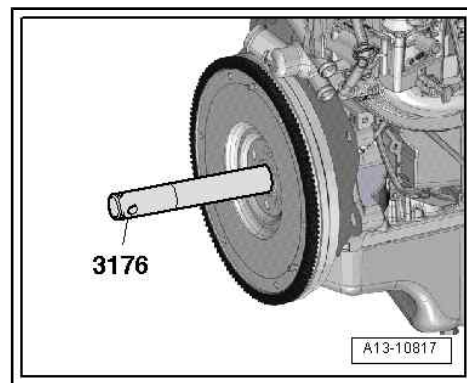
Procedure

- Gearbox removed
- Remove flywheel ➤ [page 59](#).
- Use internal puller Kukko 21/2 -arrow-, puller - T10055- and adapter -T10055/3- to pull out needle bearing.





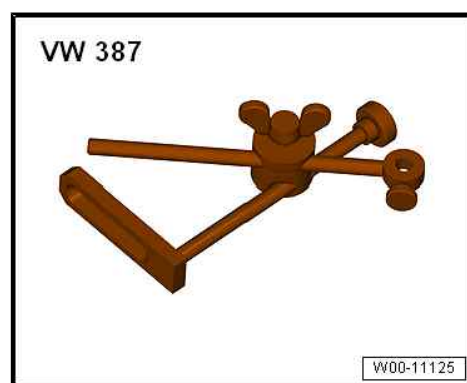
- Drive in needle bearing using centring mandrel - 3176- ; needle bearing must be flush.
- Install flywheel ➔ [page 59](#) .



### 3.4 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-



- ◆ Dial gauge - VAS 6079-



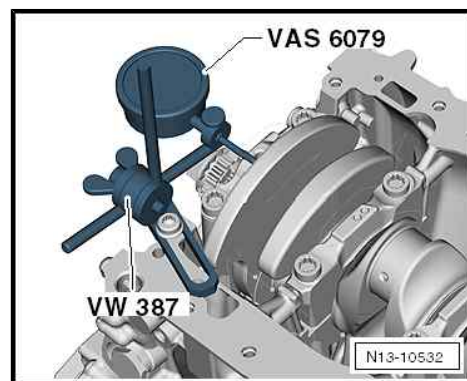
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#### Procedure

- Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder block as shown in illustration.
- Apply dial gauge to crank web.
- Press crankshaft against dial gauge by hand and set gauge to "0".
- Push crankshaft away from dial gauge and read off value.

Axial clearance:

- New: 0.07 ... 0.24 mm.
- Wear limit: 0.26 mm.





### 3.5 Measuring radial clearance of crankshaft

#### Special tools and workshop equipment required

- ◆ Plastigauge

#### Procedure

- Remove bearing cap and clean bearing journal.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- The Plastigauge must be positioned in the centre of the bearing shell.
- Fit bearing cap and secure with old bolts ⇒ [Item 4 \(page 70\)](#) without rotating crankshaft.
- Remove bearing cap again.
- Compare width of Plastigauge with measurement scale.

#### Radial clearance:

- New: 0.03 ... 0.05 mm.
- Wear limit: 0.13 mm.
- Renew bearing cap bolts.



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## 4 Pistons and conrods

⇒ [“4.1 Exploded view - pistons and conrods”, page 75](#)

⇒ [“4.2 Removing and installing pistons”, page 77](#)

⇒ [“4.3 Checking pistons and cylinder bores”, page 78](#)

⇒ [“4.4 Checking radial clearance of conrod bearings”, page 79](#)

### 4.1 Exploded view - pistons and conrods

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#### Note

- ◆ All bearing and running surfaces must be oiled before assembling.
- ◆ Oil spray jet and pressure relief valve ⇒ [page 77](#)

#### 1 - Bolts

- ☐ Renew
- ☐ Use old bolts when measuring radial clearance
- ☐ Lubricate threads and contact surface
- ☐ 30 Nm +90°

#### 2 - Conrod bearing cap

- ☐ Mark cylinder and conrod allocation before removing -A-
- ☐ Installation position: marking -B- faces towards pulley end (apply marking before removal if no marking is visible)

#### 3 - Bearing shells

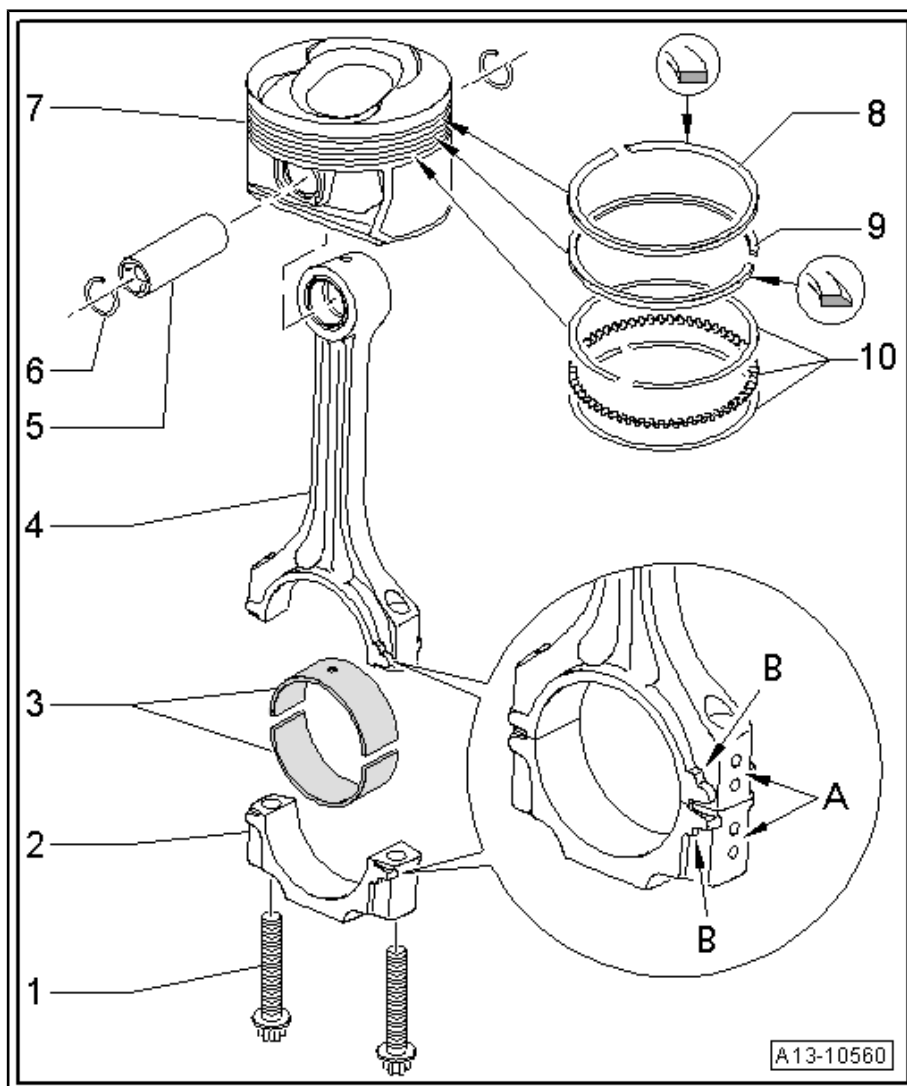
- ☐ Upper bearing shell with oil hole for piston pin lubrication
- ☐ Installation position ⇒ [page 76](#)
- ☐ Renew used bearing shells

#### 4 - Conrod

- ☐ Only renew as a complete set
- ☐ Mark cylinder and conrod bearing cap allocation before removing -A-
- ☐ Installation position: marking -B- faces towards pulley end (apply marking before removal if no marking is visible)
- ☐ Guided axially via piston
- ☐ Measuring radial clearance ⇒ [page 79](#)

#### 5 - Piston pin

- ☐ Removing and installing ⇒ [“4.2 Removing and installing pistons”, page 77](#)





## 6 - Circlip

- ☐ 2x
- ☐ Renew

## 7 - Piston

- ☐ Mark installation position and cylinder number
- ☐ Installation position: arrow on piston crown points to pulley end
- ☐ Removing and installing ⇒ [page 77](#)
- ☐ Checking pistons and cylinder bores ⇒ [page 78](#)

## 8 - Compression ring

- ☐ Pay attention to cross section
- ☐ Offset gap by 120° to next compression ring
- ☐ Use piston ring pliers to remove and install
- ☐ Inscription "TOP" faces towards piston crown
- ☐ Measuring ring gap ⇒ [page 78](#)
- ☐ Measuring ring-to-groove clearance ⇒ [page 78](#)

## 9 - Compression ring

- ☐ Pay attention to cross section
- ☐ Offset gap 120° relative to adjacent oil scraper ring
- ☐ Use piston ring pliers to remove and install
- ☐ Inscription "TOP" faces towards piston crown
- ☐ Measuring ring gap ⇒ [page 78](#)
- ☐ Measuring ring-to-groove clearance ⇒ [page 78](#)

## 10 - Oil scraper ring

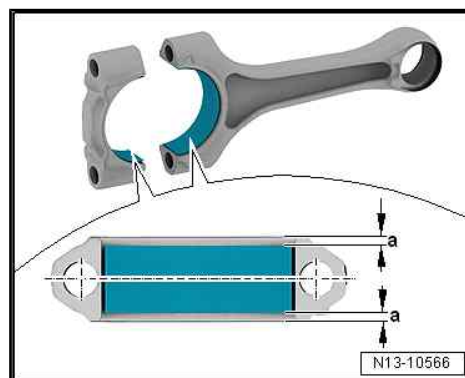
- ☐ 3 parts
- ☐ Offset gap of top steel element of piston ring by 120° to next compression ring
- ☐ Offset gaps of individual parts of oil scraper ring
- ☐ Measuring ring gap ⇒ [page 78](#)
- ☐ Ring-to-groove clearance cannot be checked

Nominal dimension

⇒ ["4.3 Checking pistons and cylinder bores", page 78](#) .

### Installation position of bearing shells in conrods

- Insert bearing shells centrally in conrod/conrod bearing cap.
- Distance -a- = approx. 1.5 mm.





### Oil spray jet and pressure relief valve

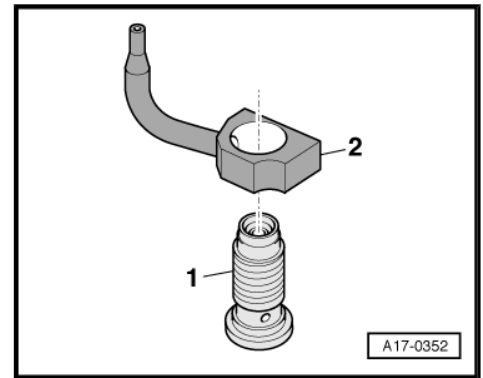
- 1 - Bolt with pressure relief valve, 27 Nm
  - 2 - Oil spray jet for piston cooling
- Installation position: align locating edge of oil spray jet with machined surface of cylinder block.



#### Caution

*Risk of damage to oil spray jets.*

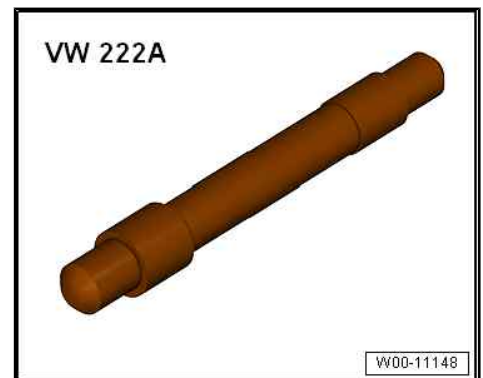
- ◆ *Do not bend oil spray jets.*
- ◆ *Always renew bent oil spray jets.*



## 4.2 Removing and installing pistons

### Special tools and workshop equipment required

- ◆ Pin - VW 222 A-



- ◆ Piston ring clamp, commercially available

### Removing

- Remove cylinder head ➔ [page 110](#).
- Remove sump ➔ [page 147](#).
- Mark installation position and cylinder number of piston.
- Mark installation position and matching of cylinder and conrod bearing cap to conrod ➔ [Item 4 \(page 75\)](#).
- Remove conrod bearing cap and pull out piston and conrod upwards.



#### Note

*If piston pin is difficult to remove, heat piston to approx. 60 °C.*

- Take circlip out of piston pin boss.
- Use drift - VW 222 A- to drive out piston pin.

### Installing

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



## Note

*Renew bolts tightened with specified tightening angle.*

- Oil running surfaces of bearing shells.
- Install piston using commercially available piston ring clamp; note installation position.
- Install conrod bearing cap; note installation position  
⇒ [page 76](#) .
- Install cylinder head ⇒ [page 110](#) .
- Install sump ⇒ [page 147](#) .

## Tightening torques

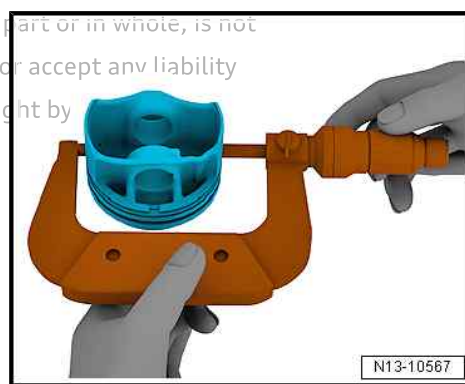
- ♦ ⇒ [“4.1 Exploded view - pistons and conrods”, page 75](#)

## 4.3 Checking pistons and cylinder bores

### Checking piston

- Using a micrometer, measure approx. 12 mm from the lower edge, perpendicular to the piston pin axis.
- Maximum deviation from nominal dimension: 0.04 mm.

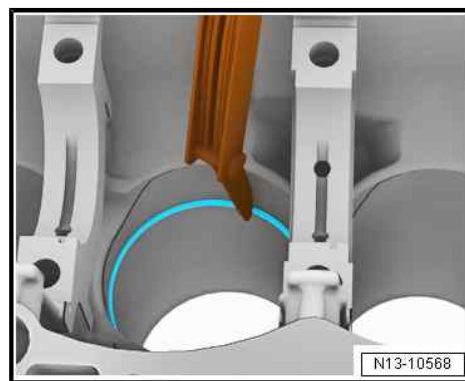
| Piston Ø mm                                                                                                                                                |                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Nominal dimension                                                                                                                                          | 76.475 <sup>1)</sup> |
| Repair dimension                                                                                                                                           | 76.495 <sup>1)</sup> |
| <ul style="list-style-type: none"> <li>• <sup>1)</sup> Dimensions including coating (thickness 0.01 mm). The coating will wear down in service.</li> </ul> |                      |



### Measuring piston ring gap

- Insert piston ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder. To do so, use a piston without rings.

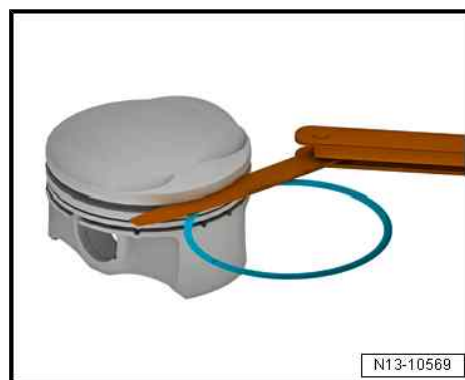
| Piston ring          | new mm        | Wear limit mm                |
|----------------------|---------------|------------------------------|
| 1st compression ring | 0.20 ... 0.40 | 1.00                         |
| 2nd compression ring | 0.40 ... 0.60 | 1.00                         |
| Oil scraper ring     | 0.20 ... 0.80 | No wear limit data available |



### Measuring ring-to-groove clearance

- Clean groove in piston before checking clearance.

| Piston ring          | new mm             | Wear limit mm |
|----------------------|--------------------|---------------|
| 1st compression ring | 0.04 ... 0.08      | 0.15          |
| 2nd compression ring | 0.02 ... 0.06      | 0.15          |
| Oil scraper ring     | Cannot be measured |               |





## Measuring cylinder bore



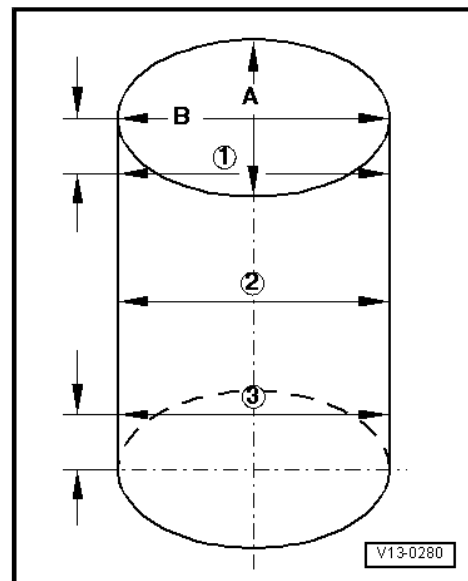
### Caution

*Risk of damage to the surface of the cylinder bore.*

- ◆ *Do not machine cylinder bore (reboring, honing, grinding) with workshop equipment.*

- Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.
- Maximum deviation from nominal dimension: 0.08 mm.

| Cylinder bore Ø mm |       |
|--------------------|-------|
| Nominal dimension  | 76.51 |
| Repair dimension   | 76.53 |



### Note

*Measuring the cylinder bores must not be done when the cylinder block is mounted to the engine and gearbox support - VAS 6095-, as incorrect measurements may result.*

## 4.4 Checking radial clearance of conrod bearings

### Special tools and workshop equipment required

- ◆ Plastigauge

### Procedure

- Remove conrod bearing cap.
- Clean bearing cap and bearing journal.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- Fit conrod bearing cap and secure with old bolts  
⇒ [Item 1 \(page 75\)](#) without rotating crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigauge with measurement scale.

### Radial clearance:

- New: 0.02 ... 0.06 mm.
- Wear limit: 0.09 mm.
- Renew conrod bolts.



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## 15 – Cylinder head, valve gear

### 1 Timing chain cover

⇒ "1.1 Exploded view - timing chain cover", page 80

⇒ "1.2 Removing and installing timing chain cover", page 81

#### 1.1 Exploded view - timing chain cover

##### 1 - Bolt

- ☐ Renew
- ☐ Tightening torque  
⇒ Item 2 (page 43)

##### 2 - Poly V-belt pulley



##### Caution

*Risk of damage to engine.*

*No prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.*

- ☐ Removing and installing  
⇒ page 51

##### 3 - Idler roller

- ☐ For poly V-belt for vehicles with air conditioning
- ☐ Tightening torque  
⇒ Item 6 (page 43)

##### 4 - Bolt

- ☐ 50 Nm

##### 5 - Timing chain cover

- ☐ Removing and installing  
⇒ page 81

##### 6 - Gasket

- ☐ Renew
- ☐ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

##### 7 - Seal

- ☐ Inserted onto rear of timing chain cover
- ☐ Renew

##### 8 - Oil supply line

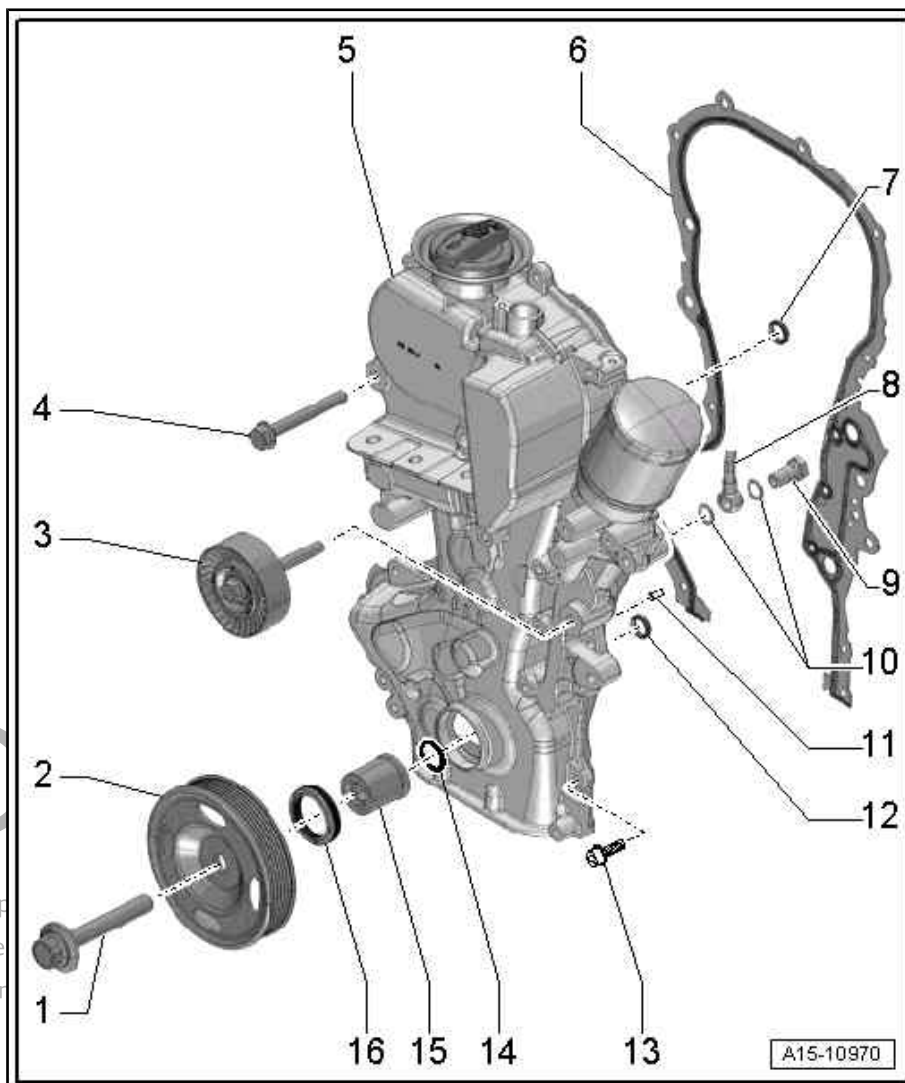
- ☐ To turbocharger

##### 9 - Banjo bolt

- ☐ Tightening torque ⇒ Item 10 (page 195)

##### 10 - Seals

- ☐ Renew





#### 11 - Dowel pin

#### 12 - Seal

- ☐ Inserted onto rear of timing chain cover
- ☐ Renew

#### 13 - Bolt

- ☐ Tighten in diagonal sequence
- ☐ 10 Nm

#### 14 - O-ring

- ☐ Renew

#### 15 - Bearing bush

- ☐ Installation position: collar faces crankshaft

#### 16 - Oil seal

- ☐ For crankshaft
- ☐ Renewing ⇒ [page 55](#)

## 1.2 Removing and installing timing chain cover

### Special tools and workshop equipment required

- ◆ Threaded pin M6x80 (2x)
  - ◆ Vehicles with 6-speed manual gearbox:
  - ◆ Support bracket - 10 - 222 A-
  - ◆ Adapters - 10 - 222 A /19-
  - ◆ Engine support basic set - T40091-
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### Removing

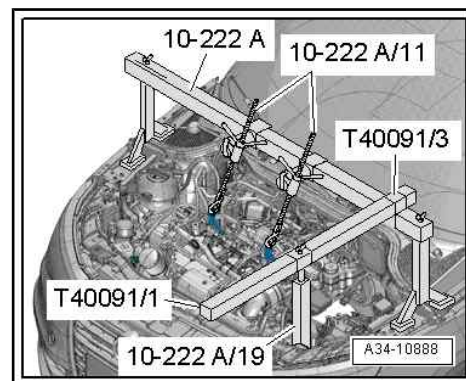
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove poly V-belt pulley for crankshaft ⇒ [page 51](#) .
- Remove poly V-belt pulley for coolant pump ⇒ [page 174](#) .
- Vehicles with air conditioning: Remove idler roller for poly V-belt ⇒ [page 48](#) .
- Remove engine cover panel ⇒ [page 40](#) .

### Applies to vehicles with 6-speed manual gearbox

- For the following repair work, support bracket must be set up as follows on vehicles with 6-speed manual gearbox:
- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (left-side), as shown in illustration.
- Attach hooks of spindles -10 - 222 A /11- to engine lifting eyes.
- Take up weight of engine with spindles but do not lift.

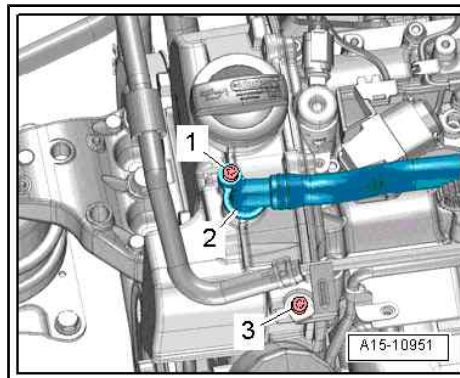
### All vehicles (continued):

- Remove sump ⇒ [page 147](#) .
- Remove engine mounting ⇒ [page 32](#) .

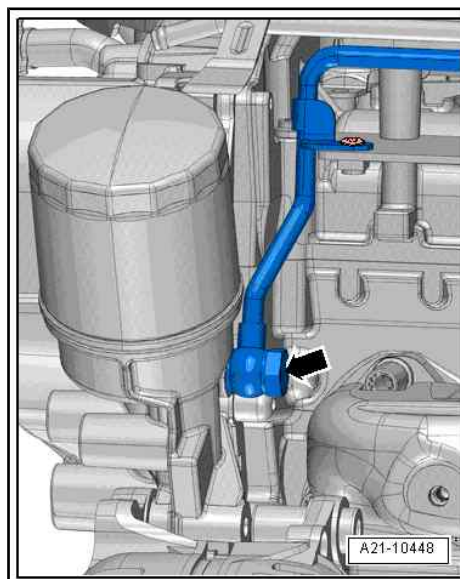




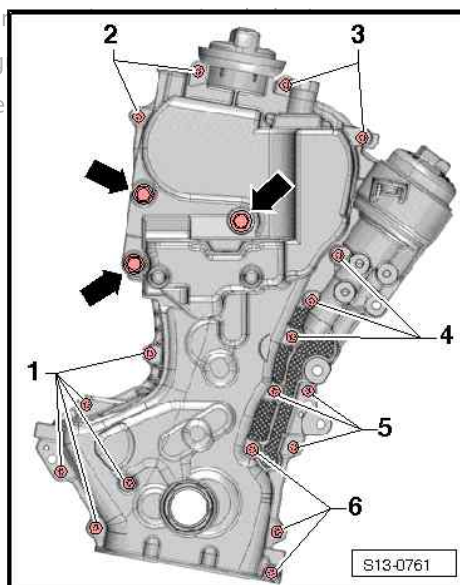
- Remove bolts -1 and 3- and detach crankcase breather hose -2-.



- Remove banjo bolt -arrow- for oil supply line at timing chain cover.



- Remove bolts -1 ...6- and -arrows- for timing chain cover.
- Raise engine slightly and remove timing chain cover.
- Use drift to drive out crankshaft oil seal.



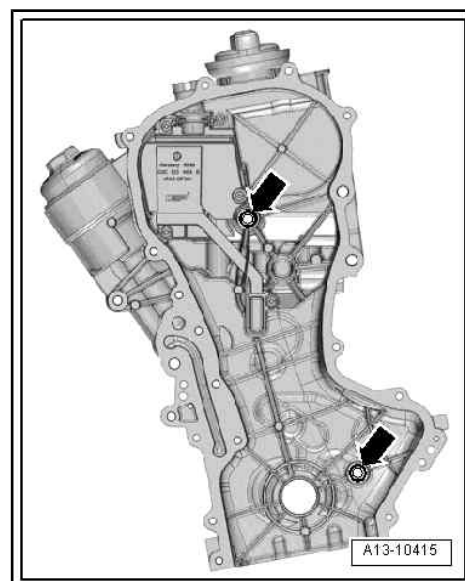


## Installing



### Note

- ◆ *Renew gasket and O-rings.*
- ◆ *Please note that the contact surfaces of the pulley, the securing bolt, the bearing bush and the crankshaft chain sprocket must be free of oil and grease.*
- Clean sealing surfaces; they must be free of oil and grease.
- Insert O-rings -arrows- on reverse side of timing chain cover.



- Apply a bead of sealant to each joint, Ø 10 mm, approx. 1 mm thick.

1- Joint between camshaft housing and cylinder head

2- Joint between cylinder head and cylinder block

- Fit gasket onto dowel pins in cylinder block.

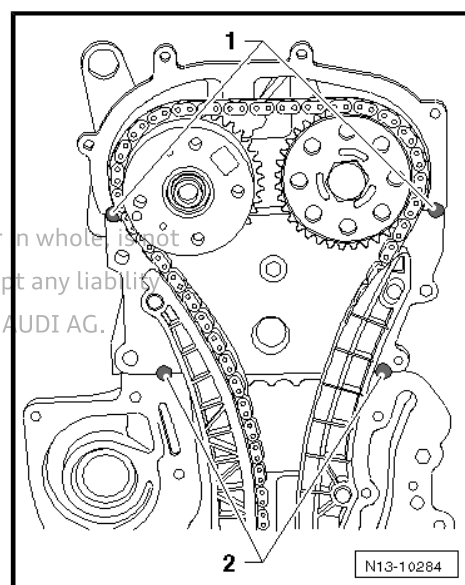
– Screw 2 threaded pins M6x80 into cylinder head and cylinder block to help guide cover.

- Carefully fit timing chain cover onto threaded pins and dowel pins, then tighten bolts evenly in diagonal sequence.

- Make sure that the timing chain cover remains straight.

The remaining installation steps are carried out in the reverse sequence. When doing so, note the following:

- Install crankcase breather hose ⇒ [page 156](#) .
- Install engine mountings ⇒ [page 32](#) .
- Renew crankshaft oil seal ⇒ [page 55](#) .
- Install sump ⇒ [page 147](#) .
- Install engine cover panel ⇒ [page 40](#) .
- Install idler roller for poly V-belt ⇒ [page 48](#) .
- Install poly V-belt pulley for coolant pump ⇒ [page 174](#) .
- Install poly V-belt pulley for crankshaft ⇒ [page 51](#) .



## Tightening torques

- ◆ ⇒ [“1.1 Exploded view - timing chain cover”, page 80](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator



## 2 Chain drive

⇒ ["2.1 Exploded view - timing chain", page 84](#)

⇒ ["2.2 Removing and installing camshaft timing chain", page 85](#)

⇒ ["2.3 Checking valve timing", page 97](#)

⇒ ["2.4 Checking timing chain", page 101](#)

### 2.1 Exploded view - timing chain

#### 1 - Bolt

- ☐ 9 Nm

#### 2 - Chain tensioner

- ☐ Exerts spring pressure
- ☐ Before removing, lock in place using locking pin - T40011-

#### 3 - Tensioning rail

#### 4 - Guide pin

- ☐ 18 Nm

#### 5 - Bolt



#### Caution

**Bolt with left-hand thread!**

- ☐ Renew
- ☐ When loosening and tightening, lock camshaft chain sprocket using counterhold tool - T10172-
- ☐ 40 Nm +90°

#### 6 - Camshaft adjuster

- ☐ For inlet camshaft
- ☐ Do not dismantle
- ☐ Use with -item 8-
- ☐ Removing and installing ⇒ [page 85](#)

#### 7 - Camshaft timing chain

- ☐ Before removing, mark running direction with paint
- ☐ Removing and installing ⇒ [page 85](#)
- ☐ Checking ⇒ ["2.4 Checking timing chain", page 101](#)

#### 8 - Bearing bush

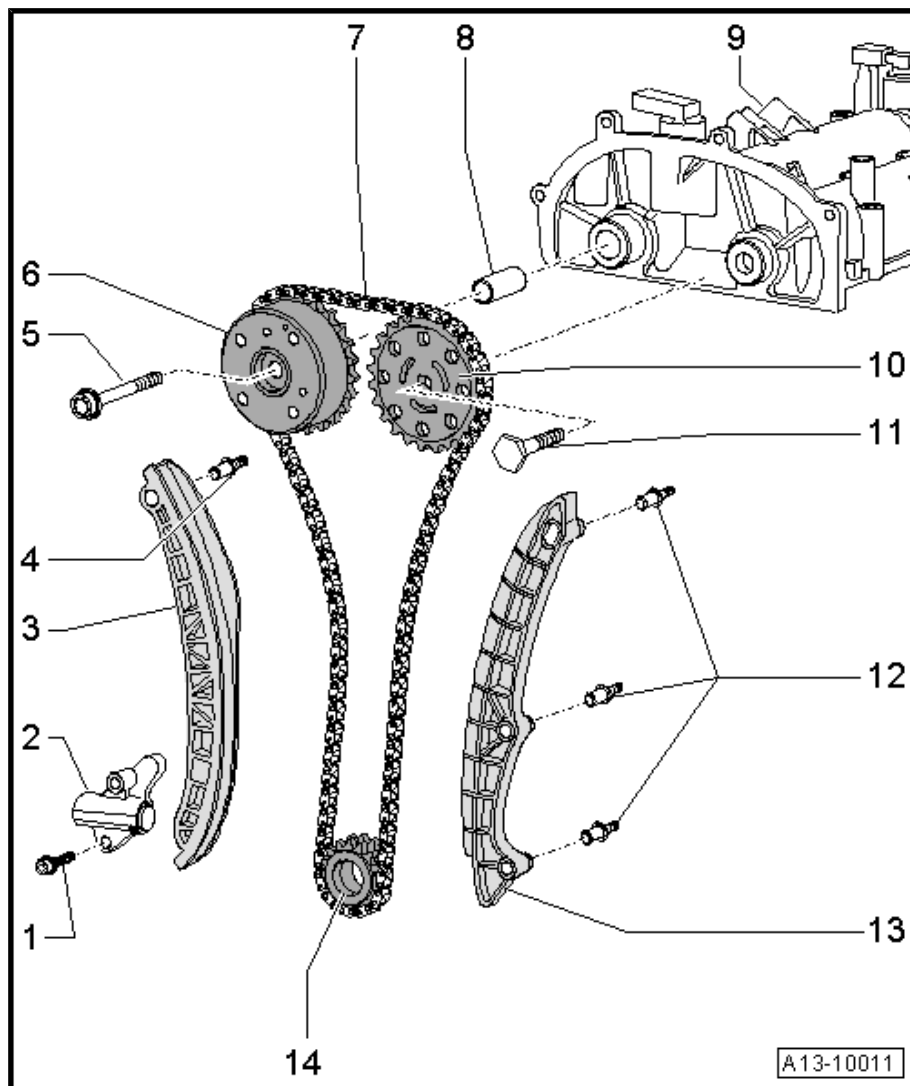
- ☐ For camshaft adjuster

#### 9 - Camshaft housing

- ☐ Removing and installing ⇒ [page 123](#)

#### 10 - Camshaft chain sprocket

- ☐ For exhaust camshaft





- ☐ Removing and installing ⇒ [page 85](#)

#### 11 - Bolt

- ☐ Renew
- ☐ When loosening and tightening, lock camshaft chain sprocket using counterhold tool - T10172-
- ☐ 50 Nm +90°

#### 12 - Guide pin

- ☐ 18 Nm

#### 13 - Guide rail

- ☐ Removing and installing ⇒ [page 85](#)

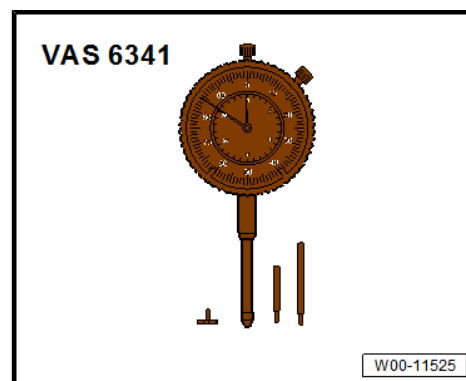
#### 14 - Chain sprocket

- ☐ For drive chain for oil pump and camshaft timing chain
- ☐ Push-fitted onto crankshaft
- ☐ To remove or install ⇒ [“2.2 Removing and installing camshaft timing chain”, page 85](#) and  
⇒ [“1.4.2 Removing and installing oil pump”, page 151](#)
- ☐ Installation position ⇒ [page 71](#)
- ☐ Contact surfaces must be free of oil and grease

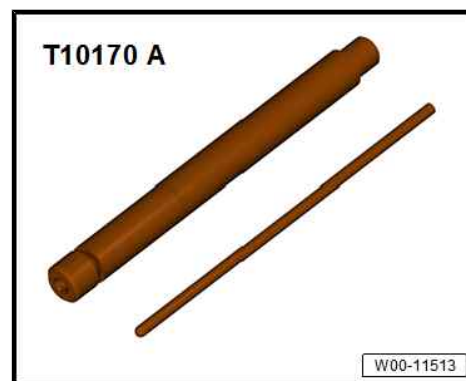
## 2.2 Removing and installing camshaft timing chain

### Special tools and workshop equipment required

- ◆ Dial gauge set, 4-part - VAS 6341-



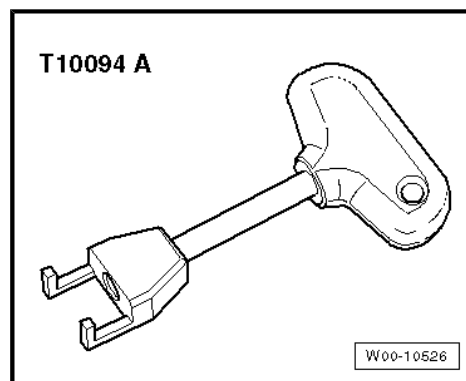
- ◆ Adapter for dial gauge - T10170 A-



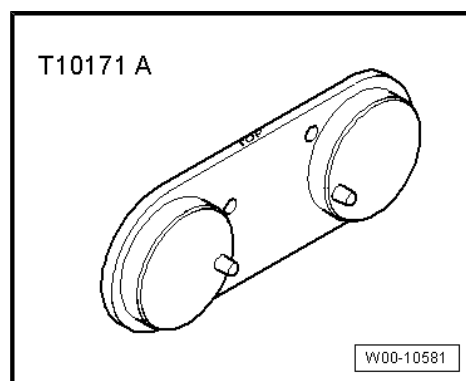
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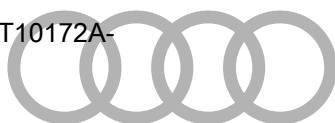
◆ Puller - T10094A-



◆ Camshaft clamp - T10171 A- / -T10171 B-



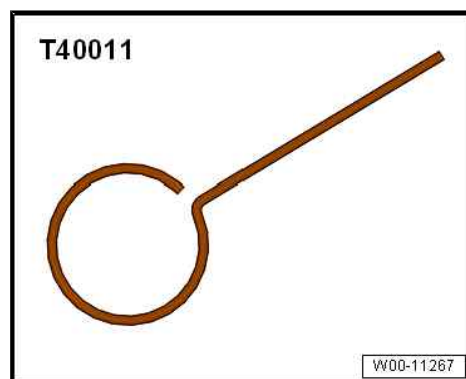
◆ Counterhold tool - T10172A-



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◆ Locking pin - T40011-





- ◆ Spark plug spanner - 3122 B-



- ◆ Locking pin - T10340-



- ◆ Counterhold tool - 3415- with pins -3415/1-



- ◆ Hose clip pliers - VAS 6362-



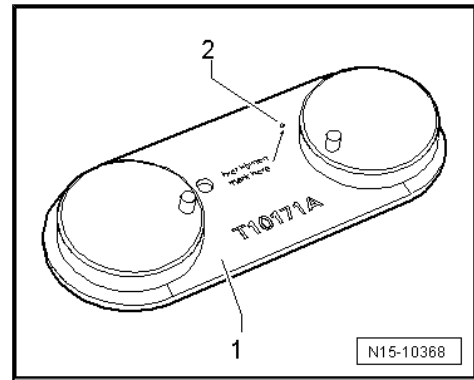
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## Note

- ◆ *Camshaft clamp - T10171- can also be used instead of camshaft clamp - T10171 A- / -T10171 B- if an additional hole is drilled as described below.*
- ◆ *Place drilling template -1- onto camshaft clamp - T10171- as shown in illustration.*
- ◆ *Apply a centre punch mark at marking -2-.*
- ◆ *Use a Ø 7 mm drill bit to drill a hole at position marked and deburr hole.*
- ◆ *Apply identification marking "T10171 A" to tool*



## Removing

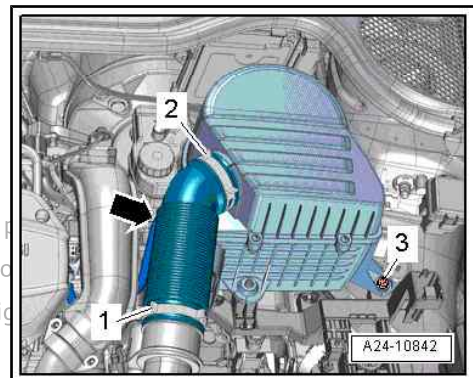
- Remove poly V-belt  
⇒ ["1.2 Removing and installing poly V-belt", page 44](#) .
- Remove engine cover panel  
⇒ ["3.1 Removing and installing engine cover panel", page 40](#) .
- Detach vacuum hose -arrow- from air hose.
- Release hose clips -1 and 2- and remove air hose.



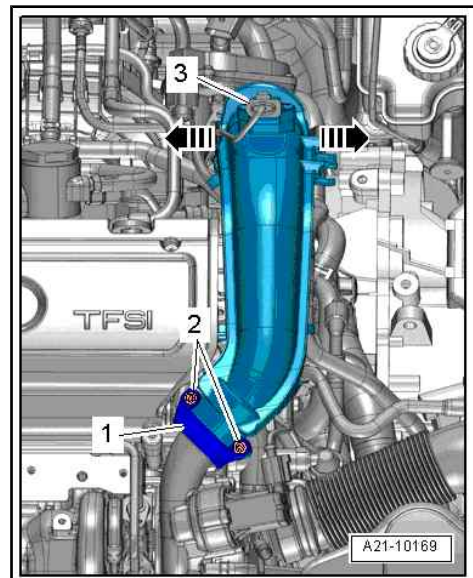
## Note

*Disregard -item 3-*

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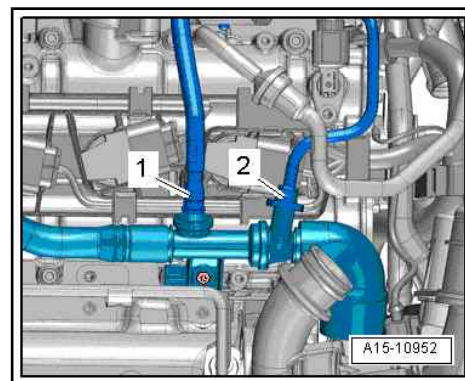


- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe.





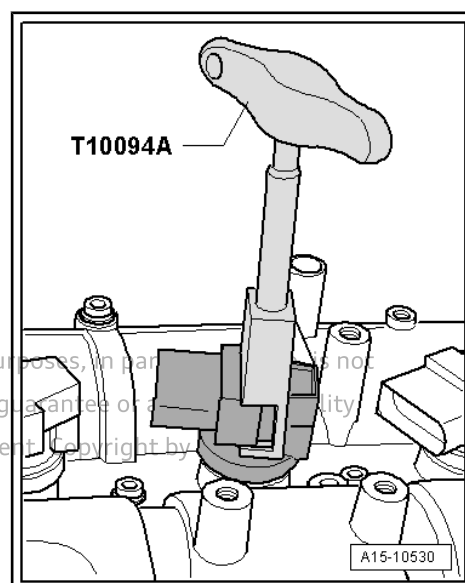
- Detach vacuum line -1-.
- Disconnect vacuum line -2- by pressing release ring.



- Apply puller - T10094 A- to all ignition coils, pull out ignition coils and at the same time unplug electrical connectors at ignition coils for cylinders 1 ... 4.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .



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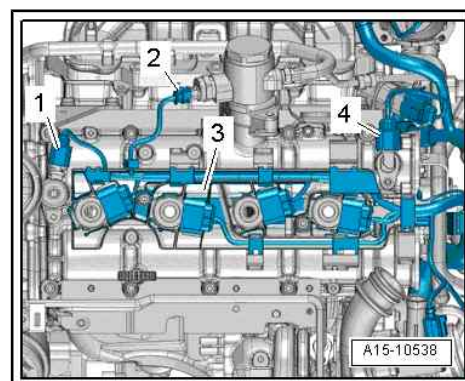


- Unplug electrical connectors -1, 2-, detach wiring duct-3- from camshaft housing and swivel to left side.

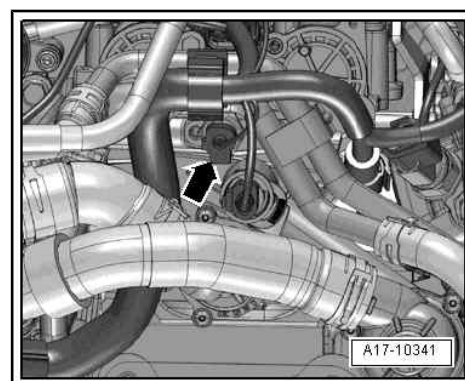


#### Note

Disregard -item 4-.



- Unplug electrical connector -arrow- on oil pressure switch - F1- .



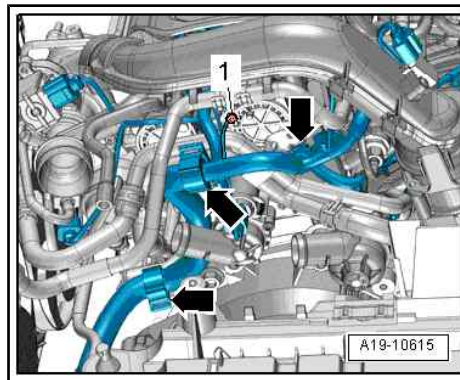


- Remove bolt -1- for earth wire.



**Note**

*Disregard -arrows-.*

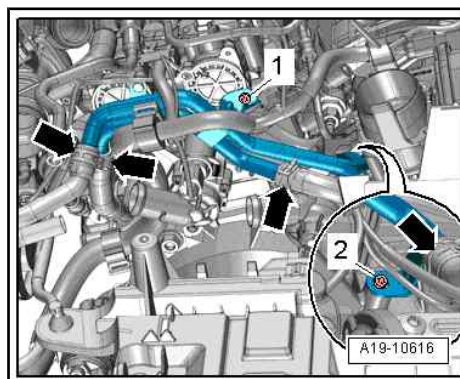


- Remove bolts -1 and 2- and press coolant pipes (left-side) to left side.



**Note**

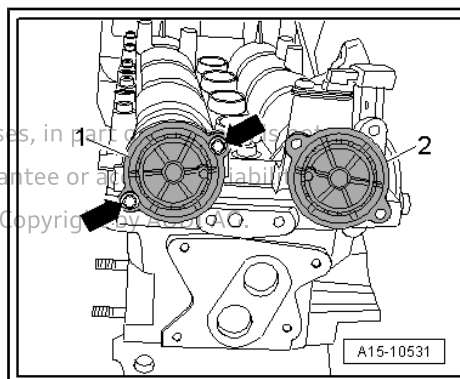
*Disregard -arrows-.*



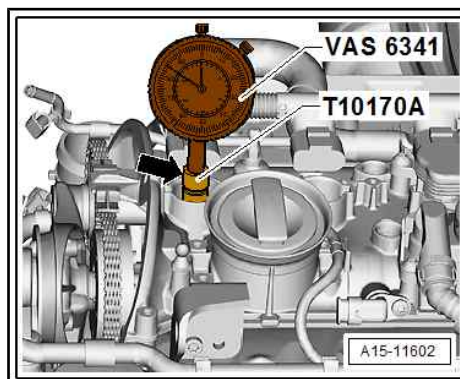
- Remove bolts -arrows- and detach sealing caps -1- and -2-.



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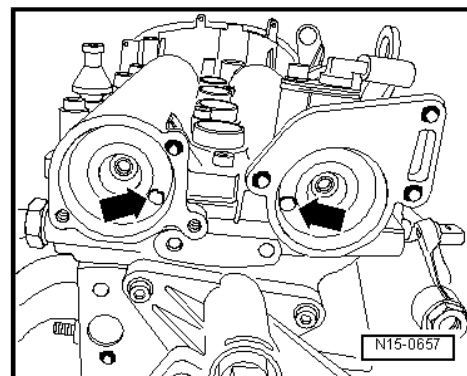


- Screw adapter for dial gauge - T10170 A- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6341- with extension -T10170 A/1- and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to “TDC”.
- “TDC” = maximum measured value on dial gauge.

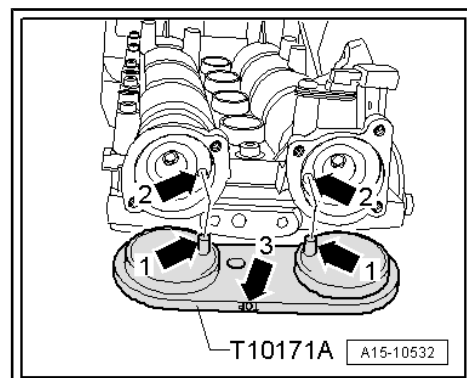




- The threaded holes -arrows- in the camshafts must be positioned as shown in illustration. Turn crankshaft one turn (360°) if necessary.



- Insert camshaft clamp - T10171 A- into holes in camshafts as far as stop.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription "TOP" -arrow 3- should be legible from above.



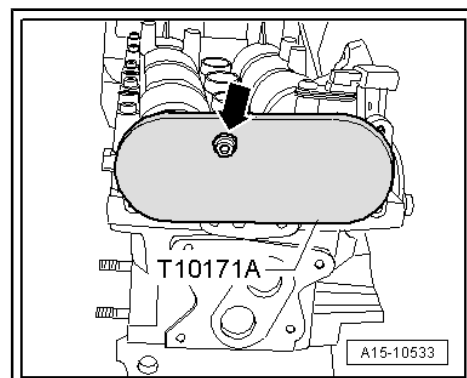
- To secure the camshaft clamp - T10171 A- , screw in an M6 bolt -arrow- hand-tight, but do not tighten.



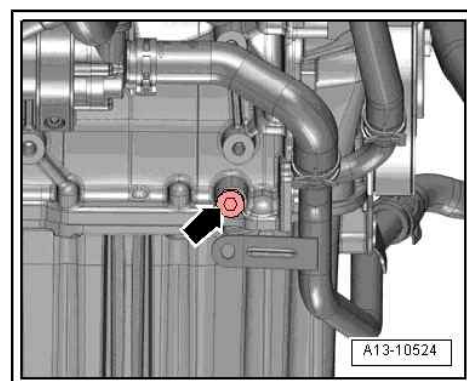
#### Caution

*Risk of damage to camshafts.*

- ◆ *The camshaft clamp - T10171 A- must not be used as a counterhold tool.*



- Unscrew plug -arrow- for "TDC" hole on cylinder block.



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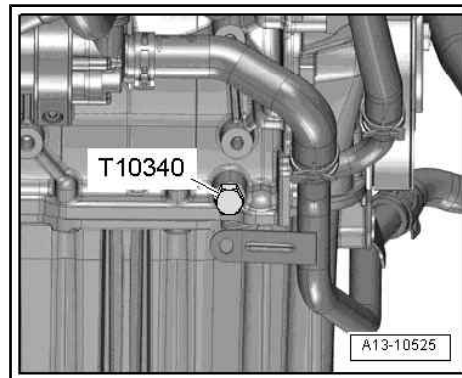


- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



#### Note

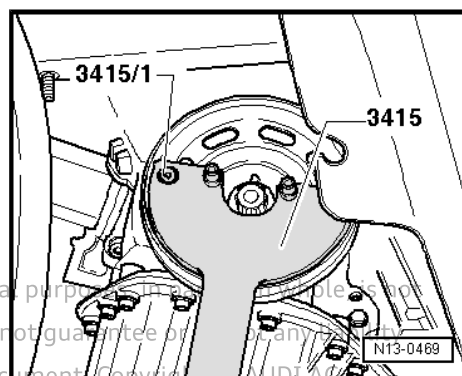
*The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.*



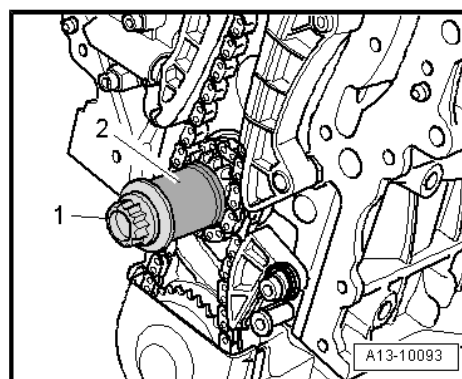
#### Caution

**Risk of damage to engine.**

- ◆ **To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.**



- Loosen bolt for poly V-belt pulley using counterhold tool - 3415- and pin -3415/1-.
- Remove bolt and take off poly V-belt pulley.
- Remove timing chain cover  
⇒ [“1.2 Removing and installing timing chain cover”, page 81](#) .
- Insert bearing bush -2- and screw in crankshaft pulley bolt -1- hand-tight to secure chain sprocket on crankshaft.





- Press tensioning rail -2- in direction of -arrow- and use locking pin - T40011- to lock piston for chain tensioner -1-.



#### Caution

*If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.*

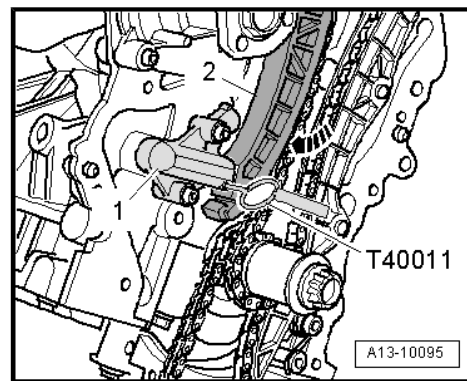
- ◆ *Mark running direction of timing chain with coloured arrows for re-installation. Do not mark timing chain by means of centre punch, notch or the like.*

*Risk of damage to camshafts.*

- ◆ *The camshaft clamp - T10171 A- must not be used as a counterhold tool.*

*Risk of damage to thread.*

- ◆ *The camshaft adjuster central bolt has a left-hand thread.*

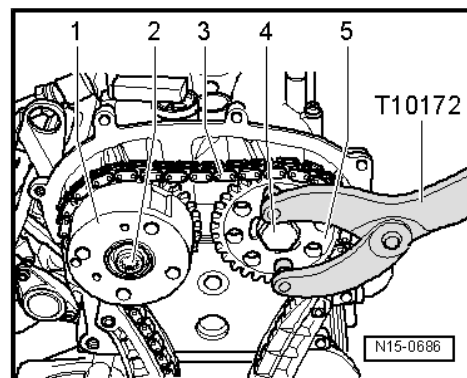


- Loosen bolt -2- for camshaft adjuster -1- and bolt -4- for camshaft chain sprocket -5-, using counterhold tool - T10172- to counterhold on camshaft chain sprocket.
- Detach camshaft chain sprocket together with camshaft timing chain -3-.



#### Note

*Leave camshaft adjuster on camshaft.*



#### Installing



#### Note

- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *Renew gaskets and O-rings for camshaft sealing caps.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ➔ Electronic parts catalogue .*

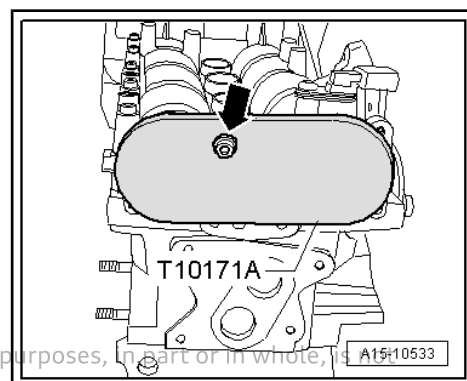
- Check “TDC” position of camshaft and crankshaft:
- The camshaft clamp - T10171 A- must be fitted to camshaft housing.



#### Caution

*Risk of damage to valve gear.*

- ◆ *The camshafts must not be moved axially when turning.*

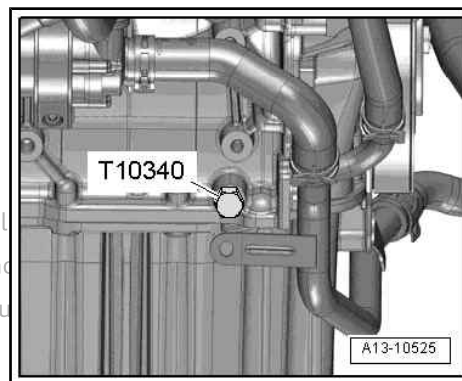


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- Locking pin - T10340- screwed into cylinder block as far as stop and tightened to 30 Nm.
- Turn crankshaft in direction of engine rotation until it makes contact with locking pin - T10340- .

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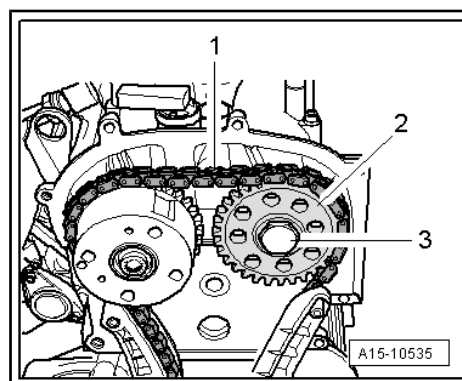
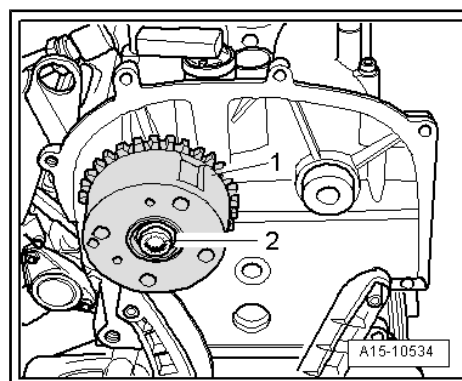


### Caution

**Risk of damage to thread.**

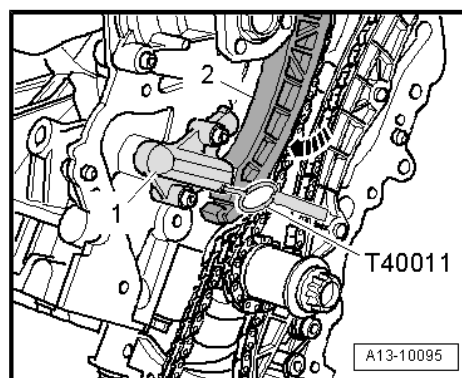
- ◆ **The camshaft adjuster central bolt has a left-hand thread.**

- Fit bolt -2- for camshaft adjuster -1- without tightening.
- It should just be possible to turn the adjuster on the camshaft without axial movement.
- Fit camshaft timing chain according to marks applied when removing.
- Fit camshaft timing chain -1- together with chain sprocket -2- for exhaust camshaft onto crankshaft sprocket and camshaft adjuster.
- Fit bolt -3- for camshaft chain sprocket without tightening.
- It should just be possible to turn the camshaft chain sprocket on the camshaft without axial movement.
- Remove locking pin - T40011- from chain tensioner -1- and tension camshaft timing chain.
- Check “TDC” position of camshaft and crankshaft again  
⇒ [page 93](#) .



### Note

Disregard -arrow-.



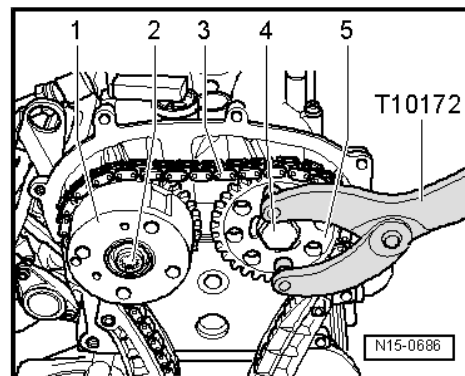


### Caution

*Risk of damage to thread.*

- ◆ *The camshaft adjuster central bolt has a left-hand thread.*

- Tighten bolt -2- for camshaft adjuster -1- to 40 Nm and bolt -4- for camshaft chain sprocket -5- to 50 Nm, using counterhold tool - T10172- to counterhold on camshaft chain sprocket.



### Note

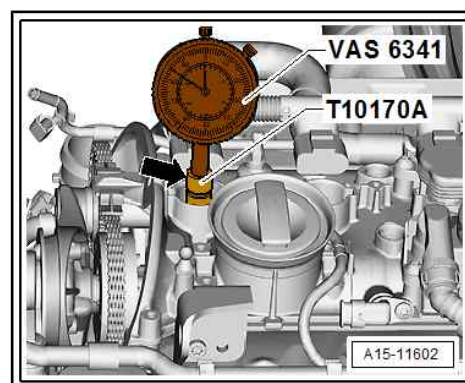
- ◆ *Do not tighten bolts for camshaft adjuster and camshaft chain sprocket to final torque before checking timing again.*
- ◆ *When tightening the bolts, the crankshaft must not turn and the camshaft timing chain -3- must remain tensioned on both sides.*

- Detach camshaft clamp - T10171 A- .
- Remove locking pin - T10340- .
- Turn crankshaft 2 revolutions in direction of engine rotation and set to "TDC".
- "TDC" = maximum measured value on dial gauge.

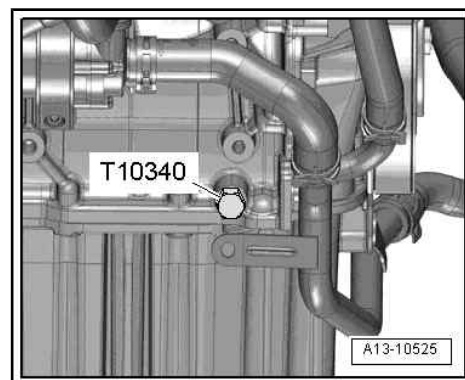


### Note

- ◆ *If the crankshaft was turned more than 0.01 mm beyond "TDC", turn back the crankshaft approx. 45° in the opposite direction of normal rotation. Then turn crankshaft in normal direction of rotation to "TDC".*
- ◆ *Permissible deviation from TDC:  $\pm 0.01$  mm.*
- ◆ *Disregard -arrow-.*

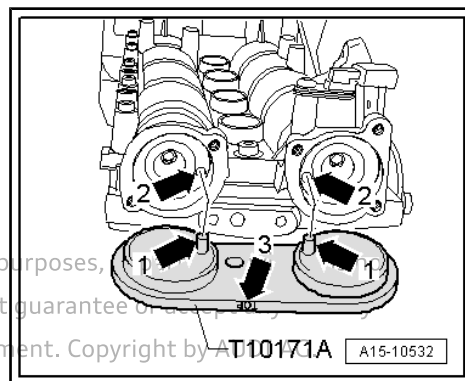


- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.
- Turn crankshaft in direction of engine rotation until it makes contact with locking pin.





- Insert camshaft clamp - T10171 A- into holes in camshafts as far as stop.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription "TOP" -arrow 3- should be legible from above.
- If camshaft clamp - T10171 A- cannot be fully inserted into holes in camshafts, repeat adjustment.
- If it is possible to insert camshaft clamp - T10171 A- completely, take off camshaft clamp again.
- Remove locking pin - T10340-.

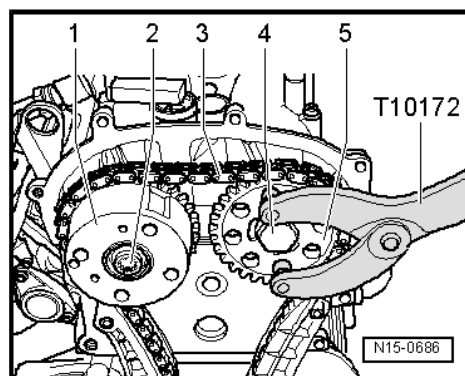


### Caution

**Risk of damage to thread.**

- ◆ **The camshaft adjuster central bolt has a left-hand thread.**

- Tighten bolt -2- for camshaft adjuster -1- and bolt -4- for camshaft chain sprocket -5- and turn further through specified angle to final setting ⇒ [page 84](#) (counterhold at camshaft chain sprocket using counterhold tool - T10172- ).



### Note

*Disregard -item 3-.*

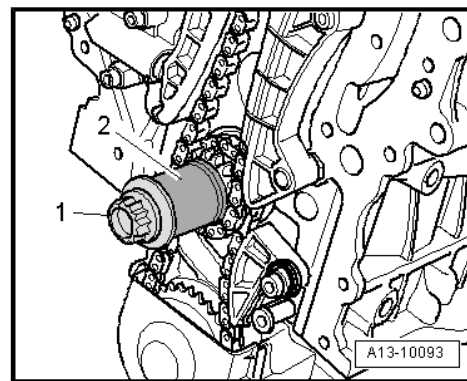
- Turn crankshaft 2 revolutions in direction of engine rotation and set to "TDC".
- Check adjustment ⇒ [page 95](#) ; repeat adjustment if necessary.



#### Caution

*Risk of damage to engine.*

- ◆ *To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.*



- Remove bolt for poly V-belt pulley -1-.



#### Note

*Leave bearing bush -2- in position on crankshaft.*

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

- Install timing chain cover ⇒ [page 81](#) .
- Lubricate O-rings for camshaft sealing caps with oil before installing.
- Install poly V-belt pulley for crankshaft ⇒ [page 51](#) .
- Tighten plug for “TDC” drilling ⇒ [page 71](#) .
- Install coolant pipes (left-side) ⇒ [page 179](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install spark plug ⇒ Maintenance ; Booklet 819 .
- Install air pipe ⇒ [page 195](#) .
- Install engine cover panel ⇒ [page 40](#) .
- Install poly V-belt ⇒ [page 44](#) .

#### Tightening torques

- ◆ ⇒ [“2.1 Exploded view - timing chain”, page 84](#)

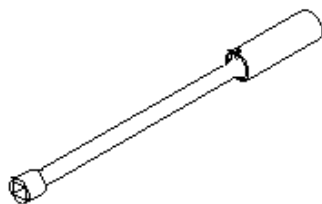
## 2.3 Checking valve timing



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**Special tools and workshop equipment required**

3122 B



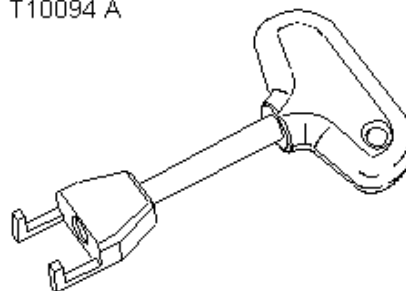
V.A.G 1331



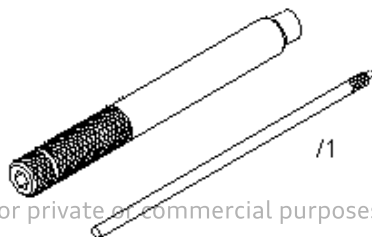
VAS 6079



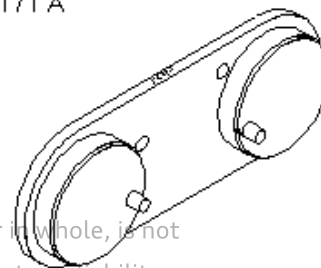
T10094 A



T10170



T10171 A



WV15-10067

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- ◆ Spark plug spanner - 3122 B-
- ◆ Torque wrench (5 ... 50 Nm) - V.A.G 1331-
- ◆ Dial gauge - VAS 6079-
- ◆ Puller - T10094 A-
- ◆ Dial gauge adapter - T10170- or dial gauge adapter - T10170 A-
- ◆ Camshaft clamp - T10171 A-

**Note**

*The attachment points for securing the camshaft clamps have changed. A new special tool (designated camshaft clamp - T10171 A-) has been introduced. The previous camshaft clamp - T10171- can still be used if it is adapted as described below.*

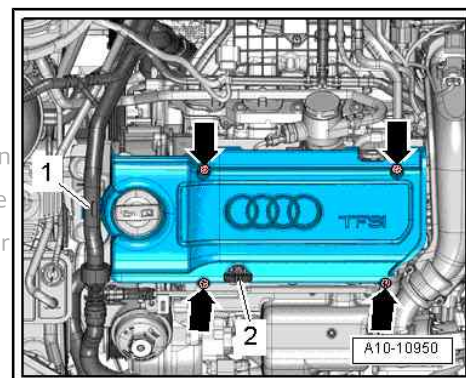
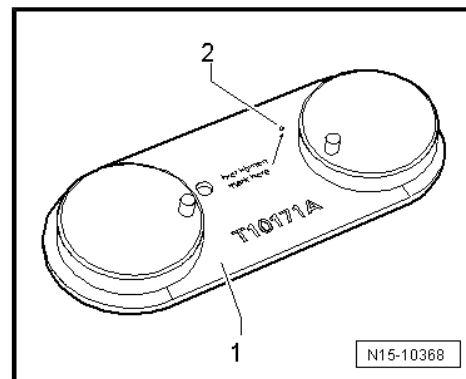


- Place drilling template -1- onto camshaft clamp - T10171- .
- Apply a centre punch mark at marking -2- on camshaft clamp - T10171- .
- Drill a hole in the camshaft clamp - T10171- using a 7 mm drill.
- Deburr the hole on both sides.
- Add an »A« to the tool designation -T10171- .

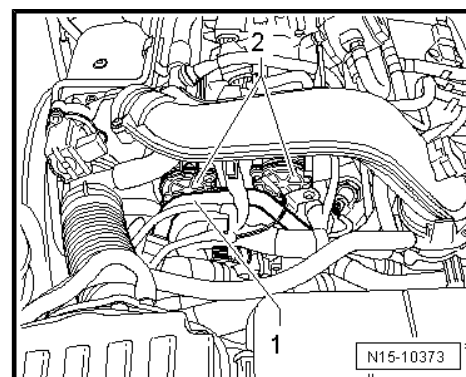
#### Test sequence

- Remove lower section of front wheel housing liner (right-side)  
⇒ General body repairs; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Drain off coolant ⇒ [page 162](#) .
- Unscrew securing bolts -arrows- for engine cover panel.
- Pull oil dipstick -2- out of guide tube.
- Disengage coolant hoses -1- at engine cover panel and pull engine cover panel upwards.

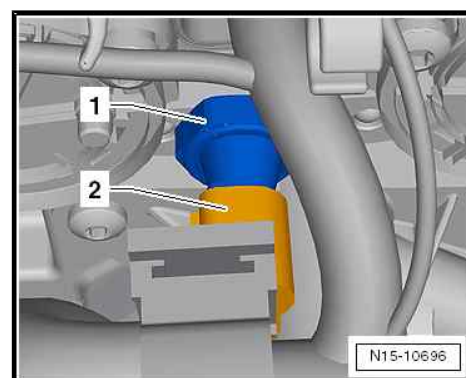
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- Detach coolant hoses from coolant pipe -1- and unbolt coolant pipe from camshaft housing and cylinder block (from below).

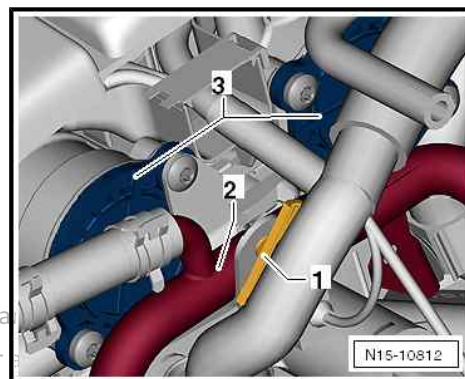


- Release connector -2- and unplug.
- Remove oil pressure switch - F1- -1-.
- Unscrew bolts for both camshaft covers -3-.



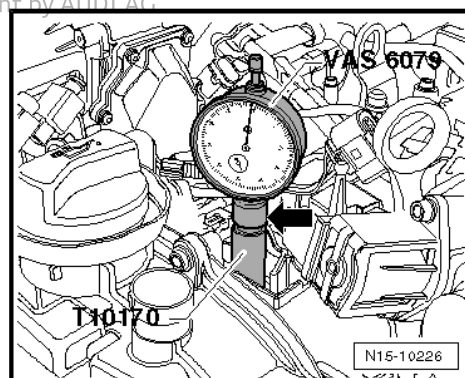


- Unclip engine prewiring -1-.
- Pull coolant pipe -2- and engine prewiring -1- away from cylinder head.
- Prise both camshaft covers -3- out of cylinder head.
- Remove spark plug from cylinder 1. To do so, use puller - T10094 A- and spark plug socket and extension 3122 B.



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- Screw dial gauge adapter -T10170- into spark plug thread as far as stop.
- Insert dial gauge - VAS 6079- with extension -T10170/1- as far as stop and secure using locking nut -arrow-.
- Turn crankshaft in normal direction of rotation to TDC for cylinder 1 and note position of small indicator on dial gauge.

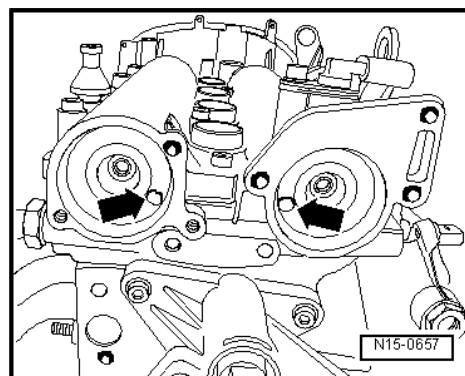


The threaded holes -arrows- in the camshafts must be positioned as shown in illustration. If necessary, turn crankshaft one turn further (360°).



#### Note

- ◆ If the crankshaft has been turned more than 0.01 mm beyond the TDC position, it must be turned two rotations further in normal direction of engine rotation so that it is at the TDC position for cylinder 1.
- ◆ Permissible deviation from TDC for cylinder 1:  $\pm 0.01$  mm.



#### Caution

**Before inserting camshaft clamp - T10171 A- , check if the pins on the tool protrude by at least 7 mm.**

**If this is not the case, the camshaft clamp is defective and must be renewed.**

**Do not knock camshaft clamp into place with any kind of tool.**



- Insert camshaft clamp -T10171 A- into camshaft openings as far as stop.

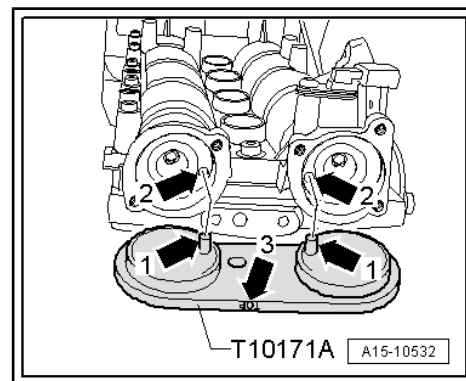
The locking pins -arrows 1- must engage in the holes -arrows 2-. The inscription "TOP" -arrow 3- should be legible from above.

If the camshaft clamp -T10171 A- cannot be inserted into the camshaft openings as far as the stop, the valve timing is not correct and must be adjusted ⇒ [page 85](#) .

The valve timing is OK if the camshaft clamp -T10171 A- can be inserted into the camshaft openings as far as the stop.

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

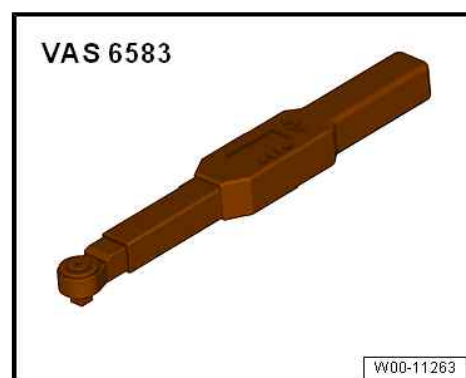
- ◆ Renew seals for camshaft sealing caps and lubricate with oil before installing.
- ◆ Because the seal cannot be renewed individually, the oil pressure switch must be renewed after removal.
- ◆ Tightening torque for oil pressure switch - F1- : 20 Nm
- Fill system with coolant ⇒ [page 162](#) .



## 2.4 Checking timing chain

### Special tools and workshop equipment required

- ◆ Torque wrench - VAS 6583-



- ◆ Testing tools - T10550-



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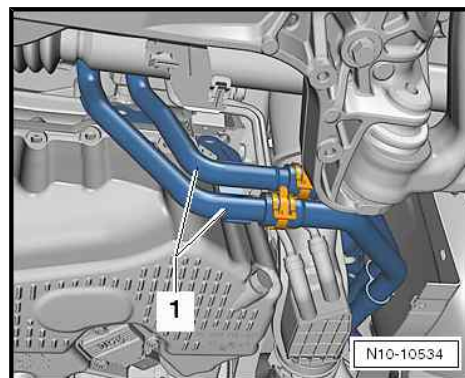
- ◆ Camshaft clamp - T10550/1-
- ◆ Pointer - T10550/2-
- ◆ Scaling sleeve - T10550/3-
- Engine oil temperature must be at least 40 °C ⇒ Vehicle diagnostic tester.
- Engine must not be at »TDC« position.



- Remove front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Noise insulation; Exploded view - noise insulation .
- Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner .
- Remove poly V-belt ⇒ [page 46](#) .

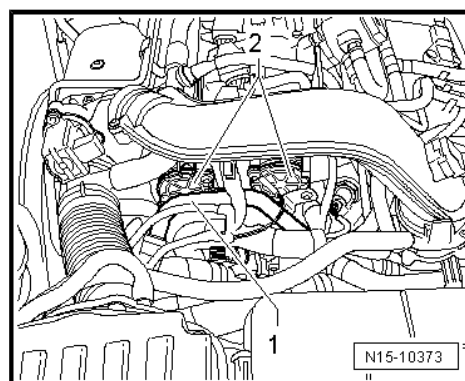
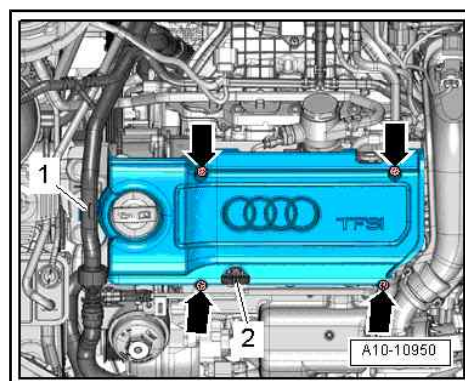
#### Vehicles with auxiliary/supplementary heater:

- Clamp off coolant hoses with hose clamps up to 25 mm - 3094- .
- Open clamps and disconnect coolant hoses from coolant pipes -1-.
- Remove auxiliary/supplementary heater with exhaust pipe and coolant hoses connected ⇒ Auxiliary/supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater .



#### All vehicles (continued):

- Disengage coolant hose -1- at engine cover panel.
- Pull oil dipstick -2- out of guide tube.
- Unscrew bolts -arrows- and detach engine cover panel.
- Detach coolant hoses from coolant pipe -1- and unbolt coolant pipe from camshaft housing and cylinder block (from below).
- Release connector -2- and unplug.



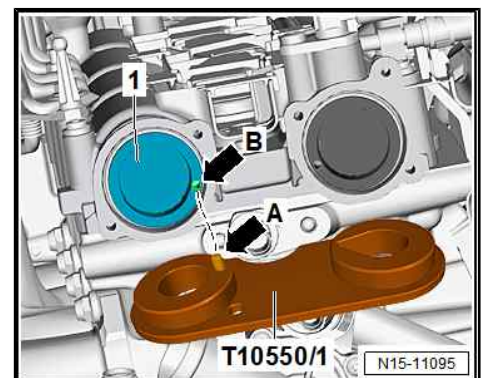
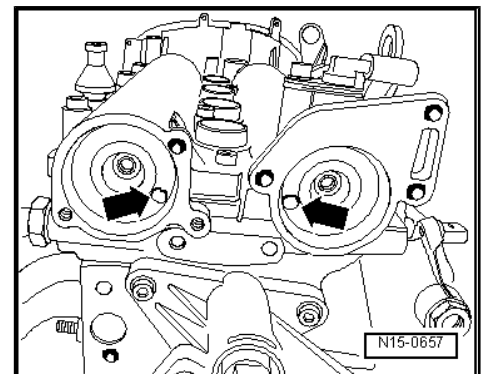
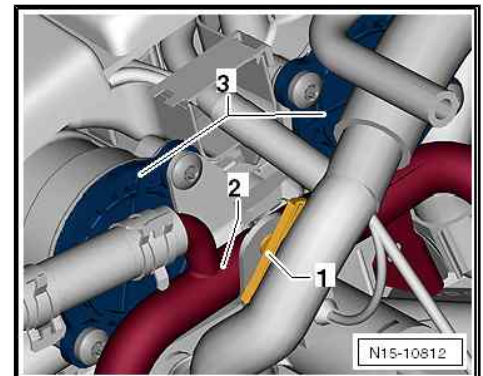
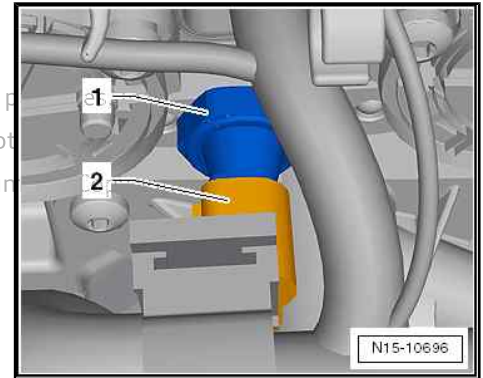
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Disregard item -1-.

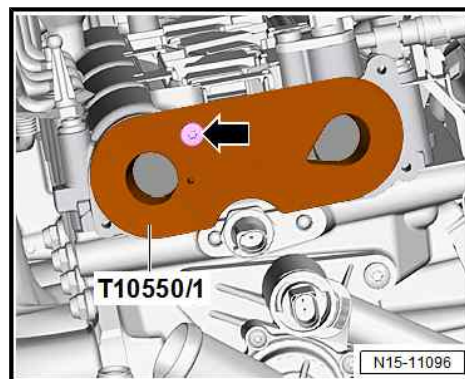
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- Remove bolts from both camshaft covers -3-.
  - Unclip electrical wiring harness -1-.
  - Pull coolant pipe -2- and electrical wiring harness -1- away from cylinder head.
  - Prise both camshaft covers -3- out of cylinder head.
- 
- Hole -left arrow- in exhaust camshaft (left-side) must be in position shown.
  - If necessary, turn crankshaft in direction of engine rotation.
- 
- Insert camshaft clamp - T10550/1- all the way into camshaft openings.
  - Locking pin -arrow A- must engage in hole -arrow B- in exhaust camshaft.
  - Marking "TOP" should be legible from above.

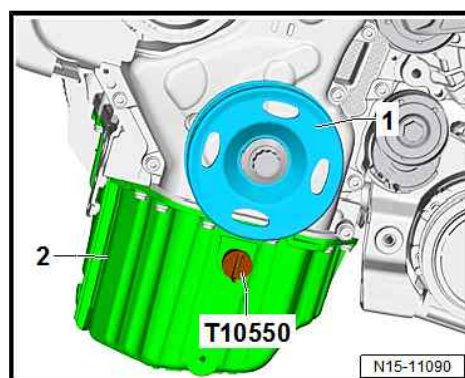




- Secure camshaft clamp - T10550/1- with bolt so it is hand-tight.
- Use one of the camshaft cover bolts -arrow-.



- Screw pointer - T10550/2- into hole in sump.
- Align pointer vertically, ensuring that tip faces upwards.
- Tighten pointer with knurled nut.



- Position scaling sleeve - T10550/3- on pulley.



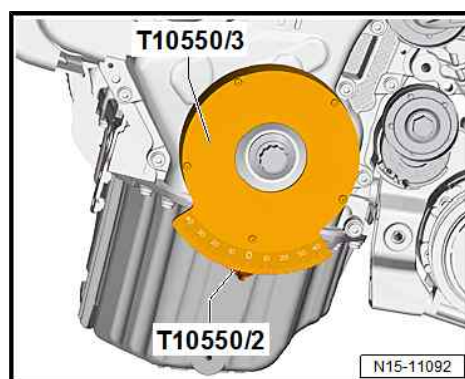
#### Caution

**Risk of injury: fingers could become jammed between the parts.**

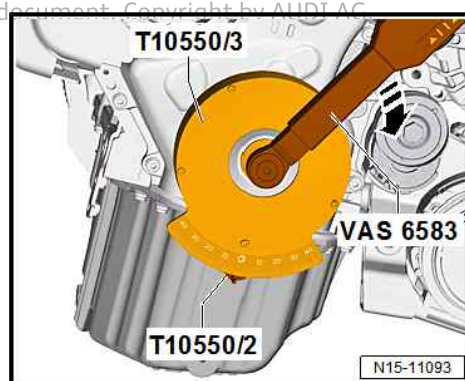
**The scaling sleeve - T10550/3- is fitted with magnets.**

**Carefully bring the parts together.**

**When doing so, note that the parts pull towards each other very quickly.**



- Align scaling sleeve - T10550/3- with pointer - T10550/2- as shown.
- Fit torque wrench - VAS 6583- onto crankshaft bolt using a suitable socket.
- Push torque wrench - VAS 6583- clockwise and hold at 40 Nm.
- Turn scaling sleeve - T10550/3- so that pointer - T10550/2- is at position »0«.





- Switch torque wrench - VAS 6583- direction setting and slowly push it anti-clockwise.
- Hold torque wrench - VAS 6583- at 40 Nm.
- Read off value indicated on scaling sleeve.
- If timing chain skips during test, it must be renewed  
⇒ [page 85](#) .
- Timing chain skipping can be easily heard and felt.

#### Test evaluation

- If timing chain is elongated by up to 28°, it is OK.
- If timing chain is elongated by 29° or more, it is not OK and must be renewed ⇒ [page 85](#) .

Assemble in reverse order. Note the following:

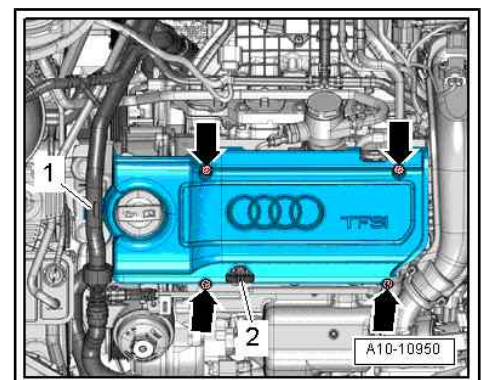
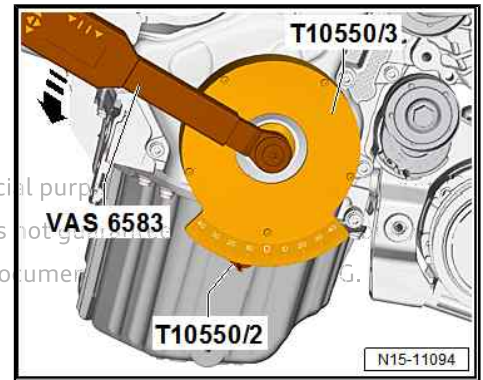


#### Note

- ◆ *The scaling sleeve - T10550/3- is fitted with magnets.*
- ◆ *Do not use any tools to prise the scaling sleeve - T10550/3- off the pulley.*
- Turn scaling sleeve - T10550/3- approx. 45° to the right so that the scaling area is no longer above the pointer - T10550/2- .
- Reach behind scaling sleeve - T10550/3- with both hands.
- Press against pulley bolt with your thumbs and pull off scaling sleeve - T10550/3- .
- Renew seals for camshaft sealing caps and lubricate with oil before installing.
- Fill up with coolant ⇒ [page 162](#) .

#### Tightening torques

- ◆ ⇒ [“2.1 Exploded view - timing chain”, page 84](#)
- ◆ ⇒ [“1.2.2 Removing and installing poly V-belt - vehicles with air conditioning”, page 46](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 50 ; Noise insulation; Exploded view - noise insulation
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres
- Fit engine cover panel onto camshaft housing and engage coolant hose -1- in retainer.
- Tighten securing bolts -arrows- to 10 Nm.





### 3 Cylinder head

⇒ "3.1 Exploded view - cylinder head", page 106

⇒ "3.2 Exploded view - camshaft housing", page 108

⇒ "3.3 Removing and installing cylinder head", page 110

⇒ "3.4 Removing and installing camshaft housing", page 123

⇒ "3.5 Checking compression", page 129

#### 3.1 Exploded view - cylinder head

##### 1 - Cylinder head

- ☐ Removing and installing  
⇒ page 110
- ☐ Checking for distortion  
⇒ page 107
- ☐ Sealing surface for camshaft housing must be free of oil and grease
- ☐ If renewed, change coolant and engine oil

##### 2 - Guide pin

- ☐ Tightening torque  
⇒ Item 4 (page 84)

##### 3 - Bolt

- ☐ 20 Nm

##### 4 - Engine lifting eye

##### 5 - Hydraulic compensation element

- ☐ Do not interchange
- ☐ Lubricate contact surface

##### 6 - Securing clip

- ☐ Check for firm attachment
- ☐ Not available as separate part

##### 7 - Roller rocker finger

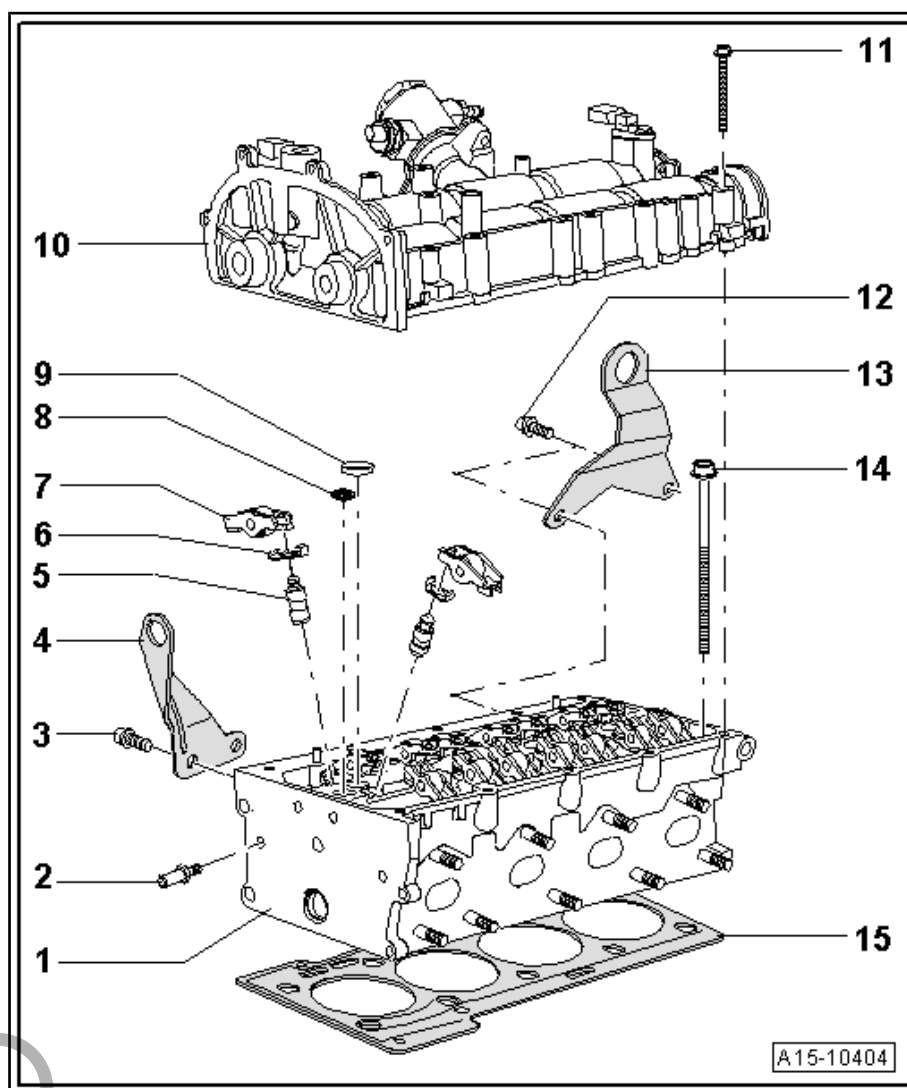
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surfaces before installing
- ☐ Attach to hydraulic compensation element -item 5- using securing clip -item 6-

##### 8 - Oil strainer

- ☐ Inserted into cylinder head
- ☐ Renew

##### 9 - Seal

- ☐ Inserted into cylinder head
- ☐ 4x
- ☐ Renew





### 10 - Camshaft housing

- ☐ Removing and installing ⇒ [page 123](#)

### 11 - Bolt

- ☐ Renew
- ☐ Note correct sequence when loosening ⇒ [page 127](#)
- ☐ Tightening torque and sequence ⇒ [page 109](#)

### 12 - Bolt

- ☐ 20 Nm

### 13 - Engine lifting eye

### 14 - Bolt

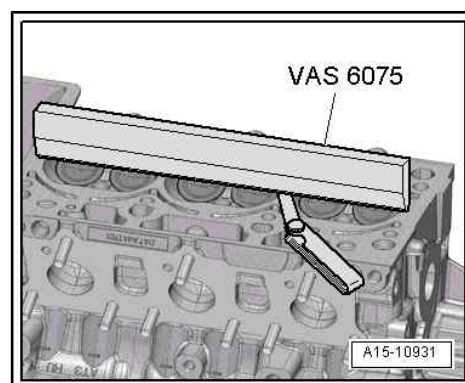
- ☐ Renew
- ☐ Note correct sequence when loosening ⇒ [page 120](#)
- ☐ Tightening torque and sequence ⇒ [page 108](#)

### 15 - Cylinder head gasket

- ☐ Renewing ⇒ [“3.3 Removing and installing cylinder head”, page 110](#)
- ☐ Installation position: Part number points towards cylinder head, and must be legible from the inlet side
- ☐ If renewed, change coolant and engine oil

### Checking cylinder head for distortion

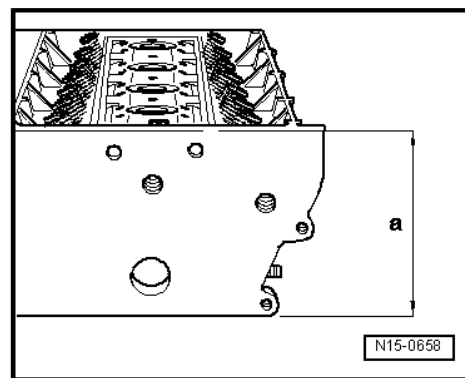
- Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.
- Max. permissible distortion: 0.05 mm.



### Reworking cylinder head sealing surface

Machining of the cylinder head (surface grinding) is only permissible down to the minimum dimension -a-.

- Minimum dimension: -a- = 108.25 mm





## Cylinder head - tightening torque and sequence

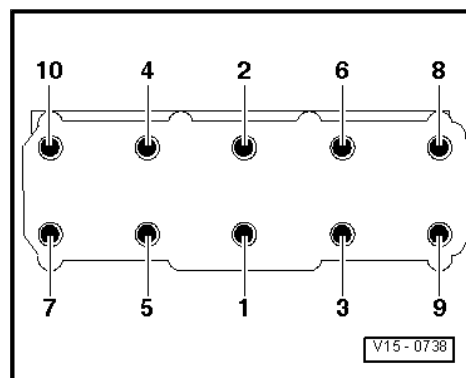


### Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

| Stage | Bolts      | Tightening torque/angle specification  |
|-------|------------|----------------------------------------|
| 1.    | -1 ... 10- | Screw in by hand until contact is made |
| 2.    | -1 ... 10- | 30 Nm                                  |
| 3.    | -1 ... 10- | Turn 90° further                       |
| 4.    | -1 ... 10- | Turn 90° further                       |
| 5.    | -1 ... 10- | Turn 90° further                       |



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## 3.2 Exploded view - camshaft housing

### 1 - Guide sleeve

### 2 - Seal

- ☐ 4x
- ☐ Inserted into cylinder head
- ☐ Renew

### 3 - Oil strainer

- ☐ Inserted into cylinder head
- ☐ Renew

### 4 - Camshaft housing

- ☐ With integrated camshaft bearings
- ☐ Removing and installing  
⇒ [page 123](#)

### 5 - O-ring

- ☐ Renew

### 6 - Camshaft control valve 1 - N205-

### 7 - Bolt

- ☐ 10 Nm

### 8 - High-pressure pump

- ☐ With fuel pressure regulating valve - N276-
- ☐ Removing and installing  
⇒ [page 254](#)

### 9 - Bolt

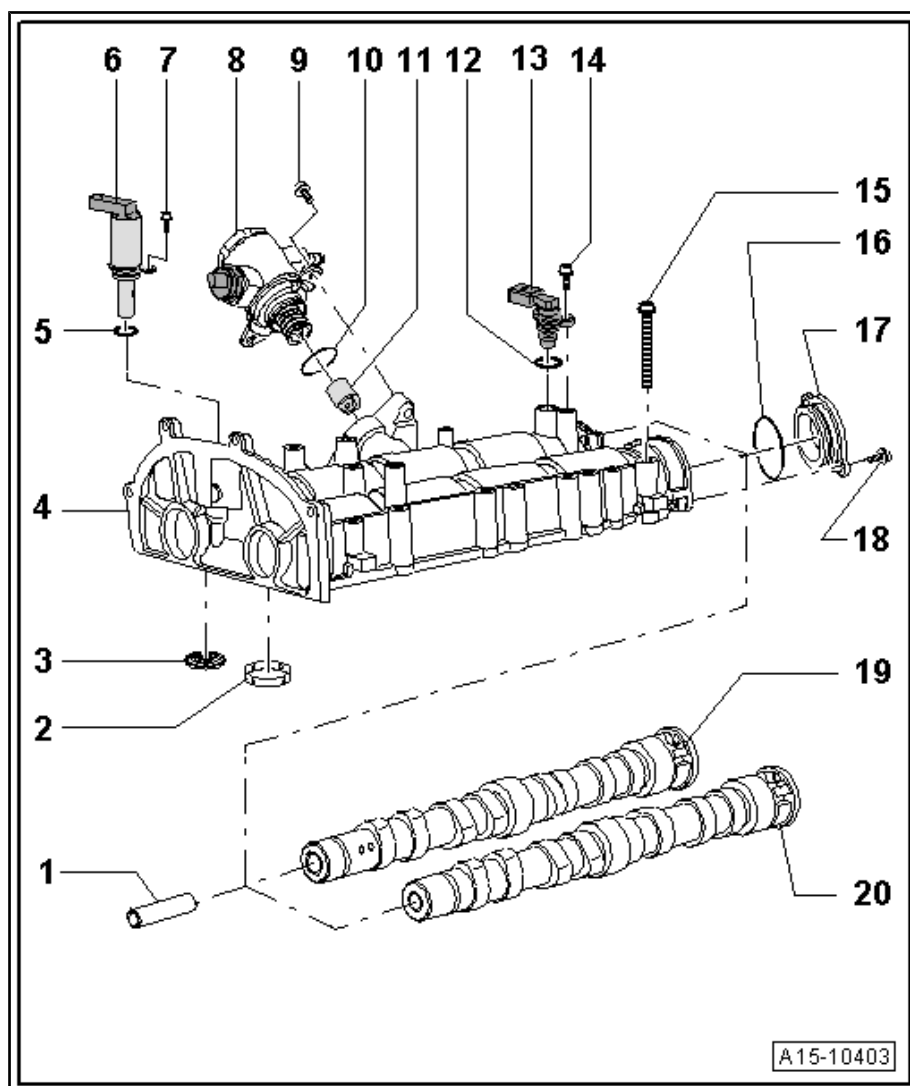
- ☐ Tightening torque  
⇒ [Item 1 \(page 252\)](#)

### 10 - O-ring

- ☐ Renew

### 11 - Roller tappet

- ☐ For high-pressure pump





- ☐ Can only be inserted in one position

## 12 - O-ring

- ☐ Renew

## 13 - Hall sender - G40-

- ☐ Removing and installing ⇒ [page 282](#)

## 14 - Bolt

- ☐ Tightening torque ⇒ [Item 4 \(page 280\)](#)

## 15 - Bolt

- ☐ Correct sequence when slackening ⇒ [page 127](#)
- ☐ Renew
- ☐ Tightening torque and sequence ⇒ [page 109](#)

## 16 - O-ring

- ☐ Renew

## 17 - Sealing cap

## 18 - Bolt

- ☐ 10 Nm

## 19 - Inlet camshaft

- ☐ With cam for high-pressure pump
- ☐ Before removing, detach roller tappet for high-pressure pump
- ☐ Measuring axial clearance ⇒ [page 132](#)
- ☐ Removing and installing ⇒ [page 132](#)
- ☐ Lubricate with oil before installing (also lubricate collar of axial bearing)

## 20 - Exhaust camshaft

- ☐ Measuring axial clearance ⇒ [page 132](#)
- ☐ Removing and installing ⇒ [page 132](#)
- ☐ Lubricate with oil before installing (also lubricate collar of axial bearing)

## Camshaft housing - tightening torque and sequence

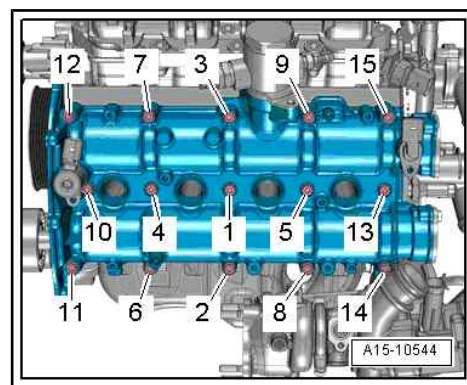


### Note

*Renew bolts tightened with specified tightening angle.*

- Tighten bolts in 2 stages in the sequence shown:

| Stage | Bolts      | Tightening torque/angle specification |
|-------|------------|---------------------------------------|
| 1.    | -1 ... 15- | 10 Nm                                 |
| 2.    | -1 ... 15- | Turn 90° further                      |



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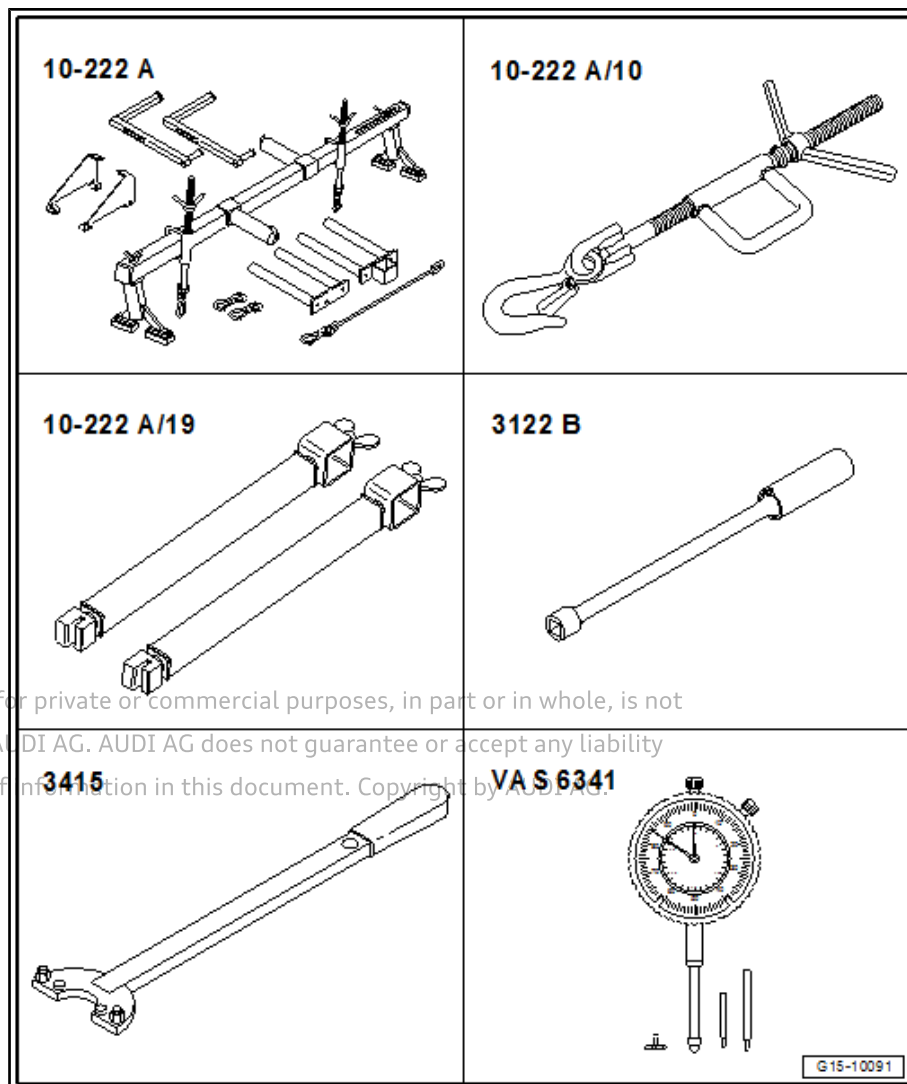


### 3.3 Removing and installing cylinder head

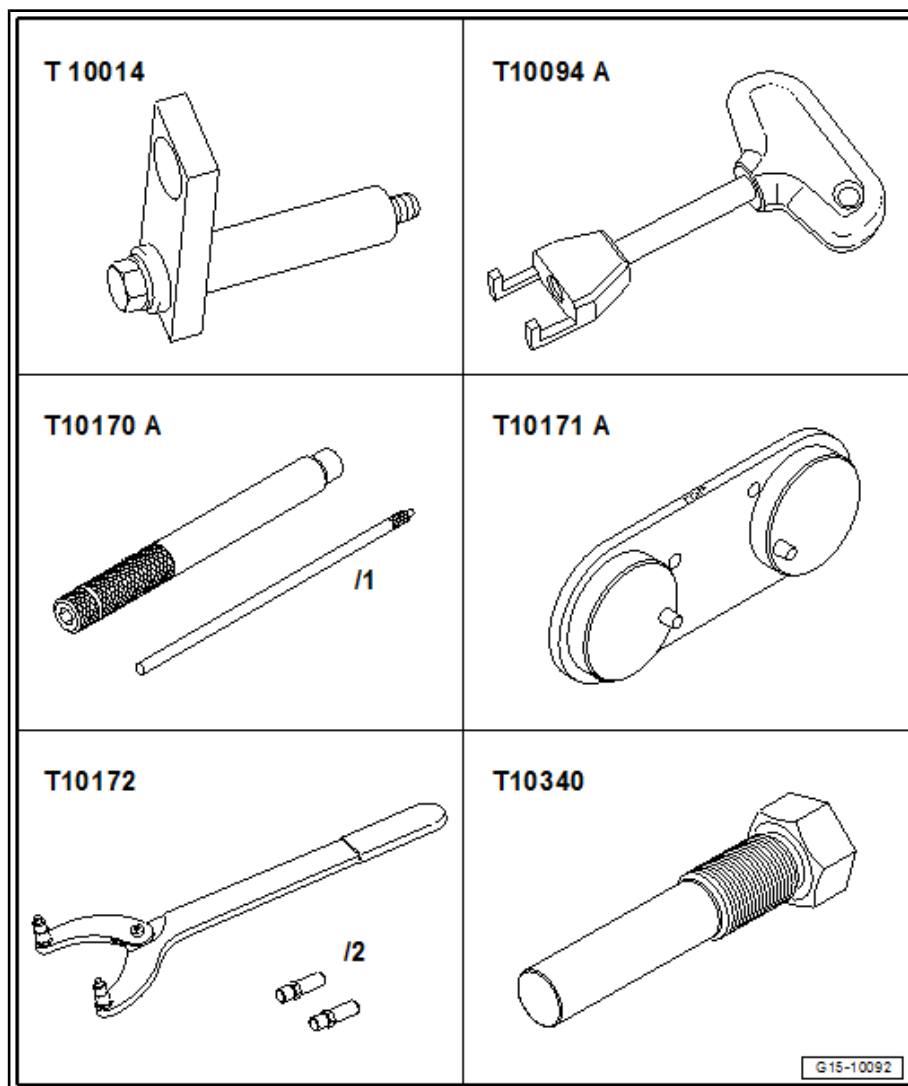
Special tools and workshop equipment required



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- ◆ Support bracket - 10 - 222 A-
- ◆ Hook - 10 - 222 A /10-
- ◆ Adapters - 10 - 222 A /19-
- ◆ Spark plug spanner - 3122 B-
- ◆ Counterhold tool - 3415-
- ◆ Dial gauge set, 4-part - VAS 6341-



- ◆ Bracket - T10014-
- ◆ Puller - T10094 A-
- ◆ Adapter for dial gauge - T10170 A-
- ◆ Camshaft clamp - T10171 A-
- ◆ Counterhold tool - T10172-
- ◆ Locking pin - T10340-
- ◆ Hose clip pliers - VAS 6362-

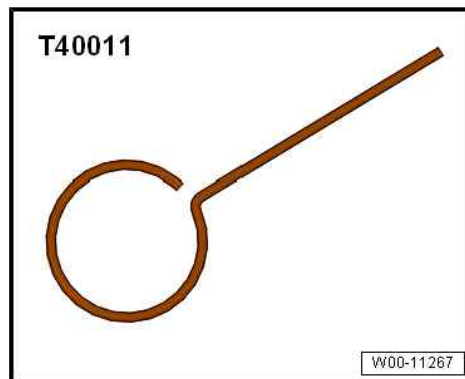


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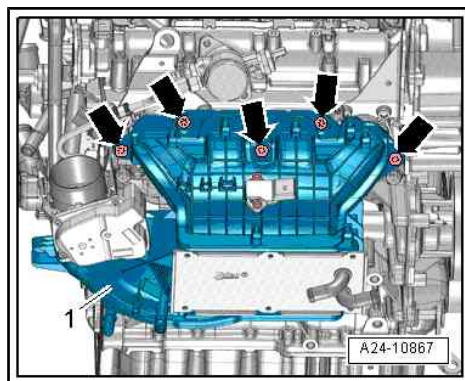


- ◆ Locking pin - T40011-



## Removing

- Drain coolant ⇒ [page 162](#) .
- Remove intake manifold (top section) ⇒ [page 236](#) .
- Remove catalytic converter with centre silencer  
⇒ ["2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012", page 274](#) or  
remove catalytic converter  
⇒ ["2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards", page 276](#) .
- Remove sump ⇒ [page 147](#) .
- Remove thermostat housing ⇒ [page 182](#) .
- Vehicles without air conditioning: Remove poly V-belt  
⇒ [page 44](#) .
- Vehicles with air conditioning: Remove bracket for ancillaries  
⇒ [page 50](#) .
- Remove engine cover panel ⇒ [page 40](#) .



## WARNING

*The fuel system is pressurised.*

*Risk of injury as fuel may spray out.*

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap a clean cloth around connection and open connection carefully).

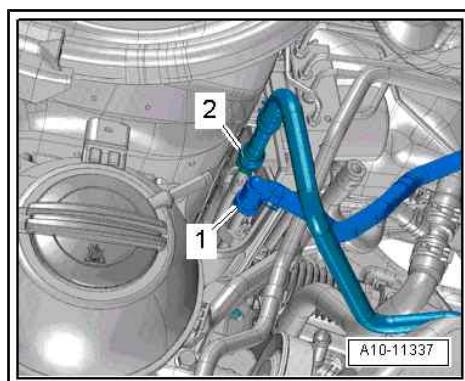
- Disconnect fuel supply line -2- (pull release ring).



## Note

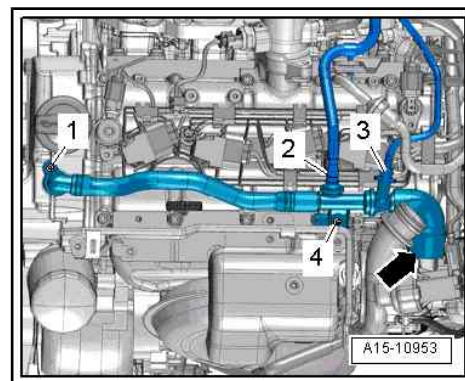
*Disregard -item 1-.*

- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .





- Remove bolt -1- and detach crankcase breather hose from turbocharger -arrow-.
- Disconnect crankcase breather hose from timing chain cover and detach it with lines -2- and -3- connected.

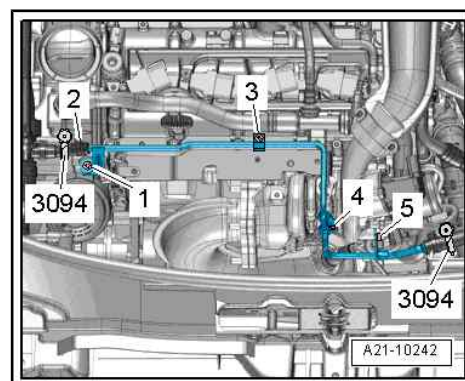


- Remove bolts -1, 3, 4, 5-.
- Disconnect coolant lines from turbocharger and move clear to one side.

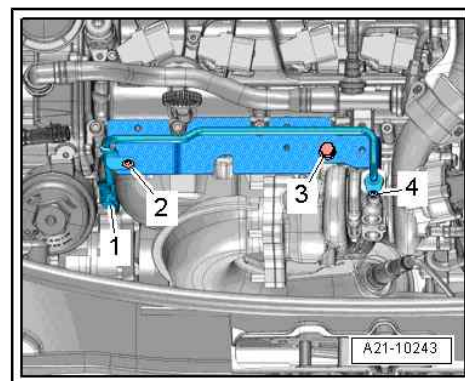


**Note**

*Disregard -item 2- and -3094- .*



- Remove banjo bolt -1- and bolts -2, 3, 4-, detach oil supply line and retaining plate from turbocharger.
- Pull out oil dipstick.

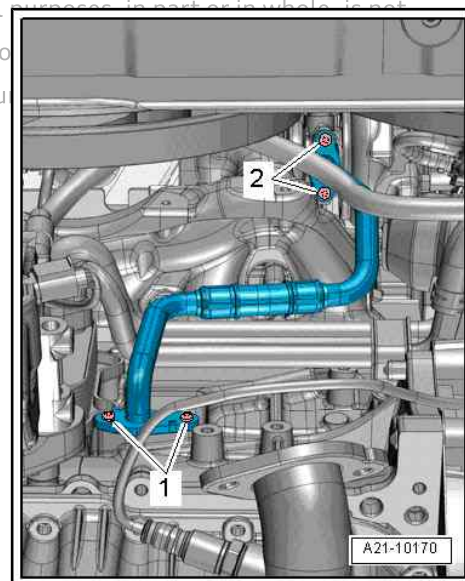


- Remove bolts -2- for oil return pipe (top).



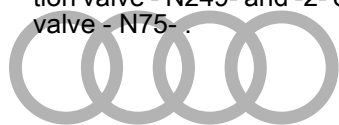
**Note**

*Disregard -item 1-.*

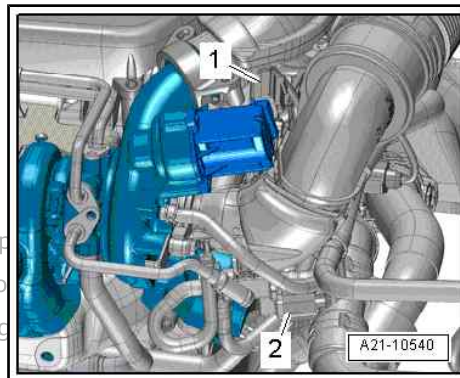




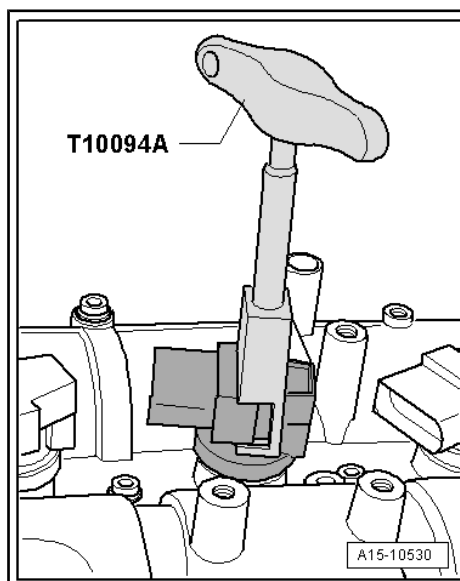
- Unplug electrical connector -1- on turbocharger air recirculation valve - N249- and -2- on charge pressure control solenoid valve - N75- .



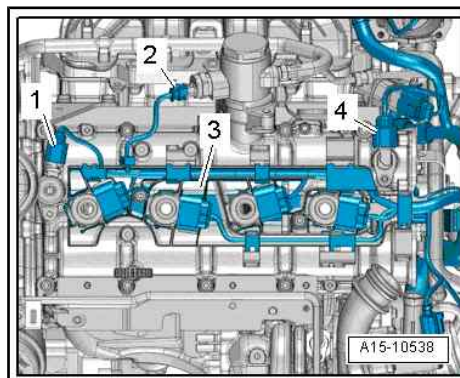
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- Apply puller - T10094 A- to all ignition coils, pull out ignition coils and at the same time unplug electrical connectors at ignition coils for cylinders 1 ... 4.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .



- Unplug electrical connectors -1, 2, 4-, detach wiring duct -3- from camshaft housing and swivel to left side.



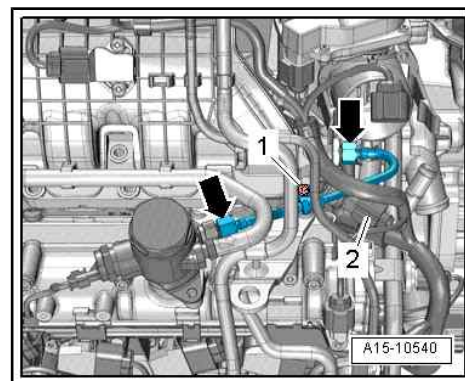


# **WARNING**

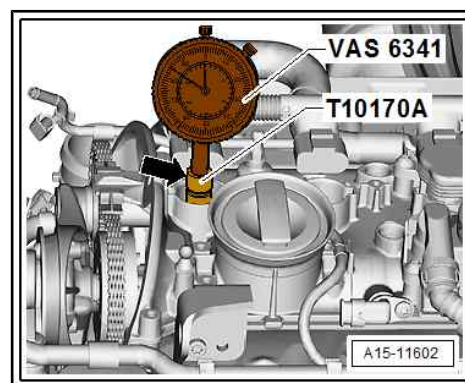
*The fuel system is pressurised.*

*Risk of injury as fuel may spray out.*

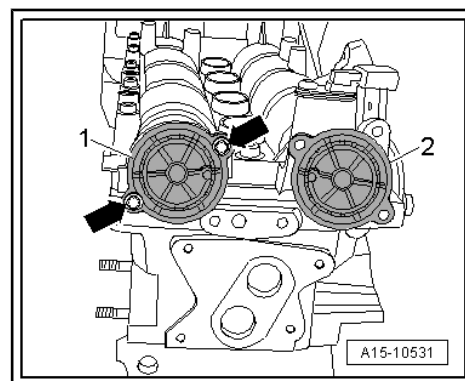
- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.
- Unplug electrical connector -2- on fuel pressure regulating valve - N276- .
- Unplug electrical connectors at injectors and move clear.
- Screw adapter for dial gauge - T10170 A- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6341- with extension -T10170 A/1- and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to “TDC”.
- “TDC” = maximum measured value on dial gauge.

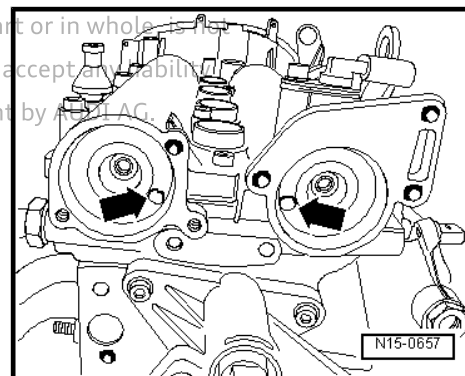


- Remove bolts -arrows- and detach sealing caps -1- and -2-.



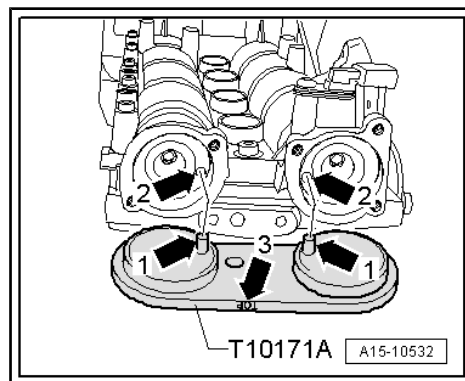
- The threaded holes -arrows- in the camshafts must be positioned as shown in illustration. Turn crankshaft one turn (360°) if necessary.

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- Insert camshaft clamp - T10171 A- into holes in camshafts as far as stop.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription “TOP” -arrow 3- should be legible from above.



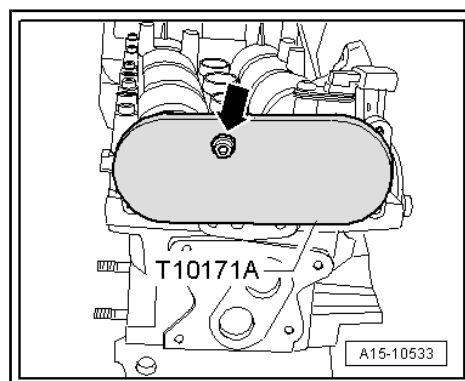
- To secure the camshaft clamp - T10171 A- , screw in an M6 bolt -arrow- hand-tight, but do not tighten.



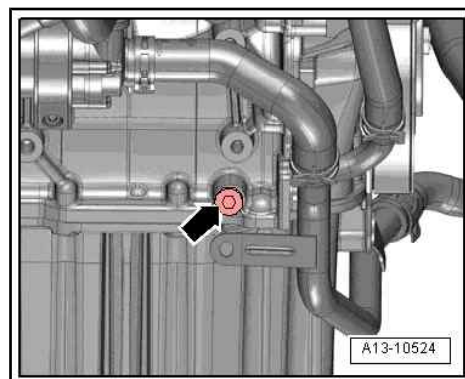
### Caution

**Risk of damage to camshafts.**

- ♦ **The camshaft clamp - T10171 A- must not be used as a counterhold tool.**



- Unscrew plug -arrow- for “TDC” hole on cylinder block.



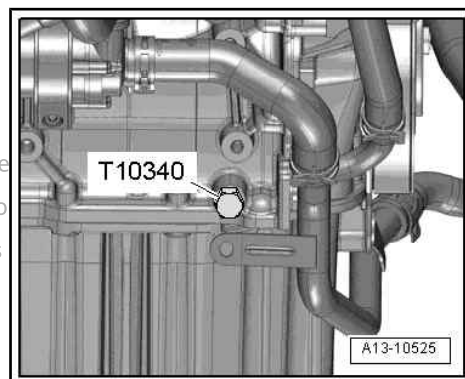
- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



### Note

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**The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.**





### Caution

**Risk of damage to engine.**

- ◆ **To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.**

- Loosen bolt for poly V-belt pulley using counterhold tool - 3415- with pin -3415/1- .
- Remove bolt and take off poly V-belt pulley.
- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (right-side), as shown in illustration.
- Attach hook - 10 - 222 A /10- in right engine lifting eye and tighten spindle slightly to take up weight of engine/gearbox assembly.



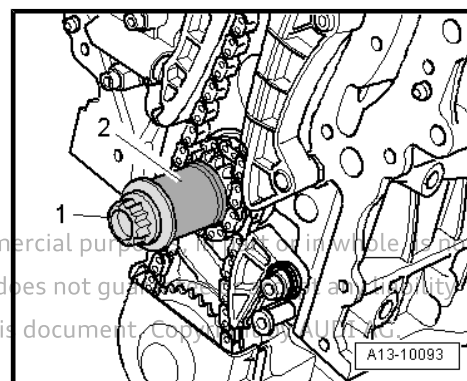
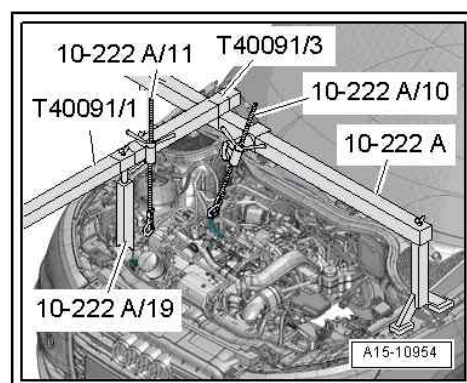
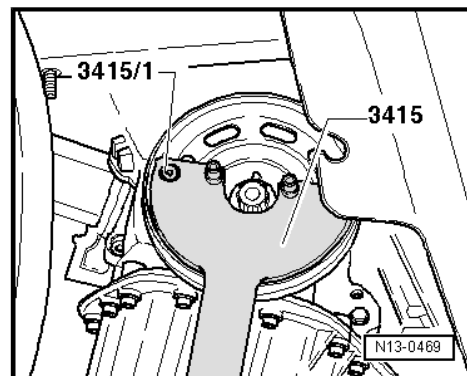
### Note

*Spindle - 10 - 222 A /11- is not used at this stage.*

- Remove timing chain cover ⇒ [page 81](#) .
- Insert bearing bush -2- and screw in crankshaft pulley bolt -1- hand-tight to secure chain sprocket on crankshaft.



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- Press tensioning rail -2- in direction of -arrow- and use locking pin - T40011- to lock piston for chain tensioner -1-.



### Caution

**If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.**

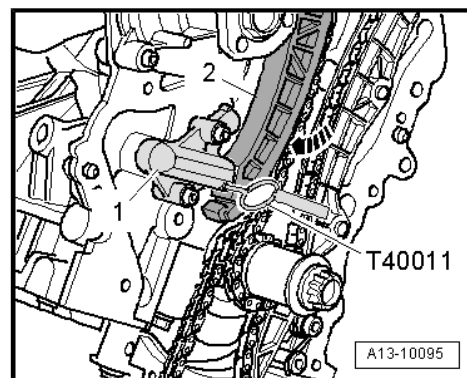
- ◆ **Mark running direction of timing chain with coloured arrows for re-installation. Do not mark timing chain by means of centre punch, notch or the like.**

**Risk of damage to camshafts.**

- ◆ **The camshaft clamp - T10171 A- must not be used as a counterhold tool.**

**Risk of damage to thread.**

- ◆ **The camshaft adjuster central bolt has a left-hand thread.**



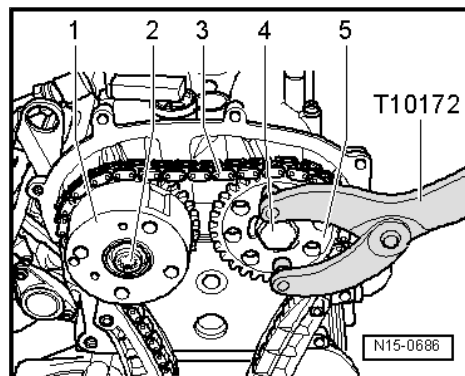


- Loosen bolt -2- for camshaft adjuster -1- and bolt -4- for camshaft chain sprocket -5-, using counterhold tool - T10172- to counterhold on camshaft chain sprocket.
- Detach camshaft chain sprocket together with camshaft timing chain -3-.

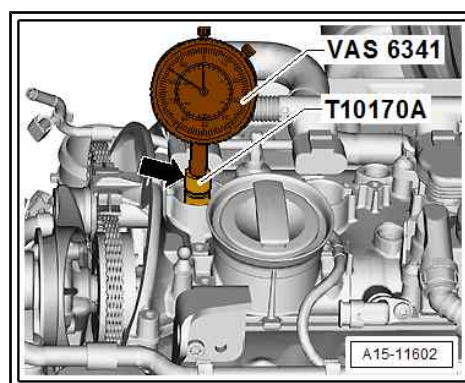


### Note

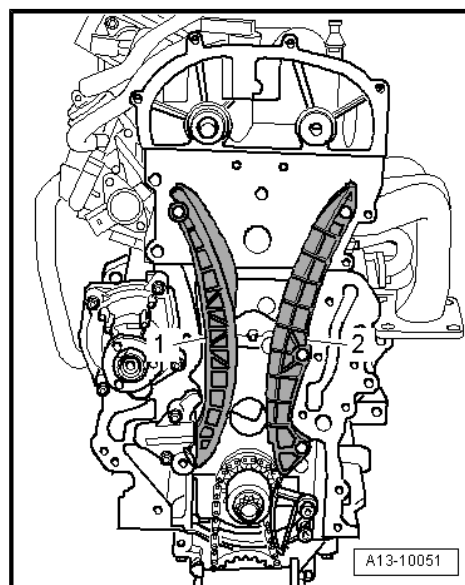
*Leave camshaft adjuster on camshaft.*



- Loosen locking nut -arrow- and detach adapter for dial gauge - T10170 A- with dial gauge - VAS 6341- .



- Pull tensioning rail -1- and guide rail -2- off mounting pins.



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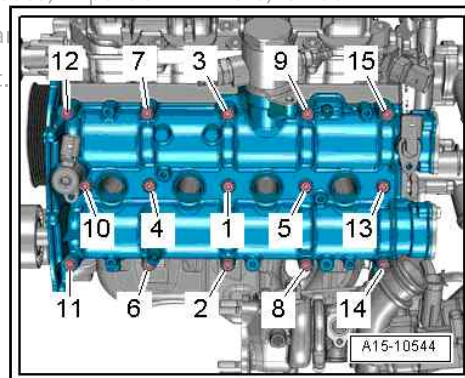
- Slacken camshaft housing bolts in the sequence -15 ... 1-.



### Note

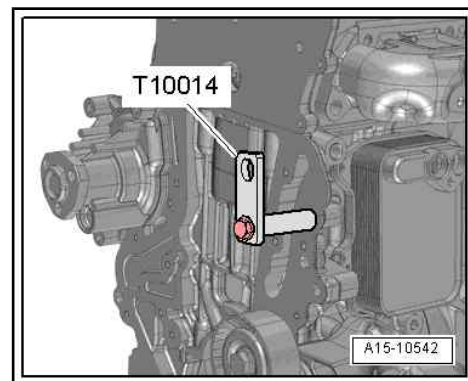
*Bolt -14- below turbocharger remains in camshaft housing.*

- Carefully detach camshaft housing to the right.
- Mark original positions of roller rocker fingers and compensation elements for re-installation.
- Remove roller rocker fingers together with compensation elements and put down on a clean surface.

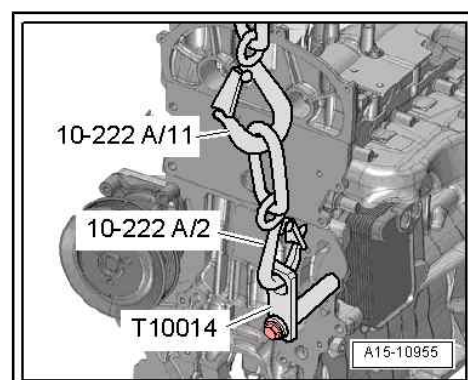




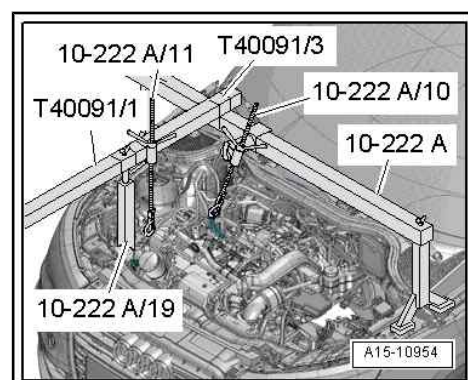
- Secure retainer - T10014- in threaded hole in cylinder block as shown in illustration and tighten to 40 Nm.



- Attach spindle - 10 - 222 A /11- of support bracket to retainer - 10 - 222 A /2- with hook - T10014- and partly take up weight with spindle.



- Detach hook - 10 - 222 A /10- and move clear to one side.



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- Slacken cylinder head bolts in the sequence -1 ... 10-.
- Remove bolts and carefully take off cylinder head.
- Place cylinder head onto soft surface (foam plastic).

#### Installing



#### Caution

##### *Risk of damage to sealing surfaces.*

- ◆ *Carefully remove sealant residue from cylinder head and cylinder block.*
- ◆ *Ensure that no long scores or scratches are made on the surfaces.*

##### *Risk of damage to cylinder block.*

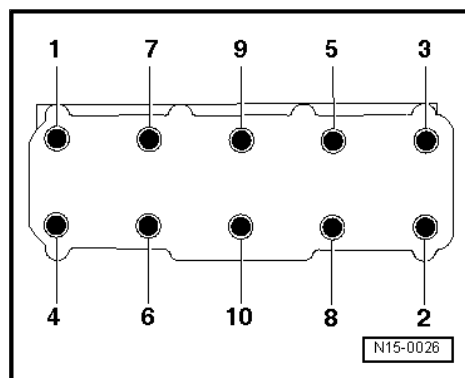
- ◆ *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.*

##### *Risk of leaks at cylinder head gasket.*

- ◆ *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 the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.*

##### *Risk of damage to open valves.*

- ◆ *When installing an exchange cylinder head, the plastic protectors fitted to protect the open valves should not be removed until the cylinder head is ready to be fitted.*



#### Note

- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- ◆ *Renew oil strainer in cylinder head.*
- ◆ *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the cylinder head cover.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.*



#### Caution

##### *Protect lubrication system and bearings against contamination.*

- ◆ *Cover exposed parts of the engine.*

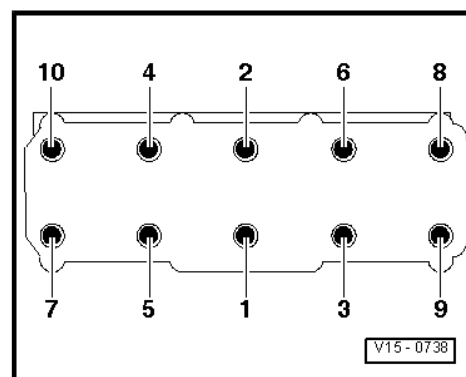


- Remove sealant residue on cylinder head and camshaft housing.
- Clean sealing surfaces; they must be free of oil and grease.
- Check that crankshaft is still positioned at “TDC” and then turn back in the opposite direction of engine rotation by approx. 45°.
- Place cylinder head gasket in position.
- Installation position: Part No. must be visible.
- Note position of dowel sleeves in cylinder block.
- Fit cylinder head.
- Tighten cylinder head bolts ➔ [page 108](#) .



#### Note

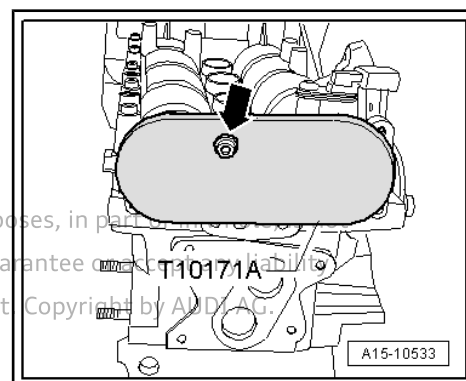
*Cylinder head bolts do not have to be torqued down again later after repair work.*



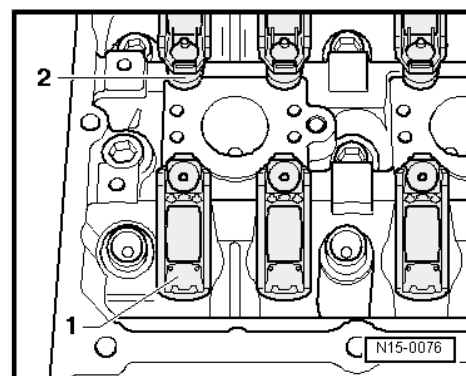
- Camshaft clamp - T10171 A- must be fitted and secured with a bolt -arrow- before installing camshaft housing.



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- Ensure all roller rocker fingers contact the valve ends -1- correctly and are clipped into their respective support elements -2-.





### Caution

***Make sure lubrication system is not clogged by excess sealant.***

- ◆ ***The sealant bead must not be thicker than specified.***

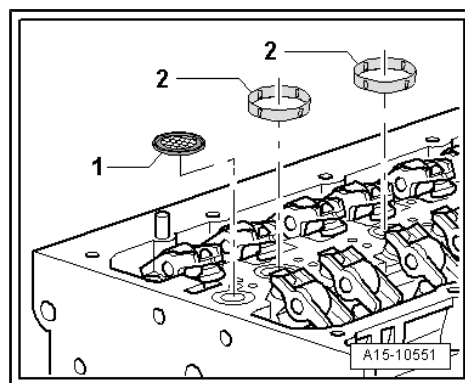
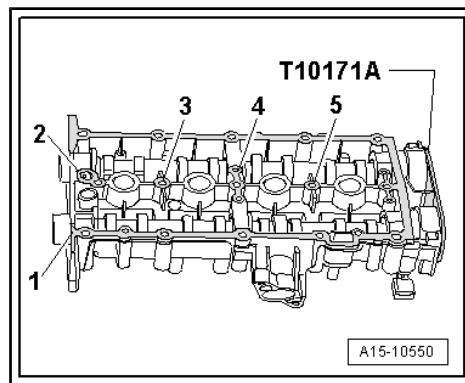
- Apply a thin and even layer of sealant to the clean sealing surface of the camshaft housing at grey-shaded areas -1 ... 5- shown in illustration.



### Note

***The camshaft housing must be installed within 5 minutes after applying the sealant.***

- Fit new oil strainer -1- in cylinder head.
- Fit 4 seals -2- into cylinder head.



### Caution

***Make sure remnants of oil are removed before fitting, otherwise leakage can occur.***

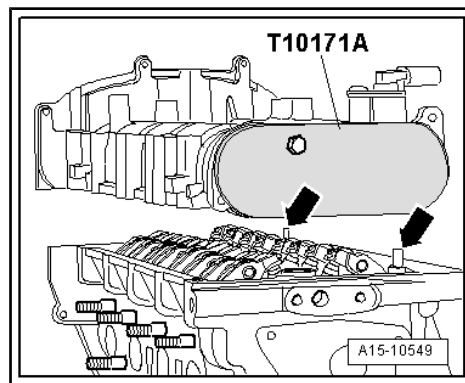
- ◆ ***Make sure sealing surfaces are free of oil when fitting camshaft housing.***

- Carefully fit the camshaft housing vertically onto the dowel pins -arrows- on cylinder head from above.



### Note

***Make sure that camshaft housing is kept straight.***



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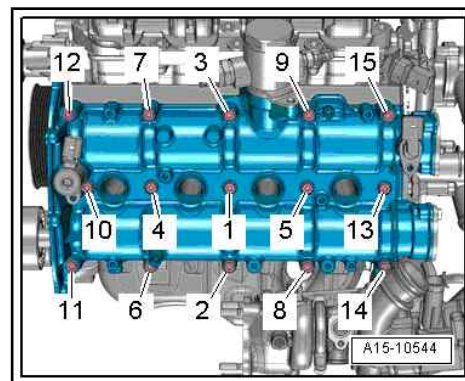


- Tighten camshaft housing bolts ⇒ [page 109](#) .



#### Note

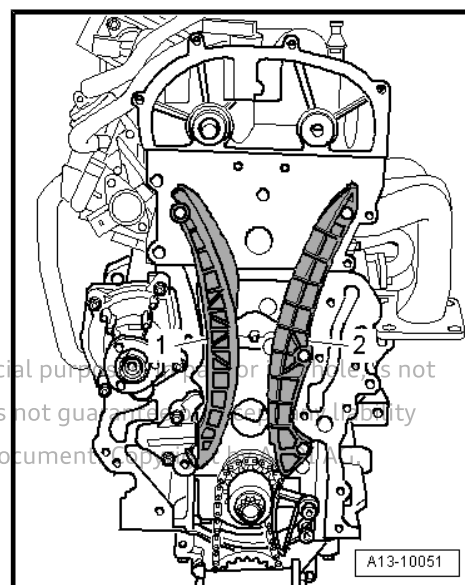
After fitting camshaft housing, allow sealant to dry for approx. 30 minutes.



- Fit tensioning rail -1- and guide rail -2- onto mounting pins.
- Install camshaft timing chain ⇒ [page 93](#) .

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

- Install high-pressure pipe ⇒ [page 257](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install turbocharger ⇒ [page 197](#) .
- Install engine cover panel ⇒ [page 40](#) .
- Install poly V-belt ⇒ [page 44](#) or bracket for ancillaries ⇒ [page 50](#) .
- Install thermostat housing ⇒ [page 182](#) .
- Install intake manifold (top section) ⇒ [page 236](#) .
- Install catalytic converter  
⇒ “2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274 or  
⇒ “2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276 .



#### Caution

*Risk of damage to valves and piston crowns after working on valve gear.*

- ◆ *Turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.*

#### Tightening torques

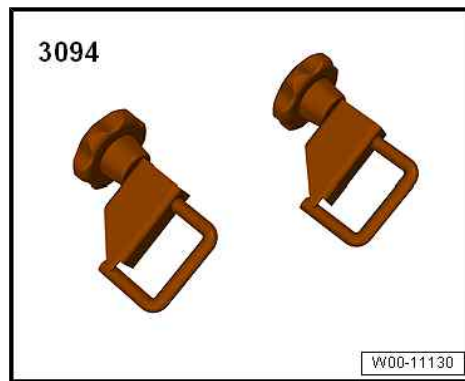
- ◆ ⇒ “3.1 Exploded view - cylinder head”, page 106
- ◆ ⇒ Fig. ““Cylinder head - tightening torque and sequence””, page 108
- ◆ ⇒ Fig. ““Camshaft housing - tightening torque and sequence””, page 109

### 3.4 Removing and installing camshaft housing

Special tools and workshop equipment required



- ◆ Hose clamps up to 25 mm - 3094-



- ◆ Sealant ➔ Electronic parts catalogue

### Removing

- Remove camshaft timing chain ➔ [page 85](#) .

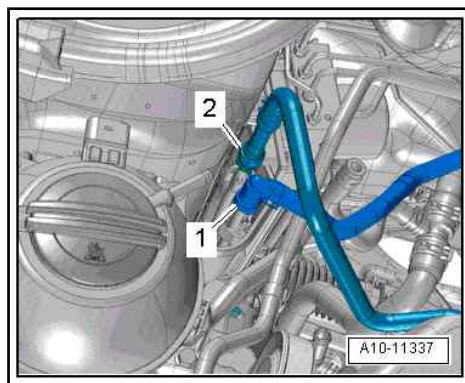


### WARNING

*The fuel system is pressurised.*

*Risk of injury as fuel may spray out.*

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap a clean cloth around connection and open connection carefully).



- Disconnect fuel supply line -2- (pull release ring).
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### Note

Disregard -item 1-.

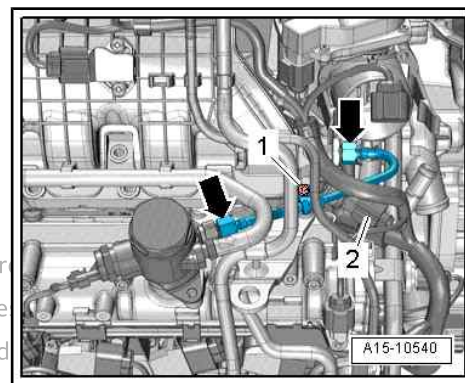
- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



# **WARNING**

*The fuel system is pressurised.  
Risk of injury as fuel may spray out.*

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



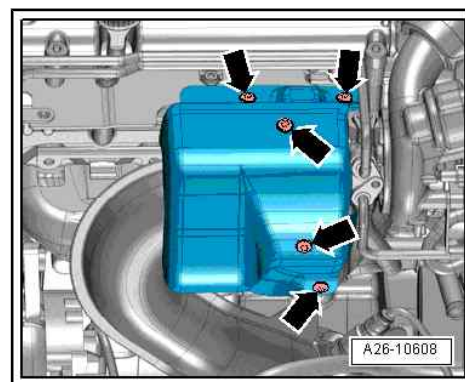
- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



## **Note**

*Disregard -item 2-.*

- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .
- Remove bolts -arrows- and detach heat shield for turbocharger.

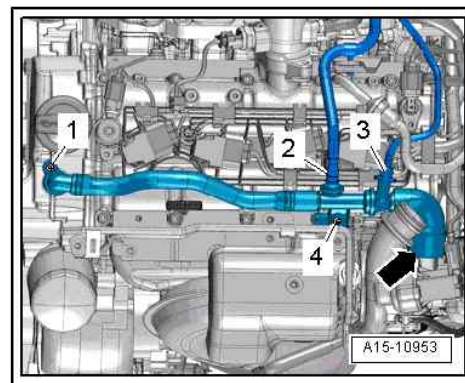


- Remove bolt -4- and detach crankcase breather hose -arrow- from turbocharger.



## **Note**

*Disregard -items 1, 2, 3-.*





- Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.
- Remove bolts -1, 3, 4, 5-.



**Note**

*Place a cloth underneath to catch escaping coolant.*

- Disconnect coolant lines from turbocharger and move clear to one side.



**Note**

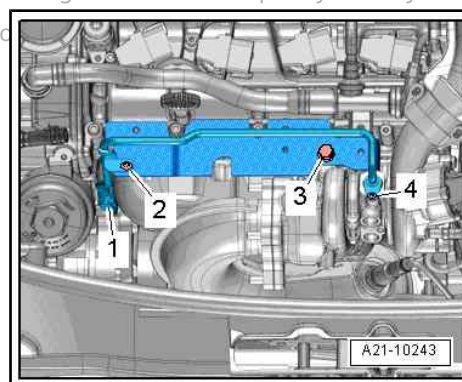
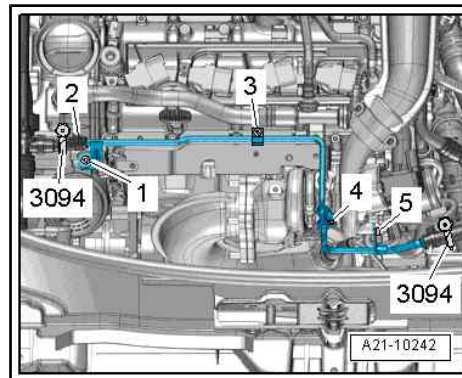
*Disregard -item 2-* protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability

- Remove bolts -2- and -3- and take off retaining plate



**Note**

*Disregard items -1 and 4-*.





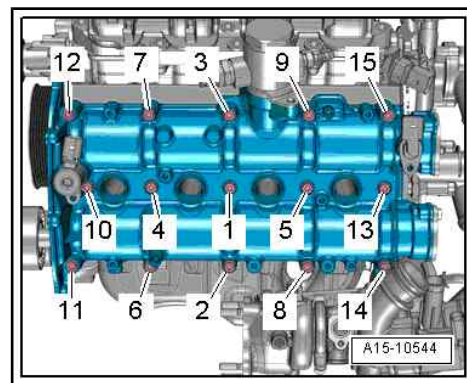
- Slacken camshaft housing bolts in the sequence -15 ... 1-.



#### Note

*Bolt -14- below turbocharger remains in camshaft housing.*

- Carefully lift off camshaft housing.
- Mark original positions of roller rocker fingers and compensation elements for re-installation.
- Remove roller rocker fingers together with compensation elements and put down on a clean surface.



#### Installing

- No piston at "TDC".



#### Note

*Renew oil strainer, seals in cylinder head and O-rings.*

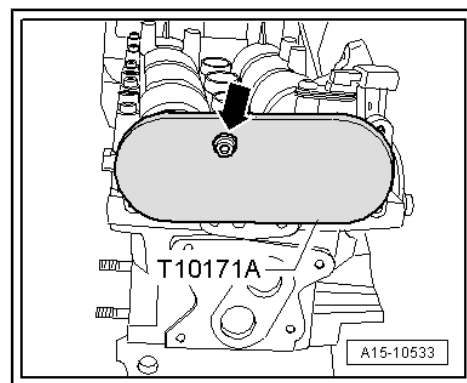


#### Caution

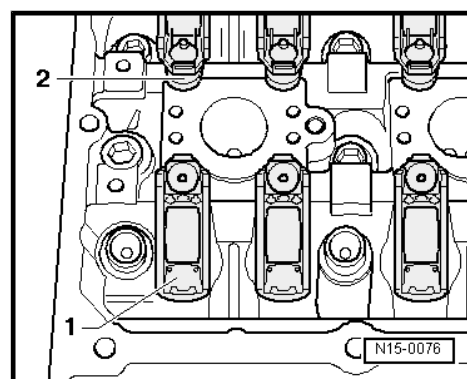
***Protect lubrication system and bearings against contamination.***

- ◆ ***Cover exposed parts of the engine.***

- Carefully remove sealant residue on cylinder head and camshaft housing.
- Clean sealing surfaces; they must be free of oil and grease.
- Camshaft clamp - T10171 A- must be fitted and secured with a bolt -arrow- before installing camshaft housing.



- Ensure all roller rocker fingers contact the valve ends -1- correctly and are clipped into their respective support elements -2-.



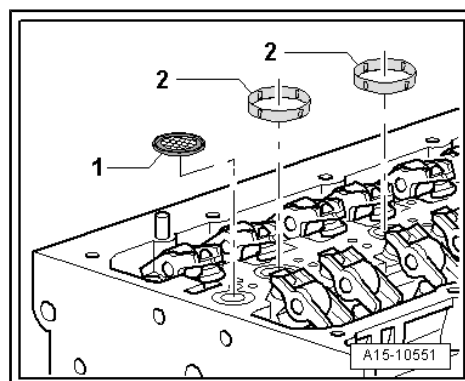
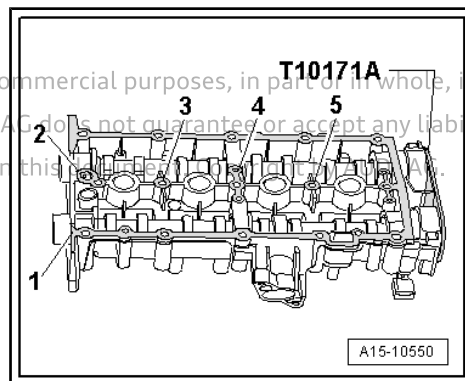


### Caution

**Make sure lubrication system is not clogged by excess sealant.**

- ◆ **Do not apply sealant too thick.**

- Apply a thin and even layer of sealant to the clean sealing surface of the camshaft housing at grey-shaded areas -1 ... 5- shown in illustration.
- Fit new oil strainer -1- in cylinder head.
- Fit 4 seals -2- into cylinder head.

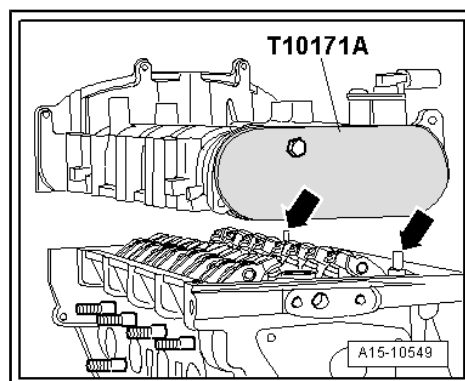


### Caution

**Make sure remnants of oil are removed before fitting, otherwise leakage can occur.**

- ◆ **Make sure sealing surfaces are free of oil when fitting camshaft housing.**

- Carefully fit the camshaft housing vertically onto the dowel pins -arrows- on cylinder head from above.



### Note

**Make sure that camshaft housing is kept straight.**



- Tighten camshaft housing bolts ⇒ [page 109](#) .



#### Note

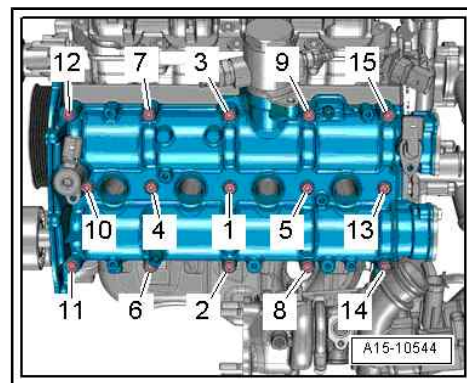
*After fitting camshaft housing, allow sealant to dry for approx. 30 minutes.*

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

- Install heat shield for turbocharger ⇒ [page 195](#) .
- Install high-pressure pipe ⇒ [page 257](#) .
- Install camshaft timing chain ⇒ [page 93](#) .
- Check coolant level ⇒ [page 168](#) .

#### Tightening torques

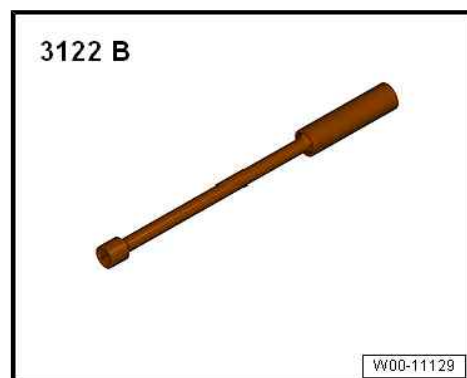
- ◆ ⇒ Fig. ““Camshaft housing - tightening torque and sequence””, [page 109](#)
- ◆ ⇒ “1.1 Exploded view - turbocharger”, [page 195](#)



## 3.5 Checking compression

### Special tools and workshop equipment required

- ◆ Spark plug spanner - 3122 B-



- ◆ Compression tester - V.A.G 1763-



#### Procedure

- Engine oil temperature at least 30 °C
- Battery voltage at least 12.5 V
- Switch off ignition.
- Remove fuse for fuel pump control unit - J538- in fuse holder C - SC- under dash panel cover (driver's side); for identification



of fuses refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

- Remove engine cover panel ⇒ [page 40](#) .
- Remove ignition coils ⇒ [page 281](#) .
- Unscrew spark plugs using spark plug socket - 3122 B- .
- Check compression pressure with compression tester - V.A.G 1763- (see ⇒ operating instructions for details of how to use tester).
- Have a second mechanic press down the accelerator pedal completely and at the same time operate the starter until the pressure on the tester display no longer increases.
- Repeat procedure on each cylinder.

| Compression pressure                 | bar           |
|--------------------------------------|---------------|
| When new                             | 10.0 ... 15.0 |
| Wear limit                           | 9.0           |
| Maximum difference between cylinders | 3.0           |

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

- Install spark plugs ⇒ [Maintenance, Booklet 819](#) .
- Install ignition coils ⇒ [page 281](#) .
- Install engine cover panel ⇒ [page 40](#) .
- Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, Guided Functions, Interrogate event memory, then Generate readiness code.

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## 4 Valve gear

⇒ [“4.1 Exploded view - valve gear”, page 131](#)

⇒ [“4.2 Measuring axial clearance of camshaft”, page 132](#)

⇒ [“4.3 Removing and installing camshaft”, page 132](#)

⇒ [“4.4 Removing and installing valve stem oil seals”, page 133](#)

### 4.1 Exploded view - valve gear

#### 1 - Inlet valve

- ☐ Must not be machined; only grinding-in is permissible
- ☐ Valve dimensions  
⇒ [“5.4 Valve dimensions”, page 144](#)
- ☐ Checking valve guides  
⇒ [page 142](#)
- ☐ Machining valve seats  
⇒ [page 140](#)

#### 2 - Exhaust valve

- ☐ Must not be machined; only grinding-in is permissible
- ☐ Valve dimensions  
⇒ [page 144](#)
- ☐ Checking valve guides  
⇒ [page 142](#)
- ☐ Machining valve seats  
⇒ [page 140](#)

#### 3 - Cylinder head

#### 4 - Valve stem oil seal

- ☐ Renewing with cylinder head installed  
⇒ [page 133](#)
- ☐ Renewing with cylinder head removed  
⇒ [page 136](#)

#### 5 - Valve spring

#### 6 - Valve spring plate

#### 7 - Valve cotters

#### 8 - Roller rocker finger

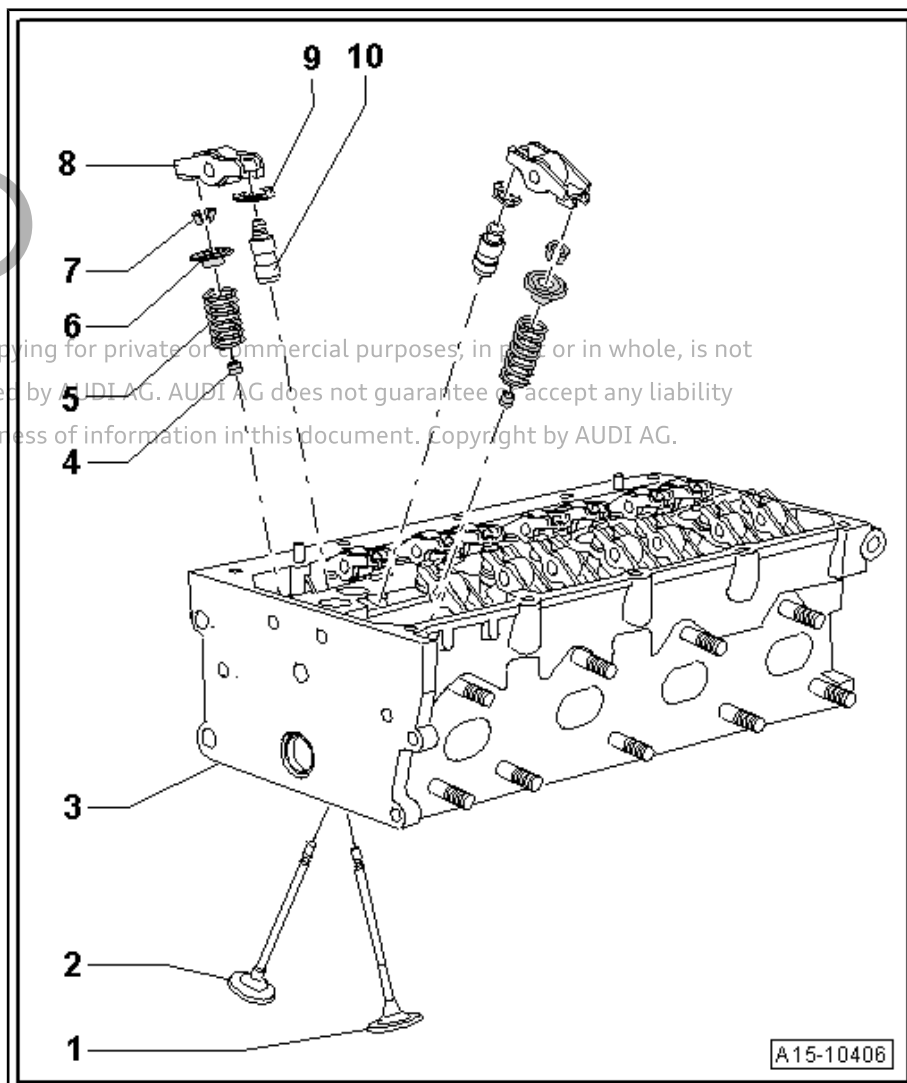
- ☐ Mark installation position for re-installation with a coloured pen
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surfaces before installing
- ☐ Attach to hydraulic compensation element -item 10- using securing clip -item 9-

#### 9 - Securing clip

- ☐ Check for firm attachment
- ☐ Not available as separate part

#### 10 - Hydraulic compensation element

- ☐ Mark installation position for re-installation with a coloured pen



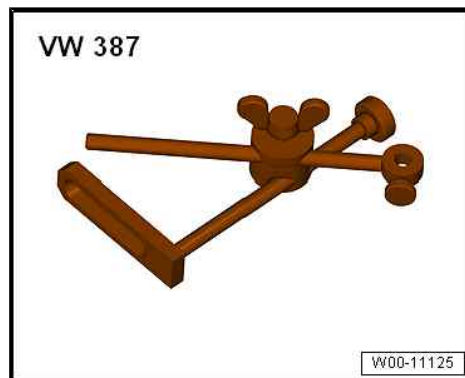


- ❑ Lubricate contact surfaces before installing

## 4.2 Measuring axial clearance of camshaft

### Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-



- ◆ Dial gauge - VAS 6080-

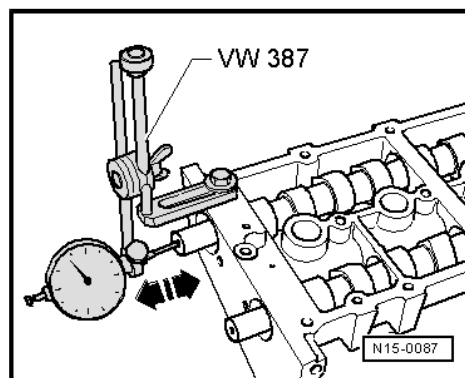


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### Procedure

- Perform measurements with camshaft housing removed and sealing caps fitted.
- Secure universal dial gauge bracket - VW 387- with dial gauge - VAS 6080- to camshaft housing, as shown in illustration.
- Measure axial clearance.
- Wear limit: 0.40 mm.



## 4.3 Removing and installing camshaft

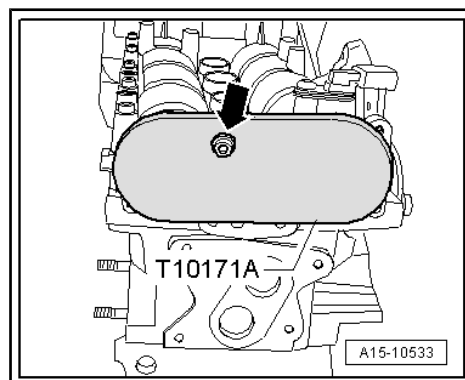
### Removing

- Remove camshaft housing ⇒ [page 123](#) .
- Remove high-pressure pump and roller tappet ⇒ [page 254](#) .
- Remove camshaft clamp - T10171 A- -arrow-.
- Pull camshafts out of camshaft housing.

### Installing

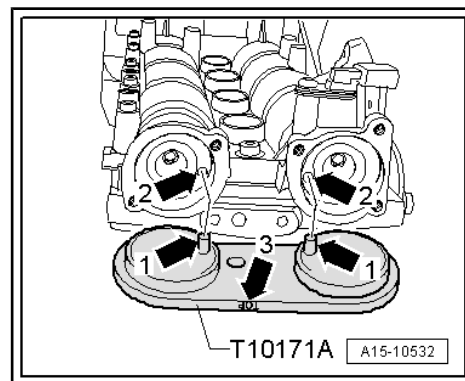
Installation is carried out in reverse order; note the following:

- Insert camshafts into camshaft housing (lubricate running surfaces including collar of axial bearing with oil before fitting).

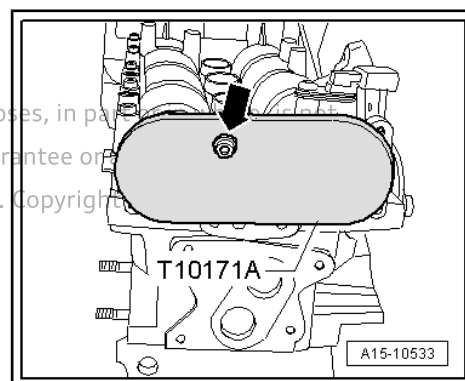




- Turn the inlet and exhaust camshafts in the removed camshaft housing by hand until the camshaft clamp - T10171 A- can be inserted all the way into the holes in the camshafts.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription “TOP” -arrow 3- should be legible from above.



- To secure the camshaft clamp - T10171 A- , screw in an M6 bolt -arrow- hand-tight, but do not tighten.
- Install high-pressure pump ➔ [page 254](#) .
- Install camshaft housing ➔ [page 123](#) .



## 4.4 Removing and installing valve stem oil seals

➔ [“4.4.1 Removing and installing valve stem oil seals \(cylinder head installed\)”](#), page 133

➔ [“4.4.2 Removing and installing valve stem oil seals \(cylinder head removed\)”](#), page 136

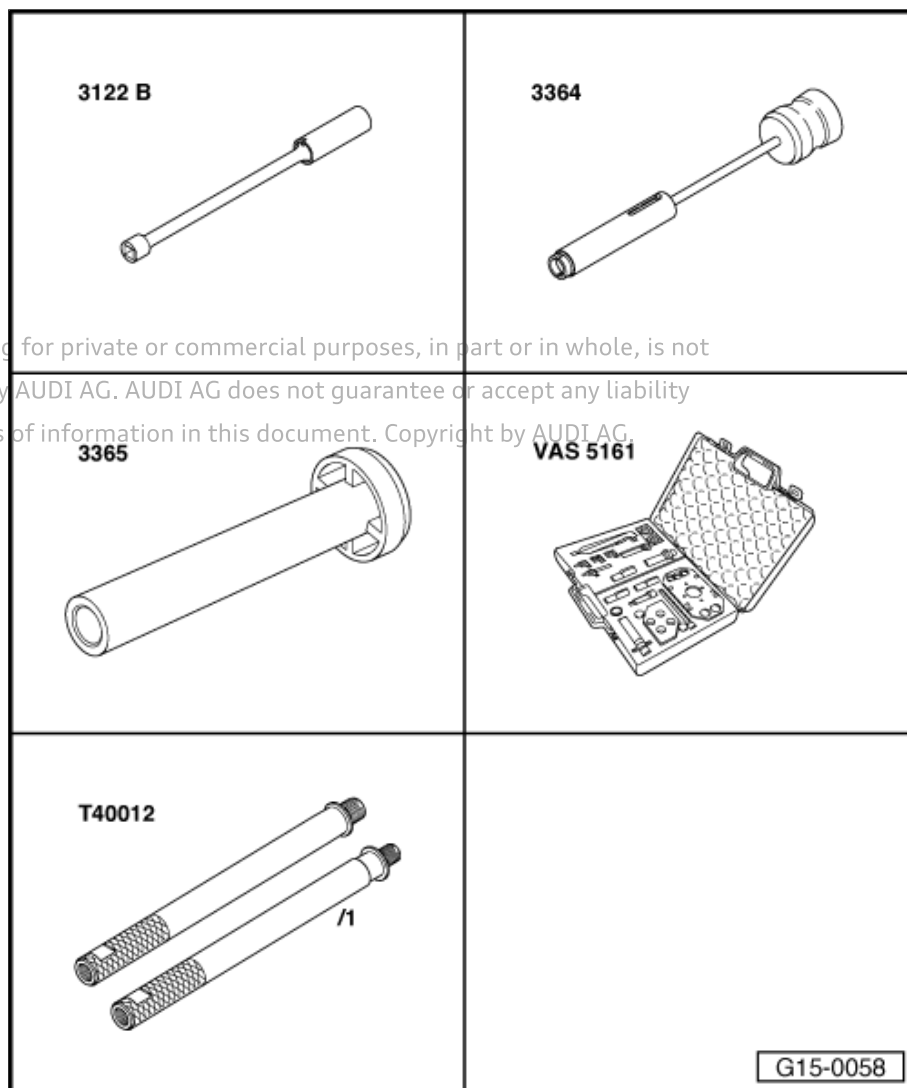
### 4.4.1 Removing and installing valve stem oil seals (cylinder head installed)



### Special tools and workshop equipment required



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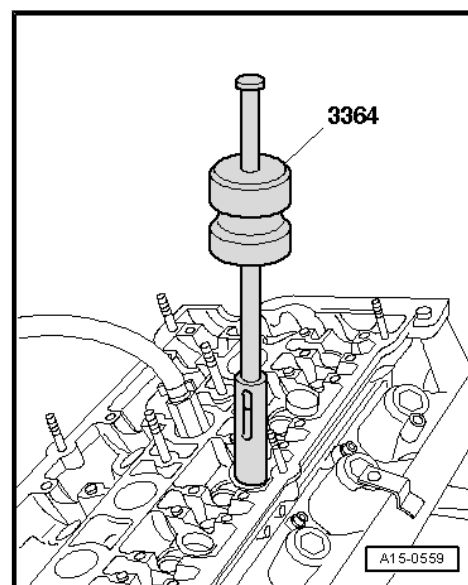
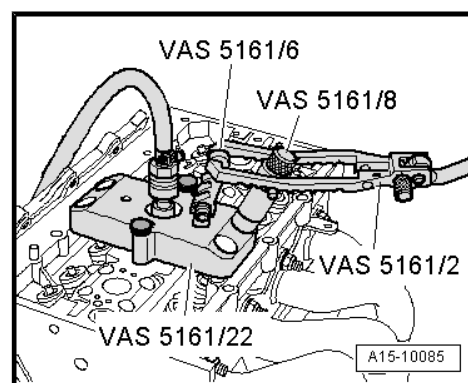
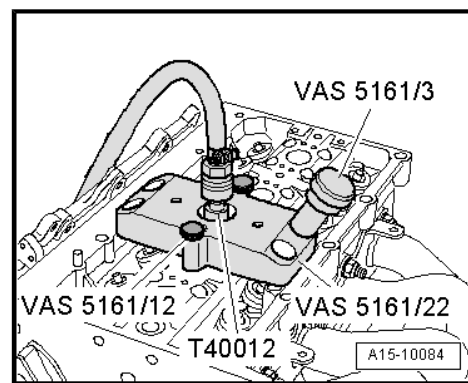
- ◆ Spark plug spanner - 3122 B-
- ◆ Valve stem seal puller - 3364-
- ◆ Valve stem oil seal fitting tool - 3365-
- ◆ Removal and installation device for valve cotters - VAS 5161  
A- with guide plate for 1.6 ltr. FSI engine - VAS 5161/22-
- ◆ Adapters - T40012-

### Procedure

- Remove intake manifold (top section) ⇒ [page 236](#) .
- Remove camshaft housing ⇒ [page 123](#) .
- Detach intake manifold (bottom section) with fuel rail from cylinder head ⇒ [page 238](#) .
- Detach engine lifting eyes from cylinder head.
- Remove turbocharger ⇒ [page 197](#) .
- Unscrew spark plugs using spark plug socket - 3122 B- .
- Set piston of appropriate cylinder to “bottom dead centre”.



- Screw adapter - T40012- with seal hand-tight into the corresponding spark plug thread.
- Connect adapter to compressed air line using a commercially available connection piece and apply constant air pressure.
- Minimum pressure: 6 bar
- Fit guide plate for 1.6 ltr. FSI engine - VAS 5161/22- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12- onto cylinder head.
- Apply drift -VAS 5161/3- to guide plate and use plastic-headed hammer to release sticking valve cotters.
- Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge 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.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- The compressed air hose remains connected.
- Detach valve spring with valve spring plate.
- Pull off valve stem oil seal with valve stem seal puller - 3364- .



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### 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- .
- Remove plastic sleeve.

If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotters faces upwards.
- Press assembly cartridge onto insertion device from above and pick up valve cotters.



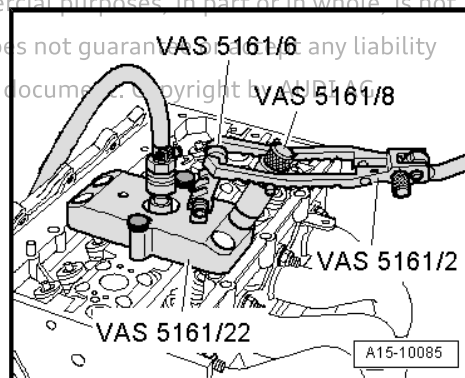
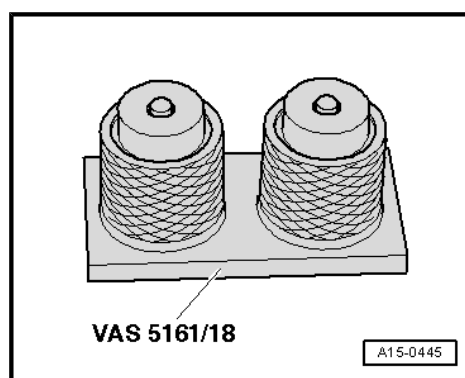
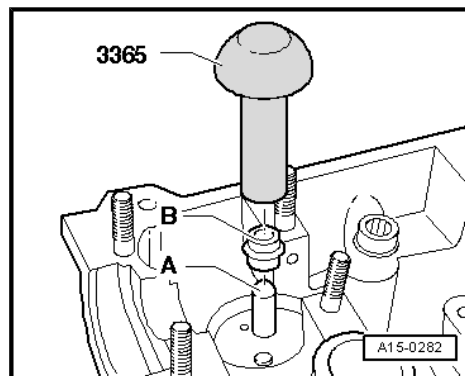
- Insert valve spring and valve spring plate.
- Secure guide plate -VAS 5161/22- back onto cylinder head.
- Insert assembly cartridge -VAS 5161/8- in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

### Assembling

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

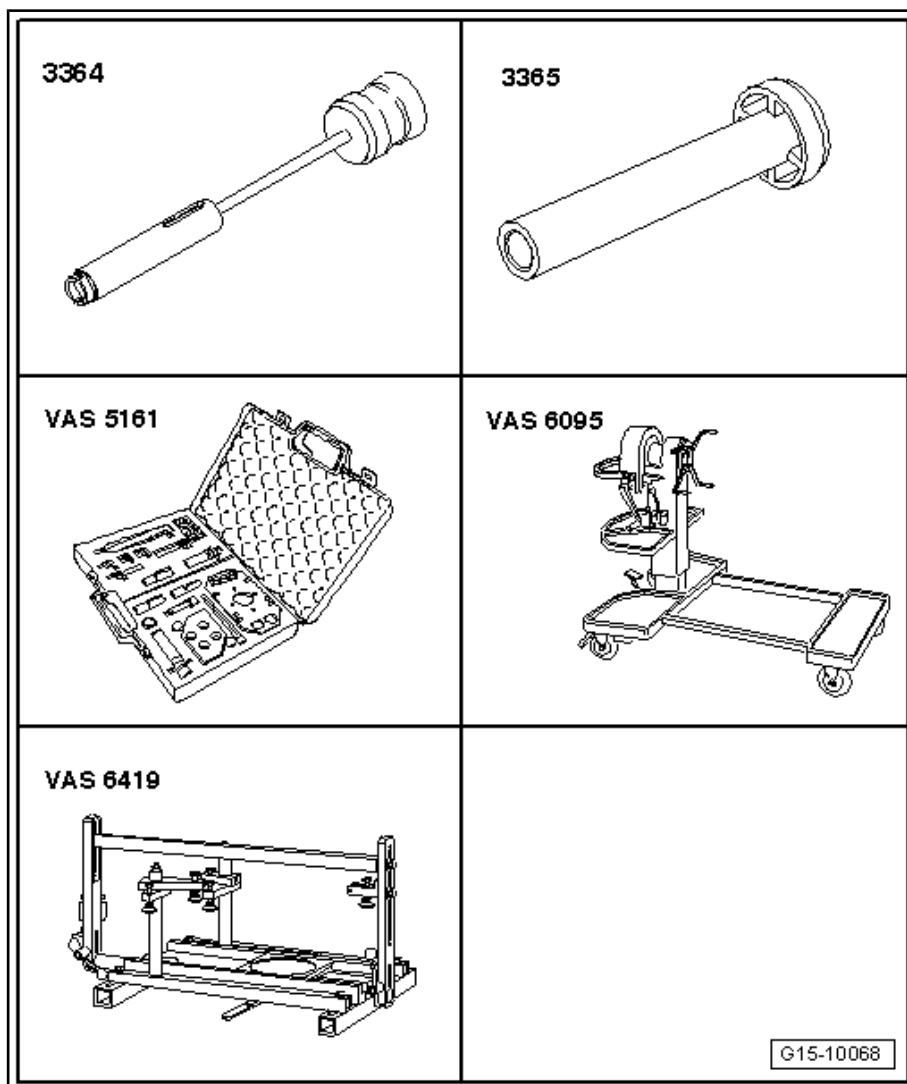
- Install spark plugs ⇒ Maintenance ; Booklet 819 .
- Install turbocharger ⇒ [page 197](#) .
- Install engine lifting eyes ⇒ [page 106](#) .
- Install intake manifold (bottom section) with fuel rail ⇒ [page 238](#) .
- Install camshaft housing ⇒ [page 123](#) .
- Install intake manifold (top section) ⇒ [page 236](#) .

## 4.4.2 Removing and installing valve stem oil seals (cylinder head removed)





## Special tools and workshop equipment required



◆ Valve stem seal puller - 3364-

◆ Valve stem oil seal fitting tool - 3365-

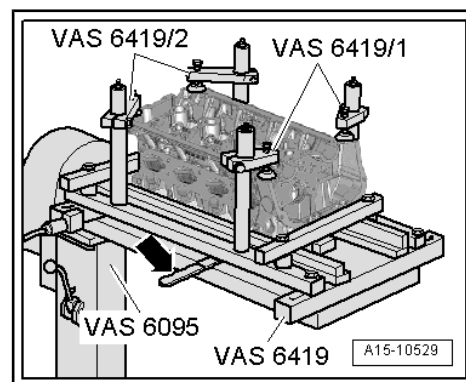
◆ Removal and installation device for valve cutters - VAS 5161  
A- with guide plate for 1.6 ltr. FSI engine - VAS 5161/22-

◆ Engine and gearbox support - VAS 6095-

◆ Cylinder head tensioning device - VAS 6419-

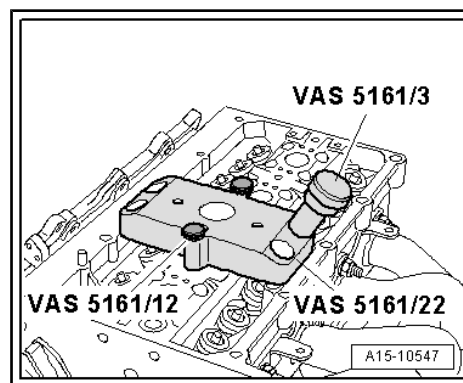
### Procedure

- Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .
- Secure cylinder head in cylinder head tensioning device, as illustrated.
- Connect cylinder head tensioning device to compressed air supply.
- Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seals are to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.

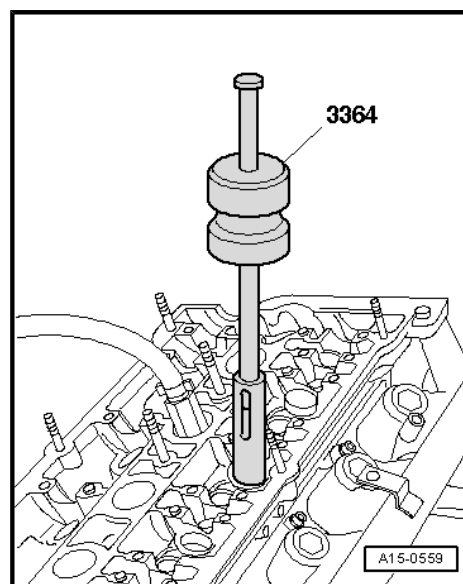
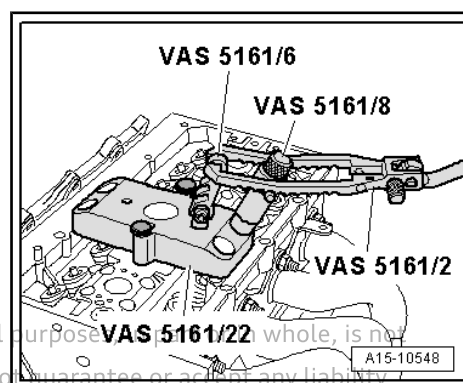




- Fit guide plate for 1.6 ltr. FSI engine - VAS 5161/22- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12- onto cylinder head.
- Apply drift -VAS 5161/3- to guide plate and use plastic-headed hammer to release sticking valve cotters.



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge 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.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- Detach valve spring with valve spring plate.
- Pull off valve stem oil seal with valve stem seal puller - 3364- .



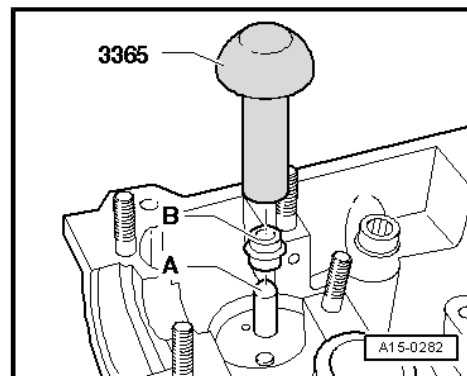


### Caution

**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- .
- Remove plastic sleeve.



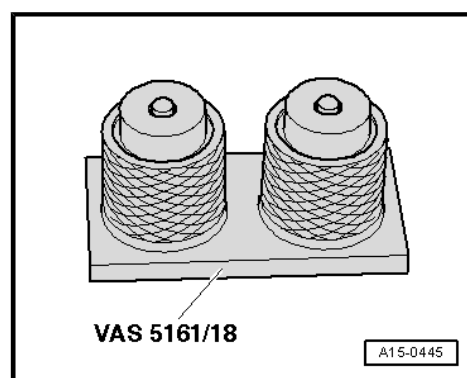
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .



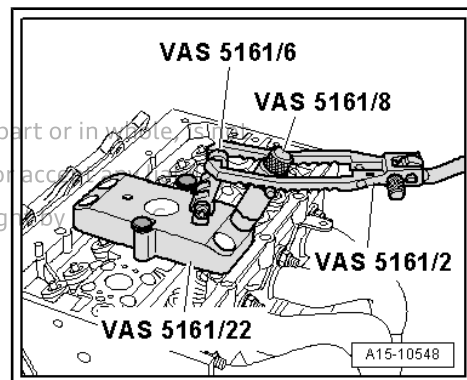
### Note

*Larger diameter of valve cotters faces upwards.*

- Press assembly cartridge onto insertion device from above and pick up valve cotters.



- Insert valve spring and valve spring plate.
- Secure guide plate -VAS 5161/22- back onto cylinder head.
- Insert assembly cartridge -VAS 5161/8- in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.





## 5 Inlet and exhaust valves

⇒ [“5.1 Machining valve seats”, page 140](#)

⇒ [“5.2 Checking valve guides”, page 142](#)

⇒ [“5.3 Checking valves”, page 143](#)

⇒ [“5.4 Valve dimensions”, page 144](#)

### 5.1 Machining valve seats

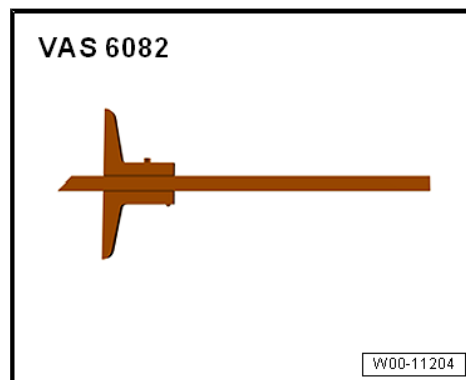


#### Note

- ◆ *If a good seating pattern cannot be obtained by grinding the valve seats (lapping), they must be refaced (machined).*
- ◆ *When servicing engines with leaking valves, it is not sufficient to machine (reface) the valve seats and renew the valves. The valve guides must also be checked for wear. This is particularly important on high-mileage engines ⇒ [page 142](#) .*
- ◆ *Valve seats should only be machined to the extent required to give a proper seating pattern.*
- ◆ *The maximum permissible machining dimension must be calculated before starting work.*
- ◆ *If the machining dimension is exceeded, the function of the hydraulic valve play compensation can no longer be guaranteed and the cylinder head must be renewed.*

#### Special tools and workshop equipment required

- ◆ Depth gauge - VAS 6082-



- ◆ Valve seat machining tool



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## A - Calculating maximum permissible machining dimension

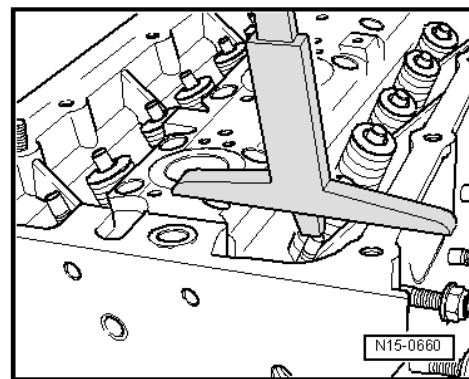
- Insert valve and press firmly against valve seat.



### Note

*If the valve has to be renewed as part of a repair, use a new valve for the measurement.*

- Measure distance between end of valve stem (upper edge) and top surface of cylinder head.
- Calculate maximum permissible machining dimension from measured distance and minimum dimension.
- Minimum dimension for inlet valve and exhaust valve: 7.6 mm.  
Measured distance minus minimum dimension = max. permissible machining dimension.



### Example:

|                                         |          |
|-----------------------------------------|----------|
| Measured distance                       | 8.0 mm   |
| Minimum dimension                       | – 7.6 mm |
| Maximum permissible machining dimension | = 0.4 mm |



### Note

- ◆ *If the calculated maximum permissible machining dimension is 0 mm or less than 0 mm, repeat the measurement with a new valve.*
- ◆ *If the result is again 0 mm or less than 0 mm, renew the cylinder head.*



## B - Machining valve seats

### Inlet valve seat

a -  $\varnothing$  28.7 mm

b - Maximum permissible machining dimension

c - 1.5...1.8 mm

Z - Bottom surface of cylinder head

$\alpha$  - 45° valve seat angle

$\beta$  - 30° upper correction angle

$\gamma$  - 60° lower correction angle

### Exhaust valve seat

a -  $\varnothing$  25.0 mm

b - Maximum permissible machining dimension

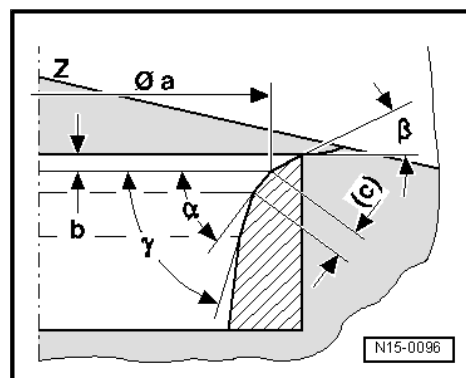
c - approx. 1.8 mm

Z - Lower edge of cylinder head

$\alpha$  - 45° valve seat angle

$\beta$  - 30° upper correction angle

$\gamma$  - 60° lower correction angle



### Note

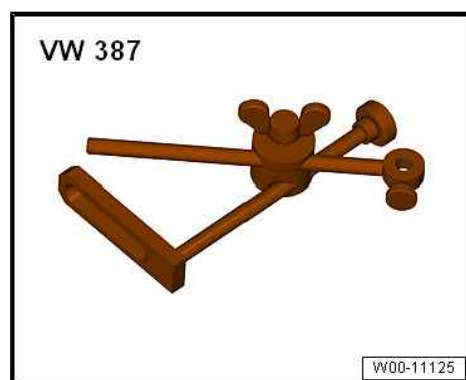
Calculating maximum permissible machining dimension  
⇒ [page 141](#).

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## 5.2 Checking valve guides

### Special tools and workshop equipment required

- ♦ Universal dial gauge bracket - VW 387-





◆ Dial gauge - VAS 6079-

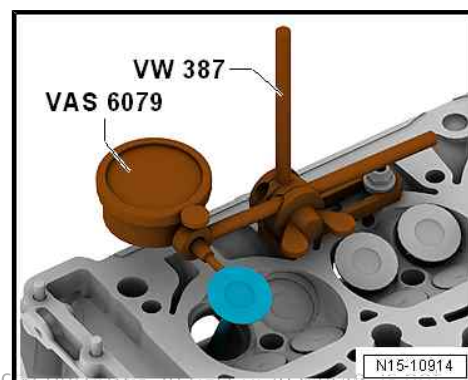


### Procedure



#### Note

- ◆ *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- ◆ *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*
- Attach dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder head.
- Insert valve into guide.
- End of valve stem must be flush with valve guide.
- Measure the amount of sideways play.
- Wear limit: 0.8 mm.
- If the wear limit is exceeded, repeat the measurement with new valves.
- Renew cylinder head if wear limit is still exceeded.



#### Note

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*Valve guides cannot be renewed.*

## 5.3 Checking valves

- Visually inspect for scoring on valve stems and valve seat surfaces.
- Renew valve if scoring is clearly visible.



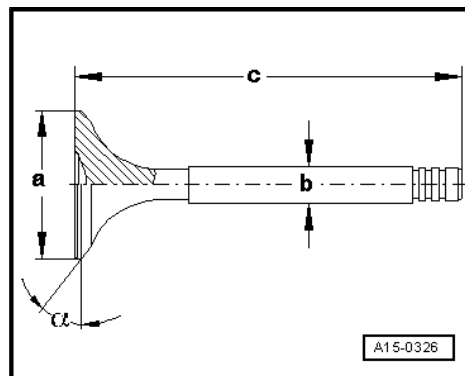
## 5.4 Valve dimensions



### Note

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

| Dimension |    | Inlet valve | Exhaust valve |
|-----------|----|-------------|---------------|
| Ø a       | mm | 29.5        | 26.0          |
| Ø b       | mm | 5.973       | 5.953         |
| c         | mm | 100.9       | 100.5         |
| α         | ∠° | 45          | 45            |



### WARNING

*Care must be taken when disposing of old sodium-cooled exhaust valves - risk of injury.*

- ◆ *The valves must be sawn in two with a metal saw between the centre of the stem and valve head. When doing so, the valves must not come into contact with water.*
- ◆ *Then throw a maximum of ten valves into a bucket of water and step away immediately.*
- ◆ *A sudden chemical reaction will occur upon contact with water in which the sodium filling burns.*
- ◆ *After performing these steps the valves can be disposed of in the normal way.*

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## 17 – Lubrication

### 1 Sump/oil pump

⇒ [“1.1 Exploded view - sump/oil pump”, page 145](#)

⇒ [“1.2 Engine oil”, page 147](#)

⇒ [“1.5 Removing and installing oil level and oil temperature sender G266”, page 153](#)

⇒ [“1.3 Removing and installing sump”, page 147](#)

⇒ [“1.4 Removing and installing oil pump”, page 150](#)

#### 1.1 Exploded view - sump/oil pump



##### Note

*If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*

##### 1 - Oil level and oil temperature sender - G266-

- ☐ Removing and installing  
⇒ [page 153](#)

##### 2 - Seal

- ☐ Renew

##### 3 - Sump

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

##### 4 - Bolt

- ☐ Renew
- ☐ Tightening torque and sequence ⇒ [page 147](#)
- ☐ When loosening and tightening the bolts on the gearbox end, use Allen key, long reach - T10058-

##### 5 - Bolt

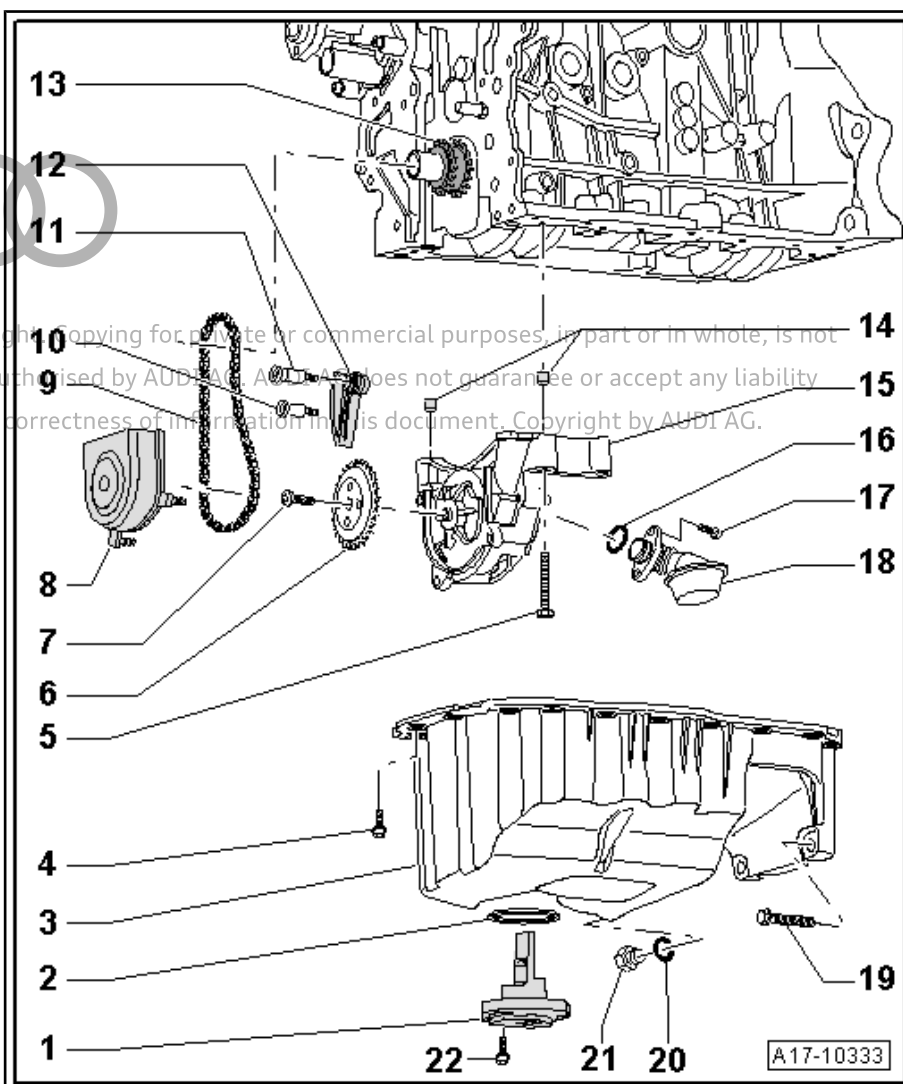
- ☐ Renew
- ☐ 14 Nm +90°

##### 6 - Chain sprocket

- ☐ For oil pump
- ☐ Sprocket can only be fitted on oil pump shaft in one position.
- ☐ Lock using counterhold tool - T10172-

##### 7 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°





## 8 - Cover

- ☐ For chain sprocket
- ☐ Clipped onto oil pump

## 9 - Drive chain

- ☐ For oil pump
- ☐ Before removing, mark running direction with paint
- ☐ Check for wear
- ☐ Removing and installing ⇒ [page 150](#)

## 10 - Stop bolt

- ☐ For chain tensioner
- ☐ 8 Nm

## 11 - Bearing mounting

- ☐ For chain tensioner
- ☐ 8 Nm

## 12 - Chain tensioner

- ☐ For drive chain for oil pump
- ☐ With tensioning spring
- ☐ Do not dismantle
- ☐ When installing, pre-tension spring and engage

## 13 - Chain sprocket

- ☐ For drive chain for oil pump and camshaft timing chain
- ☐ Push-fitted onto crankshaft
- ☐ To remove or install ⇒ [“2.2 Removing and installing camshaft timing chain”, page 85](#) and [⇒ “1.4.2 Removing and installing oil pump”, page 151](#)
- ☐ Installation position ⇒ [page 71](#)
- ☐ Contact surfaces must be free of oil and grease

## 14 - Dowel sleeves

## 15 - Oil pump

- ☐ With pressure relief valve
- ☐ Removing and installing ⇒ [page 151](#)
- ☐ Before installing, check that the two dowel sleeves for centring oil pump/cylinder block are fitted

## 16 - O-ring

- ☐ Renew

## 17 - Bolt

- ☐ 10 Nm

## 18 - Suction pipe

- ☐ Clean strainer if dirty

## 19 - Bolt

- ☐ Tightening torque and sequence ⇒ [page 147](#)

## 20 - Seal

- ☐ Renew

## 21 - Oil drain plug

- ☐ 30 Nm

## 22 - Bolt

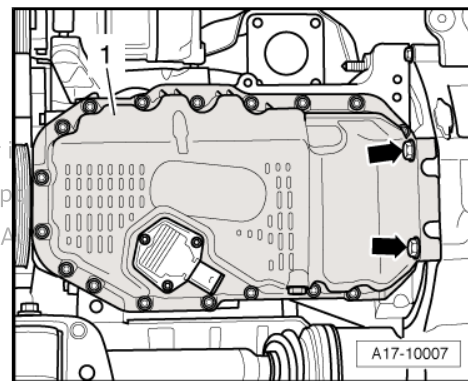
- ☐ 10 Nm



## Sump - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

| Stage | Bolts                  | Tightening torque/angle specification        |
|-------|------------------------|----------------------------------------------|
| 1.    | Sump to cylinder block | 5 Nm                                         |
| 2.    | -Arrows-               | 40 Nm, using Allen key, long reach - T10058- |
| 3.    | Sump to cylinder block | 13 Nm                                        |



## 1.2 Engine oil

Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .



### Caution

*Risk of damage to catalytic converter.*

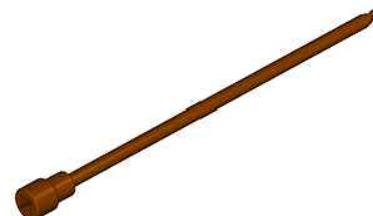
- ◆ *The oil level must not be above the "MAX" mark on the dipstick.*

## 1.3 Removing and installing sump

Special tools and workshop equipment required

- ◆ Socket - T10058-

T10058



W00-11195

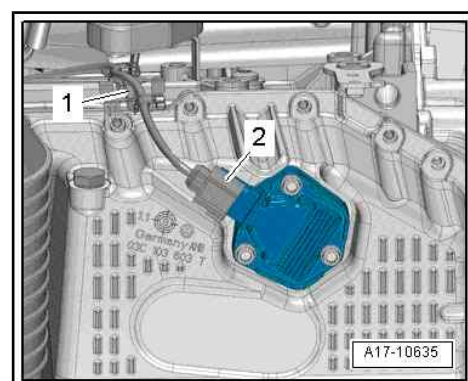
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Electronic parts catalogue

### Removing

- Engine oil drained ⇒ Maintenance ; Booklet 819
- Remove catalytic converter with centre silencer  
⇒ ["2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012", page 274](#) or  
remove catalytic converter  
⇒ ["2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards", page 276](#) .

Applies to vehicles with 6-speed manual gearbox

- Remove flywheel ⇒ [page 59](#) .





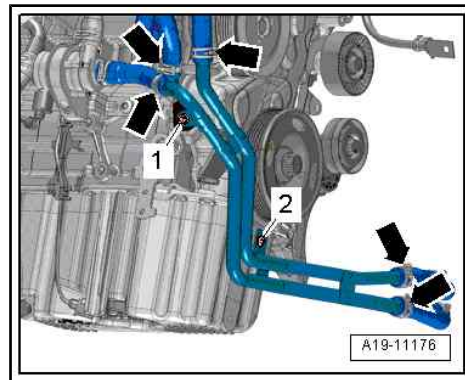
### All vehicles (continued)

- Unplug electrical connector -2- at oil level and oil temperature sender - G266- .
- Unclip retainer -1- for electrical wiring.
- Unscrew bolts -1 and 2- and press coolant pipes (right-side) to the side.



### Note

Disregard -arrows-.

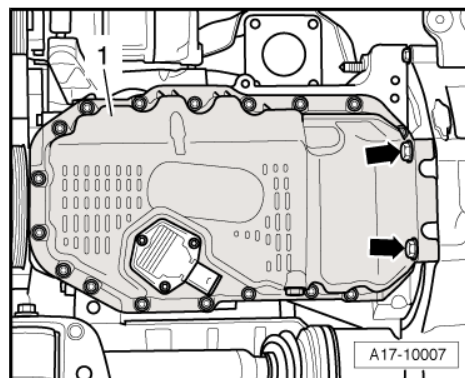


### Applies to vehicles without 6-speed manual gearbox

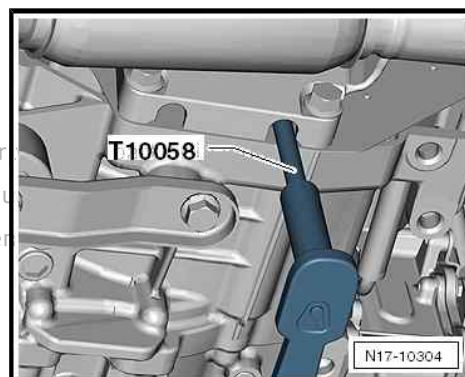
- Remove bolts securing sump to gearbox -arrows-.

### All vehicles (continued)

- Unscrew bolts for sump with Allen key, long reach - T10058- in diagonal sequence and remove.



- Two bolts may not be immediately accessible on the gearbox side. If bolt heads cannot be reached with Allen key, long reach - T10058- , turn crankshaft in normal direction of engine rotation until bolts are accessible. There are recesses on the flywheel.
- Carefully release sump from bonded joint.



### Installing



### Caution

*Take care to keep cylinder block clean.*

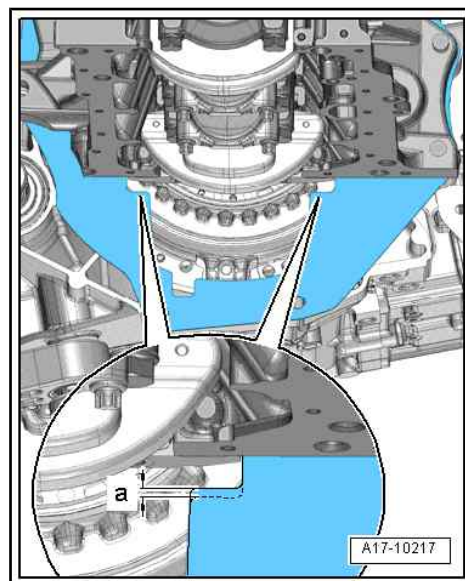
- ◆ *Cover exposed parts of the engine.*

- Machine intermediate plate between engine and gearbox to dimension -a- as shown in illustration.
- Dimension -a- = 5 mm



### Note

*It is not possible to fit sump with sealant bead onto cylinder block without machining the intermediate plate.*





### Caution

**Protect lubrication system against contamination.**

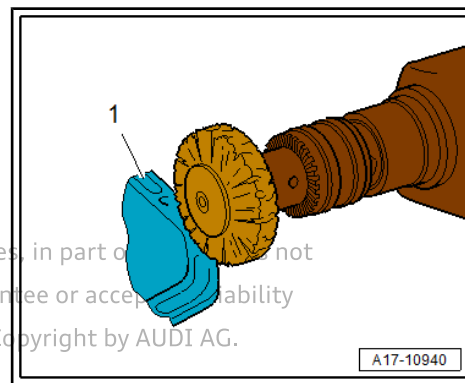
- ◆ **Cover exposed parts of the engine.**



### WARNING

**Risk of eye injury.**

- ◆ **Put on safety goggles.**



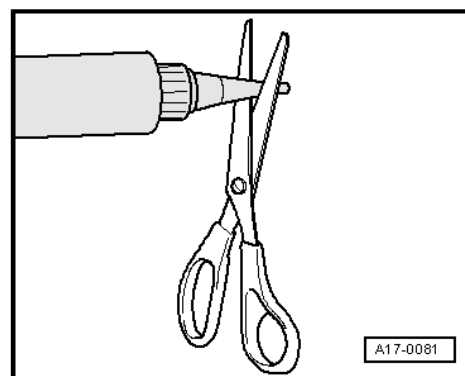
- Remove sealant residue from sump and cylinder block using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



### Note

*Note the use-by date of the sealant.*

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



### Caution

**Make sure lubrication system is not clogged by excess sealant.**

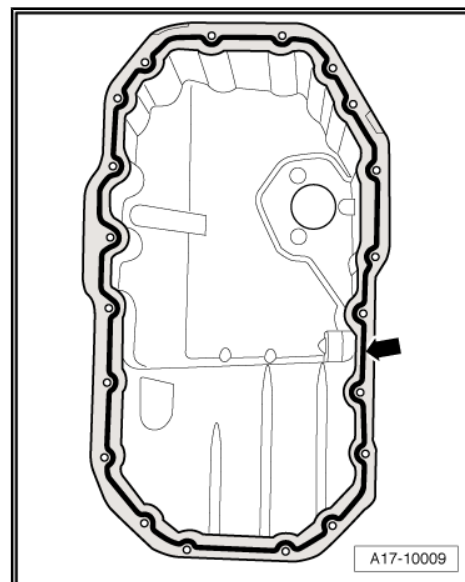
- ◆ **The sealant bead must not be thicker than specified.**

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



### Note

- ◆ *Take particular care when applying sealant bead in area of sealing flange.*
- ◆ *The sump must be installed within 5 minutes after applying the sealant.*





- Fit sump and tighten bolts ⇒ [page 147](#) .



#### Note

- ♦ *If sump is fitted with engine removed, make sure sump is flush with cylinder block at gearbox end.*
- ♦ *After fitting sump, sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.*

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

- If removed, install flywheel ⇒ [page 59](#) .
- Install coolant pipes (right-side) ⇒ [page 181](#) .
- Install catalytic converter with centre silencer ⇒ [page 274](#) or install centre silencer ⇒ [page 271](#) .
- Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 819 .

#### Tightening torques

- ♦ ⇒ [Fig. “Sump - tightening torque and sequence”](#) , [page 147](#)

## 1.4 Removing and installing oil pump

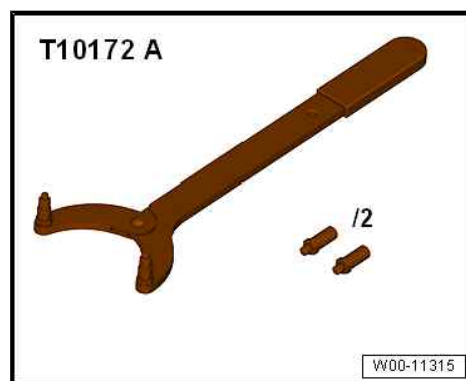
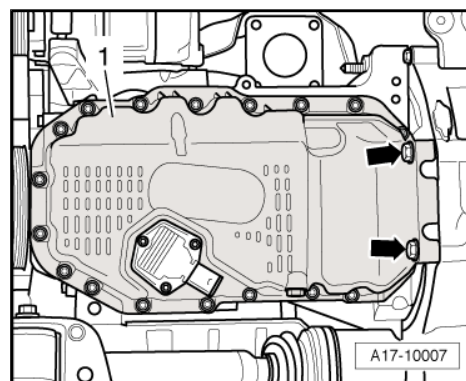
⇒ [“1.4.1 Removing and installing drive chain for oil pump”](#), [page 150](#)

⇒ [“1.4.2 Removing and installing oil pump”](#), [page 151](#)

### 1.4.1 Removing and installing drive chain for oil pump

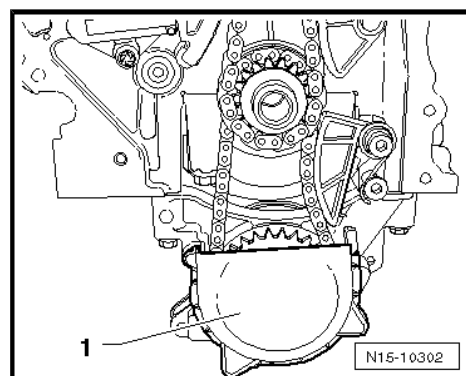
#### Special tools and workshop equipment required

- ♦ Counterhold tool - T10172 A-



#### Removing

- Remove camshaft timing chain ⇒ [page 85](#) .
- Unclip cover -1- for chain sprocket for oil pump





### Caution

*If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.*

- ◆ *Mark running direction of drive chain with paint for re-installation. Do not mark drive chain by means of centre punch, notch or the like.*

- Using a screwdriver, pry off tensioning spring -3- at bolt -2- and detach



### Note

*Disregard -item 1-.*

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- Loosen bolt -1- for chain sprocket for oil pump; use counterhold tool - T10172 A- to counterhold at chain sprocket.
- Remove bolt for chain sprocket for oil pump and detach chain sprocket for oil pump with drive chain.

### Installing

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



### Note

*Renew bolts tightened with specified tightening angle.*

- Install drive chain for oil pump together with chain sprocket for oil pump according to marks applied when removing.
- The chain sprocket for oil pump can only be installed correctly in one position.
- Install camshaft timing chain ➔ [page 85](#) .

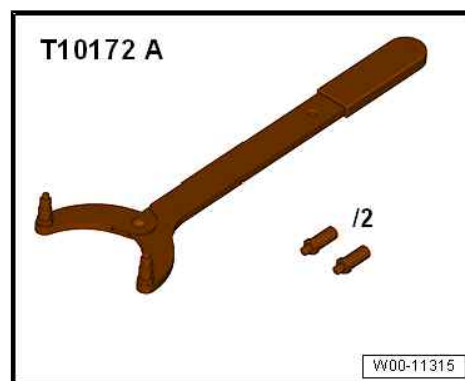
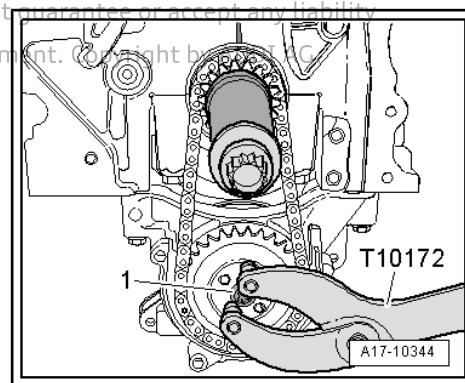
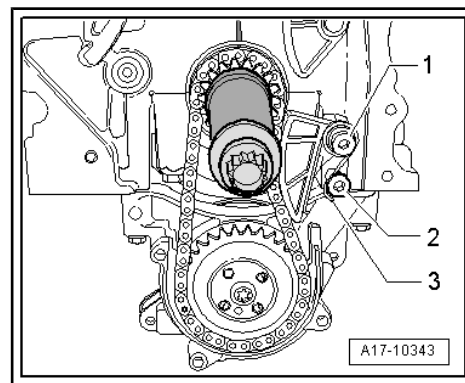
### Tightening torques

- ◆ ➔ ["1.1 Exploded view - sump/oil pump", page 145](#)

## 1.4.2 Removing and installing oil pump

### Special tools and workshop equipment required

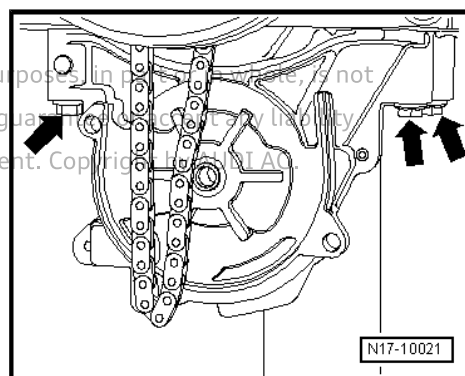
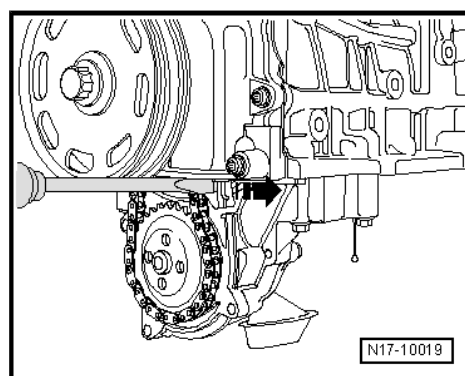
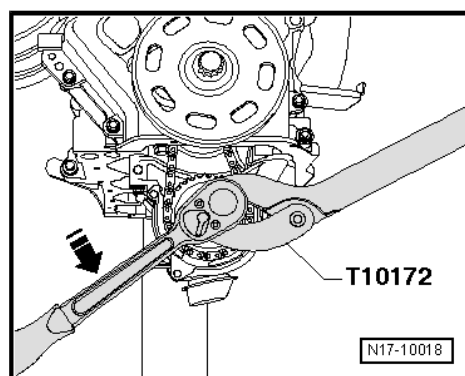
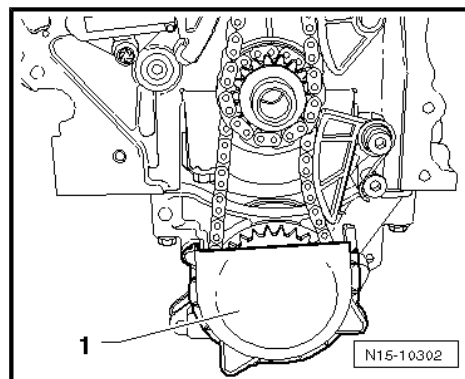
- ◆ Counterhold tool - T10172 A-





## Removing

- Remove sump ➤ [page 147](#) .
- Unclip cover -1- for chain sprocket for oil pump
- Slacken off bolt for chain sprocket for oil pump several turns -arrow-; use counterhold tool - T10172 A- to counterhold at chain sprocket.
- Use screwdriver to press chain tensioner in direction of -arrow-.
- Remove bolt for chain sprocket for oil pump.
- Detach chain sprocket from oil pump and take out of drive chain.



- Remove bolts -arrows- and remove oil pump.

## Installing



### Note

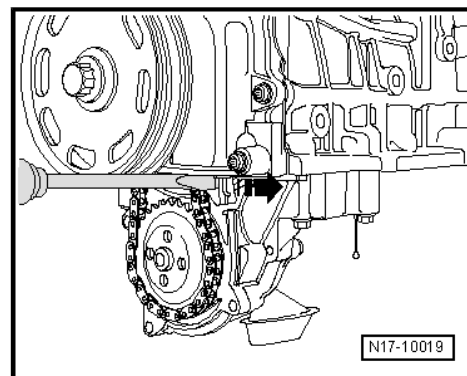
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*Renew bolts tightened with specified tightening angle.*

- Check whether dowel sleeves for centring oil pump and cylinder block are fitted; install missing dowel sleeves.
- Fit oil pump and tighten bolts.



- Use screwdriver to press chain tensioner in direction of -arrow-.



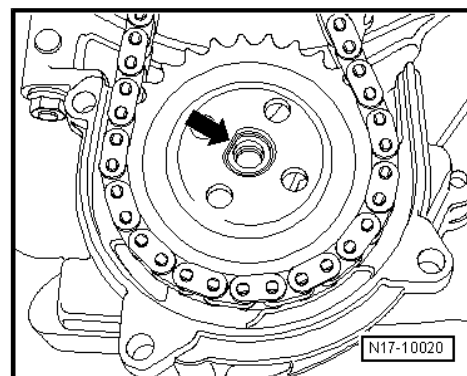
- Fit chain sprocket for oil pump
- Installation position: Sprocket can only be fitted on oil pump shaft in one position -arrow-.

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

- Install sump ⇒ [page 147](#) .

#### Tightening torques

- ⇒ [“1.1 Exploded view - sump/oil pump”, page 145](#)



## 1.5 Removing and installing oil level and oil temperature sender - G266-

### Removing

- Engine oil drained ⇒ Maintenance ; Booklet 819
- Unplug electrical connector -3-.
- Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.

### Installing

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



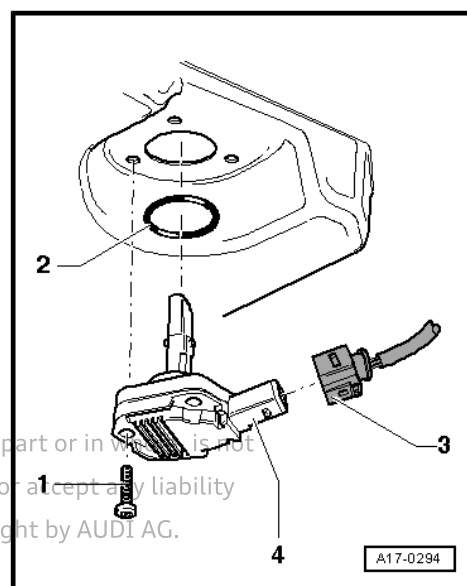
Note

*Renew seal -2-.*

- Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 819.

### Tightening torques

- ◆ ⇒ [“1.1 Exploded view - sump/oil pump”, page 145](#)





## 2 Engine oil cooler

⇒ "2.1 Exploded view - engine oil cooler", page 154

⇒ "2.2 Removing and installing engine oil cooler", page 154

### 2.1 Exploded view - engine oil cooler

#### 1 - Engine oil cooler

- ❑ See note ⇒ [page 145](#)
- ❑ Removing and installing  
⇒ [page 154](#)

#### 2 - Gasket

- ❑ Renew

#### 3 - O-rings

- ❑ Renew

#### 4 - Coolant pipes (front)

- ❑ Version fitted in vehicle  
may differ from illustration

#### 5 - Bolt

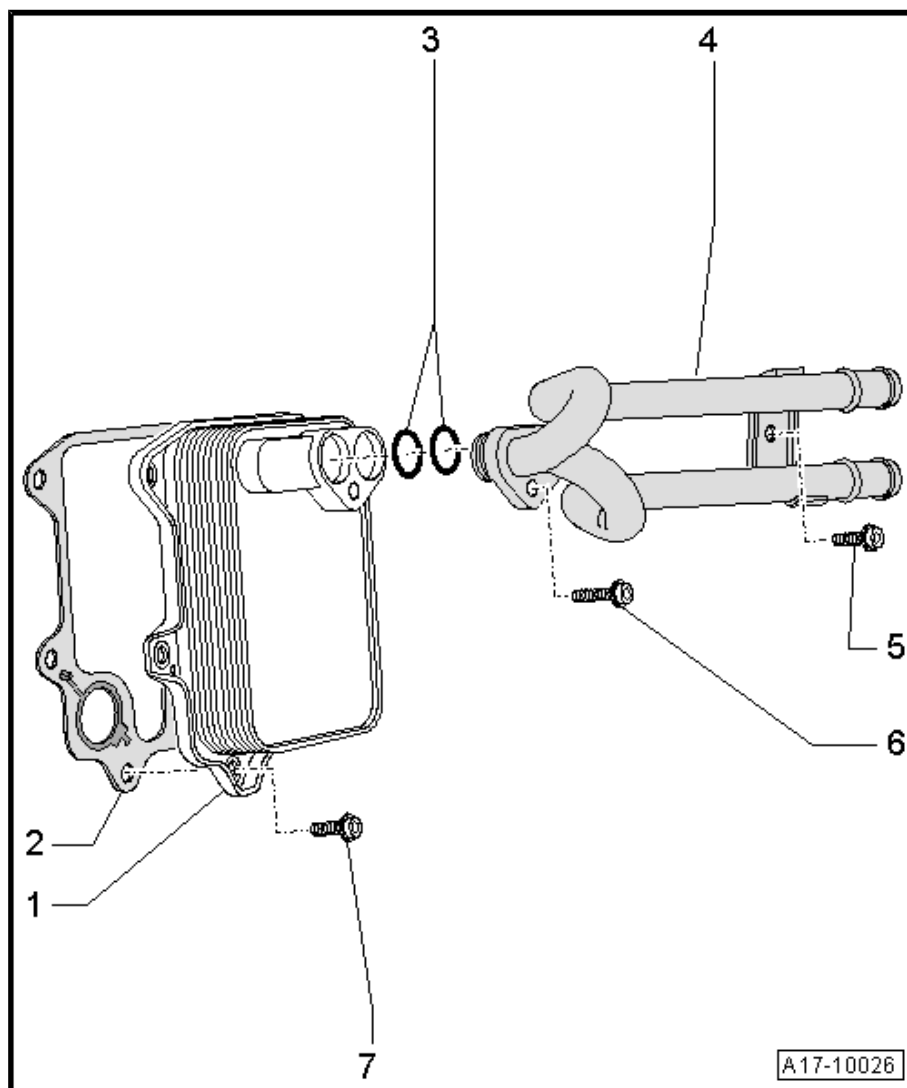
- ❑ Tightening torque  
⇒ [Item 1 \(page 177\)](#)

#### 6 - Bolt

- ❑ Tightening torque  
⇒ [Item 3 \(page 177\)](#)

#### 7 - Bolt

- ❑ 8 Nm



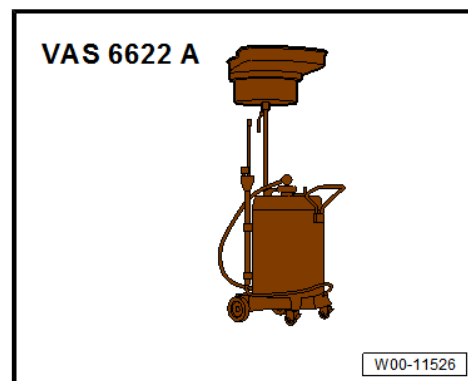
### 2.2 Removing and installing engine oil cooler

#### Special tools and workshop equipment required

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- ◆ Used oil collection and extraction unit - VAS 6622A-



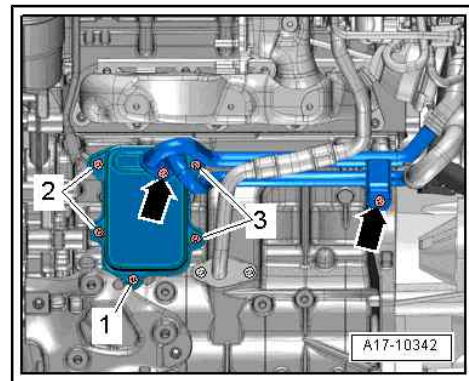
## Removing

- Drain coolant ⇒ [page 162](#) .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove bolts -arrows- for coolant pipes at cylinder block and engine oil cooler.
- Position used oil collection and extraction unit - VAS 6622A- below engine.
- Pull coolant pipes forwards out of engine oil cooler.
- Unscrew bolts -1, 2, 3- and remove engine oil cooler from cylinder block.



### Note

*For illustration purposes, the installation position is shown with the catalytic converter removed.*



## Installing

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



### Note

*Fit new O-rings.*

- Install coolant pipes (front) ⇒ [page 178](#) .



### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

## Tightening torques

- ◆ ⇒ [“2.1 Exploded view - engine oil cooler”, page 154](#)

- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

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### 3 Oil filter/oil pressure switch

⇒ "3.1 Exploded view - oil filter/oil pressure switch", page 156

⇒ "3.2 Removing and installing oil pressure switch F1",  
page 157

⇒ "3.3 Checking oil pressure and oil pressure switch",  
page 157

#### 3.1 Exploded view - oil filter/oil pressure switch

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1 - Timing chain cover with oil  
filter housing

2 - Cap

3 - Seal

☐ Renew if leaking

4 - Sealing cap

5 - Bolt

☐ 9 Nm

6 - Hose

☐ For crankcase breather

☐ Press release tabs to  
detach

7 - O-ring

☐ Renew

8 - Seal

☐ Renew if leaking

9 - Bolt

☐ 5 Nm

10 - Oil separator

11 - Oil supply line

☐ To turbocharger

12 - Banjo bolt

☐ 20 Nm

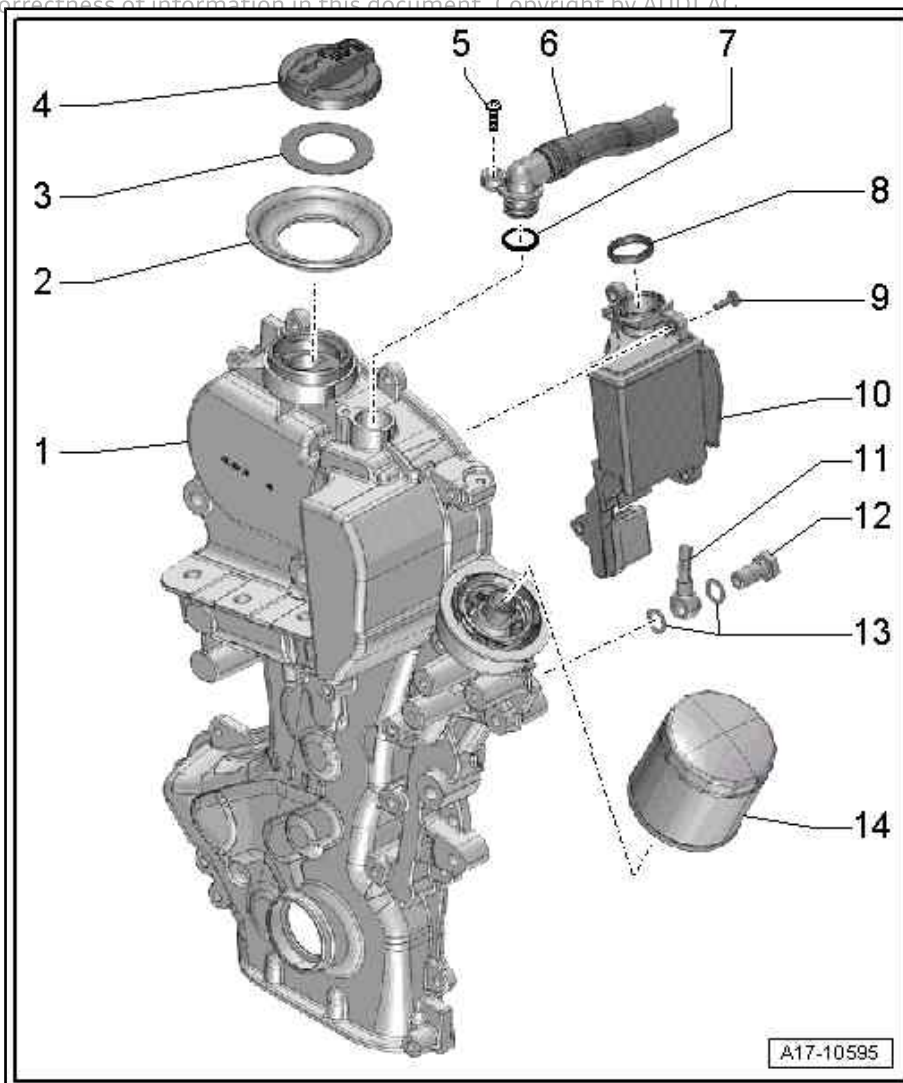
13 - Seals

☐ Renew

14 - Oil filter

☐ Removing and installing  
⇒ Maintenance ; Book-  
let 819

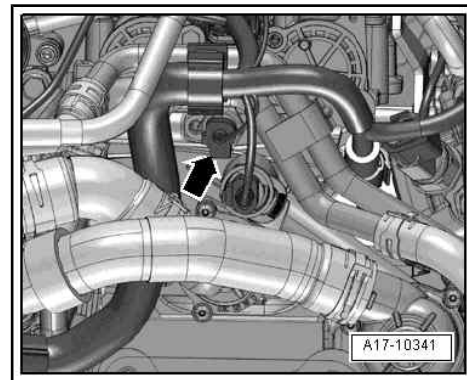
☐ 20 Nm





#### Oil pressure switch - F1- -arrow-

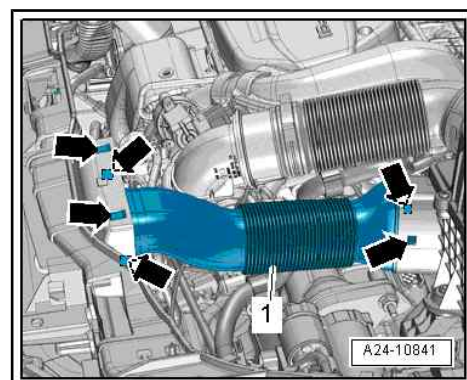
- ◆ Checking ⇒ [page 157](#)
- ◆ Removing and installing ⇒ [page 157](#)
- ◆ 20 Nm



### 3.2 Removing and installing oil pressure switch - F1-

#### Removing

- Release fasteners -arrows- and detach air duct -1-.



- Unplug electrical connector -arrow-.
- Unscrew oil pressure switch - F1- .

#### Installing

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

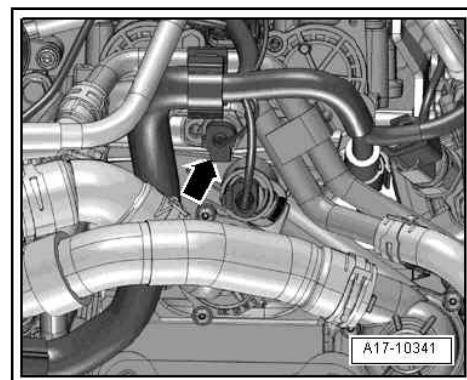


#### Note

- ◆ *Renew seal.*
- ◆ *Fit the new oil pressure switch - F1- into the connection immediately to avoid loss of oil.*
- Check oil level ⇒ Maintenance ; Booklet 819 .

#### Tightening torques

- ◆ ⇒ Fig. ““ Oil pressure switch -F1- -arrow-”” , [page 157](#)

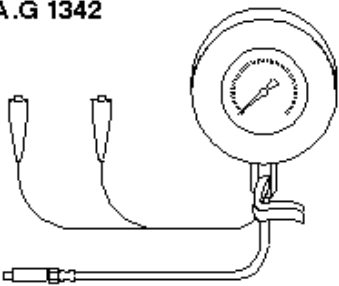
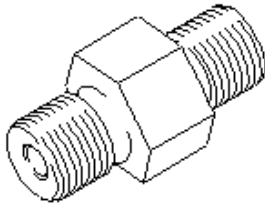
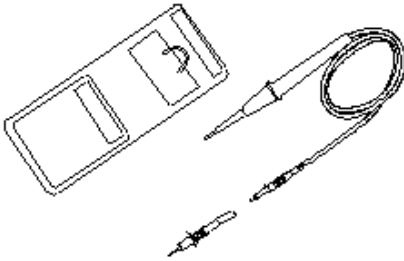


### 3.3 Checking oil pressure and oil pressure switch

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### Special tools and workshop equipment required

|                                                                                                          |                                                                                                             |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>V.A.G 1342</b><br>   | <b>V.A.G 1342/14</b><br> |
| <b>V.A.G 1527 B</b><br> | <b>V.A.G 1594 C</b><br>  |
|                       |                                                                                                             |
| <div>G17-10005</div>                                                                                     |                                                                                                             |

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- ◆ Oil pressure tester - V.A.G 1342-
- ◆ Adapter - V.A.G 1342/14-
- ◆ Voltage tester - V.A.G 1527B-
- ◆ Auxiliary measuring set - V.A.G 1594C-

### Procedure

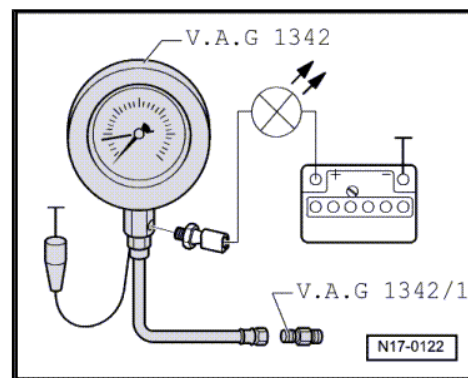
- Oil level OK
- Engine oil temperature approx. 80 °C
- Remove oil pressure switch - F1- ➔ [page 157](#) .



- Connect oil pressure tester - V.A.G 1342- with adapter - V.A.G 1342/14- to bore for oil pressure switch.
- Screw oil pressure switch - F1- into oil pressure tester - V.A.G 1342- .
- Connect brown wire of oil pressure tester to earth “-”.

#### Checking oil pressure switch

- Connect voltage tester - V.A.G 1527B- with adapter leads from auxiliary measuring set - V.A.G 1594C- to oil pressure switch and battery positive (“+”).
- LED should not light up.



#### Note

*Renew oil pressure switch if LED lights up at this stage.*

- Start engine.



#### Note

*Observe oil pressure tester and LED while starting engine, as switching point of oil pressure switch may already be exceeded when starting.*

- LED should light up at 0.3 ... 0.6 bar.
- Renew oil pressure switch if LED does not light up.

#### Checking oil pressure

- Start engine.
- Oil pressure at 2000 rpm: at least 2.0 bar.

#### Assembling

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

- Install oil pressure switch - F1- ➔ [page 157](#) .

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## 19 – Cooling

### 1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 160

⇒ “1.3 Draining and filling cooling system”, page 162

⇒ “1.2 Checking cooling system for leaks”, page 161

#### 1.1 Connection diagram - coolant hoses



##### Note

- ◆ Blue = Large coolant circuit
- ◆ Red = Small coolant circuit
- ◆ Orange = Charge air cooling circuit.
- ◆ Brown = Heating circuit
- ◆ Arrows show direction of coolant flow.

1 - Water radiator for charge air cooling circuit

2 - Engine oil cooler

3 - Turbocharger

4 - Cylinder head and cylinder block

5 - Coolant pump

6 - Non-return valve

- Arrow points in direction of through-flow

7 - Coolant expansion tank

8 - Filler cap

- For coolant expansion tank
- Checking pressure relief valve ⇒ [page 162](#)

9 - Continued coolant circulation pump - V51-

10 - Non-return valve

- Arrow points in direction of through-flow

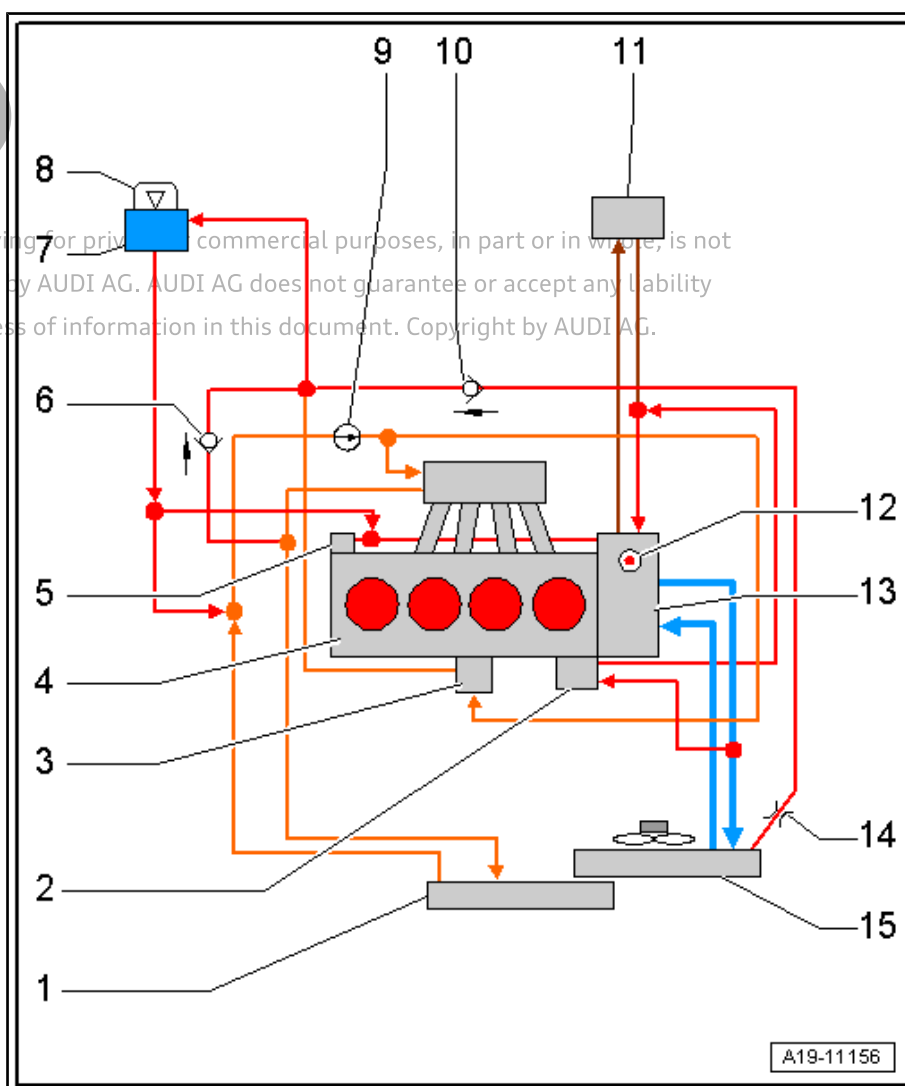
11 - Heat exchanger for heater

12 - Thermostat housing

13 - Coolant temperature sender - G62-

14 - Restrictor

15 - Radiator





## 1.2 Checking cooling system for leaks

Special tools and workshop  
equipment required



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|                                                                                                       |                                                                                                         |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <p>V.A.G 1274/8</p>  | <p>V.A.G 1274/9</p>  |
| <p>V.A.G 1274 B</p>  |                                                                                                         |
|                                                                                                       | <p>W19-10069</p>                                                                                        |

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



## Procedure

- Engine must be warm.

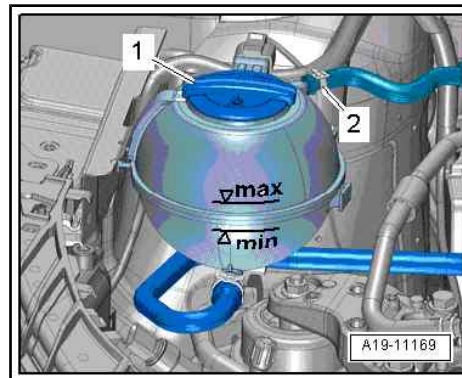


### WARNING

*The cooling system is under pressure when the engine is hot.  
Risk of scalding due to hot steam and hot coolant.*

*Danger of scalding skin and other parts of the body.*

- ◆ Put on protective gloves.
- ◆ Put on safety goggles.
- ◆ Cover filler cap on expansion tank with a cloth and open carefully to release pressure.



- Open filler cap -1- on coolant expansion tank.



### Note

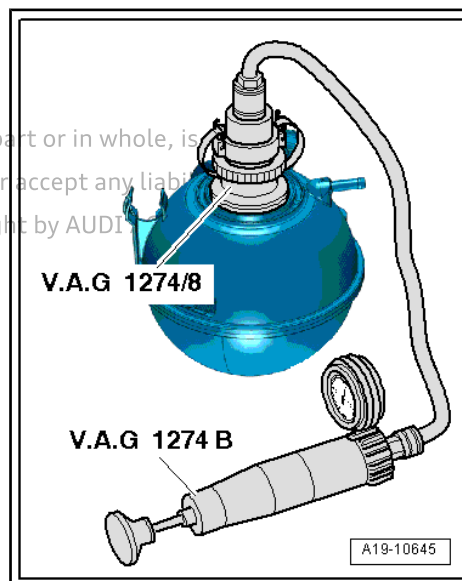
*Disregard -item 2-.*

- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.
- Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.
- The pressure should not drop more than 0.2 bar within 10 minutes.
- If the pressure drops more than 0.2 bar, locate leak and eliminate fault.



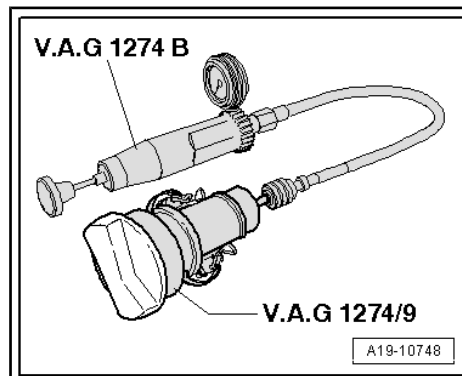
### Note

*The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.*



## Checking pressure relief valve in filler cap

- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.
- Build up pressure with hand pump on cooling system tester.
- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.
- Renew filler cap if pressure relief valve does not open as described.



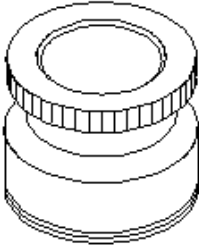
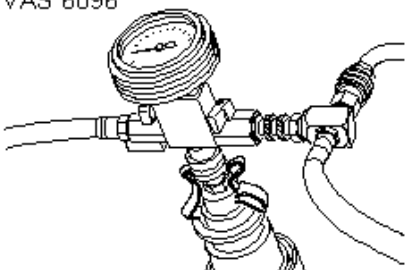
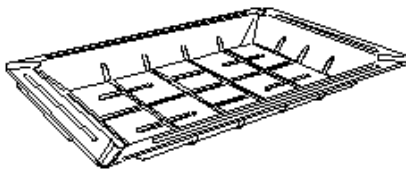
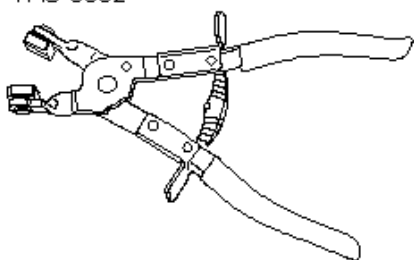
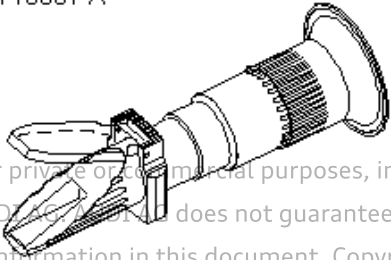
## 1.3 Draining and filling cooling system



# Special tools and workshop equipment required



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|                                                                                                       |                                                                                                     |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <p>V.A.G 1274/8</p>  | <p>VAS 6096</p>  |
| <p>VAS 6208</p>      | <p>VAS 6362</p>  |
| <p>T10007 A</p>     | <p>G19-10030</p>                                                                                    |

- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Cooling system charge unit - VAS 6096- with -VAS 6096/1-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clip pliers - VAS 6362-
- ◆ Refractometer - T10007 A-



## Draining



### WARNING

*Risk of scalding due to hot steam and hot coolant.*

- ◆ *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 -1- on coolant expansion tank.



### Note

*Disregard -item 2-.*

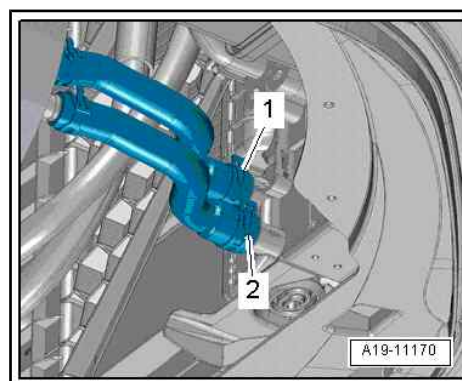
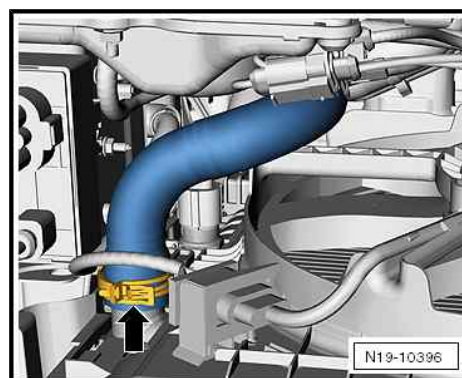
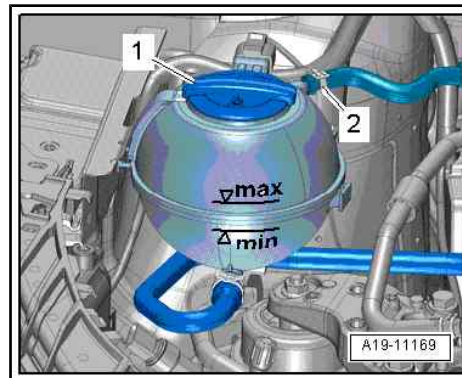
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Place drip tray for workshop hoist - VAS 6208- beneath engine.
- Release hose clip -arrow- and detach coolant hose (bottom left) from radiator.
- Release hose clips -1 and 2- and detach coolant hoses (bottom right) from water radiator for charge air cooling circuit.

## Filling



### Caution

*To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.*



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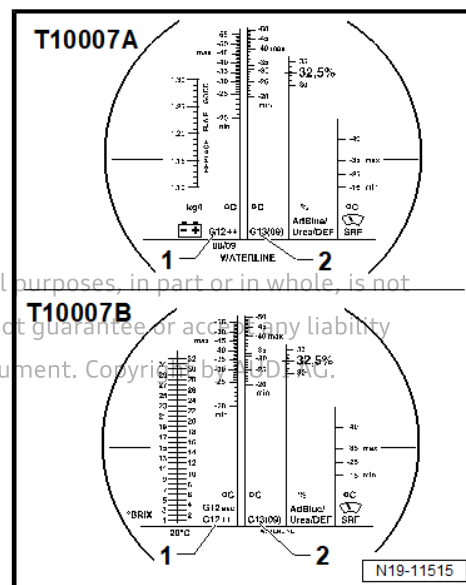


## Note

- ◆ *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- ◆ *Use only coolant additives listed in the ➔ Electronic parts catalogue (ETKA). If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- ◆ *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- ◆ *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- ◆ *Refractometer - T10007A- or refractometer - T10007B- MUST be used to determine the current level of frost protection.*
- ◆ *Scale -1- on the refractometer applies to coolant additives G12 ++ and G12evo.*
- ◆ *Scale -2- on the refractometer applies to coolant additive G13.*
- ◆ *If more than one type of coolant additive has been used: Always use the scale for G13 to determine the anti-freeze protection.*
- ◆ *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- ◆ *The temperature indicated on the refractometer corresponds to the temperature at which the first ice crystals can form in the coolant.*
- ◆ *Do not reuse coolant.*
- ◆ *Only use water/coolant additive as a lubricant for coolant hoses.*

## Recommended mixture ratio for coolant

- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant ➔ Electronic parts catalogue





## Procedure

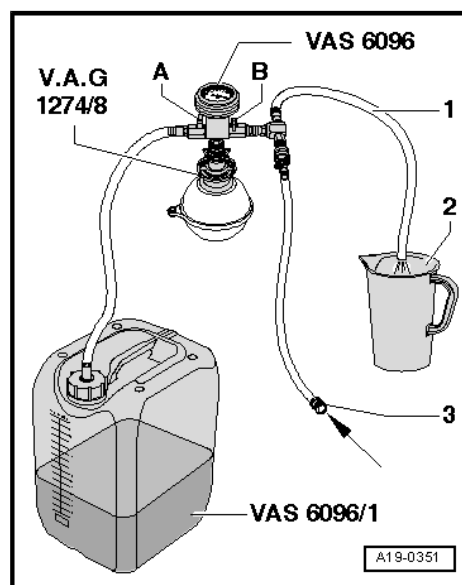
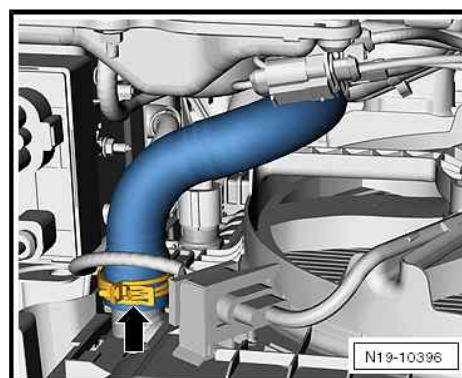
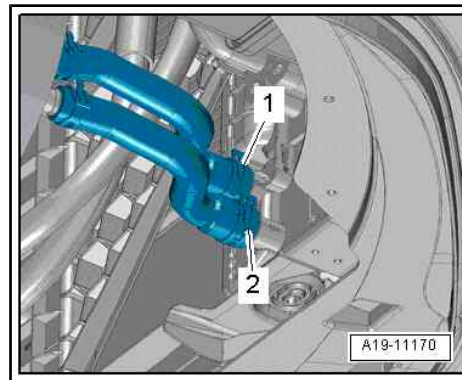
- Connect coolant hoses to water radiator for charge air cooling circuit with hose clips -1 and 2-.
- Connect coolant hose to radiator (bottom) with hose clip -arrow-.
- Fill reservoir of -VAS 6096- with at least 8 litres of premixed coolant (according to recommended ratio).
- Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
- Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
- Run vent hose -1- into a small container -2-.



### Note

*The vented air draws along a small amount of coolant, which should be collected.*

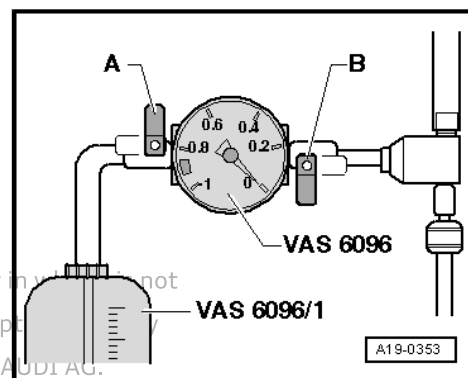
- Close both valves -A- and -B- (turn lever at right angles to direction of flow).
- Connect hose -3- to compressed air supply.
- Pressure: 6 ... 10 bar.



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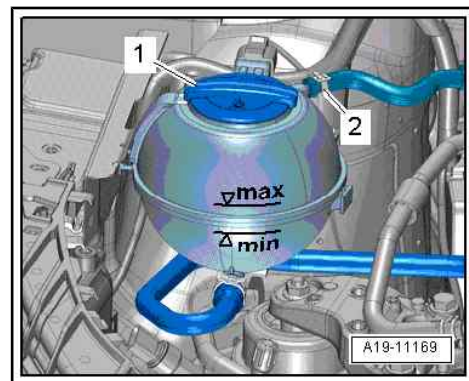


- Open valve -B- by setting lever in direction of flow.
- The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.
- Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of -VAS 6096- can fill with coolant.
- Close valve -A- again.
- Leave valve -B- open for another 2 minutes.
- The suction jet pump continues to generate a partial 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.



### Note

- ◆ *If the needle does not reach the green zone, repeat the process.*
- ◆ *Check cooling system for leaks if the vacuum is not maintained.*
- Detach compressed air hose.
- Open valve -A-.
- The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of -VAS 6096- ; the cooling system is then filled.
- Top up coolant to "max" mark.
- Start engine and run for 2 minutes (maximum) at approx. 1500 rpm.
- Top up coolant to overflow hole on expansion tank with engine running.
- On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
- Close filler cap on coolant expansion tank (make sure it engages).
- Allow engine to run at idling speed until both large coolant hoses at radiator become warm.
- Switch off ignition and allow engine to cool down.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



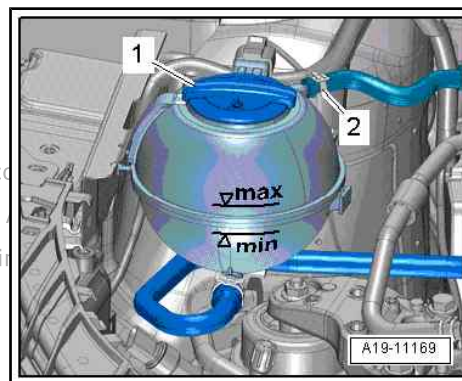


- Check coolant level.
- The coolant level must be between the “min” and “max” markings when the engine is cold.
- The coolant level can be at the “max” marking when the engine is warm.
- Top up with coolant again if necessary.



**Note**

*Disregard items -1 and 2-*





## 2 Coolant pump/thermostat assembly

⇒ [“2.1 Exploded view - coolant pump”, page 169](#)

⇒ [“2.2 Exploded view - thermostat”, page 170](#)

⇒ [“2.3 Removing and installing electric coolant pump”, page 171](#)

⇒ [“2.4 Removing and installing coolant pump”, page 173](#)

⇒ [“2.5 Removing and installing thermostat”, page 173](#)

⇒ [“2.6 Removing and installing coolant pump pulley”, page 174](#)

⇒ [“2.7 Removing and installing coolant temperature sender G62”, page 175](#)

⇒ [“2.8 Removing and installing radiator outlet coolant temperature sender G83”, page 176](#)

### 2.1 Exploded view - coolant pump

1 - Coolant hose

2 - Bolt

□ 10 Nm

3 - Continued coolant circulation pump - V51-

□ Removing and installing  
⇒ [page 171](#)

4 - Coolant hose

5 - Bracket

6 - Coolant pump

□ Removing and installing  
⇒ [page 173](#)  
□ With integral seal

7 - Bolt

□ 9 Nm

8 - Bolt

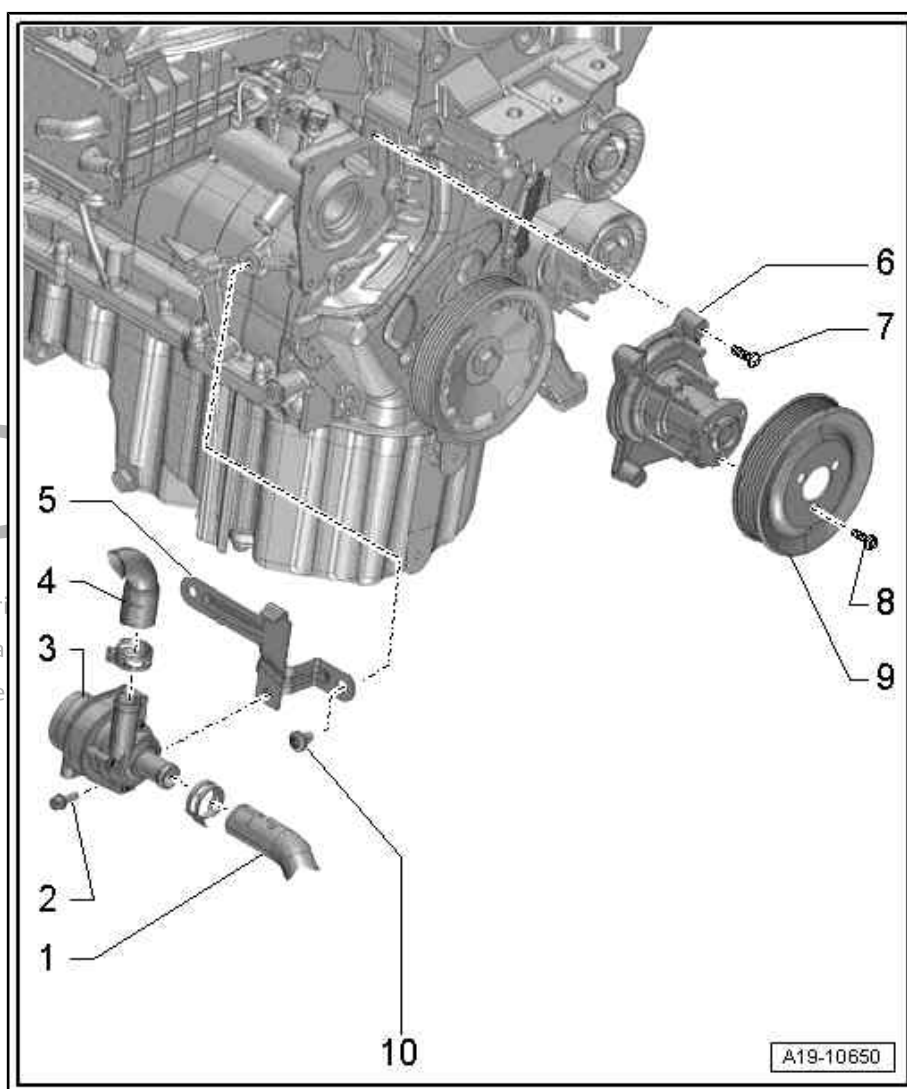
□ 20 Nm permitted unless a

9 - Poly V-belt pulley

□ For coolant pump  
□ Removing and installing  
⇒ [page 174](#)

10 - Bolt

□ 20 Nm





## 2.2 Exploded view - thermostat

### 1 - Bolt

- ☐ 5 Nm

### 2 - Connection

### 3 - Bolt

- ☐ 5 Nm

### 4 - Connection

### 5 - O-ring

- ☐ Renew

### 6 - Compression spring

### 7 - Plunger

- ☐ For thermostat
- ☐ Removing and installing  
⇒ [page 182](#)

### 8 - Thermal element

- ☐ For 95 °C thermostat
- ☐ Removing and installing  
⇒ [page 182](#)

### 9 - Retaining clip

- ☐ Check for firm attachment

### 10 - Coolant temperature sender - G62-

- ☐ Removing and installing  
⇒ [page 175](#)

### 11 - O-ring

- ☐ Renew

### 12 - Bolt

- ☐ 10 Nm

### 13 - Thermostat housing

- ☐ Removing and installing ⇒ [page 182](#)

### 14 - Gasket

- ☐ Renew

### 15 - O-ring

- ☐ Renew

### 16 - Coolant pipe

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

### 17 - Retaining clip

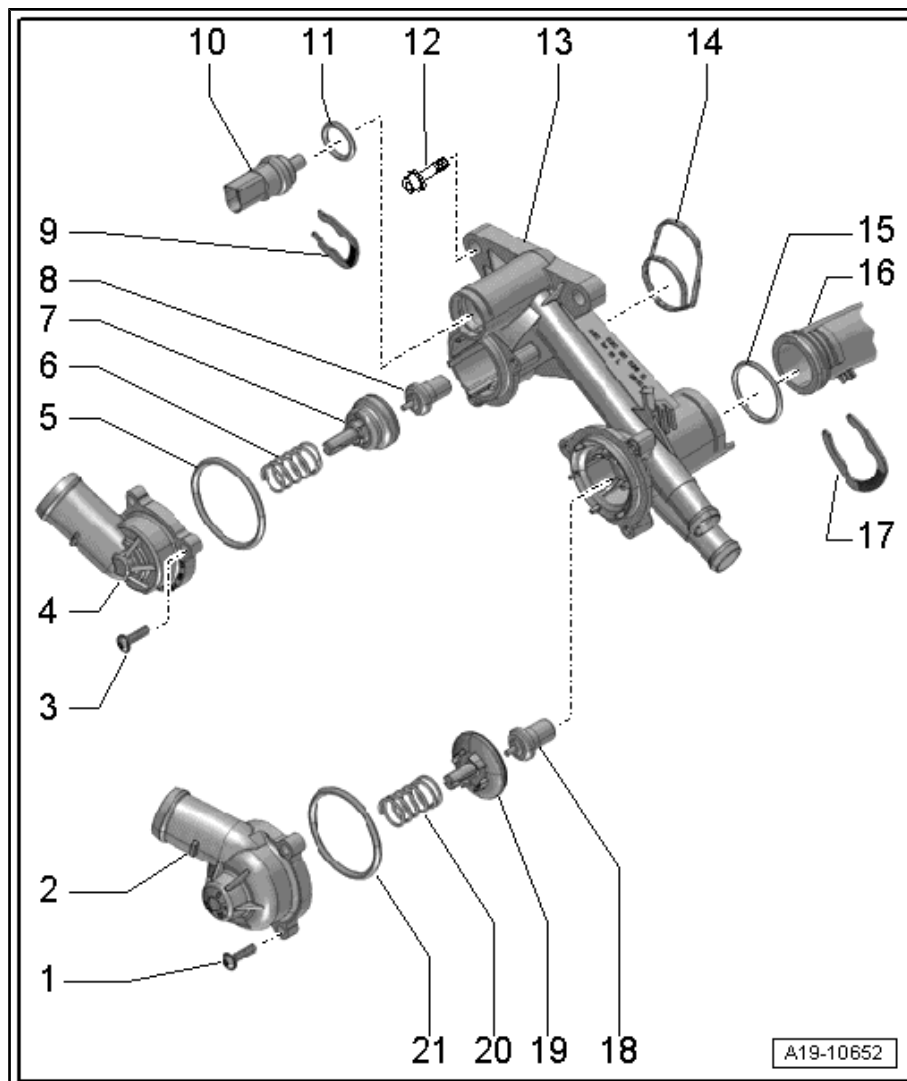
- ☐ For coolant pipe

### 18 - Thermal element

- ☐ For 83 °C thermostat
- ☐ Removing and installing ⇒ [page 182](#)

### 19 - Plunger

- ☐ For thermostat
- ☐ Removing and installing ⇒ [page 182](#)



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20 - Compression spring

21 - O-ring

☐ Renew



## 2.3 Removing and installing electric coolant pump

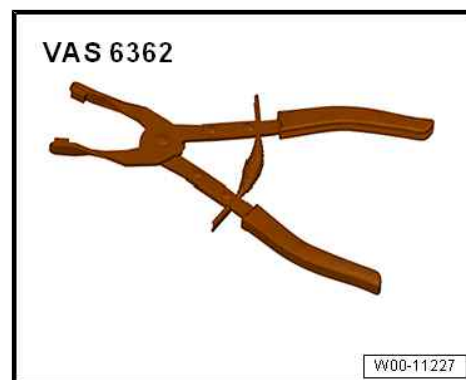
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Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm - 3094-



- ◆ Hose clip pliers - VAS 6362-





## Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Unplug electrical connector -3-.
- Remove bolt -2- and detach continued coolant circulation pump - V51- from bracket.



### Note

*Place a cloth underneath to catch escaping coolant.*

- Clamp off coolant hoses -arrows- with hose clamps, up to 25 mm - 3094- and disconnect hoses from continued coolant circulation pump - V51- .



### Note

*Disregard -item 1-.*

## Installing

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



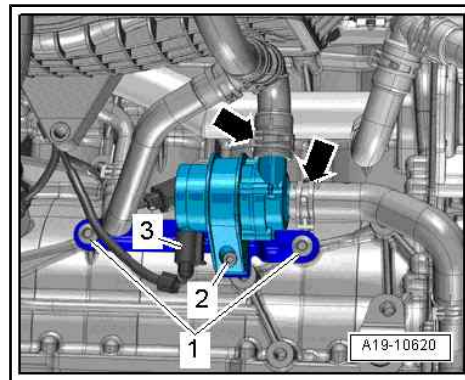
### Note

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

- Check coolant level ⇒ [page 168](#) .

## Tightening torques

- ♦ ⇒ [“2.1 Exploded view - coolant pump”, page 169](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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## 2.4 Removing and installing coolant pump

### Removing

- Drain coolant ➔ [page 162](#) .
- Remove poly V-belt pulley for coolant pump ➔ [page 174](#) .
- Remove bolts -arrows- and detach coolant pump.

### Installing

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

- Install poly V-belt pulley for coolant pump ➔ [page 174](#) .



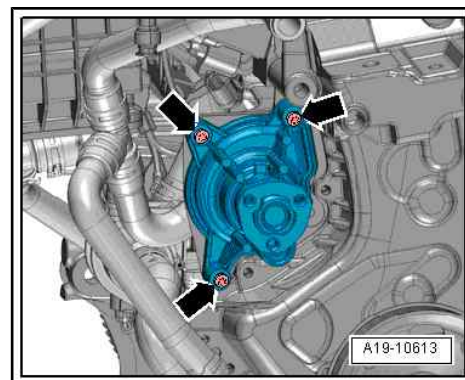
#### Note

*Do not reuse coolant.*

- Fill up with coolant ➔ [page 164](#) .

### Tightening torques

- ♦ ➔ [“2.1 Exploded view - coolant pump”, page 169](#)



## 2.5 Removing and installing thermostat

### Special tools and workshop equipment required

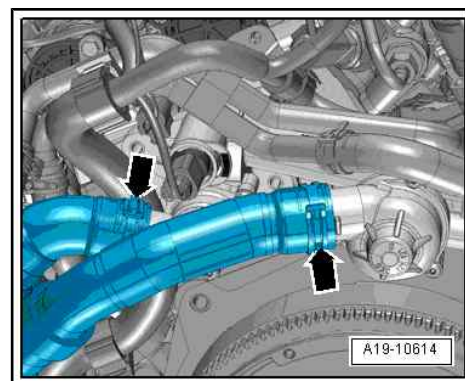
- ♦ Hose clip pliers - VAS 6362-



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### Removing

- Drain coolant ➔ [page 162](#) .
- Remove air cleaner housing ➔ [page 233](#) .
- Release hose clips -arrows- and disconnect coolant hoses from thermostat housing.





- Unscrew bolts -arrows- and remove corresponding connection.
- Detach spring, plunger and thermostat.

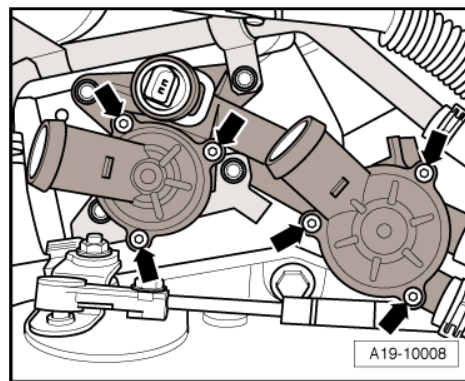
### Installing

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



#### Note

- ◆ *Fit new O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Clean and smoothen sealing surfaces for O-rings.
- Lubricate O-rings with coolant.
- Insert thermostat.
- Installation position: the hole in the thermostat plunger must face upwards.
- Install air cleaner housing ⇒ [page 233](#) .



#### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

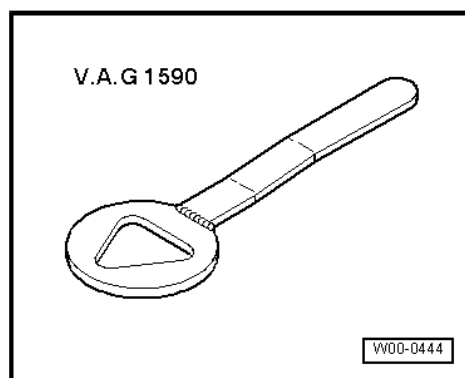
### Tightening torques

- ◆ ⇒ [“2.2 Exploded view - thermostat” page 170](#)
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## 2.6 Removing and installing coolant pump pulley

### Special tools and workshop equipment required

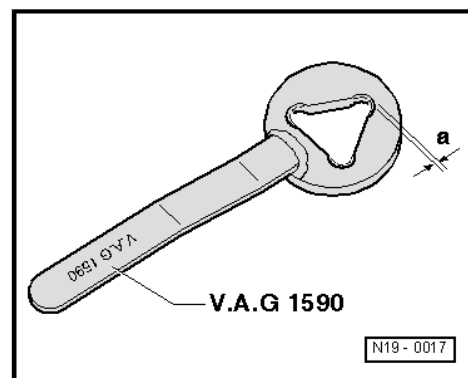
- ◆ Water pump wrench - V.A.G 1590-





#### Note

Check whether the 3 round corners on the water pump wrench - V.A.G 1590- have been filed down to dimension -a- = 1 mm. If this is not the case, file the corners down.



#### Removing

- Remove poly V-belt ➔ [page 44](#) .
- Remove bolts for coolant pump pulley (counterhold with water pump wrench - V.A.G 1590- ).

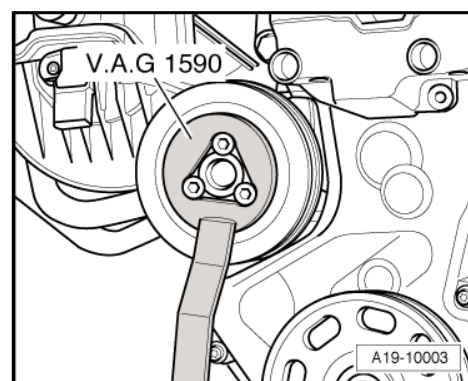
#### Installing

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

- Install poly V-belt ➔ [page 44](#) .

#### Tightening torques

- ◆ ➔ ["2.1 Exploded view - coolant pump", page 169](#)



## 2.7 Removing and installing coolant temperature sender - G62-

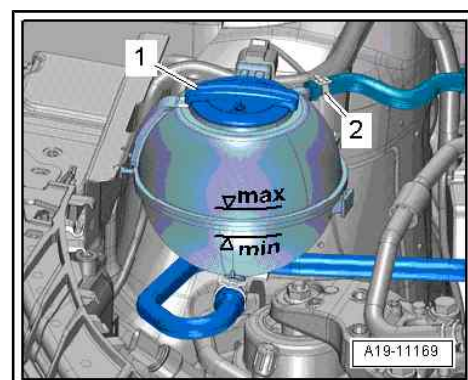
#### Removing

- Engine cold.
- To relieve residual pressure in cooling system, open filler cap -1- on coolant expansion tank briefly and then close cap again (it should click into place).

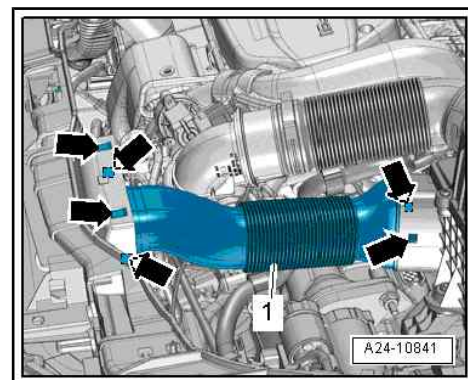


#### Note

Disregard -item 2-.



- Release fasteners -arrows- and detach air duct -1-.



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- Unplug electrical connector -1-.



#### Note

Place a cloth underneath to catch escaping coolant.

- Pull off retaining clip -2- and detach coolant temperature sender - G62- .

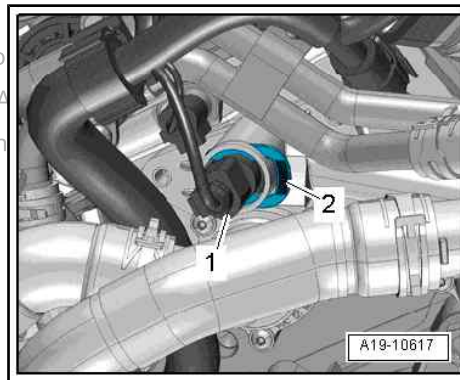
#### Installing

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



#### Note

- ♦ Fit new O-ring.
- ♦ Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.
- Check coolant level ⇒ [page 168](#) .



## 2.8 Removing and installing radiator outlet coolant temperature sender - G83-

#### Removing

- Engine cold.
- To relieve residual pressure in cooling system, open filler cap -1- on coolant expansion tank briefly and then close cap again (it should click into place).



#### Note

Disregard -item 2-.

- Unplug electrical connector -arrow-.



#### Note

Place a cloth underneath to catch escaping coolant.

- Unscrew radiator outlet coolant temperature sender - G83- .

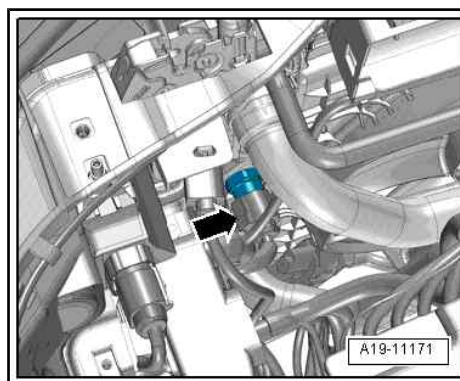
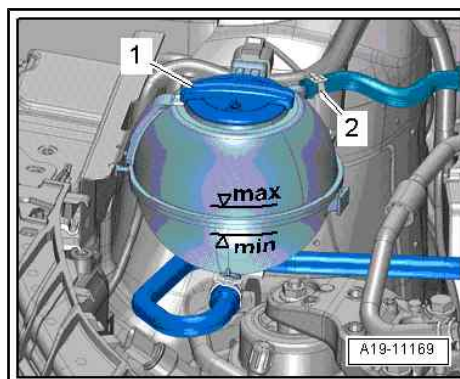
#### Installing

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



#### Note

- ♦ Fit new O-ring.
- ♦ To avoid loss of coolant, screw in new radiator outlet coolant temperature sender - G83- immediately.
- Check coolant level ⇒ [page 168](#) .





### 3 Coolant pipes

⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)

⇒ [“3.2 Removing and installing coolant pipes”, page 178](#)

#### 3.1 Exploded view - coolant pipes



##### Note

*The arrow markings on coolant pipes and on ends of hoses must align.*

##### 1 - Bolt

□ 8 Nm

##### 2 - Coolant pipes (front)

□ Removing and installing  
⇒ [page 178](#)

##### 3 - Bolt

□ 8 Nm

##### 4 - O-rings

□ Renew

##### 5 - Bolt

□ 20 Nm

##### 6 - Coolant pipe (right-side)

□ Removing and installing  
⇒ [page 181](#)

##### 7 - Bolt

□ 9 Nm

##### 8 - Seal

□ Renew

##### 9 - Coolant pipe (rear)

□ Removing and installing  
⇒ [“3.2.4 Removing and installing coolant pipe \(rear\) with thermostat housing”, page 182](#)

##### 10 - O-ring

□ Renew

##### 11 - Bolt

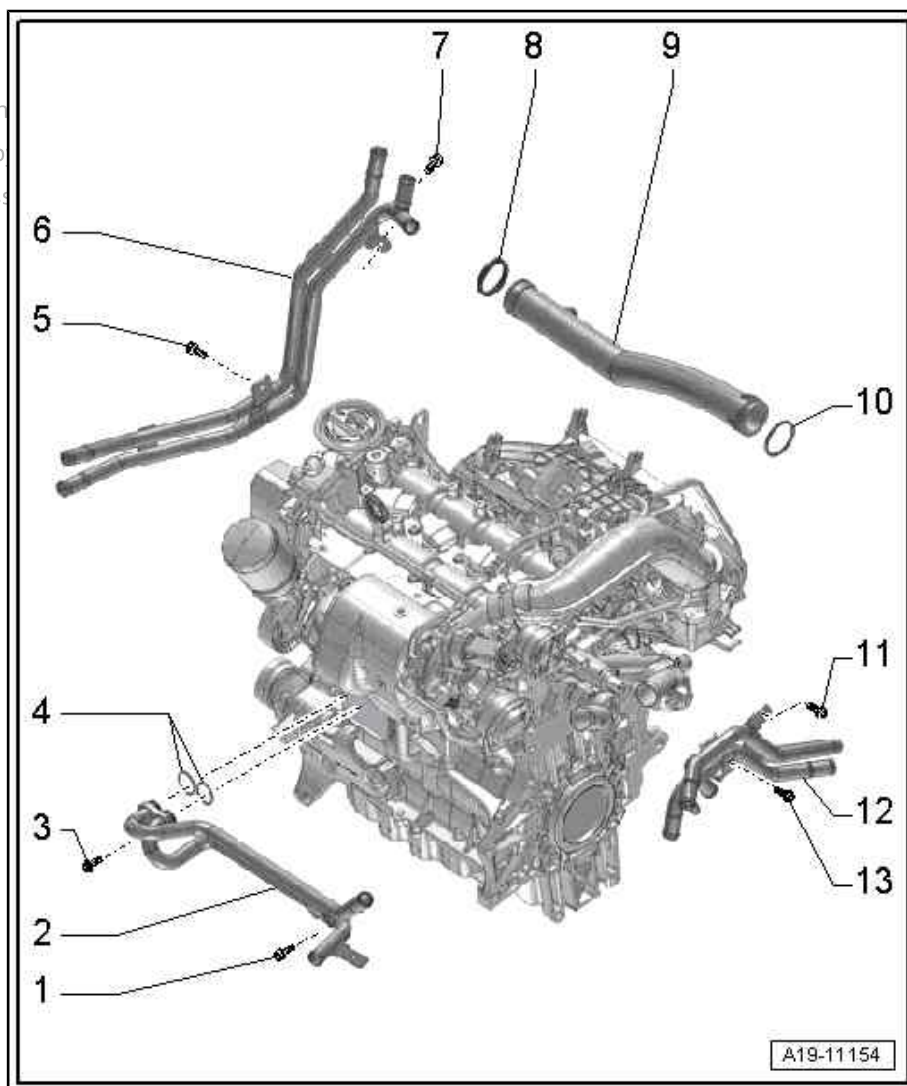
□ 9 Nm

##### 12 - Coolant pipes (left-side)

□ Removing and installing ⇒ [page 179](#)

##### 13 - Bolt

□ 9 Nm



A19-11154



## 3.2 Removing and installing coolant pipes

⇒ [“3.2.1 Removing and installing coolant pipes \(front\)”, page 178](#)

⇒ [“3.2.2 Removing and installing coolant pipes \(left-side\)”, page 179](#)

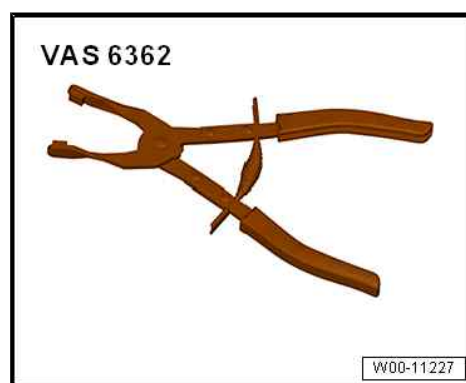
⇒ [“3.2.3 Removing and installing coolant pipes \(right-side\)”, page 181](#)

⇒ [“3.2.4 Removing and installing coolant pipe \(rear\) with thermostat housing”, page 182](#)

### 3.2.1 Removing and installing coolant pipes (front)

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



#### Removing

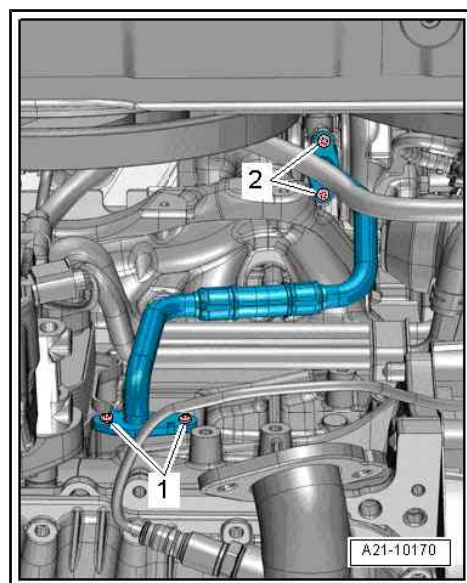
- Drain coolant ⇒ [page 162](#) .
- Remove catalytic converter with centre silencer  
⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#) or  
remove catalytic converter  
⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#) .



#### Note

*Place a cloth underneath to catch escaping engine oil.*

- Unscrew bolts -1- and -2- and remove oil return pipe for turbocharger.



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- Move clear electrical connectors.
- Remove bolts -1- and -2- and detach coolant pipes (front) from engine oil cooler.
- Detach coolant hoses -arrows-.

#### Installing

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



#### Note

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

- Install oil return pipe for turbocharger ⇒ [page 195](#) .
- Install catalytic converter with centre silencer  
⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#) or  
install catalytic converter  
⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#) .



#### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

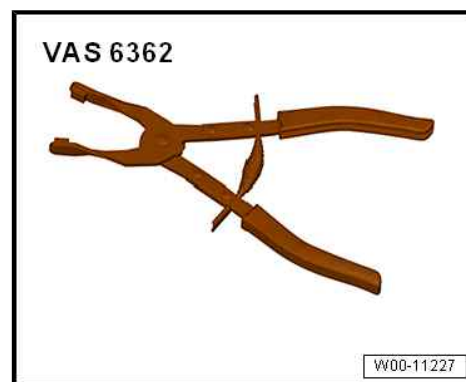
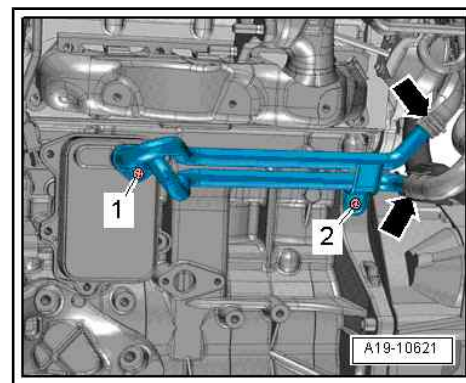
#### Tightening torques

- ♦ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)

### 3.2.2 Removing and installing coolant pipes (left-side)

#### Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6362-



#### Removing

- Drain coolant ⇒ [page 162](#) .
- Remove air cleaner housing ⇒ [page 233](#) .

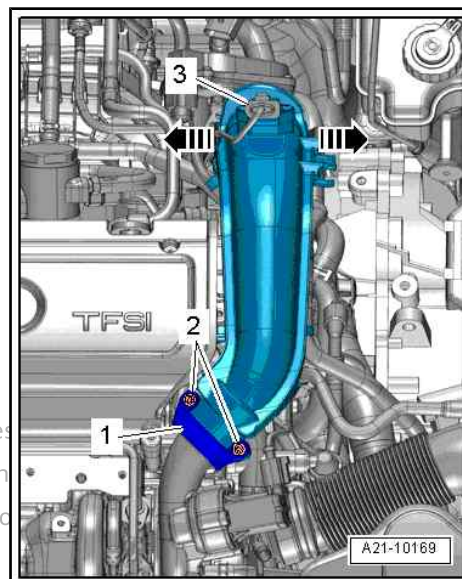
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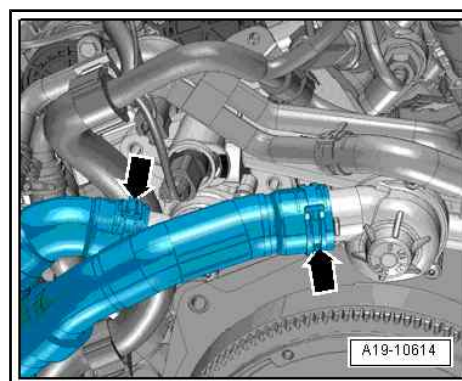
- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe and detach air pipe.



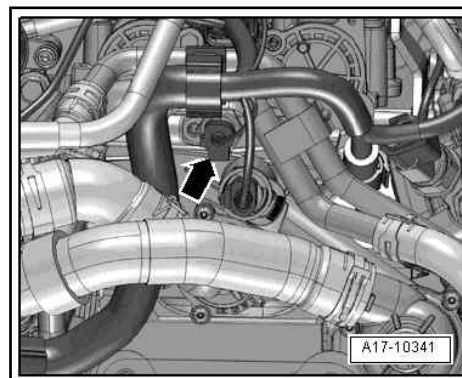
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- Detach coolant hoses -arrows- from thermostat housing.



- Unplug electrical connector -arrow- on oil pressure switch - F1- .

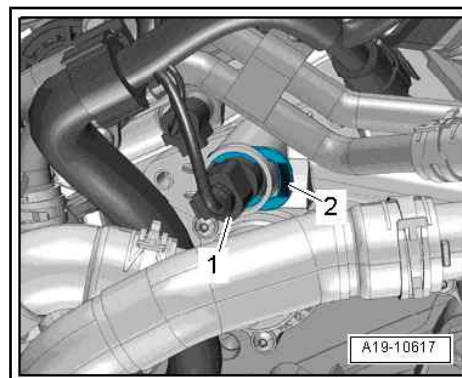


- Unplug electrical connector -1- at coolant temperature sender - G62- .



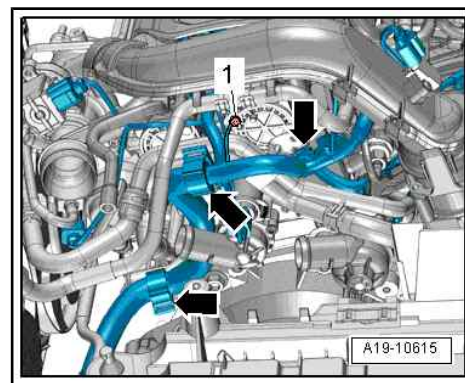
#### Note

Disregard -item 2-.





- Move clear electrical wiring harness at brackets -arrows-.
- Unscrew bolt -1- and move earth wiring clear.



- Remove bolts -1- and -2- and disconnect coolant hoses -arrows-.
- Move coolant pipes (left-side) to rear and detach.

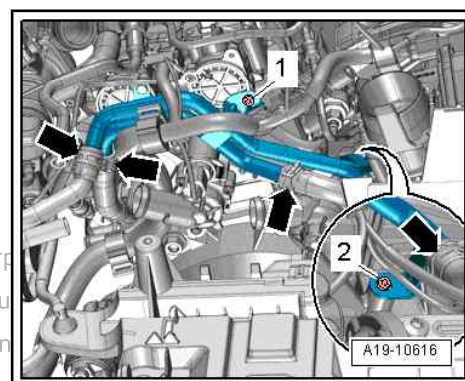
### Installing

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



#### Note

- ◆ *Fit new O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*



- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install air pipe ⇒ [page 195](#) .
- Install air cleaner housing ⇒ [page 233](#) .



#### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

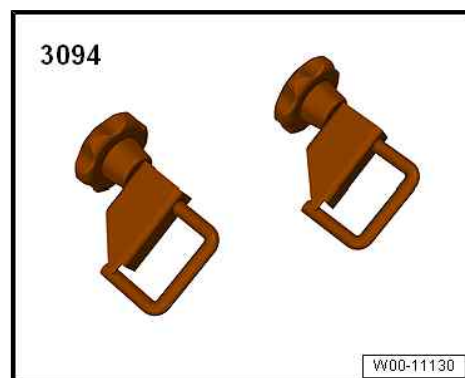
### Tightening torques

- ◆ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)

## 3.2.3 Removing and installing coolant pipes (right-side)

### Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm - 3094-





◆ Drip tray for workshop hoist - VAS 6208-



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◆ Hose clip pliers - VAS 6362-



### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Place drip tray for workshop hoist - VAS 6208- beneath engine.
- Clamp off coolant hoses -arrows- with hose clamps up to 25 mm - 3094- and detach.
- Remove bolts -1- and -2- and take off coolant pipe (right-side).

### Installing

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



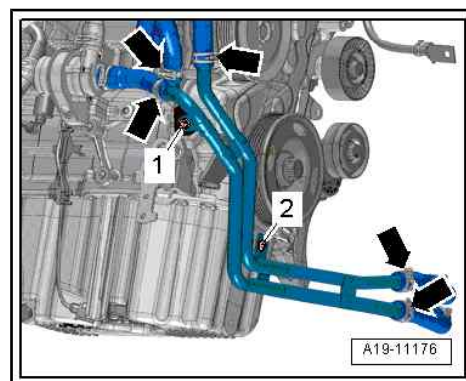
#### Note

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

- Check coolant level ⇒ [page 168](#) .

### Tightening torques

- ◆ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



## 3.2.4 Removing and installing coolant pipe (rear) with thermostat housing

Special tools and workshop equipment required

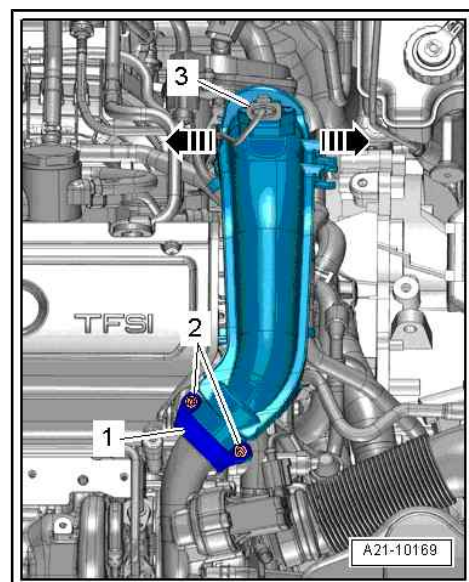


- ◆ Hose clip pliers - VAS 6362-



### Removing

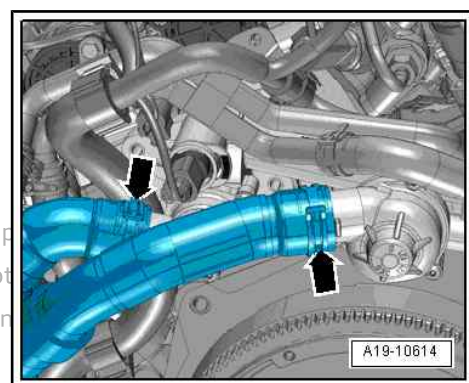
- Drain coolant ➔ [page 162](#) .
- Remove air cleaner housing ➔ [page 233](#) .
- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe and detach air pipe.



- Release hose clips -arrows- and disconnect coolant hoses from thermostat housing.

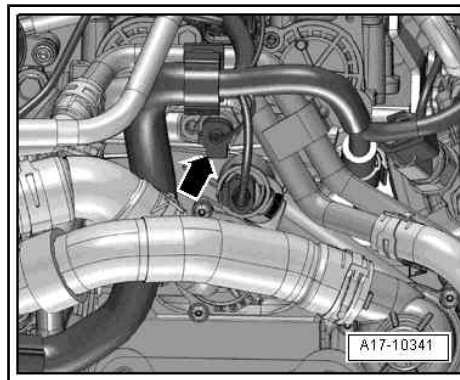


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- Unplug electrical connector -arrow- on oil pressure switch - F1- .

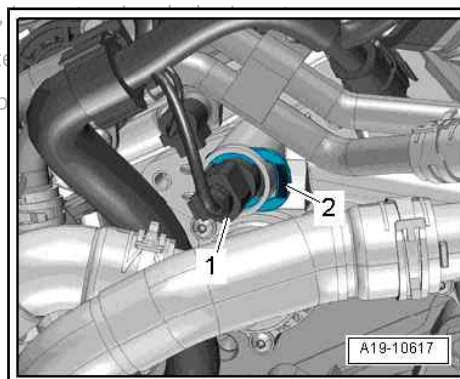


- Unplug electrical connector -1- at coolant temperature sender - G62- .



**Note**

*Disregard -item 2-.*

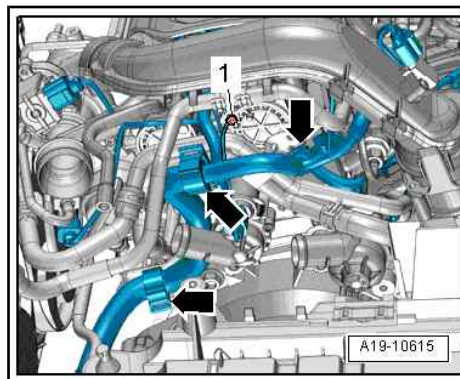


- Move clear electrical wiring harness at brackets -arrows-.



**Note**

*Disregard -item 1-.*

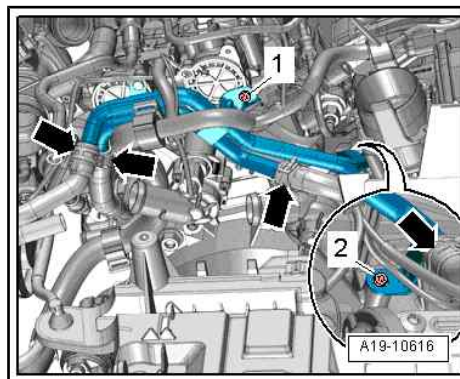


- Remove bolts -1- and -2- and disconnect coolant hoses -left arrows-.
- Swivel coolant pipes (left-side) slightly to rear.



**Note**

*Disregard -arrows- on right-side of illustration.*

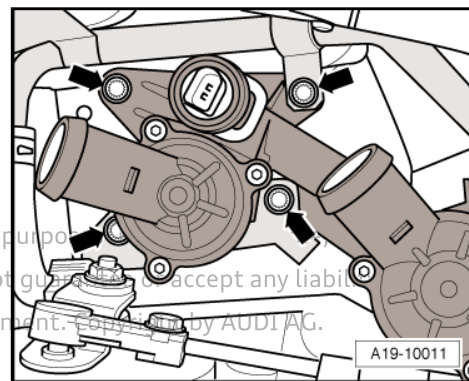




- Remove bolts -arrows- for thermostat housing.



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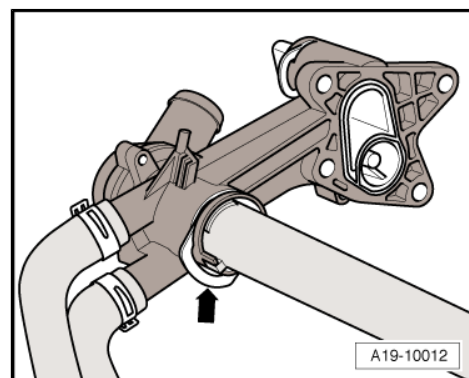
- Pull out retaining clip -arrow- for coolant pipe.



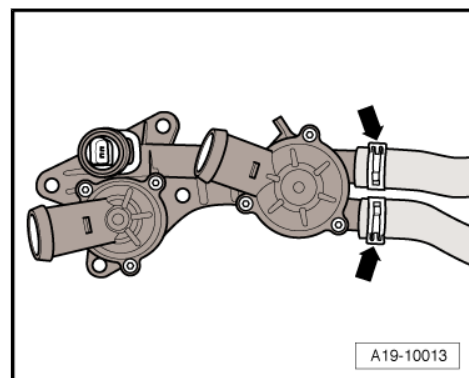
#### Note

*For illustration purposes, the installation position is shown with the thermostat housing removed.*

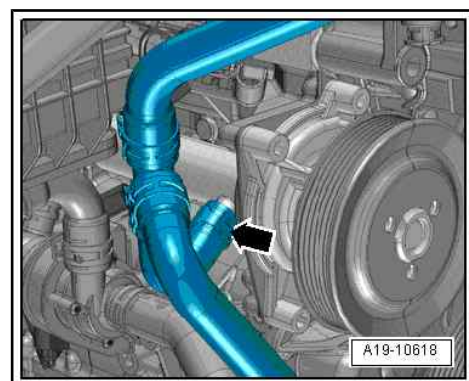
- Detach thermostat housing from coolant pipe.



- Pull thermostat housing slightly towards front.
- Mark position of coolant hoses on thermostat housing for re-installation, release hose clips -arrows- and detach coolant hoses.



- Release hose clip -arrow- and disconnect coolant hose from rear coolant pipe.





- Detach coolant pipe -1- (rear) from cylinder block -3-.
- Detach O-ring -2-.

### Installing

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



#### Note

◆ *Renew seals and O-rings.*

◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) → [Electronic parts catalogue](#).*

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- Clean and smoothen sealing surface for O-ring.
- Lubricate O-ring with coolant.
- Attach coolant hoses to thermostat housing according to markings made during removal.
- After securing thermostat housing, move coolant pipe up against housing as far as stop and only then insert retaining clip -arrow-.
- Check that coolant pipe is firmly secured in thermostat housing.

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

- Install coolant pipes (left-side) ⇒ [page 179](#) .



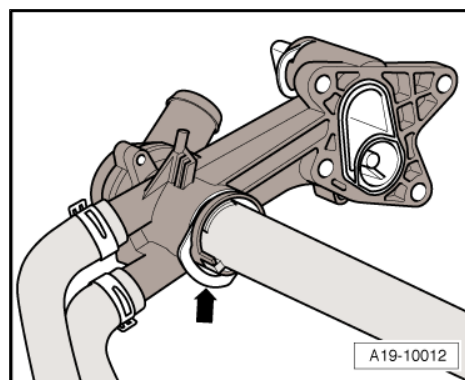
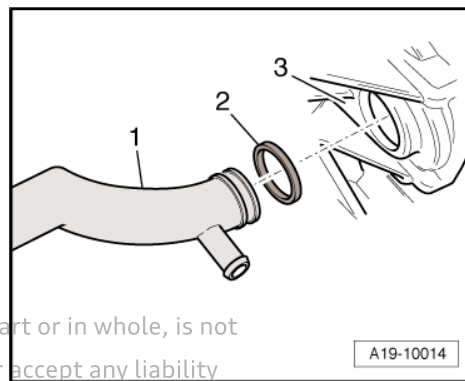
#### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

### Tightening torques

- ◆ ⇒ [“2.2 Exploded view - thermostat”, page 170](#)





## 4 Radiator/radiator fan

⇒ "4.1 Exploded view - radiator/radiator fan", page 187

⇒ "4.2 Removing and installing radiator", page 189

⇒ "4.3 Removing and installing radiator cowl", page 192

⇒ "4.4 Removing and installing radiator fan", page 193

### 4.1 Exploded view - radiator/radiator fan

#### Radiator

1 - Coolant hoses

2 - Air duct

3 - Water radiator for charge air cooling circuit

- ☐ If renewed, change coolant in entire system
- ☐ Removing and installing  
⇒ [page 189](#)

4 - Coolant hose (bottom)

5 - Radiator outlet coolant temperature sender - G83-

- ☐ Removing and installing  
⇒ [page 176](#)
- ☐ 35 Nm

6 - Seal

- ☐ Renew

7 - Coolant hose (top)

8 - Air duct

9 - Coolant hose

- ☐ To coolant expansion tank

10 - Radiator

- ☐ Removing and installing  
⇒ [page 189](#)
- ☐ If renewed, change coolant in entire system

11 - Condenser

- ☐ Removing and installing  
⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

12 - Bolt

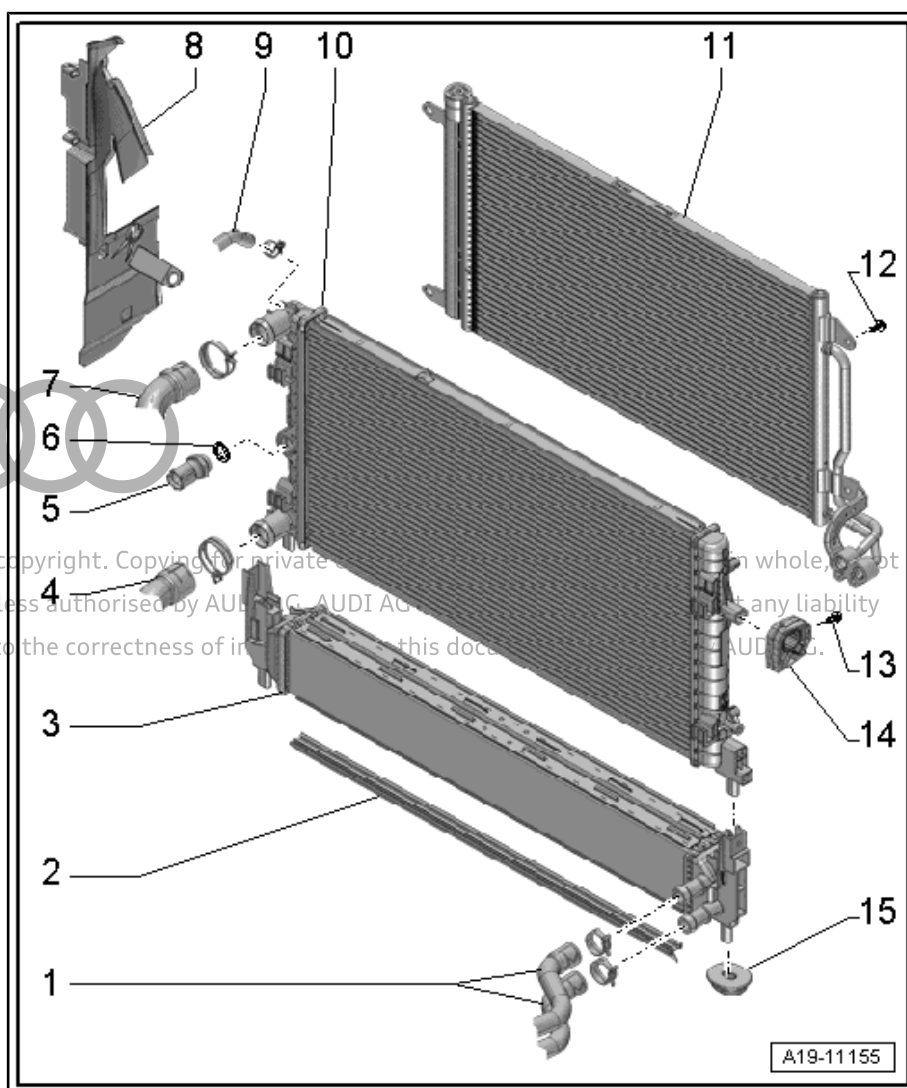
- ☐ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Exploded view - condenser

13 - Bolt

- ☐ 5 Nm

14 - Bracket

- ☐ Note installation position





## 15 - Bracket

- ☐ For water radiator for charge air cooling circuit

## Radiator cowl and radiator fan

### 1 - Radiator cowl

- ☐ Removing and installing  
⇒ [page 192](#)

### 2 - Bolt

- ☐ 1.5 Nm

### 3 - Heat shield

### 4 - Nut

- ☐ 9 Nm

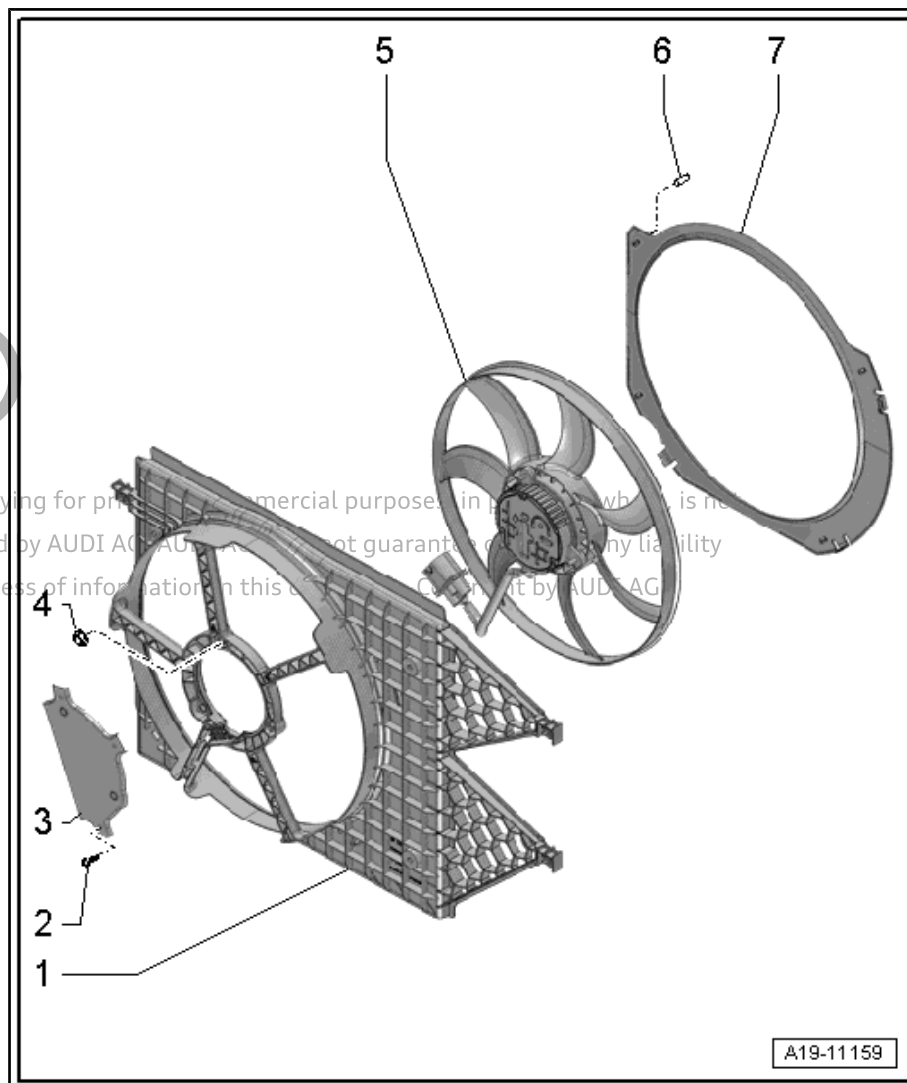
### 5 - Radiator fan - V7-

- ☐ With radiator fan control unit - J293-
- ☐ Removing and installing  
⇒ [page 193](#)

### 6 - Pin

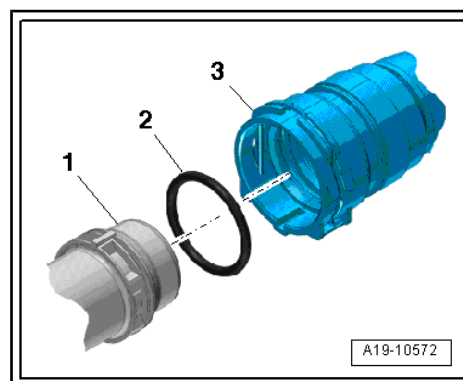
### 7 - Trim

- ☐ For radiator fan



## Connecting coolant hose with plug-in connector to radiator

- Remove old O-ring -2- from coolant hose -3-.
- Lubricate new O-ring with coolant additive and fit O-ring in coolant hose.
- Press coolant hose onto radiator -1- until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.





## 4.2 Removing and installing radiator



### Note

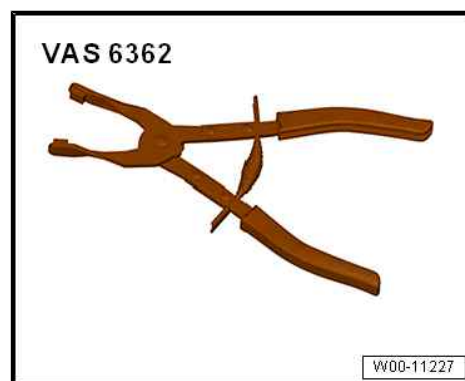
*Radiator and water radiator for charge air cooling circuit must be removed and installed together.*

### Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Hose clip pliers - VAS 6362-



### Removing



### Note

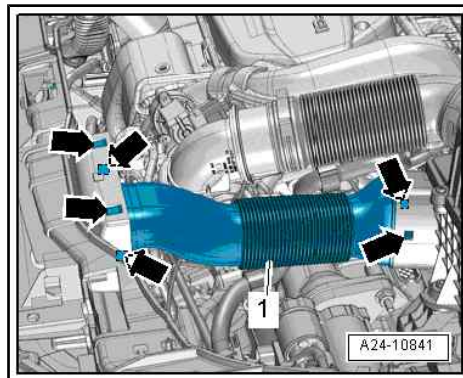
*If there are slight impressions on the fins, refer to ➔ [page 6](#) .*

- Remove radiator cowl ➔ [page 192](#) .
- Drain coolant ➔ [page 162](#) .
- Remove bumper cover ➔ General body repairs, exterior; Rep. gr. 63 ; Bumper (front): Removing and installing bumper cover .

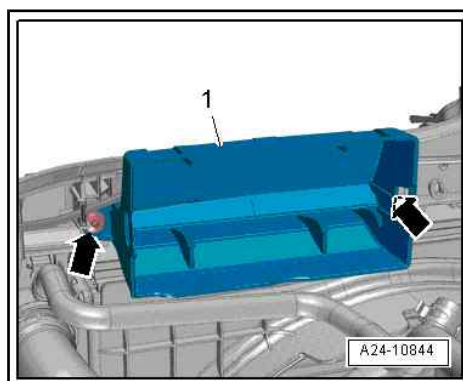
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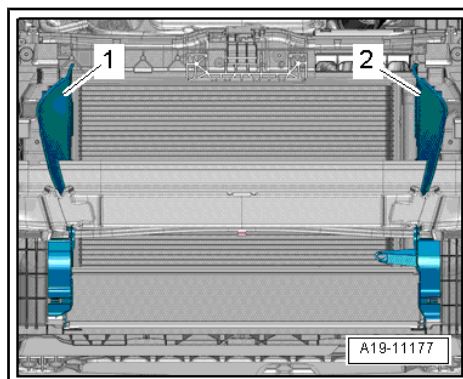
- Release fasteners -arrows- and detach air duct -1-.



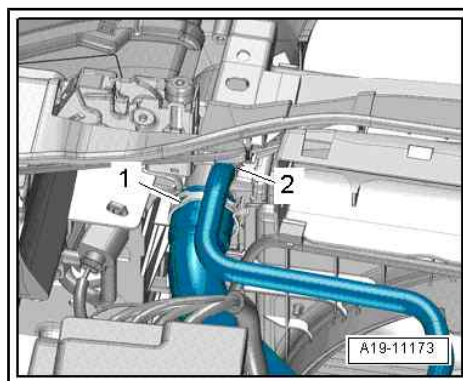
- Remove bolts -arrows- and detach air duct -1-.



- Release fasteners and detach air ducts -1 and 2-.



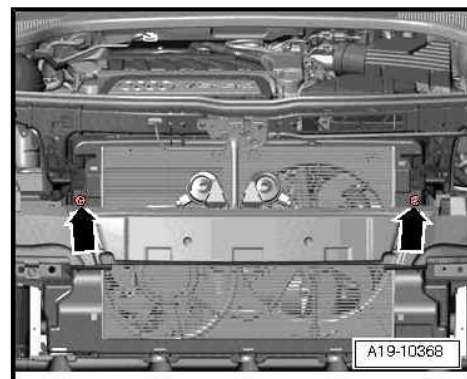
- Release hose clips -1 and 2- and detach coolant hoses (top left) from radiator.



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- Remove bolts -arrows-.
- Swivel top edge of radiator slightly to rear.
- Lift radiator, disengage it from bottom mounting points and press it to the rear.



Vehicles with air conditioner:



**WARNING**

*Risk of injury caused by refrigerant.*

- ◆ *The air conditioner refrigerant circuit must not be opened.*

- Remove bolts -arrows-.

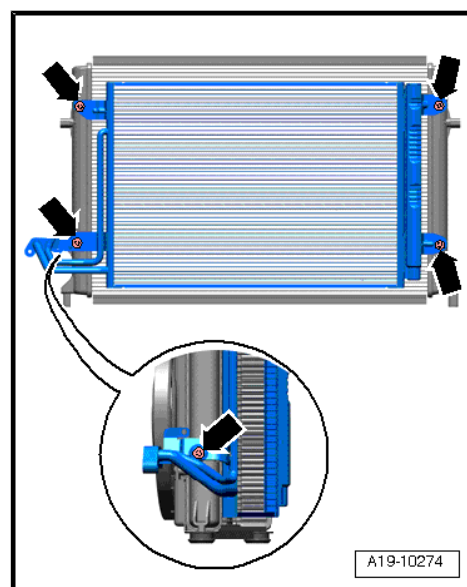


**Caution**

*Risk of damage to refrigerant lines and hoses*

- ◆ *Do NOT stretch, kink or bend refrigerant lines and hoses.*

- Move condenser to front and place in lock carrier, then secure with cable ties to prevent from dropping.



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#### All vehicles (continued):

- Release fasteners at water radiator for charge air cooling circuit -1- -arrows A-.
- Pull water radiator for charge air cooling circuit off radiator -2- -arrow B- and disengage -arrow C-.
- Remove both radiators.

#### Installing

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



#### Note

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

- Vehicles with air conditioning: Install condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .
- Install air duct ⇒ [page 232](#) .
- Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
- Install radiator cowl ⇒ [page 192](#) .



#### Note

*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

#### Tightening torques

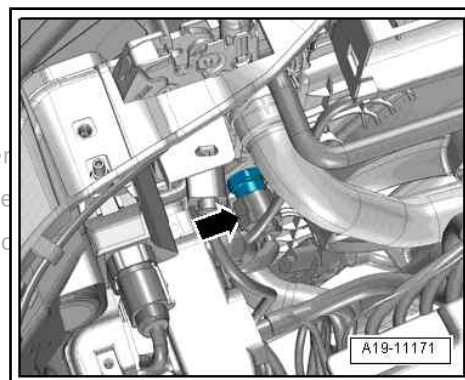
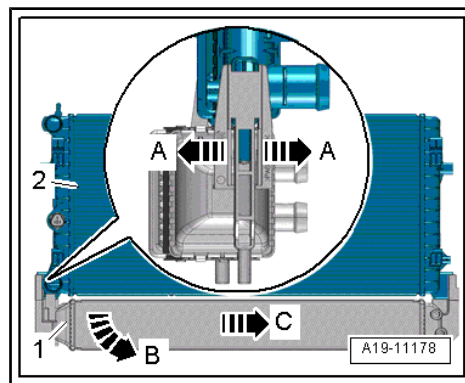
- ♦ ⇒ [“4.1 Exploded view - radiator/radiator fan”, page 187](#)

## 4.3 Removing and installing radiator cowl

#### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Unplug electrical connector -arrow- at radiator outlet coolant temperature sender - G83- .

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#### WARNING

*Risk of injury as the radiator fans may start up automatically.*

- ◆ *Unplug electrical connectors before performing work on radiator cowl.*

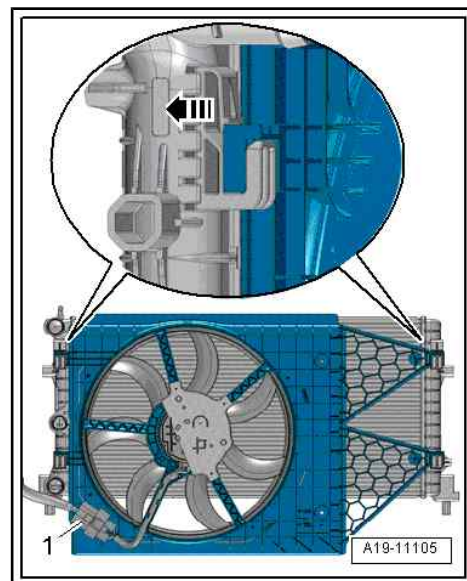
- Unplug electrical connector -1- for radiator fan at bottom of radiator cowl.
- Press locking tabs on left and right sides of radiator cowl together -arrow- and lift radiator cowl off radiator.

#### Installing

Installation is carried out in reverse sequence.

#### Tightening torques

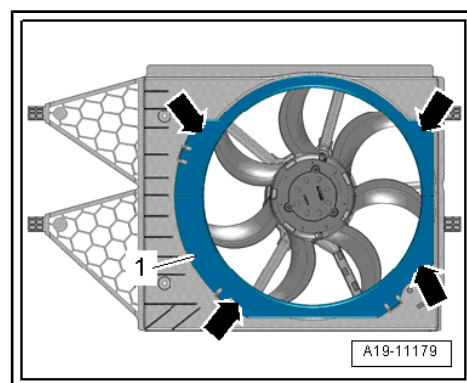
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



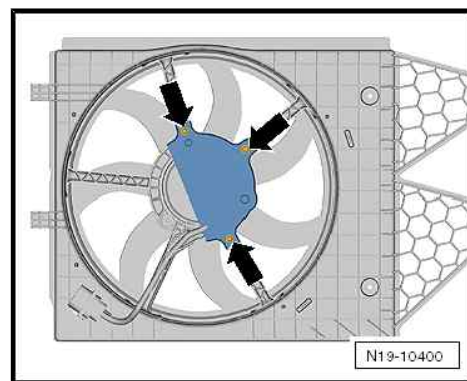
## 4.4 Removing and installing radiator fan

### Removing

- Remove radiator cowl ⇒ [page 192](#) .
- Press out clamping pins -arrows- and detach ring -1- of fan.



- Remove bolts -arrows- and detach heat shield.



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- Take electrical wiring -1- out of cable guide.
- Unscrew nuts -arrows- and detach radiator fan - V7- .

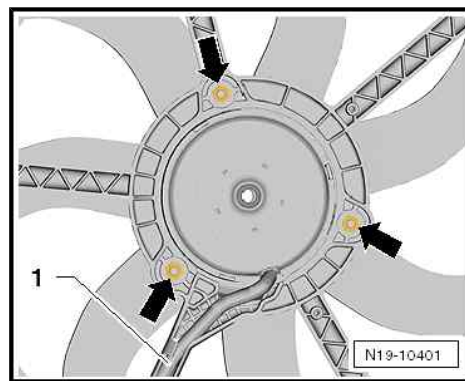
### Installing

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

- Install radiator cowl ⇒ [page 192](#) .

### Tightening torques

- ♦ ⇒ [“4.1 Exploded view - radiator/radiator fan”, page 187](#)



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## 21 – Turbocharging/supercharging

### 1 Turbocharger

⇒ [“1.1 Exploded view - turbocharger”, page 195](#)

⇒ [“1.2 Removing and installing turbocharger”, page 197](#)

⇒ [“1.3 Checking vacuum unit for turbocharger”, page 202](#)

⇒ [“1.4 Adjusting vacuum unit for turbocharger”, page 204](#)

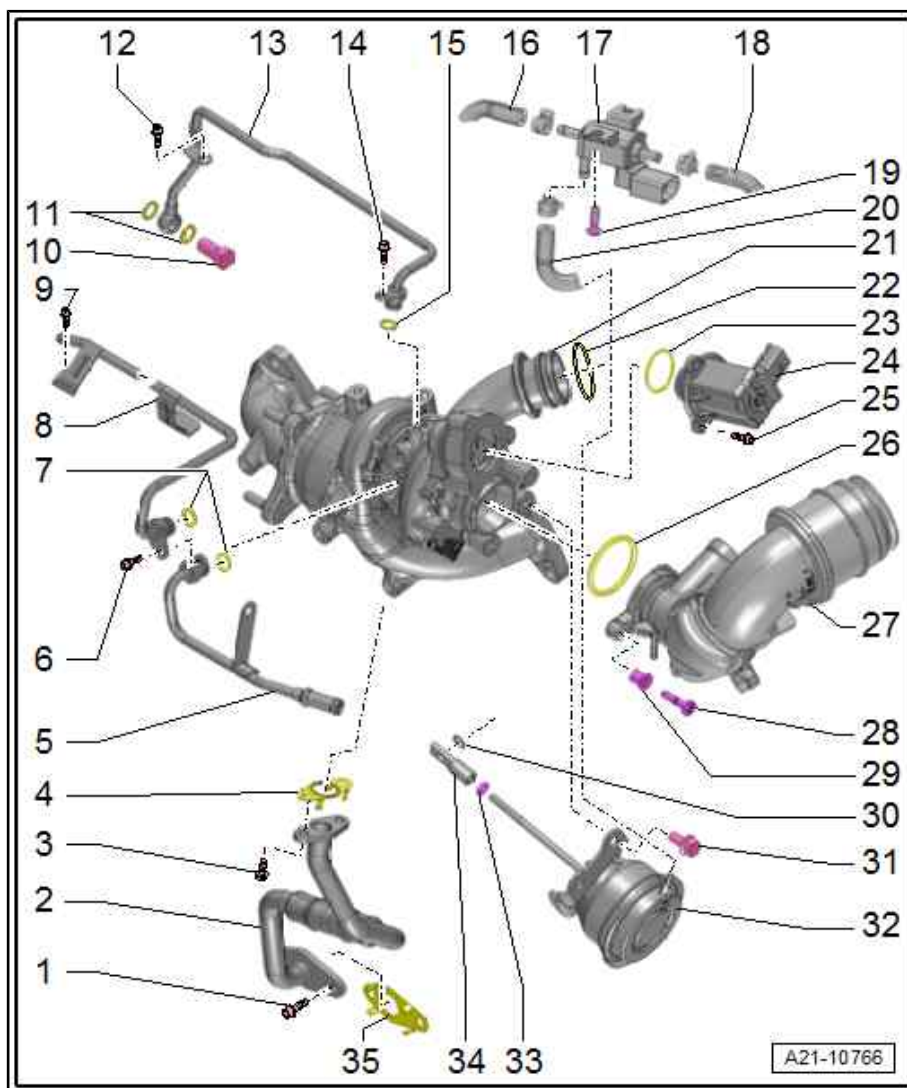
⇒ [“1.5 Renewing vacuum unit for turbocharger”, page 211](#)

⇒ [“1.6 Removing and installing compressor housing and turbine housing”, page 215](#)

#### 1.1 Exploded view - turbocharger

##### Part 1

- 1 - Bolt  
☐ 8 Nm
- 2 - Oil return line
- 3 - Bolt  
☐ 8 Nm
- 4 - Gasket  
☐ Renew
- 5 - Coolant supply line
- 6 - Bolt  
☐ 11 Nm
- 7 - O-rings  
☐ Renew
- 8 - Coolant return line
- 9 - Bolt  
☐ 8 Nm
- 10 - Banjo bolt  
☐ 20 Nm
- 11 - Seals  
☐ Renew
- 12 - Bolt  
☐ 8 Nm
- 13 - Oil supply line
- 14 - Bolt  
☐ 8 Nm
- 15 - O-ring  
☐ Renew





**16 - Connecting hose**

**17 - Charge pressure control solenoid valve - N75-**

**18 - Connecting hose**

**19 - Bolt**

- ☐ 10 Nm

**20 - Connecting hose**

**21 - Turbocharger**

- ☐ Combined with exhaust manifold
- ☐ Removing and installing ⇒ [page 197](#)

**22 - O-ring**

- ☐ Renew

**23 - O-ring**

- ☐ Renew

**24 - Turbocharger air recirculation valve - N249-**

**25 - Bolt**

- ☐ 11 Nm

**26 - O-ring**

- ☐ Renew

**27 - Intake connecting pipe**

**28 - Bolt**

- ☐ 10 Nm

**29 - Sleeve**

**30 - Retaining clip**

- ☐ Renew

**31 - Bolt**

- ☐ 20 Nm

**32 - Vacuum unit for turbocharger**

- ☐ Checking ⇒ [page 202](#)
- ☐ Removing and installing ⇒ [page 211](#)
- ☐ Adjusting ⇒ [page 204](#)

**33 - Lock nut**

- ☐ 10 Nm

**34 - Operating lever**

**35 - Gasket**

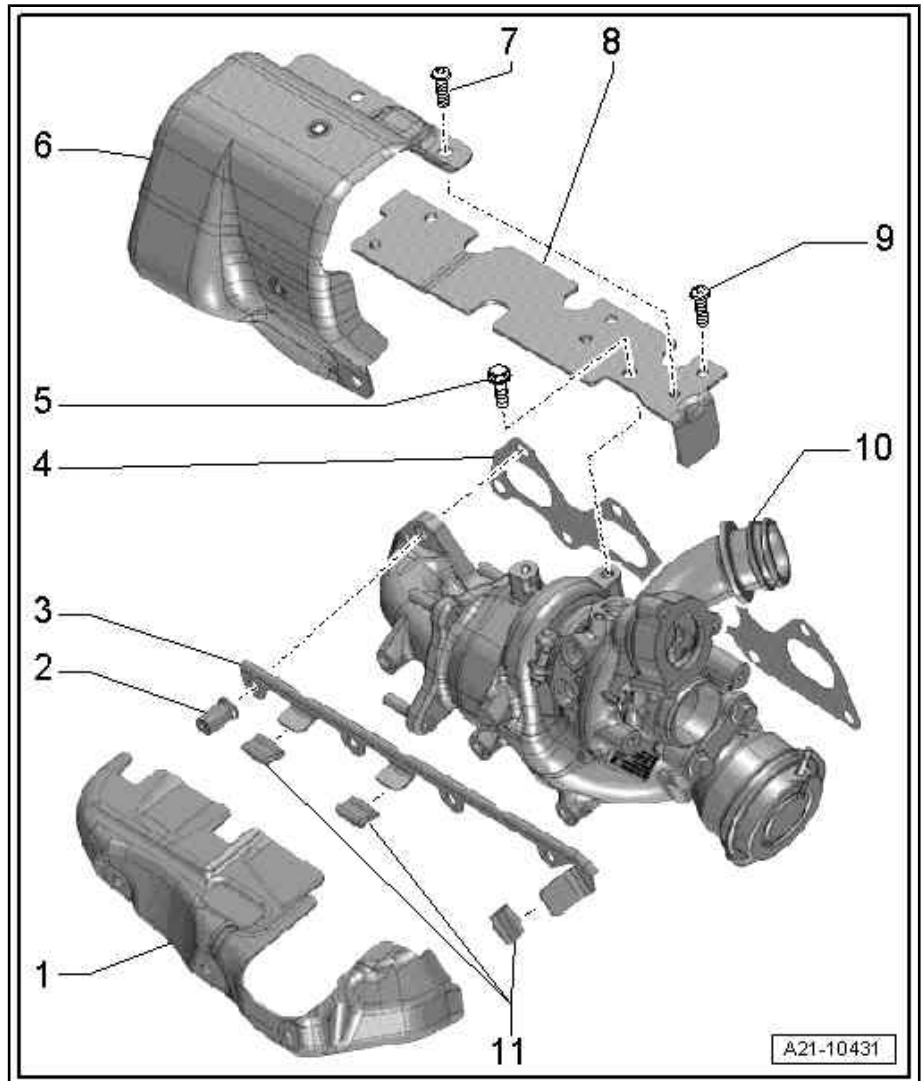
- ☐ Renew

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**Part 2**



- 1 - Heat shield
- 2 - Nut
  - ☐ Tightening torque and sequence ⇒ [page 197](#)
- 3 - Bracket
  - ☐ For heat shield
- 4 - Gasket
  - ☐ For exhaust manifold
  - ☐ Renew
- 5 - Bolt
  - ☐ 23 Nm
- 6 - Heat shield
- 7 - Bolt
  - ☐ 10 Nm
- 8 - Bracket
- 9 - Bolt
  - ☐ 10 Nm
- 10 - Turbocharger
  - ☐ Combined with exhaust manifold
  - ☐ Removing and installing ⇒ [page 197](#)
- 11 - Clip
  - ☐ 3x



## Turbocharger - tightening torque and sequence

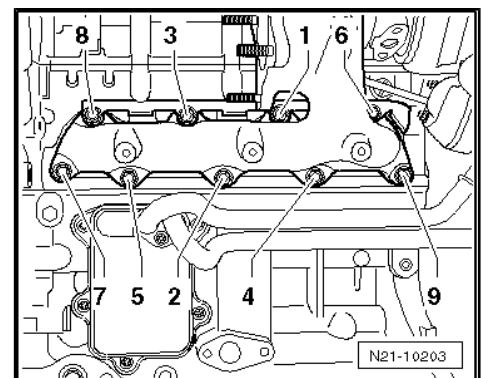


Note

*Renew nuts.*

– Tighten nuts in 2 stages in the sequence shown:

| Stage | Nuts      | Tightening torque                      |
|-------|-----------|----------------------------------------|
| 1.    | -1 ... 9- | Screw in by hand until contact is made |
| 2.    | -1 ... 9- | 16 Nm                                  |



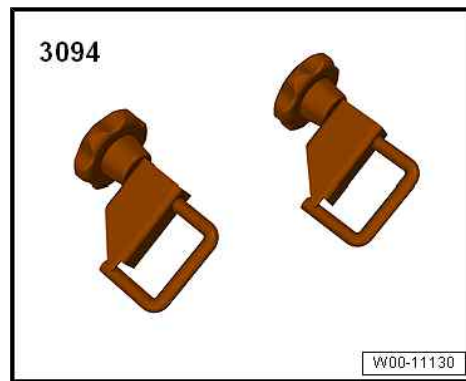
## 1.2 Removing and installing turbocharger

### Special tools and workshop equipment required

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- ◆ Hose clamps up to 25 mm - 3094-



- ◆ Hose clip pliers - VAS 6362-



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Bit XZN 10 - T10501-

#### Removing



#### Caution

*If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:*

- ◆ Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.
- ◆ Check the entire charge air system (including the charge air cooler) for foreign matter.
- ◆ If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.



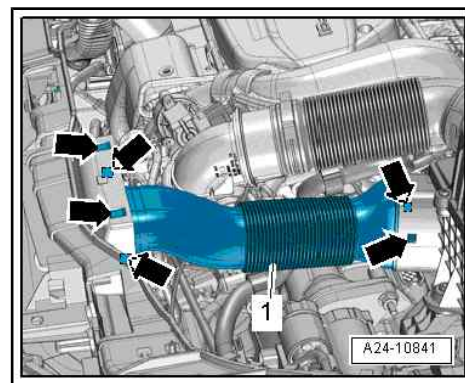
#### Note

Observe rules for cleanliness ⇒ [page 4](#) .

- Remove engine cover panel ⇒ [page 40](#) .
- Remove catalytic converter with centre silencer  
⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#) or  
remove catalytic converter  
⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#) .



- Release fasteners -arrows- and detach air duct -1-.

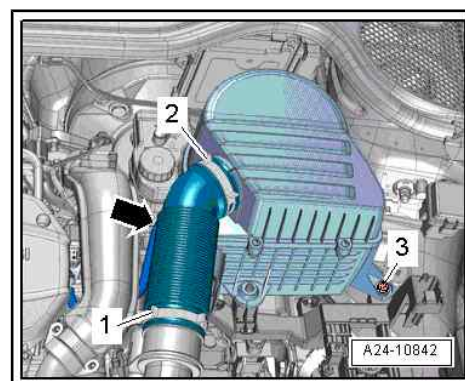


- Detach vacuum hose -arrow- from air hose.
- Release hose clips -1 and 2- and remove air hose.

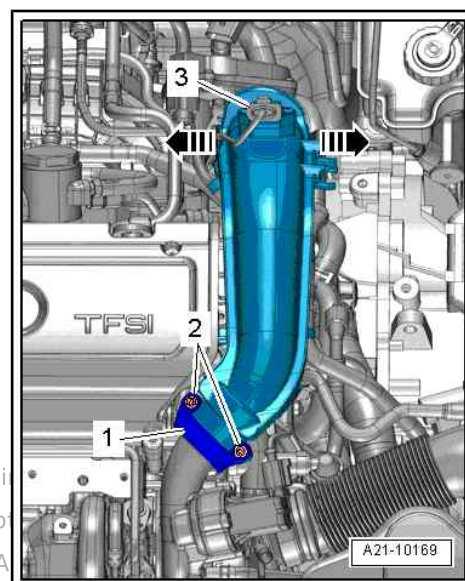


#### Note

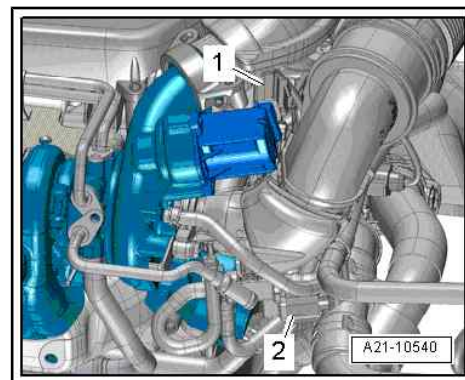
*Disregard -item 3-.*



- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe.



- Unplug electrical connector -1- on turbocharger air recirculation valve - N249- and -2- on charge pressure control solenoid valve - N75- .



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- Remove bolt -4- and detach crankcase breather hose from turbocharger -arrow-.



**Note**

*Disregard -items 1, 2, 3-.*



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- Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.
- Remove bolts -1, 3, 4, 5-.



**Note**

*Place a cloth underneath to catch escaping coolant.*

- Disconnect coolant lines from turbocharger and move clear to one side.



**Note**

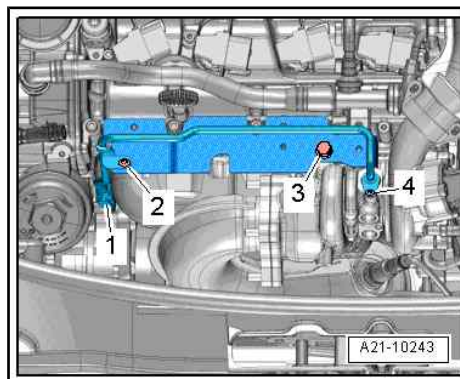
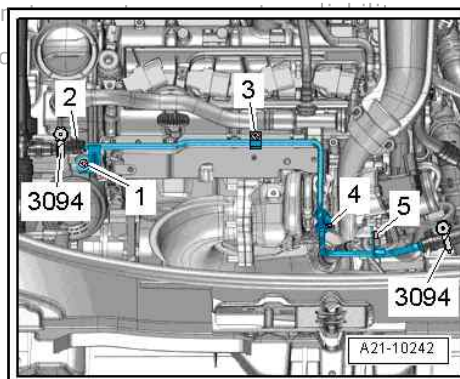
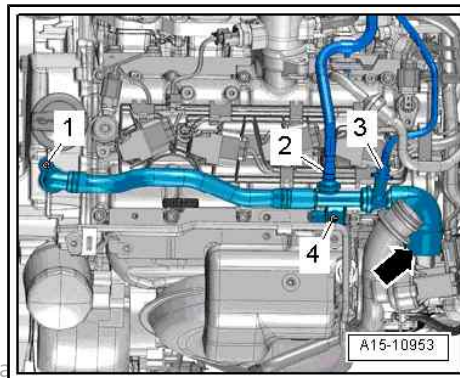
*Disregard -item 2-.*

- Remove banjo bolt -1- and bolts -2, 3- and detach oil supply line and retaining plate from turbocharger.
- Detach retaining plate.



**Note**

- ♦ *Do not attempt to bend oil supply line to a different shape.*
- ♦ *Disregard -item 4-.*





- Remove bolts -2- for oil return pipe (top).

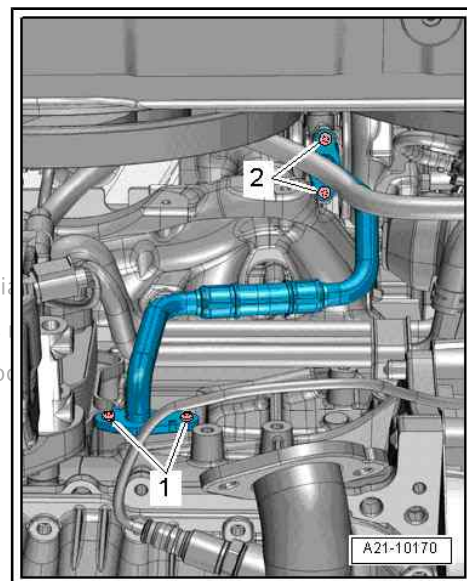


**Note**

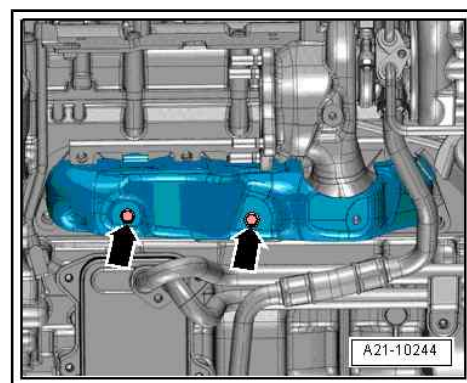
*Disregard -item 1-.*



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- Remove bolts -arrows- and detach heat shield.





- Remove nuts -arrows- and detach bracket -1- and turbocharger with exhaust manifold.



#### Note

Seal off open pipes/lines and connections on turbocharger with clean plugs or protective caps to prevent dirt from entering.

#### Installing

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



#### Note

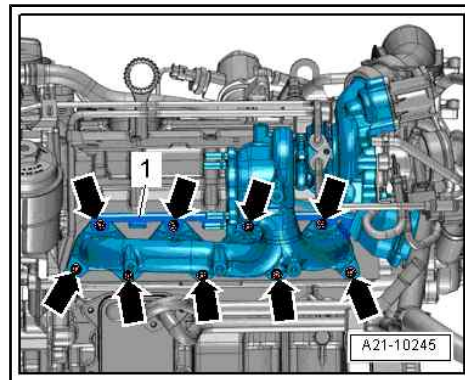
- ♦ Renew seals, gaskets, O-rings and self-locking nuts.
  - ♦ Fill turbocharger with engine oil at connection for oil supply line.
  - ♦ Hose connections and hoses for charge air system must be free of oil and grease prior to fitting.
  - ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue*.
  - ♦ After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.
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- Install air pipe ⇒ [page 195](#).
  - Install air hose ⇒ [page 232](#).
  - Install catalytic converter with centre silencer  
⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#) or  
install catalytic converter  
⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#).
  - Install engine cover panel ⇒ [page 40](#).
  - Check oil level ⇒ Maintenance ; Booklet 819.
  - Check coolant level ⇒ [page 168](#).

#### Tightening torques

- ♦ ⇒ [“1.1 Exploded view - turbocharger”, page 195](#)
- ♦ ⇒ [“2.1 Exploded view - charge air system”, page 220](#)
- ♦ ⇒ [Fig. “Turbocharger - tightening torque and sequence”, page 197](#)

### 1.3 Checking vacuum unit for turbocharger

Special tools and workshop equipment required





◆ Hand vacuum pump - VAS 6213-

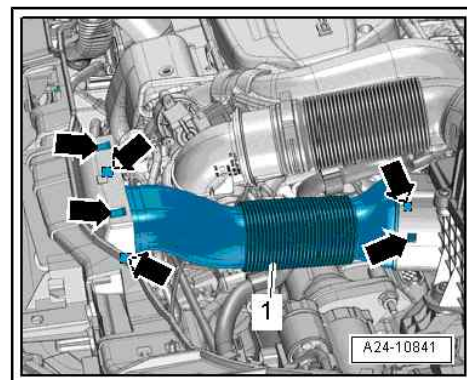


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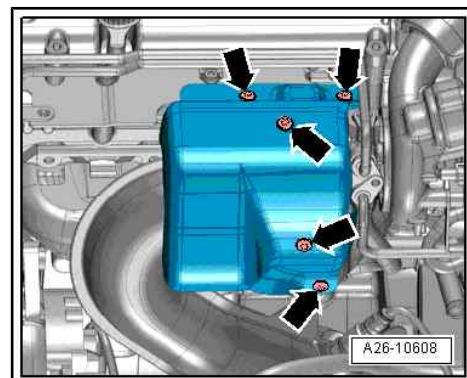


**Procedure**

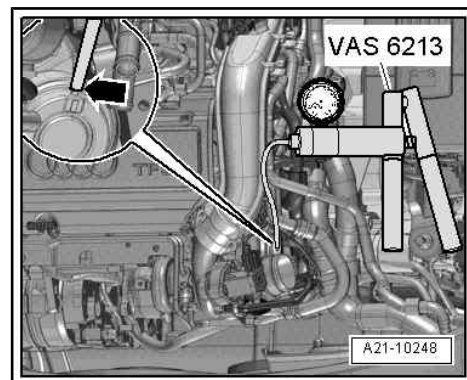
- Hose from turbocharger via charge pressure solenoid valve - N75- to vacuum unit must be airtight and unobstructed.
- Charge pressure control solenoid valve - N75- OK.
- Release fasteners -arrows- and detach air duct -1-.



- Remove bolts -arrows- and detach heat shield for turbocharger.



- Disconnect vacuum hose -arrow- at vacuum unit on turbocharger and attach hand vacuum pump - VAS 6213- instead.





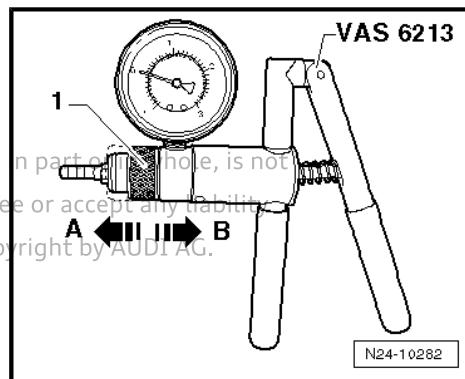
- Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -B- to select “pressure”.
- Operate hand vacuum pump - VAS 6213- several times.



### Caution

**Risk of damage to vacuum unit on account of excessive pressure.**

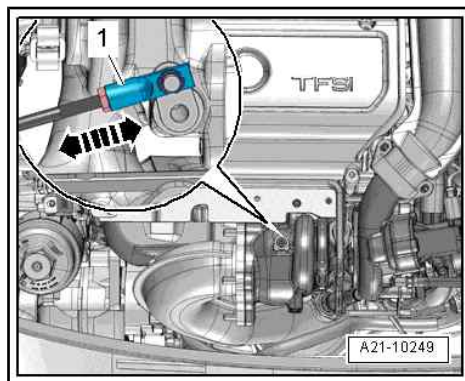
- ◆ **The pressure must not exceed 800 mbar.**



### Note

*Illustration shows installation position with turbocharger removed.*

- Observe operating rod -1- of vacuum unit for turbocharger.
- The operating rod should move at a pressure of approx. 300 mbar and above.
- The operating rod should be at its end position at a pressure of approx. 800 mbar.
- Vent hand vacuum pump - VAS 6213- -arrow A-.
- The operating rod should move in the opposite direction.



### Note

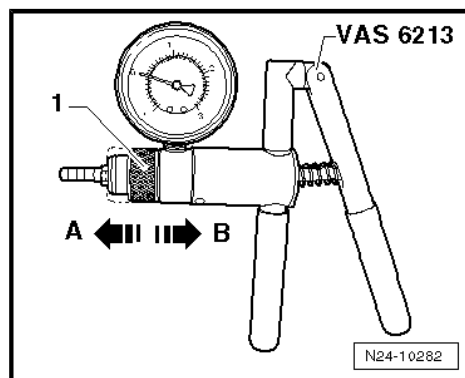
*Observe the movement of the operating rod over the complete range of travel. It should move steadily and smoothly.*

### Assembling

Assemble in reverse order.

### Tightening torques

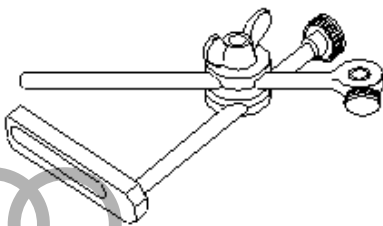
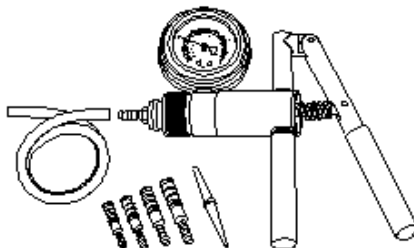
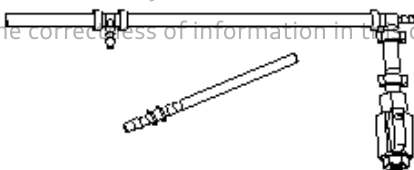
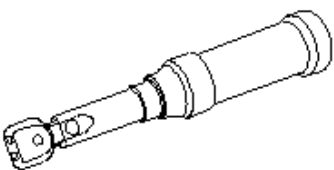
- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 195](#)
- ◆ ⇒ [“2.1 Exploded view - charge air system”, page 220](#)



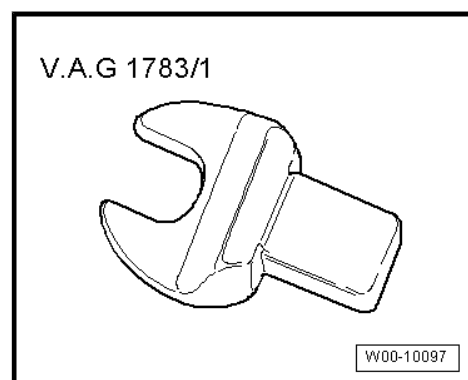
## 1.4 Adjusting vacuum unit for turbocharger



# Special tools and workshop equipment required

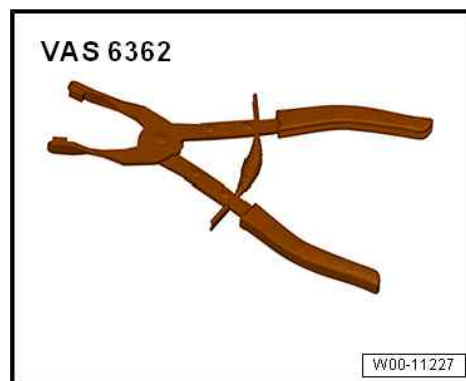
|                                                                                                           |                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <p><b>VW 387</b></p>     | <p><b>VAS 6213</b></p>                       |
| <p><b>VAS 6342</b></p>   | <p><b>V.A.G 1397 A</b></p>                   |
| <p><b>VAS 6341</b></p>  | <p><b>V.A.G 1783</b></p>  <p>G21-10000</p> |

- ◆ 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-part - VAS 6341-
- ◆ Torque wrench - V.A.G 1783-
- ◆ Open end spanner insert (10 mm) - V.A.G 1783/1-



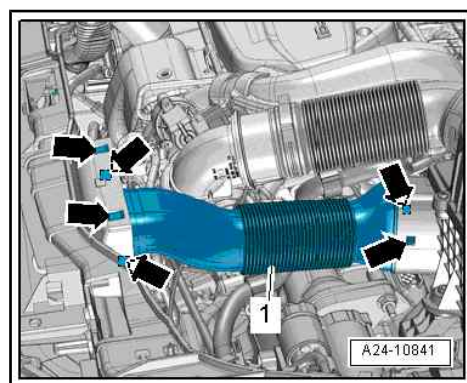


- ◆ Hose clip pliers - VAS 6362-



### Procedure

- Remove engine cover panel ➔ [page 40](#) .
- Release fasteners -arrows- and detach air duct -1-.

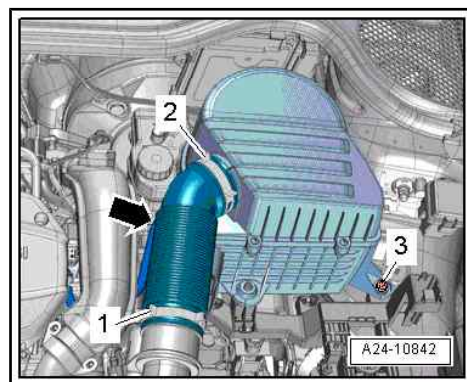


- Detach vacuum hose -arrow- from air hose.
- Release hose clips -1 and 2- and remove air hose.

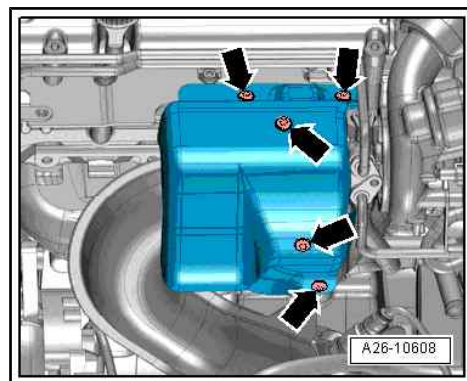


### Note

*Disregard -item 3-.*



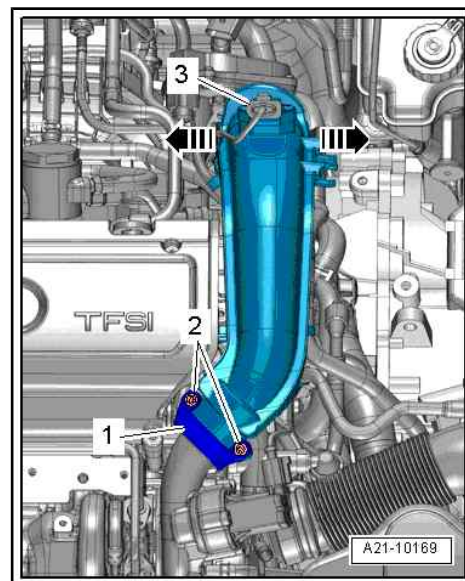
- Remove bolts -arrows- and detach heat shield for turbocharger.



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- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe.

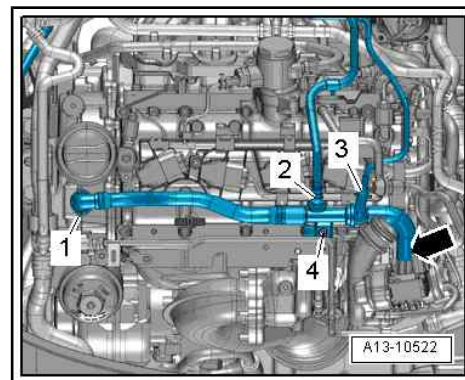


- Remove bolt -4-, detach crankcase breather hose from turbocharger -arrow- and move clear to one side.



**Note**

*Disregard -items 1, 2, 3-.*



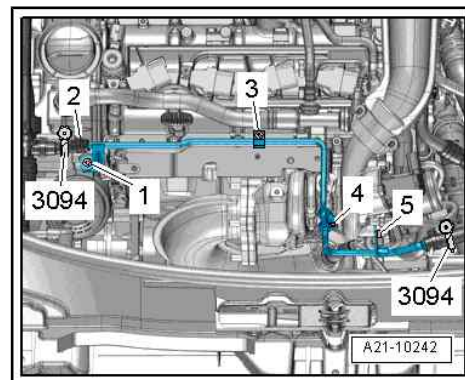
- Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.
- Remove bolts -1, 3, 4, 5-.



**Note**

*Place a cloth underneath to catch escaping coolant.*

- Disconnect coolant lines from turbocharger and move clear to one side.



**Note**

*Disregard -item 2-.*





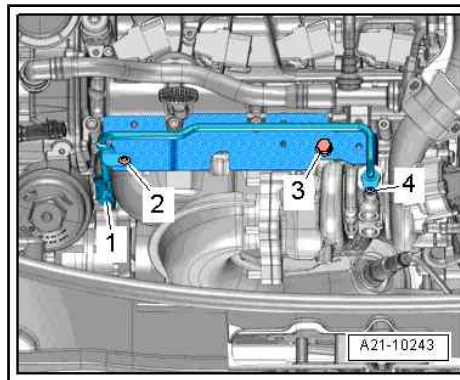
- Remove bolts -2- and -3- and take off retaining plate.



#### Note

Disregard items -1 and 4-.

- Remove catalytic converter with centre silencer  
⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#) or  
remove catalytic converter  
⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#) .

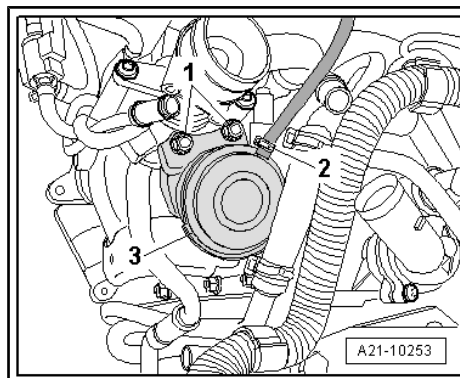


- Disconnect hose -2- at vacuum unit -3- for turbocharger.

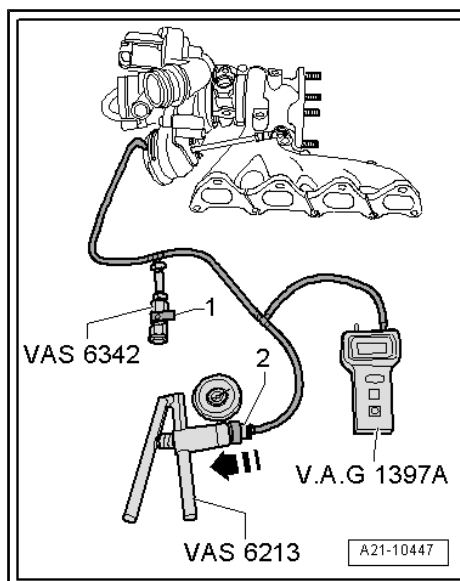


#### Note

Disregard -item 1-.

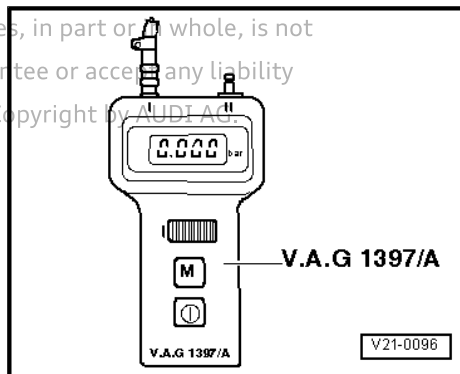


- Close lever -1- on pressure control valve - VAS 6342- .
- Set up measuring equipment and testers as shown in illustration and connect to connection “II” of turbocharger tester - V.A.G 1397A- and to vacuum unit for turbocharger.
- Move adjuster ring -2- on hand vacuum pump - VAS 6213- to select “pressure” -arrow-.



- Switch on turbocharger tester - V.A.G 1397A- and set sliding switch to position “II”.

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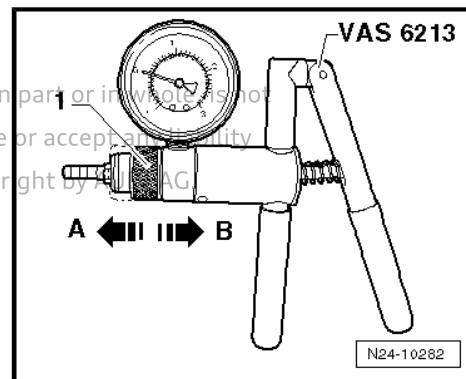
- Operate hand vacuum pump - VAS 6213- several times until the pressure is approx. 800 mbar.



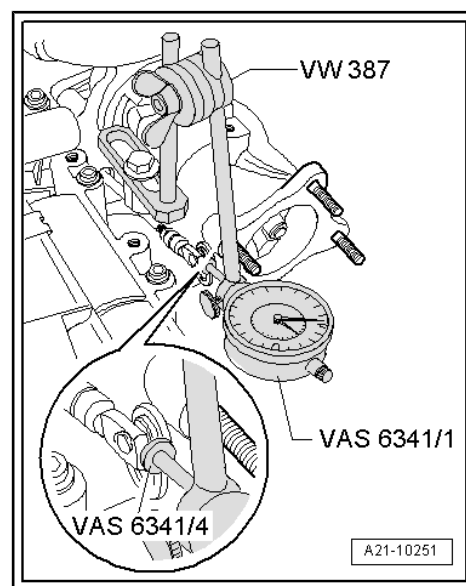
### Caution

***Risk of damage to vacuum unit on account of excessive pressure.***

- ◆ ***The pressure must not exceed 800 mbar.***



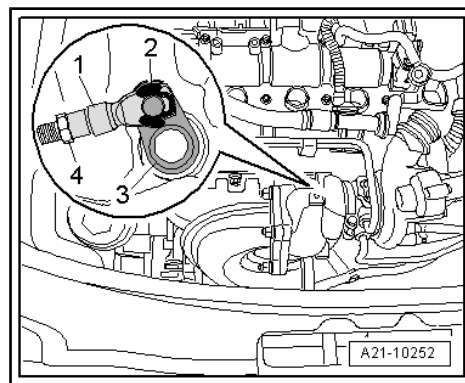
- Vent hand vacuum pump - VAS 6213- -arrow A- to make sure the linkage of the charge pressure control in the turbocharger is free to move.
- Repeat procedure 5 times.
- Attach dial gauge -VAS 6341/1- with flat probe -VAS 6341/4- to universal dial gauge bracket - VW 387- .
- Secure universal dial gauge bracket - VW 387- to turbocharger as shown in illustration.
- 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".
- Operate hand vacuum pump - VAS 6213- several times until the pressure displayed on turbocharger tester - V.A.G 1397A- is approx. 385 mbar.
- Specification on dial gauge -VAS 6341/1- : 1 mm travel





## Note

- ◆ If reading does not match specification, loosen lock nut -4-.
- ◆ Lever off retaining clip -2- and detach threaded collar -1- from pin of operating lever -3-.
- ◆ Turn threaded collar on operating rod until specification is met. Fit threaded collar onto pin of operating lever each time adjustment is checked.
- ◆ Secure threaded collar with retaining clip -2- onto pin of operating lever and tighten lock nut -4-.



## Checking adjustment of vacuum unit

- With pressure at 0 bar, set dial gauge -VAS 6341/1- to 1 mm preload.

### Measurement 1:

- Operate hand vacuum pump - VAS 6213- several times until the pressure displayed on turbocharger tester - V.A.G 1397A- is approx. 750 ... 800 mbar.
- Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 375 mbar.
- Read off and note travel indicated on dial gauge - VAS 6341/1- .
- Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 0 mbar.
- Operate hand vacuum pump - VAS 6213- several times until the pressure displayed on turbocharger tester - V.A.G 1397A- is approx. 375 mbar.
- Read off and note travel indicated on dial gauge - VAS 6341/1- .
- Determine average value: add values “1” and “2” together and divide by 2.
- Specification: 1 mm

### Measurement 2:

- Operate hand vacuum pump - VAS 6213- several times until the pressure displayed on turbocharger tester - V.A.G 1397A- is approx. 750 ... 800 mbar.
- Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 475 mbar.
- Read off and note travel indicated on dial gauge - VAS 6341/1- .
- Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 0 mbar.
- Set scale of dial gauge -VAS 6341/1- to “0”.
- Operate hand vacuum pump - VAS 6213- several times until the pressure displayed on turbocharger tester - V.A.G 1397A- is approx. 475 mbar.
- Read off and note travel indicated on dial gauge - VAS 6341/1- .
- Determine average value: add values “1” and “2” together and divide by 2.
- Specification: 5 mm

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- Repeat adjustment procedure if readings do not match specifications ⇒ [page 210](#) .

### Assembling

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



#### Note

- ◆ *Fit new O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Install catalytic converter with centre silencer  
⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#) or  
install catalytic converter  
⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#) .
- Install air pipe ⇒ [page 195](#) .
- Install air hose ⇒ [page 232](#) .
- Install engine cover panel ⇒ [page 40](#) .



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*Do not reuse coolant.*

- Fill up with coolant ⇒ [page 164](#) .

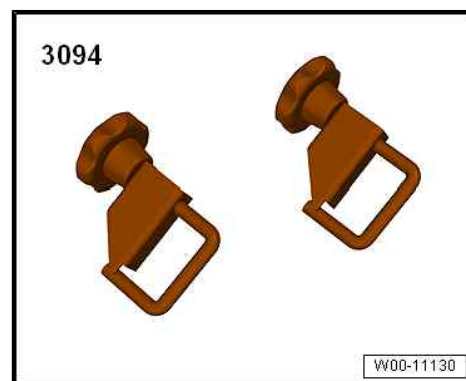
### Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 195](#)
- ◆ ⇒ [“2.1 Exploded view - charge air system”, page 220](#)

## 1.5 Renewing vacuum unit for turbocharger

### Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm - 3094-





◆ Drip tray for workshop hoist - VAS 6208-

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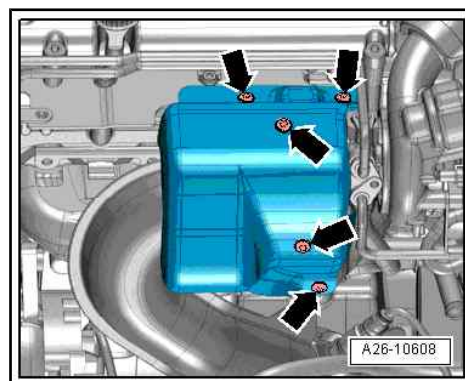


◆ Hose clip pliers - VAS 6362-

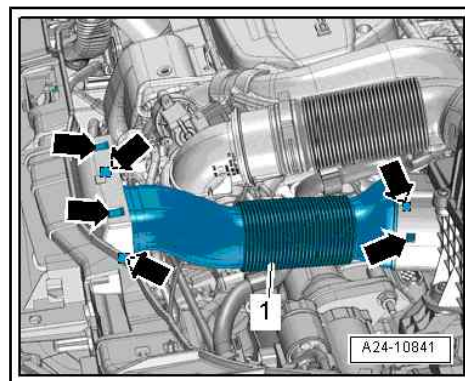


**Removing**

- Remove engine cover panel ⇒ [page 40](#) .
- Remove bolts -arrows- and detach heat shield for turbocharger.



- Release fasteners -arrows- and detach air duct -1-.



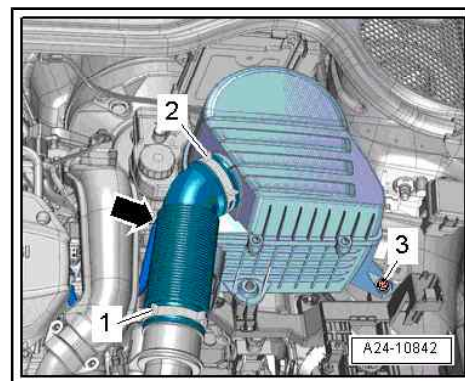


- Detach vacuum hose -arrow- from air hose.
- Release hose clips -1 and 2- and remove air hose.

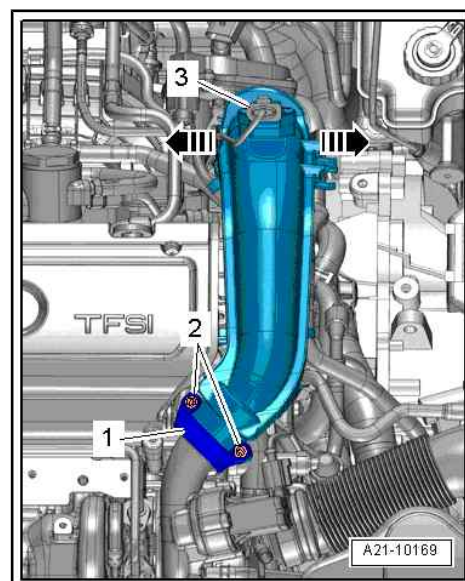


#### Note

*Disregard -item 3-.*



- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe.

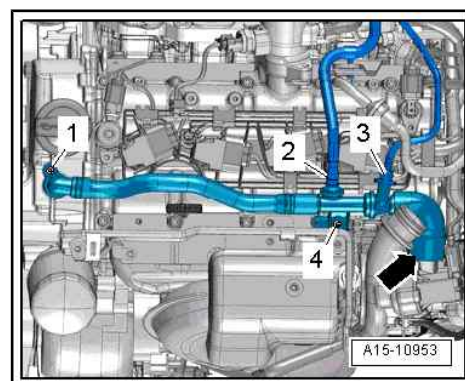


- Remove bolt -4-, detach crankcase breather hose from turbo-charger -arrow- and move clear to one side.



#### Note

*Disregard -items 1, 2, 3-.*



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- Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.
- Remove bolts -1, 3, 4, 5-.



**Note**

*Place a cloth underneath to catch escaping coolant.*

- Disconnect coolant lines from turbocharger and move clear to one side.



**Note**

*Disregard -item 2-.*

- Remove bolts -2- and -3- and take off retaining plate.



**Note**

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*Disregard items -1 and 4-.*

with respect to the correctness of information in this document.

- Remove bolts -3 and 4-, detach connection and press to the side.



**Note**

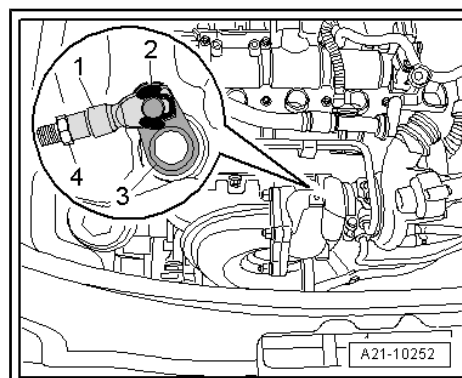
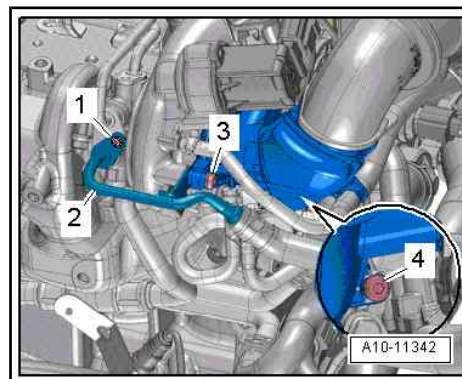
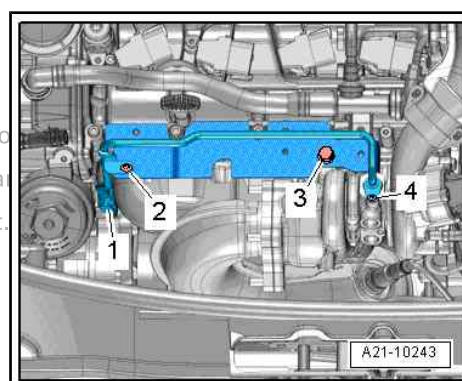
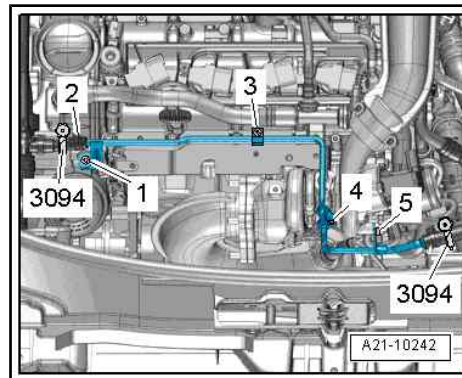
*Disregard items -1 and 2-.*

- Lever off retaining clip -2- and detach threaded collar -1- on operating rod from pin of operating lever -3-.



**Note**

*Disregard -item 4-.*





- Disconnect hose -2- at vacuum unit for turbocharger.
- Remove bolts -1- and detach vacuum unit -3- for turbocharger.

### Installing

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



#### Note

- ◆ Check correct installation of the vacuum unit and its operating rod.
- ◆ Renew retaining clip for operating rod.

- Adjust vacuum unit for turbocharger ➔ [page 204](#) .

### Tightening torques

- ◆ ➔ ["1.1 Exploded view - turbocharger", page 195](#)

## 1.6 Removing and installing compressor housing and turbine housing

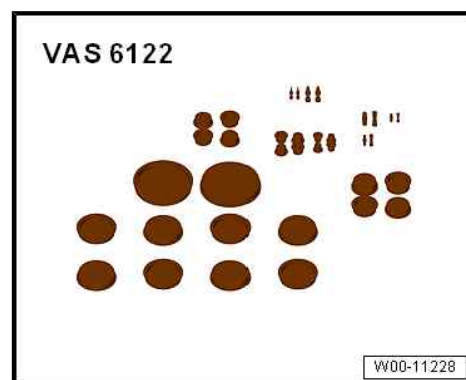
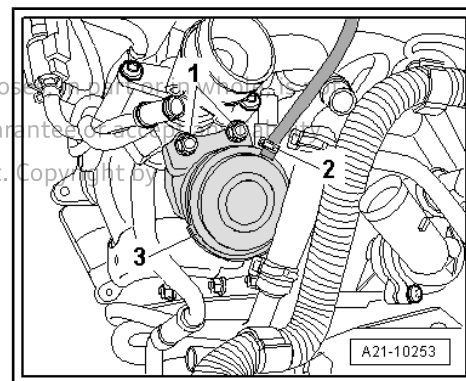


#### Note

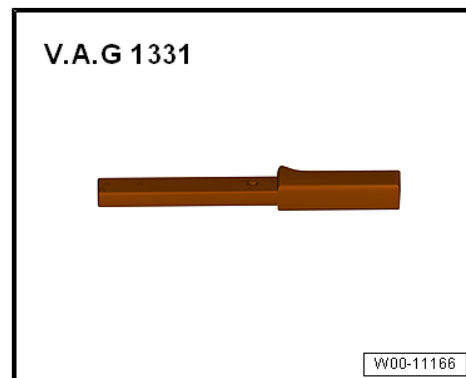
A repair kit is required for this repair procedure ➔ *Electronic parts catalogue (ETKA)* .

### Special tools and workshop equipment required

- ◆ Engine bung set - VAS 6122-

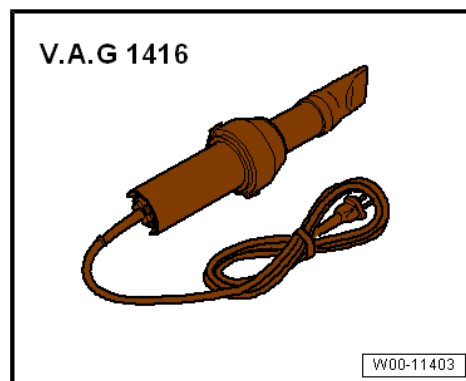


- ◆ Torque wrench - V.A.G 1331-



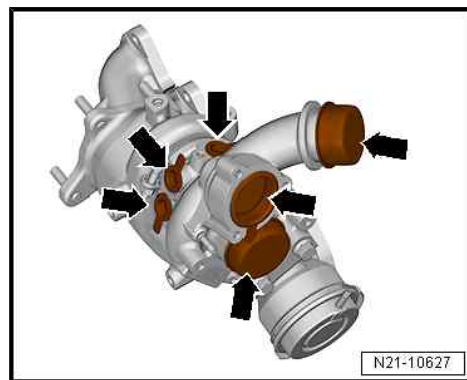


◆ Hot air blower - V.A.G 1416-



### Removing

- Remove turbocharger ➔ [page 197](#) .
- Check vacuum unit for turbocharger ➔ [page 202](#) .
- Seal all openings on turbocharger -arrows- using corresponding plugs from engine bung set - VAS 6122- .

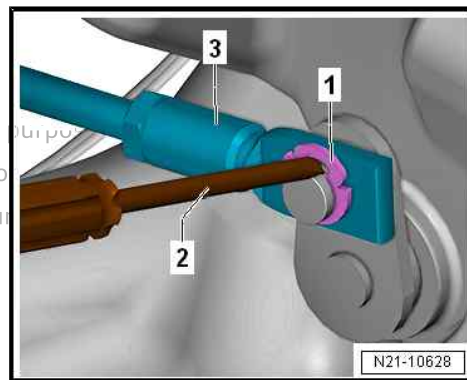


- Use screwdriver -2- to remove circlip -1-.
- Pull threaded rod -3- off pin.



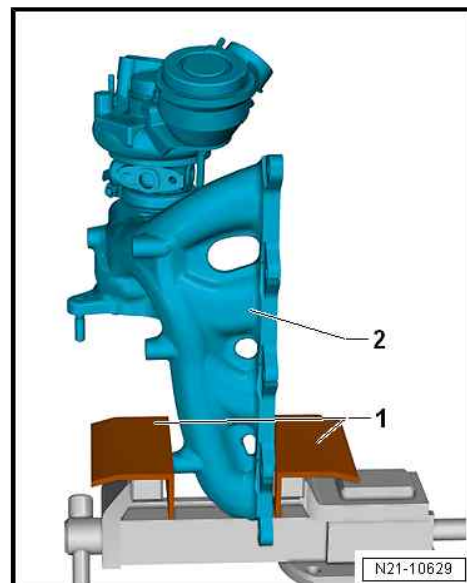
### Caution

*The vice must be fitted with aluminium jaw covers -1- in order to prevent damage to the exhaust manifold.*





- Clamp exhaust manifold -2- in vice, as shown.



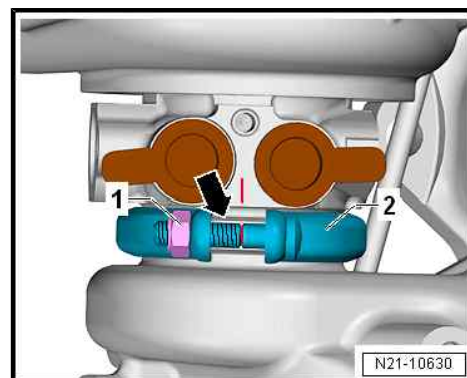
- Use a waterproof pen to mark the position of the bolt -arrow- in relation to the compressor housing.
- Unscrew securing nut -1- for clamp -2- and detach clamp.



#### Caution

*If the turbine housing cannot be readily detached from the compressor housing after removing the clamp -2-:*

- *Do not use a lever tool!*
- *Hot air blower - V.A.G 1416- must be used in order to loosen the connection without damaging the centring pin on the turbine housing.*



If deposits are preventing compressor housing from being readily separated from turbine housing:

- Heat full circumference of joint between compressor housing and turbine housing evenly for approx. 2 minutes using hot air blower - V.A.G 1416- .
- Carefully lift off compressor housing.

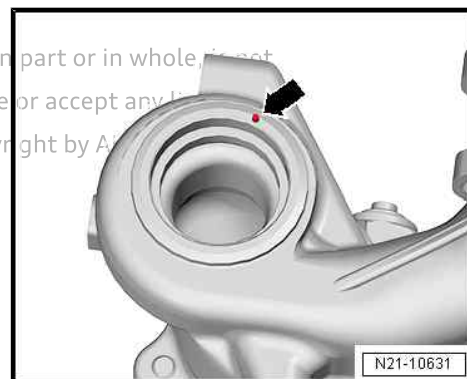
If centring pin -arrow- is sheared off or damaged, turbocharger must be renewed together with exhaust manifold.



#### Caution

*Place the compressor housing down on the workbench as shown in illustration to prevent damage to the turbine.*

*Do not use compressed air to clean the compressor housing.*





- Clean all round compressor housing -arrows-, e.g. with brake cleaner and sandpaper (220 ... 1000 grain size).
- Take exhaust manifold out of vice.

#### Installing



#### Caution

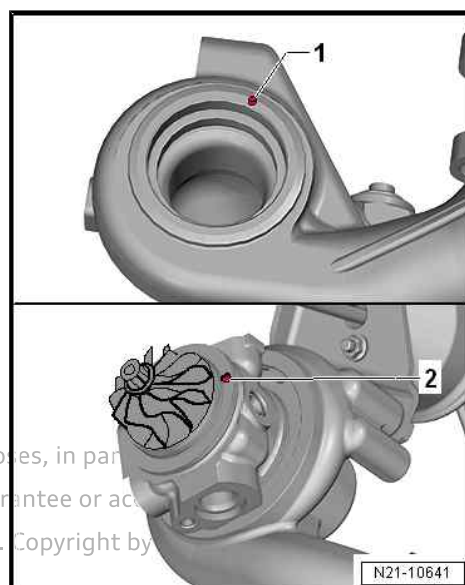
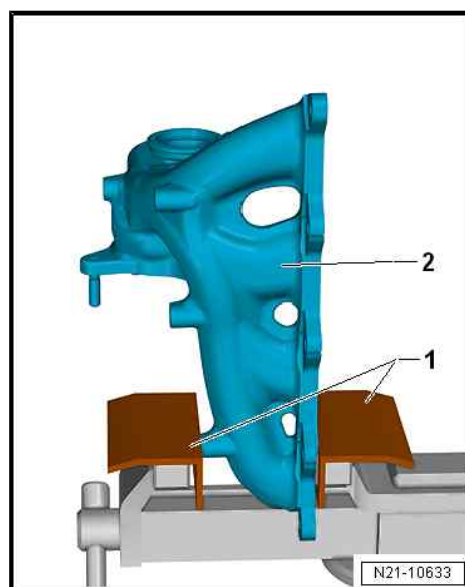
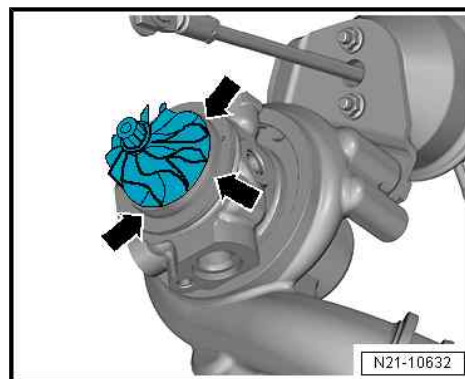
*The vice must be fitted with aluminium jaw covers -1- in order to prevent damage to the exhaust manifold.*

- Clamp new exhaust manifold -2- in vice, as shown.
- Fit compressor housing onto turbine housing.

Centring pin -1- on turbine housing must engage in hole -2- on compressor housing.



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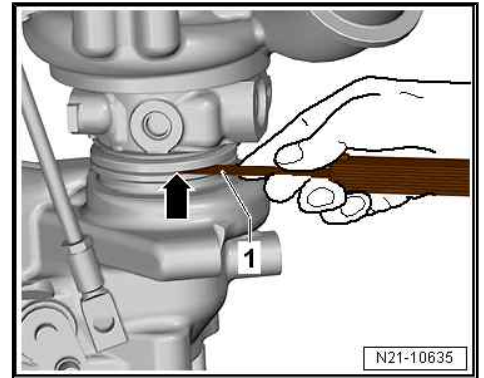




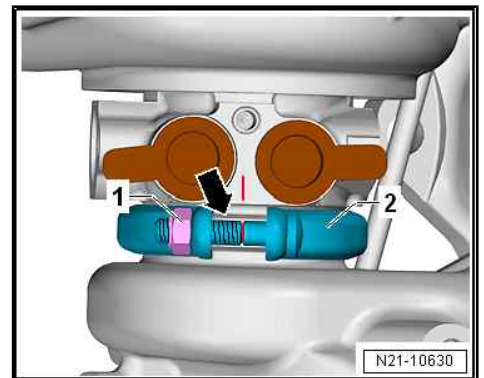
- Use a gauge -1- to measure gap -arrow- between compressor housing and turbine housing.
- Dimension should be  $\leq 1.2$  mm around complete circumference.
- Fit new clamp around both flanges.

**i Note**

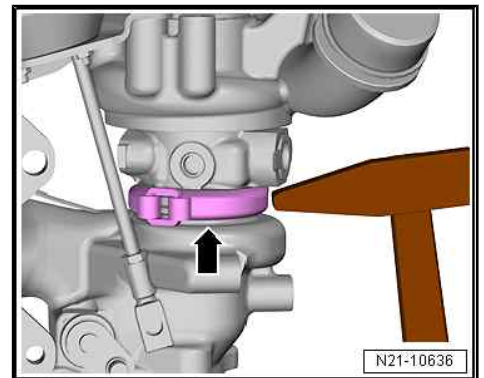
- ◆ *The stud may become slightly distorted when the securing nut is tightened to 9 Nm. This is normal and non-critical.*
- ◆ *For this reason, a new clamp with a new stud must always be used during installation.*



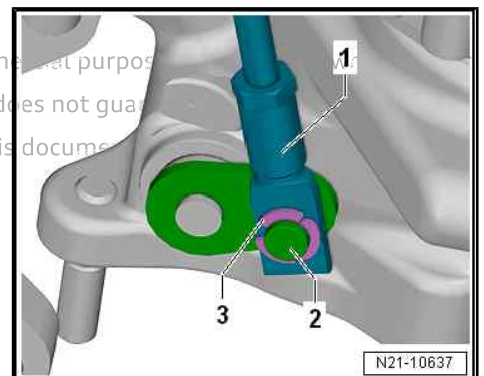
- Adjust clamp so that centre of stud is aligned with marking -arrow- on compressor housing.
- Tighten securing nut -1- of clamp -2- to 9 Nm.



- Using a hammer, knock lightly on alternate sides of clamp -arrow-.
- This will ensure that the clamp is correctly seated.
- Then tighten securing nut to 9 Nm again.



- Slide threaded rod -1- of vacuum unit onto pin -2-.
- Slide new circlip -3- into groove on pin.
- Adjust vacuum unit for turbocharger ➤ [page 204](#).
- Install turbocharger ➤ [page 197](#).





## 2 Charge air system

⇒ ["2.1 Exploded view - charge air system", page 220](#)

⇒ ["2.2 Removing and installing charge air cooler", page 221](#)

⇒ ["2.3 Removing and installing charge pressure sender G31 / intake air temperature sender 2 G299", page 223](#)

⇒ ["2.4 Checking charge air system for leaks", page 223](#)

### 2.1 Exploded view - charge air system

#### 1 - Intake manifold (top section)

- ❑ Removing and installing  
⇒ [page 236](#)

#### 2 - Seal

- ❑ Renew

#### 3 - Throttle valve module - J338-

- ❑ Removing and installing  
⇒ [page 239](#)

#### 4 - Securing clip

#### 5 - Bolt

- ❑ 7 Nm

#### 6 - O-ring

- ❑ Renew

#### 7 - Air pipe

#### 8 - Retaining bracket

#### 9 - Bolt

- ❑ 7 Nm

#### 10 - O-ring

- ❑ Renew

#### 11 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

- ❑ Removing and installing  
⇒ [page 223](#)

#### 12 - Bolt

- ❑ 5 Nm

#### 13 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

#### 14 - Bolt

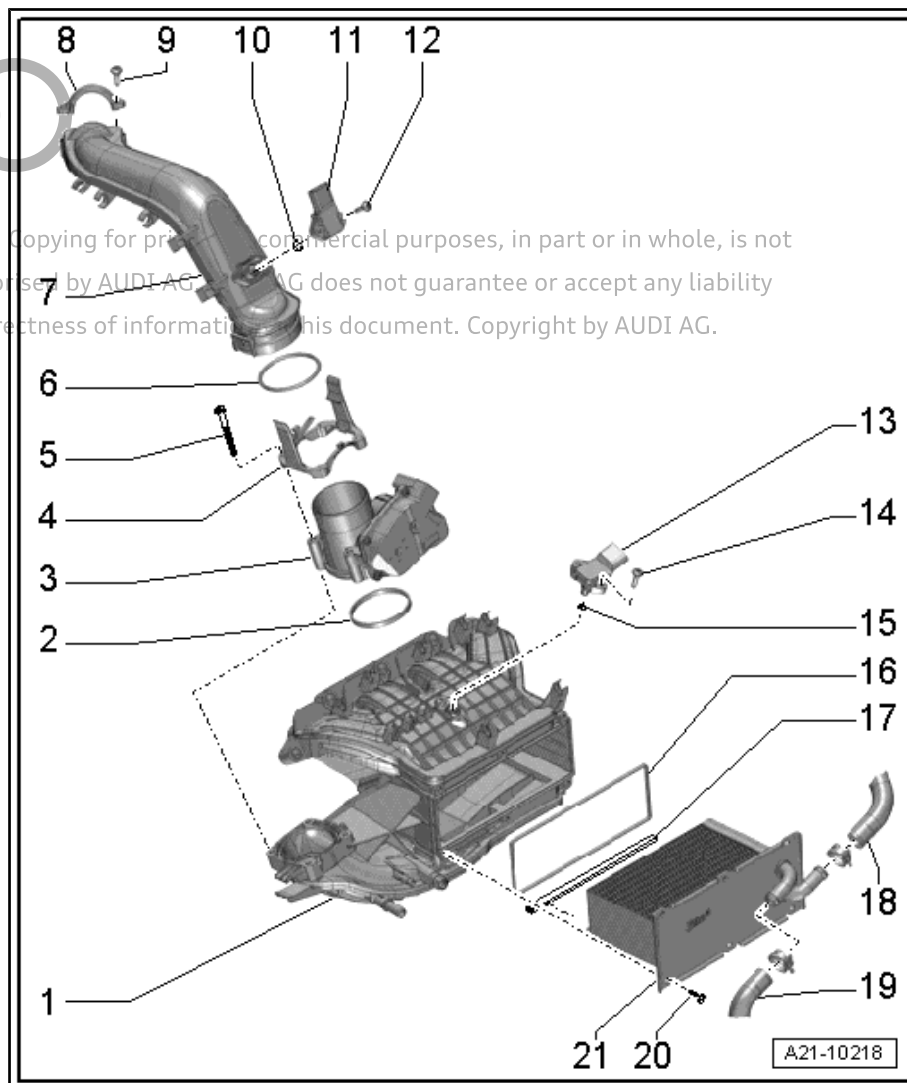
- ❑ 5 Nm

#### 15 - O-ring

- ❑ Renew

#### 16 - Gasket

- ❑ Renew





17 - Sealing lip

18 - Coolant return hose

19 - Coolant supply hose

20 - Bolt

- ❑ Tightening torque and sequence ⇒ [page 221](#)

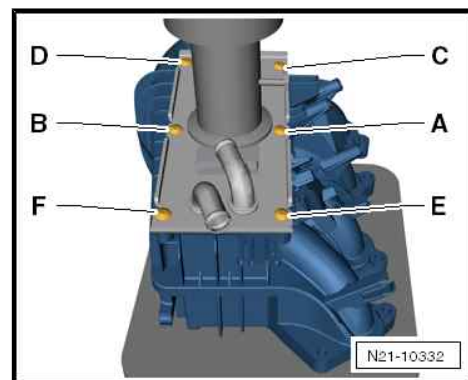
21 - Charge air cooler

- ❑ Removing and installing ⇒ [page 221](#)

### Charge air cooler - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

| Stage | Bolts     | Tightening torque                      |
|-------|-----------|----------------------------------------|
| 1.    | -A ... F- | Screw in by hand until contact is made |
| 2.    | -A ... F- | 7 Nm                                   |



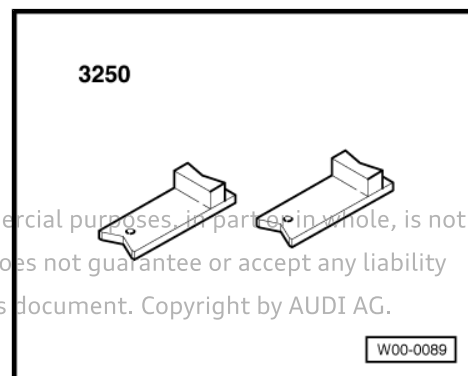
## 2.2 Removing and installing charge air cooler

### Special tools and workshop equipment required

- ◆ Support - 3250-



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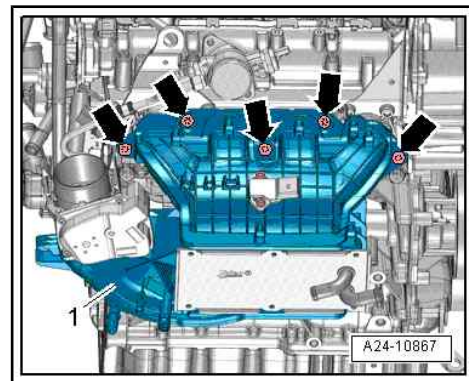
### Removing



Note

Observe rules for cleanliness ⇒ [page 4](#) .

- Remove intake manifold (top section) ⇒ [page 236](#) .





- Slacken and remove bolts in the sequence: -A ... F- and pull charge air cooler out of intake manifold.

### Installing



#### Note

- ◆ *Renew gasket.*
  - ◆ *The workshop press is used to install the charge air cooler to ensure a perfect seal.*
- Press sealing lip -1- onto edge of charge air cooler -arrow-.
  - Check that seal is correctly seated on intake manifold.
  - Insert charge air cooler into intake manifold as far as stop (take care not to tilt it).



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- Position intake manifold on table of workshop press with a piece of wood underneath.

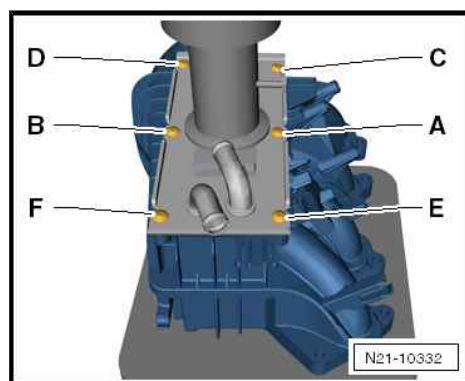
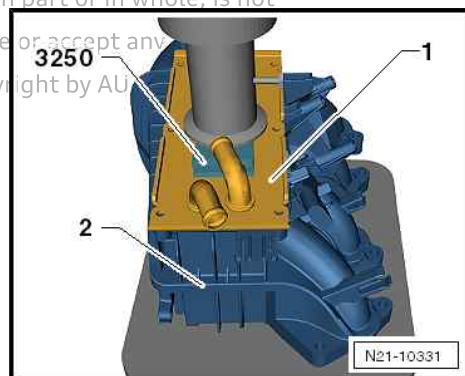
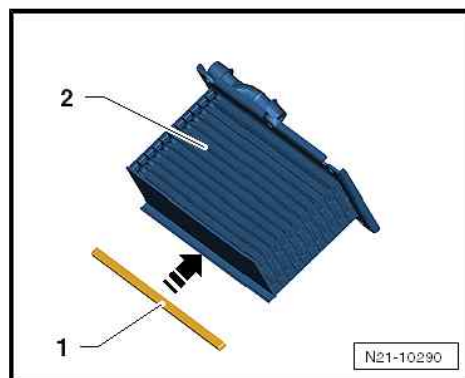
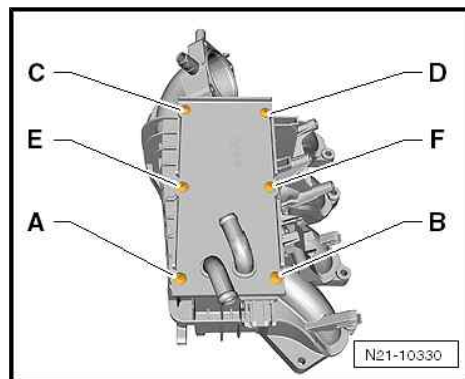
- Housing of charge air cooler -1- must be horizontal.
- Apply support - 3250- to centre of charge air cooler.
- Carefully lower workshop press until housing of charge air cooler makes contact with intake manifold -2-.

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

- Tighten bolts for charge air cooler ⇒ [page 221](#) .
- Install intake manifold (top section) ⇒ [page 236](#) .

### Tightening torques

- ◆ ⇒ [Fig. “Charge air cooler - tightening torque and sequence”](#), [page 221](#)





## 2.3 Removing and installing charge pressure sender - G31- / intake air temperature sender 2 - G299-

### Removing

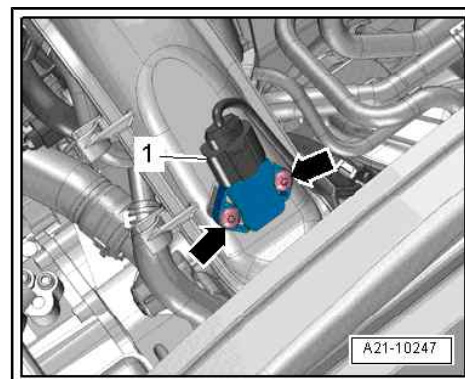
- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and remove charge pressure sender - G31- / intake air temperature sender 2 - G299- .

### Installing

Installation is carried out in reverse sequence.

### Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 195](#)



## 2.4 Checking charge air system for leaks

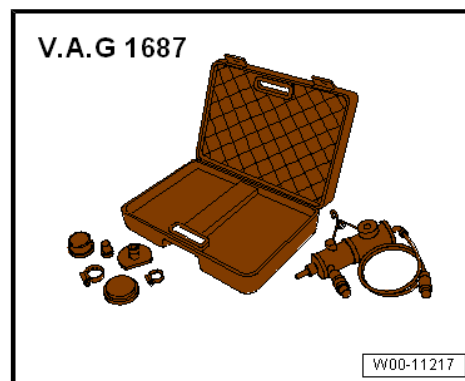
### Special tools and workshop equipment required

- ◆ Charge air system tester - V.A.G 1687- with adapters -V.A.G 1687/10- and -V.A.G 1687/14-



- ◆ Hose clip pliers - VAS 6362-

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## Procedure



### Note

Observe rules for cleanliness ⇒ [page 4](#) .

- Disconnect vacuum hose -arrow-.
- Release hose clips -1 and 2- and remove air hose.



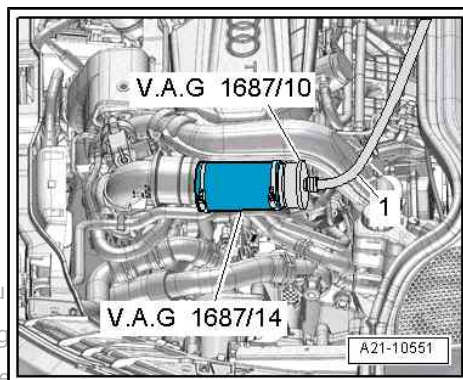
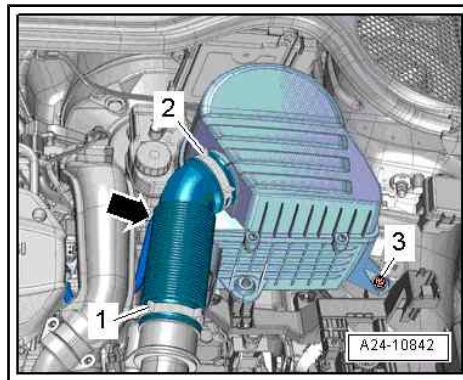
### Note

Disregard -item 3-.

- Connect adapter - V.A.G 1687/10- with -V.A.G 1687/14- to turbocharger.
- Connect hose -1- of charge air system tester -V.A.G 1687- to adapter.



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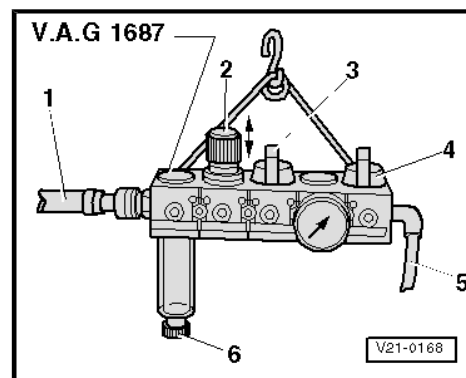
Prepare charge air system tester - V.A.G 1687- as follows:

- Unscrew pressure control valve -2- completely and close valves -3- and -4-.
- Make sure knob is pulled out before turning pressure control valve.
- Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.



#### Note

*If there is water in sight glass, remove drain plug -6- and drain water.*



- Open valve -3-.



#### Caution

*Risk of damage if pressure is set too high.*

♦ *The pressure must not exceed 0.5 bar.*

- Adjust pressure to 0.5 bar via pressure control valve -2-.
- Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.
- Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detection spray or use ultrasonic tester - V.A.G 1842- .



#### Note

- ♦ *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- ♦ *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*
- ♦ *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*
- ♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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## 24 – Mixture preparation - injection

### 1 Injection system

#### 1.1 Overview of fitting locations - injection system

##### Engine compartment

1 - Vacuum pump for brakes - V192-

2 - Camshaft control valve 1 - N205-

- ❑ Exploded view  
⇒ [page 108](#)

3 - Injector, cylinder 1 - N30-

- ❑ Exploded view  
⇒ [page 235](#)

4 - Injector, cylinder 2 - N31-

- ❑ Exploded view  
⇒ [page 235](#)

5 - Injector, cylinder 3 - N32-

- ❑ Exploded view  
⇒ [page 235](#)

6 - Injector, cylinder 4 - N33-

- ❑ Exploded view  
⇒ [page 235](#)

7 - Brake servo pressure sensor - G294-

- ❑ Fitting location  
⇒ [page 230](#)

8 - Brake light switch - F- /  
brake pedal switch - F63-

- ❑ Fitting location  
⇒ [page 230](#)
- ❑ Removing and installing  
⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light switch

9 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

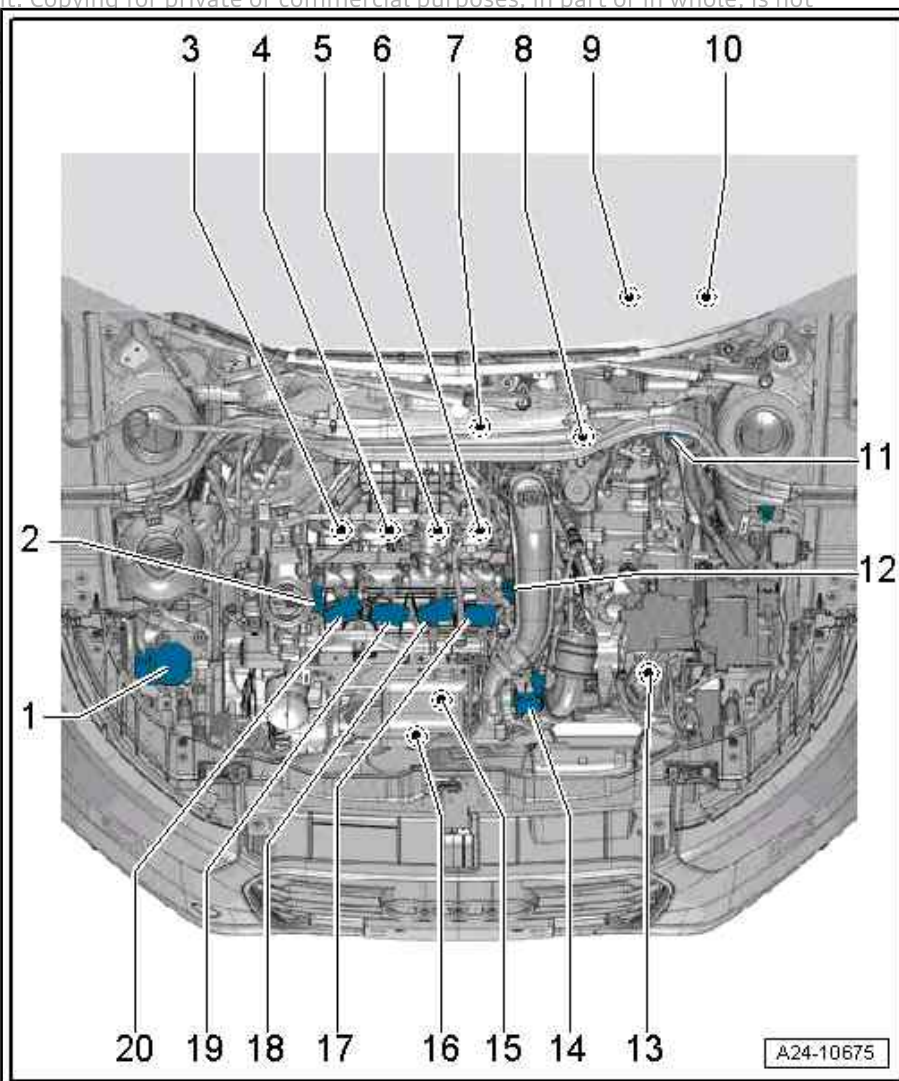
- ❑ Fitting location ⇒ [page 230](#)
- ❑ Removing and installing ⇒ Fuel supply system, petrol engines; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185-

10 - Clutch position sender - G476-

- ❑ For vehicles with manual gearbox
- ❑ Fitting location ⇒ [page 230](#)
- ❑ Removing and installing ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch position sender - G476-

11 - Engine control unit - J623-

- ❑ Fitting location ⇒ [page 229](#)





**12 - Hall sender - G40-**

- ☐ Camshaft position sensor
- ☐ Exploded view ⇒ [page 280](#)

**13 - Gearbox neutral position sender - G701-**

- ☐ For vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 231](#)

**14 - Turbocharger air recirculation valve - N249-**

- ☐ Exploded view ⇒ [page 195](#)

**15 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-**

- ☐ Exploded view ⇒ [page 259](#)

**16 - Lambda probe - G39- with Lambda probe heater - Z19-**

- ☐ Exploded view ⇒ [page 259](#)

**17 - Ignition coil 4 with output stage - N292-**

- ☐ Exploded view ⇒ [page 280](#)

**18 - Ignition coil 3 with output stage - N291-**

- ☐ Exploded view ⇒ [page 280](#)

**19 - Ignition coil 2 with output stage - N127-**

- ☐ Exploded view ⇒ [page 280](#)

**20 - Ignition coil 1 with output stage - N70-**

- ☐ Exploded view ⇒ [page 280](#)

**Engine (intake side)**

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**1 - Knock sensor 1 - G61-**

- ☐ Exploded view  
⇒ [page 280](#)
- ☐ Removing and installing  
⇒ [page 282](#)

**2 - Throttle valve module - J338-**

- ☐ Including throttle valve drive for electric throttle - G186- , throttle valve drive angle sender 1 for electric throttle - G187- and throttle valve drive angle sender 2 for electric throttle - G188-
- ☐ Exploded view  
⇒ [page 234](#)

**3 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-**

- ☐ Removing and installing  
⇒ [page 223](#)

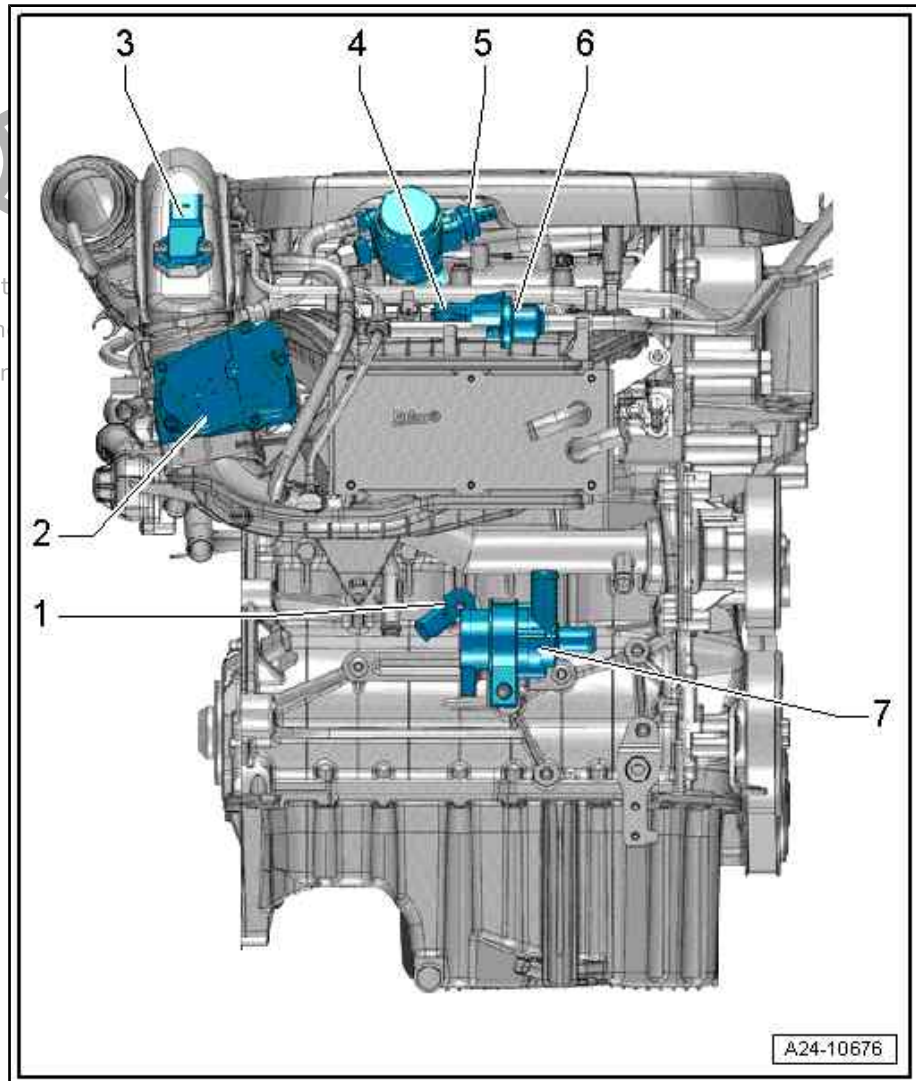
**4 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-**

**5 - Fuel pressure regulating valve - N276-**

**6 - Activated charcoal filter solenoid valve 1 - N80-**

**7 - Continued coolant circulation pump - V51-**

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



Engine (gearbox end)



**1 - Charge pressure control solenoid valve - N75-**

**2 - Oil pressure switch - F1-**

- ❑ Removing and installing  
⇒ [page 157](#)

**3 - Coolant temperature sender - G62-**

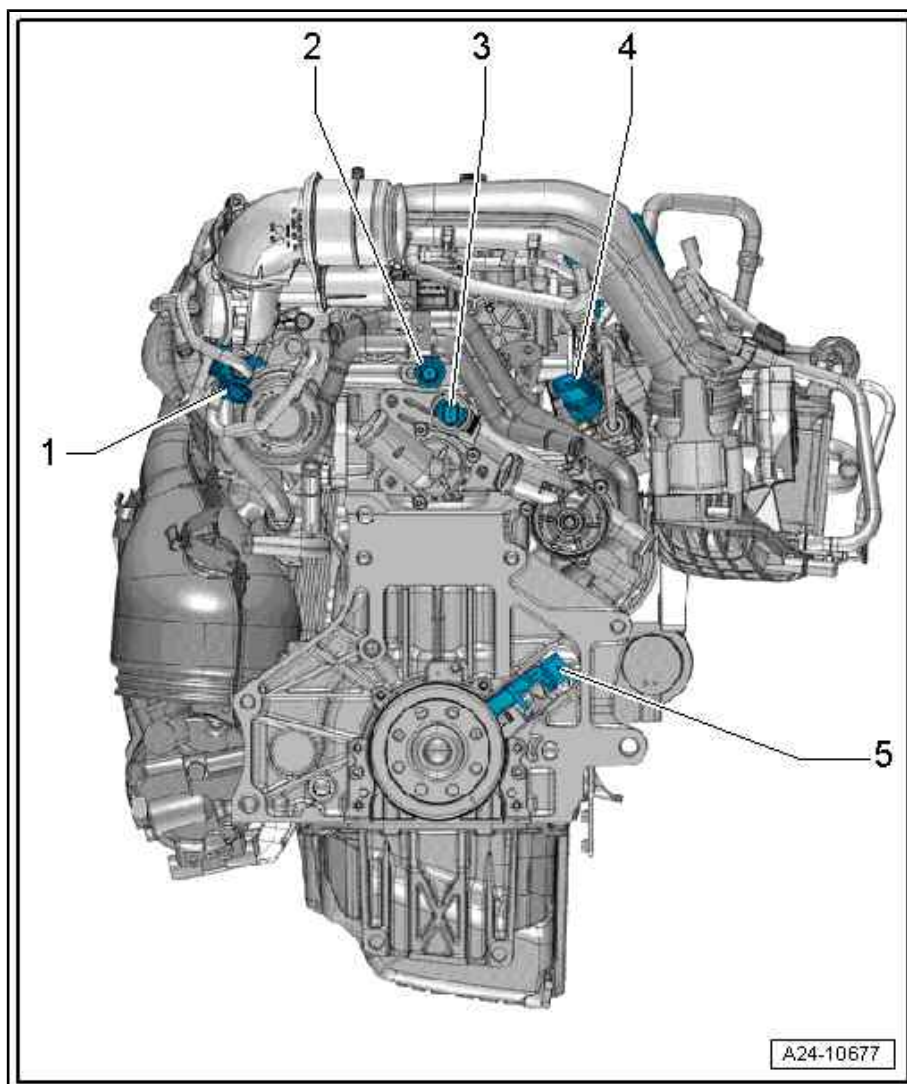
- ❑ Exploded view  
⇒ [page 170](#)

**4 - Fuel pressure sender - G247-**

- ❑ Exploded view  
⇒ [page 235](#)

**5 - Engine speed sender - G28-**

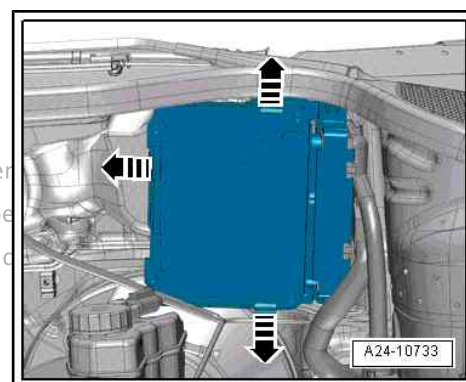
- ❑ Exploded view  
⇒ [page 280](#)



**Fitting location of engine control unit - J623-**

- ◆ At plenum chamber partition panel (left-side)

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### Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

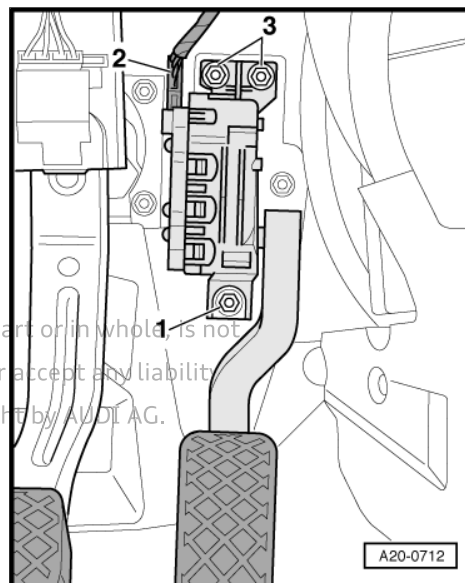
2 - Electrical connector for accelerator pedal module



#### Note

*The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.*

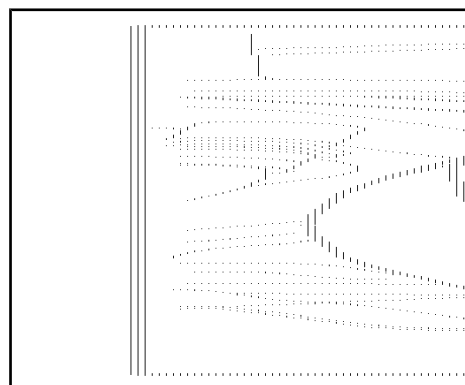
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### Fitting location of brake light switch - F- / brake pedal switch - F63-

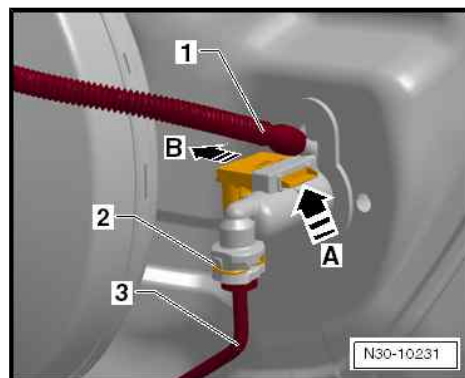
◆ On brake master cylinder

C - Brake light switch - F- / brake pedal switch - F63-



### Fitting location of clutch position sender - G476-

◆ On clutch master cylinder, next to brake servo



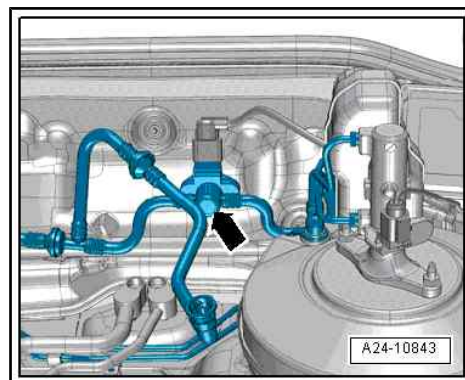
### Fitting location of brake servo pressure sensor - G294-

◆ Next to brake servo -arrow-



#### Note

*The illustration shows the brake servo pressure sensor - G294- from underneath.*

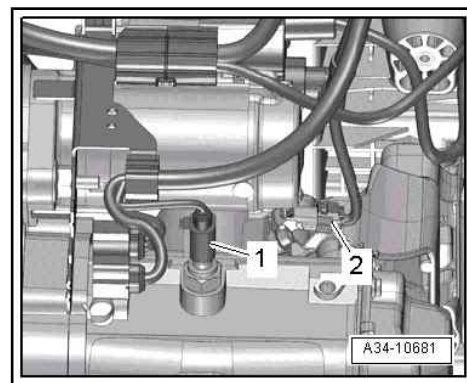




### Fitting location of gearbox neutral position sender - G701-

1 - Electrical connector for gearbox neutral position sender - G701-

◆ At front of manual gearbox



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## 2 Air cleaner

⇒ [“2.1 Exploded view - air cleaner housing”, page 232](#)

⇒ [“2.2 Removing and installing air cleaner housing”, page 233](#)

### 2.1 Exploded view - air cleaner housing

#### 1 - Connection

#### 2 - Air duct

- ☐ To lock carrier
- ☐ Clean out salt deposits, dirt and leaves, etc.

#### 3 - Air cleaner (bottom section)

- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Removing and installing  
⇒ [“2.2 Removing and installing air cleaner housing”, page 233](#)

#### 4 - Vacuum hose

- ☐ Renew if damaged

#### 5 - Air hose

#### 6 - Air cleaner (top section)

- ☐ Clean out salt deposits, dirt and leaves, etc.

#### 7 - Bolt

- ☐ 1.6 Nm

#### 8 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing ⇒ Maintenance ; Booklet 819

#### 9 - O-ring

- ☐ Renew if damaged
- ☐ Use lubricant when installing

#### 10 - Rubber buffer

- ☐ Clipped onto air cleaner (bottom section)

#### 11 - Bracket

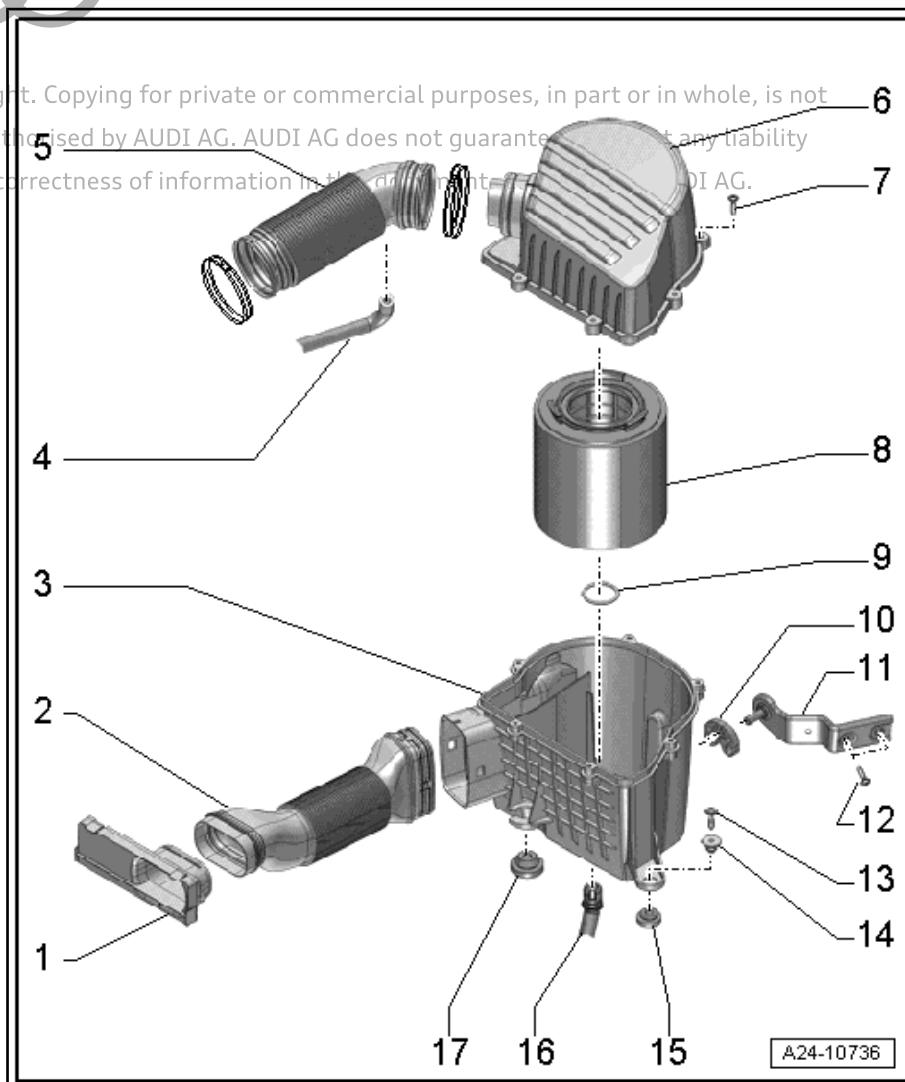
- ☐ For air cleaner (bottom section)

#### 12 - Bolt

- ☐ 9 Nm

#### 13 - Bolt

- ☐ 9 Nm





14 - Sleeve

15 - Grommet

16 - Water drain hose

□ Clean

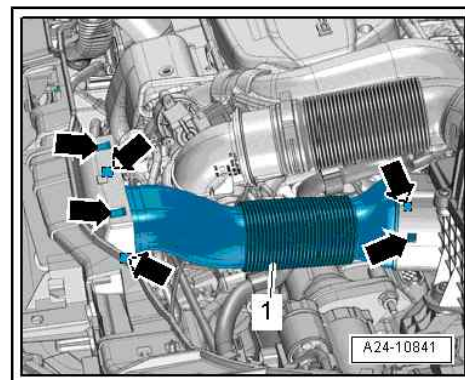
17 - Rubber buffer

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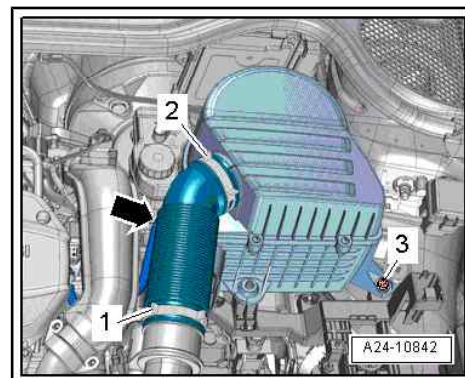
## 2.2 Removing and installing air cleaner housing

### Removing

- Release fasteners -arrows- and detach air duct -1-.



- Release hose clip -1- and detach air hose from turbocharger.
- Disconnect vacuum hose -arrow-.
- Unscrew bolt -3- and detach air cleaner housing.



### Note

Disregard -item 2-.

### Installing



### Note

- ◆ Always use genuine air filter elements (same as original equipment).
- ◆ Hose connections and charge air system hoses must be free of oil and grease prior to fitting. Do not use any lubricants containing silicone when assembling.
- ◆ Both sections of the air cleaner housing must be clean.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .
- ◆ To prevent malfunctions, cover all critical parts of the engine air intake tract with a clean cloth when blowing out the air cleaner housing with compressed air.
- ◆ Please observe requirements for disposal.



## 3 Intake manifold

⇒ [“3.1 Exploded view - intake manifold”, page 234](#)

⇒ [“3.2 Exploded view - intake manifold \(bottom section\) with fuel rail”, page 235](#)

⇒ [“3.3 Removing and installing intake manifold \(top section\)”, page 236](#)

⇒ [“3.4 Removing and installing intake manifold \(bottom section\) with fuel rail”, page 238](#)

⇒ [“3.5 Removing and installing throttle valve module J338”, page 239](#)

⇒ [“3.6 Cleaning throttle valve module”, page 241](#)

### 3.1 Exploded view - intake manifold

#### 1 - Vacuum hose

- ☐ To brake servo
- ☐ Press release tabs to detach

#### 2 - O-ring

- ☐ Renew

#### 3 - Intake manifold (top section)

- ☐ Removing and installing  
⇒ [page 236](#)

#### 4 - Bolt

- ☐ Tighten in stages and in diagonal sequence
- ☐ 20 Nm

#### 5 - Gaskets

- ☐ Renew

#### 6 - Seal

- ☐ Renew

#### 7 - Throttle valve module - J338-

- ☐ Removing and installing  
⇒ [page 239](#)
- ☐ Cleaning ⇒ [page 241](#)
- ☐ After renewing, erase learnt values and adapt engine control unit - J623- ⇒ vehicle diagnostic tester

#### 8 - Bolt

- ☐ 7 Nm

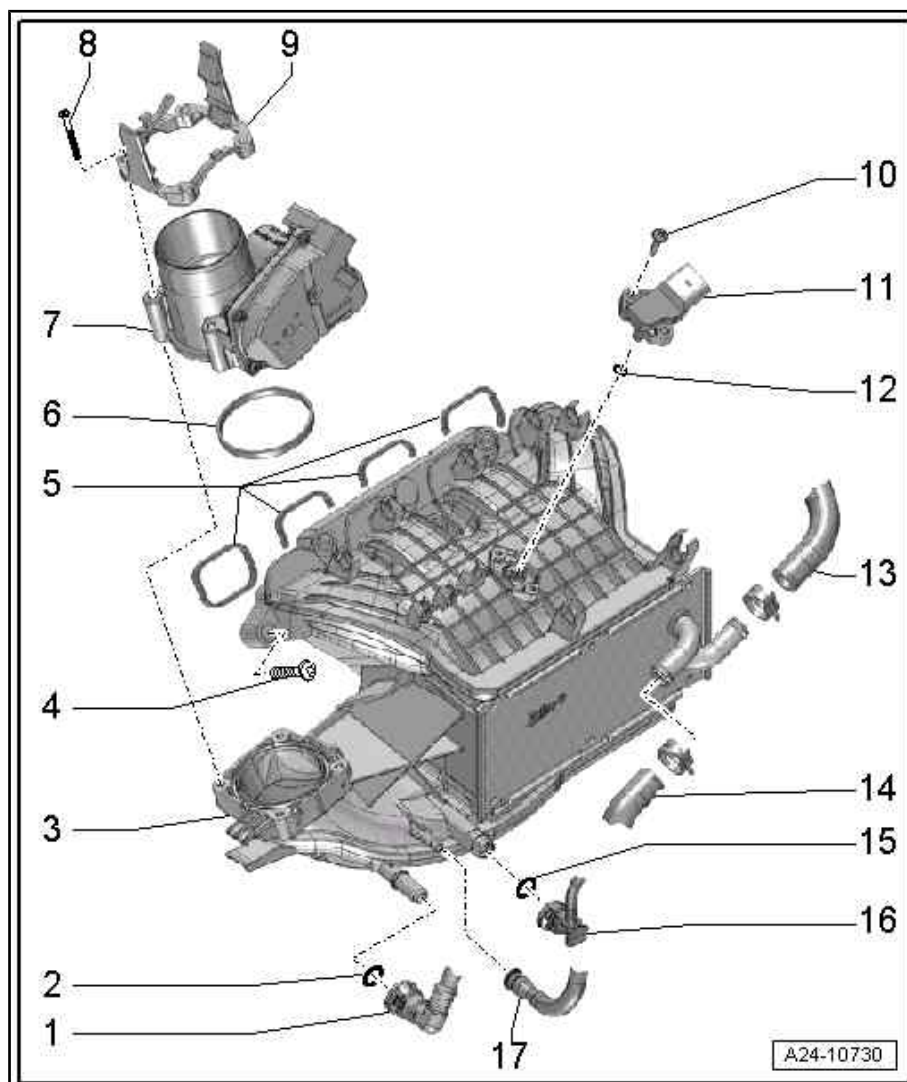
#### 9 - Bracket

#### 10 - Bolt

- ☐ 5 Nm

#### 11 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ☐ Removing and installing ⇒ [page 251](#)





## 12 - O-ring

- ☐ Renew

## 13 - Coolant hose

## 14 - Coolant hose

## 15 - O-ring

- ☐ Renew

## 16 - Vacuum hose

- ☐ From activated charcoal filter
- ☐ Press release ring to detach

## 17 - Vacuum hose

- ☐ For crankcase breather

## 3.2 Exploded view - intake manifold (bottom section) with fuel rail

### 1 - Intake manifold (bottom section)

- ☐ Removing and installing  
⇒ [page 238](#)

### 2 - Connection

- ☐ Always renew after removing
- ☐ For high-pressure pipe
- ☐ 80 Nm

### 3 - Fuel pressure sender - G247-

- ☐ Removing and installing  
⇒ [page 250](#)
- ☐ Lubricate threads
- ☐ 22 Nm

### 4 - Gasket

- ☐ Renew

### 5 - Bolt

- ☐ Starting from centre, tighten in stages
- ☐ 20 Nm

### 6 - O-ring

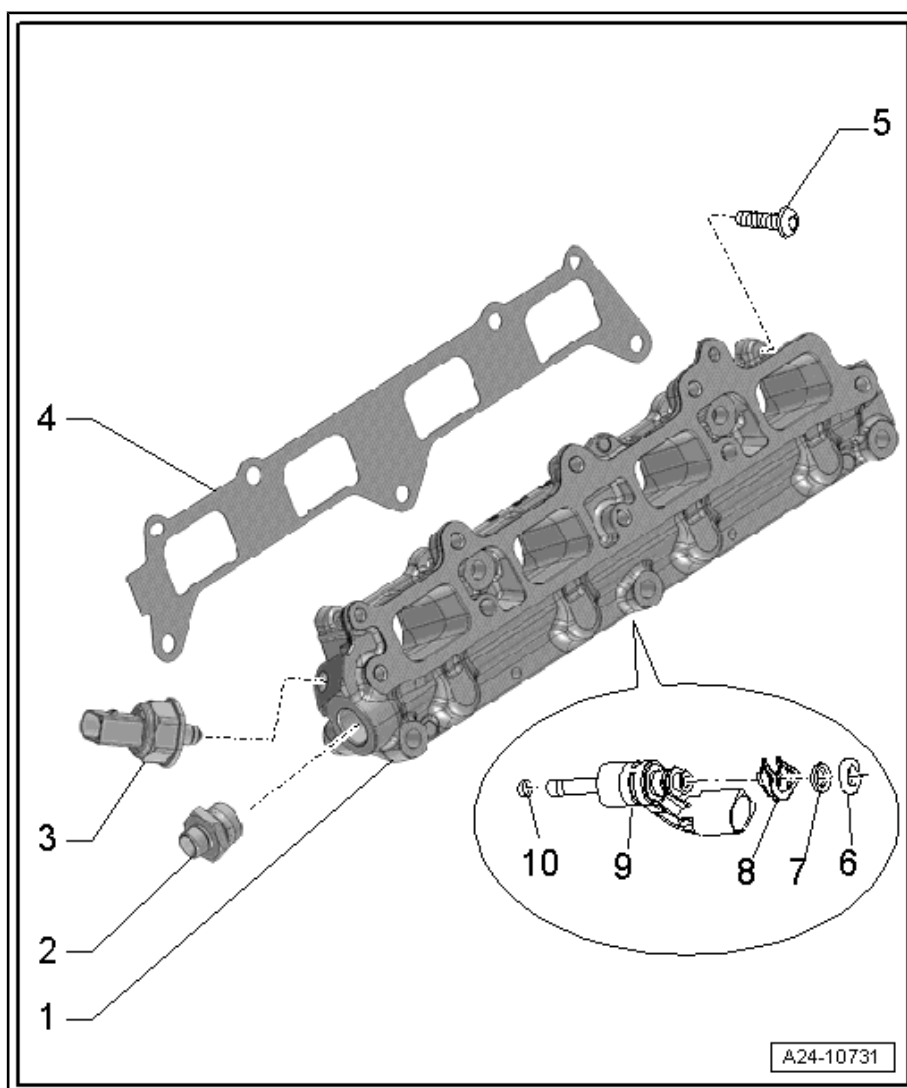
- ☐ Renew
- ☐ Before installing, lubricate lightly with clean engine oil

### 7 - Support ring

- ☐ Always renew after injector has been removed  
⇒ ["4.2 Renewing teflon seal and support ring at injector", page 245](#)

### 8 - Spring element

- ☐ Always renew if intake manifold (bottom section) is removed
- ☐ Check for correct fit on injector





## 9 - Injector

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Injector, cylinder 4 - N33-
- ☐ Removing and installing ⇒ [page 243](#)

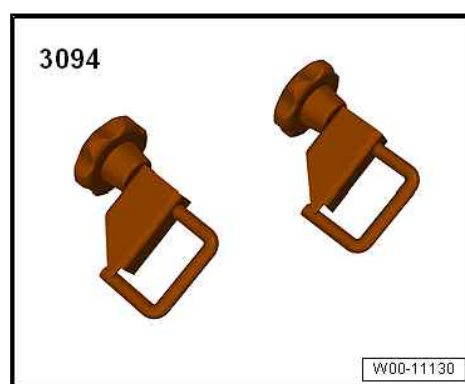
## 10 - Combustion chamber ring seal

- ☐ Always renew after injector has been removed  
⇒ [“4.2 Renewing teflon seal and support ring at injector”, page 245](#)

## 3.3 Removing and installing intake manifold (top section)

### Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm - 3094-



- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Hose clip pliers - VAS 6362-

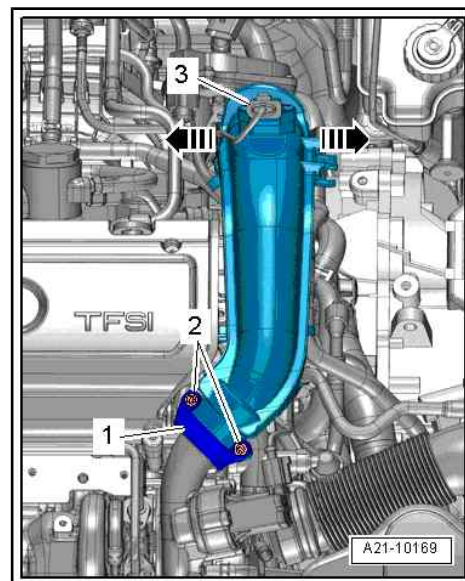


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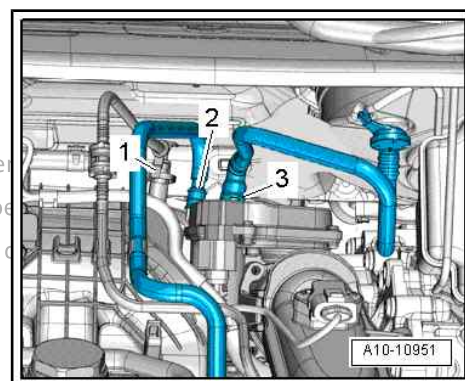
## Removing

- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrow- and detach pressure pipe first from throttle valve module - J338- and then from turbocharger.
- Move hoses on pressure pipe clear.



- Press release tabs and disconnect vacuum line -1 and 3-.
- Detach vacuum line -2-.

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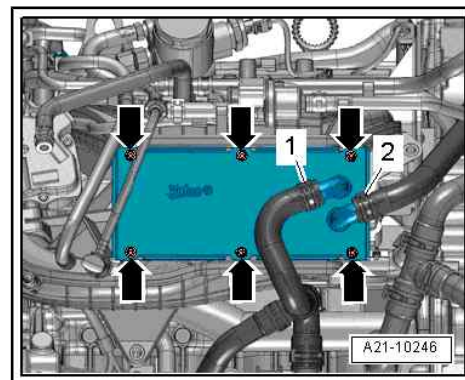


- Place drip tray for workshop hoist - VAS 6208- beneath engine.
- Use hose clamps up to 25 mm - 3094- to clamp off coolant hoses -1 and 2- and detach coolant hoses from charge air cooler.

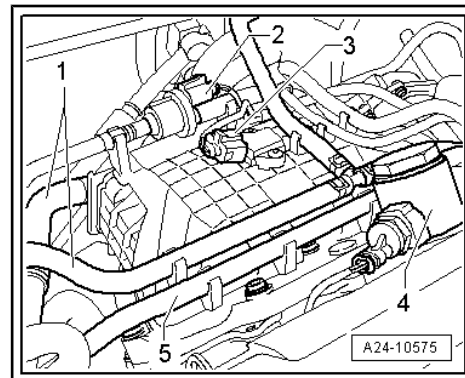


### Note

Arrows show securing bolts for charge air cooler. Disregard.



- Unplug electrical connector at intake manifold pressure sender - G71- -3-.
- Move activated charcoal filter solenoid valve 1 - N80- -2- clear to one side (do not disconnect hoses and electrical connector).
- Move clear hoses -1 and 5- at intake manifold.





- Unscrew bolts securing manifold.
- Carefully remove intake manifold upwards.

#### Installing

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



#### Note

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

- Check coolant level ⇒ [page 168](#) .

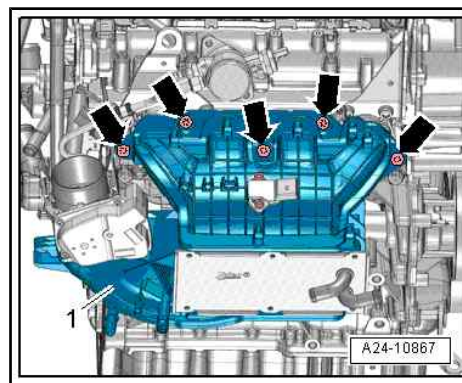
#### Tightening torques

- ♦ ⇒ [“3.1 Exploded view - intake manifold”, page 234](#)

### 3.4 Removing and installing intake manifold (bottom section) with fuel rail

#### Special tools and workshop equipment required

- ♦ Assembly tool - T10118-



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#### Removing

- Remove intake manifold ⇒ [page 236](#) .

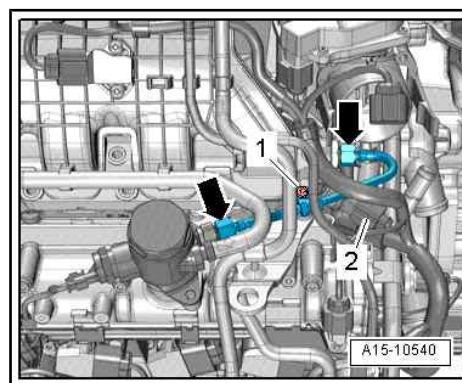


#### WARNING

***The fuel system is pressurised.***

***Risk of injury as fuel may spray out.***

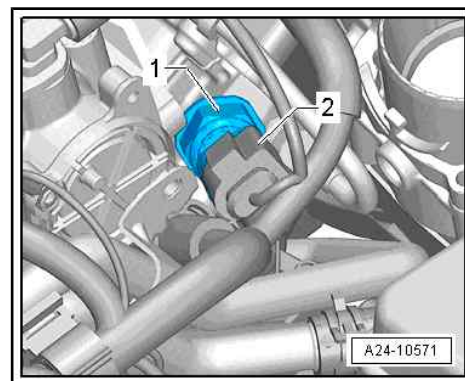
- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap a clean cloth around connection and open connection carefully).***



- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



- Unplug electrical connector -2- at fuel pressure sender - G247-  
-1-.



- Pull wiring duct for injectors out of both clips -1-.
- Unscrew securing bolts -arrows- from intake manifold (bottom section).
- Detach intake manifold (bottom section) carefully from injectors.

#### Installing

- The remaining installation steps are carried out in the reverse sequence.



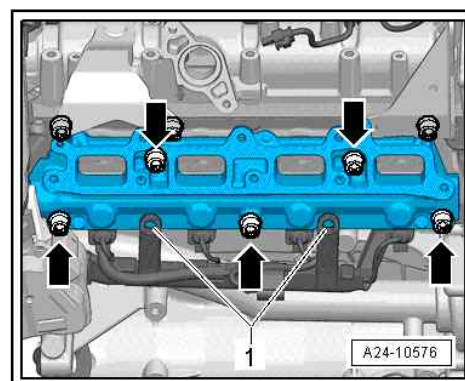
#### Note

*Make sure that injectors are installed correctly.*

- Install intake manifold (top section) ➔ [page 236](#) .

#### Tightening torques

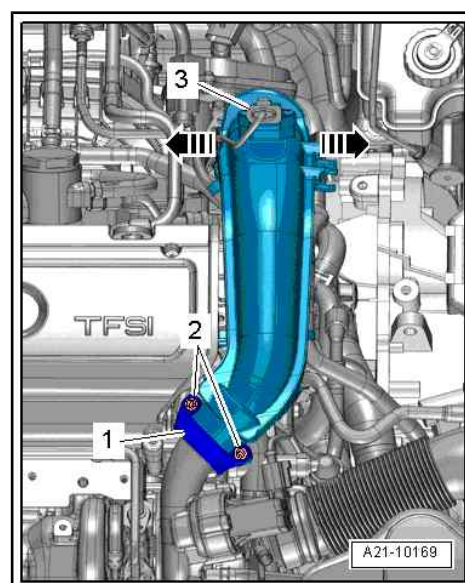
- ◆ ➔ ["3.2 Exploded view - intake manifold \(bottom section\) with fuel rail", page 235](#)



### 3.5 Removing and installing throttle valve module - J338-

#### Removing

- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe.



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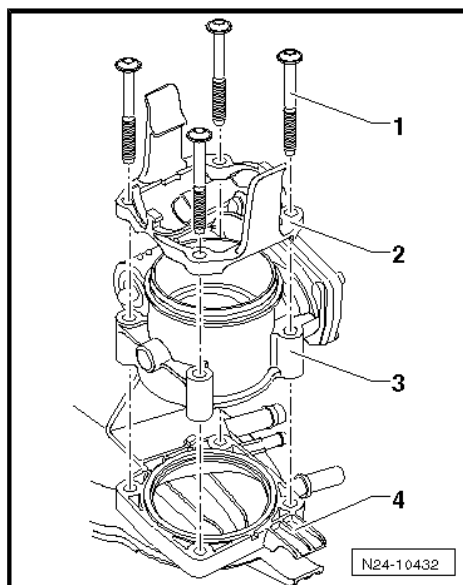
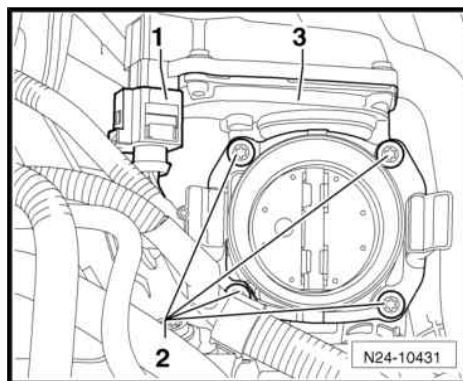


- Unplug electrical connector -1- at throttle valve module - J338- .
- Remove securing bolts -2- and detach throttle valve module - J338- -3- from intake manifold.

### Installing

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

- Insert new seal in groove on intake manifold.
- Fit throttle valve module - J338- -3- together with adapter -2- and securing bolts -1- onto intake manifold -4-.



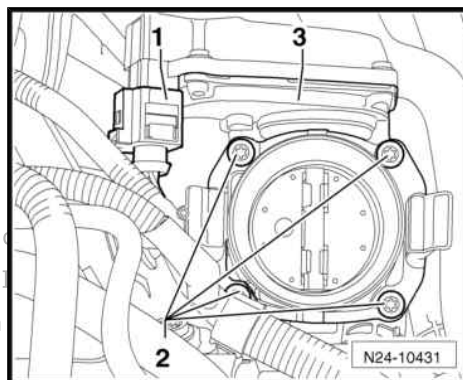
- Tighten securing bolts -2-.
- Plug in electrical connector -1- at throttle valve module - J338- -3-.



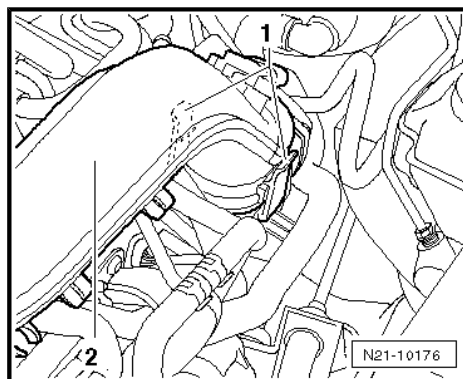
### Note

*Before installing, lubricate O-rings at turbocharger and in pressure pipe lightly with engine oil.*

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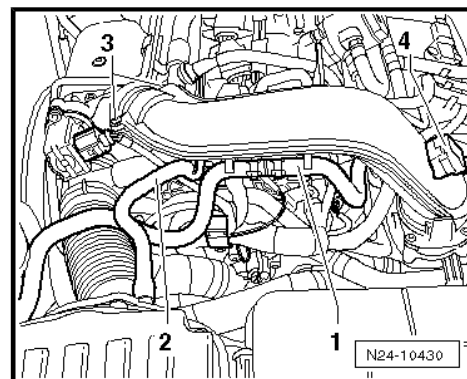


- Fit air pipe -2- on turbocharger.
  - Push air pipe -2- onto throttle valve module - J338- .
- Retaining clips -1- should engage audibly.

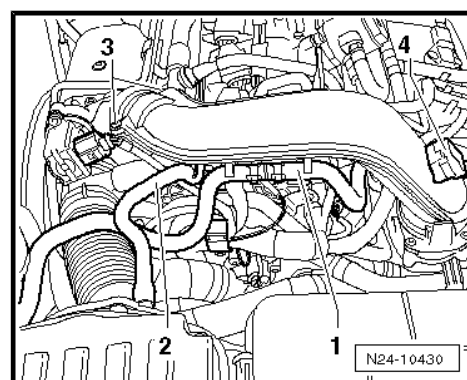




- Tighten securing bolts -3- for retaining clips.
- Plug in electrical connector at charge pressure sender - G31- / intake air temperature sender 2 - G299- .



- Press hoses -1- and -2- into retainers on pressure pipe.
- If a new throttle valve module - J338- has been installed:
- Erase learnt values and adapt engine control unit - J623- to throttle valve module - J338- . Use vehicle diagnostic tester to do so.



#### Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 234](#)

### 3.6 Cleaning throttle valve module



#### Note

- ◆ If a new engine control unit - J623- is installed, it must be adapted to the throttle valve module.

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- ◆ Take care not to scratch the throttle valve housing when cleaning it.

#### Special tools and workshop equipment required

- ◆ Acetone (commercially available)
- ◆ Brush

#### Procedure

- Remove throttle valve module - J338- ⇒ [page 239](#) .
- Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.



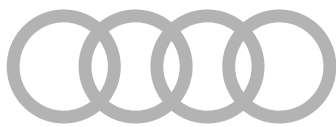
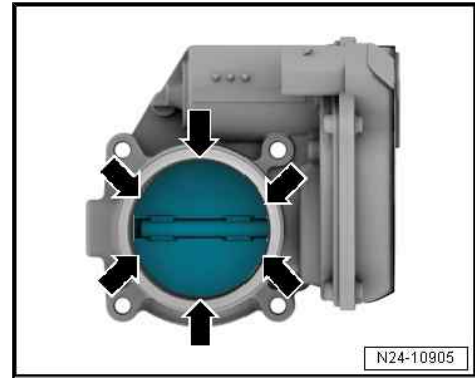
#### WARNING

**Acetone is highly flammable. Please observe all accident prevention regulations and safety precautions when handling flammable liquids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and protective clothing to avoid possible injury and skin contact.**





- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to evaporate completely and re-install throttle valve module after cleaning.
- Install throttle valve module - J338- ➔ [page 239](#) .
- Erase learnt values and adapt engine control unit - J623- to throttle valve module. Use vehicle diagnostic tester to do so.



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## 4 Injectors

⇒ [“4.1 Removing and installing injectors”, page 243](#)

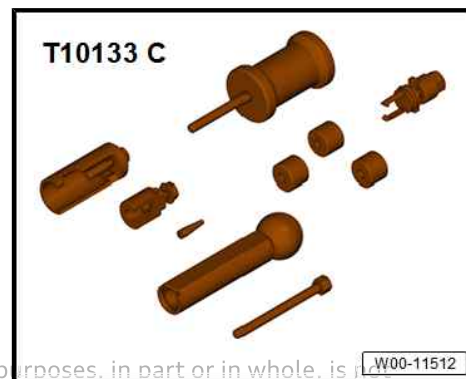
⇒ [“4.2 Renewing teflon seal and support ring at injector”, page 245](#)

⇒ [“4.3 Cleaning injectors”, page 248](#)

### 4.1 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool set for FSI engines - T10133 C-



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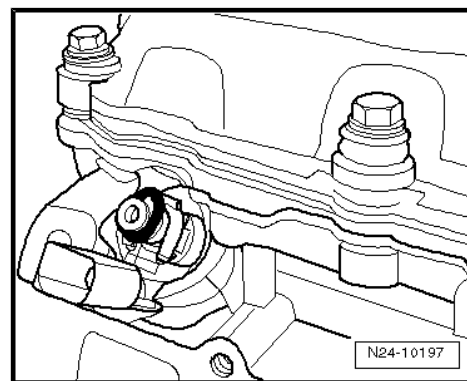
#### Note

*The combustion chamber ring seal must always be renewed before the injector is re-installed*

⇒ [“4.2 Renewing teflon seal and support ring at injector”, page 245](#) .

#### Removing

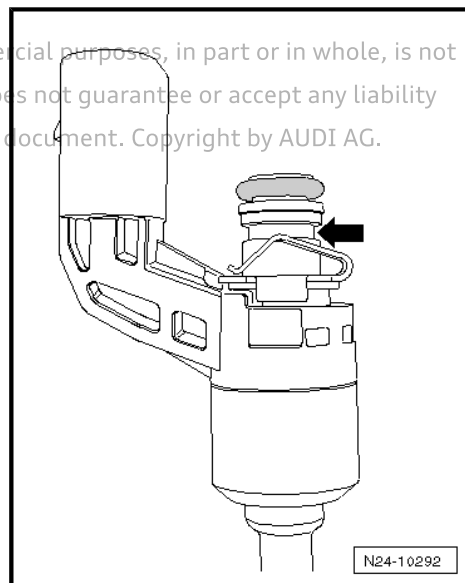
- Remove intake manifold ⇒ [page 236](#) .
- Remove intake manifold (bottom section) ⇒ [page 238](#) .
- Press O-ring by hand upwards (as illustrated) and remove from injector.
- Screw striker - T10133/3- onto puller - T10133/15- .



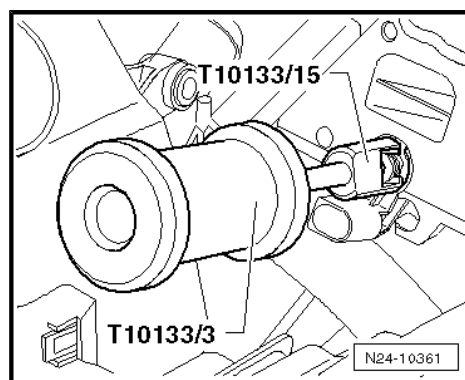


- Then guide puller - T10133/15- into groove -arrow- on injector.

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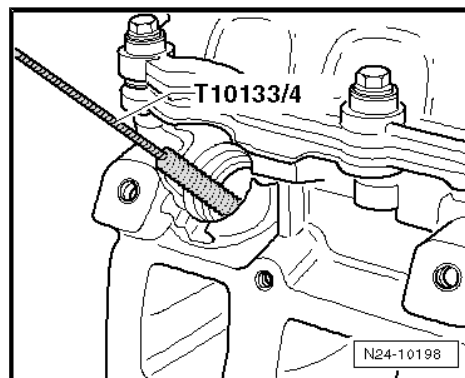


- Pull out injector by knocking carefully.
- The combustion chamber ring seal must always be renewed before the injector is re-installed ⇒ [page 245](#).

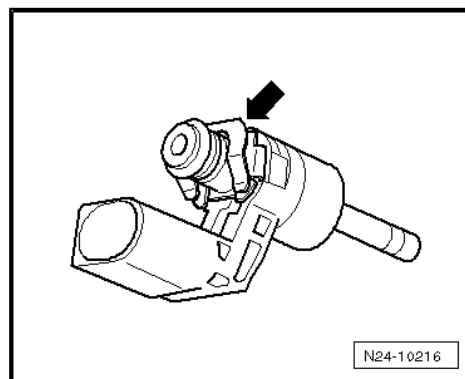


### Installing

- Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4-.

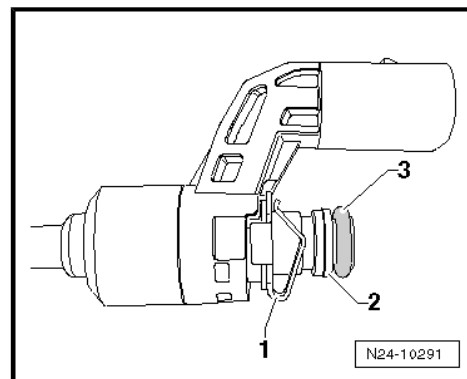


- Always renew spring element -arrow- if injectors have been removed.



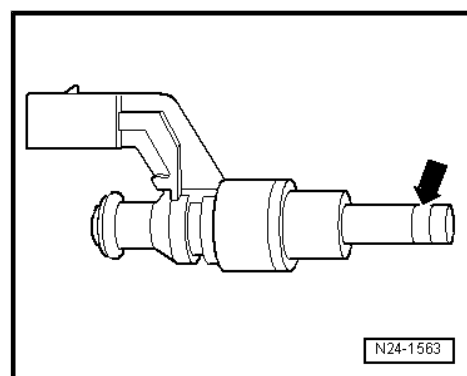


- Fit a new O-ring on each injector. Lubricate O-ring -3- lightly with clean engine oil before installing.
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.



#### Note

- ◆ *The teflon seal -arrow- must not be lubricated when fitting the injector.*
- ◆ *Make sure that there is no cleaning fluid or oil in the holes in the cylinder head when installing the injectors.*
- ◆ *It should be possible to insert the injector easily. If necessary, wait until the teflon seal has contracted sufficiently.*
- ◆ *Note correct installation position and ensure that injectors are properly seated in cylinder head.*



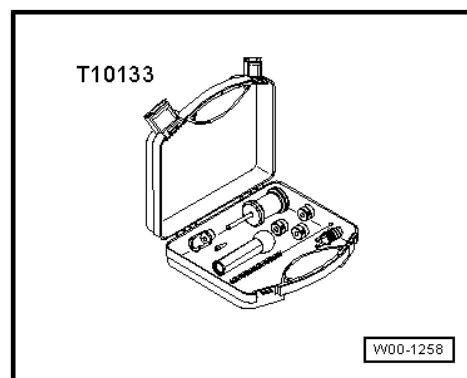
The remaining installation steps are carried out in the reverse sequence.

- Install bottom section of intake manifold ⇒ [page 238](#) .
- Install intake manifold ⇒ [page 236](#) .

## 4.2 Renewing teflon seal and support ring at injector

### Special tools and workshop equipment required

- ◆ Tool set - T10133-



### Procedure

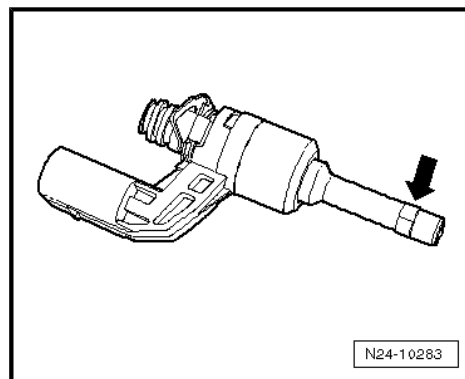
#### Renewing teflon ring seal

- **Injector removed** ⇒ [page 243](#) .
- Clean injector thoroughly.
- Carefully cut seal -arrow- open with a knife (as illustrated); make absolutely sure not to touch injector body with knife blade.

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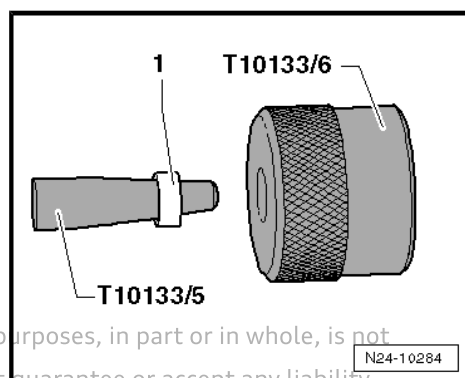
- Remove old seal and clean ring groove where seal was located -arrow-. Remove any carbon deposits with a brass wire brush.



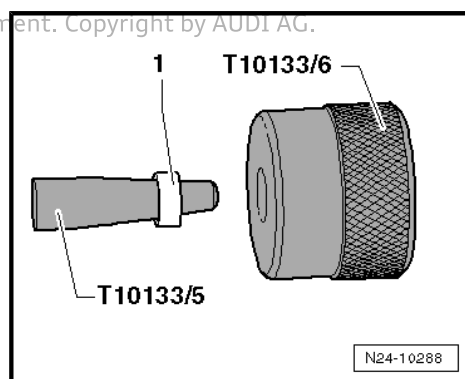
- Fit new seal -1- onto assembly cone - T10133/5- . Push seal lightly onto assembly cone - T10133/6- as far as possible using assembly sleeve - T10133/5- (knurled side faces towards seal -1-).



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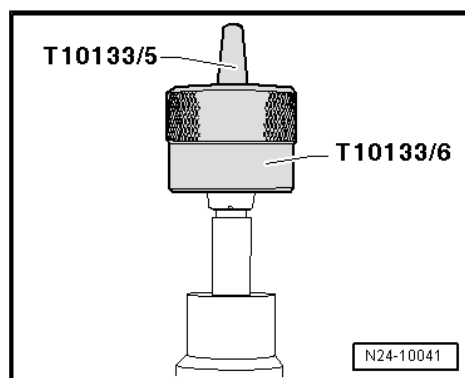


- Turn round assembly sleeve - T10133/6- (knurled side no longer faces towards seal) and push seal -1- up to end of assembly cone - T10133/5- .
- Now fit assembly cone - T10133/5- with seal from the front onto injector. Push seal further onto injector using assembly sleeve - T10133/6- .



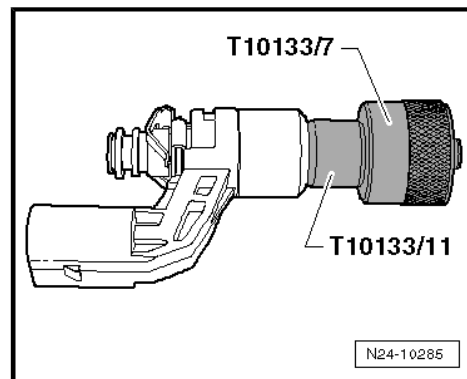
The seal is not yet in its groove.

- Remove assembly sleeve - T10133/6- and assembly cone - T10133/5- .
- Slide seal by hand into ring groove.
- Fit spacer sleeve - T10133/11- onto body of injector.



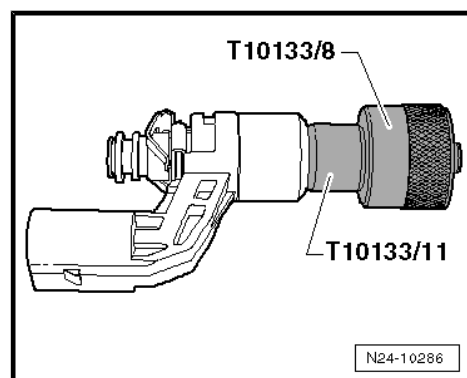


- Press calibration sleeve - T10133/7- over seal as far as possible onto spacer sleeve - T10133/11- , turning it while doing so (approx. 180°).
- Pull calibration sleeve - T10133/7- off again.



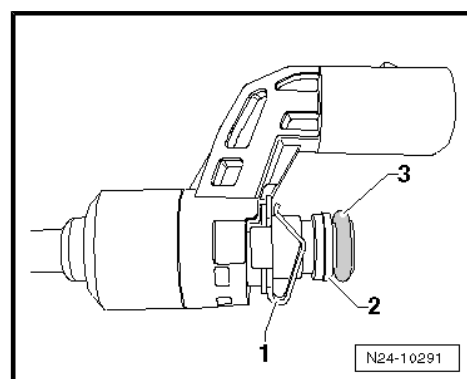
- Press calibration sleeve - T10133/8- over seal as far as possible onto spacer sleeve - T10133/11- , turning it while doing so (approx. 180°).
- Pull calibration sleeve - T10133/8- off again.

The teflon ring seal is now installed in the correct position.

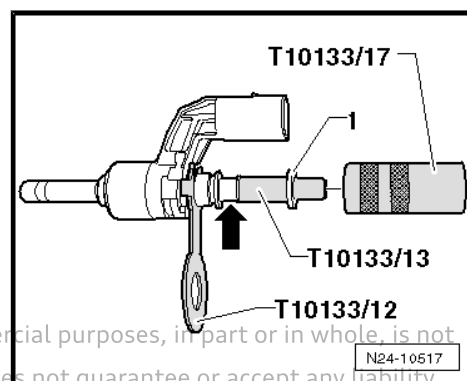


### Renewing support ring

- Remove O-ring -3-.
- Cut open support ring -2- with small side-cutting pliers and remove support ring.
- Detach spring element -1- from injector and fit locking plate - T10133/12- in place of spring element.



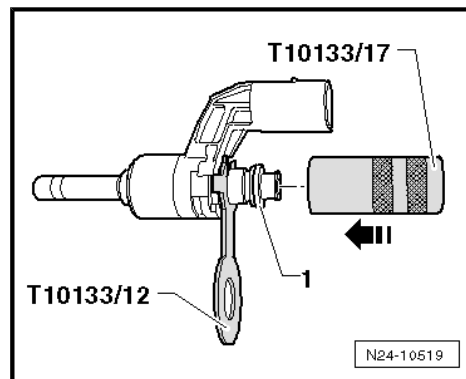
- Fit a new support ring -1- onto assembly cone - T10133/13- and fit onto injector (as illustrated).
- Using calibration sleeve - T10133/17- (knurled side faces towards injector), push support ring -1- into first groove -arrow- on injector.



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- Then turn round calibration sleeve - T10133/17- (knurled side now faces away from injector). Push calibration sleeve over support ring -1- in direction of -arrow- until it makes contact with locking plate - T10133/12- .
  - Pull calibration sleeve - T10133/17- off again.
- Support ring now has its correct installation depth.



- Now install a new spring element -1- in place of locking plate - T10133/12- . Fit a new O-ring -3- next to support ring -2-.



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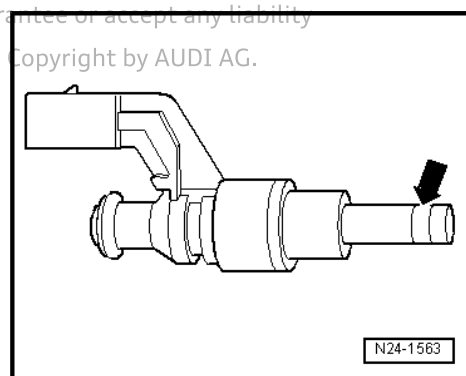
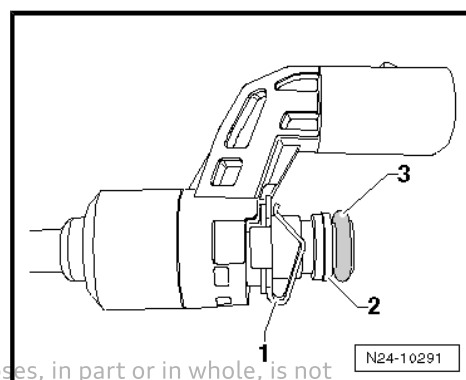


#### Note

*The teflon seal -arrow- must not be lubricated when fitting the injector.*

- Install injector ⇒ [page 243](#) .

Further installation steps are carried out in the reverse sequence of removal.



## 4.3 Cleaning injectors

### Special tools and workshop equipment required

- ◆ Ultrasonic cleaning unit - VAS 6418-
- ◆ Mounting plate for injectors - VAS 6418/1-
- ◆ Cleaning fluid - VAS 6418/2-



#### Note

*Observe safety precautions and operating instructions for ultrasonic unit.*

### Cleaning

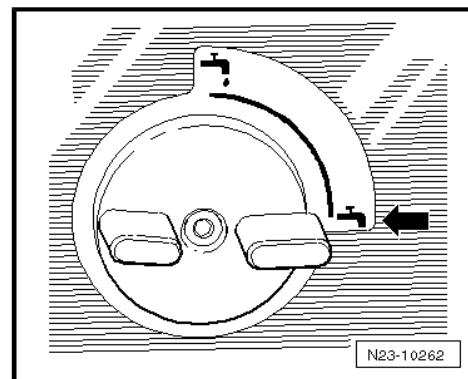
- Remove injectors ⇒ [page 243](#) .



- Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).
- Fill ultrasonic unit with 2,120 ml of water which has been allowed to settle for a few minutes and cleaning fluid - VAS 6418/2- .

#### Mixture ratio for cleaning fluid

- 2,100 ml of tap water which has been allowed to settle for a few minutes and 20 ml of cleaning fluid - VAS 6418/2-



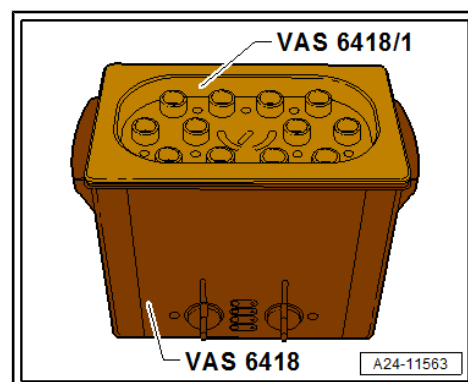
- Place mounting plate for injectors - VAS 6418/1- on top of cleaning unit.



#### WARNING

*It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418- .*

*The ideal fluid level is approx. 1-4 mm above the base of the mounting plate. The ultrasonic cleaning unit - VAS 6418- can be damaged if the fluid level is too low.*

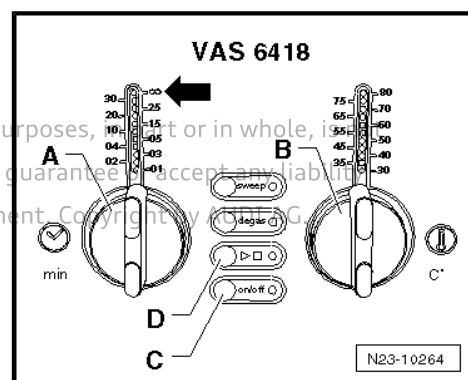


- Insert FSI injectors all the way into guides of mounting plate for injectors - VAS 6418/1- .
- Switch on cleaning unit by pressing **on/off** button -C-.
- Select a cleaning time of 30 minutes with rotary control -A-.
- Set rotary control -B- to a temperature of 50°C
- Press **▶** button -D- to start cleaning procedure.



#### Note

- ◆ *The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached.*
- ◆ *The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.*
- After cleaning, always renew combustion chamber ring seal (teflon ring seal) for each injector.
- Install injectors ➔ [page 243](#) .





## 5 Senders and sensors

⇒ ["5.1 Removing and installing fuel pressure sender G247", page 250](#)

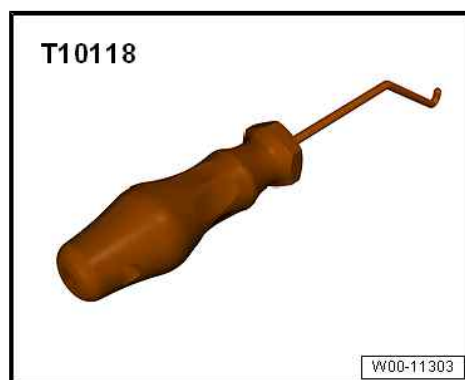
⇒ ["5.2 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71", page 251](#)

### 5.1 Removing and installing fuel pressure sender - G247-

If the fuel pressure sender - G247- fails, the fuel pressure regulating valve - N276- is switched off, the electric fuel pump is fully activated and the engine is operated with the fuel pressure which remains. This will reduce engine torque considerably.

#### Special tools and workshop equipment required

- ◆ Assembly tool - T10118-



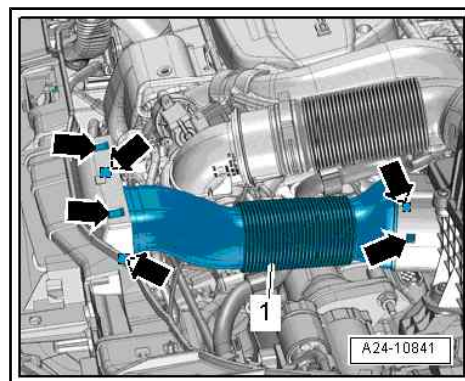
- ◆ Bit (27 mm) - T40218- or commercially available socket (27 mm)



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#### Removing

- Release fasteners -arrows- and detach air duct -1-.



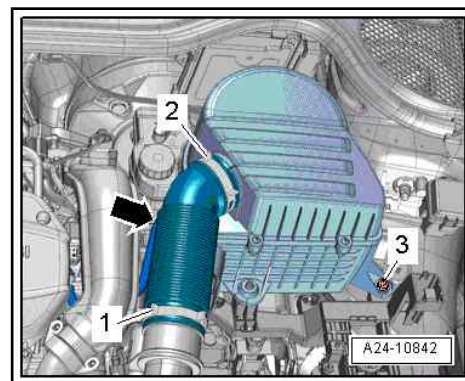


- Disconnect vacuum hose -arrow-.
- Release hose clips -1 and 2- and remove air hose.



#### Note

Disregard -item 3-.



- Unplug electrical connector -2- at fuel pressure sender - G247- -1- using assembly tool - T10118- .

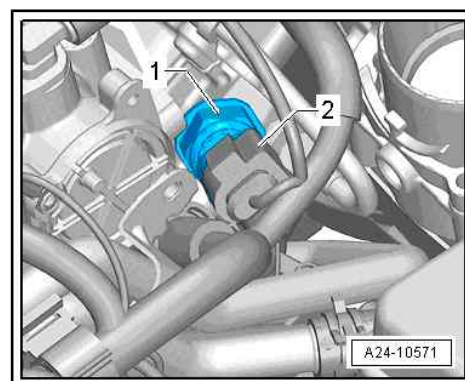


#### WARNING

*The fuel system is pressurised.*

*Risk of injury as fuel may spray out.*

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap a clean cloth around connection and open connection carefully).



- Unscrew fuel pressure sender - G247- -1- using bit, 27 mm - T40218- .

#### Installing

- Installation is carried out in reverse sequence.

#### Tightening torques

- ◆ ⇒ ["3.2 Exploded view - intake manifold \(bottom section\) with fuel rail", page 235](#)

## 5.2 Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71-

#### Removing

- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and detach intake air temperature sender - G42- / intake manifold pressure sender - G71- .

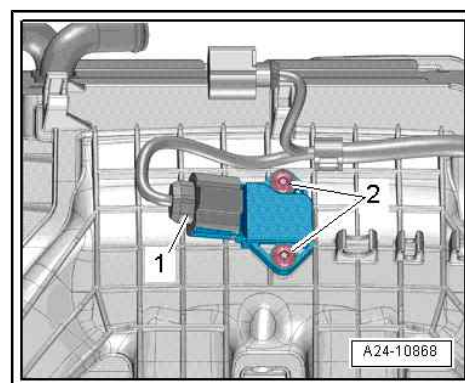
#### Installing

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



#### Note

Fit new O-ring.



#### Tightening torques

- ◆ ⇒ ["3.1 Exploded view - intake manifold", page 234](#)



## 6 High-pressure pump

⇒ "6.1 Exploded view - high-pressure pump", page 252

⇒ "6.2 Removing and installing high-pressure pump", page 254

⇒ "6.3 Removing and installing high-pressure pipe", page 257

### 6.1 Exploded view - high-pressure pump



#### Note

Observe installation instructions for high-pressure pump.

#### 1 - Bolts for high-pressure pump

- ☐ Hand-tighten in diagonal sequence, then tighten to 5 Nm
- ☐ Final torque: 20 Nm
- ☐ Do not tilt high-pressure pump

#### 2 - Connecting piece for fuel supply line from fuel tank

- ☐ Always renew after removing

#### 3 - Spring-type clip

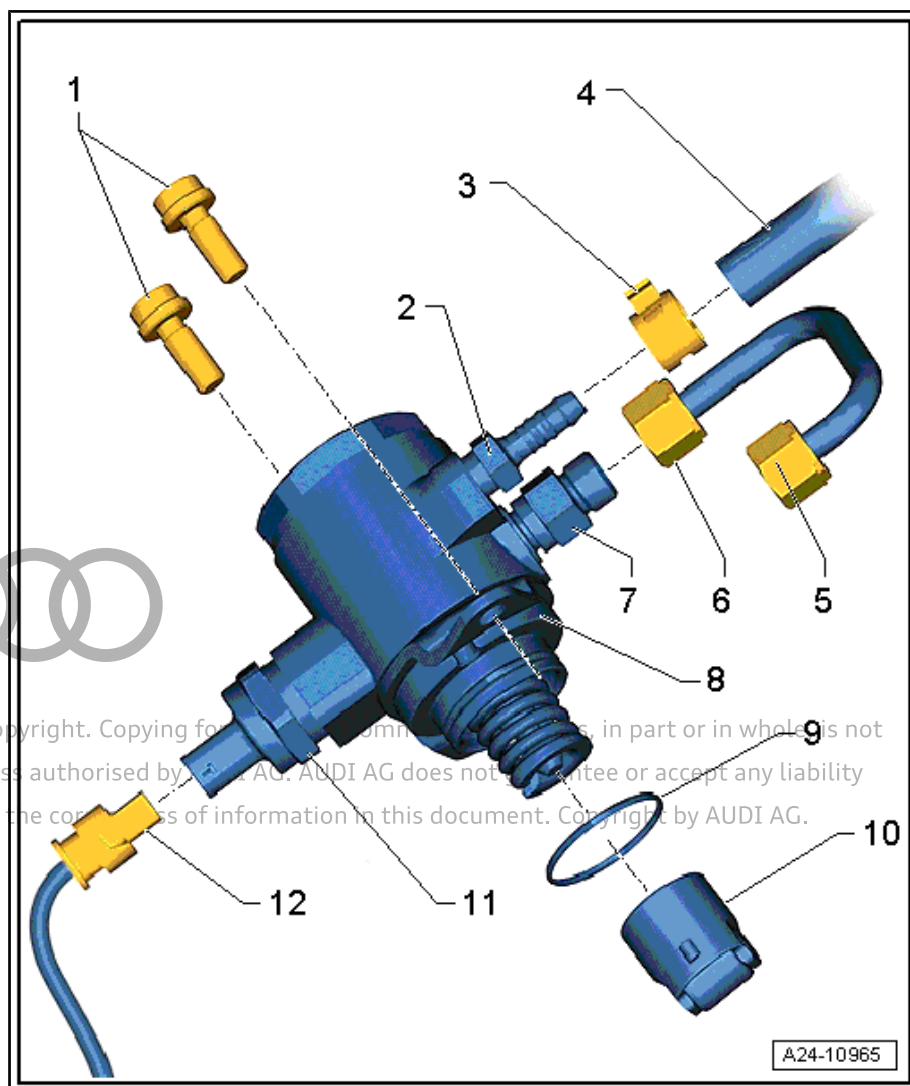
- ☐ Remove and install using hose clip pliers - VAS 6340-
- ☐ Always renew after removing

#### 4 - Fuel supply line

- ☐ From fuel tank

#### 5 - High-pressure pipe

- ☐ Do not alter shape
- ☐ Tighten bracket for fuel supply line to 8 Nm
- ☐ Check for damage before re-installing
- ☐ Lubricate thread of un-





ion nut with fuel

- ☐ 25 Nm

#### 6 - High-pressure pipe

- ☐ Do not alter shape
- ☐ Counterhold at connecting piece when loosening union nut
- ☐ Tighten bracket for fuel supply line to 8 Nm
- ☐ Check for damage before re-installing
- ☐ Lubricate thread of union nut with fuel
- ☐ 25 Nm

#### 7 - Connection

- ☐ Always renew after removing
- ☐ Check tightening torque: 30 Nm

#### 8 - High-pressure pump with fuel pressure regulating valve - N276-

- ☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump
- ☐ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ☐ Fuel lines must be free of tension when installed.
- ☐ When connector is unplugged, high-pressure pump switches to full delivery (approx. 140 bar)



#### Caution

*When removing or installing the high-pressure pump, take hold of it only by the housing.*

*If the piston spring assembly of the high-pressure pump comes loose, the high-pressure pump will leak and must be renewed.*

- ☐ Removing and installing ⇒ [page 254](#)

#### 9 - O-ring

- ☐ Renew

- ☐ When installing lubricate lightly with engine oil

#### 10 - Roller tappet

- ☐ May possibly remain lodged in camshaft housing when high-pressure pump is removed
- ☐ When installing lubricate lightly with engine oil

#### 11 - Fuel pressure regulating valve - N276-

#### 12 - Electrical connector for fuel pressure regulating valve - N276-

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## 6.2 Removing and installing high-pressure pump

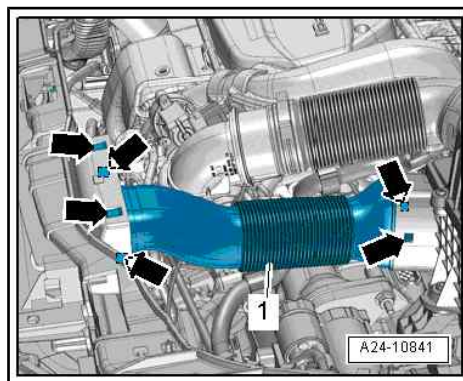
### Removing



#### Note

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- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
  - ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
  - ◆ *Use a cloth to catch escaping fuel.*
  - ◆ *The O-ring must always be renewed.*
  - ◆ *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*
- Release fasteners -arrows- and detach air duct -1-.

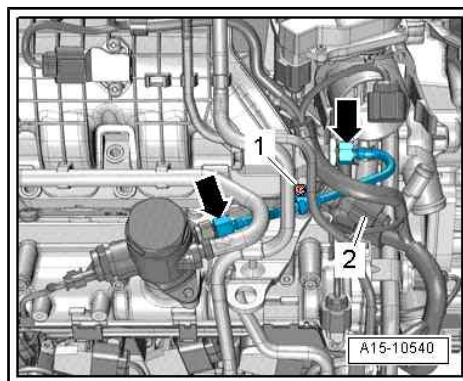


#### WARNING

*The fuel system is pressurised.*

*Risk of injury as fuel may spray out.*

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



#### Note

- ◆ *Do NOT bend open bracket for fuel line.*
- ◆ *If bracket has been bent open or fuel line has to be renewed, bracket must also be renewed.*

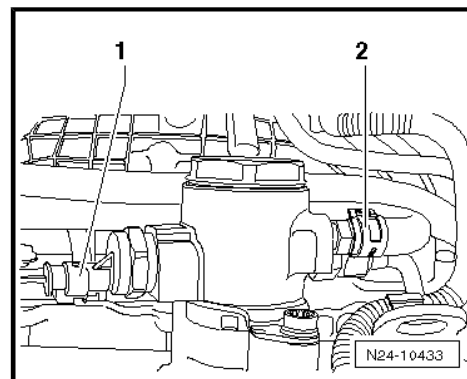


- Detach fuel supply line -2- from high-pressure pump.

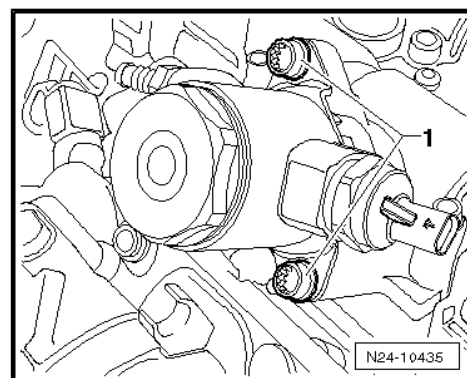


#### Note

*Use a cloth to catch escaping fuel.*



- Unscrew securing bolts -1- evenly.



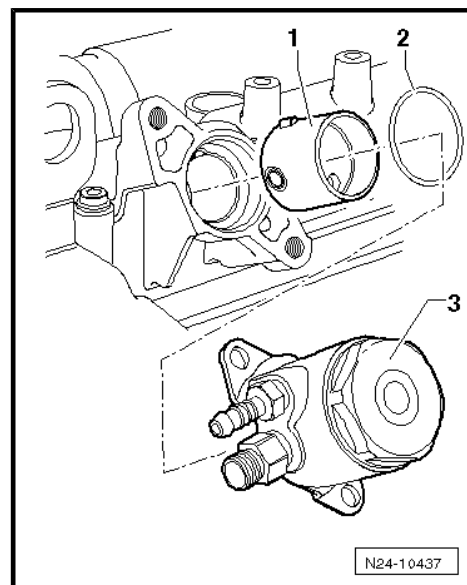
- Pull high-pressure pump -3- and roller tappet -1- out of camshaft housing.



#### Caution

*When removing or installing the high-pressure pump, take hold of it only by the housing.*

*If the piston spring assembly of the high-pressure pump comes loose, the high-pressure pump will leak and must be renewed.*



#### Installing



#### Note

*Renew O-ring for high-pressure pump.*

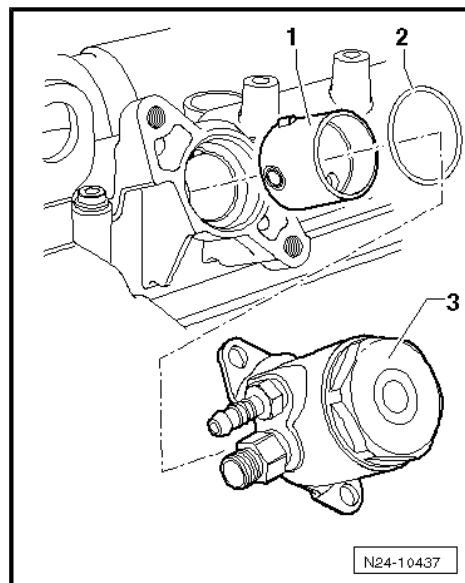
- Check roller tappet for damage and renew if necessary.
- Lubricate roller tappet -1- with clean engine oil.
- Insert lubricated roller tappet -1- into camshaft housing.



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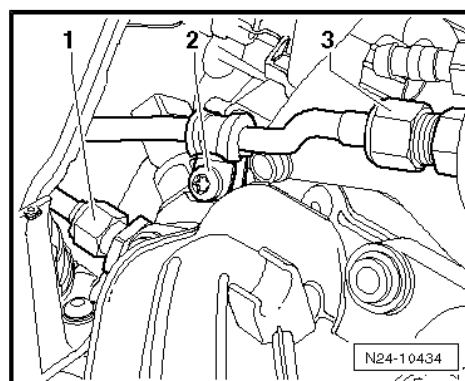
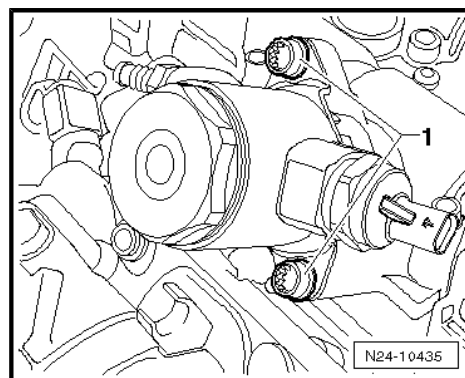
- Turn crankshaft in direction of engine rotation until roller tappet is positioned at lowest point.
- Renew connecting piece for high-pressure pipe at high-pressure pump.
- Insert a new, oiled O-ring -2- into groove on high-pressure pump -3-.
- Carefully insert high-pressure pump -3-.
- Press high-pressure pump down by hand as far as possible onto stop.



- At the same time, tighten securing bolts -1- by hand.
- Then tighten securing bolts -1- alternately to 5 Nm (do not tilt high-pressure pump).
- Now tighten securing bolts -1- alternately to final torque.

Fitting instructions for high-pressure pipe: (install free of stress)

- Screw in union nuts -1- and -3- on high-pressure pipe (two threads by hand).
- Screw in bolt -2- by hand.
- Tighten both union nuts -1- and -3- as far as stop.
- Tighten bolt -2- to 8 Nm.
- Tighten both union nuts -1- and -3- to specified torque.
- Re-connect fuel supply line -2- to high-pressure pump (make sure it is securely fitted).



- Re-attach electrical connector -1- for fuel pressure regulating valve - N276- .

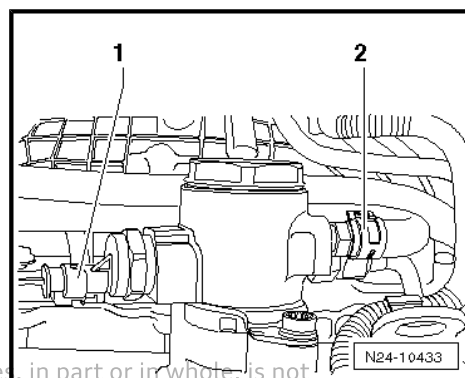


#### Note

Check fuel system for leaks.

#### Tightening torques

- ♦ ➔ [“6.1 Exploded view - high-pressure pump”, page 252](#)



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## 6.3 Removing and installing high-pressure pipe

### Special tools and workshop equipment required

- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-



### Removing

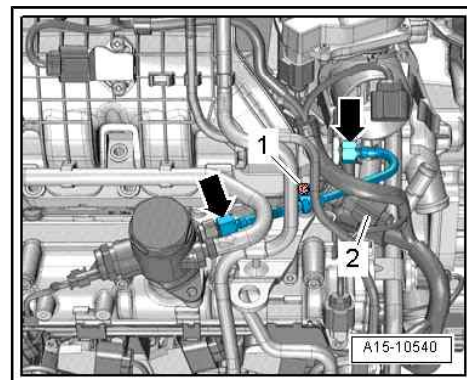


#### WARNING

*The fuel system is pressurised.*

*Risk of injury as fuel may spray out.*

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



#### Note

*Disregard -item 2-.*

### Installing



#### Note

- ◆ *Renew connecting piece.*
- ◆ *The connections of the high-pressure pipe must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipe to a different shape.*



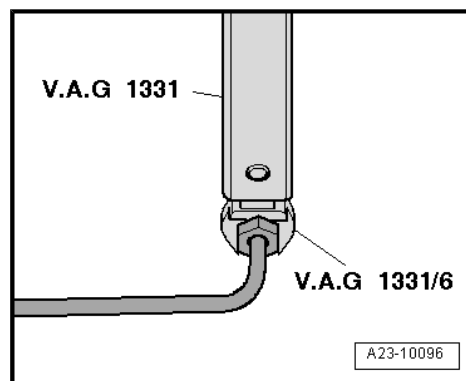
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- First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.
- Tighten union nut with torque wrench - V.A.G 1331- and open end spanner insert (AF 17) - V.A.G 1331/6- ; to do so, counterhold at hexagon flats of threaded connection with an open-end spanner.
- Do not tighten bolt for retainer until high-pressure pipe has been tightened.

#### Tightening torques

- ◆ ⇒ [“6.1 Exploded view - high-pressure pump”, page 252](#)



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## 7 Lambda probe

⇒ [“7.1 Exploded view - Lambda probe”, page 259](#)

⇒ [“7.2 Removing and installing Lambda probe”, page 260](#)

### 7.1 Exploded view - Lambda probe



#### Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ [Electronic parts catalogue](#)*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

#### 1 - Lambda probe after catalytic converter - G130-

- ☐ With Lambda probe 1 heater after catalytic converter - Z29-
- ☐ Removing and installing  
⇒ [“7.2.2 Removing and installing Lambda probe after catalytic converter G130”, page 262](#)
- ☐ 55 Nm

#### 2 - Lambda probe - G39-

- ☐ With Lambda probe heater - Z19-
- ☐ Removing and installing  
⇒ [“7.2.1 Removing and installing Lambda probe G39”, page 260](#)
- ☐ 55 Nm

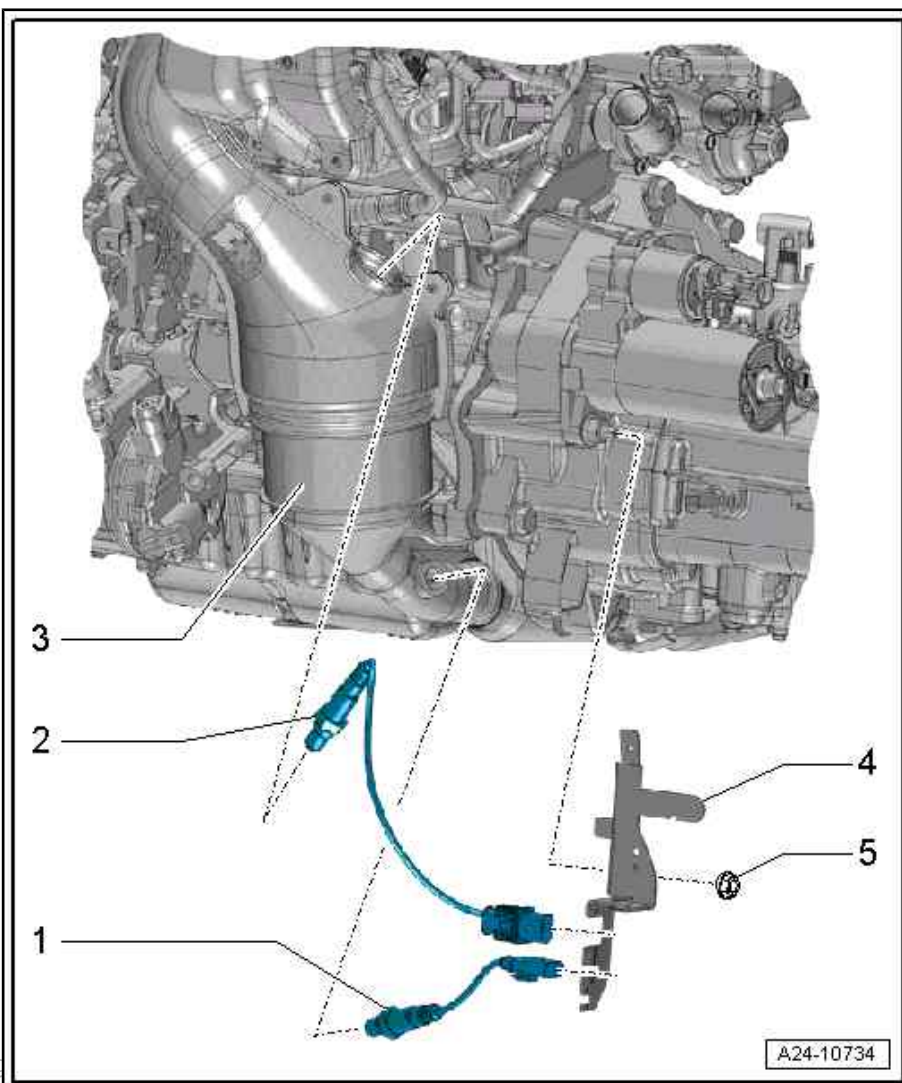
#### 3 - Catalytic converter

#### 4 - Bracket

- ☐ For electrical connectors

#### 5 - Nut

- ☐ M6: 9 Nm
- ☐ M8: 23 Nm



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## 7.2 Removing and installing Lambda probe

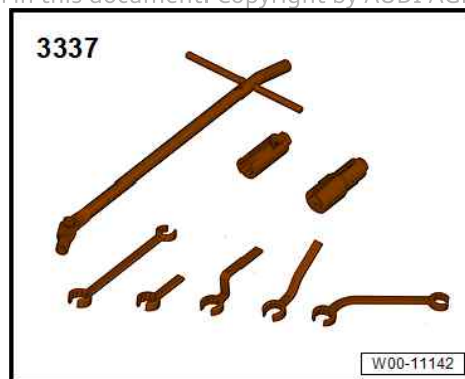
⇒ ["7.2.1 Removing and installing Lambda probe G39", page 260](#)

⇒ ["7.2.2 Removing and installing Lambda probe after catalytic converter G130", page 262](#)

### 7.2.1 Removing and installing Lambda probe - G39-

#### Special tools and workshop equipment required

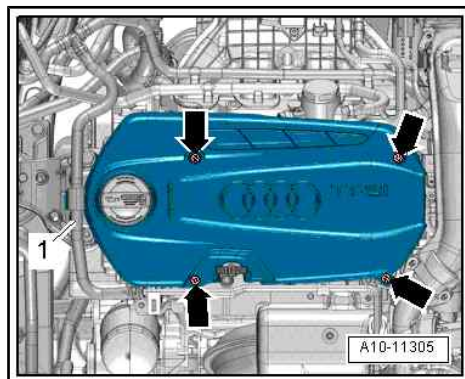
- ◆ Lambda probe open ring spanner set - 3337-



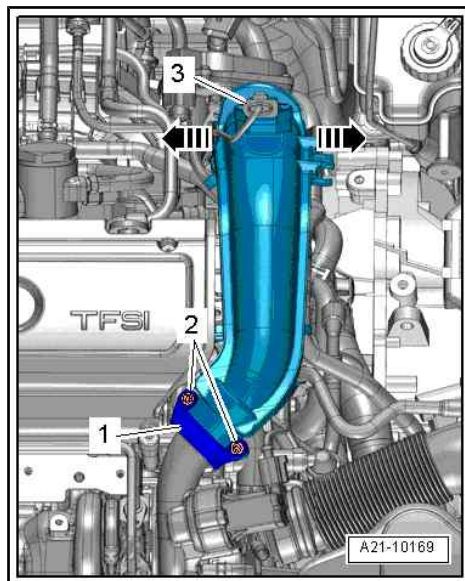
- ◆ Wobble drive extension (commercially available)

#### Removing

- Move coolant hose -1- clear.
- Unscrew bolts -arrows- and detach engine cover panel.

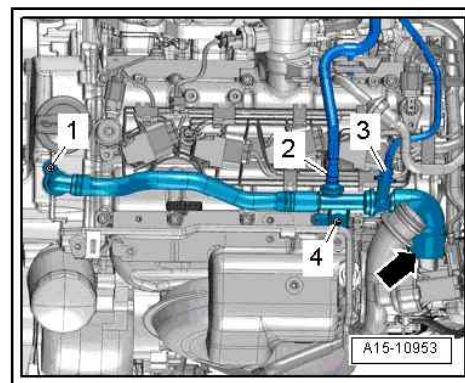


- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module - J338- and then from turbocharger.
- Move clear hoses at air pipe.

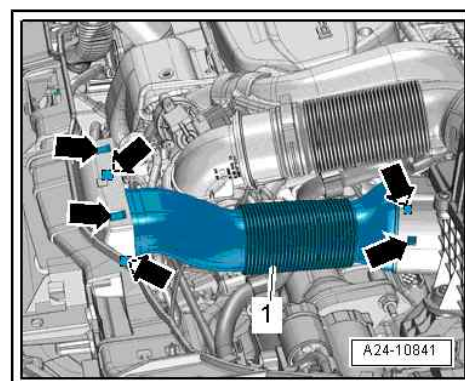




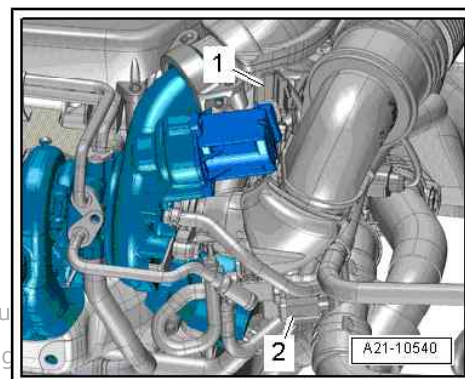
- Press release ring and detach lines -2- and -3-.
- Remove bolts -1 and 4- and pull crankcase breather hose off timing chain cover.



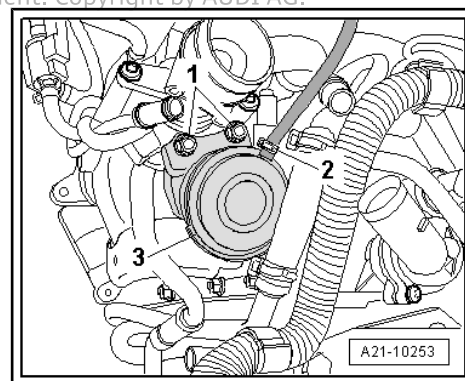
- Release fasteners -arrows- and detach air duct -1-.



- Unplug electrical connector -1- on turbocharger air recirculation valve - N249- and -2- on charge pressure control solenoid valve - N75- .
- Disconnect hose for charge pressure control solenoid valve - N75- from turbocharger.



- Disconnect hose -2- at vacuum unit -3- for turbocharger.



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- Remove bolts -3 and 4-, detach connection and press to one side with crankcase breather hose connected.

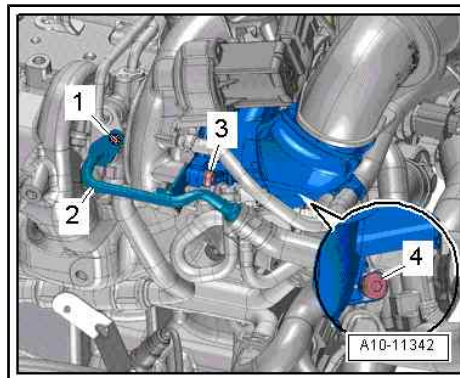


#### Note

Disregard items -1 and 2-.

#### Applies to vehicles with S tronic gearbox

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



#### All vehicles (continued)

- Unplug electrical connector -2- for Lambda probe - G39- and Lambda probe heater - Z19- .
- Unscrew Lambda probe - G39- -1- using tool from Lambda probe open ring spanner set - 3337- .

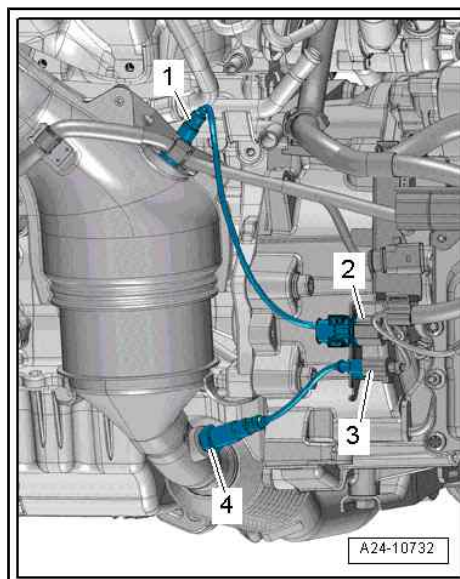
#### Installing

When installing, note the following:



#### Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*



#### Tightening torques

- ◆ ⇒ [“7.1 Exploded view - Lambda probe”, page 259](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

## 7.2.2 Removing and installing Lambda probe after catalytic converter - G130-

#### Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-

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## Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Unplug electrical connector -3- for Lambda probe after catalytic converter - G130- and Lambda probe heater - Z19- .
- Unscrew Lambda probe after catalytic converter - G130- -4- using tool from Lambda probe open ring spanner set - 3337- .

## Installing

When installing, note the following:

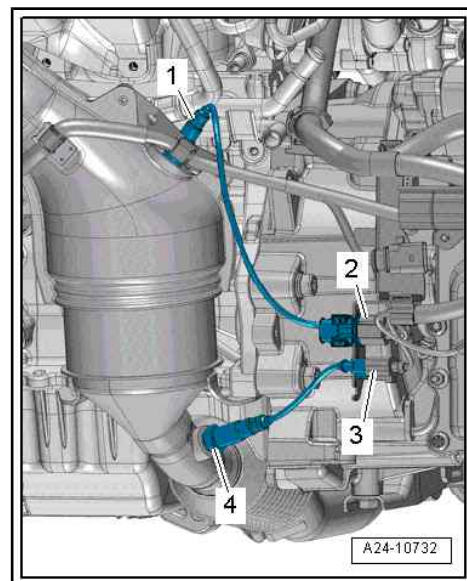


### Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

## Tightening torques

- ◆ ⇒ [“7.1 Exploded view - Lambda probe”, page 259](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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## 8 Engine control unit

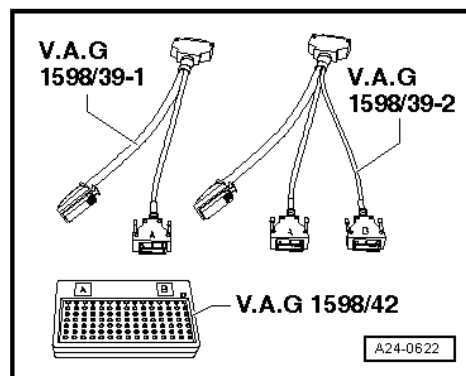
⇒ ["8.1 Wiring and component check with test box", page 264](#)

⇒ ["8.2 Removing and installing engine/motor control unit J623", page 265](#)

### 8.1 Wiring and component check with test box

#### Special tools and workshop equipment required

- ◆ Adapter cable - V.A.G 1598/39-



- ◆ Test box - V.A.G 1598/42-
- ◆ Vehicle diagnostic tester



#### Note

- ◆ The test box - V.A.G 1598/42- has 105 sockets. It can be connected to the engine control unit via 2 different adapter cables.
- ◆ Each engine control unit is connected to the vehicle's wiring harness via two connectors, one of which has 60 pins, the other has 94 pins. Protected by copyright. A provision 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
- ◆ To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector ⇒ *Current flow diagrams, Electrical fault finding and Fitting locations.*
- ◆ To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ *Current flow diagrams, Electrical fault finding and Fitting locations.*
- ◆ The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time. The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ Always use auxiliary measuring set - V.A.G 1527B- to connect test equipment (e.g. voltage tester - V.A.G 1526D- , hand-held multimeter - V.A.G 1594C- etc.).

The engine control unit has to be removed before connectors can be unplugged from engine control unit ⇒ [page 265](#) .



### Caution

**Risk of irreparable damage to electronic components.**

- ◆ **Select the appropriate measuring range before connecting the test leads and observe test requirements.**

- Connect test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in repair procedure.
- Make sure you fit protective housing back on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- Interrogate event memory and erase if necessary.

## 8.2 Removing and installing engine/motor control unit - J623-

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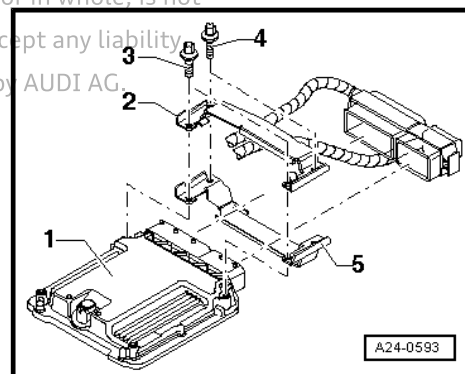
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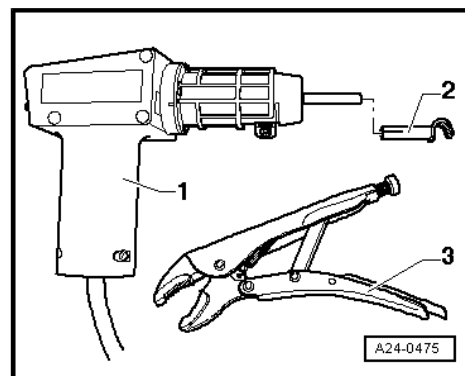
### Note

- ◆ *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- ◆ *The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- ◆ *The protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



### Special tools and workshop equipment required

- ◆ Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-

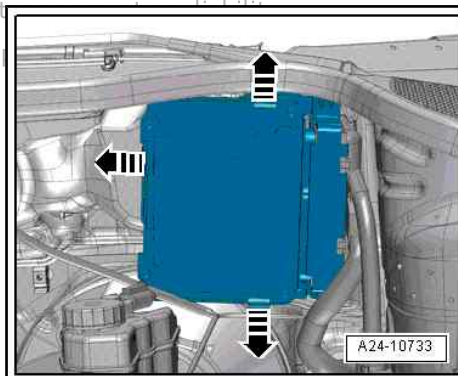


- ◆ Small mole grips -3- (commercially available)



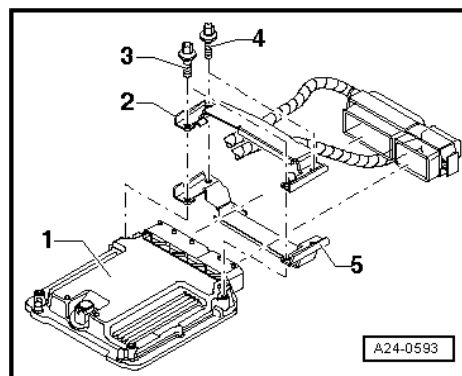
## Removing

- When renewing engine control unit, select diagnosis object “Replace engine control unit” in “Guided Functions” mode of ⇒ Vehicle diagnostic tester.
- Switch off ignition and remove ignition key.
- Remove air cleaner housing ⇒ [page 233](#).
- Release fasteners -arrows- and detach engine control unit -J623- from bracket.



### Note

- ♦ The threads of the two shear bolts -4- which are not screwed into the engine control unit -1- are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.
- ♦ The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.





### Caution

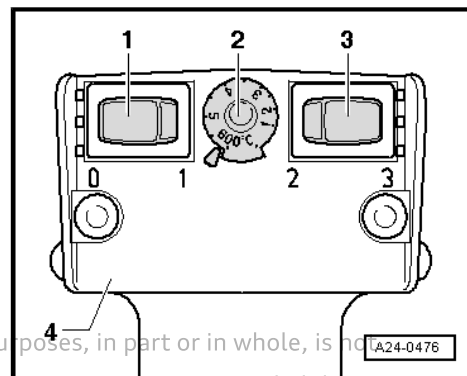
*Wiring, connectors, insulation and control units can be burnt and damaged.*

- ◆ *Keep exactly to the following procedure. Observe operating instructions for hot air blower.*

– Select settings on hot air blower -4- as shown in illustration:

2 - Temperature potentiometer to maximum heat output

3 - Two-stage air flow switch to position "3"



### Note

- ◆ *Then use hot air blower to heat threaded holes in protective housing into which shear bolts have been screwed. This reduces the inhibiting action of the locking fluid on the shear bolt threads and makes it easier to unscrew these bolts.*
- ◆ *Cover up all painted parts to avoid any damage caused by hot air blower or vice-grip pliers.*



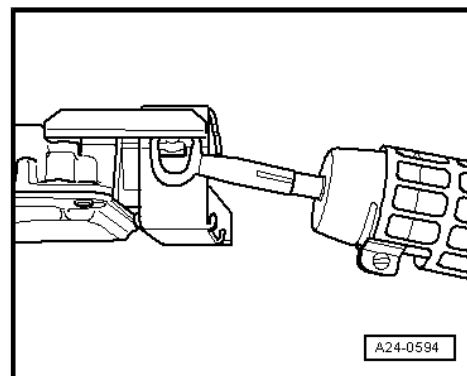
### WARNING

*Risk of burns.*

- ◆ *Parts of the metal locking plate will become very hot as a result of heating the shear bolts. Try to ensure that only the thread is heated and none of the nearby components. These should be covered if necessary.*

Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

Switch on the hot air blower and heat the bolt for approximately 20 ... 30 seconds.



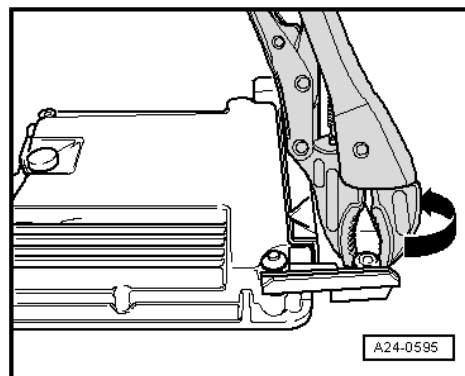


- Then grasp bolt head with vice-grip pliers and unscrew shear bolt.
- Repeat procedure for second shear bolt.
- Detach protective housing from multi-pin connectors.
- Unscrew the two shear bolts screwed into the engine control unit (they do not need to be heated).

### Installing

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

- After installation, the protective housing must be re-fitted on the engine control unit - J623-
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.



**After installing a new engine control unit, the following operation must be performed:**

- Activate engine control unit using → Vehicle diagnostic tester in “Guided Functions” mode “Replace engine control unit”

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## 26 – Exhaust system

### 1 Exhaust pipes/silencers

⇒ ["1.1 Exploded view - silencers", page 269](#)

⇒ ["1.2 Removing and installing centre silencer", page 271](#)

⇒ ["1.3 Stress-free alignment of exhaust system", page 272](#)

⇒ ["1.4 Checking exhaust system for leaks", page 273](#)

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#### 1.1 Exploded view - silencers



##### Note

The exhaust manifold and the turbocharger are combined as one unit; removing and installing ⇒ [page 197](#).

##### 1 - Bolt

- ☐ 23 Nm

##### 2 - Rubber mounting

- ☐ Renew if damaged

##### 3 - Nuts

- ☐ 23 Nm

##### 4 - Gasket

- ☐ Renew

##### 5 - Catalytic converter

- ☐ From model year 2013 onwards
- ☐ Protect against knocks and impact
- ☐ Removing and installing ⇒ [page 276](#)
- ☐ Use clips when installing ⇒ [page 271](#)

##### 6 - Subframe

##### 7 - Rubber mounting

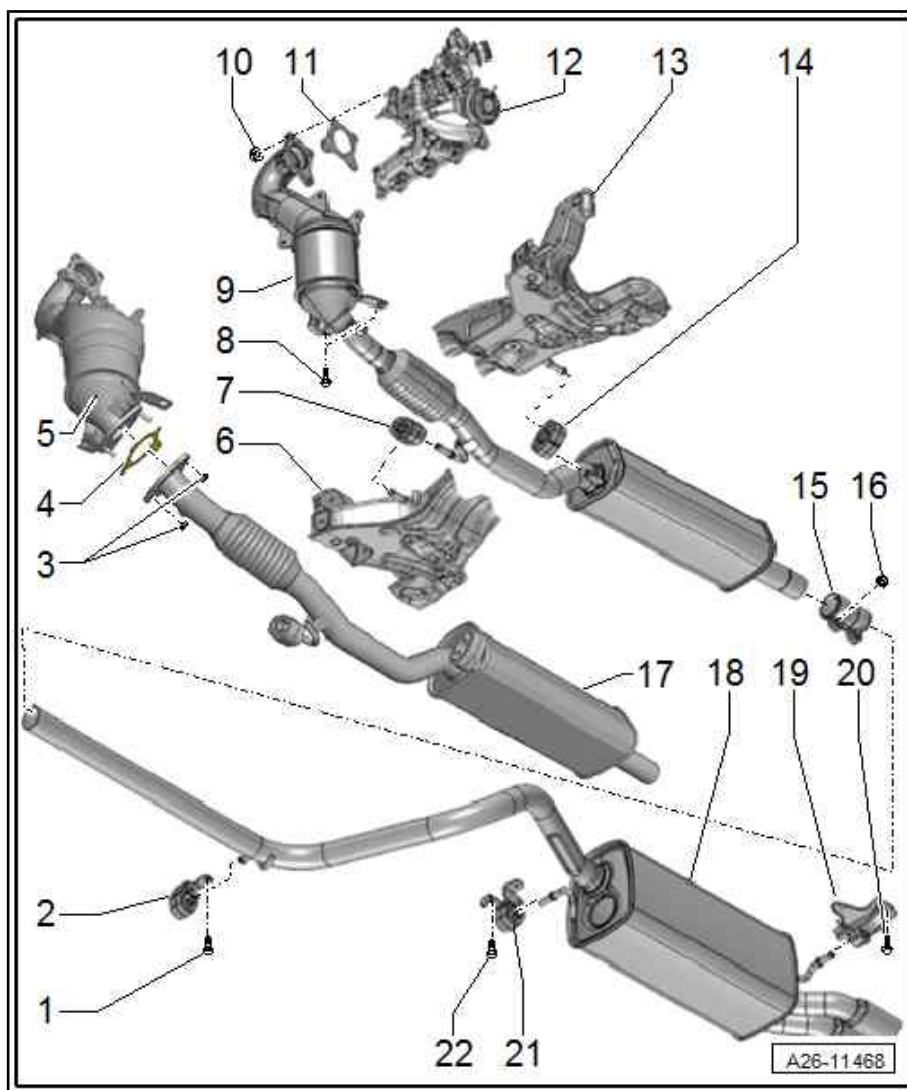
- ☐ Renew if damaged

##### 8 - Bolt

- ☐ Use clips when installing ⇒ [page 271](#)
- ☐ Tightening sequence ⇒ [page 276](#)
- ☐ 23 Nm

##### 9 - Catalytic converter with centre silencer

- ☐ Up to model year 2013
- ☐ Protect against knocks and impact
- ☐ Removing and installing ⇒ [page 274](#)
- ☐ Use clips when installing ⇒ [page 271](#)





#### 10 - Nut

- ☐ Tightening sequence ⇒ [page 276](#)
- ☐ 23 Nm

#### 11 - Gasket

- ☐ Renew

#### 12 - Turbocharger

#### 13 - Subframe

#### 14 - Rubber mounting

- ☐ Renew if damaged

#### 15 - Clamp

- ☐ Before tightening, align exhaust system so it is free of stress ⇒ [page 272](#)
- ☐ Installation position ⇒ [page 270](#)
- ☐ Tighten bolted connections evenly

#### 16 - Nut

- ☐ 23 Nm

#### 17 - Centre silencer

- ☐ From model year 2013 onwards
- ☐ Protect against knocks and impact

- ☐ Removing and installing ⇒ [page 271](#)

#### 18 - Rear silencer

- ☐ Align exhaust system so it is free of stress ⇒ [page 272](#)

#### 19 - Rubber mounting

- ☐ Renew if damaged

#### 20 - Bolt

- ☐ 23 Nm

#### 21 - Rubber mounting

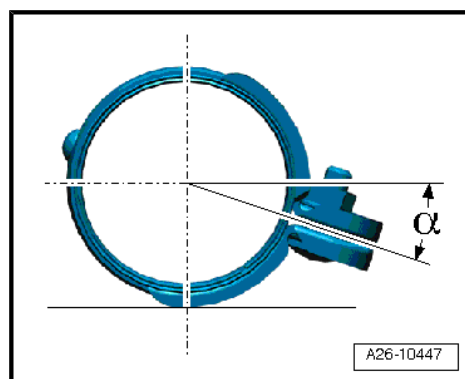
- ☐ Renew if damaged

#### 22 - Bolt

- ☐ 23 Nm

#### Installation position of clamp

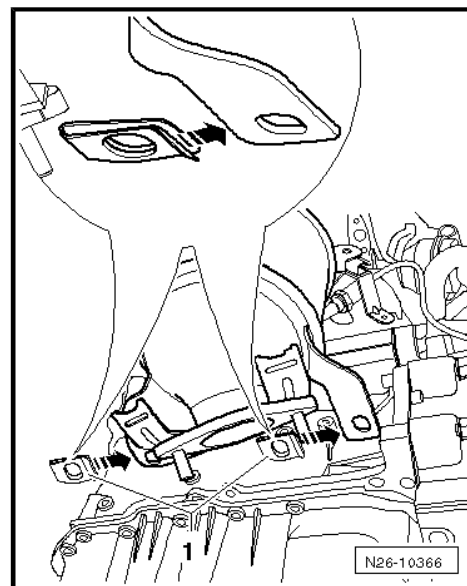
- Fit the clamp at the angle shown.
- Bolted connections face to right.
- Nuts face upwards.
- $\alpha$  = approx.  $20^\circ$





### Installing catalytic converter

- Fit clips onto brackets -arrow-.
- Angled side of clips faces downwards.
- Tighten bolts to specified torque ➔ [page 276](#) .



## 1.2 Removing and installing centre silencer



### Note

*On vehicles from model year 2013 onwards, the centre silencer can be removed without the catalytic converter.*

### Removing

- Remove noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

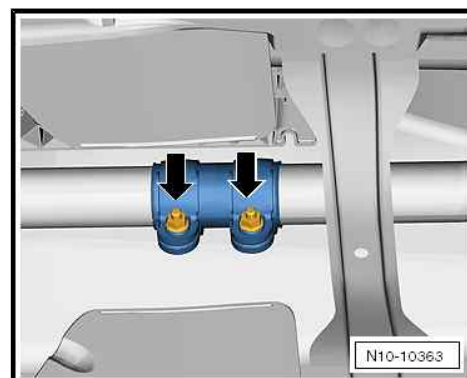


### Caution

*Risk of damage to flexible joint.*

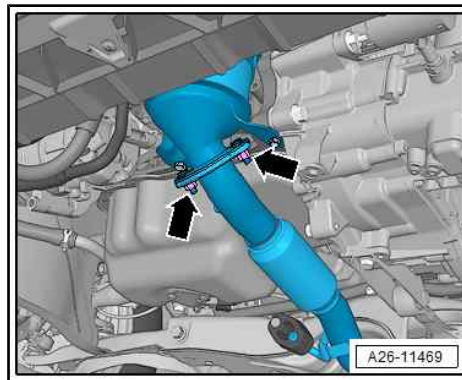
◆ *Do not bend flexible joint more than 10°.*

- Unscrew nuts -arrows- and push clamp towards rear.





- Remove nuts -arrows-.



- Press mountings -1- for exhaust system off pins.
- Detach centre silencer -2- from below, taking care not to bend flexible joint more than 10°.

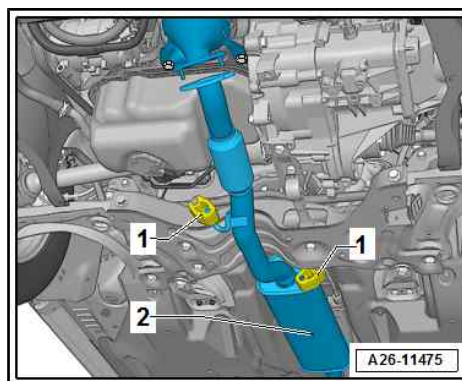
### Installing

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

- Align the exhaust system so it is free of stress ⇒ [page 272](#) .

### Tightening torques

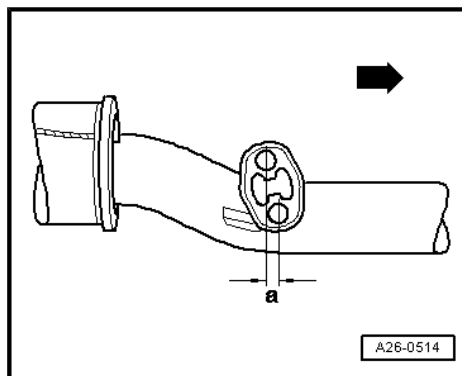
- ♦ ⇒ [“1.1 Exploded view - silencers”, page 269](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



## 1.3 Stress-free alignment of exhaust system

### Procedure

- The exhaust system must be aligned when it is cool.
- Loosen bolted connections on front clamp.
- Push rear section of exhaust system towards front of vehicle -arrow-, so that rear mounting for centre silencer is preloaded by -a- = 13 ... 17 mm.

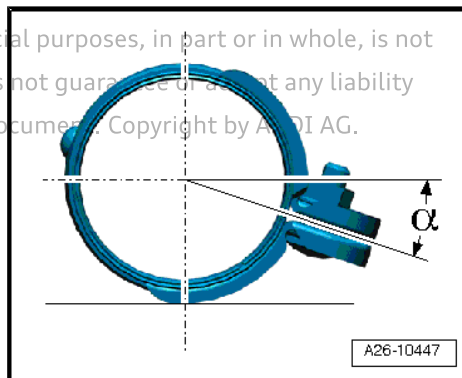


- Fit the clamp at the angle shown.

- Bolted connections face to right.

- Nuts face upwards.

- $\alpha$  = approx. 20°

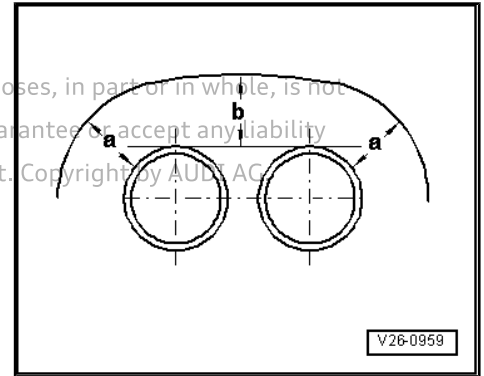




- Position rear silencer to align tailpipes as follows:
- Distance between tailpipes and bumper cut-out must be equal on both sides.
- Distance -a- is the same on both sides.
- At the same time, specified clearance must be maintained between bumper cut-out and top of tailpipes.
- Distance -b- = 21 mm.
- If necessary, unfasten rear silencer mounting to align tailpipes.

#### Tightening torques

- ◆ ⇒ ["1.1 Exploded view - silencers", page 269](#)



## 1.4 Checking exhaust system for leaks

### Procedure

- Start the engine and run at idling speed.
- Plug tailpipe during leak test (e.g. with cloth or plugs).
- Listen for leaks at joints between cylinder head and exhaust manifold with turbocharger, exhaust manifold/turbocharger and front exhaust pipe, etc.
- Rectify any leaks that are found.



## 2 Emission control system

⇒ [“2.1 Removing and installing catalytic converter”, page 274](#)

### 2.1 Removing and installing catalytic converter

⇒ [“2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012”, page 274](#)

⇒ [“2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards”, page 276](#)

#### 2.1.1 Removing and installing catalytic converter with centre silencer, vehicles up to model year 2012

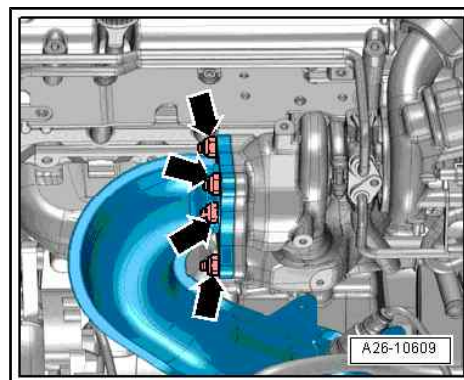
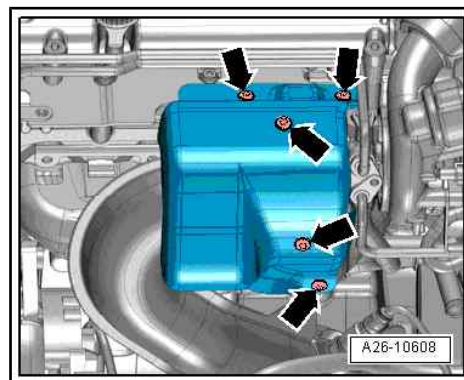


#### Note

*On vehicles up to model year 2012, the catalytic converter and centre silencer must be removed together.*

#### Removing

- Remove bolts -arrows- and detach heat shield for turbocharger.
- Remove nuts -arrows- for catalytic converter.
- Move clear electrical wiring harness leading to alternator at catalytic converter.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



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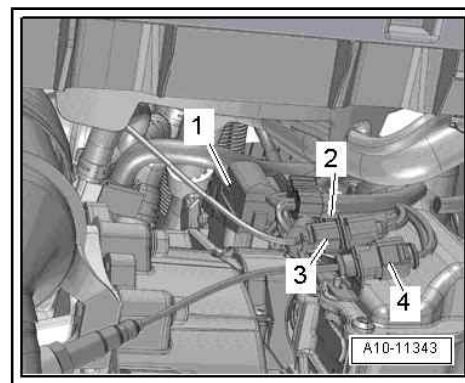


- Remove electrical connector -4- for Lambda probe - G39- from bracket and unplug connector.



#### Note

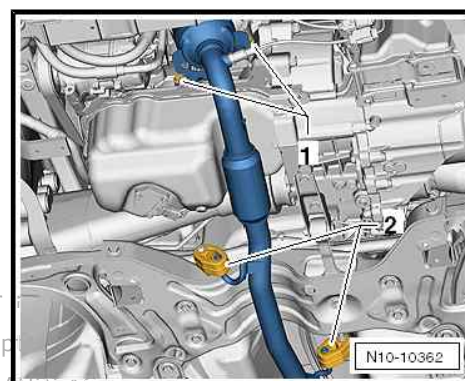
- ◆ *Illustration shows fitting location on a vehicle with a dual clutch gearbox as an example.*
- ◆ *Disregard -items 1, 2, 3-.*



- Move clear electrical wiring harness at catalytic converter.
- Remove bolts -1-.
- Press mountings -2- for exhaust system off pins.



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- Unscrew nuts -arrows- and push clamp towards rear.
- Detach catalytic converter with centre silencer from underneath.

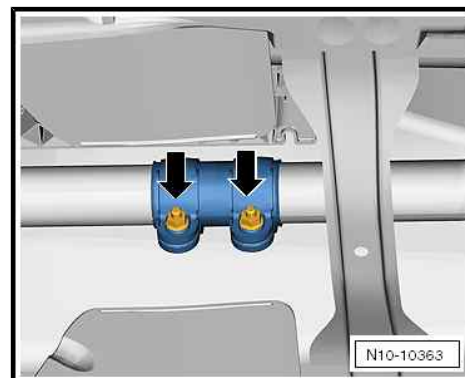
#### Installing

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



#### Note

*Renew gasket and nuts.*





- Note sequence for installing catalytic converter:



### Caution

**Risk of damage to flexible joint.**

- ◆ **While the catalytic converter is being secured to the engine, a second mechanic must take hold of the centre silencer to take the load off the flexible joint.**

- Install clips ⇒ [page 271](#) .
- Secure catalytic converter in 6 stages as follows:

| Stage | Bolts/nuts | Tightening torque                                                                 |
|-------|------------|-----------------------------------------------------------------------------------|
| 1.    |            | Insert centring lug -1- on catalytic converter in hole in cylinder block -arrow-. |
| 2.    |            | Fit catalytic converter onto studs of turbocharger.                               |
| 3.    | -2-        | Screw in by hand until contact is made                                            |
| 4.    | -3-        | Tighten                                                                           |
| 5.    | -4-        | Tighten                                                                           |
| 6.    | -2-        | Tighten                                                                           |

- Engage centre silencer in rubber mountings.
- Align the exhaust system so it is free of stress ⇒ [page 272](#) .
- Install heat shield for turbocharger ⇒ [page 195](#) .

### Tightening torques

- ⇒ [“1.1 Exploded view - silencers”, page 269](#)
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

## 2.1.2 Removing and installing catalytic converter, vehicles from model year 2013 onwards

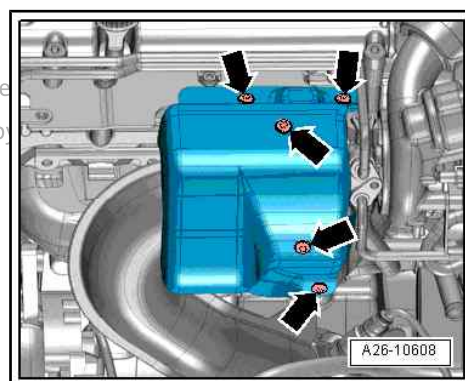
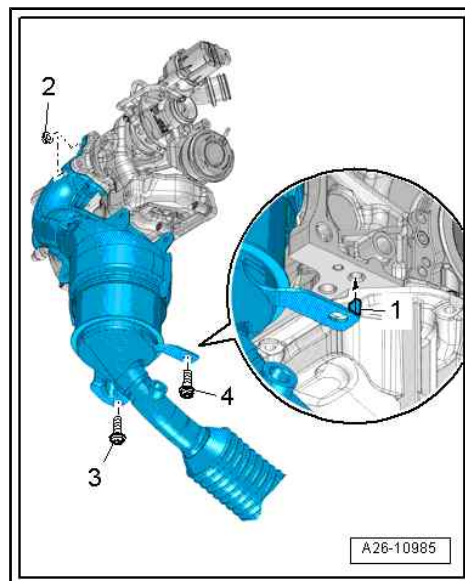


### Note

*On vehicles from model year 2013 onwards, the catalytic converter can be removed without the centre silencer.*

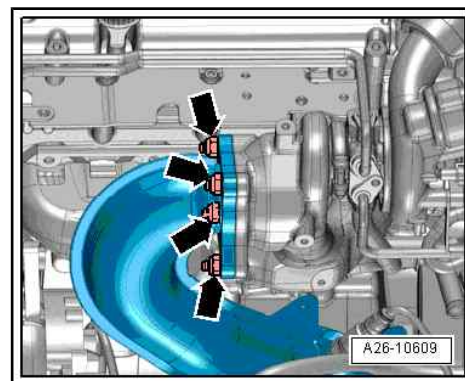
### Removing

- Remove bolts -arrows- and detach heat shield for turbocharger.





- Remove nuts -arrows- for catalytic converter.
- Move clear electrical wiring harness leading to alternator at catalytic converter.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

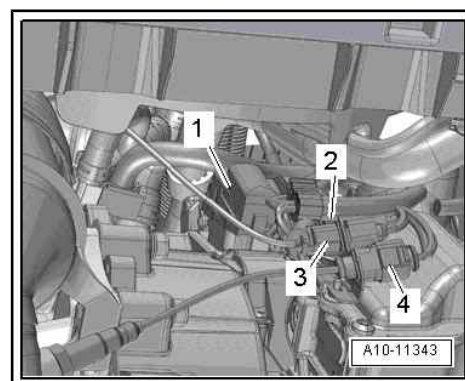


- Remove electrical connector -4- for Lambda probe - G39- from bracket and unplug connector.



#### Note

- ◆ *Illustration shows fitting location on a vehicle with a dual clutch gearbox as an example.*
- ◆ *Disregard -items 1, 2, 3-.*
- Move clear electrical wiring harness at catalytic converter.



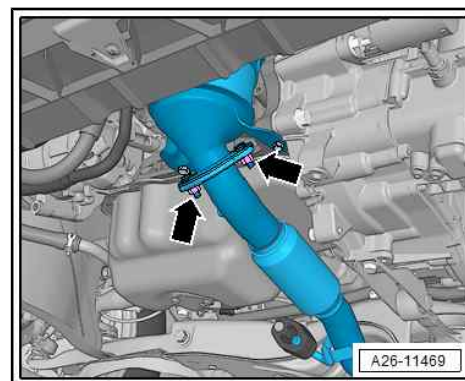
- Remove nuts -arrows- and tie flexible joint up to a suitable point on the engine with a piece of wire.



#### Caution

*Risk of damage to flexible joint.*

- ◆ *Do not bend flexible joint more than 10°.*



- Remove bolts -arrows- and detach catalytic converter from below.

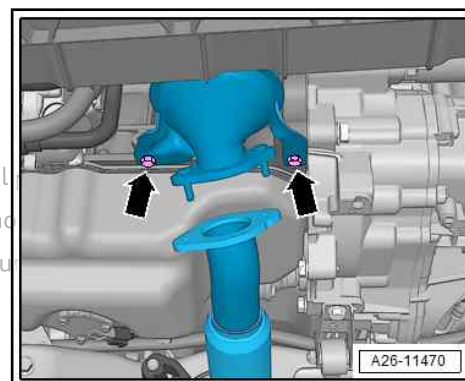
#### Installing

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



#### Note

*Renew gasket and nuts.*





- Note sequence for installing catalytic converter:



#### Note

The illustration shows the catalytic converter with centre silencer.



#### Caution

**Risk of damage to flexible joint.**

- ◆ Do not bend flexible joint more than 10°.

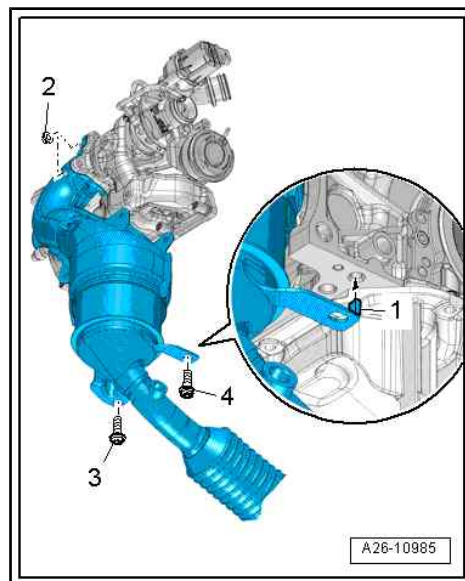
- Install clips ⇒ [page 271](#) .
- Secure catalytic converter in 6 stages as follows:

| Stage | Bolts/nuts | Tightening torque                                                                 |
|-------|------------|-----------------------------------------------------------------------------------|
| 1.    |            | Insert centring lug -1- on catalytic converter in hole in cylinder block -arrow-. |
| 2.    |            | Fit catalytic converter onto studs of turbocharger.                               |
| 3.    | -2-        | Screw in by hand until contact is made                                            |
| 4.    | -3-        | Tighten                                                                           |
| 5.    | -4-        | Tighten                                                                           |
| 6.    | -2-        | Tighten                                                                           |

- Align the exhaust system so it is free of stress ⇒ [page 272](#) .
- Install heat shield for turbocharger ⇒ [page 195](#) .

#### Tightening torques

- ⇒ [“1.1 Exploded view - silencers”, page 269](#)
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation





### 3 Exhaust manifold

The exhaust manifold and the turbocharger are combined as one unit; removing and installing

⇒ ["1.2 Removing and installing turbocharger", page 197](#) .





## 28 – Ignition system

### 1 Ignition system

⇒ [“1.1 Exploded view - ignition system”, page 280](#)

⇒ [“1.2 Test data - spark plugs”, page 281](#)

⇒ [“1.3 Removing and installing ignition coils with output stages”, page 281](#)

⇒ [“1.4 Removing and installing knock sensor”, page 282](#)

⇒ [“1.5 Removing and installing Hall senders”, page 282](#)

⇒ [“1.6 Removing and installing engine speed sender G28”, page 282](#)

#### 1.1 Exploded view - ignition system

##### 1 - Spark plug

- ☐ Remove and install with spark plug socket and extension - 3122 B-  
⇒ Maintenance ; Book-let 819
- ☐ Change interval ⇒ Maintenance tables
- ☐ Tightening torque  
⇒ Maintenance ; Book-let 819

##### 2 - Cable guide

##### 3 - Ignition coil with output stage

- ☐ Ignition coil 1 with output stage - N70-
- ☐ Ignition coil 2 with output stage - N127-
- ☐ Ignition coil 3 with output stage - N291-
- ☐ Ignition coil 4 with output stage - N292-
- ☐ Removing and installing  
⇒ [page 281](#)

##### 4 - Bolt

- ☐ 9 Nm

##### 5 - Hall sender - G40-

- ☐ Removing and installing  
⇒ [page 282](#)

##### 6 - O-ring

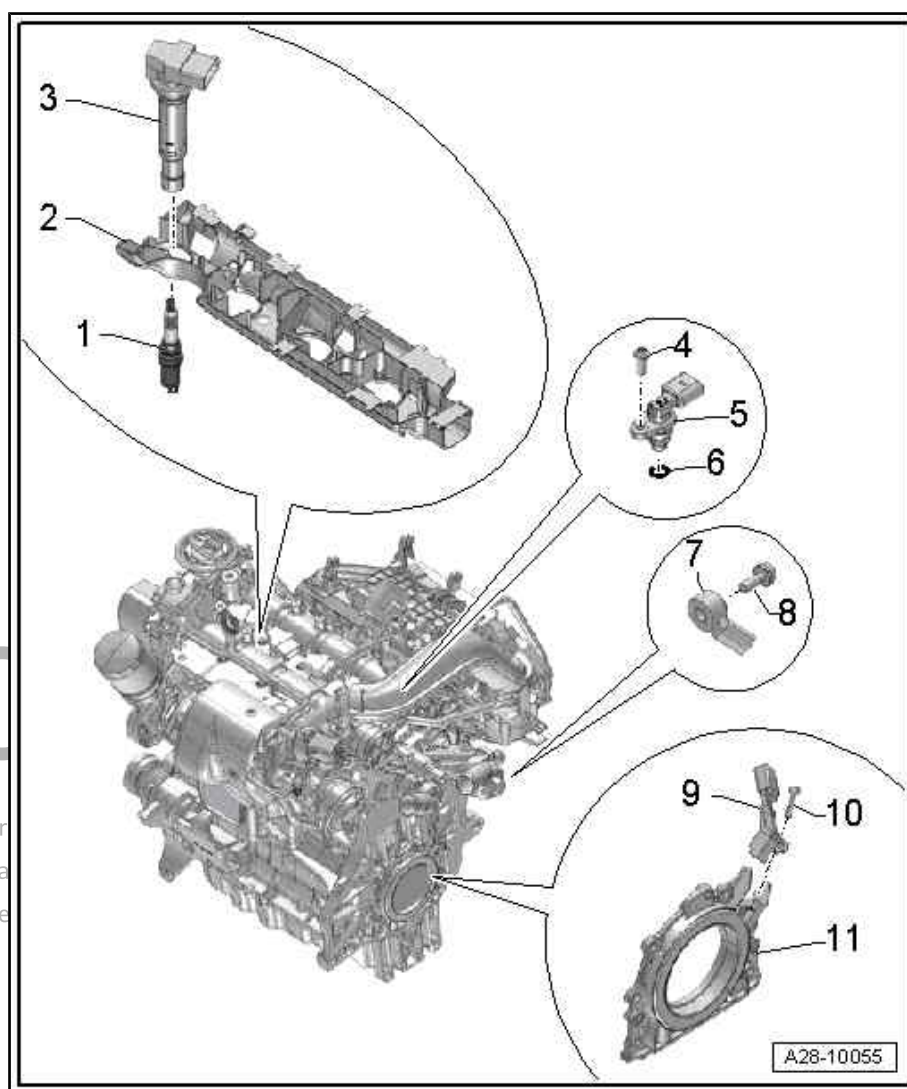
- ☐ Renew if damaged

##### 7 - Knock sensor 1 - G61-

- ☐ Removing and installing ⇒ [page 282](#)

##### 8 - Bolt

- ☐ 20 Nm
- ☐ Tightening torque influences the function of the knock sensor





## 9 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ [page 282](#)

## 10 - Bolt

- ❑ 4.5 Nm

## 11 - Sender wheel

- ❑ For engine speed sender - G28-
- ❑ Removing and installing ⇒ ["2.3 Removing and installing sealing flange \(gearbox end\)", page 60](#)

## 1.2 Test data - spark plugs

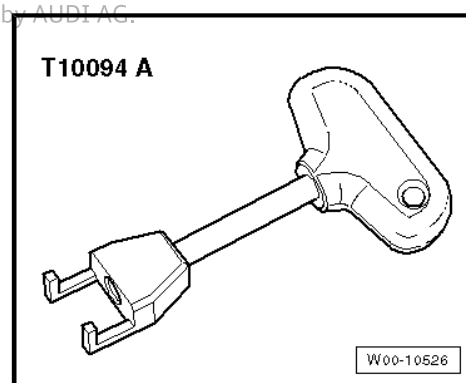
| 1.4 ltr. TFSI engine |                   |                                                                                                                                |
|----------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Idling speed         |                   | Cannot be adjusted; regulated by idling speed stabilisation                                                                    |
| Ignition timing      |                   | Not adjustable (determined by control unit)                                                                                    |
| Ignition system      |                   | Multi-coil system with 4 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors |
| Spark plugs          | Designations      | ⇒ Electronic parts catalogue                                                                                                   |
|                      | Tightening torque | ⇒ Maintenance ; Booklet 819                                                                                                    |
| Firing order         |                   | 1-3-4-2                                                                                                                        |

## 1.3 Removing and installing ignition coils with output stages

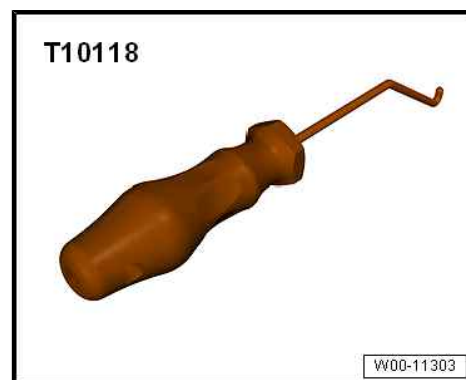
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### Special tools and workshop equipment required

- ◆ Puller - T10094 A-



- ◆ Assembly tool - T10118-





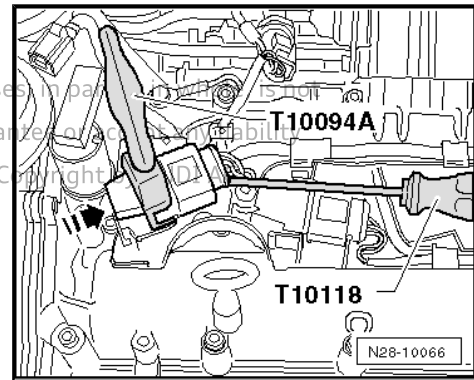
## Removing

- Remove engine cover panel ⇒ [page 40](#) .
- Apply puller - T10094 A- to all ignition coils and pull out ignition coils.
- At the same time detach electrical connectors at all ignition coils; to do so apply assembly tool - T10118- as shown and release electrical connectors.

## Installing

- Fit all ignition coils loosely into spark plug holes.
- Align ignition coils with electrical connectors and plug all connectors simultaneously onto coils.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use tools).

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



## 1.4 Removing and installing knock sensor

### Removing

- Unplug electrical connector -1- at knock sensor 1 - G61- .



### Note

*Knock sensor 1 - G61- is located below intake manifold and knock sensor 1 - G61- must therefore be removed from below.*

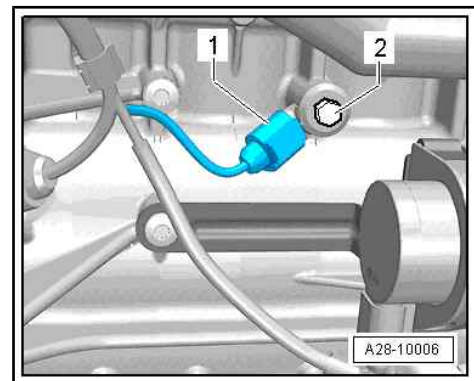
- Remove knock sensor 1 - G61- -2-.

### Installing

- Installation is carried out in reverse sequence.

### Tightening torques

- ♦ ⇒ [“1.1 Exploded view - ignition system”, page 280](#)



## 1.5 Removing and installing Hall senders

### Removing

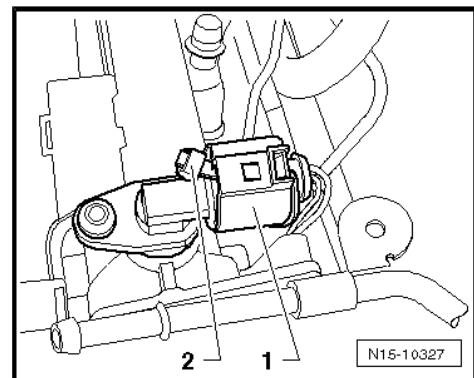
- Remove engine cover panel ⇒ [page 40](#) .
- Unplug electrical connector -1-.
- Unscrew bolt and remove Hall sender - G40- .

### Installing

- Installation is carried out in reverse sequence.

### Tightening torques

- ♦ ⇒ [“1.1 Exploded view - ignition system”, page 280](#)

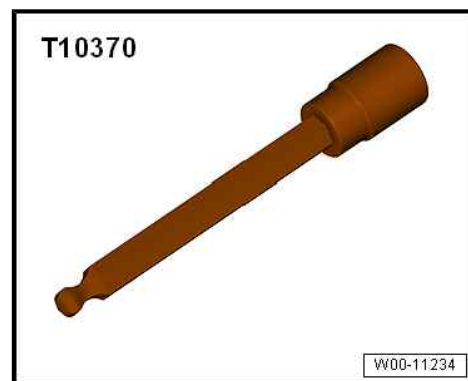


## 1.6 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required



- ◆ Socket, 4 mm - T10370-



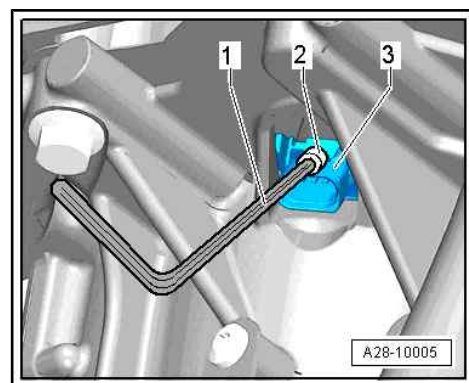
### Removing

- Remove intake manifold ⇒ [page 236](#) .
- Unplug electrical connector for engine speed sender - G28-  
-item 3-.
- Unscrew bolt -2- and detach engine speed sender.



### Note

*If access is difficult, use socket (4 mm) - T10370- .*



### Installing

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

- Lubricate O-ring with clean engine oil.
- Carefully insert engine speed sender - G28- into guide (do not  
knock in).
- Install intake manifold ⇒ [page 236](#) .

### Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 280](#)