

# Workshop Manual Audi TT 2007 ➤

4-cylinder TDI engine (2.0 ltr. 4-valve common rail), mechanics									
Engine ID	CBB B								

Edition 04.2010



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Service

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

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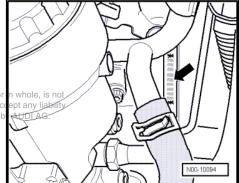




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## **Engine number**

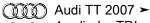
- The engine number ("Engine code" and "Serial number") -arrow- can be found at the front of the joint between engine and gearbox.
- There is also a sticker on the toothed belt cover showing the "Engine code" and "Serial number".
- Starting with the Jetterby Copy the engine codes consist of 4 let, in part or permitted unless authorised by AUDI AG. AUDI AG does not guarantee or ac with respect to the correctness of information in this document. Copyright b
- The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped on 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.





#### Note

- The 4-character engine code can be found on the type plate (in versions for some countries only) and on the vehicle data sticker and the engine control unit.
- Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance : Booklet 810 .



# 2 Engine data

Code letters		CBBB		
Capacity	ltr.	1.968		
Power output	kW at rpm	125/4200		
Torque	Nm at rpm	350/1750 2500		
Bore	$\varnothing$ in mm	81.0		
Stroke	mm	95.5		
Compression ra- tio		16.5		
CN	not less than	51		
Firing order		1-3-4-2		
Emission standards		EU4 plus		
Exhaust gas recircu	lation	yes		
Exhaust gas temper	ature control	yes		
Turbocharging/supe	rcharging	Turbocharger		
Glow plugs		Steel glow plugs		
Charge air cooling		yes		
Lambda control		1 Lambda probe		
Particulate filter		yes		
Valves per cylinder		4		



## Note

Audi TT models with a TDI engine (2.0 ltr. 4-valve common rail) are always equipped with steel glow plugs.



#### 3 Safety precautions

When working on the fuel system note the following warnings:



#### WARNING

Risk of injury - fuel system operates under pressure.

- Wrap a clean cloth around the connection before opening the fuel system. Then release pressure by carefully loosening the connection.
- Wear protective gloves.
- Wear safety goggles.

The fuel can become extremely hot. This can cause injuries.

- ♦ In extreme cases the temperature of the fuel lines and the fuel can be up to 100 °C after the engine is switched off. Allow the fuel to cool down before disconnecting the lines - danger of scalding.
- Wear protective gloves.
- Wear safety goggles.

Observe the following points to prevent personal injuries and damage to the injection and glow plug system:

- Always switch off the ignition before connecting or disconnecting tester cables or electrical wiring for the injection or glow plug system.
- Always switch off ignition before washing engine.
- Faults are stored in engine control unit if electrical connectors have been unplugged:
- "Interrogate fault memory" in "Vehicle self-diagnosis".



#### Caution

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

- Observe notes on procedure for disconnecting the battery.
- Always switch off the ignition before disconnecting the battery.
- Disconnect battery ⇒ Rep. Gr. 27.



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## When working on the cooling system note the following warnings:



#### **WARNING**

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

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

Risk of injury as the radiator fans may start up automatically.

 Unplug electrical connectors before starting to work in the area of radiator cowl.



#### Caution

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

♦ Firmly close filler cap on coolant expansion tank.

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

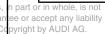


#### WARNING

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

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

- The use of test equipment while driving causes distraction.
- There is an increased risk of injury if test equipment is not, secured.
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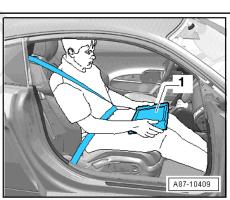


#### TT Coupé:

Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.

## TT Roadster:

- ♦ Move the passenger's seat back as far as it will go.
- ♦ Use only vehicle diagnosis and service information system -VAS 5052- or diagnosis system -VAS 5053- .
- ◆ The test equipment -1- must rest flat on the passenger's thighs (as shown in illustration) and must be operated by the passenger.



#### 4 General repair instructions

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

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

- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- Seal off open pipes/lines and connections using engine bung set -VAS 6122- .
- Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have not been stored in the proper packaging (e.g. in tool boxes etc.).
- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not ♦ When the system is open. Do not work with compressed air nice or accept any liability Do not move the vehicle unless absolutely necessary."
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

#### 4.2 Checking for leaks in the fuel system

#### **Procedure**

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

#### 4.3 Contact corrosion!

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

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

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

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

#### Note the following:

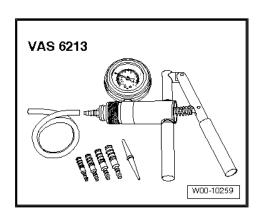
We recommend using only genuine replacement parts; these have been tested and are compatible with aluminium.

- ♦ We recommend the use of Audi accessories.
- Damage caused by contact corrosion is not covered under warranty.

## 4.4 Checking vacuum system

## Special tools and workshop equipment required

♦ Hand vacuum pump -VAS 6213-



#### **Procedure**

- Check all vacuum lines in the complete vacuum system for:
- ♦ Cracks
- ♦ Traces of animal bites
- ♦ Kinked or crushed lines
- ♦ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the fault memory, check the vacuum lines of leading to the corresponding component and also check the remaining vacuum lines in the system.
- 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.

# 4.5 Routing and attachment of pipes, hoses and wiring

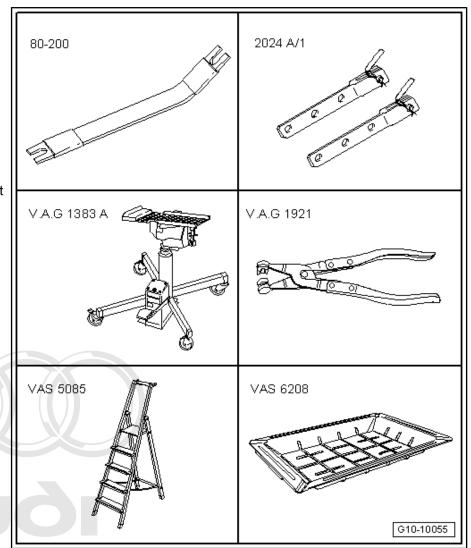
Mark hydraulic lines, vacuum lines and electrical wiring before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.

#### 10 – Removing and installing engine

## Removing engine

## Special tools and workshop equipment required

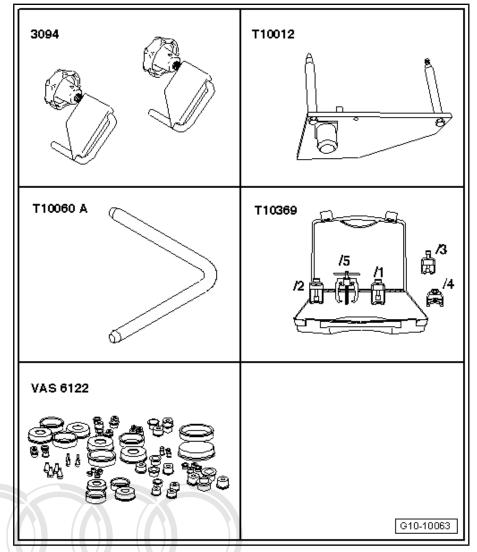
- Removal lever -80 200-
- Extension -2024 A /1-
- Engine and gearbox jack V.A.G 1383 A-
- Hose clip pliers -V.A.G 1921-
- Stepladder -VAS 5085-
- Drip tray for workshop hoist -VAS 6208-



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- Hose clamps for hoses up to 25 mm -3094-
- Engine bracket -T10012-
- Locking pin -T10060 A-
- Puller -T10369-
- Engine bung set -VAS 61Ž2-
- Safety goggles
- Protective gloves



#### **Procedure**



## Note

- The engine is removed from underneath together with the gearbox.
- Collect drained coolant in a clean container for requise or dispart or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- Fit cable ties in the original positions when installing.
- Fit heat insulation sleeves in the original positions when installing.

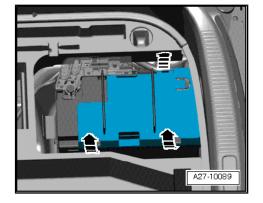


## Caution

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

Observe notes on procedure for disconnecting the battery.

- Take out luggage compartment floor covering.
- Take out luggage compartment floor mat.
- Remove rear cross panel trim if cover for negative battery terminal is located behind rear cross panel trim ⇒ Rep. Gr. 70.
- Release retaining clips -arrows- and detach cover for negative terminal.



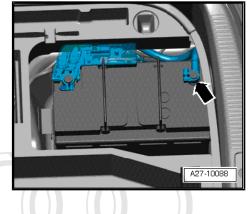
 Loosen nut a few turns and disconnect battery clamp on earth wire -arrow- from battery terminal.



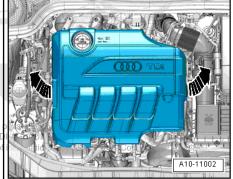
#### **WARNING**

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

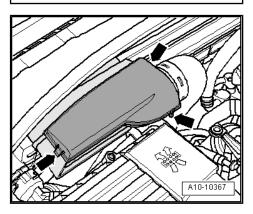
- ◆ The cooling system is under pressure when the engine is hot.
- ♦ To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.
- Open filler cap on coolant expansion tank.
- Remove engine cover panel -arrows-.



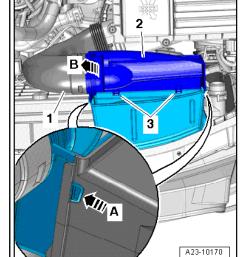
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- Pull cover off air duct (release clips on sides) -arrows-.

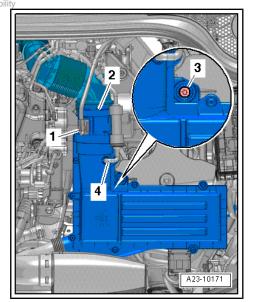


- Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
- Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
- Detach air pipe -1- from air duct (bottom) -arrow B-.

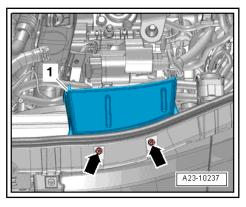


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- Unplug electrical connectors of infrom air mass meter of 70 AUDI AG.
- Detach hose -4-.
- Release hose clip -2- and detach air hose.
- Unscrew bolt -3- and remove air cleaner housing.



Remove bolts -arrows- and detach air duct -1- from lock carrier.

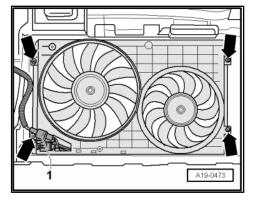


Remove bolts -top arrows- for radiator cowl.

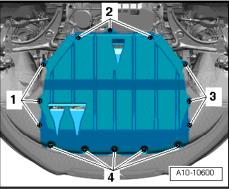


## Note

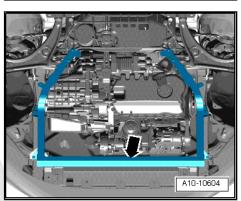
The bolts -bottom arrows- are removed at a later stage.



- Remove both front wheels.
- Release fasteners -1 ... 4- and remove centre noise insulation.



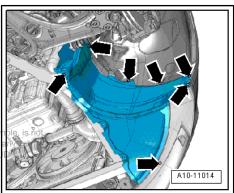
Only on TT Roadster: Remove noise insulation frame -arrow-  $\Rightarrow$  Rep. Gr. 50 .



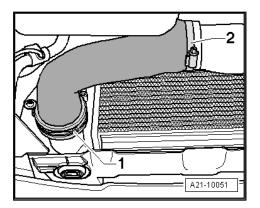
Release fasteners -arrows- and remove wheel housing liner (bottom section) on both sides.



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Release hose clip -2-, lift retaining clip -1- and remove air hose.

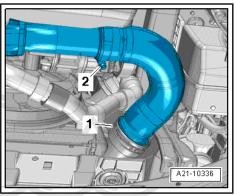


Release hose clip -2-, lift retaining clip -1- and remove air hose.



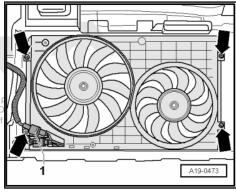
## Note

To prevent coolant from entering, seal off connection on charge air cooler with a clean plug from engine bung set -VAS 6122-.

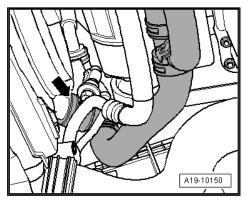


- Unplug electrical connector -1-.
- Remove bolts -bottom arrows- and take out air cowl downwards.

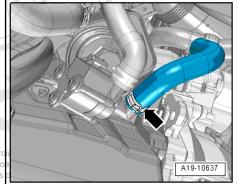




- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Lift retaining clip -arrow-, disconnect coolant hose (bottom right) from radiator and drain off coolant.



Open hose clip -arrow-, disconnect coolant hose (bottom) leading to pump for exhaust gas recirculation cooler -V400and drain off coolant.



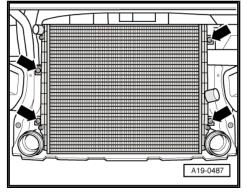
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- Remove bolts -bottom arrows- on rear side of radiator.

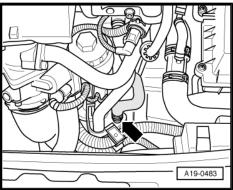


## Note

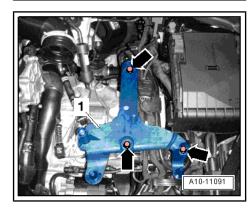
The bolts -top arrows- are removed at a later stage.



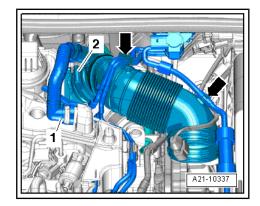
As an additional step, open hose clip -arrow-, disconnect coolant hose at top of engine oil cooler and drain off remaining coolant.



Remove bolts -arrows- and detach bracket -1- for air cleaner housing.



- Press release tabs and disconnect crankcase breather hose
   -1- from cylinder head cover.
- Move clear vacuum hoses -arrows- at air pipe.
- Loosen hose clip -2- and detach air pipe.

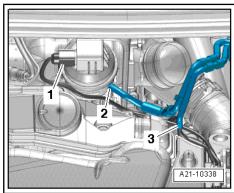


- Detach vacuum hose -2- from vacuum unit of turbocharger.
- Disconnect vacuum hose -3-.

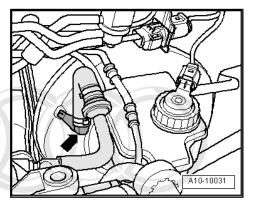


## Note

Disregard -item 1-.



Detach vacuum hose -arrow- from brake servo.



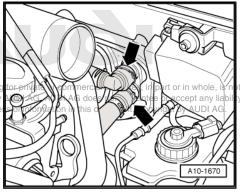


## Note

Place a cloth underneath heat exchanger to catch escaping coolant.

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Lift retaining clips -arrows- and detach coolant noses from heat exchanger.

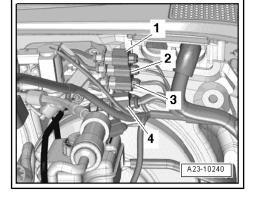


- Detach electrical connector -1- from bracket and unplug.
- Move clear electrical wiring.



## Note

Disregard -items 2, 3 and 4-.

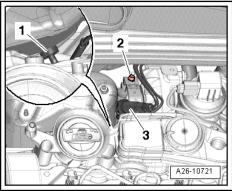


- Slacken bolt -2- and remove clamp.



## Note

Disregard -items 1, 3-.

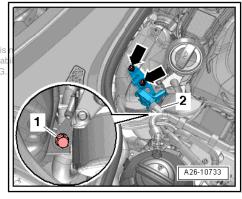


- Unplug electrical connector -2- on exhaust gas pressure sensor 1 -G450- .
- Remove bolt of 1 copyright. Copying for private or commercial purposes, in part or in whole, is permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any lial with respect to the correctness of information in this document. Copyright by AUDI AG.



#### Note

Disregard -arrows-.



Unplug electrical connector -4- on fuel temperature sender -



#### **WARNING**

The fuel can become extremely hot. This can cause injuries.

- In extreme cases the temperature of the fuel lines and the fuel can be up to 100 °C after the engine is switched off. Allow the fuel to cool down before disconnecting the lines - danger of scalding.
- Wear protective gloves.
- Wear safety goggles.
- Release hose clips -2- and -3- and disconnect fuel supply hose and fuel return hose.



#### Note

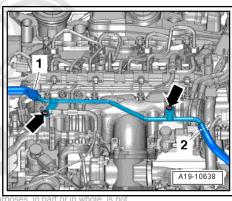
Disregard items marked -1- and -arrow-.

Release hose clip -1- and detach coolant hose.



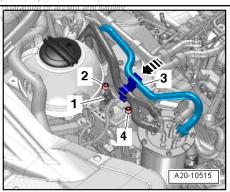
#### Note

Ignore items marked -2- and -arrows-.

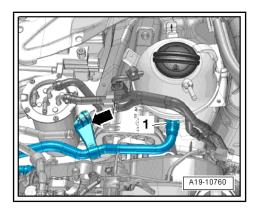


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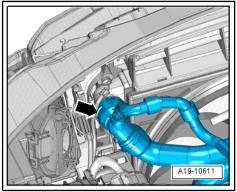
  Disengage fuel hose -3- at permitted unless authorised by AUDI AG. AUDI AG does not be a considered by AUDI AG. AUDI AG does not be a considered by AUDI AG. AUDI AG does not be a considered by AUDI AG. AUDI AG does not be a considered by AUDI AG. AUDI AG does not be a considered by AUDI AG. A
- Pull off bracket for fuel lines towards right -arrow- and move clear to one side.
- Unplug electrical connector -1- at supplementary fuel pump -
- Remove bolts -2- and -4-, detach bracket with supplementary fuel pump -V393- and move clear to one side.



Release hose clip -1-, detach coolant hose from coolant expansion tank and move coolant hose clear -arrow-.



Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.



Unplug electrical connector -A- at high-pressure sender -G65-item B-.



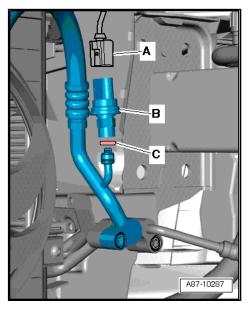
Note

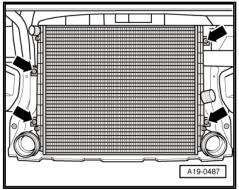
Disregard -item C-.



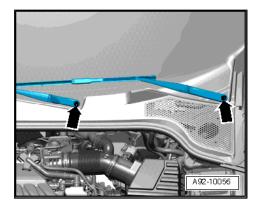
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Remove bolts tob arrows are and lift out radiator accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

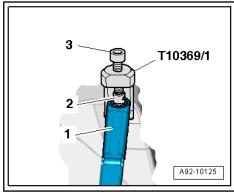




- Pry off caps on windscreen wiper arms with a screwdriver.
- Slacken nuts -arrows- one turn.



- Apply puller -T10369/1- to wiper arm -1- as shown in illustra-
- Apply thrust piece -2- onto wiper shaft.
- Turn bolt -3- in clockwise direction until wiper arm is pulled off wiper shaft.
- Remove nuts and detach windscreen wiper arms.



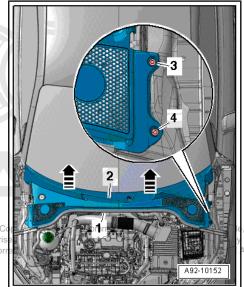
Remove seal -1-.



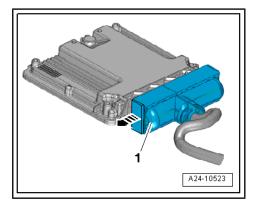
## Caution

Risk of damage to plenum chamber cover.

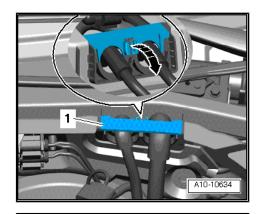
- Apply a small quantity of soap solution to transition between windscreen and plenum chamber cover -2-. Then, starting at edge of windscreen, carefully pull plenum chamber cover upwards off retainer at windscreen -arrows-.
- Detach plenum chamber cover by pulling it carefully off retainer at windscreen.
- Move clear engine wiring harness at rear of plenum chamber right. partition panel. with respect to the co



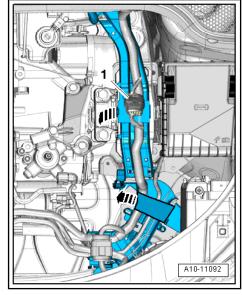
- Remove engine control unit ⇒ Rep. Gr. 23.
- Release electrical connector -1- for engine wiring harness -arrow- and detach.



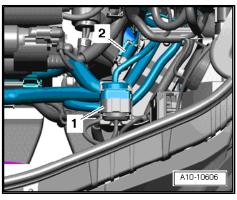
Release wiring protector -1- for engine wiring harness -arrow- and lift off.



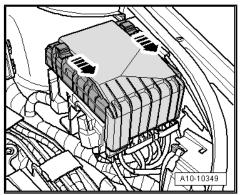
- Move clear and unplug electrical connector -1-.
- Open wiring duct bracket -arrows-, use removal lever -80 -200- to unclip wiring and press wiring to side.
- Unclip wiring duct.



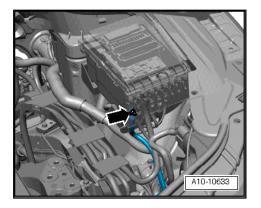
- Unclip electrical connector -1- from bracket and unplug.
- Open wiring duct bracket located underneath.
- Unclip wiring harness for engine control unit from wiring duct.
- Place engine wiring harness with engine control unit on top of engine.
- Secure engine control unit to prevent it falling.
- Unclip electrical connector -2- from bracket and unplug.



permitted Slide the two clips in the direction of the arrows and remove with respect from electronics box in engine compartment.



 Remove nut -arrow-, detach terminal 30 wire from electronics box in engine compartment and move it clear.

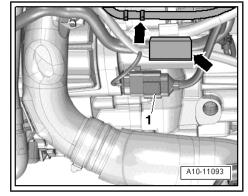


Unplug electrical connector -1-.

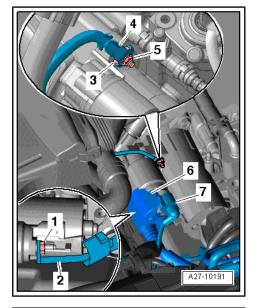


## Note

Disregard -arrows-.



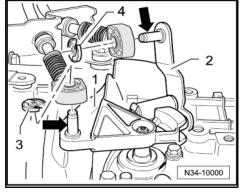
- Unplug electrical connector -7- (push retainer to the rear and press down release catch).
- Push back protective sleeve -6-.
- Remove nut -1- and detach B+ wire -item 2- from starter solenoid switch.
- Remove nut -5- and detach earth wire -4-.
- Remove top starter bolt -3-.



 Detach securing clip -3- for gear selector cable from gearbox selector lever -1- and pull cable off pin -arrow-.

## Metal selector relay lever:

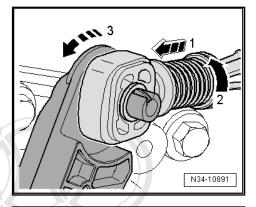
 Detach securing clip -4- for gate selector cable from selector relay lever -2- and pull cable off pin -arrow-.



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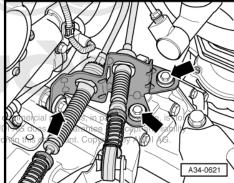
## Plastic selector relay lever:

- 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 selector relay lever towards front -arrow 3-.



## All vehicles (continued):

Remove cable support bracket -arrows- from gearbox and place to one side (selector cables remain fitted).



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If a plastic pipe is installed between clutch master cylinder and slave cylinder, clamp off supply hose to clutch master cylinder using hose clamp -3094- .



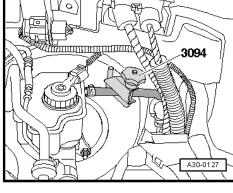
#### Note

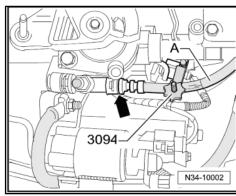
- Make sure brake fluid does not come into contact with starter or gearbox when performing the following operations. If it does, clean affected area thoroughly.
- Seal off open pipes/lines and connections with clean plugs from engine bung set -VAS 6122- to prevent dirt from entering.
- If a pipe/hose assembly is installed between clutch master cylinder and slave cylinder, clamp off hose -A- using hose clamp for hoses up to 25 mm -3094-.



#### Note

Disregard -arrow-.





- Pull out clip -arrow- as far as stop.
- Pull plastic pipe or pipe/hose assembly -A- out of clutch slave cylinder and seal end of pipe.



#### Note

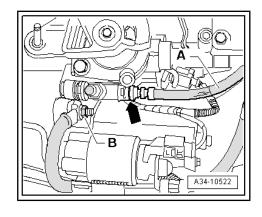
Disregard -item B-.

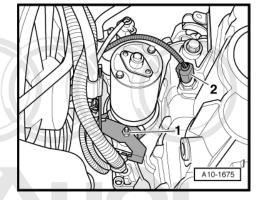


#### Caution

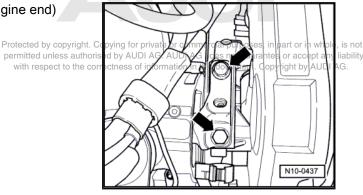
Risk of contamination by escaping brake fluid.

- ◆ Do not operate clutch pedal after detaching pipe from bleeder screw on clutch slave cylinder.
- Unplug electrical connector -2- for reversing light switch -F4-.
- Remove nut -1- and press bracket to side.
- Remove bottom starter bolt and detach starter.

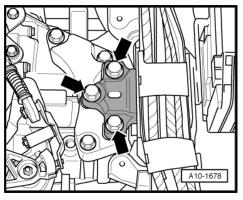




Loosen bolts -arrows- for assembly mounting (engine end) approx. 2 turns.



Loosen bolts -arrows- for assembly mounting (gearbox end) approx. 2 turns.





#### Caution

If a used belt runs in the opposite direction when it is refitted, this can cause breakage.

- Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen for re-installation.
- To slacken poly V-belt turn tensioner in clockwise direction -arrow-.
- Lock tensioner with locking pin -T10060 A-
- Take off poly V-belt.
- Unplug electrical connector -2- on air conditioner compressor regulating valve -N280- .

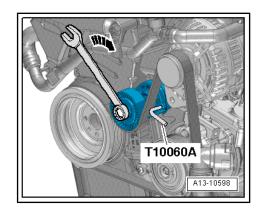


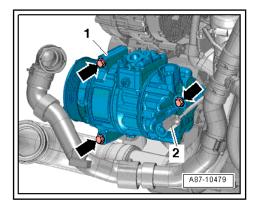
## Caution

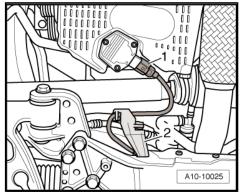
Make sure that air conditioner compressor and refrigerant pipes and hoses are not damaged.

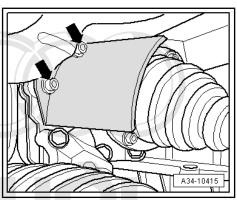
- ◆ Do NOT stretch, kink or bend refrigerant lines and hoses.
- Remove bolts -arrow-, detach air conditioner compressor -1with refrigerant lines connected and tie up to front.
- Unplug electrical connector -1- at oil level and oil temperature sender -G266- .
- Unclip bracket -2- for wire to oil level and oil temperature sender -G266- from subframe.

- Remove bolts -arrows- and detach heat shield for drive shaft (right-side).
- Detach drive shaft (left-side) from flange shaft of gearbox and tie up.
- Detach drive shaft (right-side) from flange shaft of bevel box.



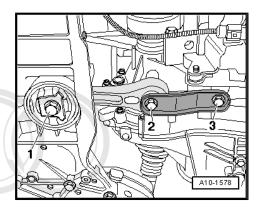




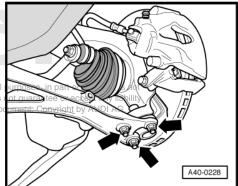


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Remove bolts -1, 2, 3- and remove pendulum support.



- Mark position of nuts -arrows- securing swivel joint.
- Remove nuts for swivel joint (right-side).
- If fitted, remove nut on bracket for front right vehicle level sender -G289- .
- Detach swivel joint from wishbloded by copyright. Copying for private or commercial permitted unless authorised by AUDI AG. AUDI AG does with respect to the correctness of information in this do



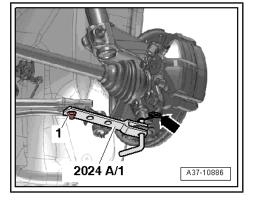
Swing suspension strut (right-side) outwards and support with extension -2024 A /1- as shown in illustration.



#### **WARNING**

Accident risk from loose components of support bracket.

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

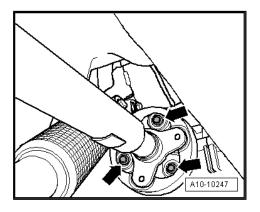




## Note

The illustration shows the installation position on front suspension (left-side).

- Mark position of flexible coupling and flange for bevel box in relation to each other.
- Unbolt flexible coupling for propshaft at bevel box -arrows-(counterhold using a suitable lever at the triangular flange).



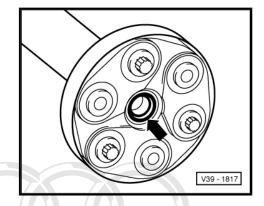
Push engine/gearbox assembly forward slightly (towards front end) and pull propshaft off bevel box.



## Caution

Make sure not to damage the seal -arrow- in the propshaft flange.

♦ Push the propshaft horizontally to the rear and towards the right side of vehicle as far as possible.

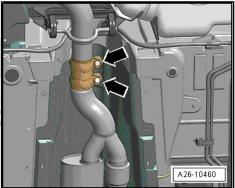




## Note

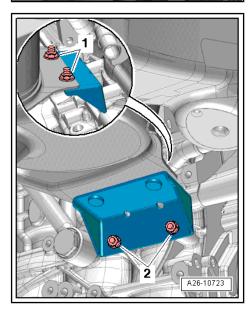
The propshaft must be renewed if oil seal is damaged.

- Unfasten nuts -arrows- for clamp.

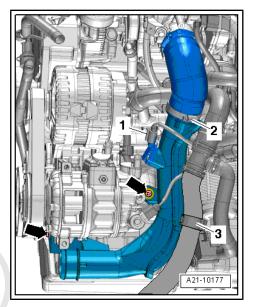


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- Remove nuts -1- and -2- and detach bottom bracket for particulate filter.
- Tie up particulate filter to rear.



- Remove bolts -arrows-.
- Move coolant hose -3- clear.
- Loosen hose clip -2-.
- Unplug electrical connector -1- at charge pressure sender -G31- and detach air pipe.



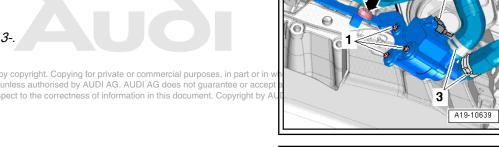
Remove bolt -arrow- and push pump for exhaust gas recirculation cooler -V400- to the side.



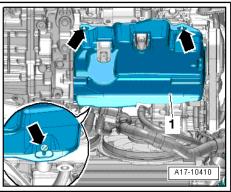
## Note

Disregard -items 1, 2, 3-.

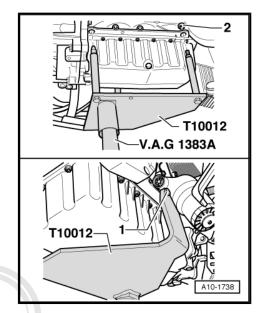
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Release fasteners -arrows- and remove noise insulation -1for sump.



- Secure engine bracket -T10012- to cylinder block with bolt -1- and nut -2- (tightening torque: approx. 20 Nm).
- Insert engine and gearbox jack -V.A.G 1383 A- in engine support -T10012- and raise engine/gearbox assembly slightly.





#### Note

To unscrew bolts for assembly mounting use stepladder -VAS 5085-.

Remove bolts -arrows- for assembly mounting (engine end).

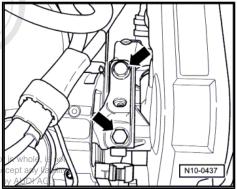
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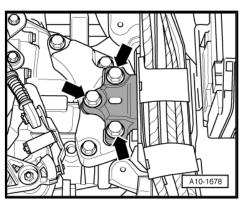
Remove bolts -arrows- for assembly mounting (gearbox end).



#### Note

- Check that all hoses, pipes and wiring connections between engine, gearbox and body have been detached.
- Carefully guide engine/gearbox assembly when lowering to avoid damage.
- Make sure there is sufficient clearance at air conditioner compressor and at left-side drive shaft.
- First lower engine/gearbox assembly only slightly.
- Then swing gearbox end of engine/gearbox assembly forwards and only then lower further.

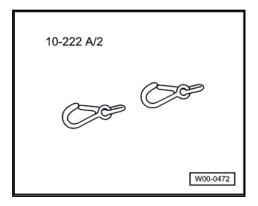




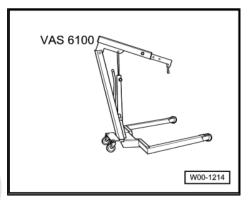
## 2 Separating engine from manual gearbox

## Special tools and workshop equipment required

♦ Hooks -10 - 222 A /2-



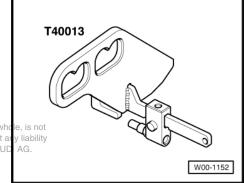
♦ Workshop hoist -VAS 6100-



◆ Lifting tackle -T40013-



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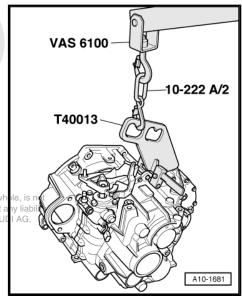


#### **Procedure**

- Engine/gearbox assembly removed and attached to engine bracket -T10012- .
- Attach lifting tackle -T40013- to gearbox and close lock.
- Attach workshop hoist -VAS 6100- with hooks -10 222 A /2to the lifting tackle.



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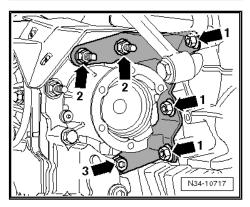


Remove bolts -arrows 2, 3- securing bracket for bevel box.



Note

Disregard -arrows 1-.

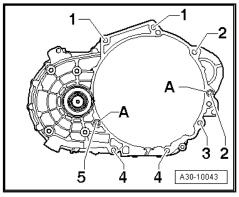


- Remove bolts -1, 3, 4, 5- securing gearbox to engine.
- Detach gearbox from engine.



Note

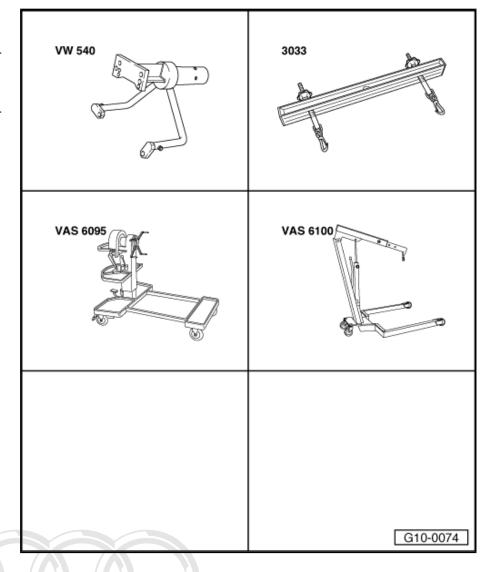
Disregard -items 2, A-.



## 3 Securing engine to engine and gearbox support

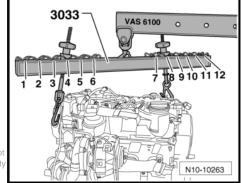
# Special tools and workshop equipment required

- Engine and gearbox support -VW 540-
- ◆ Lifting tackle -3033-
- Engine and gearbox support -VAS 6095-
- Workshop hoist -VAS 6100-



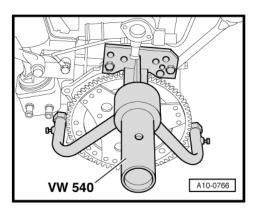
## **Procedure**

- Gearbox detached from engine ⇒ page 28.
- Attach lifting tackle -3033- to engine and workshop hoist -VAS 6100- as shown in illustration.
- Lift engine off engine bracket -T10012- using workshop hoist -VAS 6100- .



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Secure engine to engine and gearbox support -VAS 6095- using engine and gearbox support -VW 540- .





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### 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 ± 15 %.

Tightening torques <u>⇒ page 37</u>

### Further tightening torques

Component		Nm
Bolts/nuts	M6	10
	M7	15
	M8	20
	M10	40
	M12	65



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1

5

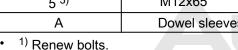
2

3

A30-10043

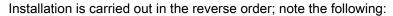
### Securing manual gearbox to engine

Item	Bolt <sup>1</sup>	Nm	
1 <sup>2)</sup>	M12x55	80	
2 <sup>2)</sup>	M12x165	80	
3	M10x105	40	
4	M10x50	40	
5 <sup>3)</sup>	M12x65	80	
Α	Dowel sleeves	Dowel sleeves for centralising	



2) Bolt with M8 threaded pin Copying for private or commercial purposes, in part or in whole, is not

3) Screwed into gearbox from rengine side attorned by AUDI AG. AUDI AG does not guarantee or accept any liability Screwed into gearbox from rengine side attorned to the AUDI AG. right by AUDI AG.

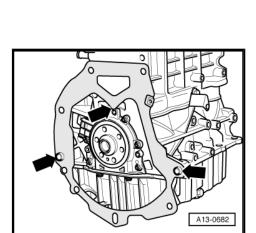


Engine/gearbox assembly attached to engine bracket -T1ŎO12- .

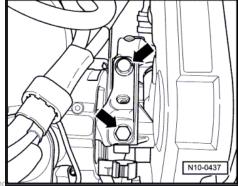


### Note

- Renew the 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 and hoses must be free of oil and grease before assembly.
- Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .
- To secure the air hoses at their connections, spray rust remover onto the worm thread of the used hose clips before installing.
- Fit all cable ties in the original positions when installing.
- If not already fitted, install dowel sleeves for centring engine and gearbox in cylinder block.
- Ensure that intermediate plate is engaged on sealing flange and pushed onto dowel sleeves -arrows-.
- Remove needle bearing in crankshaft if fitted ⇒ page 72.
- Renew clutch release bearing if worn ⇒ Rep. Gr. 30.
- Lubricate splines of gearbox input shaft lightly with grease for clutch plate splines ⇒ Electronic parts catalogue.
- Make sure that clutch plate is properly centred.
- Secure gearbox to engine.
- Guide engine/gearbox assembly into body.



Initially hand-tighten bolts -arrows- for assembly mounting (engine end) as far as stop.



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Initially hand-tighten bolts -arrows- for assembly mounting (gearbox end) as far as stop.



### Note

The bolts are tightened to final torque only after adjusting the assembly mountings <del>⇒ page 39</del>.

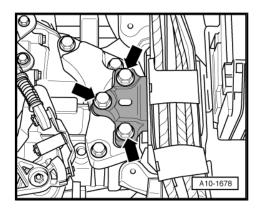
- Remove engine support -T10012- from engine.
- Install pump for exhaust gas recirculation cooler -V400-⇒ page 175
- Install air pipe  $\Rightarrow$  page 208.
- Install particulate filter ⇒ page 218.
- Secure propshaft with flexible coupling to bevel box flange ⇒ Rear final drive 02D/0AV; Rep. Gr. 39.
- Install wishbone ⇒ Rep. Gr. 40.
- Install pendulum support ⇒ Rep. Gr. 34.
- Install drive shafts ⇒ Rep. Gr. 40.
- Install air conditioner compressor ⇒ Rep. Gr. 87.
- Install starter ⇒ Rep. Gr. 27
- Install poly V-belt ⇒ page 44.
- Install engine control unit ⇒ Rep. Gr. 23
- Install radiator ⇒ page 191.
- Install radiator cowl ⇒ page 192.
- Connect coolant hoses with plug-in connector to heat exchanger <u>⇒ page 191</u>.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install air hose with plug-in connector ⇒ page 209.
- Connect clutch slave cylinder CRep (Grive 30 r commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability
- Install gear selector cable and gate selector cable selector cable selector cable and gate selector cable selector cable and gate selector cable and gate selector cable selector cable and gate selector cable selector 34 .
- Adjust assembly mountings ⇒ page 39.
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe notes on procedure for connecting the battery ⇒ Rep.
- Install and adjust wiper arms ⇒ Rep. Gr. 92.
- Install supplementary fuel pump -V393- ⇒ Rep. Gr. 20.
- Check oil level ⇒ Maintenance : Booklet 810 .



### Caution

Risk of damage to control units because of excessive voltage.

- Never use battery charging equipment for boost starting.
- Fill up with coolant ⇒ page 166.





### Note

- ◆ Do not use drained coolant again if:
- the cylinder head or cylinder block have been renewed.
- ♦ the coolant is contaminated or dirty.
- Install noise insulation frame ⇒ Rep. Gr. 50.
- Install wheel housing liners (bottom section) and noise insulation ⇒ Rep. Gr. 66.



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### 5 Assembly mountings

### 5.1 Assembly mountings - exploded view

### 1 - Bolt

- Gearbox support to gearbox
- Tightening torque ⇒ Rep. Gr.  $34 \Rightarrow$  Rep. Gr.

### 2 - Bolts

- Pendulum support to gearbox
- Tightening torque ⇒ Rep. Gr.  $34 \Rightarrow \text{Rep. Gr.}$

### 3 - Engine support

- With support arm
- Version fitted in vehicle may differ from illustration

### 4 - Bolt

- ☐ Engine support to engine
- Observe correct tightening sequence ⇒ page 38
- □ 40 Nm + 180°

### 5 - Engine mounting

### 6 - Bolt

- Engine mounting to body
- □ Renew
- □ 40 Nm + 90°

### 7 - Connecting bracket

### 8 - Bolt

- □ Renew
- □ 20 Nm + 90°

### 9 - Bolt

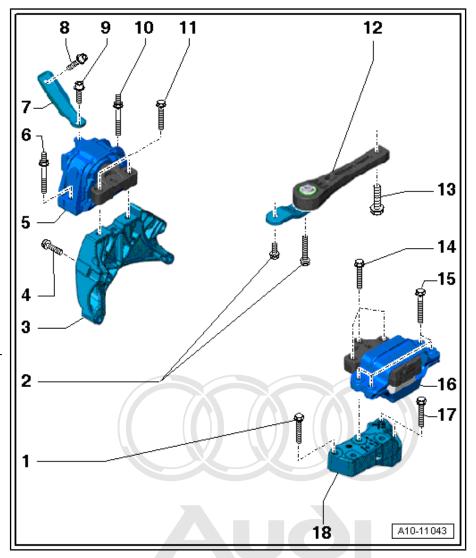
- Connecting bracket to body
- □ Renew
- □ 20 Nm + 90°

### 10 - Bolt

- Engine mounting to body
- □ Renew
- □ 40 Nm + 90°

### 11 - Bolts

Engine mounting to engine support



□ Connecting bracket to engine mounting Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- □ Renew
- □ 60 Nm + 90°

### 12 - Pendulum support

### 13 - Bolt

- ☐ Pendulum support to subframe
- ☐ Tightening torque ⇒ Rep. Gr. 34 ⇒ Rep. Gr. 37

### 14 - Bolt

- ☐ Gearbox mounting to gearbox support
- ☐ Tightening torque ⇒ Rep. Gr. 34 ⇒ Rep. Gr. 37

### 15 - Bolt

- ☐ Gearbox mounting to body
- ☐ Tightening torque ⇒ Rep. Gr. 34 ⇒ Rep. Gr. 37

### 16 - Gearbox mounting

■ With support arm

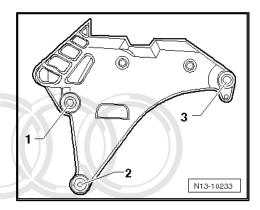
### 17 - Bolt

- ☐ Gearbox support to gearbox
- ☐ Tightening torque ⇒ Rep. Gr. 34 ⇒ Rep. Gr. 37

### 18 - Gearbox bracket

### Tightening sequence for gearbox support

- 1 Screw in bolts in the sequence -1, 2, 3- hand-tight.
- 2 Tighten bolts in the sequence -1, 2, 3- to 40 Nm.
- 3 Turn bolts in the sequence -1, 2, 3- 180° further.

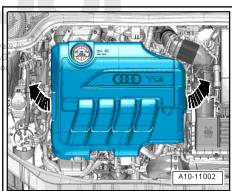


# 5.2 Checking adjustment of assembly mountings (engine/gearbox mountings)

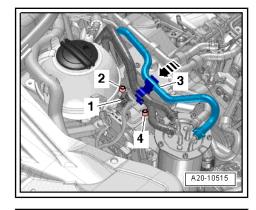
### **Procedure**

Remove engine cover panel -arrows-.

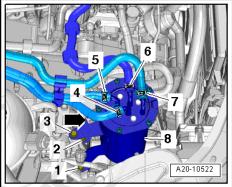
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- Disengage fuel hose -3- at bracket.
- Pull off bracket for fuel lines towards right -arrow- and move clear to one side.
- Unplug electrical connector -1- at supplementary fuel pump -V393- .
- Remove bolts -2- and -4-, detach bracket with supplementary fuel pump -V393- and move clear to one side.



- Loosen bolt -1-.
- Remove nut -2- and bolt -3-.
- Detach hose retainer -arrow- from fuel filter and move fuel filter -8- clear to one side with fuel hoses -4 ... 7- connected.



The following specifications must be obtained:

- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- = distance -x-).



### Note

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Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

If the distance measured is too large or small, the assembly mountings must be adjusted <u>⇒ page 39</u>.

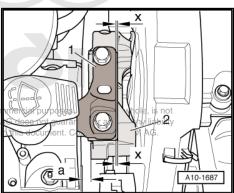
### **Assembling**

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

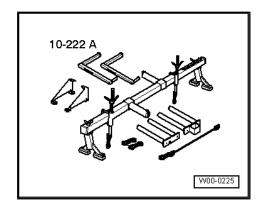
Install fuel filter and supplementary fuel pump -V393- ⇒ Rep. Gr. 20.

### 5.3 Adjusting assembly mountings

Special tools and workshop equipment required

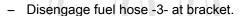


♦ Support bracket -10 - 222 A-



### **Procedure**

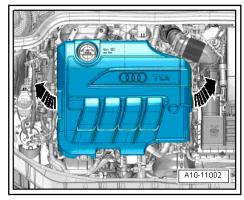
- Tightening torques ⇒ page 37
- Remove engine cover panel -arrows-.

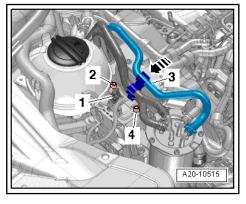


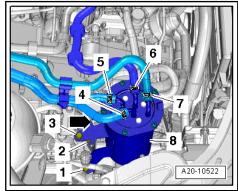
- Pull off bracket for fuel lines towards right -arrow- and move clear to one side.
- Unplug electrical connector -1- at supplementary fuel pump -V393- .
- Remove bolts -2- and -4-, detach bracket with supplementary fuel pump -V393- and move clear to one side.

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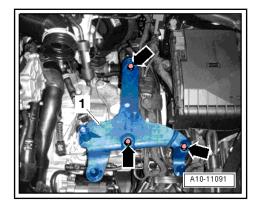
- Loosen bolt -1-.
- Remove nut -2- and bolt -3-.
- Detach hose retainer -arrow- from fuel filter and move fuel filter
   -8- clear to one side with fuel hoses -4 ... 7- connected.



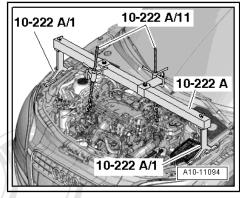




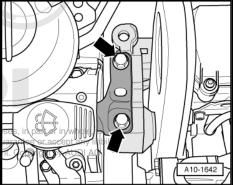
- Remove air cleaner housing ⇒ Rep. Gr. 23.
- Remove bolts -arrows- and detach bracket -1- for air cleaner housing.



- Position support bracket -10 222 A- with spindles -10 222
   A /11- on bolted flanges of wing panels as shown in illustration.
- Attach hooks of spindles to engine lifting eyes.
- Take up weight of engine/gearbox assembly evenly with both spindles (do not raise assembly).



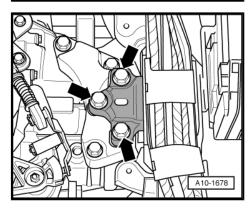
- Remove bolts -arrows- for assembly mounting (engine end) one by one and renew (if they were not renewed when installing engine).
- Initially fit bolts hand-tight.



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- Remove bolts -arrows- for assembly mounting (gearbox end) one by one and renew (if they were not renewed when installing engine).
- Initially fit bolts hand-tight.



- Audi
- Using assembly lever, adjust engine/gearbox assembly between engine mounting and support arm -1- until specifications listed below are attained:
- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- = distance -x-).



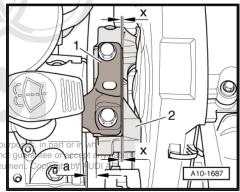
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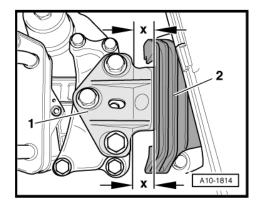
Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

- Tighten bolts for assembly mounting (engine end).
- Ensure that the edges of the support arm (on the gearbox assembly mounting) -1- and gearbox mounting -2- are parallel.
- Dimension -x- = dimension -x-.
- Tighten bolts for assembly mounting (gearbox end).

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

- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install fuel filter and supplementary fuel pump -V393- ⇒ Rep. Gr. 20 .





### 13 – Crankshaft group

### Cylinder block (pulley end) 1

### 1.1 Poly V-belt drive with tensioner and air conditioner compressor - exploded view

### 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 - Poly V-belt tensioner

Removing and installing ⇒ page 47

### 3 - Vibration damper

- With poly V-belt pulley
- ☐ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- Removing and installing ⇒ page 49

### 4 - Bolt

- Renew
- ☐ Use only genuine bolts ⇒ Electronic parts catalogue
- □ 10 Nm + 90°

6 - Dowel sleeve

### 5 - Bolt

### Tightening torque ⇒ Rep. Gr. 27

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Ensure correct seating in bracket for ancillaries mation in this document. Copyright by AUDI AG.

### 7 - Bolt

☐ Tightening torque ⇒ Rep. Gr. 23

### 8 - Bolt

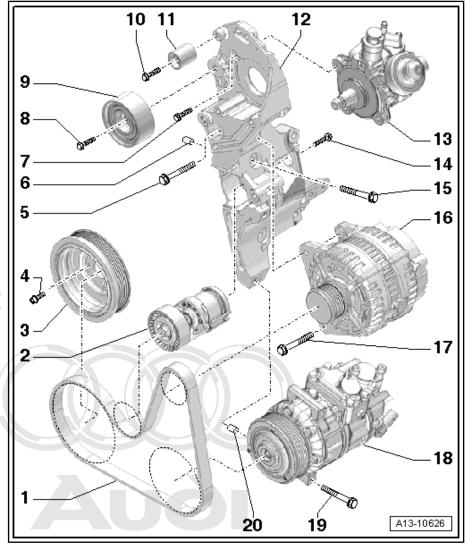
☐ Tightening torque ⇒ Item 20 (page 85)

### 9 - Idler roller

☐ For toothed belt

### 10 - Bolt

☐ Tightening torque ⇒ Item 6 (page 84)



### 11 - Idler roller

☐ For toothed belt

### 12 - Bracket for ancillaries

□ Removing and installing ⇒ page 50

### 13 - High-pressure pump

□ Removing and installing ⇒ Rep. Gr. 23

### 14 - Bolt

□ 23 Nm

### 15 - Bolt

☐ Tightening torque and sequence ⇒ page 44

### 16 - Alternator

☐ Removing and installing ⇒ Rep. Gr. 27

### 17 - Bolt

☐ Tightening torque ⇒ Rep. Gr. 27

### 18 - Air conditioner compressor

□ Removing and installing ⇒ Rep. Gr. 87

### 19 - Bolt

☐ Tightening torque ⇒ Rep. Gr. 87

### 20 - Dowel sleeve

☐ Ensure correct seating in bracket for ancillaries

### Bracket for ancillaries - tightening torque and tightening sequence

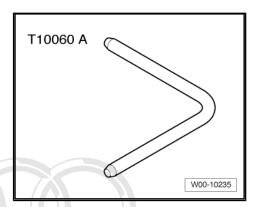
- Renew bolts for bracket for ancillaries and fit as follows:
- ♦ Bolts -1- and -2- M10x52.
- ♦ Bolts -3- and -6- M10x30.
- ♦ Bolts -4- and -5- M10x60.
- Tighten bolts for bracket for ancillaries in the sequence
   -1 ... 6- in 4 stages as follows:
- 1. Screw in all bolts by hand until they make contactual AG. AUDI AG doe
- 2. Tighten all bolts to 40 Nm.
- 3. Turn bolts -3- and -6- 45° further.
- 4. Turn bolts -1, 2, 4, 5- 90° further.

# cillaries and fit as follows: biggins in the sequence biggins in the

# 1.2 Removing and installing poly V-belt - vehicles with tensioner and air conditioner compressor

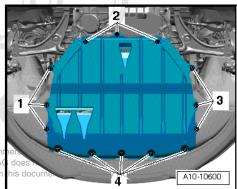
Special tools and workshop equipment required

♦ Locking pin -T10060 A-



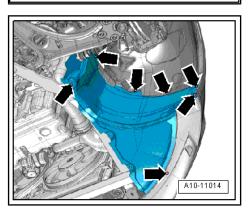
### Removing

- Release fasteners -1 ... 4- and remove centre noise insulation.



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Release fasteners -arrows- and remove right wheel housing liner (bottom section).





### Caution

If a used belt runs in the opposite direction when it is refitted, this can cause breakage.

- ◆ Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen for re-installation.
- To slacken poly V-belt turn tensioner in clockwise direction -arrow-.
- Lock tensioner with locking pin -T10060 A-
- Take off poly V-belt.

### Installing

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



### Note

Before fitting poly V-belt, make sure all mechanical units (e.g. alternator and air conditioner compressor) are firmly in position.

- Fit poly V-belt on all poly V-belt pulleys:
- 1 Crankshaft
- 2 Tensioner
- 3 Alternator
- 4 Air conditioner compressor

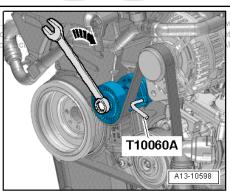
3 2 A13-10597

WI

T10060A

A13-10598

- Hold tensioner with ring spanner and remove locking pin T10060 A- .
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  with respect to the
- Slacken tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that belt runs properly.
- Install right wheel housing liner (bottom section) and noise insulation ⇒ Rep. Gr. 66.

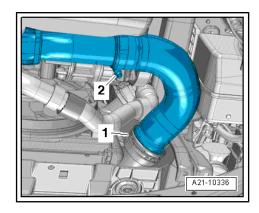


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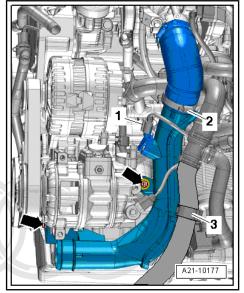
### 1.3 Removing and installing tensioner for poly V-belt

### Removing

- Detach poly V-belt from tensioner ⇒ "1.2 Removing and installing poly V-belt - vehicles with tensioner and air conditioner compressor", page 44.
- Release hose clip -2-, lift retaining clip -1- slightly and remove air hose.



- Remove bolts -arrows-.
- Move coolant hose -3- clear.
- Loosen hose clip -2-.
- Unplug electrical connector -1- at charge pressure sender -G31- and detach air pipe.



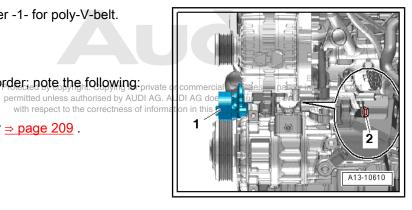
- Remove bolt -2- and take off tensioner -1- for poly-V-belt.

### Installing

Tightening torque ⇒ page 43.

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

- Install air pipe ⇒ page 208.
- Install air hose with plug-in connector ⇒ page 209.
- Install poly V-belt <u>⇒ page 44</u>.



### 1.4 Poly V-belt drive without air conditioner compressor - exploded view

### 1 - Vibration damper

- With poly V-belt pulley
- Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- □ Removing and installing⇒ page 49

### 2 - Bolt

☐ Tightening torque ⇒ Electrical system; Rep. Gr. 27

### 3 - Alternator

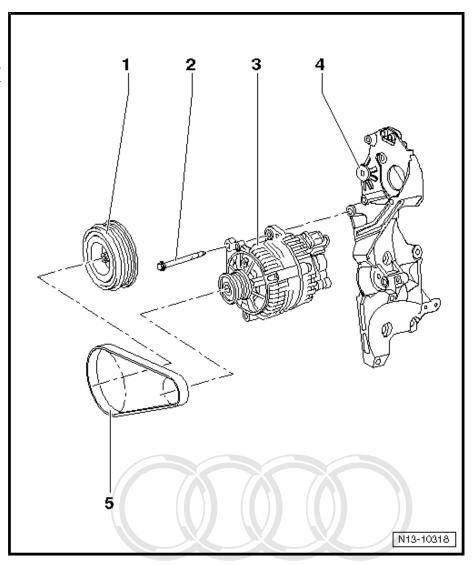
□ Removing and installing
 ⇒ Electrical system;
 Rep. Gr. 27

### 4 - Bracket for ancillaries

□ Removing and installing⇒ page 50

### 5 - Poly V-belt

- ☐ Renew.
- □ Removing and installing⇒ page 48



# 1.5 Removing and installing poly V-belt - vehicles without air conditioner compressor



Note

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The poly V-belt tensioner is not installed on vehicles without air conditioner (equipment version).

### Special tools and workshop equipment required

 ◆ Poly V-belt repair set with assembly tool ⇒ Electronic parts catalogue

### **Procedure**

- Release fasteners -1 ... 4- and remove centre noise insulation.



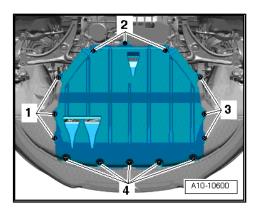
### Note

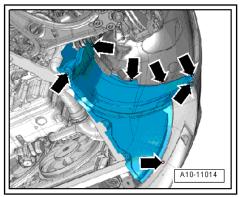
The poly V-belt repair set with assembly tool contains the assembly tool -T10367- and illustrated instructions.

- Remove front right wheel.
- Release fasteners -arrows- and remove right wheel housing liner (bottom section).
- Follow procedure specified in illustrated instructions.

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

- Install front section of wheel housing liner (front section) ⇒ Rep. Gr. 66.
- Install noise insulation ⇒ Rep. Gr. 50.
- Install front wheel ⇒ Rep. Gr. 44.

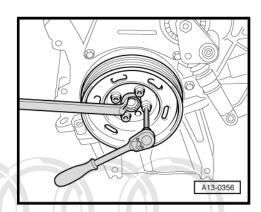




### 1.6 Removing and installing vibration damper

### Removing

- Removing poly V-belt
- ⇒ "1.2 Removing and installing poly V-belt vehicles with tensioner and air conditioner compressor", page 44
- ⇒ "1.5 Removing and installing poly V-belt vehicles without air conditioner compressor", page 48
- Counterhold by applying ring spanner to bolt for crankshaft sprocket and slacken bolts for vibration damper.
- Remove bolts and take off vibration damper.





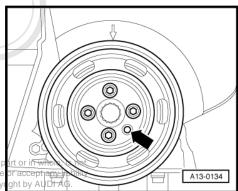
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### Installing

- Tightening torque ⇒ page 43.
- Tightening torque
   ⇒ "1.1 Poly V-belt drive with tensioner and air conditioner compressor exploded view", page 43.
- Tightening torque
   ⇒ "1.4 Poly V-belt drive without air conditioner compressor exploded view", page 48

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

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### Note

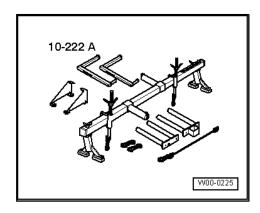
Renew bolts for vibration damper.

- Installation position: hole -arrow- in vibration damper must be positioned over raised section of crankshaft sprocket.
- Install poly V-belt.
- ◆ ⇒ "1.2 Removing and installing poly V-belt vehicles with tensioner and air conditioner compressor", page 44
- ♦ "1.5 Removing and installing poly V-belt vehicles without air conditioner compressor", page 48

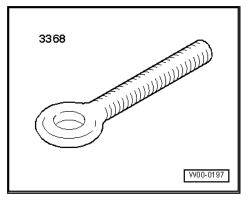
## 1.7 Removing and installing bracket for ancillaries

### Special tools and workshop equipment required

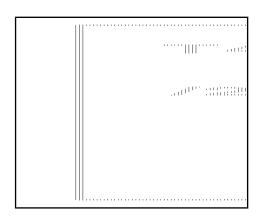
Support bracket -10 - 222 A-



◆ Eye-head bolt -3368-



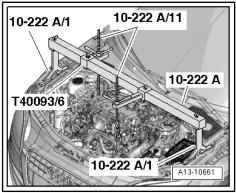
◆ Engine support bracket (supplementary set) -T40093-



◆ Flange nut M10 or nut M10 with washer

### Removing

- Remove alternator  $\Rightarrow$  Rep. Gr. 27.
- Remove high-pressure pump ⇒ Rep. Gr. 23.
- Position support bracket -10 222 A- with adapters and spindles on bolted flanges of wing panels as shown in illustration.
- Attach hook of spindle to engine lifting eye (left-side).

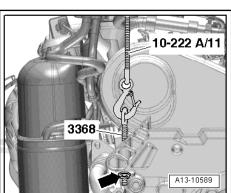




### **WARNING**

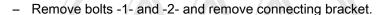
Risk of accident because of loose bolt connections.

- Screw on flange nut or nut with washer -arrow- at least 6 turns to ensure that eye-head bolt -3368- is properly secured.
- Secure eye-head bolt -3368- with flange nut M10 or nut with washer to engine support as shown in illustration.
- Attach spindle -10 222 A /11- (right-side) to eye-head bolt -3368- .
- Take up weight of engine evenly with both spindles (but do not raise engine).



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- Remove bolts -arrows-.
- Detach electrical connector at coolant shortage indicator switch -F66- and move coolant expansion tank to side.



Remove bolts -3 ... 6- and detach engine mounting.



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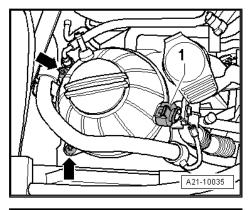
Remove bolt -3- on engine support. Copyright by AUDI AG.

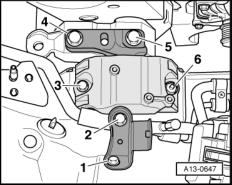


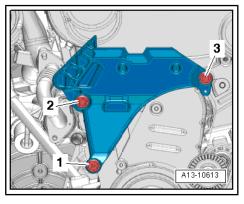
Note

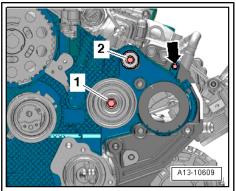
Disregard -items 1, 2-.

- Remove bolt -arrow-.
- Remove bolts -1- and -2- and remove idler rollers for toothed belt.









Remove bolts -1 ... 6- and detach bracket for ancillaries.

### Installing

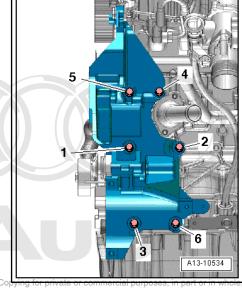
Installation is carried out in the reverse order; note the following:



### Note

Renew bolts securing bracket for ancillaries.

- Check that dowel sleeve at top right between bracket for ancillaries and cylinder block is fitted; insert dowel sleeve if necessary.
- Tighten bolts for bracket for ancillaries ⇒ page 44.
- Install engine support and engine mounting ⇒ page 37.
- Install high-pressure pump ⇒ Rep. Gr. 23.
- Install toothed belt (adjust valve timing) ⇒ page 91.
- Install alternator ⇒ Rep. Gr. 27.



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### 1.8 Sealing flange (pulley end) - exploded view

### 1 - Bolt

□ Tightening torque ⇒ Item 25 (page 85)

### 2 - Crankshaft sprocket

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

### 3 - Oil seal for crankshaft (pulley end)

- □ Renewing ⇒ page 54
- □ Do not lubricate with oil

### 4 - Sealing flange (pulley end)

- ☐ Should be positioned on dowel pins
- Removing and installing ⇒ page 56

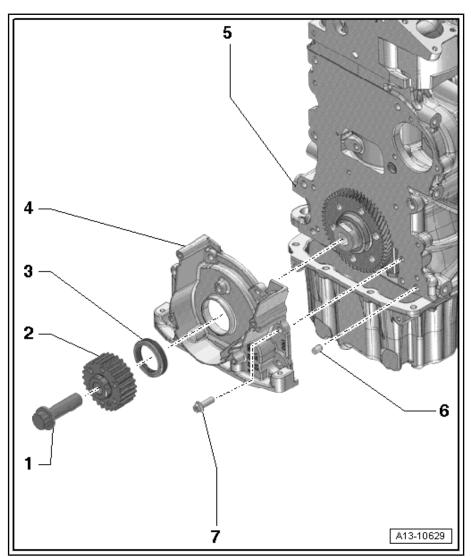
### 5 - Cylinder block

### 6 - Dowel pin

□ 2x

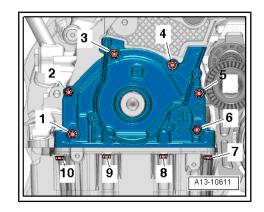
### 7 - Bolt

Tightening torque and sequence <u>⇒ page 54</u>



### Sealing flange (pulley end) - tightening torque and sequence

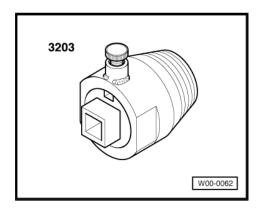
- Tighten bolts for sealing flange on pulley end -1 ... 10- in three stages as follows:
- 1. Screw in bolts -1 ... 10- by hand until they make contact.
- 2. Tighten bolts -1 ... 6- in diagonal sequence and in stages to 15 Nm.
- 3. Tighten bolts -7 ... 10- to 15 Nm.



# 1.9 Renewing crankshaft oil seal (pulley end)

### Special tools and workshop equipment required

♦ Oil seal extractor -3203-

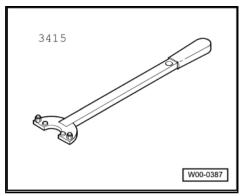


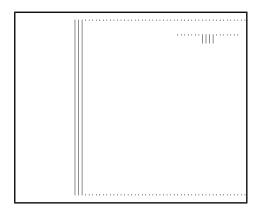
♦ Counterhold tool -3415-



♦ Assembly tool -T10053-



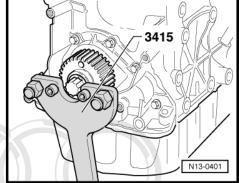




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### **Procedure**

- Remove toothed belt ⇒ page 86.
- Loosen bolt for crankshaft sprocket using counterhold tool
- Remove bolt and detach crankshaft sprocket.



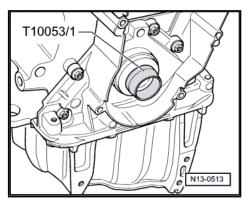
- Adjust inner section of oil seal extractor -3203- so it is flush with the outer section and lock in position with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice and use pliers to remove private oil seal. permitted unless authorised by AUDI AG.
- Clean contact surface and sealing surface for oil seal.
- Remove oil residue from crankshaft journal with a clean cloth.



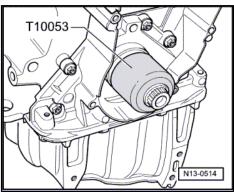
### Note

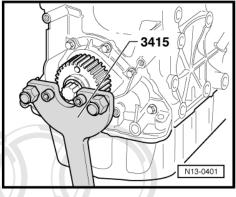
Do not lubricate sealing lip and outer rim of oil seal before pressing in.

- Fit guide sleeve -T10053/1- onto crankshaft journal.
- Push oil seal over guide sleeve onto crankshaft journal.



- Press in oil seal using bolt for crankshaft sprocket and thrust sleeve of assembly tool -T10053- until flush.
- Install crankshaft sprocket ⇒ page 84.
- Install toothed belt (adjust valve timing) ⇒ page 91.





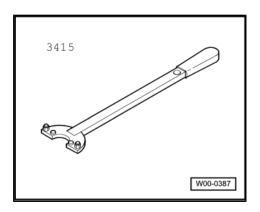
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# 1.10 Removing and installing sealing flange (pulley end)

### Special tools and workshop equipment required

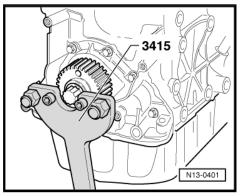
♦ Counterhold tool -3415-



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

### Removing

- Remove toothed belt ⇒ page 86 .
- Loosen bolt for crankshaft sprocket using counterhold tool -3415- .
- Remove bolt and detach crankshaft sprocket.



- Remove bolts -1 ... 10- and carefully release sealing flange from bonded joint.
- Drive out oil seal with sealing flange removed.

### Installing

• Tightening torque <u>⇒ page 53</u>.

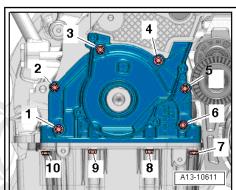
Installation is carried out in the reverse order; note the following:



### Caution

Make sure sealant residue does not enter lubrication system.

- Place a clean cloth over the exposed section of the sump.
- Carefully remove sealant residue on cylinder block and sump.



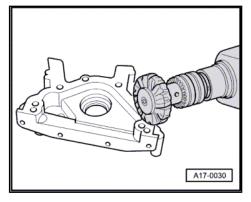
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### **WARNING**

Protect eyes against injuries.

- Wear safety goggles.
- Use e.g. rotating plastic brush to remove sealant residue on sealing flange.
- Clean sealing surfaces; they must be free of oil and grease.

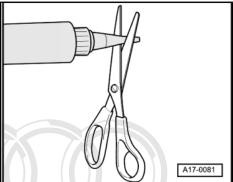




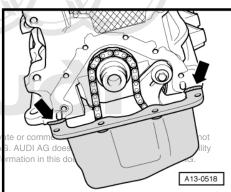
### Note

Note the use-by date of the sealant.

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



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



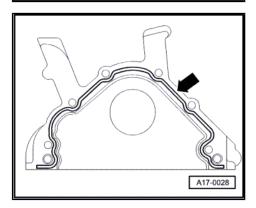
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### Caution

Make sure lubrication system is not clogged by excess sealant.

- ♦ The bead of sealant must not be thicker than specified.
- Apply bead of sealant -arrow- onto clean sealing surface of sealing flange as shown in illustration.
- Thickness of sealant bead: 2 ... 3 mm



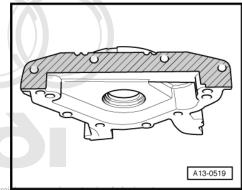
Apply a thin coat of sealant to bottom sealing surface -shaded- on sealing flange.



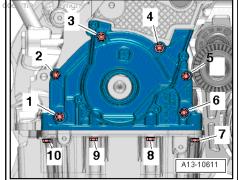
### Note

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

Carefully fit sealing flange onto dowel pins in cylinder block.



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- Install crankshaft oil seal (pulley end) ⇒ page 54.



### 2 Cylinder block (gearbox end)



Note

Servicing clutch ⇒ Rep. Gr. 30

### 2.1 Dual-mass flywheel and sealing flange (gearbox end) - exploded view

### 1 - Bolt

- □ Renew
- □ 60 Nm + 90°

### 2 - Dual-mass flywheel

- Removing and installing
- ☐ Can only be installed in one position

### 3 - Sender wheel

- ☐ For engine speed sender -G28-
- □ Removing and installing ⇒ "2.3 Renewing sealing flange (gearbox end)", page 61

### 4 - Engine speed sender -G28-

□ Removing and installing ⇒ "2.3 Renewing sealing flange (gearbox end)", page 61

### 5 - Bolt

□ 4.5 Nm

### 6 - Dowel pin

□ 2x

### 7 - Intermediate plate

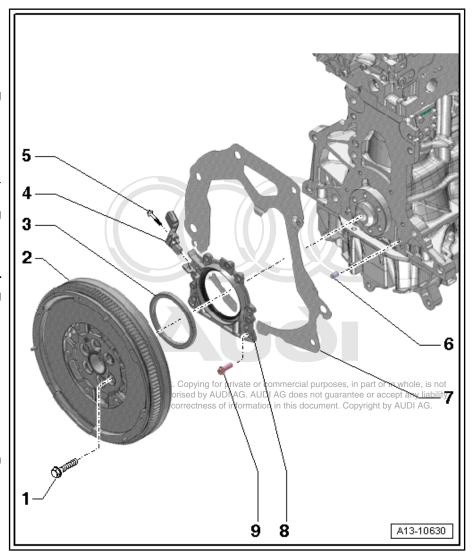
- Should be positioned on dowel pins
- Do not damage or bend when assembling
- Engaging on sealing flange <del>⇒ page 60</del>

### 8 - Sealing flange (gearbox end)

- With oil seal
- □ Renewing ⇒ page 61

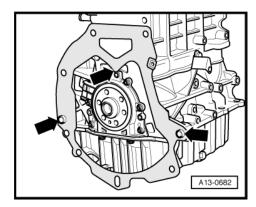
### 9 - Bolt

☐ Tightening torque and sequence ⇒ page 60



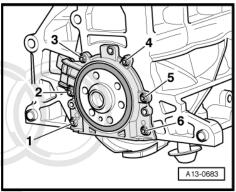
### Installing intermediate plate

Engage intermediate plate on sealing flange -top arrow- and push onto dowel sleeves -bottom arrows-.



### Sealing flange (gearbox end) - tightening torque and sequence

- Renew sealing flange bolts (gearbox end).
- Tighten bolts -1 ... 6- in 2 stages as follows:
- 1. Screw in bolts by hand until they make contact.
- 2. Tighten in stages and in diagonal sequence; final torque 15



### 2.2 Removing and installing dual-mass flywheel

Special tools and workshop equipment required

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### Removing

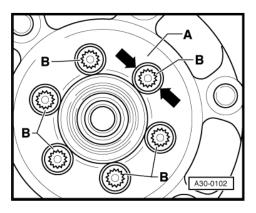
Gearbox removed.



### Caution

Make sure dual-mass flywheel is not damaged.

- Remove bolts -B- using normal hand tools (do not use pneumatic wrench or impact driver, etc.).
- When removing the bolts, make sure that the bolt heads do not come into contact with the dual-mass flywheel.
- Rotate the dual-mass flywheel -A- so that the bolts -Balign centrally with the holes -arrows-.



- Insert counterhold tool -3067- in hole on cylinder block -item B-, slacken bolts for dual-mass flywheel.
- Remove bolts and take off dual-mass flywheel.

### Installing

Tightening torque ⇒ page 59.

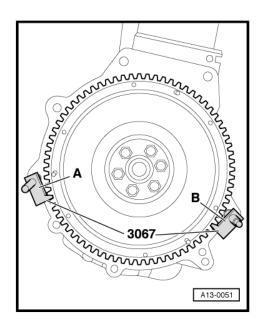
Installation is carried out in the reverse order; note the following:



### Note

Renew bolts for dual-mass flywheel.

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



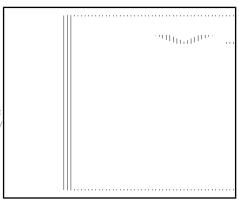
### 2.3 Renewing sealing flange (gearbox end)

Special tools and workshop equipment required

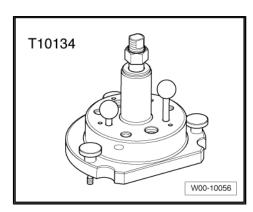
◆ Tool insert, AF 24 -V.A.G 1332/11-



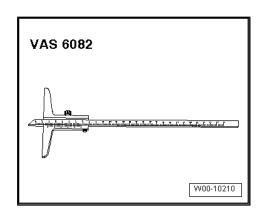
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Assembly tool -T10134-



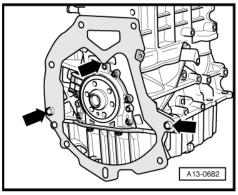
◆ Depth gauge -VAS 6082-



- Hexagon screwdriver insert with ball head 4 mm for hexagon socket head bolts (commercially available)
- ♦ 3x M6x35 bolt
- ♦ 2x M7x35 bolt

### Pressing out sealing flange with sender wheel

- · Gearbox removed.
- Remove dual-mass flywheel ⇒ page 60.
- Detach intermediate plate from sealing flange and dowel pins -arrows-.



- Rotate crankshaft by turning bolt for toothed belt sprocket until crankshaft is positioned at "TDC", as shown in illustration.
- Remove sump ⇒ page 139 .



### Note

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

Use hexagon screwdriver insert with ball head 4 mm for hexagon socket head bolts to remove engine speed sender -G28-item 1-.

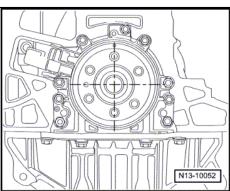


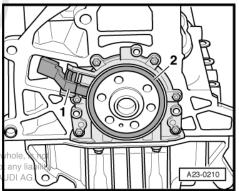
### Note

Disregard -item 2-.

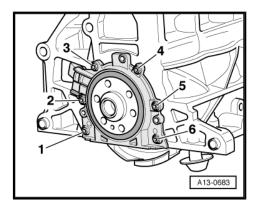
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Remove bolts -1 ... 6- for sealing flange.



### 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 1/2 turn at a time.
- Take off sealing flange with sender wheel.

### Pressing in sealing flange with sender wheel



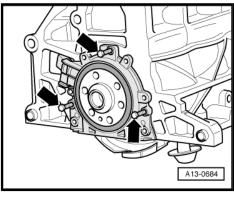
### Note

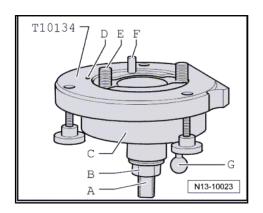
- The sealing flange with PTFE oil seal is fitted with a sealing lip support ring. This support ring acts as an assembly sleeve and must not be removed before installation.
- Sealing flange and sender wheel must not be separated or rotated out of position after removal from packaging.
- The sender wheel 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 must always 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.

### Construction of assembly tool -T10134-

- A Tightening flats
- B Hexagon 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)

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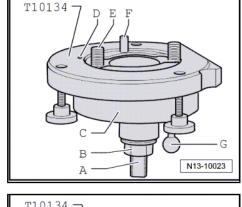


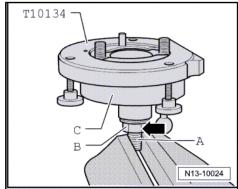
### A - Fitting sealing flange with sender wheel onto assembly tool - T10134-:

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



- Clamp assembly tool -T10134- in a vice on tightening flats
   -A- of threaded spindle.
- Press assembly housing -C- downwards so that it lies on hexagon nut -arrow-.
- Prolumer part rofit assembly, device, and assembly housing must be pealign (be-level) with each other a does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



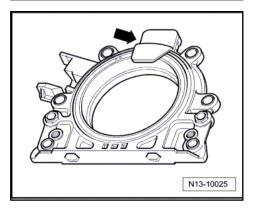


Remove the securing clip -arrow- from new sealing flange.

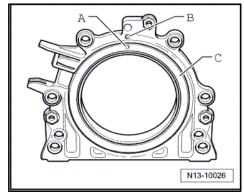


### Note

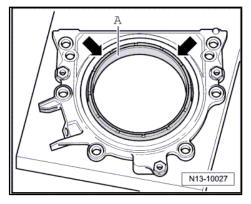
The sender wheel must not be taken out of the sealing flange or rotated out of position.



- The locating hole -A- on the sender wheel -C- must align with the marking -B- on the sealing flange.
- Place the sealing flange (with the front side downwards) on a clean flat surface.

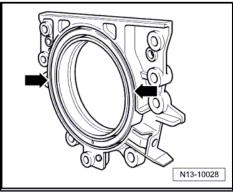


Press the sealing lip support ring -A- downwards in direction of -arrows- until it lies against the flat surface.

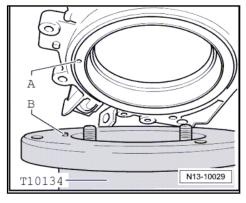


The upper edge of the sender wheel and the front edge of the sealing flange must align -arrows-.

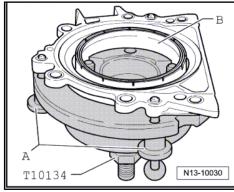
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- Place front side of sealing flange on assembly tool -T10134-, so that locating pin -B- can be inserted in hole -A- in sender wheel.
- Ensure the sealing flange lies flat on the assembly tool.



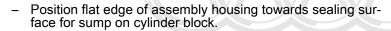
- Press the sealing flange and sealing lip support ring -B- onto the surface of the assembly tool -T10134- while tightening the 3 knurled screws -A- so that the locating pin will not slip out of the hole in the sender wheel.
- Ensure that the sender wheel remains fixed on the assembly tool when installing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

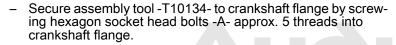


### Audi TT 2007 ➤

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

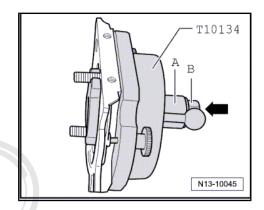
- · Crankshaft flange must be free of oil or grease.
- · Engine is at "TDC" position.
- Screw hexagon nut -B- to end of threaded spindle.
- Press the threaded spindle of assembly tool -T10134- in direction of -arrow- until the hexagon nut -B- lies on the assembly housing -A-.

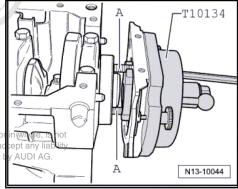


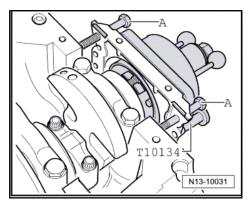


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 Screw two bolts M7×35 mm -item A- into cylinder block to guide sealing flange.







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

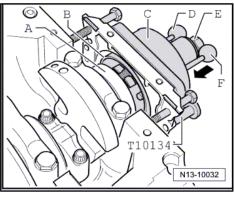
 Press the assembly housing -C- by hand in the direction of the -arrow- until the sealing lip support ring -B- lies on the surface of the crankshaft flange -A-.



### Caution

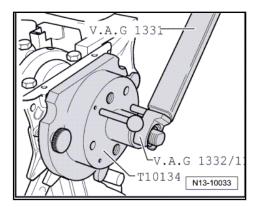
Do not interchange components.

- ◆ The guide pin for PETROL engines (red handle) -F- MUST NOT be inserted into the threaded hole in the crankshaft.
- Push guide pin for diesel engine (black handle) -D- into hole in crankshaft. This brings the sender wheel into its final installation position.
- Tighten the two hexagon socket head bolts on assembly tool hand-tight.
- Screw hexagon nut -E- onto threaded spindle by hand until it lies against the assembly housing -C-.



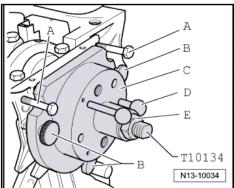
#### D - Pressing sender wheel onto crankshaft flange with assembly tool -T10134-:

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

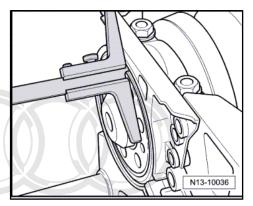


# E - Checking installation position of sender wheel on crankshaft:

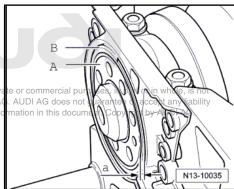
- Screw hexagon nut -E- to end of threaded spindle.
- Remove bolts -A- from cylinder block.
- Unscrew knurled screws -B- from sealing flange.
- Detach assembly tool -T10134-.
- Detach sealing lip support ring.



Apply depth gauge -VAS 6082- to crankshaft flange.

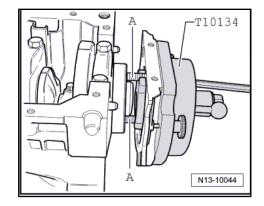


- Measure distance between crankshaft flange -A- and sender wheel -B-.
- Specification: Distance -a- = 0.5 mm.
- Press sender wheel in further if distance -a- is too small ⇒ page 68 . Protected by copyright. Copying for priv
- If reading matches specification, continue with assembly receives of info ⇒ page 68 .

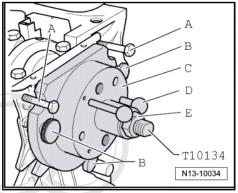


#### F - Pressing sender wheel in further:

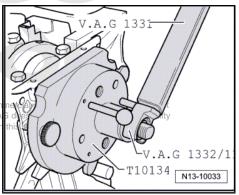
- Secure assembly tool -T10134- -item A- to crankshaft flange by tightening hexagon socket head bolts hand-tight.
- Press assembly tool onto sealing flange by hand.



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

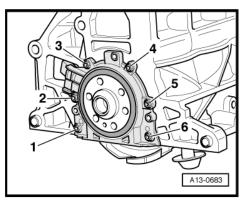


- Tighten hexagon nut on assembly tool -T10134- to 40 Nm.
- Check installation position of sender wheel on crankshaft again ⇒ page 67.
- If distance "a" is still to small, tighten hexagon nut on assembly tool -T10134- to 45 Nm.
- Check installation position of sender wheel on crankshaftprivate or compermitted unless authorised by AUDI AG. AUDI. again <u>⇒ page 67</u> . with respect to the correctness of information



#### Assembling:

Tighten sealing flange bolts ⇒ page 60.



Install engine speed sender -G28- -item 1-.

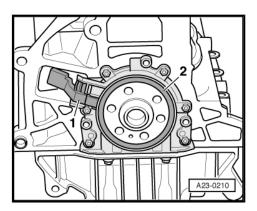


# Note

Disregard -item 2-.

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

- Install sump <u>⇒ page 139</u>.
- Install dual-mass flywheel ⇒ page 60.





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# 3 Crankshaft



#### Note

When carrying out repairs, secure engine with engine and gearbox support -VW 540- to engine and gearbox support ⇒ page 30.

# 3.1 Crankshaft - exploded view

#### 1 - Bearing shell

- ☐ For cylinder block (with oil groove)
- Mark used bearing shells for re-installation but not on bearing surface

## 2 - Drive chain sprocket

□ Renewing ⇒ page 74

#### 3 - Bearing shell

- ☐ For bearing cap (without oil groove)
- Mark used bearing shells for re-installation but not on bearing surface

# 4 - Thrust washers

- ☐ For bearing No. 3
- Different types for cylinder block and bearing cap
- Note location

#### 5 - Bolts

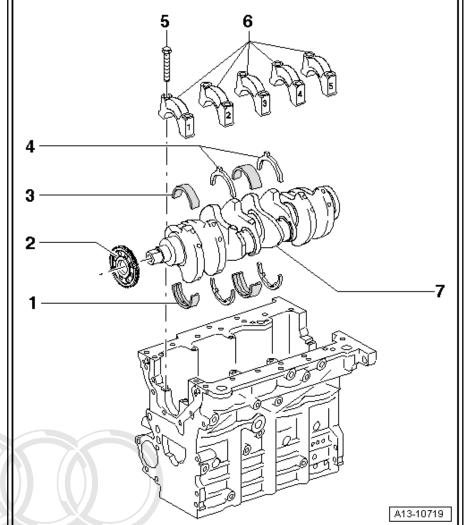
- □ Renew
- □ 65 Nm + 90°
- For measuring radial clearance of crankshaft tighten to 65 Nm, but not further

# 6 - Bearing cap

- ☐ Bearing cap 1: Pulley end
- 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

#### 7 - Crankshaft

- ☐ vMeasuringeaxialtelearancetion page 74ment. Copyright by AUDI AG.
- Measuring radial clearance ⇒ page 71
- □ Crankshaft dimensions ⇒ page 71



☐ With drive spur gear for balance shaft assembly

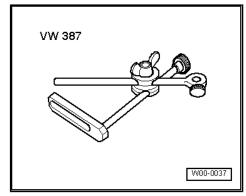
#### 3.2 Crankshaft dimensions

Honing di- mension	Main bearing journal Ø	Conrod journal Ø mm		
Basic dimension	54.00 -0.022 -0.042	50.90 -0.022 -0.042		

#### 3.3 Measuring axial clearance of crankshaft

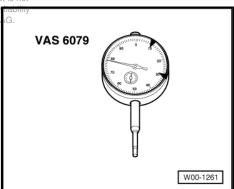
Special tools and workshop equipment required

♦ Universal dial gauge bracket -VW 387-



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♦ Dial gauge With specific puthorised by AUDI AG. AUDI AG does not guarantee or accept any with expect to the correctness of information in this document. Copyright by AUDI



#### **Procedure**

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

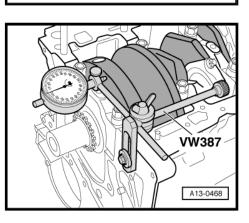
#### Axial clearance:

- New: 0.07 ... 0.17 mm.
- Wear limit: 0.37 mm

#### 3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

Plastigage



#### **Procedure**



#### Note

- Mark used bearing shells for re-installation (but do not mark bearing surface).
- If bearing shells are worn down to nickel layer they must be renewed.
- Remove bearing cap and clean bearing journal.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- The Plastigage must be positioned in the centre of the bearing shell.
- Fit bearing cap and tighten to 30 Nm. Do not rotate crankshaft.
- Remove bearing cap again.
- Compare width of Plastigage with measurement scale.

#### Radial clearance:

- New: 0.03 ... 0.08 mm.
- Wear limit: 0.17 mm.

#### 3.5 Extracting and driving in needle bearing for crankshaft



#### Note

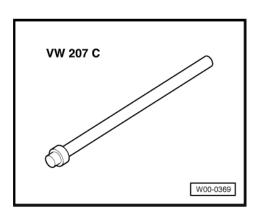
Depending on the version of the gearbox, a needle bearing is fitted in the crankshaft ⇒ Electronic parts catalogue.

#### Special tools and workshop equipment required

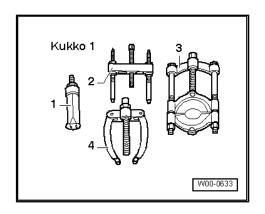
Drift -VW 207 C- or centring mandrel -3176-



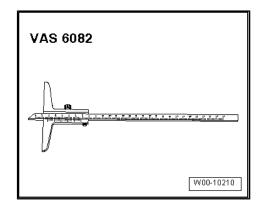
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◆ -1- Internal puller Kukko 21/1

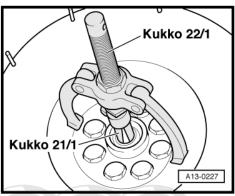


- ◆ -4- Counter-support Kukko 22/1
- ♦ Depth gauge -VAS 6082-



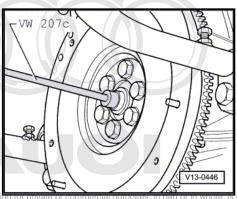
# **Pulling out**

- Gearbox removed.
- Remove needle bearing using internal puller Kukko 21/1 and counter-support Kukko 22/1.

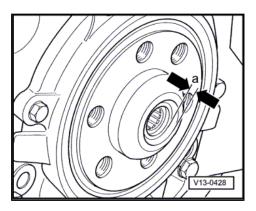


# Driving in

- Drive in needle bearing with drift -VW 207 C- or centring mandrel -3176- .
- Installation position: side with lettering faces outwards.

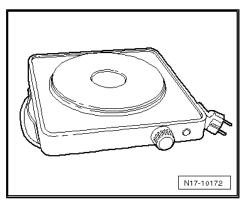


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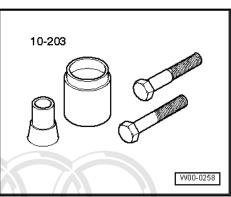


# 3.6 Pulling spur gear off crankshaft and shrink-fitting new spur gear

♦ Hotplate (commercially available)



♦ Fitting tool -10 - 203-



- ♦ Puller -T10392-
- ♦ Thrust piece -T10392/1-
- ◆ Temperature gauge -VAS 6519-
- Remove sealing flange (pulley end) <u>⇒ page 56</u>.
- Remove sump ⇒ page 139 .



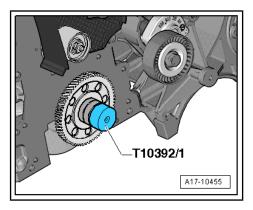
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If the balance shaft assembly does not have to be renewed, it is of information in this document. Copyright by AUDI AG. sufficient just to remove the idler gear.

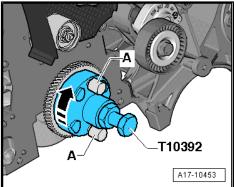
Remove balance shaft assembly ⇒ page 144.

# Pulling off spur gear

- Insert thrust piece -T10392/1- in end of crankshaft.



Insert puller -T10392- in holes in spur gear, turn clockwise -arrow- and screw in locking pins -A-.



Counterhold crankshaft with ring spanner -A- and pull spur gear offend of crankshaft by screwing in spindle with ring whole, is no spanner Bullet authorised by AUDI AG. AUDI AG does not guarantee or accept any liability spannerni Bd.ur ect to the correctness of information in this document. Copyright by AUDI AG.

# Shrink-fitting spur gear



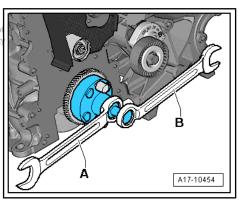
# Note

- While heating up the new spur gear, monitor the temperature with the temperature gauge -VAS 6519- .
- When the temperature reaches 200 °C, you have approx. 4 seconds to fit the spur gear on the crankshaft.
- A higher temperature increases the amount of time available (220°C = approx. 6 seconds).
- Make sure the end of the crankshaft is clean.



### Caution

Do not exceed a maximum temperature of 240 °C; otherwise the spur gear can become discoloured and distorted.



- Place the new spur gear flat on a hotplate (commercially available) and heat it to at least 200 °C, but not more than 240 °C.
   The lettering must face upwards.
- Set temperature gauge -VAS 6519- to measuring range 2.
- Position temperature sensor -VAS 6519/1- on collar of spur gear (as shown) and read off temperature at temperature gauge.



#### **WARNING**

Risk of burns. Use suitable protective gloves for the following steps.



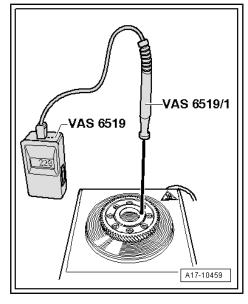


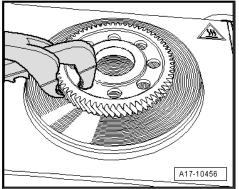
# Note

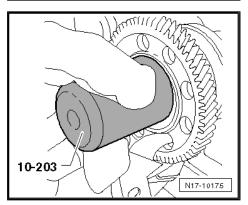
Take care not to damage the teeth of the spur gear.

- With the aid of fitting tool -10 203-, slide spur gear by hand onto end of crankshaft as far as stop. This must be done without delay, taking care to keep the gear straight.
- Wait a few minutes to allow the spur gear to cool down, and then install the balance shaft assembly.
- ⇒ "1.6 Installing a new balance shaft assembly", page 146
- ⇒ "1.7 Re-installing a used balance shaft assembly", page 149









#### 4 Pistons and conrods



## Note

Oil spray jet and pressure relief valve <del>⇒ page 80</del>

#### 4.1 Pistons and conrods - exploded view

#### 1 - Bolt

- □ Renew
- Lubricate threads and contact surface
- □ 30 Nm + 90°
- When measuring radial clearance, tighten used bolt to 30 Nm but not fur-

#### 2 - Conrod bearing cap

- Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- Mark cylinder allocation in colour -B-
- Installation position: Markings -A- face towards pulley end

## 3 - Bearing shell

- ☐ Installation position ⇒ page 80
- Mark used bearing shells for re-installation but not on bearing sur-
- Note version: Upper bearing shell (closest to piston) is constructed from a more wear-resistant material. Distinguishing feature on new

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- bearing shells: black marking on bearing surface near joint
- Check that it is securely seated
- □ Axial clearance: wear limit: 0.37 mm
- Measuring radial clearance ⇒ page 82

# 4 - Conrod

- Only renew as a complete set
- ☐ With industrially cracked conrod bearing cap
- □ Separating parts of new conrod ⇒ page 80
- ☐ Mark cylinder allocation in colour -B-
- ☐ Installation position: Markings -A- face towards pulley end

5 -	Circlip
-----	---------

□ Renew

### 6 - Piston pin

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

#### 7 - Piston

- With combustion chamber
- ☐ Version fitted in vehicle may differ from illustration
- ☐ Mark installation position and cylinder number ⇒ page 79
- □ Checking ⇒ page 79
- Install using piston ring clamp
- ☐ Piston and cylinder dimensions <u>⇒ page 82</u>
- Measuring cylinder bore ⇒ page 79
- □ Checking piston projection at "TDC" ⇒ page 81

#### 8 - Piston rings

- Compression rings
- ☐ Offset gaps by 120°
- ☐ Use piston ring pliers to remove and install
- ☐ Installation position: marking "TOP" or side with lettering faces towards piston crown
- Measuring ring gap ⇒ page 78
- Measuring ring-to-groove clearance ⇒ page 79

#### 9 - Piston ring

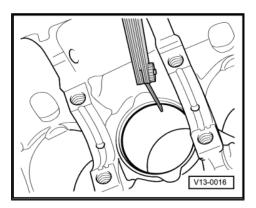
- Oil scraper ring
- ☐ Offset gap 120° from bottom compression ring
- ☐ Use piston ring pliers to remove and install
- Measuring ring gap ⇒ page 78
- Measuring ring-to-groove clearance ⇒ page 79

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#### Measuring piston ring gap

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

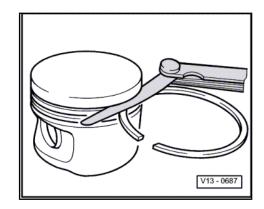
Piston ring	new mm	Wear limit mm		
1st compression ring	0.25 0.40	1.00		
2nd compression ring	0.25 0.40	1.00		
Oil scraper ring	0.25 0.50	1.00		



#### Measuring ring-to-groove clearance

- Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm		
1st compression ring	0.06 0.09	0.25		
2nd compression ring	0.05 0.08	0.25		
Oil scraper ring	0.03 0.06	0.15		



# Checking piston

- Using a micrometer (75 ... 100 mm), measure approx. 15 mm from the lower edge, perpendicular to the piston pin axis.
- Maximum deviation from nominal dimension: 0.04 mm.

#### Nominal dimension

⇒ "4.3 Piston and cylinder dimensions", page 82.

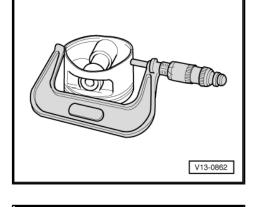


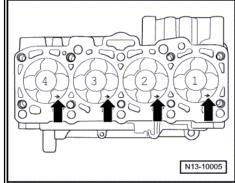
# Note

Renew piston if cracking is visible on piston skirt.

# Installation position of pistons and allocation of piston/cylinder

Arrow on piston crown points to pulley end -arrows-.



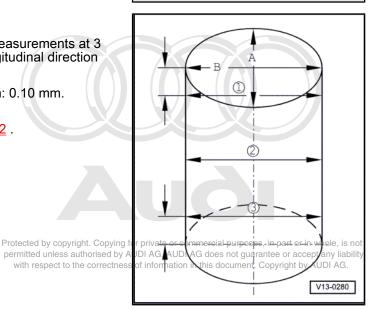


# Measuring cylinder bore

- Use a cylinder gauge -VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction
- Maximum deviation from nominal dimension: 0.10 mm.

#### Nominal dimension

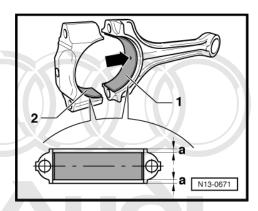
⇒ "4.3 Piston and cylinder dimensions", page 82.



# Audi TT 2007 ➤

#### Installation position of bearing shells in conrods

- Bearing shell with oil drilling -arrow- for conrod.
- 2 Bearing shell without oil drilling for conrod bearing cap.
- Position bearing shells in centre of conrod and conrod bearing cap when fitting.
- · Distance -a- is the same on both sides.

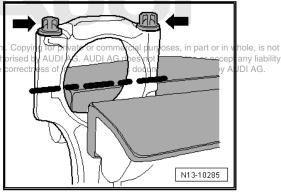


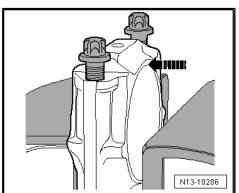
# Separating parts of new conrod

It is possible that the two parts of a new conrod are not completely separated as intended. If it is not possible to take off the conrod copyrig bearing cap by hand, proceed as follows:

permitted unless aut

- To avoid any risk of damage, the conrod should only be clamped lightly in a vice using jaw covers as shown in illustration.
- The conrod is clamped in position below the dotted line.
- Unscrew bolts -arrows- approx. 5 turns.
- Using a plastic hammer, carefully knock conrod bearing cap loose -arrow-.





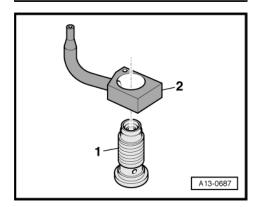
#### Oil spray jet and pressure relief valve

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



#### Note

- ♦ Take care not to bend oil spray jets.
- ♦ Always renew bent oil spray jets.

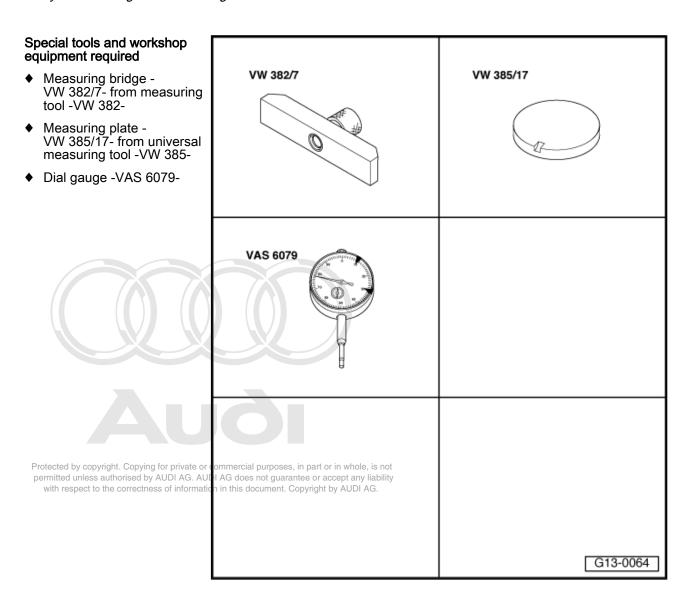


#### 4.2 Measuring piston projection at "TDC"



### Note

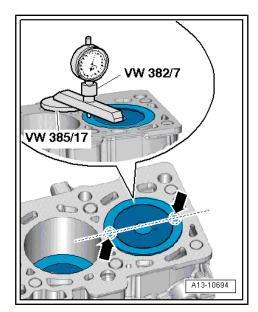
- Piston projection at "TDC" must be measured when installing new pistons or a short engine.
- ♦ If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct gasket size.
- Depending upon piston projection, install the corresponding cylinder head gasket according to the table below.



#### **Procedure**

- Secure dial gauge -VAS 6079- with measuring bridge -VW 382/7- and measuring plate -VW 385/17- to cylinder block as shown in illustration.
- Measure piston projection at two points marked with -arrows- for each piston.

Piston projection above top sur- face of cylinder block mm	Identification (No. of holes)
0.91 1.00	1
1.01 1.10	2
1.11 1.20	3



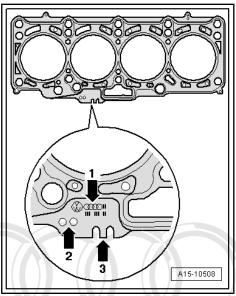
# Identification of cylinder head gasket

- 1 Part number
- 2 Holes
- 3 Ignore



#### Note

If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct gasket size.



# 4.3 Piston and cylinder dimensions

Honing dimension	Piston Ø mm	Cylinder bore Ø mm		
Basic dimension	80.96 <sup>1)</sup>	81.01		
		*		

<sup>1)</sup> Dimensions including coating (thickness 0.02 mm). The coating will wear down in service.

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# 4.4 Measuring radial clearance of conrods<sup>®</sup>

# Special tools and workshop equipment required

◆ Plastigage

# **Procedure**

- Remove conrod bearing cap. Clean bearing cap and bearing journal.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or in the bearing shell.





- Fit conrod bearing caps and tighten to 30 Nm without rotating crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigage with measurement scale.

#### Radial clearance:

- Wear limit: 0.08 mm.
- Renew conrod bolts.



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A13-10627

# ( Audi TT 2007 ➤

# Cylinder head, valve gear

# Toothed belt drive

#### 1.1 Toothed belt - exploded view

#### 1 - Toothed belt

- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- Check for wear
- □ Removing ⇒ page 86
- □ Installing (adjusting valve timing) ⇒ page 91
- 2 Idler roller
- 3 Nut
  - □ 20 Nm
- 4 Tensioning roller
- 5 Nut
  - □ 20 Nm + 45°
- 6 Bolt
  - □ 20 Nm
- 7 Idler roller
- 8 Bolt
  - □ 20 Nm + 45°
  - ☐ Renew
- 9 Camshaft sprocket
- 10 Bolt
  - ☐ Slacken and tighten with counterhold tool -T10051-
  - □ 100 Nm

#### 11 - Camshaft hub

□ Removing and installing

⇒ "3.5 Removing and installing camshafts", page 121



13 - Cover (rear) for toothed belt

# 14 - Bolt

□ 10 Nm

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# 15 - High-pressure pump hub

☐ Removing and installing ⇒ Rep. Gr. 23

# 16 - Nut

☐ Tightening torque ⇒ Rep. Gr. 23

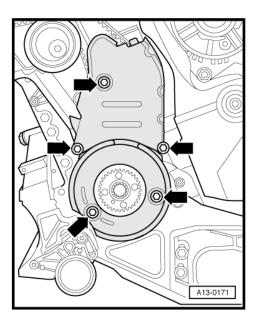


# 17 - High-pressure pump sprocket

- 18 Bolt
  - ☐ Tightening torque ⇒ Rep. Gr. 23
- 19 Idler roller
- 20 Bolt
  - ☐ Renew
  - □ 50 Nm + 90°
- 21 O-ring
  - □ Renew
- 22 Coolant pump
  - ☐ Removing and installing ⇒ page 170
- 23 Bolt
  - ☐ Tightening torque ⇒ Item 1 (page 170)
- 24 Crankshaft sprocket
  - ☐ Contact surface between sprocket and crankshaft must be free of oil
  - ☐ Can only be installed in one position
- 25 Bolt
  - □ Renew
  - ☐ Slacken and tighten with counterhold tool -3415-
  - Do not additionally oil threads and shoulder
  - ☐ 120 Nm + 90°

# Cover for toothed belt (bottom and centre) - tightening torque

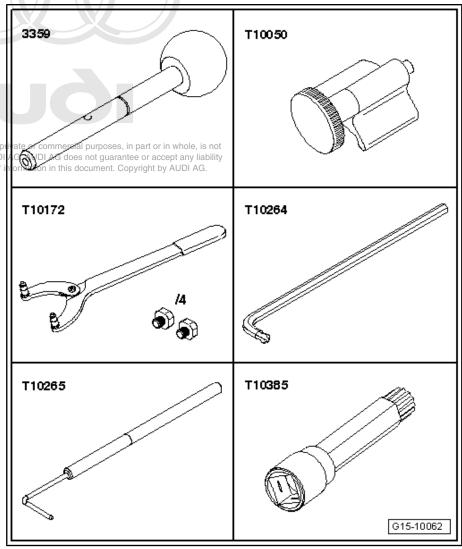
- Tighten bolts -arrows- to 9 Nm. this document. Copyright by AUDI AG.



#### 1.2 Removing and installing toothed belt

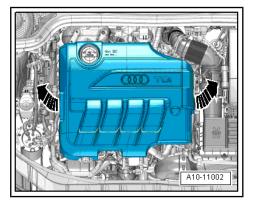
### Special tools and workshop equipment required

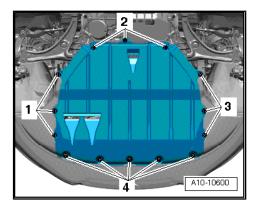
- 2x Diesel injection pump locking pin -3359-
- Crankshaft stop -T10050-
- Counterhold tool -T10172-
- Special wrench, long reach -T10264ad by copyright. Copying for proprinted unless authorised by AUDI Locking tools of 10265 at the soft
- Bit XZN 10 -T10385-



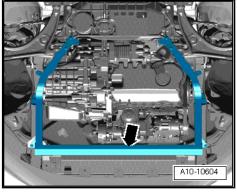
### Removing

Remove engine cover panel -arrows-.





Only on TT Roadster: Remove noise insulation frame -arrow-  $\Rightarrow$  Rep. Gr. 50 .

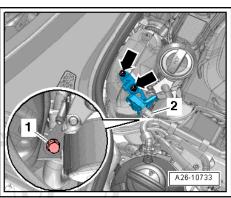


Unplug electrical connector -2- on exhaust gas pressure sensor 1 -G450- .



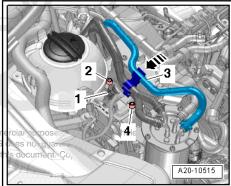
# Note

Ignore items marked -1- and -arrows-.

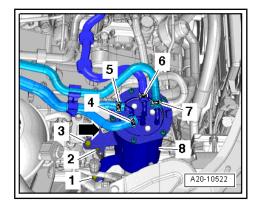


- Disengage fuel hose -3- at bracket.
- Pull off bracket for fuel lines towards right -arrow- and move clear to one side.
- Unplug electrical connector -1- at supplementary fuel pump -
- Remove bolts -2- and -4-, detach bracket with supplementary fuel pump -V393- and move clear to one side.

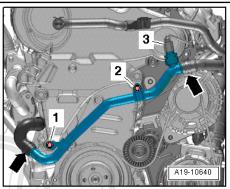
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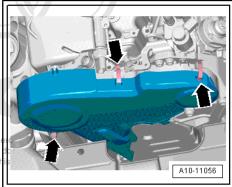
- Loosen bolt -1-.
- Remove nut -2- and bolt -3-.
- Detach hose retainer -arrow- from fuel filter and move fuel filter -8- clear to one side with fuel hoses -4 ... 7- connected.



- Unplug electrical connector -3- at radiator outlet coolant temperature sender -G83- .
- Remove nut -1- and bolt -2-.
- Move coolant pipe (right-side) -arrows- to side (coolant hoses remain connected).



Release retaining clips -arrows- and detach cover (top) for toothed belt.



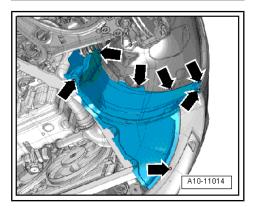
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- Release fasteners -arrows- and remove right wheel housing liner (bottom section).
- Remove vibration damper <u>⇒ page 49</u>.

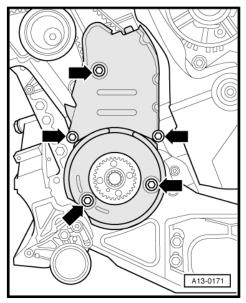


# Note

The poly V-belt tensioner does not have to be locked.



- Remove bolts -arrows-.
- Detach toothed belt cover (bottom and centre).





#### Caution

Irreparable damage can be caused if the toothed belt slips.

- ♦ Turn crankshaft only in direction of engine rotation.
- Rotate crankshaft by turning bolt on crankshaft sprocket until camshaft sprocket is positioned at "TDC".
- The toothed segment -arrow- must face upwards.
- Lock camshaft hub with diesel injection pump locking pin -3359- .



#### Note

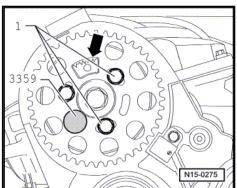
- Camshaft sprocket is shown in illustration with toothed belt removed.
- Disregard -item 1-.
- Lock crankshaft sprocket in position with crankshaft stop -T10050-.
- The markings on the sprocket -2- and the crankshaft stop -1must align -arrow-. The pin of the crankshaft stop must engage in the aperture in the sealing flange.

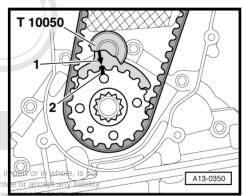


#### Note

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

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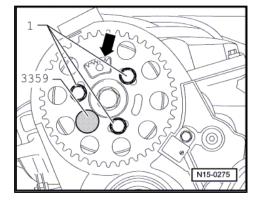


Slacken bolts -1- for camshaft sprocket approx. 90°.

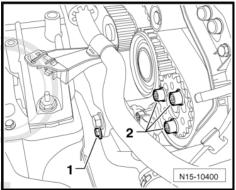


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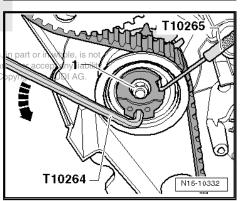
Disregard -arrow-.



- Remove bolt -1- for coolant pipe.
- Using bit XZN 10 -T10385- , loosen bolts -2- for high-pressure pump sprocket approx. 90°.



- Loosen nut -1- for tensioning roller.
- Turn eccentric adjuster of tensioning roller with special wrench, long reach -T10264+ anti-clockwise + arrow + until-ten-urposes sioning roller can be secured with locking tool -T10265 does not guara with respect to the correctness of information in this document. €



T10264

N15-10333

Then use special wrench, long reach -T10264- to turn eccentric adjuster of tensioning roller clockwise -arrow- as far as stop and tighten nut -1- by hand.



#### Caution

If a used belt runs in the opposite direction when it is refitted, this can cause breakage.

- ♦ Before removing, mark direction of rotation of toothed belt with chalk or felt-tipped pen for re-installation.
- Take off toothed belt first from idler roller and then from remaining sprockets.

# Installing (adjusting valve timing)

Tightening torques ⇒ page 84



# Note

Perform adjustments on toothed belt only when engine is cold.



#### Caution

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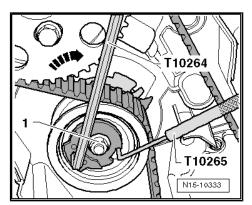
Avoid damage to valves and piston crowns.

The crankshaft must not be at "TDC" at any cylinder when the camshaft is turned.

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#### Requirements:

Tensioning roller is locked with locking tool -T10265- and secured at right stop with nut.

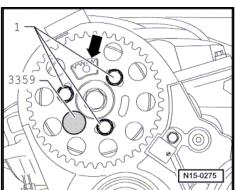


- Camshaft hub locked with diesel injection pump locking pin -3359- .
- Bolts -1- are fitted but not tightened.
- It should just be possible to turn the sprocket on the camshaft without axial movement.

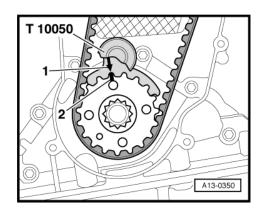


#### Note

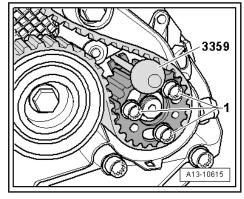
Disregard -arrow-.



• Crankshaft is locked in position with crankshaft stop -T10050-.



- Hub of high-pressure pump locked with diesel injection pump locking pin -3359- .
- · Bolts -1- are fitted but not tightened.
- The high-pressure pump sprocket should still just turn, but there must be no axial movement.

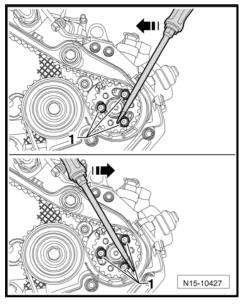




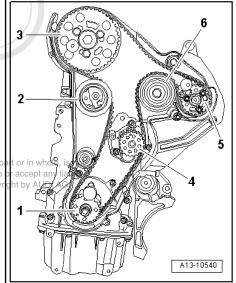
# Note

If necessary, apply a screwdriver to bolt heads -1- and turn the high-pressure pump hub until it can be locked with the locking pin.

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- Install toothed belt in the specified sequence:
- 1 -Crankshaft sprocket
- 2 -Tensioning roller
- 3 -Camshaft sprocket
- 4 -Coolant pump sprocket
- 5 -
- High-pressure pump sprocket
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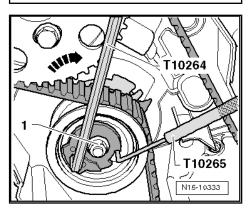


Loosen nut -1- for tensioning roller and detach locking tool -T10265-.



#### Note

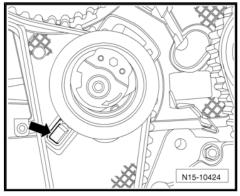
Disregard -arrow-.



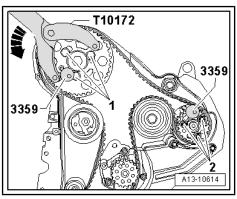


#### Note

Ensure that tensioning roller is seated properly in toothed belt cover (rear) -arrow-.



- Position counterhold tool -T10172- on camshaft sprocket as shown in illustration.
- Apply force to counterhold tool in anti-clockwise direction -arrow- and maintain tension.
- Tighten bolts -1- for camshaft sprocket and bolts -2- for highpressure pump sprocket in this position.
- Tightening torque: 20 Nm.



- Carefully turn eccentric adjuster of tensioning roller clockwise -arrow- using special wrench, long reach -T10264- until pointer -2- aligns with the centre of the slot on the base plate.
- Nut -1- must not turn.
- Hold tensioning roller in this position and tighten nut.
- Remove locking pins -3359- and crankshaft stop -T10050- .

#### Checking valve timing:

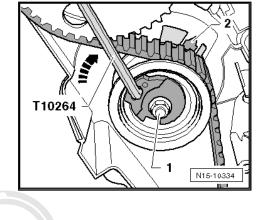


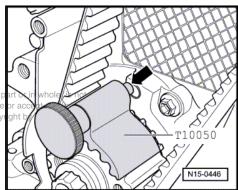
#### Caution

Irreparable damage can be caused if the toothed belt slips.

- Turn crankshaft only in direction of engine rotation.
- Turn crankshaft two rotations in direction of engine rotation by turning bolt for crankshaft sprocket until crankshaft is just before "TDC".
- Fit crankshaft stop -T10050- to crankshaft sprocket again.
- Then turn the crankshaft in direction of engine rotation until the pin -arrow- on the crankshaft stop engages in the sealing flange as the crankshaft rotates.

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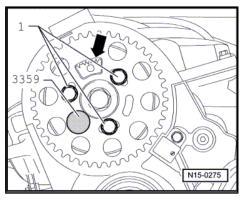
It should now be possible to lock camshaft hub with diesel injection pump locking pin -3359-.

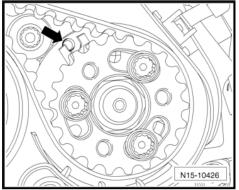


# Note

Disregard items marked -1- and -arrow-.

It is very difficult to reproduce the locking position of the highpressure pump hub. However, a slight deviation -arrow- does not influence engine operation.





 Pointer -2- on tensioner roller must be centred between tabs -1- and -3- on base plate.



#### Note

The maximum permissible sideways deviation from the specified position is 5 mm.

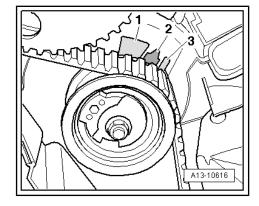
- Re-adjust valve timing if requirements are not met
   ⇒ page 95.
- ♦ If requirements are met, continue with procedure after adjusting valve timing correctly as described below ⇒ page 95.

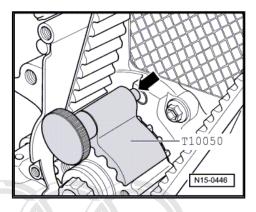
#### Re-adjusting valve timing:

- If camshaft hub cannot be locked, withdraw crankshaft stop -T10050- until pin is clear of bore.
- Turn crankshaft in opposite direction of engine rotation slightly past "TDC".
- Now turn crankshaft slowly in direction of engine rotation until it is possible to lock camshaft hub.
- Loosen bolts for camshaft sprocket after locking hub.
- A If pin of crankshaft stop -T10050- is on left side of bore:
- Then turn the crankshaft in direction of engine rotation until the pin -arrow- on the crankshaft stop engages in the sealing flange as the crankshaft rotates.
- Tighten camshaft sprocket bolts to 20 Nm.
- B If pin of crankshaft stop -T10050- is on right side of bore:
- Turn crankshaft slightly in opposite direction to engine rotation.
- Turn crankshaft in direction of engine rotation again until pin of crankshaft stop engages in sealing flange as crankshaft rotates.
- Tighten camshaft sprocket bolts to 20 Nm.

#### Procedure after adjusting valve timing correctly:

- Remove diesel injection pump locking pin -3359- and crankshaft stop -T10050- .
- Turn crankshaft two rotations in direction of engine rotation by turning bolt for crankshaft sprocket until crankshaft is just before "TDC".
- Check valve timing once again ⇒ page 94.







- If camshaft hub can now be locked, tighten camshaft sprocket bolts -1- to final torque ⇒ Item 8 (page 84).
- Tighten bolts -2- for high-pressure pump sprocket to final torque  $\Rightarrow$  Rep. Gr. 23 .
- Check valve timing once again ⇒ page 94.

#### **Assembling**

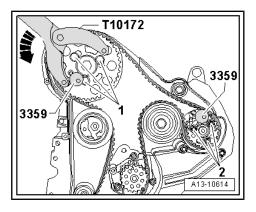
Installation is carried out in the reverse order; note the following:



#### Note

- Renew seals and/or gaskets.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- Install vibration damper ⇒ page 49.
- Install right wheel housing liner (bottom section) ⇒ Rep. Gr. 66.
- Install coolant pipe (right-side) ⇒ page 186.
- Install fuel filter ⇒ Rep. Gr. 20.
- Install supplementary fuel pump -V393- ⇒ Rep. Gr. 20.
- Install noise insulation frame ⇒ Rep. Gr. 50 .
- Install noise insulation ⇒ Rep. Gr. 66.

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#### 2 Cylinder head



Audi TT models with a TDI engine (2.0 ltr. 4-valve common rail) are always equipped with steel glow plugs.

#### 2.1 Cylinder head cover - exploded view

#### 1 - Bolts

□ 5 Nm

#### 2 - Fuel rail

- Observe rules for cleanliness ⇒ page 5
- Do not attempt to bend high-pressure pipes to a different shape
- □ Installing high-pressure pipes  $\Rightarrow$  Rep. Gr. 23

#### 3 - Bolt

Tightening torque ⇒ Rep. Gr. 23

#### 4 - Injector

- Observe rules for cleanliness ⇒ page 5
- Removing and installing ⇒ Rep. Gr. 23

#### 5 - Bolt

Tightening torque ⇒ Rep. Gr. 23

#### 6 - Cover for injector

#### 7 - Bush for fuel rail

Renew if damaged or leaking

# 8 - Nut

- □ Tightening torque ⇒ Rep. Gr. 23
  Protected by copyright. Copying for private
- ised by AUDI AG. prectness of inform 9 - Clamping piece

#### 10 - Cable guide

## 11 - Cylinder head cover

□ Removing and installing ⇒ page 98

# 12 - Gasket

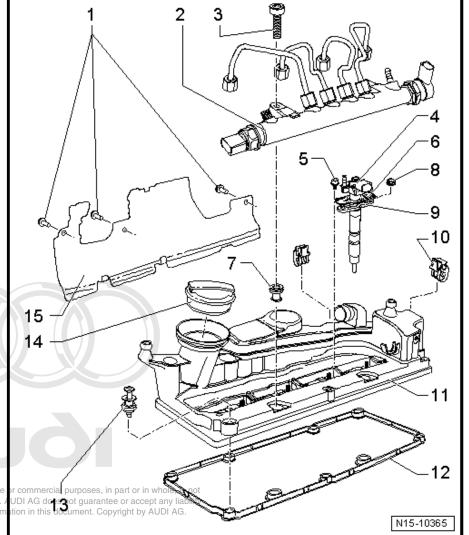
□ Renew if damaged or leaking

# 13 - Bolt

- □ Renew if seal is damaged
- ☐ Tightening torque and sequence ⇒ page 98

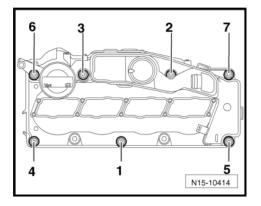
#### 14 - Sealing cap

15 - Heat shield



# Cylinder head cover - tightening torque and sequence

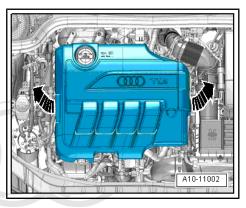
 Tighten bolts for cylinder head cover in the sequence -1 ... 7to 9 Nm.



# 2.2 Removing and installing cylinder head cover

# Removing

Remove engine cover panel -arrows-.

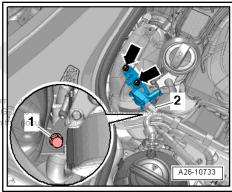


Unplug electrical connector -2- on exhaust gas pressure sensor 1 -G450-.

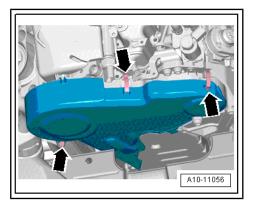


# Note

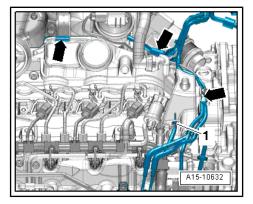
Ignore items marked -1- and -arrows rotected by copyright. Copying for private or compermitted unless authorised by AUDI AG. AUDI A with respect to the correctness of information in



 Unfasten clips -arrows- and press toothed belt cover (top) to right side.



- Remove injectors ⇒ Rep. Gr. 23.
- Disconnect vacuum hose -1- from cylinder head cover.
- Move electrical wiring and remaining vacuum hoses clear -arrows-.

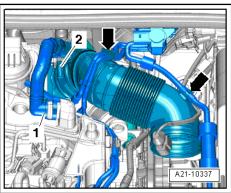


Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.

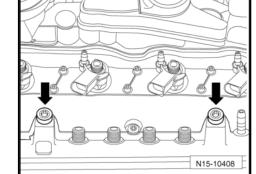


#### Note

Ignore items marked -2- and -arrows-.



Remove bolts -arrows- and detach fuel rail from cylinder head cover.





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- Remove bolts and take off cylinder head cover.

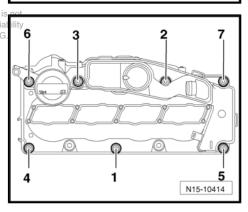
#### Installing

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



# Note

- Renew gasket for cylinder head cover if damaged.
- Renew bolts for cylinder head cover if seals on bolts are damaged.
- Tighten cylinder head cover bolts ⇒ page 98.



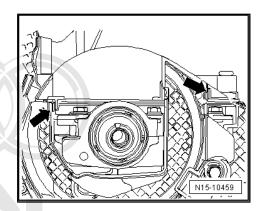
 Make sure that cylinder head cover is clipped properly to toothed belt cover.



#### Note

For illustration purposes, the installation position is shown with the camshaft sprocket removed.

- Use screwdriver to press clips -arrows- on toothed belt cover onto cylinder head cover until they engage with a click.
- Make sure there is a clearance between hub and toothed belt cover.
- Install fuel rail and injectors ⇒ Rep. Gr. 23



# 2.3 Cylinder head ← exploded yview ivate or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

#### 1 - Cylinder head

- Removing and installing⇒ page 102
- ☐ After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface
- ☐ Checking for distortion⇒ page 101
- Must not be machined
- ☐ If renewed, change coolant and engine oil

#### 2 - Washer

#### 3 - Bolt

- Renew
- □ Correct sequence when slackening ⇒ page 111
- ☐ Tightening torque and sequence ⇒ page 102

#### 4 - Centre hex stud

- ☐ Renew
- □ 20 Nm + 90°

### 5 - Engine lifting eye

#### 6 - Gasket

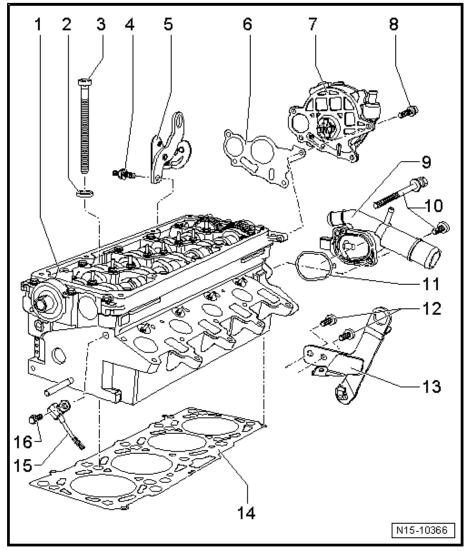
☐ Renew

#### 7 - Exhauster pump

□ Removing and installing⇒ Rep. Gr. 47

#### 8 - Bolt

☐ Tightening torque ⇒ Rep. Gr. 47



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#### 10 - Bolts

☐ Tightening torque ⇒ Item 19 (page 175)

#### 11 - Gasket

☐ Renew

#### 12 - Bolts

- ☐ Renew
- □ 20 Nm + 90°

#### 13 - Engine lifting eye

# 14 - Cylinder head gasket

- ☐ Renewing ⇒ "2.4 Removing and installing cylinder head", page 102
- ☐ Identification ⇒ page 101
- ☐ If renewed, change coolant and engine oil

15 - Hall sender -G40- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not For camshaft position espect to the correctness of information in this document. Copyright by AUDI AG.

#### 16 - Bolt

- ☐ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- □ 10 Nm

## Checking cylinder head for distortion

- Use straight edge and feeler gauge to measure cylinder head for distortion at several points.
- Max. permissible distortion: 0.1 mm.



#### Note

Cylinder heads must not be reworked on TDI engines.

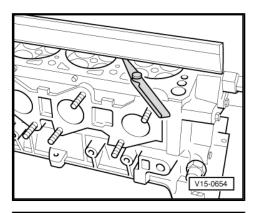
# Identification of cylinder head gasket

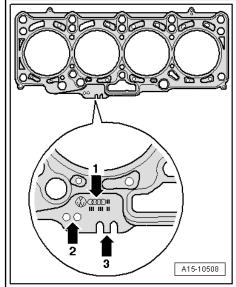
- Part number
- 2 -Holes
- Ignore



# Note

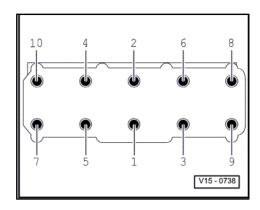
- Cylinder head gaskets of different thicknesses are fitted depending on the amount of piston projection ⇒ page 81.
- When renewing only the cylinder head gasket, the new gasket should have the same identification as the old one.





# Cylinder head - tightening torque and sequence

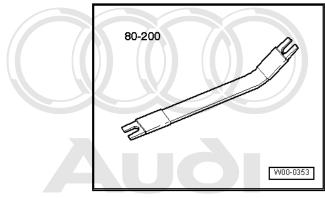
- Renew cylinder head bolts.
- Tighten bolts in the sequence -1 ... 10- in 4 stages as follows:
- 1. Tighten to 30 Nm.
- 2. Tighten to 50 Nm.
- Turn 90° further. 3.
- Turn 90° further. 4.



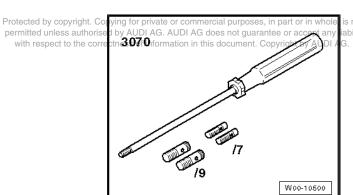
#### 2.4 Removing and installing cylinder head

# Special tools and workshop equipment required

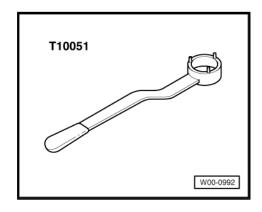
Removal lever -80 - 200-

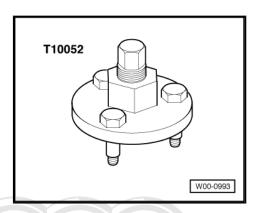


Guide pins -3070- with -3070/9-



Counterhold tool -T10051-





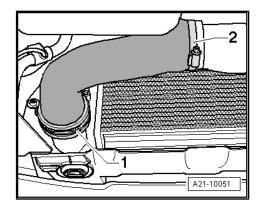
## Removing



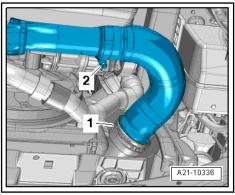
## Caution

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

- ♦ Observe notes on procedure for disconnecting the battery.
- Disconnect earth wire at battery with ignition switched off ⇒ Rep. Gr. 27.
- Drain coolant ⇒ page 163.
- 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 air cleaner housing ⇒ Rep. Gr. 23 . with respect to the correctness of information in this document. Copyright by AUDI AG.
- Remove radiator cowl ⇒ page 192.
- Remove flange shaft (right-side) ⇒ Rep. Gr. 39.
- Release hose clip -2-, lift retaining clip -1- and remove air hose.



Release hose clip -2-, lift retaining clip -1- and remove air hose.

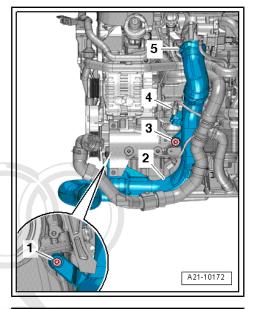


- Remove bolts -1- and -3-.
- Slacken hose clip -5- at intake manifold flap motor -V157-, detach air pipe -2- but do not remove.



## Note

Disregard -item 4-.



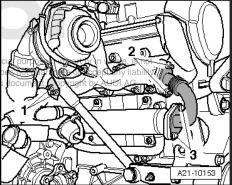
Remove nuts -2- and bolts -3-, and detach exhaust gas recirculation pipe.



## Note

Disregard -item 1-.

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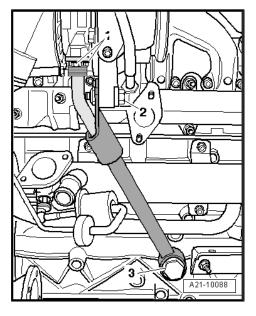


- Remove bolt -2- and banjo bolt -3-.
- Detach support for turbocharger from oil return line.



## Note

Disregard -item 1-.

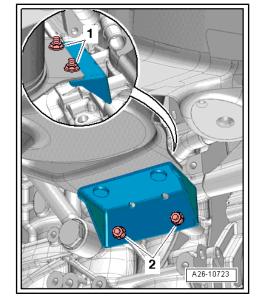


Remove nuts -2-.

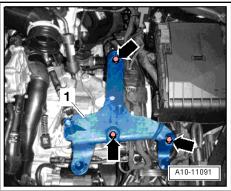


## Note

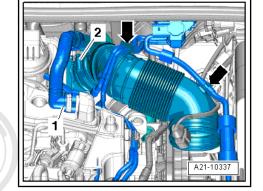
Disregard -item 1-.



Remove bolts -arrows- and detach bracket -1- for air cleaner housing.

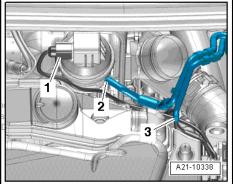


- Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
- Move clear vacuum hoses -arrows- at air pipe.
- Loosen hose clip -2- and detach air pipe.



- Unplug electrical connector -1- at position sender for charge pressure positioner -G581- .
- Detach vacuum hose -2- from vacuum unit of turbocharger.
- Disconnect vacuum hose -3-.
- Remove exhaust gas temperature sender 1 -G235-

⇒ page 223 Protected by copyright. Copying for private or commercial purposes, in part or in the part of the part permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accep with respect to the correctness of information in this document. Copyright by Al



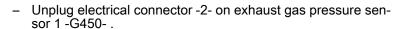
Slacken bolt -2- and remove clamp.



## Note

Disregard -items 1, 3-.

Move clear electrical wiring at turbocharger.







## Note

Disregard -arrows-.

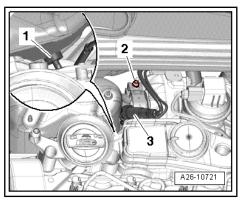
- Remove upper bolt -1- at bracket for particulate filter and tie particulate filter to rear.
- Unplug electrical connectors -1- at exhaust gas recirculation valve -N18- and -3- at intake manifold flap motor -V157- .
- Remove bolt -arrow- for dipstick guide tube.
- Remove bolts -2- for exhaust gas recirculation pipe.

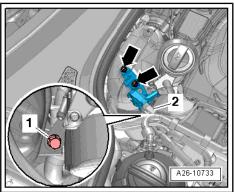


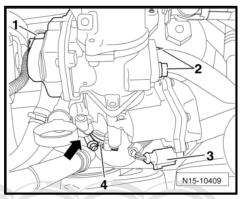
## Note

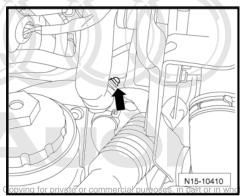
Disregard -item 4-.

Unclip wiring harness from retainer -arrow-.

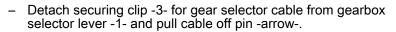






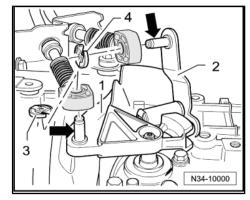


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## Metal selector relay lever:

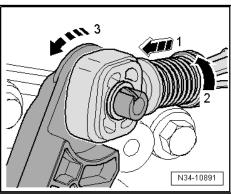
Detach securing clip -4- for gate selector cable from selector relay lever -2- and pull cable off pin -arrow-.



## Plastic selector relay lever:

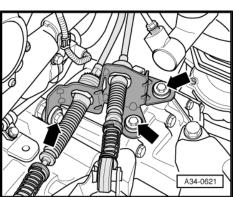
- To prevent damage to gate selector cable, cable end-piece must be detached from gate selector cable before removing.
- Pull locking device forwards onto stop -arrow 1- and lock by turning anti-clockwise -arrow 2-.
- Press selector relay lever towards front -arrow 3-.

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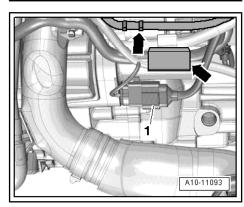


## All vehicles (continued):

Remove cable support bracket -arrows- from gearbox and place to one side (selector cables remain fitted).



Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



- Remove bolts -2, 5- and -arrows-.
- Using removal lever -80 200-, move clear electrical wiring and hoses at air pipe (left-side).
- Loosen hose clip -3- and detach air pipe (left-side).



## Note

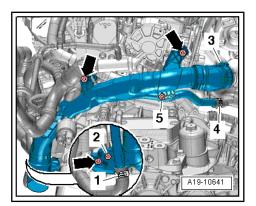
Disregard -items 1, 4-.

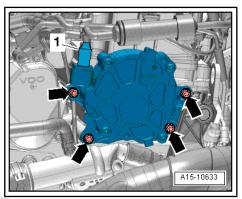
Disconnect vacuum hose -1- from vacuum pump.



## Note

Disregard -arrows-.



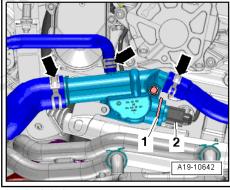


- Unplug electrical connector -2- at coolant temperature sender
- Slacken hose clips -arrows- and detach coolant hoses from connection.



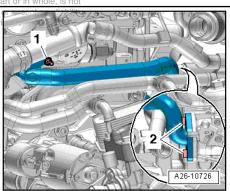
## Note

Disregard -item 1-.



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Remove nut -1- and bolts 424 detach exhaust gas recirculation arante with respect to the correctness of information in this document. Cop pipe.

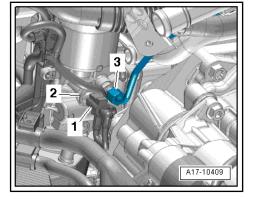


Disconnect oil supply line from connection on oil filter bracket. To do so, counterhold at hexagon flats with an open-end spanner and loosen union nut -3-.

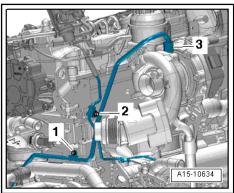


## Note

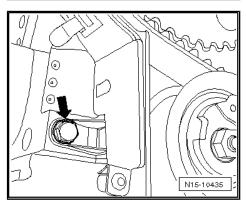
Disregard -items 1, 2-.



- Remove nut -2- at retaining clip for vacuum line.
- Remove bolt -1-.
- Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.



- Remove bolt -arrow- securing rear cover for toothed belt.
- Take toothed belt off camshaft sprocket ⇒ page 86.

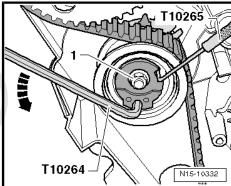


- Remove locking tool -T10265- .
- Remove nut -1-.



## Note

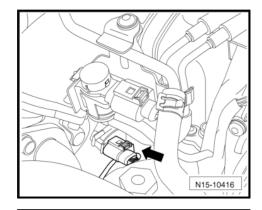
Disregard -arrow-.



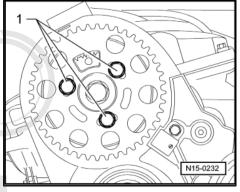


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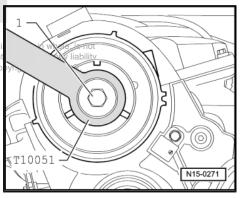
- Unplug electrical connector -arrow- at Hall sender -G40- .
- Remove cylinder head cover <u>⇒ page 98</u>.
- Unplug electrical connectors on glow plugs.



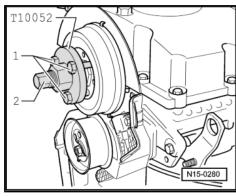
Remove bolts -1- and detach camshaft sprocket.



- Counterhold using counterhold tool -T10051- and loosen bolt -1- for camshaft hub.
- Unscrew bolt approx P 2 trim's copyright. Copying for private or commercial purposes, permitted unless authorised by AUDI AG. AUDI AG does not guarar with respect to the correctness of information in this document. Co



- Apply puller -T10052- to camshaft hub and and screw bolts -1- into hub.
- Counterhold on hexagon flats (30 mm) of puller and screw in bolt -2- to pull off camshaft hub.
- Detach hub from taper of camshaft.



Slacken cylinder head bolts in the sequence -1 ... 10-.



## Note

- A second mechanic is required for removal of the cylinder head.
- The toothed belt tensioning roller is detached from the stud when the cylinder head is lifted out.
- The oil return line from the turbocharger is pulled out of the support when the cylinder head is lifted out.
- Lift cylinder head at gearbox end first and guide out of toothed belt cover. Make sure toothed belt tensioning roller does not drop out.
- Take care to place cylinder head down without bending oil return line. If necessary, place a block of wood below exhaust manifold.



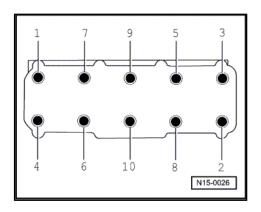
## Caution

Risk of damage to glow plugs when putting down cylinder head.

After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface.

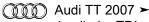
## Installing

Tightening torques ⇒ page 100





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## Caution

Avoid 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.

Avoid 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 sealant residue from the cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces.
- Carefully remove any remaining emery and abrasive material.
- Do not remove new cylinder head gasket from packaging until it is ready to be fitted.
- Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.

Avoid 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.

Avoid damage to valves and piston crowns after working on valve gear.

Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

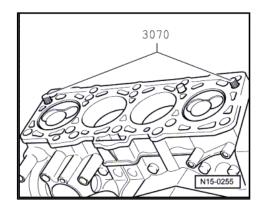


## Note

- Renew the bolts tightened with specified tightening angle.
- Renew self-locking nuts as well as seals, gaskets and O-rings.
- Cylinder heads must not be reworked on TDI engines.
- ♦ When installing an exchange cylinder head, the contact surfaces between roller rocker fingers and cams must be oiled.
- Hose connections and air pipes and hoses must be free of oil and grease before assembly.
- Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- ♦ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.

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- Before fitting cylinder head, remove crankshaft stop -T10050and turn crankshaft against normal direction of rotation until all pistons are positioned approximately equally below "TDC".
- To centralise, screw guide pins -3070/9- into outer holes on inlet side.



- Note cylinder head gasket identification:
- Part number
- 2 -Holes
- Ignore



## Note

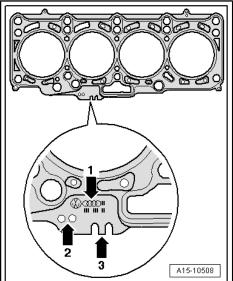
- If the cylinder head gasket or cylinder head have been replaced, select the new cylinder head gasket according to the number of holes on the old gasket.
- ♦ If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC" ⇒ page 81.
- Place cylinder head gasket in position.
- Note position of dowel sleeves in cylinder block.
- Installation position of cylinder head gasket: the word "oben" (top) or the part number should face towards the cyl-inder head.
- Fit cylinder head.



## Note

Position tensioning roller on stud when fitting cylinder head.

- Screw in 8 cylinder head bolts by hand until they make contact.
- Unscrew guide pins -3070/9- through bolt holes in cylinder head and screw in remaining cylinder head bolts by hand until they make contactotected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Tighten cylinder head bolts ⇒ page 102.



## Note

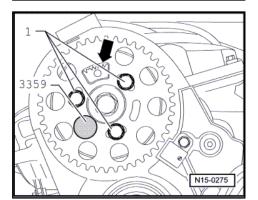
Cylinder head bolts do not have to be torqued down again.

- Install rear cover for toothed belt, camshaft hub and sprocket
   ⇒ page 84.
- Lock camshaft hub with diesel injection pump locking pin -3359- .



## Note

Disregard items marked -1- and -arrow-.



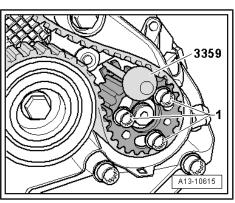
V15 - 0738

 Lock high-pressure pump hub with diesel injection pump locking pin -3359- .



## Note

Disregard -item 1-.



# Audi

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- Then turn the crankshaft in direction of engine rotation until the pin -arrow- on the crankshaft stop engages in the sealing flange as the crankshaft rotates.
- Install toothed belt (adjust valve timing) ⇒ page 91.

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

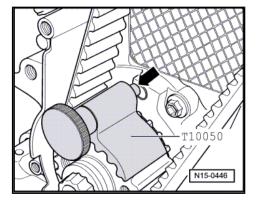
- Install cylinder head cover ⇒ page 98.
- Install oil supply line ⇒ Item 6 (page 151).
- Install exhaust gas recirculation pipes <u>⇒ page 227</u>.
- Install air pipe (left-side) ⇒ page 208.
- Install gear selector cable and gate selector cable ⇒ Rep. Gr.
- Install dipstick guide tube ⇒ page 138.
- Install particulate filter ⇒ page 218.
- Install exhaust gas temperature sender 1 -G235-<u>⇒ page 223</u> .
- Install support for turbocharger ⇒ page 198.
- Install air hose with plug-in connector ⇒ page 209.
- Install flange shaft (right-side) ⇒ Rep. Gr. 39.
- Install radiator cowl ⇒ page 192.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Observe notes on procedure for connecting the battery ⇒ Rep. Gr. 27.

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- Change engine oil ⇒ Maintenance ; Bookletes 10 othe correctness of information in this document. Copyright by AUDI AG.
- Fill cooling system with fresh coolant ⇒ page 166.

#### 2.5 Checking compression

To check compression, select function "Self-diagnosis compatible systems" in "Guided Fault Finding" ⇒ Vehicle diagnosis, testing and information system VAS 5051.



#### 3 Valve gear



## Caution

Avoid damage to valves and piston crowns after working on valve gear.

- The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.
- Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.



## Note

Cylinder heads with cracks between the valve seats may be used without reducing engine life, provided the cracks are small and not more than 0.5 mm wide.

#### Valve gear - exploded view 3.1

## 1 - Oil seal

□ Renewing ⇒ page 119

## 2 - Bolt

- □ Correct sequence when slackening ⇒ page 122
- □ Tightening torque and sequence <u>⇒ page 117</u>

### 3 - Nut

- ☐ Correct sequence when slackening ⇒ page 122
- ☐ Tightening torque and sequence <u>⇒ page 117</u>

## 4 - Retaining frame

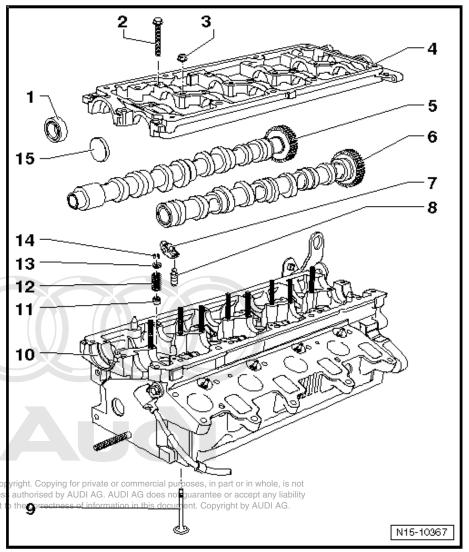
- With integrated camshaft bearings
- Removing and installing ⇒ "3.5 Removing and installing camshafts", page 121

## 5 - Exhaust camshaft

- Removing and installing ⇒ page 121
- Measuring axial clearance ⇒ page 117
- Measuring radial clearance ⇒ page 118

## 6 - Inlet camshaft

- □ Removing and installing <u>⇒ page 121</u>
- Measuring axial clearance ⇒ page 117
- Measuring radial clear-



ance ⇒ page 118

## 7 - Roller rocker finger

- ☐ Removing and installing ⇒ "3.5 Removing and installing camshafts", page 121
- ☐ Mark installation position for re-installation
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surfaces before installing

## 8 - Hydraulic valve compensation element

- With retaining clip
- ☐ Mark installation position for re-installation
- Lubricate contact surfaces before installing

## 9 - Valve

- ☐ Must not be machined; only grinding-in is permissible
- Mark installation position for re-installation
- ☐ Checking <u>⇒ page 135</u>
- □ Valve dimensions ⇒ page 134
- ☐ Checking valve guides ⇒ page 134

## 10 - Cylinder head

## 11 - Valve stem oil seal

□ Renewing: with cylinder head installed ⇒ page 127, with cylinder head removed ⇒ page 130

## 12 - Valve spring

## 13 - Valve spring plate

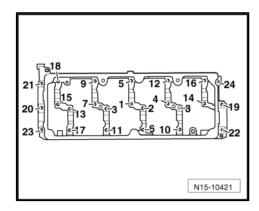
### 14 - Valve cotters

## 15 - Sealing cap

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

## Retaining frame - tightening torque and sequence

- Tighten retaining frame bolts and nuts in the sequence -1 ... 24- in 2 stages as follows:
- Screw in bolts and nuts evenly by hand until they make con-
- The retaining frame should make contact with the cylinder head over the full surface.
- 2. Tighten to 10 Nm.



#### 3.2 Measuring axial clearance of camshafts

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Universal dial gauge bracket -VW 387-

Dial gauge -VAS 6079-



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- Remove retaining frame ⇒ "3.5 Removing and installing camshafts", page 121
- Secure dial gauge -VAS 6079- with universal dial gauge bracket -VW 387- to cylinder head as shown in illustration.
- Press camshaft against dial gauge by hand.
- Set dial gauge to "0".
- Press camshaft away from dial gauge and read off value:

Axial clearance on inlet camshaft and exhaust camshaft

- Specification: 0.048 ... 0.118 mm.
- Wear limit: 0.17 mm.

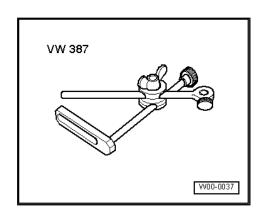
### 3.3 Measuring radial clearance of camshafts

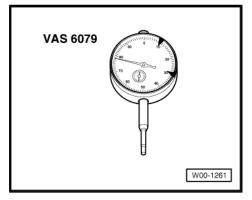
## Special tools and workshop equipment required

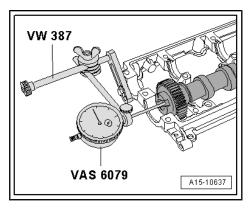
◆ Plastigage

## **Procedure**

- Remove roller rocker fingers ⇒ "3.5 Removing and installing camshafts", page 121.
- Clean bearing and bearing journal.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.
- The Plastigage must be positioned in the centre of the bearing.
- Fit retaining frame and tighten to 10 Nm without rotating camshafts <del>⇒ page 117</del>.







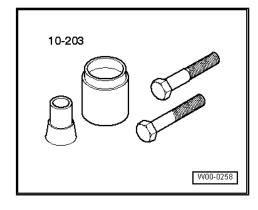
- Remove retaining frame again.
- Compare width of Plastigage with measurement scale.

Radial clearance: 0.035 ... 0.085 mm

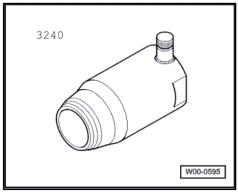
#### 3.4 Renewing camshaft oil seal

## Special tools and workshop equipment required

♦ Fitting tool -10 - 203-



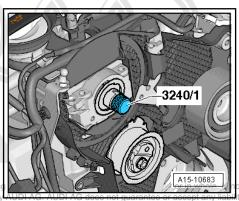
♦ Oil seal extractor -3240-



♦ M12x1.5x75

## **Procedure**

- Remove camshaft sprocket and hub ⇒ "3.5 Removing and installing camshafts", page 121
- Insert thrust piece -3240/1- in camshaft.



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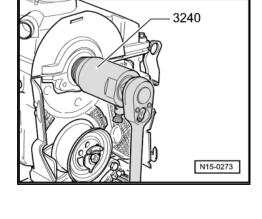
- Screw inner section of oil seal extractor -3240- two turns out of outer section (approx. 3 mm) and lock with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner section against camshaft until oil seal is pulled out.
- Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.
- Clean contact surface and sealing surface.

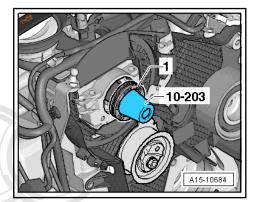


## Note

The sealing lip of the oil seal must not be additionally oiled or greased.

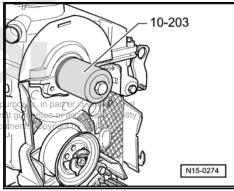
- Apply guide sleeve of fitting tool -10 203- to camshaft as shown in illustration.
- Carefully push oil seal -1- over guide sleeve and onto camshaft.





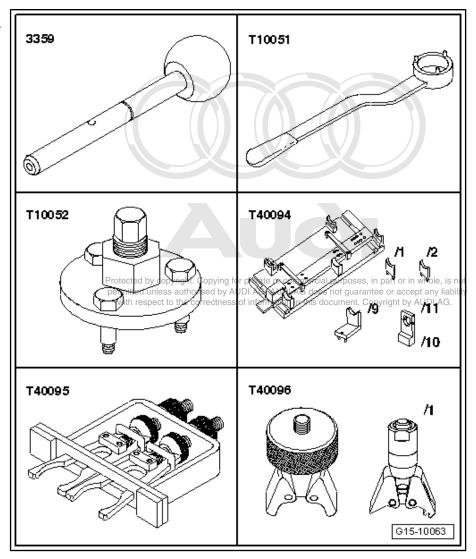
- Press in oil seal onto stop using thrust piece of fitting tool -10
   203- and bolt M12×1.5×75.
- Install camshaft sprocket and hub
   ⇒ "3.5 Removing and installing camshafts", page 121
- Install toothed belt (adjust valve timing) ⇒ page 91.

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#### Removing and installing camshafts 3.5

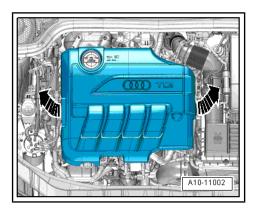
- Diesel injection pump locking pin -3359-
- Counterhold tool -T10051-
- Puller -T10052-
- Camshaft fitting tool -T40094-
- Camshaft fitting tool T40095-
- Clamping tool -T40096/1-



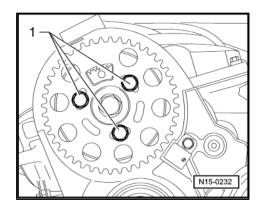
- ♦ Electric drill with plastic brush attachment
- Safety goggles
- ◆ Sealant ⇒ Electronic parts catalogue

## Removing

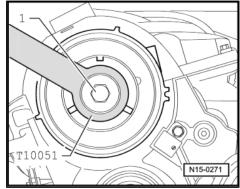
- Cylinder head installed.
- Remove engine cover panel -arrows-.
- Take toothed belt off camshaft sprocket and high-pressure pump sprocket ⇒ "1.2 Removing and installing toothed belt", page 86.
- Remove cylinder head cover <del>⇒ page 98</del>.



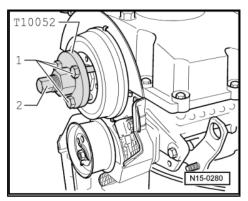
Remove bolts -1- and detach camshaft sprocket.



- Counterhold using counterhold tool -T10051- and loosen bolt -1- for camshaft hub.
- Unscrew bolt approx. 2 turns.



- Apply puller -T10052- to camshaft hub and and screw bolts -1- into hub.
- Counterhold on hexagon flats (30 mm) of puller and screw in bolt -2- to pull off camshaft hub.
- Detach hub from taper of camshaft.
- Remove exhauster pump ⇒ Rep. Gr. 47.



- Slacken retaining frame bolts and nuts in the sequence -24 ... 1-.
- Remove bolts and carefully release retaining frame from bonded joint.
- Mark fitting location of camshafts for re-installation and remove.

## Installing

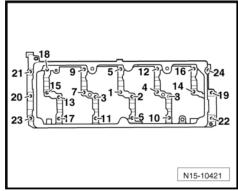
Tightening torques ⇒ page 116



## Caution

Make sure axial bearings in retaining frame are not damaged.

The camshafts MUST be installed using the camshaft fitting tool -T40094- as described in the following.



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## Caution

Protect lubrication system and bearings against contamination.

Cover exposed parts of the engine.



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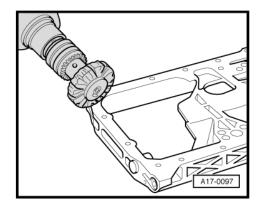
## WARNING

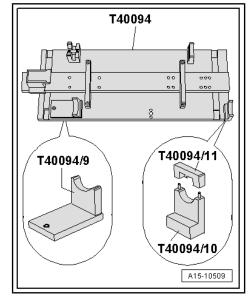
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- Wear safety goggles.
- Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.
- Oil running surfaces of both camshafts.

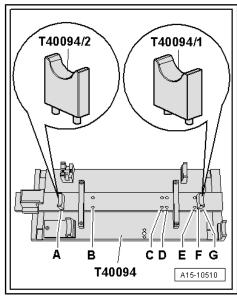
Set up camshaft fitting tool -T40094- as follows:

Secure supports -T40094/9- and -T40094/10- (with -T40094/11-) to base plate, as shown in illustration. If necessary, remove any supports already attached at these positions.

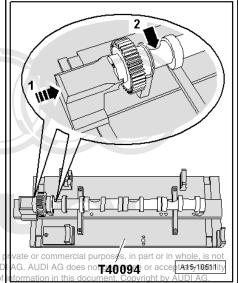




Fit support -T40094/1- onto position -F- and support -T40094/2- onto position -A-.

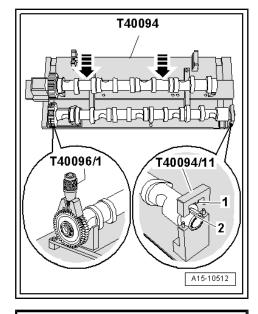


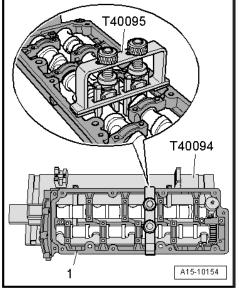
- Place inlet camshaft in supports -T40094/1- and -T40094/2- .
- Turn inlet camshaft in such a way that it can be locked in "TDC" position using locking device -arrow 1-.
- Recess -arrow 2- for cylinder head bolt must face outwards.



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- Place exhaust camshaft in supports -T40094/9- and -T40094/10- .
- Lock exhaust camshaft with top section -T40094/11-.
- The lug -1- on the top section must engage in the slot -2- in the camshaft,
- Place clamping tool -T40096/1- on teeth of exhaust camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).
- · The wider arm must engage in the wider half of the gear.
- Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.
- Slide inlet camshaft towards exhaust camshaft, until gear teeth engage -arrows-.
- Fit retaining frame -1- on camshafts.
- All camshaft bearings must be seated on the camshafts.
- Position camshaft fitting tool -T40095- and fix camshafts in position in retaining frame, as shown in illustration.
- Detach top section -T40094/11- .



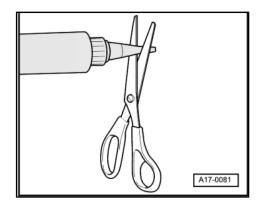




## Note

Note the use-by date of the sealant.

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





## Caution

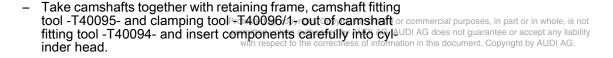
Make sure excess sealant does not contaminate camshaft bearings.

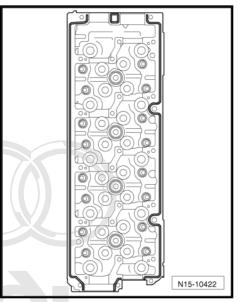
- ♦ The beads of sealant must not be thicker than specified.
- Apply beads of sealant onto clean sealing surfaces of cylinder head as shown in illustration.
- Thickness of sealant beads: 2 ... 3 mm.



## Note

- The retaining frame should be fitted and secured without delay, as the sealant starts hardening immediately.
- ♦ After installing the retaining frame, wait about 30 minutes for the sealant to dry.





- Screw in retaining frame bolts and nuts in the sequence
   -1 ... 24- evenly by hand until they make contact.
- The retaining frame should make contact with the cylinder head over the full surface.
- Tighten bolts and nuts ⇒ page 117.
- Remove camshaft fitting tool -T40095- and clamping tool -T40096/1-.

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

- Install camshaft oil seal ⇒ page 119.
- Drive new sealing cap ⇒ <u>Item 15 (page 117)</u> into cylinder head to a depth of approx. 1 ... 2 mm using suitable thrust piece.
- Install exhauster pump ⇒ Rep. Gr. 47.

Install cylinder head cover ⇒ page 98.

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## Caution

Avoid damage to valves and piston crowns after working on valve gear.

- ♦ The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.
- Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

## 3.6 Checking hydraulic tappets



## Note

- The hydraulic compensation elements cannot be serviced.
- Irregular valve noises when starting engine are normal.

## Special tools and workshop equipment required

♦ Feeler gauge 0.20 mm

## **Procedure**

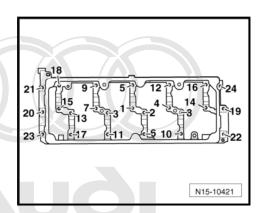
- Start engine and run until radiator fan has started up once.
- Increase engine speed to approx. 2500 rpm for 2 minutes (perform road test if necessary).



## Note

If irregular valve noise disappears but repeatedly re-occurs when travelling short distances, renew oil retention valve. The oil retention valve is located in the oil filter bracket ⇒ Item 3 (page 151).

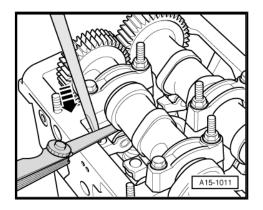
- If the compensation elements are still noisy, locate the defective compensation element as follows:
- Remove cylinder head cover ⇒ page 98.



- Rotate crankshaft by turning bolt for toothed belt sprocket until cam of supporting element to be tested is facing upwards.
- Press roller rocker finger down -arrow- to determine clearance between cam and roller rocker finger.
- If it is possible to insert a feeler gauge of 0.20 mm between cam and roller rocker finger, renew hydraulic compensation element
  - ⇒ "3.5 Removing and installing camshafts", page 121.

## Additional steps required

Install cylinder head cover ⇒ page 98.

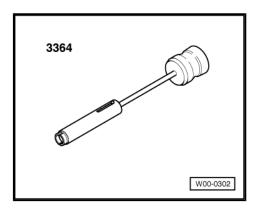


#### Renewing valve stem oil seals with cyl-3.7

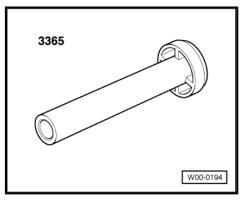
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## Special tools and workshop equipment required

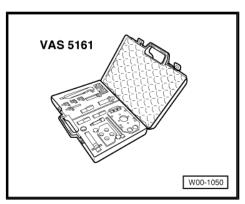
♦ Valve stem seal puller -3364-



♦ Valve stem seal fitting tool -3365-

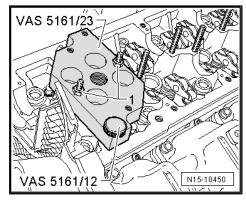


Removal and installation device for valve cotters -VAS 5161with knurled spacer ring -VAS 5161/23-1- and guide plate -VAS 5161/23-

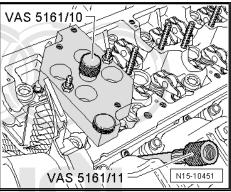


## **Procedure**

- Remove all glow plugs ⇒ Rep. Gr. 28.
- Remove camshafts ⇒ page 121 .
- Mark original positions of roller rocker fingers and hydraulic compensation elements for reinstallation.
- Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
- Set piston of appropriate cylinder to "bottom dead centre".
- Fit guide plate -VAS 5161/23- onto cylinder head.
- Secure guide plate on intake manifold side with knurled screw -VAS 5161/12- and at stud by screwing on 2 M6 nuts without shoulder by hand until they make contact.

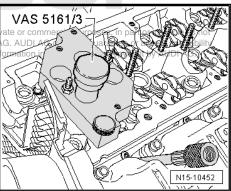


- Screw sealing pin -VAS 5161/10- into guide plate.
- Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.

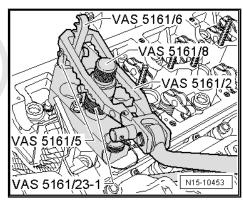


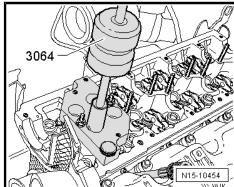
Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.

permitted unless authorised by AUDI with respect to the correctness of



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8-.
- Connect adapter to compressed air line using a commercially available connection piece, and apply constant air pressure.
- Air pressure: at least 6 bar
- 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 to in whole, is not are thus forced apart and taken up by the assembly cartridge accept any liability ct to the correctness of information in this document. Copyright by AUDI AG.
- Release pressure fork.
- Take off assembly cartridge with knurled spacer ring.
- Detach valve spring with valve spring plate.
- Pull off valve stem oil seal with valve stem seal puller -3364-.



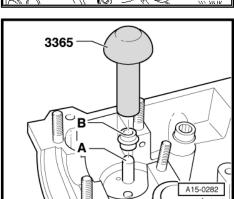




## Caution

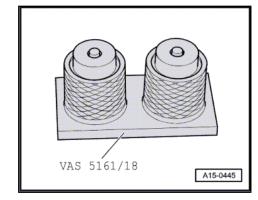
Make sure valve stem oil seals are not damaged when instal-

- ♦ New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.
- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool -3365- .
- Take off plastic sleeve.



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.
- Insert valve spring and valve spring plate.
- Press assembly cartridge onto insertion device from above and take up valve cotters.



- Insert assembly cartridge in guide plate -VAS 5161/23- again.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release the pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

## Assembling

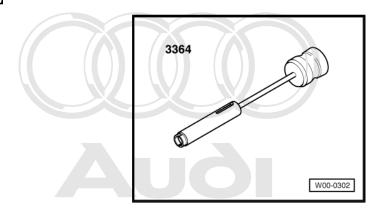
Installation is carried out in the reverse order; note the following:

- Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
- Install camshafts ⇒ page 121.
- Install glow plugs ⇒ Rep. Gr. 28.

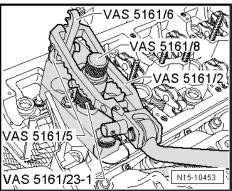
## 3.8 Renewing valve stem oil seals with cylinder head removed

## Special tools and workshop equipment required

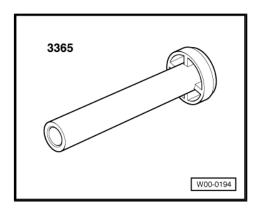
♦ Valve stem seal puller -3364-



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Valve stem seal fitting tool -3365-

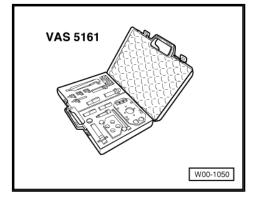


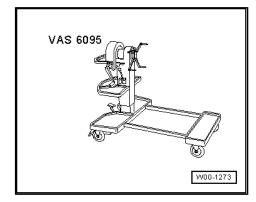
Removal and installation device for valve cotters -VAS 5161-with knurled spacer ring -VAS 5161/23-1- and guide plate -VAS 5161/23-



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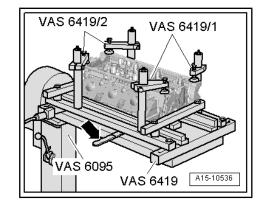


◆ Cylinder head tensioning device -VAS 6419-

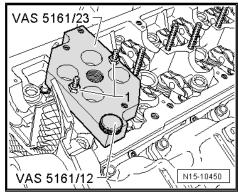
## **Procedure**

- Remove camshafts ⇒ page 121 .
- Mark original positions of roller rocker fingers and hydraulic compensation elements for reinstallation.
- Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
- Insert cylinder head tensioning device -VAS 6419- into engine and gearbox support -VAS 6095- .
- Secure cylinder head in cylinder head tensioning device, as shown in illustration.
- Connect cylinder head tensioning device to compressed air.

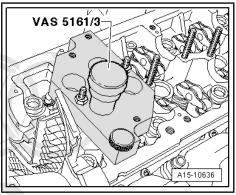
- Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.



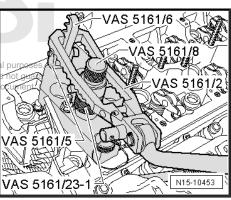
- Fit guide plate -VAS 5161/23- onto cylinder head.
- Secure guide plate on intake manifold side with knurled screw -VAS 5161/12- and at stud by screwing on 2 M6 nuts without shoulder by hand until they make contact.



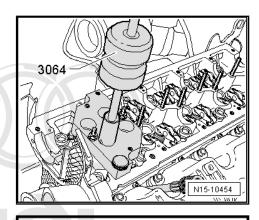
Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8-.. Protected by copyright. Copying for private or commercial permitted unless authorised by AUDI AG. AUDI AG do
- Attach pressure fork -VAS 5161/24 to snap4in device and push in this 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 off assembly cartridge with knurled spacer ring.
- Detach valve spring with valve spring plate.



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



3365

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## Caution

Make sure valve stem oil seals are not damaged when instal-

- ♦ New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.
- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool -3365- .
- Take off plastic sleeve.

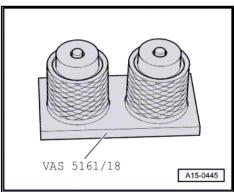
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18-.

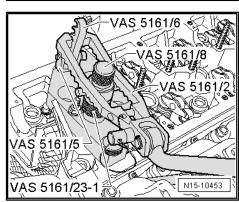
- Larger diameter of valve cotters faces upwards.
- Insert valve spring and valve spring plate.
- Press assembly cartridge onto insertion device from above and take up valve cotters.
  - VAS 5161/18
- Insert assembly cartridge in guide plate -VAS 5161/23- again.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release the 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:

- Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
- Install camshafts ⇒ page 121.





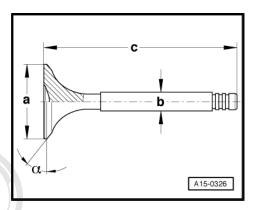
## 3.9 Valve dimensions



## Note

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

Dimension		Inlet valve	Exhaust valve
Ø a	mm	28.10	26.00
Ø b	mm	5.975	5.965
С	mm	99.30	99.10
α	∠°	45	45



## 3.10 Machining valve seats



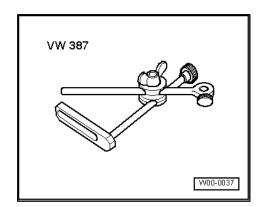
## Note

Valve seats may not be machined due to the very small tolerances.

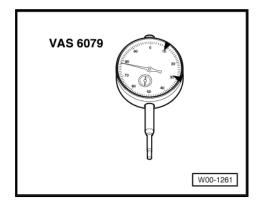
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## Special tools and workshop equipment required

♦ Universal dial gauge bracket -VW 387-



♦ Dial gauge -VAS 6079-

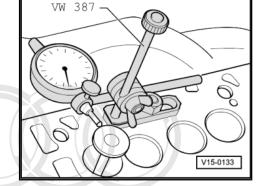


## **Procedure**



## 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 guide and exhaust valve into exhaust guide, as the stem diameters are different.
- Attach dial gauge -VAS 6079- with dial gauge bracket -VW 387- to cylinder head.
- Insert valve into guide.
- End of valve stem must be flush with guide.
- Measure the amount of sideways play.
- Wear limit: 1.0 mm.
- If the wear limit is exceeded, repeat the measurement with new valves.
- Renew cylinder head if wear limit is still exceeded.





## Note

Valve guides cannot be renewed.

#### 3.12 Checking valves

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- Visually inspect for scoring on valve stems and valve sears or AUDI AG. AUDI AG does not guarantee or accept any liability faces.

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- Renew valve if scoring is clearly visible.



## 17 - Lubrication

## Oil pump, sump, balance shaft assembly



## 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 galleries carefully and renew the oil spray jets, engine oil cooler and oil filter.
- Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.
- Oil spray jet and pressure relief valve ⇒ page 80

#### 1.1 Oil pump, sump, balance shaft assembly - exploded view

## 1 - Sump

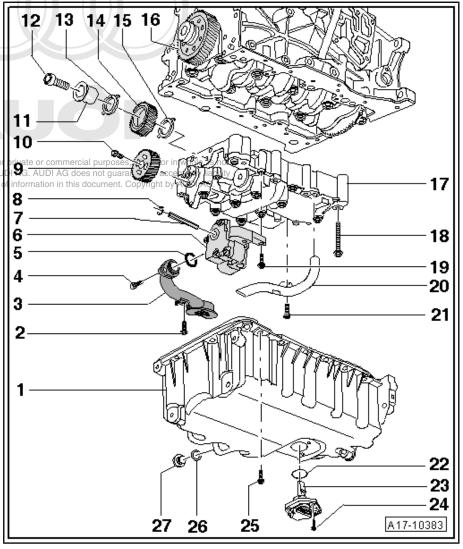
- Removing and installing ⇒ page 139
- 2 Bolt
  - □ 20 Nm
- 3 Suction pipe
  - Clean strainer if dirty
- 4 Bolt
  - 9 Netected by copyright. Copying fo itted unless authorised by Al
- **5 O-ring** with respect to the correctness
  - Renew
- 6 Oil pump
  - Removing and installing ⇒ page 144
  - Before installing, check that the two dowel sleeves for centring oil pump are fitted onto balance shaft assembly

## 7 - Oil pump drive shaft

- 8 Circlip
  - Must fit securely in groove
  - ☐ Renew circlip if damaged or stretched

## 9 - Spur gear for balance shaft

- 10 Bolt
  - □ Renew
  - □ 20 Nm + 90°
- 11 Hub
  - For idler gear

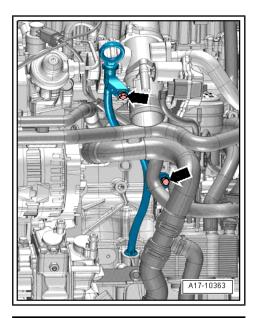


	Renew			
12 - 1	Bolt			
	Renew			
	90 Nm + 90°			
13 -	Thrust washer			
	For idler gear			
	Renew			
14 -	dler gear			
_	Renew			
	To achieve the correct backlash a coating is already applied to the new idler gear. The coating is worn down rapidly and the backlash is then correct			
	On idler gears with coating applied to teeth on parts of circumference only, a white dot indicates correct installation position			
	If there is no white dot, the complete circumference of the idler gear is coated			
	Installation position: Part No. must be visible.			
	Make sure thrust washer is properly seated <u>⇒ page 138</u>			
_	Thrust washer			
	For idler gear Renew			
	Installation position ⇒ page 138			
_	· · · · · · · · ·			
	When installing idler gear, apply grease to hold washer on balance shaft assembly Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not Crankshaft gear  Crankshaft gear			
	with respect to the correctness of information in this document. Copyright by AUDI AG.  Balance shaft assembly			
	Removing ⇒ page 144			
	Installing new balance shaft assembly ⇒ page 146			
	Before installing, check that the two dowel sleeves for centring balance shaft assembly are fitted on cylinder block			
18 - 1				
<u> </u>	Renew			
	Tightening torque and sequence <u>⇒ page 139</u>			
19 -				
	9 Nm			
20 - (	Oil intake pipe			
21 -				
	9 Nm			
22 - 3				
	Renew			
	Oil level and oil temperature sender -G266-			
	Removing and installing <u>⇒ page 139</u>			
24 -				
_	Self-locking			
25	9 Nm			
25 -				
200	Tightening torque and sequence <u>⇒ page 138</u>			
26 - 3				
	Renew			

## 27 - Oil drain plug □ 30 Nm

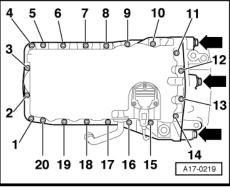
## Guide tube for oil dipstick - tightening torque

Tighten bolts -arrows- to 9 Nm.



## Sump - tightening torque and sequence

- Renew bolts for sump.
- Tighten bolts in 3 stages and in diagonal sequence as follows:
- Pre-tighten bolts -1 ... 20- in diagonal sequence to 5 Nm. 1.
- 2. Tighten bolts -arrows- securing sump to gearbox to 40 Nm.
- 3. Tighten bolts -1 ... 20- in diagonal sequence and in stages to 15 Nm.



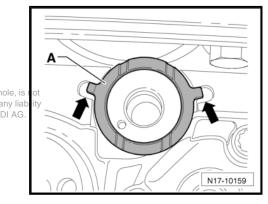
## Installation position of thrust washer



## Caution

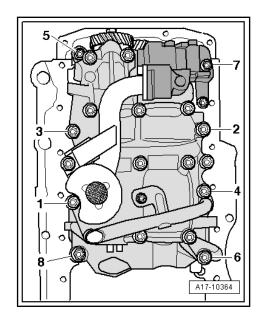
Thrust washer can slip out of position behind idler gear.

Make sure that thrust washer A-does not slip out of the precesses in the balance shaft assembly arrows when fit-A ting the idler gear. If this is neglected, the thrust washer can become trapped. If necessary, apply grease to hold washer on balance shaft assembly.



# Balance shaft assembly - tightening torque and sequence

- Renew bolts securing balance shaft assembly.
- Tighten bolts -1 ... 8- in 5 stages as follows:
- 1. Screw in bolts -1 ... 8- by hand until they make contact.
- 2. Pre-tighten bolts in the sequence -1 ... 8- to 6 Nm.
- 3. Tighten bolts -5- and -7- to 13 Nm.
- Tighten bolts -1, 2, 3, 4, 6, 8- to 20 Nm. 4.
- Turn bolts -1 ... 8- 90° further. 5.



## 1.2 Removing and installing oil level and oil temperature sender -G266-

## Removing

- Drain off engine oil ⇒ Maintenance; Booklet 810.
- Unplug electrical connector -3-.
- Remove bolts -1- and detach oil level and oil temperature sender -G266- -item 4-.

## Installing

Tightening torque ⇒ page 136.

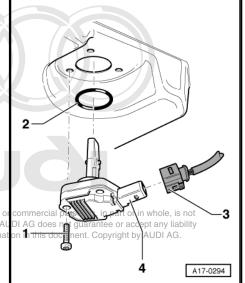
Installation is carried out in the reverse order; note the following:



## Note

Renew seal -2- and self-locking bolts -1-permitted unless authorised by AUDI AG. All with respect to the correctness of informat

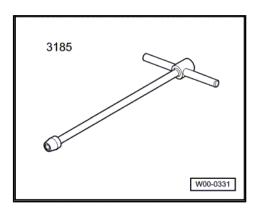
Fill with engine oil and check oil level ⇒ Maintenance; Booklet



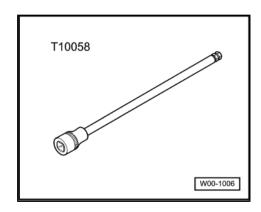
#### 1.3 Removing and installing sump

## Special tools and workshop equipment required

♦ U/J extension and socket, 10 mm -3185-



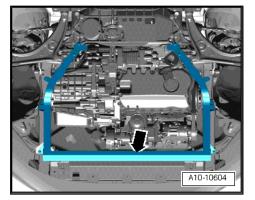
Allen key, long reach -T10058-



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

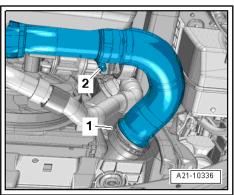
# Removing

- Drain off engine oil ⇒ Maintenance; Booklet 810.
- Only on TT Roadster: Remove noise insulation frame -arrow- ⇒ Rep. Gr. 50 .

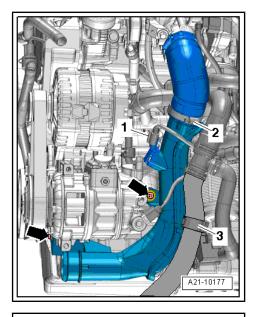


- Release hose clip -2-, lift retaining clip -1- and remove air hose.

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- Remove bolts -arrows-.
- Move coolant hose -3- clear.
- Loosen hose clip -2-.
- Unplug electrical connector -1- at charge pressure sender -G31- and detach air pipe.

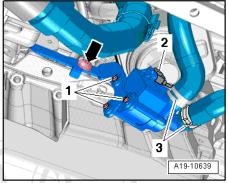


Remove bolt -arrow- and push pump for exhaust gas recirculation cooler -V400- to the side.



# Note

Disregard -items 1, 2, 3-.



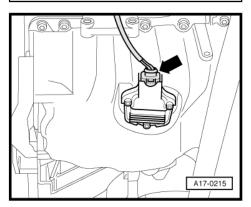
- Remove bolt -arrow- at air pipe (left-side).



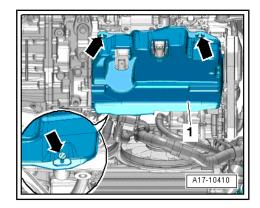
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 Unplug electrical connector -arrow- at oil level and oil temperature sender -G266- .



Release fasteners -arrows- and remove noise insulation -1for sump.



- Remove bolts securing sump to gearbox -arrows-.
- Slacken bolts -1 ... 20- in diagonal sequence and remove.
- Carefully release sump from bonded joint.

# Installing

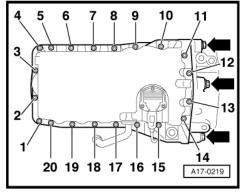
Tightening torque <u>⇒ page 138</u> .



## Caution

Protect lubrication system and bearings against contamination.

◆ Cover exposed parts of the engine.

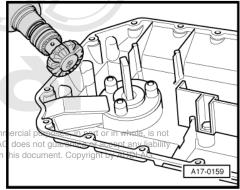




# **WARNING**

Protect eyes against injuries.

- ♦ Wear 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.



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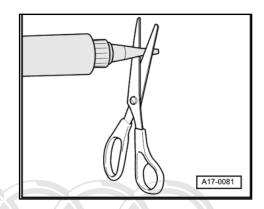




# Note

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 bead of sealant must not be thicker than specified.
- Apply bead of sealant onto clean sealing surface of sump as illustrated.
- Thickness of sealant bead: 2 ... 3 mm



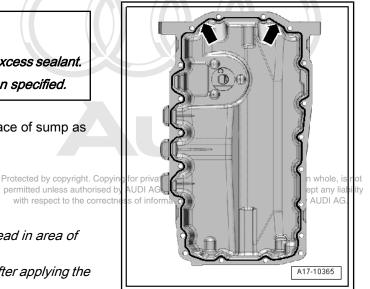
## Note

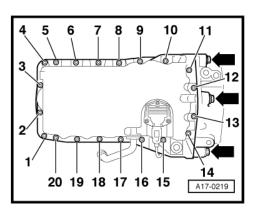
- Take particular care when applying sealant bead in area of rear sealing flange -arrows-.
- The sump must be installed within 5 minutes after applying the sealant.
- Fit sump and tighten bolts ⇒ page 138.
- The sump must make flush contact with intermediate plate/ gearbox flange.

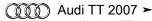


## Note

- When installing sump with engine removed from vehicle, ensure that sump is positioned flush with cylinder block at gearbox end.
- After fitting sump assembly, the sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.
- Install pump for exhaust gas recirculation cooler -V400-⇒ page 175
- Install air pipe (left-side) ⇒ page 208.
- Install air hose with plug-in connector ⇒ page 209.
- Install noise insulation frame ⇒ Rep. Gr. 50.
- Install noise insulation ⇒ Rep. Gr. 66.
- Fill with engine oil and check oil level ⇒ Maintenance; Booklet 810.







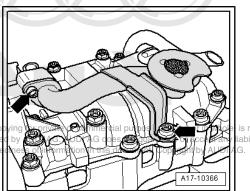
# 1.4 Removing and installing oil pump

## Special tools and workshop equipment required

- ♦ Circlip pliers, commercially available
- ♦ Bolt M3

# Removing

- Remove sump ⇒ page 139 .
- Remove bolts -arrows- and detach suction pipe from oil pump.



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- Remove circlip -1- using circlip pliers.
- Screw in an M3 bolt -2- and pull drive shaft out of oil pump -arrow-.
- Remove bolts -3, 4, 5- and detach oil pump.



## Caution

The bolt on the idler gear must NOT be loosened.

## Installing

Tightening torque ⇒ page 136.

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

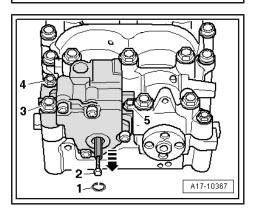


# Note

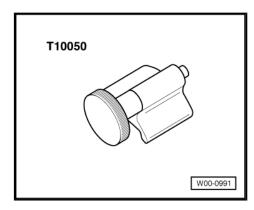
- ♦ Fit new O-ring.
- ♦ Renew circlip if damaged or stretched.
- ♦ Circlip must fit securely in groove.
- If no dowel sleeves for centring the oil pump are fitted in the balance shaft assembly, install missing dowel sleeves.
- Install sump ⇒ page 139 .
- Fill with engine oil and check oil level ⇒ Maintenance; Booklet 810.

# 1.5 Removing balance shaft assembly

Special tools and workshop equipment required



Crankshaft stop -T10050-



## **Procedure**

Remove vibration damper ⇒ page 49.



## Caution

Irreparable damage can be caused if the toothed belt slips.

- Turn crankshaft only in direction of engine rotation.
- Rotate crankshaft by turning bolt for toothed belt sprocket until crankshaft is positioned at "TDC".
- Lock crankshaft in position with crankshaft stop -T10050-.
- The markings on the sprocket -2- and the crankshaft stop -1must align -arrow-. The pin of the crankshaft stop must engage in the aperture in the sealing flange.



# Note

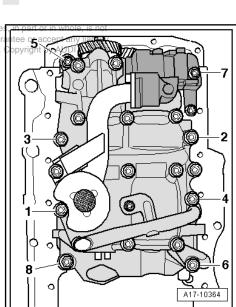
The crankshaft stop can only be pushed onto the sprocket from the front face of the teeth.

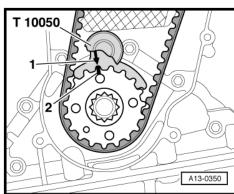
- Remove sump  $\Rightarrow$  page 139.
- Loosen bolts in the sequence 2 permitted unless authorised by AUDI AG. AUDI AG does not gua
- Remove bolts and detach balance shaft assembly with oils document pump.



## Note

- Installing a new balance shaft assembly <del>⇒ page 146</del>.
- Re-installing a used balance shaft assembly ⇒ page 149.

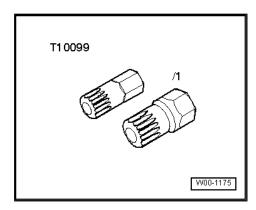




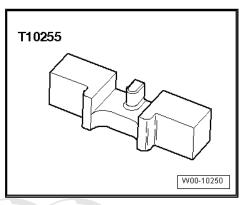
# 1.6 Installing a new balance shaft assembly

## Special tools and workshop equipment required

♦ Bits -T10099-



♦ Locking tool -T10255-



◆ Special tool -T10393-

## **Procedure**

- Tightening torques <u>⇒ page 136</u>
- Crankshaft locked in position with crankshaft stop -T10050-.



# Note

- The spur gear drive of the balance shaft assembly must be installed with a backlash of 0.038 ... 0.072 mm.
- ♦ To achieve the correct backlash, a suitably thick coating is already applied to the new idler gear mitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability
- The coating is worn down rapidly and the backlash is then
   correct.

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  correct.
- On idler gears with coating applied to teeth on parts of circumference only, a white dot indicates correct installation position.
- If there is no white dot, the complete circumference of the idler gear is coated.
- A new balance shaft assembly must always be installed in conjunction with a new idler gear which has the correct coating.
- Renew bolts securing balance shaft assembly.

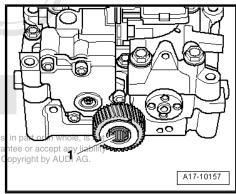


## Caution

Thrust washer can slip out of position behind idler gear.

- Before positioning balance shaft assembly, slacken off bolt for idler gear as specified below, but not further. Installation position of thrust washer ⇒ page 138
- Slacken bolt -1- for idler gear by approx. 45°.
- If not already fitted, fit dowel sleeves into cylinder block for centring balance shaft assembly.

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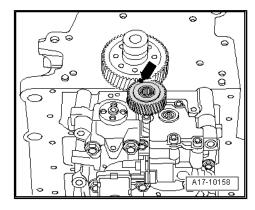
- Install balance shaft assembly on cylinder block. If the idler gear is only partially coated it must be installed in the correct position:
- White dot -arrow- on idler gear must be aligned centrally with crankshaft.
- Idler gears not marked with a white dot can be installed in any position.
- Take care not to damage the coating of the idler gear.

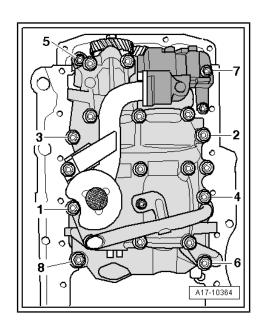


## Note

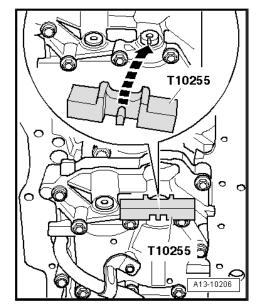
Due to the gear ratio, the white dot -arrow- will not return to its original position after the crankshaft has been rotated.

Tighten bolts securing balance shaft assembly ⇒ page 139.





- Lock balance shaft with locking tool -T10255-, turning balance shaft as required.
- The lug of the locking tool must engage in the groove of the balance shaft -arrow-.



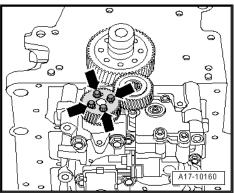
- Carefully fit balance shaft gear onto balance shaft; to do so, push idler gear slightly to one side.
- Take care not to damage the coating of the idler gear.
- The threaded holes in the balance shaft should be aligned as centrally as possible with the elongated holes in the balance shaft gear.



# Note

If it is not possible to align the elongated holes in the balance shaft gear with the threaded holes, you must turn the gear some teeth further as required and then fit it again.

- Tighten bolts -arrows- for balance shaft gear.
- Remove locking tool -T10255-.





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## Note

The following three steps have to be performed simultaneously (a second mechanic is therefore required):

- Push idler gear -3- firmly in direction of -arrow- into teeth on drive gear -2- and balance shaft gear -1-. If necessary use a suitable wooden tool.
- At the same time, turn balance shaft gear slightly anti-clockwise.
- Tighten bolt securing idler gear.
- Remove crankshaft stop -T10050-.



## Note

After installation the idler gear must have no backlash. This can be checked by exerting light pressure by hand.

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

- Install sump ⇒ page 139.
- Top up engine oil and check oil level ⇒ Maintenance ; Booklet 810.
- Install vibration damper ⇒ page 49.

## 1.7 Re-installing a used balance shaft assembly

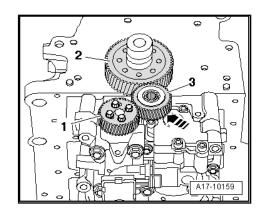
## **Procedure**



## Note

- If re-installing the "old" balance shaft assembly and neither the drive gear on the crankshaft nor the crankshaft itself have been renewed, proceed as described in the following. It is also essential that the idler gear has NOT been slackened.
- If the bolt for the idler gear has been slackened or the drive gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation <u>"1.6 Installing a new balance shaft assembly", page 146 .</u>
- Renew bolts securing balance shaft assembly.

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- Lock balance shaft with locking tool -T10255-, turning balance shaft as required.
- The lug of the locking tool must engage in the groove of the balance shaft -arrow-.
- If not already fitted, fit dowel sleeves into cylinder block for centring balance shaft assembly.
- Attach balance shaft assembly to cylinder block.
- With the balance shaft locked in position, the idler gear must engage in the drive gear on the crankshaft.
- · Idler gear must have noticeable backlash.

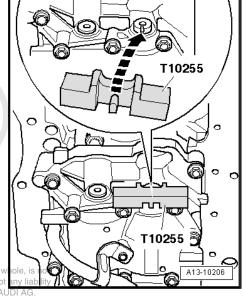


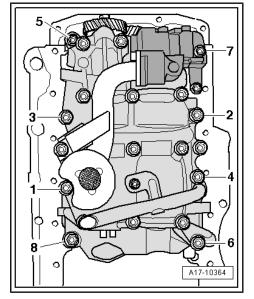
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- Tighten bolts securing balance shaft assembly ⇒ page 139.
- Remove crankshaft stop -T10050- .

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

- Install sump ⇒ page 139 .
- Top up engine oil and check oil level ⇒ Maintenance ; Booklet 810
- Install vibration damper ⇒ page 49.





#### 2 Oil filter bracket and engine oil cooler

#### 2.1 Oil filter bracket and engine oil cooler - exploded view

## 1 - Gasket

□ Renew

## 2 - Bolt

- □ Renew
- □ Tightening torque and sequence <u>⇒ page 152</u>

# 3 - Oil filter bracket

- ☐ With oil retention valve
- □ Removing and installing ⇒ "2.2 Removing and installing oil filter bracket with engine oil cooler", page 153

## 4 - Seal

□ Renew

## 5 - Connection

□ 33 Nm

## 6 - Oil supply pipe

- To turbocharger
- ☐ Installation sequence:
- Screw in union nuts by hand until they make contact.
- Tighten union nuts to 22 Nm.
- Secure bracket.

# 7 - Oil pressure switch -F1-

- With seal
- Renew seal
- □ Opening/closing pressure 0.7 bar
- Brown insulation
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  "päge" 156 authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- □ Checking ⇒ page 157
- □ 20 Nm

## 8 - Sealing cap

□ 25 Nm

## 9 - O-ring

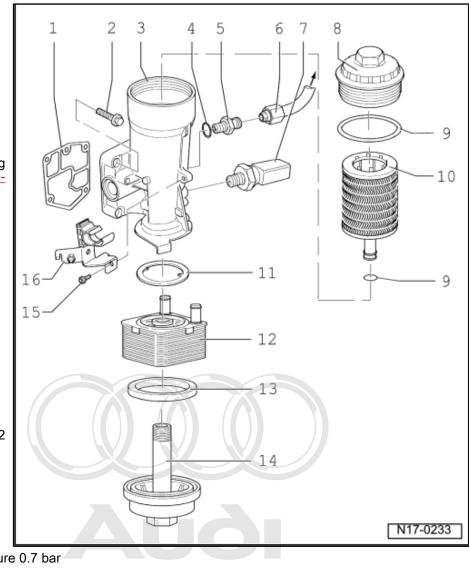
□ Renew

## 10 - Oil filter element

☐ Removing and installing ⇒ Maintenance; Booklet 810

## 11 - Seal

- □ Renew
- ☐ Installation position ⇒ page 152



# 12 - Engine oil cooler

- ☐ See note <u>⇒ page 136</u>
- ☐ Diagram of coolant hose connections ⇒ page 161
- □ Removing and installing ⇒ "2.2 Removing and installing oil filter bracket with engine oil cooler", page 153

## 13 - Seal

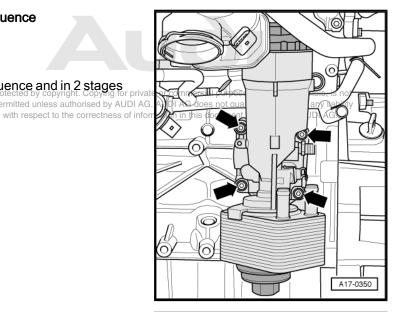
☐ Renew

## 14 - Screw plug

□ 25 Nm

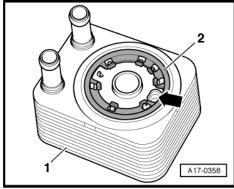
# Oil filter bracket - tightening torque and sequence

- Renew bolts for oil filter bracket.
- Fit bolts at top left and bottom right first.
- Tighten all bolts -arrows- in diagonal sequence and in 2 stages as follows: permitted unless authorised by AUDI AG
- 1. Tighten to 15 Nm.
- 2. Turn 90° further.



# Installation position of seal for engine oil cooler

- Fit seal -2- so it can be attached to all tabs on engine oil cooler
- The oil drilling -arrow- must not be covered by the seal.

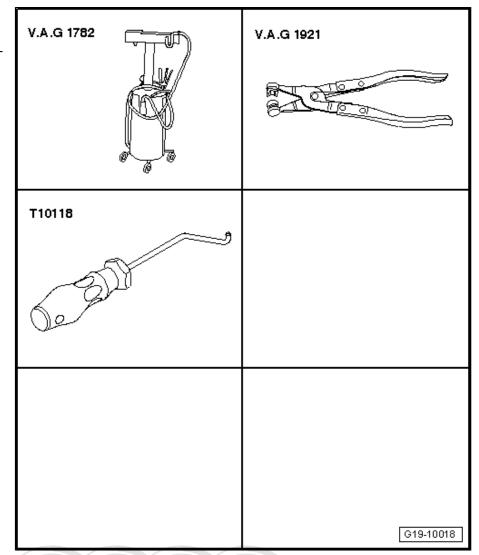




#### 2.2 Removing and installing oil filter bracket with engine oil cooler

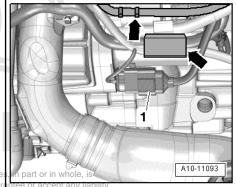
## Special tools and workshop equipment required

- ♦ Used oil collection and extraction unit -V.A.G 1782-
- Hose clip pliers V.A.G 1921-
- ♦ Assembly tool -T10118-



## Removing

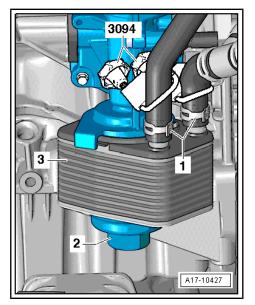
- Remove radiator cowl ⇒ page 192.
- Move wiring harnesses -arrows- and electrical connector -1clear at bracket and at air pipe.



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- Clamp off coolant hoses with hose clamps up to 25 mm -3094as shown in illustration.
- Disconnect coolant hoses -1-.



Unscrew bolt -1- and detach bracket for wiring harness.

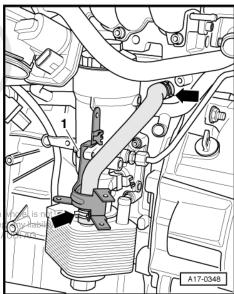


Note

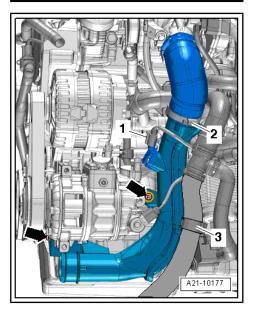
Disregard -arrows-.



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- Remove bolts -arrows-.
- Move coolant hose -3- clear.
- Loosen hose clip -2-.
- Unplug electrical connector -1- at charge pressure sender G31- and detach air pipe (front).



- Remove bolt -arrow-.
- Press pump for exhaust gas recirculation cooler -V400- to



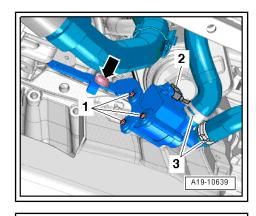
Note

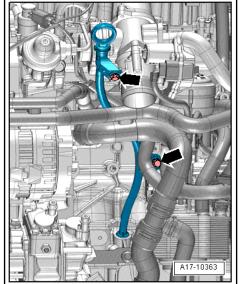
Disregard -items 1, 2, 3-.



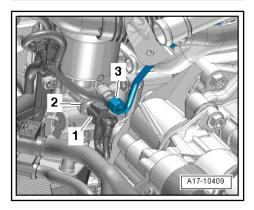
- Pull oil dipstick out slightly and remove bolts -arrows-.

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- Unplug electrical connector -1- at oil pressure switch -F1- using assembly tool -T10118- .
- Remove oil pressure switch -F1- -item 2-.
- Disconnect oil supply line from connection on oil filter bracket. To do so, counterhold at hexagon flats with an open-end spanner and loosen union nut -3-.



- Place used oil collection and extraction unit -V.A.G 1782- below engine.
- Unscrew bolts -arrows- and remove oil filter bracket.

## Installing

Tightening torques ⇒ page 151

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



## Note

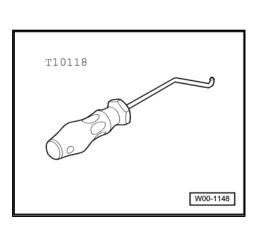
- ♦ Renew gaskets, seals and O-rings.
- Hose connections and air pipes and hoses must be free of oil and grease before assembly.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- Install oil filter bracket ⇒ page 152
- Install dipstick guide tube ⇒ page 138.
- Install pump for exhaust gas recirculation cooler -V400 ⇒ page 175
- Install air pipe (front) ⇒ page 208.
- Install air hose with plug-in connector ⇒ page 209.
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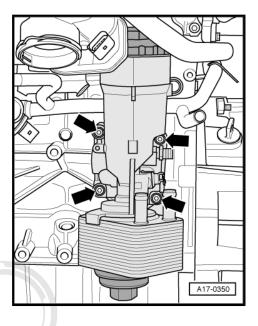
   Install radiator cowl pagent 92 authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- Top up engine oil and check oil level ⇒ Maintenance ; Booklet 810
- Check coolant level ⇒ page 169.

# 2.3 Removing and installing oil pressure switch -F1-

# Special tools and workshop equipment required

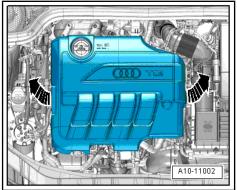
♦ Assembly tool -T10118-





# Removing

- Remove engine cover panel -arrows-.
- Remove air cleaner housing ⇒ Rep. Gr. 23.



- Unplug electrical connector -1- at oil pressure switch -F1- using assembly tool -T10118- .
- Remove oil pressure switch -F1- -item 2-.



Note

Disregard -item 3-.

# Installing

Tightening torque ⇒ page 151.

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Note

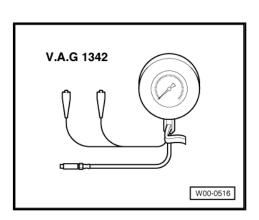
Renew seal.

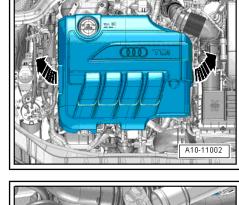
- Install air cleaner housing ⇒ Rep. Gr. 23 .

#### Checking oil pressure switch -F1-2.4

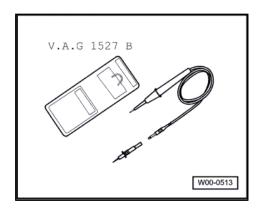
# Special tools and workshop equipment required

♦ Oil pressure tester -V.A.G 1342-





♦ Voltage tester -V.A.G 1527B-

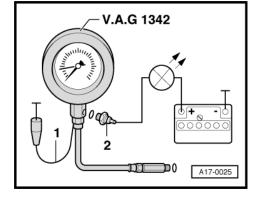


Auxiliary measuring set -V.A.G 1594C-



## **Procedure**

- Oil level OK
- Engine oil temperature approx. 80 °C.
- Remove oil pressure switch -F1- ⇒ page 156.
- Connect oil pressure tester -V.A.G 1342- to bore for oil pressure switch.
- Screw oil pressure switch -F1- -item 2- into threaded hole in oil pressure tester.
- Connect brown wire -1- of oil pressure tester to earth (–).
- LED should not light up.





# Note

Renew oil pressure switch -F1- if LED lights up at this stage.



## Note

Observe oil pressure tester and LED while starting engine, as switching point of oil pressure switch may already be exceeded when starting.

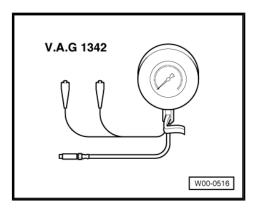
- LED should light up at 0.55 ... 0.85 bar.
- Renew oil pressure switch -F1- if LED does not light up.
- Install oil pressure switch -F1- ⇒ page 156.



#### 2.5 Checking oil pressure

## Special tools and workshop equipment required

♦ Oil pressure tester -V.A.G 1342-



## **Procedure**

- Oil level OK
- Engine oil temperature approx. 80 °C.
- Remove oil pressure switch -F1- ⇒ page 156.
- Connect oil pressure tester -V.A.G 1342- to threaded hole for oil pressure switch -F1-.
- Screw a used oil pressure switch into threaded hole on oil pressure tester -V.A.G 1342- to seal hole.
- Start engine.
- Oil pressure at idling speed: at least 0.8 bar.
- Oil pressure at 2000 rpm: at least 2.0 bar.
- Install oil pressure switch -F1- ⇒ page 156.

#### 2.6 Engine oil

Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.

#### 2.7 Checking oil level

⇒ Maintenance; Booklet 810

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# 19 - Cooling

# 1 Cooling system



## **WARNING**

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

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



# Note

- ◆ Secure all hose connections with the correct type of hose clips do by AUDI AG. AUDI AG does not guarantee or accept any liability (same as original equipment) ⇒ Electronic parts catalogue or rectness of information in this document. Copyright by AUDI AG.
- The arrow markings on coolant pipes and on ends of hoses must align.

#### 1.1 Diagram of coolant hose connections

Connection diagram for coolant hoses without 4/2-way valve:

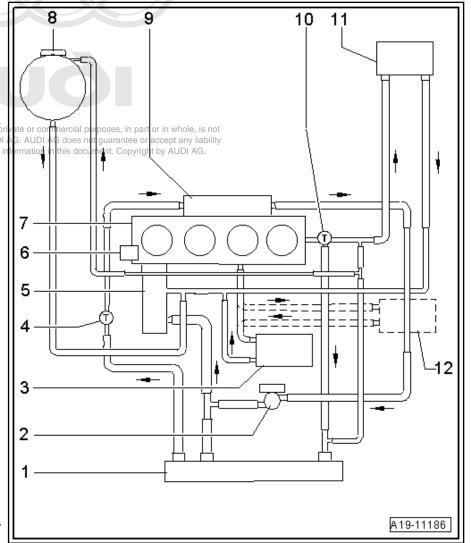
## 1 - Radiator

- ☐ If renewed, refill system with fresh coolant
- 2 Pump for exhaust gas recirculation cooler -V400-
- 3 Engine oil cooler
- 4 Radiator outlet coolant temperature sender 583 Tised by AUD
  - Removing and installing ⇒ page 178
- 5 Thermostat
- 6 Coolant pump
- 7 Cylinder head and cylinder block
  - ☐ If renewed, refill system with fresh coolant
- 8 Coolant expansion tank
  - □ With filler cap
  - Checking pressure relief valve in filler cap ⇒ page 196
- 9 Exhaust gas recirculation cooler
  - If renewed, refill system with fresh coolant
- 10 Coolant temperature sender -G62-
  - Removing and installing ⇒ page 176
- 11 Heat exchanger for heater
  - ☐ If renewed, refill system with fresh coolant

## 12 - Gear oil cooler

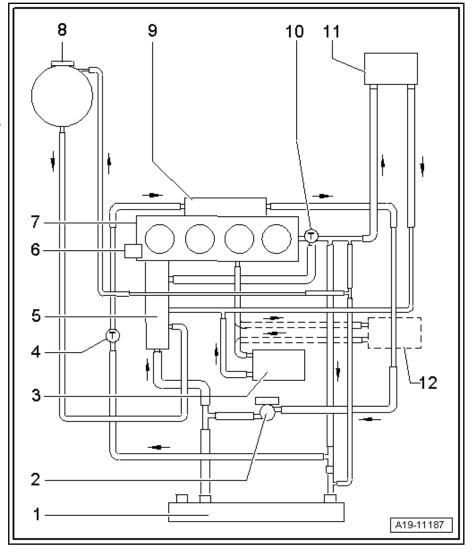
- □ For dual-clutch gearbox
- ☐ If renewed, refill system with fresh coolant

Connection diagram for coolant hoses with 4/2-way valve:



## 1 - Radiator

- ☐ If renewed, refill system with fresh coolant
- 2 Pump for exhaust gas recirculation cooler -V400-
- 3 Engine oil cooler
- 4 Radiator outlet coolant temperature sender -G83-
  - Removing and installing ⇒ page 178
- 5 4/2-way valve with thermostat
  - Removing and installing ⇒ page 173
- 6 Coolant pump
- 7 Cylinder head and cylinder block
  - ☐ If renewed, refill system with fresh coolant
- 8 Coolant expansion tank
  - □ With filler cap
  - ☐ Checking pressure relief valve in filler cap ⇒ page 196
- 9 Exhaust gas recirculation cooler
  - ☐ If renewed, refill system with fresh coolant
- 10 Coolant temperature sender -G62-
  - Removing and installing ⇒ page 176
- 11 Heat exchanger for heater
  - ☐ If renewed, refill system with fresh coolant
- 12 Gear oil cooler
  - □ For dual-clutch gearbox
  - ☐ If renewed, refill system with fresh coolant



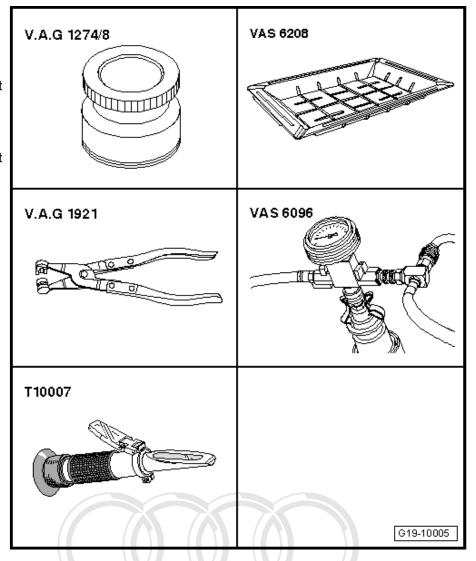


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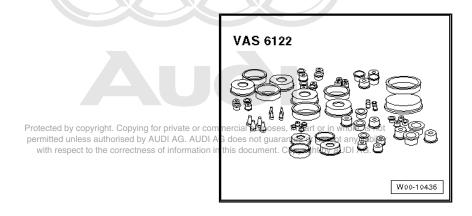
#### 1.2 Draining and filling cooling system

## Special tools and workshop equipment required

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



♦ Engine bung set -VAS 6122-



# **Draining**



Note

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

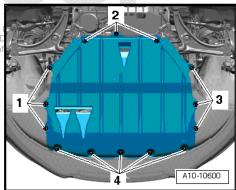


# **WARNING**

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

- The cooling system is under pressure when the engine is hot.
- To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.
- Open filler cap on coolant expansion tank.
- Release fasteners -1 ... 4- and remove centre noise insulation.

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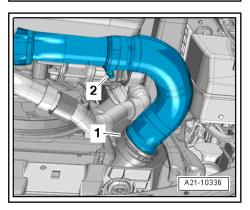


Release hose clip -2-, lift retaining clip -1- and remove air hose.

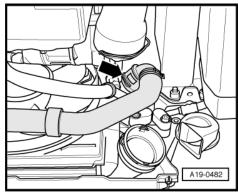


# Note

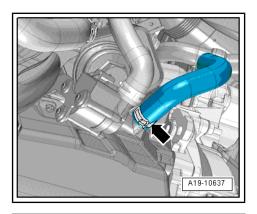
To prevent coolant from entering, seal off connection on charge air cooler with a clean plug from engine bung set -VAS 6122-.



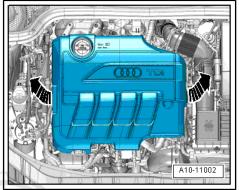
- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.



Open hose clip -arrow-, disconnect coolant hose (bottom) leading to pump for exhaust gas recirculation cooler -V400-and drain off coolant.



- Remove engine cover panel -arrows-.
- Remove air cleaner housing  $\Rightarrow$  Rep. Gr. 23.





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 As an additional step, open hose clip -arrow-, disconnect coolant hose at top of engine oil cooler and drain off remaining coolant.

## **Filling**

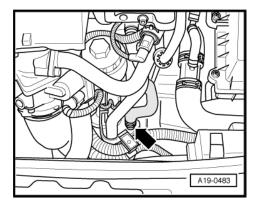


## Note

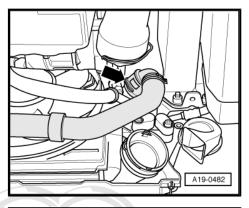
- The cooling system is filled all year round with a mixture of water and coolant additive. Mixture ratio ⇒ page 166
- ◆ Use only the coolant additive listed in the ⇒ Electronic parts catalogue. Other coolant additives could seriously impair in particular the anti-corrosion properties. The resulting damage could lead to loss of coolant and consequently to serious engine damage.
- ◆ The specified coolant (based on recommended mixture ratio) ⇒ page 166 prevents frost and corrosion damage and stops scaling. Such additives also raise the boiling point of the coolant. For these reasons the cooling system must be filled all year round with the correct coolant additive.
- Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ♦ Frost protection is required down to about −25 °C (in countries with arctic climate: down to about −35 °C).
- ◆ The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant concentration must be at least 40 %.
- ◆ If greater frost protection is required in very cold climates, the coolant concentration can be increased, but only up to 60% (this gives frost protection down to about -40 °C). If the concentration exceeds 60%, frost protection decreases again and cooling efficiency is also impaired.
- Use only clean tap water for mixing coolant.
- If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block have been renewed, do not re-use old coolant.
- Contaminated or dirty coolant must not be used again.
- To check anti-freeze protection in cooling system, use refractometer -T10007- .

## Recommended mixture ratio for coolant

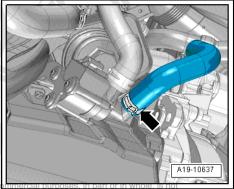
- Coolant (40 %) and water (60 %) for frost protection to –25 °C
- Coolant (50 %) and water (50 %) for frost protection to –35 °C
- Coolant (40 %) and water (60 %) for frost protection to –40 °
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Connect coolant hose with plug-in connector to radiator (bottom) <u>⇒ page 191</u>.

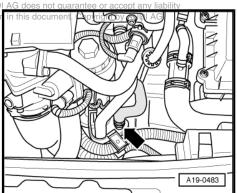


Connect coolant hose (bottom) at pump for exhaust gas recirculation cooler -V400- -arrow-.



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Connect coolant hose (top) to engine voil recoder that row hess of information



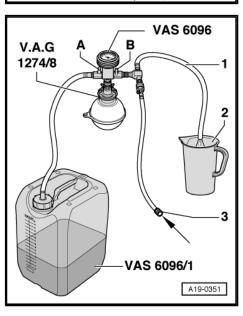
- Fill reservoir of cooling system charge unit -VAS 6096- with at least 8 litres of premixed coolant (according to recommended ratio):
- Fit adapter for cooling system tester -V.A.G 1274/8- onto coolant expansion tank.
- Attach cooling system charge unit -VAS 6096- to adapter -V.A.G 1274/8- .
- Run vent hose -1- into a small container -2-.



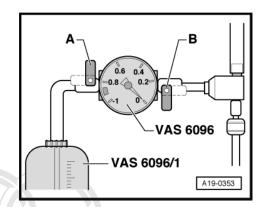
## Note

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.
- Pressure: 6 ... 10 bar.



- 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.



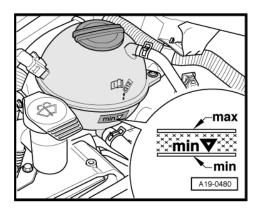


## Note

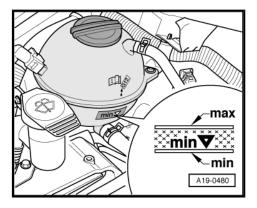
- If the needle does not reach the green zone, repeat the process.
- ♦ Check cooling system for Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not tained.

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- 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.
- Detach cooling system charge unit -VAS 6096- from coolant expansion tank.
- Top up coolant to "max" mark.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install air ducts.
- Install air hose with plug-in connector ⇒ page 209.
- Install noise insulation ⇒ Rep. Gr. 66.
- On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
- Set temperature to "HI".
- Switch off air conditioner compressor (press AC button, LED in button should not light up
- Start engine and run for 2 minutes (maximum) at approx. 1500 rpm.
- Top up coolant to overflow hole on expansion tank with engine running.
- Close filler cap on coolant expansion tank.
- Allow engine to run at idling speed until two large coolant hoses at radiator become warm.
- Switch off ignition and allow engine to cool down.



- 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.





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#### 2 Coolant pump and thermostat

#### 2.1 Coolant pump and thermostat - exploded view

## 1 - Bolt

☐ 15 Nm

# 2 - Coolant pump

□ Removing and installing <u>⇒ page 170</u>

## 3 - O-ring

□ Renew

## 4 - O-ring

□ Renew

## 5 - 4/2-way valve with thermostat

- Installed according to version
- Removing and installing ⇒ page 173
- ☐ The thermostat is located in the interior of the 4/2-way valve and cannot be renewed separately

# 6 - Bolt

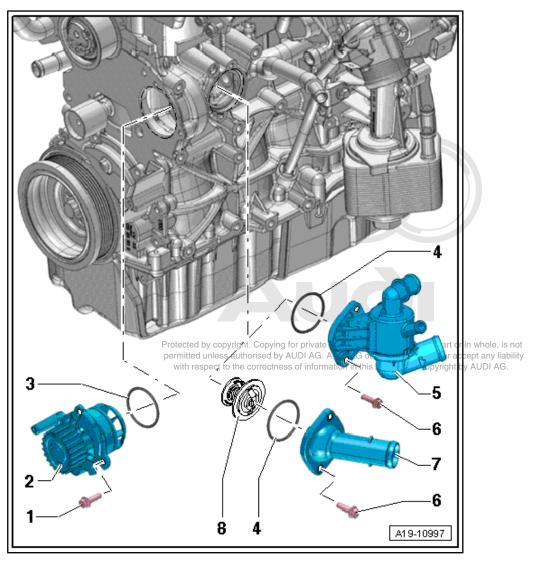
□ 15 Nm

## 7 - Connection

☐ Installed according to version

## 8 - Thermostat

- □ Removing and installing ⇒ page 171
- □ Checking ⇒ page 174
- Only fitted on version with connection -7-



#### 2.2 Removing and installing coolant pump

## Removing

- Drain coolant ⇒ page 163.
- Remove toothed belt ⇒ page 86.

A19-0084

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

## Installing

Tightening torque ⇒ page 170

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



## Note

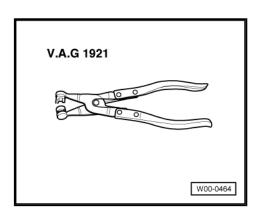
## Fit new O-ring.

- Clean and smoothen sealing surface for O-ring ercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability
- Lightly lubricate Oring 136 with coolant rmation in this document. Copyright by AUDI AG.
- Fit coolant pump -2-.
- Installation position: Sealing plug in housing faces downwards.
- Install toothed belt (adjust valve timing) ⇒ page 91.
- Fill up with coolant <u>⇒ page 166</u>.

#### 2.3 Removing and installing thermostat

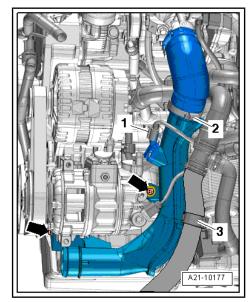
# Special tools and workshop equipment required

♦ Hose clip pliers -V.A.G 1921-



## Removing

- Drain coolant ⇒ page 163.
- Remove radiator cowl <u>⇒ page 192</u>.
- Remove bolts -arrows-.
- Move coolant hose -3- clear.
- Loosen hose clip -2-.
- Unplug electrical connector -1- at charge pressure sender -G31- and detach air pipe (front).



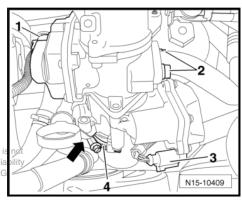
- Unplug electrical connector -3- at intake manifold flap motor -
- Release hose clip -4- and disconnect air hose from intake manifold flap motor -V157-.
- Remove bolt -arrow- for dipstick guide tube.

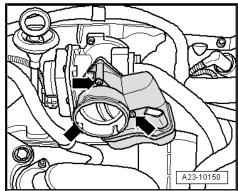


# Note

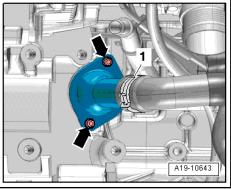
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Unscrew bolts -arrows- and detach intake manifold flap motor -V157- .





- Release hose clip -1- and detach coolant hose from connection.
- Unscrew bolts -arrows- and remove connection.



- Turn thermostat -2- approx. 90° anti-clockwise -arrow- and take thermostat out of connection.
- Detach O-ring -1-.

## Installing

• Tightening torque <u>⇒ page 170</u>.

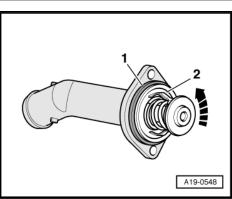
Installation is carried out in the reverse order; note the following:



# Note

## Fit new O-ring.

Clean and smoothen sealing surface for O-ring.



A19-0549

- Fit thermostat -3- with O-ring -2- into connection -1-.
- Installation position: cross-piece on thermostat must be horizontal.
- Lubricate O-ring with coolant.
- Install intake manifold flap motor -V157- ⇒ Rep. Gr. 23.
- Install air pipe (front) ⇒ page 208.
- Install air hose with plug-in connector ⇒ page 209.
- Install radiator cowl ⇒ page 192.
- Fill up with coolant <del>⇒ page 166</del>.

### 2.4 Removing and installing 4/2-way valve with thermostat

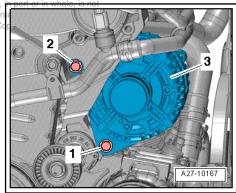
## Removing



Note

The thermostat is located in the interior of the 4/2-way valve and cannot be renewed separately.

- Drain coolant ⇒ page 163.
- Remove alternator = Electrical system; Report Gr. A27 AG does not guara
- Remove throttle valve module -J338- ⇒ Rep. Gr. 23.



- Detach coolant hoses from connections -A, B and D-.
- Remove bolt -2-.
- Remove bolts -1-.
- Pull valve out of cylinder block and detach connection -C- from coolant pipe to the left.

## Installing

Tightening torque ⇒ "2.1 Coolant pump and thermostat - exploded view",

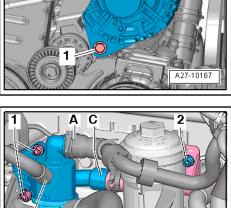
Installation is carried out in the reverse order; note the following:



## Note

## Fit new O-ring.

- Install throttle valve module -J338- ⇒ Rep. Gr. 23.
- Install alternator ⇒ Electrical system; Rep. Gr. 27.



A19-10998

#### 2.5 Checking thermostat

- Heat removed thermostat in water bath.

Starts to open	Fully open	Opening travel
approx. 87 °C	approx. 102 °C <sup>1)</sup>	at least 8 mm
1) Cannot be tested.		

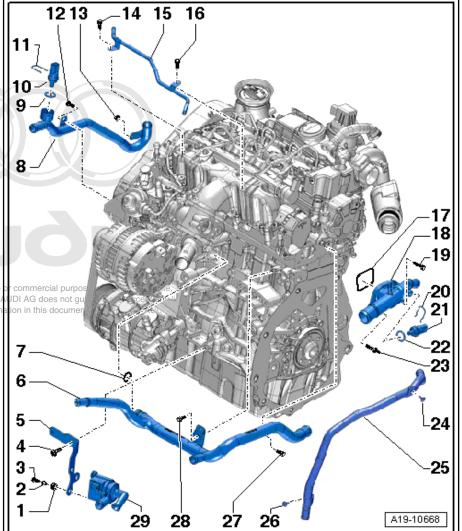


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### 3 Coolant pipes, coolant temperature senders, coolant circulation pump

### 3.1 Coolant pipes, coolant temperature senders, coolant circulation pump - exploded view

- 1 Grommet
  - Not supplied separately
- 2 Sleeve
  - Not supplied separately
- 3 Bolt
  - □ 2.7 Nm
- 4 Bolt
  - □ 40 Nm
- 5 Bracket
  - For pump for exhaust gas recirculation cooler -V400-
- 6 Coolant pipe (front)
  - □ Removing and installing ⇒ page 180
- 7 Ottoged by copyright. Copying for private permitted unless authorised by AUDI AG.
  - wiRenew to the correctness of inform
- 8 Coolant pipe (right-side)
  - Removing and installing <u>⇒ page 186</u>
- 9 O-ring
  - ☐ Renew
- 10 Radiator outlet coolant temperature sender -G83-
  - □ Removing and installing ⇒ page 178
- 11 Retaining clip
- 12 Bolt
  - □ 9 Nm
- 13 Nut
  - □ 9 Nm
- 14 Bolt
  - □ 9 Nm
- 15 Coolant pipe
- 16 Bolt
  - □ 9 Nm
- 17 Gasket
  - □ Renew
- 18 Connection



1	g	_	R	റ	lŧ

□ 9 Nm

### 20 - Retaining clip

### 21 - Coolant temperature sender -G62-

☐ Removing and installing ⇒ page 176

### 22 - O-ring

☐ Renew

### 23 - Centre hex stud

□ 9 Nm

### 24 - Bolt

□ 9 Nm

### 25 - Coolant pipe (left-side)

□ Removing and installing ⇒ page 184

### 26 - Bolt

□ 9 Nm

### 27 - Bolt

□ 40 Nm

### 28 - Bolt

□ 13 Nm

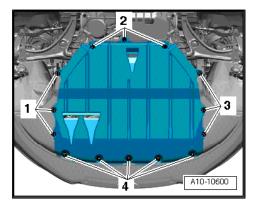
### 29 - Pump for exhaust gas recirculation cooler -V400-

□ Removing and installing ⇒ page 178

### Removing and installing coolant temper-3.2 ature sender -G62-permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

### Removing

- Engine cold.
- Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.
- Remove air cleaner housing ⇒ Rep. Gr. 23.
- Release fasteners -1 ... 4- and remove centre noise insulation.



- Remove bolts -arrows-.
- Use removal lever -80 200- to move electrical wiring and hoses at air pipe (left-side) clear.
- Release hose clip -3- and push air pipe (left-side) with coolant pipe towards the left.



### Note

Disregard -items 1, 2, 4 and 5-.

Unplug electrical connector -2- at coolant temperature sender -G62- .



### Note

Place a cloth underneath the connection to catch escaping coolant.

Pull off retaining clip -1- and pull coolant temperature sender -G62- out of connection.



### Note

Disregard -arrows-.

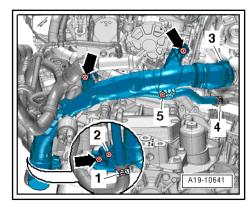
### Installing

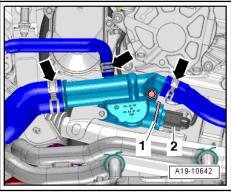
Installation is carried out in the reverse order; note the following:



### Note

- Fit new O-rings.
- To avoid loss of coolant, insert new coolant temperature sender -G62- immediately into connection.
- Install air pipe (left-side) <u>⇒ page 208</u>.
- Install noise insulation ⇒ Rep. Gr. 66.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Check coolant level ⇒ page 169.





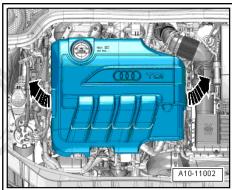
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### Audi TT 2007 ➤

# 3.3 Removing and installing radiator outlet coolant temperature sender -G83-

### Removing

- · Engine cold.
- Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.
- Remove engine cover panel -arrows-.



Unplug electrical connector -2- at radiator outlet coolant temperature sender -G83- .



### Note

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Place a cloth underneath to catch escaping coolant.

 Pull off retaining clip -1- and pull radiator outlet coolant temperature sender -G83- out of connection on coolant pipe.

### Installing

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



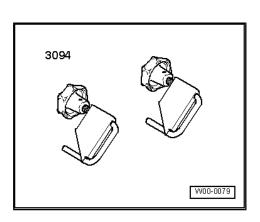
### Note

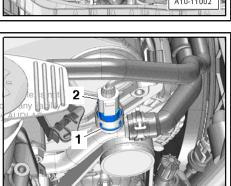
- ♦ Fit new O-ring.
- ♦ To avoid loss of coolant, fit new radiator outlet coolant temperature sender -G83- into coolant pipe immediately.
- Check coolant level ⇒ page 169.

# 3.4 Removing and installing pump for exhaust gas recirculation cooler -V400-

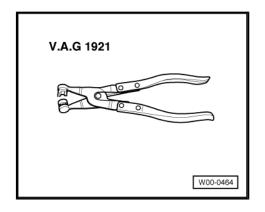
### Special tools and workshop equipment required

♦ Hose clamps for hoses up to 25 mm -3094-



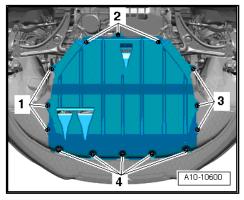


♦ Hose clip pliers -V.A.G 1921-



### Removing

- Release fasteners -1 ... 4- and remove centre noise insulation.



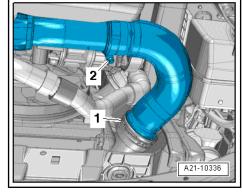
Release hose clip -2-, lift retaining clip -1- and remove air hose.

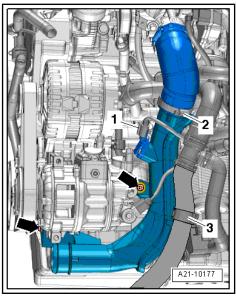


- ProtRemove, boltsopargows wate or commercial purposes, in part or in whole, is not
- permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any nauminy wRelease hose clips:2π and push front air pipe, towards the right.



Disregard -items 1, 3-.



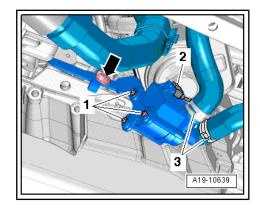




### Note

Place a cloth underneath pump for exhaust gas recirculation cooler -V400- to catch escaping coolant.

- Clamp off coolant hoses using hose clamps -3094- , release hose clips -3- and disconnect coolant hoses.
- Unplug electrical connector -2-.
- Unscrew bolts -1- and remove pump for exhaust gas recirculation cooler -V400-.





### Note

Disregard -arrow-.

### Installing

Tightening torque ⇒ page 175.

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



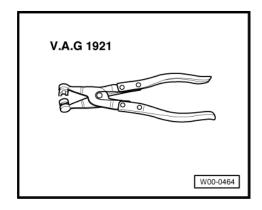
### Note

- ♦ Hose connections and air pipes and hoses must be free of oil and grease before assembly.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- ♦ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- Install air pipe (front) ⇒ page 208
- Install air hose with plug-in connector ⇒ page 209.
- Install noise insulation ⇒ Rep. Gr. 66.
- Check coolant level 
   page 169
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## 3.5 Removing and installing coolant pipe (front)

### Special tools and workshop equipment required

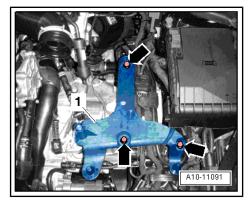
♦ Hose clip pliers -V.A.G 1921-



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### Removing

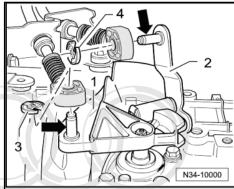
- Remove oil filter bracket ⇒ page 153.
- Remove air cleaner housing ⇒ Rep. Gr. 23.
- Remove bolts -arrows- and detach bracket -1- for air cleaner housing.



Detach securing clip -3- for gear selector cable from gearbox selector lever -1- and pull cable off pin -arrow-.

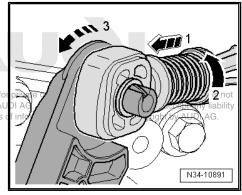
### Metal gate relay lever:

Detach securing clip -4- for gate selector cable from gate relay lever -2- and pull cable off pin -arrow-.



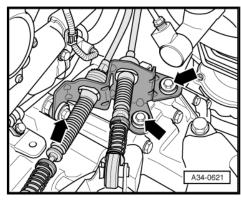
### Plastic gate relay lever:

- 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-.
- Protected by copyright. Copying for Press gate relay lever towards front -arrow 3ermitted unless authorised by A with respect to the correctness



### All vehicles (continued):

Remove cable support bracket -arrows- from gearbox and place to one side (selector cables remain fitted).



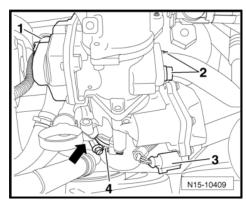
- 4-cylinder TDI engine (2.0 ltr. 4-valve common rail), mechanics Edition 04.2010
- Unplug electrical connector -3- at intake manifold flap motor -
- Release hose clip -4- and disconnect air hose from intake manifold flap motor -V157- .
- Remove bolt -2- on exhaust gas recirculation pipe.

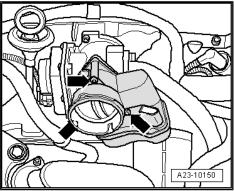


### Note

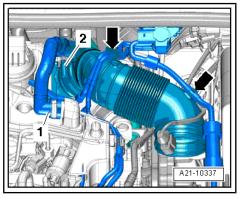
Disregard items marked -1- and -arrow-.

Unscrew bolts -arrows- and detach intake manifold flap motor -V157- .





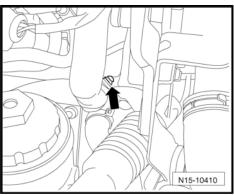
- Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
- Move vacuum hoses -arrows- on air pipe clear.
- Loosen hose clip -2- and detach air pipe.



Unclip wiring harness from retainer -arrow-.



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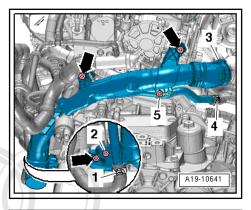
- Remove bolts -2, 5- and -arrows-.
- Use removal lever -80 200- to move electrical wiring and hoses at air pipe (left-side) clear.
- Loosen hose clip -3- and detach air pipe (left-side).

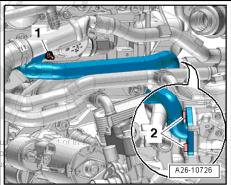


### Note

Disregard -items 1, 4-.

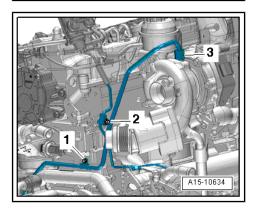
Remove nut -1- and bolts -2-, detach exhaust gas recirculation pipe.

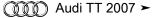




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- Remove nut -2- at retaining clip for vacuum line.
- Remove bolt -1-.
- Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.



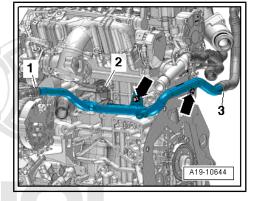


- Remove electrical connector -2- for Hall sender -G40- from bracket and unplug connector.
- Detach bracket from coolant pipe (front).
- Release hose clips -1- and -3- and disconnect coolant hoses.
- Remove bolts -arrows- and detach coolant pipe (front) from left side of cylinder block.

### Installing

Tightening torques ⇒ page 151, ⇒ page 175.

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





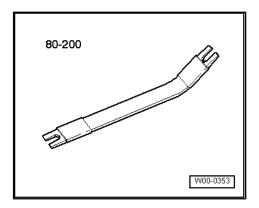
### Note

- Renew gaskets, seals and O-rings. 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
- ♦ Hose connections and air pipes and hoses must be free of oil ormation in this document. Copyright by AUDI AG. and grease before assembly.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- ♦ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- Clean and smoothen sealing surface for O-ring.
- Lightly lubricate O-ring with coolant and slide O-ring onto coolant pipe (front).
- Push coolant pipe (front) into cylinder block.
- Install oil supply line ⇒ page 151.
- Install exhaust gas recirculation pipe ⇒ page 227.
- Install air pipe (left-side) ⇒ page 208.
- Install gear selector cable and gate selector cable ⇒ Rep. Gr. 34 .
- Install intake manifold flap motor -V157- ⇒ Rep. Gr. 23.
- Install oil filter bracket ⇒ page 153.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Fill up with coolant ⇒ page 166.

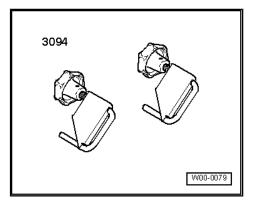
# 3.6 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

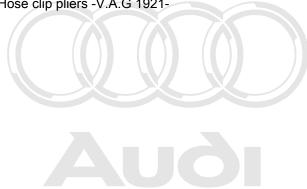
Removal lever -80 - 200-



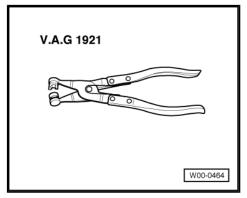
♦ Hose clamps for hoses up to 25 mm -3094-

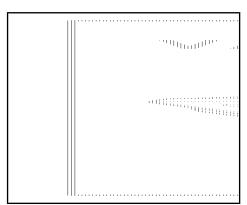


Hose clip pliers -V.A.G 1921-



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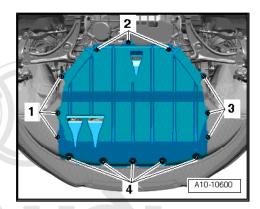




### ( Audi TT 2007 ➤

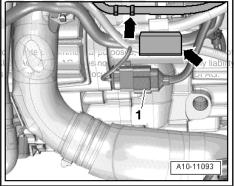
### Removing

- Release fasteners -1 ... 4- and remove centre noise insulation.
- Remove air cleaner housing ⇒ Rep. Gr. 23.



Move wiring harnesses -arrows- and electrical connector -1clear at bracket.





- Remove bolts -2, 5- and -arrows-.
- Use removal lever -80 200- to move electrical wiring and hoses at air pipe (left-side) clear.
- Loosen hose clip -3- and detach air pipe (left-side).
- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Clamp off coolant hoses using hose clamps -3094-, release hose clips -1- and -4- and disconnect coolant hoses from coolant pipe (left-side).
- Detach coolant pipe (left-side).

### Installing

Tightening torque ⇒ page 175.

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



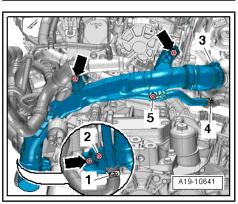
### Note

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

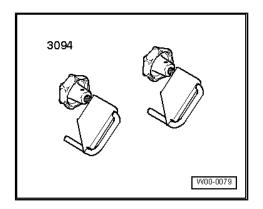
- Install air pipe (left-side) ⇒ page 208.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install noise insulation ⇒ Rep. Gr. 66.
- Fill up with coolant ⇒ page 166.

### 3.7 Removing and installing coolant pipe (right-side)

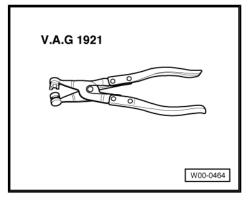
Special tools and workshop equipment required



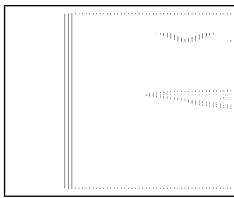
♦ Hose clamps for hoses up to 25 mm -3094-



♦ Hose clip pliers -V.A.G 1921-

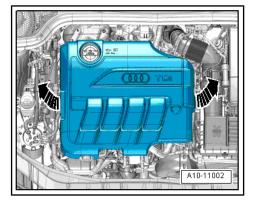


Drip tray for workshop hoist -VAS 6208-



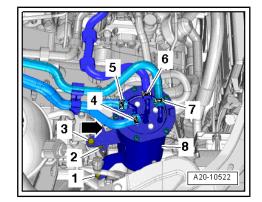
### Removing

- Remove engine cover panel -arrows-.

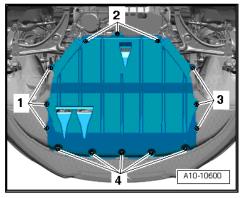


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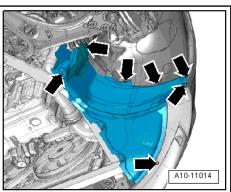
- Loosen bolt -1-.
- Remove nut -2- and bolt -3-.
- Detach hose retainer -arrow- from fuel filter and move fuel filter -8- clear to one side with fuel hoses -4 ... 7- connected.



Release fasteners -1 ... 4- and remove centre noise insulation.



Release fasteners -arrows- and remove right wheel housing liner (bottom section).



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- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Unplug electrical connector -3- at radiator outlet coolant temperature sender -G83- .
- Clamp off coolant hoses using hose clamps -3094-, release hose clips -arrows- and disconnect coolant hoses from coolant pipe (right-side).
- Remove nut -1- and bolt -2- and take off coolant pipe (rightside).

### Installing

Tightening torque <u>⇒ page 175</u>.

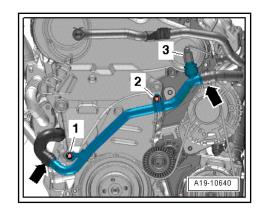
Installation is carried out in the reverse order; note the following:



### Note

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

- Install right wheel housing liner (bottom section) and noise insulation ⇒ Rep. Gr. 66.
- Install fuel filter ⇒ Rep. Gr. 20.
- Frote Check coolant level progeo 169 cial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



### Radiator and radiator fans 4



### **WARNING**

Risk of injury as the radiator fans may start up automatically.

 Unplug electrical connectors before starting to work in the area of radiator cowl.

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### Radiator and radiator fans - exploded view and record to the correctness of information in this document. Copyright by AUDI AG. 4.1

### 1 - Radiator fan -V7-

- With radiator fan control unit -J293-
- Removing and installing ⇒ page 194
- 2 Nut
  - □ 5 Nm

### 3 - Radiator cowl

Removing and installing ⇒ page 192

### 4 - Coolant hose (top)

- □ Connecting to radiator ⇒ page 191
- 5 O-ring
  - ☐ Renew

### 6 - Radiator

- Removing and installing ⇒ page 191
- ☐ If renewed, refill system with fresh coolant

### 7 - O-ring

☐ Renew

### 8 - Coolant hose (bottom)

- □ Connecting to radiator ⇒ page 191
- 9 Bolt
  - □ 5 Nm

### 10 - Nut

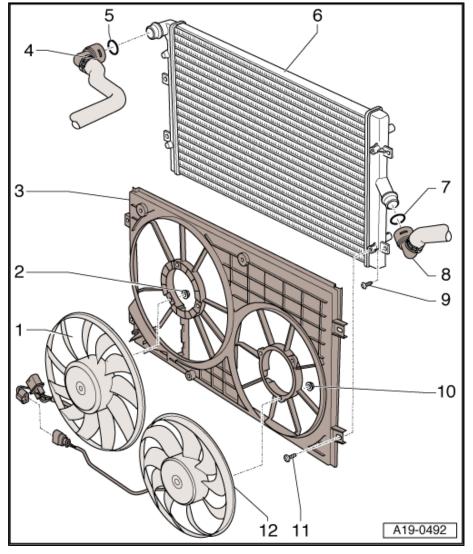
□ 5 Nm

### 11 - Bolt

□ 5 Nm

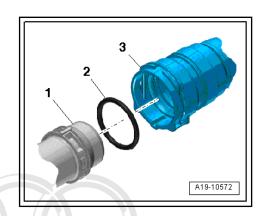
### 12 - Radiator fan 2 -V177-

□ Removing and installing ⇒ page 194



### Connecting coolant hose with plug-in connector

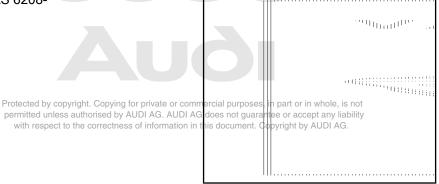
- Remove old O-ring -2- from coolant hose -3-.
- Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.
- Press coolant hose onto connection -1- until it engages audibly.
- Press coolant hose in again and then pull to check that plugin connector is correctly engaged.



### 4.2 Removing and installing radiator

### Special tools and workshop equipment required

◆ Drip tray for workshop hoist -VAS 6208-



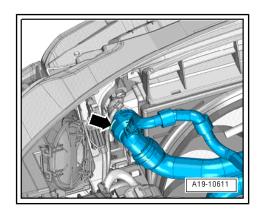
### Removing



### Note

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.

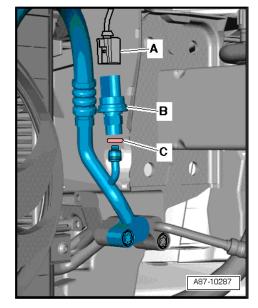
- Drain coolant ⇒ page 163.
- Remove radiator cowl ⇒ page 192.
- Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.





### Note

Disregard -item C-.



- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Remove bolts -arrows- at rear and lift out radiator.

### Installing

• Tightening torque <u>⇒ page 190</u>.

Installation is carried out in the 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 .
- Install radiator cowl ⇒ page 192.
- Fill up with coolant ⇒ page 166.

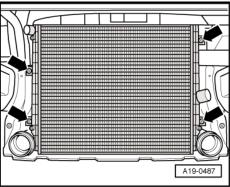
### Removing and installing radiator cowl 4.3

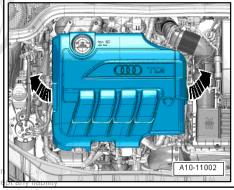
### Removing

Remove engine cover panel -arrows-.

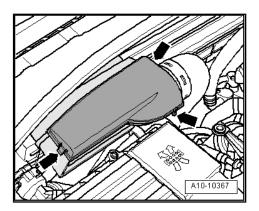


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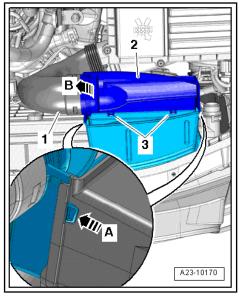




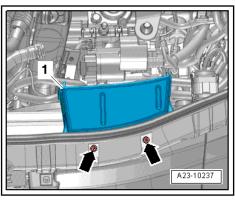
- Pull cover off air duct (release clips on sides) -arrows-.



- Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
- Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
- Detach air pipe -1- from air duct (bottom) -arrow B-.



Remove bolts -arrows- and detach air duct -1- from lock carrier.

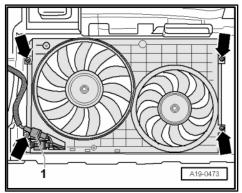


Remove bolts -top arrows- for radiator cowl.

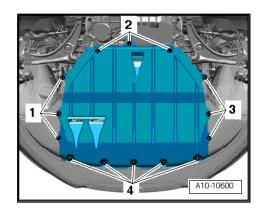


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permit The bolts bottom arrows are removed at a later stage.



Release fasteners -1 ... 4- and remove centre noise insulation.



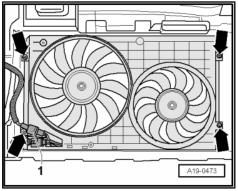
- Unplug electrical connector -1-.
- Remove bolts -bottom arrows- and lift out air cowl.

### Installing

Tightening torque ⇒ page 190.

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

Install noise insulation ⇒ Rep. Gr. 66.



### 4.4 Removing and installing radiator fans -V7- / -V177-

### Removing

- Remove radiator cowl ⇒ page 192.
- Unplug electrical connector -1- and move clear.
- Unscrew nuts -arrows- and remove radiator fans.

### Installing

• Tightening torque <u>⇒ page 190</u>. Installation is carried out in the reverse order; note the following:



### Note

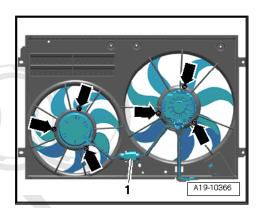
Fit all cable ties in the original positions when installing.

Install radiator cowl ⇒ page 192.

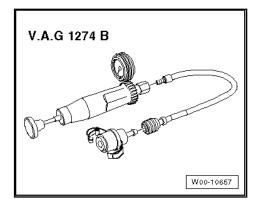
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability and the comment. Copyright by AUDI AG. Checking cooling system for leaks of information in this document. Copyright by AUDI AG.

### 4.5

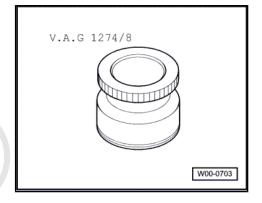
Special tools and workshop equipment required



♦ Cooling system tester -V.A.G 1274 B-



♦ Adapter for cooling system tester -V.A.G 1274/8-



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



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### **Procedure**

Engine must be warm.



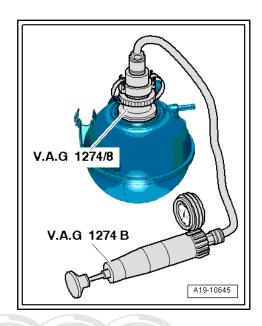
### **WARNING**

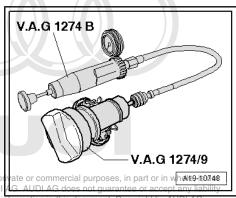
Hot steam/hot coolant can escape - risk of scalding.

- The cooling system is under pressure when the engine is hot.
- Cover filler cap on coolant expansion tank with a cloth and open carefully to dissipate pressure.
- Open filler cap on coolant expansion tank.
- 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. 1.0 bar.
- If this pressure is not maintained, locate and rectify leaks.



- 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.





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### Turbocharging/supercharging

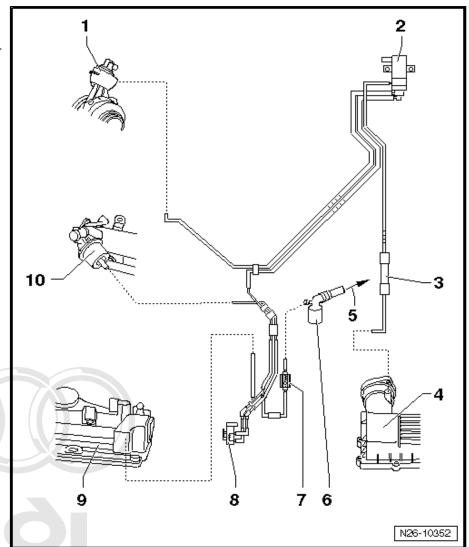
### **Turbocharger**

Observe rules for cleanliness  $\Rightarrow$  page 5.

### 1.1 Diagram of vacuum connections

### 1 - Vacuum unit

- On turbocharger
- With position sender for charge pressure positioner -G581-
- 2 Charge pressure control solenoid valve -N75-
- 3 Intake silencer
- 4 Air cleaner housing
- 5 To brake servo
- 6 Connection piece
  - □ On exhauster pump
- 7 Non-return valve
  - Note installation posi-
- 8 Exhaust gas recirculation cooler change-over valve -N345-
  - □ Checking change-over function ⇒ page 230
- 9 Cylinder head cover
- 10 Vacuum unit
  - For change-over function for exhaust gas recirculation cooler



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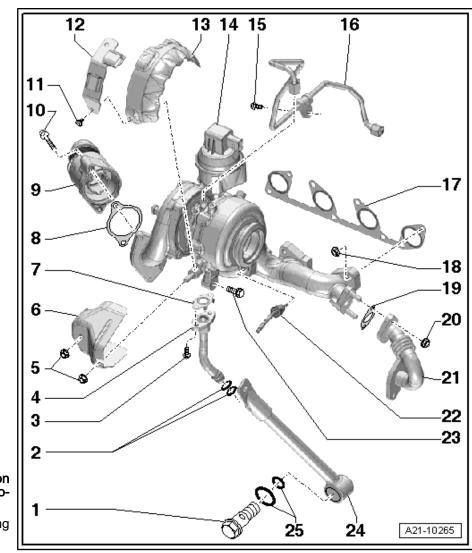
### ( Audi TT 2007 ➤

### 1.2 Turbocharger - exploded view



- □ 60 Nm
- 2 O-rings
  - □ Renew
- 3 Bolt
  - □ 15 Nm
- 4 Oil return pipe
- 5 Nuts
  - □ 20 Nm
- 6 Heat shield
- 7 Gasket
  - □ Renew
- 8 Gasket
  - ☐ Renew
- 9 Pulsation damper
- 10 Bolt
  - □ 10 Nm
- 11 Bolt
  - □ 8 Nm
- 12 Bracket
  - For electrical wiring
- 13 Heat shield
- 14 Turbocharger with position sender for charge pressure positioner -G581-
  - Removing and installing turbocharger

<u>⇒ page 199</u>



☐ Renewing position sender for charge pressure positioner -G581- <u>⇒ page 202</u>

### 15 - Bolt

□ 9 Nm

### 16 - Oil supply pipe

- □ Check for obstructions
- ☐ Before installing, fill turbocharger with engine oil at connection for oil supply pipe
- □ Tightening union nuts ⇒ Item 6 (page 151)

### 17 - Gasket

□ Renew

### 18 - Nut

□ 20 Nm

### 19 - Gasket

□ Renew

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□ 20 Nm

- 21 Pipe
  - □ To exhaust gas recirculation cooler
- 22 Exhaust gas temperature sender 1 -G235-
  - □ Removing and installing ⇒ page 223
- 23 Bolt
  - □ 20 Nm
- 24 Support
  - For turbocharger
- 25 O-rings
  - □ Renew

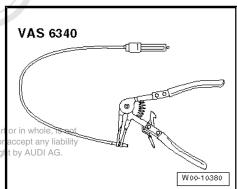
### 1.3 Removing and installing turbocharger

Special tools and workshop equipment required

♦ Hose clip pliers -VAS 6340-



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### Removing

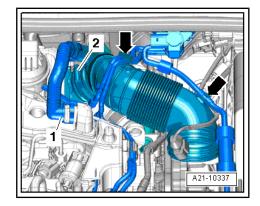


### Caution

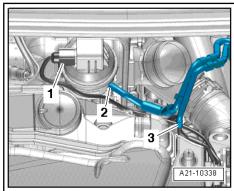
If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- Check air cleaner housing, air filter element and air intake 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.
- Remove particulate filter <u>⇒ page 218</u>.
- Remove air cleaner housing ⇒ Rep. Gr. 23.

- Press release tabs and disconnect crankcase breather hose
   -1- from cylinder head cover.
- Move vacuum hoses -arrows- on air pipe clear.
- Loosen hose clip -2- and detach air pipe.



- Detach heat shield sleeve.
- Detach vacuum hose -2- from vacuum unit of turbocharger.
- Disconnect vacuum hose -3-.
- Unplug electrical connector -1- at position sender for charge pressure positioner -G581- .



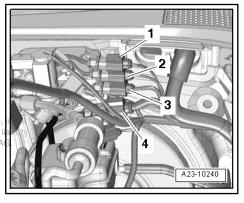
 Unplug electrical connector -1- for exhaust gas temperature sender 1 -G235- and move electrical wire clear.



### Note

Disregard -items 2, 3 and 4-.

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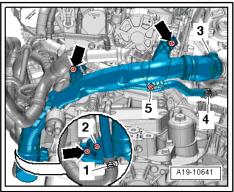


- Remove bolts -arrows-.
- Use removal lever -80 200- to move electrical wiring and hoses at air pipe (left-side) clear.
- Release hose clip -3- and push air pipe (left-side) from turbocharger towards the left.



### Note

Disregard -items 1, 2, 4 and 5-.



Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.



### Note

Disregard -items 1, 2-.

- Unscrew nuts -1- and detach heat shield (left-side) from exhaust manifold.
- Remove nuts -2- and bolts -3-, and detach exhaust gas recirculation pipe.



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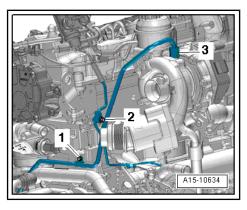
Remove bolts -1- and detach oil return pipe.

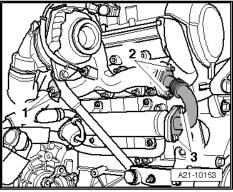


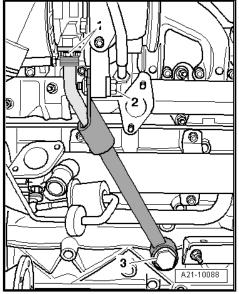
### Note

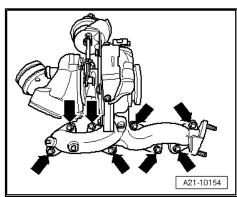
Disregard -items 2, 3-.

Remove nuts -arrows- and detach turbocharger with exhaust manifold from cylinder head.









- Move clear electrical wiring for exhaust gas temperature sender 1 -G235- -item 1-.
- Remove bolts -arrows- and detach heat shield.
- Take out turbocharger with exhaust manifold from below, at the same time pushing engine/gearbox assembly slightly forwards.

### Installing

Tightening torques ⇒ page 198

Installation is carried out in the 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 pipe.
- Hose connections and air pipes and hoses must be free of oil and grease before assembly.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- ♦ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- 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.
- Fit heat insulation sleeves in the original positions when installing.
- Install air pipe (left-side) ⇒ page 208.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install particulate filter ⇒ page 218.
- Check oil level ⇒ Maintenance; Booklet 810.

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1.4 Renewing vacuum itunit with position formation in this document. Copyright by AUDI AG. sender for charge pressure positioner G581-

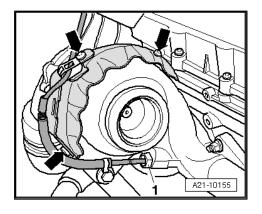
### Special tools and workshop equipment required

- ♦ Socket -T10422-
- ♦ Ring spanner -T10423-
- Vehicle diagnostic tester



### Caution

The tools listed, in particular the socket -T10422-, are only intended for use according to the procedure described in the following; do NOT use the tools for other bolted connections. There is danger of deformation if the specified torques are exceeded.



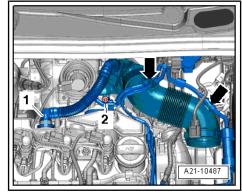


### Note

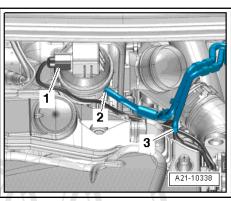
A replacement part set is available ⇒ Electronic parts catalogue for renewing the vacuum unit with position sender for charge pressure positioner -G581- .

### Removing

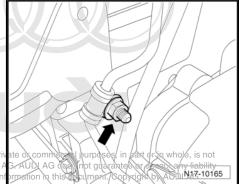
- Remove air cleaner housing with air mass meter and connecting pipe  $\Rightarrow$  Rep. Gr. 23 .
- Press release tabs and disconnect crankcase breather connecting pipe -1- from cylinder head cover.
- Move clear vacuum hoses -arrows-.
- Unscrew captive bolt -2-, swivel air pipe with connection to rear and detach from turbocharger.
- Seal opening on turbocharger with sealing cap from replacement part set.



- Detach heat shield sleeve around electrical connector -1-.
- Unplug electrical connector -1- at position sender for charge pressure positioner -G581-.
- Detach vacuum hose -2- from vacuum unit of turbocharger.



Depending on version, remove nut -arrow- securing oil supply line/vacuum line to cylinder head.



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Make an improvised tool (14 mm) to counterhold connection for oil supply line, as shown.

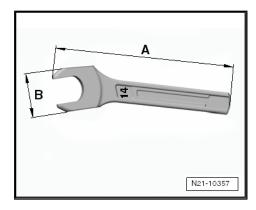
- ♦ A = 110 mm
- ♦ B = 25 mm

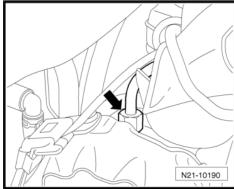


### Caution

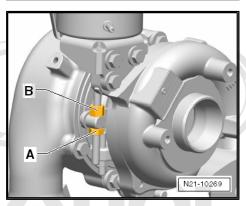
It is important that you counterhold connection when loosening oil supply line. Risk of further damage occurring later.

- Counterhold connection using improvised tool and remove oil supply line -arrow- from turbocharger.
- Seal opening for oil supply line in turbocharger with plug from replacement part set.





Counterhold lock nut -B- with ring spanner -T10423- and remove securing nut -A- from control rod using socket -T10422-.



Unscrew bolts -arrows- securing vacuum unit and detach vacuum unit -A-.

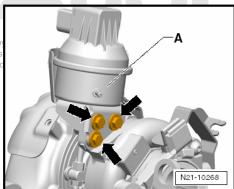
### Installing



### Caution

Only use new bolts and nuts from replacement part set.

- If necessary, remove bottom nut securing control rod from new vacuum unit.
- Screw lock nut on control rod by hand as far as stop towards vacuum unit.
- Guide control rod through adjusting lever on turbocharger, fit vacuum unit -A- and secure bolts.



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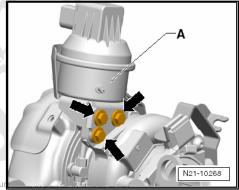
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Tighten securing bolts -arrows- to 8 Nm.



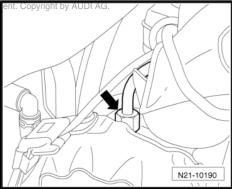
### Note

Please ensure that guide can be moved easily on control rod.



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Remove protective cap, fit oil supply line carrows on turbo in this documents charger and tighten to 22 Nm.



- Plug in connector -2- at position sender for charge pressure positioner -G581- and fasten heat shield sleeve.
- Connect vehicle diagnostic tester.

### Selecting operating mode:

On touch screen, press button for "Vehicle self-diagnosis".

### Selecting vehicle system:

On touch screen, press button for "01 - Engine electronics".

The display will show the identification and coding of the engine control unit.

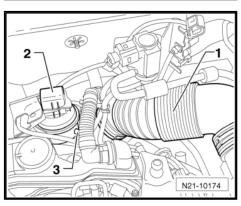
### Selecting diagnostic function:

- On touch screen, press button for "011 Measured values".
- On the numeric keypad, enter measured value block "120" and confirm your entry with "Q" key.
- Connect hand vacuum pump -VAS 6213- to vacuum unit.
- Create voltage of 0.760 V by generating a vacuum (observe minimum value of measured value block).



### Caution

During the following adjustment procedure for the control rod, the vacuum and the voltage of 0.760 V must be maintained.



- Slowly screw lock nut -B- for control rod downwards by hand. Adjusting lever is on bottom stop.
- Counterhold lock nut -B- and screw securing nut -A- on control rod against adjusting lever. Tighten slightly using ring spanner -T10423- .
- Release vacuum pressure from vacuum unit.
- Observe minimum value of measured value block: value of 3.30 ... 3.90 V should be displayed (unpressurised).
- Apply socket -T10422-, counterhold lock nut -B- using ring spanner -T10423- and tighten securing nut -A-.



### Caution

Create vacuum of 0.75 ± 0.05 bar for vacuum unit to ensure that adjusting lever is positioned at stop. A voltage of 0.760 V should build up.

# N21-10269

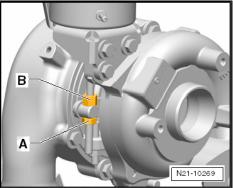
### Voltage value OK

- Press locking plate onto control rod by hand and turn by 90° in direction of -arrow-.
- Seal connection between control rod and securing nut with sealing paint from replacement part set.

### Voltage value not OK



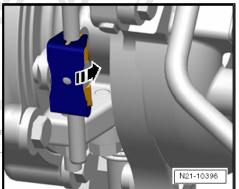
- Counterhold lock nut -B-, loosen securing nut -A- on control rod and adjust value by turning lock nut -B-.
- Counterhold lock nut -B-, screw securing nut -A- in other direction and tighten connection using socket -T10422-.



- Press locking plate onto control rod by hand and turn by 90° in direction of -arrow-.
- Seal connection between control rod and securing nut with sealing paint from replacement part set.

### Continued

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- Depending on version, fit nut -arrow- securing oil supply line/ vacuum line to cylinder head and tighten connection.
- Remove sealing cap from turbocharger.
- Fully assemble engine components.
- Start engine and erase fault memory ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- Check adjustment as follows:

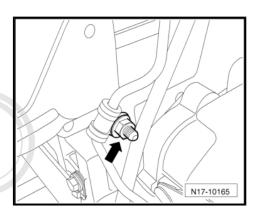
### Selecting diagnostic function:

- On touch screen, press button for "006 Basic setting".
- On the numeric keypad, enter measured value block "120" and confirm your entry with "Q" key.
- On bottom half of touch screen, press button for "Activate".
- Observe value on bottom part of display: value should fluctuate between 0.65 ... 0.85 V and 3.30 ... 3.90 V (vacuum unit is moved to both limit stops alternately) for private or commercial purposes, in part or in whole, is not

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Exit basic setting.



### 2 Charge air cooling



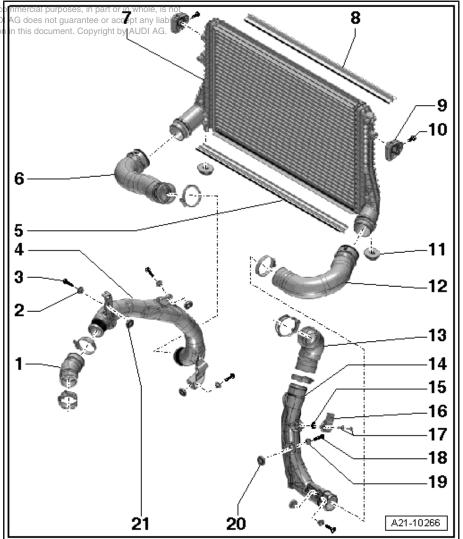
### Note

- ♦ Check that all air pipes and hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.
- Hose connections and air pipes and hoses must be free of oil and grease before assembly.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- ♦ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.

### 2.1 Charge air cooler - exploded view

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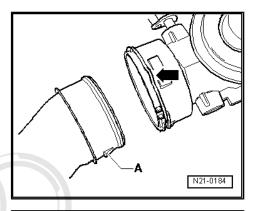
  2 VSleeve to the correctness of informatic
- 3 Bolt
  - □ 9 Nm
- 4 Air pipe (left-side)
- 5 Seal
- 6 Air hose
  - □ Removing ⇒ page 209
  - ☐ Installing ⇒ page 209
- 7 Charge air cooler
  - □ Removing and installing⇒ page 211
- 8 Seal
- 9 Mounting
- 10 Bolt
  - □ 5 Nm
- 11 Mounting
- 12 Air hose
  - □ Removing ⇒ page 209
  - ☐ Installing <u>⇒ page 209</u>
- 13 Air hose
- 14 Air pipe
- 15 O-ring
  - ☐ Renew
- 16 Charge pressure sender G31- / intake air temperature sender -G42-
  - □ Removing and installing ⇒ page 210
- 17 Bolt
  - □ 5 Nm



- 18 Bolt
  - □ 9 Nm
- 19 Sleeve
- 20 Grommet
  - Renew if damaged
- 21 Grommet
  - Renew if damaged

### Removing air hoses with plug-in connectors

- Release tab -A- on plug-in connector by lifting retaining clip
- Disconnect air pipes and hoses by hand (do not use a tool).

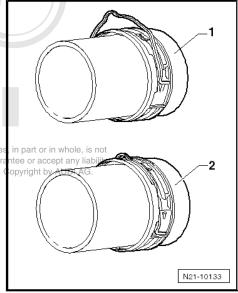


### Installing air hoses with plug-in connectors



### Note

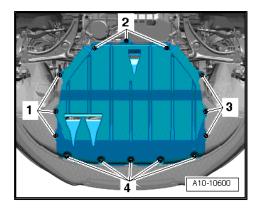
- Renew seal if damaged.
- Make sure that the seal is correctly seated in the groove on the complete circumference of the air pipe/hose.
- ♦ Apply a thin coating of silicon-free lubricant to the sealing area Protected by copyright. Copying for private or commercial purpose permitted unless authorised by AUDI AG. AUDI AG does not guar and the seal.
  - with respect to the correctness of information in this document. Release retaining clip (position -1-).
- Push air pipe/hose in as far as stop and press retaining clip to lock -2-.
- Press air pipe/hose again and pull again to check that plug-in connector is correctly engaged.



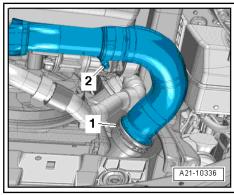
# 2.2 Removing and installing charge pressure sender -G31- / intake air temperature sender -G42-

### Removing

- Release fasteners -1 ... 4- and remove centre noise insulation.



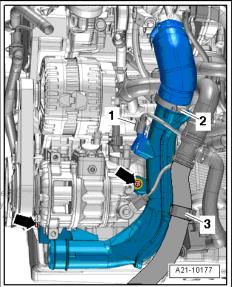
Release hose clip -2-, lift retaining clip -1- and remove air hose.



- Remove bolts -arrows-.
- Move coolant hose -3- clear.
- Loosen hose clip -2-.
- Unplug electrical connector -1- at charge pressure sender -G31- and detach air pipe (front).



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Remove bolts -arrows- and pull charge pressure sender -G31- / intake air temperature sender -G42- out of air pipe.

#### Installing

Tightening torque ⇒ page 208.

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



#### Note

Fit new O-ring.

- Install air pipe (front) ⇒ page 208.
- Install noise insulation ⇒ Rep. Gr. 66.

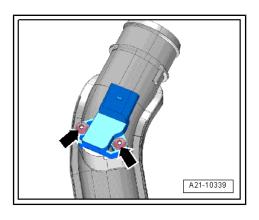
# 2.3 Removing and installing charge air cool-

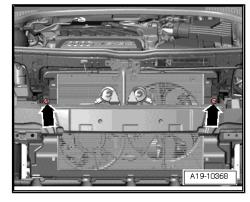
#### Removing

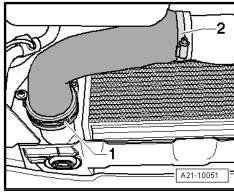
- Remove radiator ⇒ page 191 .
- Remove bumper cover (front) ⇒ Rep. Gr. 63.



- permRemove charge air hose (left side) 11 of rom charge air cooler.
- Release air ducts (left and right) and push to one side in order to remove bolts -arrows-.
- Push top edge of charge air cooler slightly towards rear.
- Lift charge air cooler out of bottom mounting points.
- Push charge air cooler towards engine.
- Support charge air cooler from below to prevent charge air cooler from dropping.







## **WARNING**

Risk of injury caused by refrigerant.

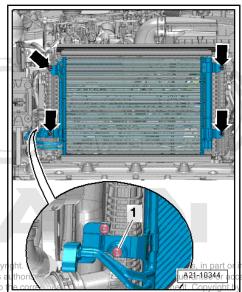
◆ The air conditioner refrigerant circuit must not be opened.



#### Caution

Make sure that condenser and refrigerant pipes and hoses are not damaged.

- ◆ Do NOT stretch, kink or bend refrigerant lines and hoses.
- Remove bolts -arrows- and -1-.
- Detach condenser from charge air cooler and take charge air cooler out from below.



n whole, is not ept any liability AUDI AG.

#### Installing

Tightening torques ⇒ page 208

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



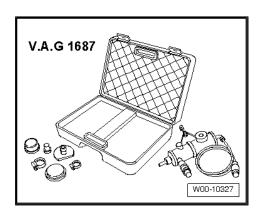
#### Note

- ♦ Hose connections and air pipes and hoses must be free of oil and grease before assembly.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- ♦ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- Install condenser ⇒ Rep. Gr. 87.
- Install bumper cover (front) ⇒ Rep. Gr. 63.
- Install air hose with plug-in connector ⇒ page 209.
- Install radiator ⇒ page 191 .

# 2.4 Checking charge air system for leaks

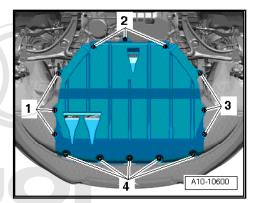
#### Special tools and workshop equipment required

 Charge air system tester -V.A.G 1687- with adapter -V.A.G 1687/12-



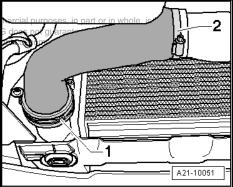
#### **Procedure**

- Release fasteners -1 ... 4- and remove centre noise insulation.

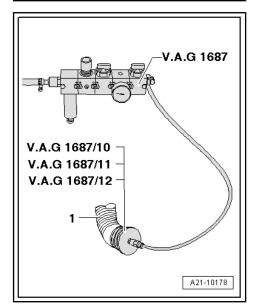


- Release hose clip -2-, lift retaining clip -1- and remove air hose.

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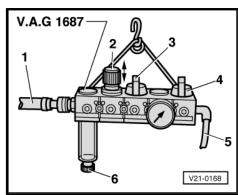


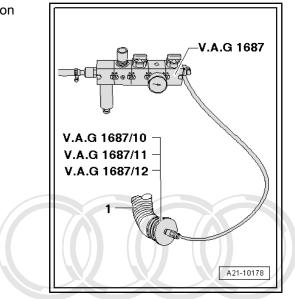
Insert adapter -1687/12- into air hose -1- and secure with hose clip.



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 -2-.







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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

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◆ The pressure must not exceed 0.5 bar.

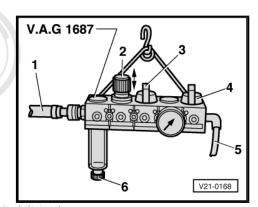


- Adjust pressure to 0.5 bar via pressure control valve -2-.
- Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.
- Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detecting spray 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 and hoses must be free of oil and grease before assembly.
- Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.



#### 26 – **Exhaust system**

## Silencers



#### Note

- After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.
- Use screwdriver to unfasten and tighten lock washers for heat shields. Tightening torque: 2 Nm.

#### 1.1 Silencers - exploded view

#### 1 - Centre silencer

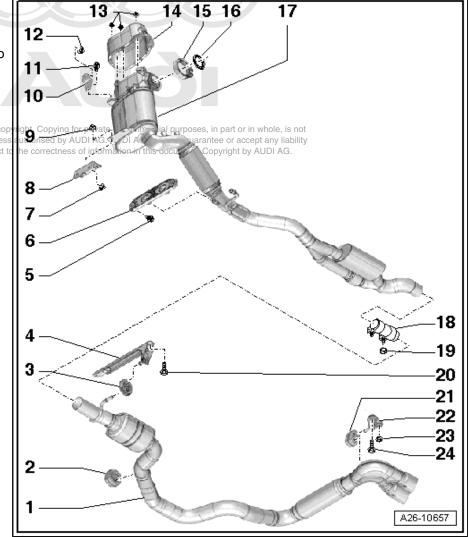
- Combined with rear silencer
- ☐ Align exhaust system so it is free of stress ⇒ page 221

#### 2 - Rubber mounting

- □ Renew if damaged
- 3 Rubber mounting permitted unle
  - □ Renew if damaged
- 4 Bracket
- 5 Bolt
  - □ 23 Nm
- 6 Mounting
  - Renew if damaged
- 7 Nut
  - □ 23 Nm
- 8 Bracket (bottom)
  - □ For particulate filter
- 9 Nut
  - □ 23 Nm

#### 10 - Bracket (top)

- □ For particulate filter
- 11 Bolt
  - □ 23 Nm
- 12 Nut
  - □ 23 Nm
- 13 Nuts
  - □ 9 Nm



#### 14 - Heat shield

## 15 - Clamp

- □ For particulate filter
- □ Renew
- ☐ Installation position ⇒ page 218
- □ 7 Nm

#### 16 - Seal

☐ Renew

#### 17 - Particulate filter

- □ Removing and installing ⇒ page 218
- ☐ After renewing, perform "Adaption" in "Guided Functions" ⇒ Vehicle diagnosis, testing and information system VAS 5051.

#### 18 - Clamp (front)

- ☐ Before tightening, align exhaust system so it is free of stress ⇒ page 221
- ☐ Installation position ⇒ page 217
- □ Tighten bolt connections evenly

#### 19 - Nut

□ 23 Nm

#### 20 - Bolt

□ 23 Nm

#### 21 - Rubber mounting

□ Renew if damaged

#### 22 - Bracket

23 - Nut

□ 23 Nm

#### 24 - Bolt

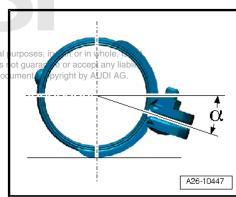
□ 23 Nm

#### Installation position of front clamp

- Fit the clamp at the angle shown.
- Angle  $-\alpha$  = approx. 20°

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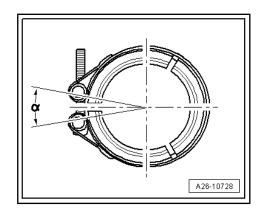
- Bolt connections facing towards right
- Nuts facing upwards



# Audi TT 2007 ➤

## Installation position of clamp for particulate filter

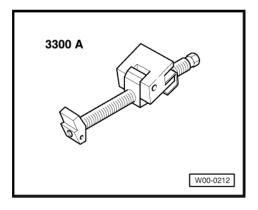
• Angle  $-\alpha - = 0 \pm 10^{\circ}$ 



#### 1.2 Removing and installing particulate filter

#### Special tools and workshop equipment required

♦ Engine support -3300 A-



#### Removing

- Remove Lambda probe ⇒ Rep. Gr. 23.
- Remove propshaft ⇒ Rear final drive 02D/0AV; Rep. Gr. 39.
- Remove bevel box  $\Rightarrow$  Rep. Gr. 34.
- Unplug electrical connector -3- for exhaust gas temperature sender 2 -G448- and move wiring clear.



## Note

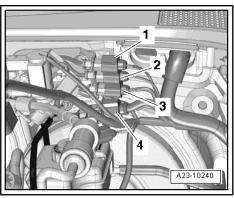
Disregard -items 1, 2, 4-.

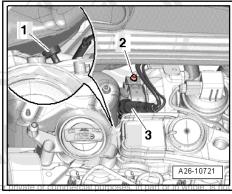
Slacken bolt -2- and remove clamp.



#### Note

Disregard -items 1, 3-.





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- Unplug electrical connector -2- on exhaust gas pressure sensor 1 -G450- .
- Remove bolt -1- and nuts -arrows- and push exhaust gas pressure sensor 1 -G450- to side.

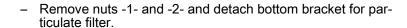


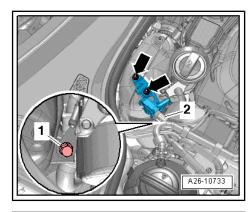
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted inscrew exhaust gas temperature sender 4 & G648-laitem 1-with from exhaust pipe behind particulate filter right by AUDI AG.

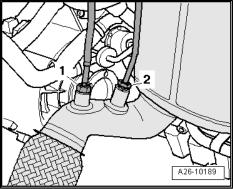


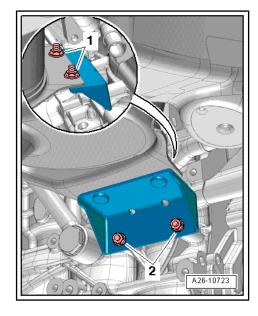
Note

Disregard -item 2-.

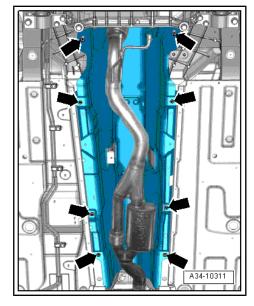




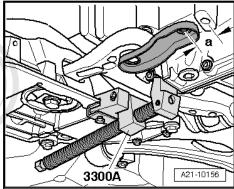




- Remove bolts and nuts -arrows-.
- Detach heat shield to rear.



- Using engine support -3300 A-, push engine/gearbox assembly forwards by distance -a-.
- Distance -a- = 35 mm.



Remove particulate filter by rotating through 180° and about its own axis -arrow-.

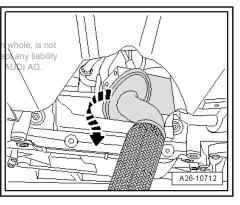
#### Installing

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



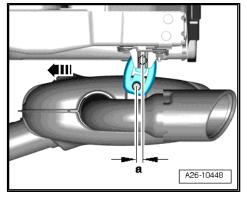
- Renew gaskets, self-locking nuts and clamp for particulate fil-
- Fit all cable ties in the original positions when installing.
- Install bevel box  $\Rightarrow$  Rep. Gr. 34.
- Install propshaft ⇒ Rear final drive 02D/0AV; Rep. Gr. 39 .
- Align the exhaust system so it is free of stress ⇒ page 221.
- Install exhaust gas temperature sender 4 -G648-⇒ page 225 .
- Install Lambda probe -G39- and exhaust gas pressure sensor 1 -G450-  $\Rightarrow\;$  Rep. Gr.  $\;23$  .
- After renewing particulate filter, perform "Adaption" in "Guided Functions" > Vehicle diagnosis, testing and information system VAS 5051.



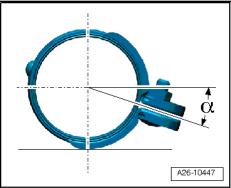
#### 1.3 Stress-free alignment of exhaust system

#### **Procedure**

- The exhaust system must be aligned when it is cool.
- Tightening torque ⇒ page 216.
- Loosen bolt connections on front clamp.
- Push exhaust system towards front of vehicle until preloading at mounting for rear silencer -a- = 11 ... 13 mm.



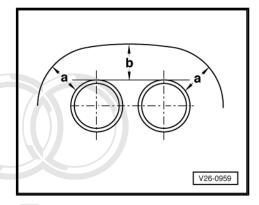
- Fit the clamp at the angle shown.
- Angle  $-\alpha$  = approx. 20°
- Bolt connections facing towards right
- Nuts facing upwards
- Tighten bolt connections on clamp evenly.



#### 1.4 Aligning tailpipes

#### **Procedure**

- Align rear silencer so that there is an equal distance -a- and -b- between bumper cut-out and tailpipes.
- Unfasten rear silencer mounting to align tailpipes



#### 1.5 Checking exhaust system for leaks

- Start the engine and run at idling speed.
- Plug tailpipes during leak test (e.g. with cloth or plug).
- Listen for noise at the connection points of cylinder, head extupl AG does not guarantee or accept any liability haust manifold, turbocharger/front/exhaust pipe/etcato/locate on in this document. Copyright by AUDI AG. any leaks.
- Rectify any leaks that are found.

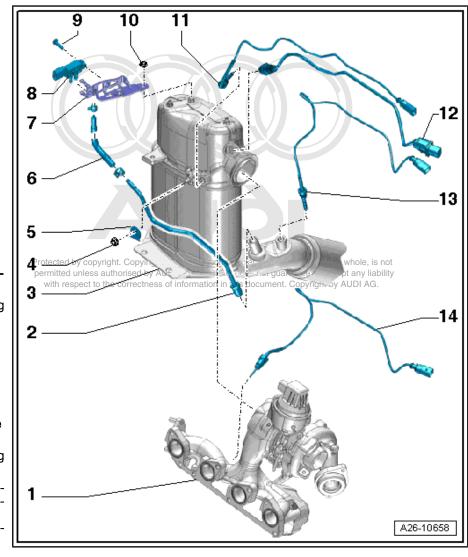
#### 2 Exhaust gas temperature control

#### 2.1 Exhaust gas temperature control - exploded view



- 2 Control pipe
  - □ 45 Nm
- 3 Particulate filter
- 4 Nut
  - □ 9 Nm
- 5 Bracket
  - Bolted to particulate filter
- 6 Hose
- 7 Bracket
  - □ For exhaust gas pressure sensor 1 -G450-
- 8 Exhaust gas pressure sensor 1 -G450-
  - Removing and installing ⇒ Rep. Gr. 23
- 9 Bolt
  - □ 8 Nm
- 10 Nut
  - □ 9 Nm
- 11 Exhaust gas temperature sender 3 -G495-
  - Removing and installing ⇒ page 224
  - Coat with high-temperature paste; for high-temperature paste refer to .

    ⇒ Electronic parts catalogue
  - □ 4.5 Nm



#### 12 - Lambda probe -G39- with Lambda probe heater -Z19-

- □ Removing and installing ⇒ Rep. Gr. 23
- 13 Exhaust gas temperature sender 4 -G648-
  - □ Removing and installing ⇒ page 225
  - ☐ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
  - □ 45 Nm

#### 14 - Exhaust gas temperature sender 1 -G235-

- □ Removing and installing ⇒ page 223
- ☐ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- □ 45 Nm

#### 2.2 Removing and installing exhaust gas temperature sender 1 -G235-

#### Removing

Unplug electrical connector -1- (black) for exhaust gas temperature sender 1 -G235- and move wiring clear.



#### Note

Disregard -items 2, 3 and 4-.



## Note

The connection can be accessed from below.

Unscrew exhaust gas temperature sender 1 -G235- -item 1from exhaust manifold.

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Tightening torque ⇒ page 222.

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

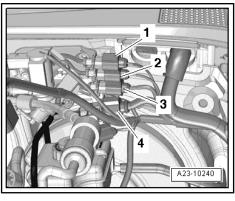


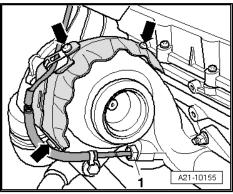
#### Note

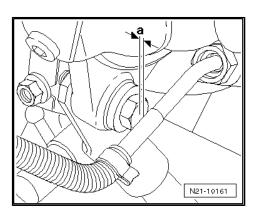
- Coat threads of exhaust gas temperature sender with hightemperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .
- Fit all cable ties in the original positions when installing.

Installation position of exhaust gas temperature sender -G235-:

The angled part of the pipe must have a clearance of -a- = 3 ... 5 mm from the bolt on the turbocharger support.







# Audi

# 2.3 Removing and installing exhaust gas temperature sender 3 -G495-

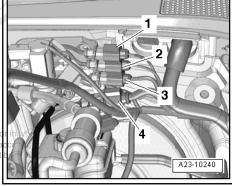
#### Removing

- Remove Lambda probe -G39- ⇒ Rep. Gr. 23.
- Unplug electrical connector -3- (brown) for exhaust gas temperature sender 3 -G495- and move wiring clear.



#### Note

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Remove exhaust gas temperature sender 3 -G495- -item 1-.



## Note

Disregard -items 2, 3-.

#### Installing

• Tightening torque <u>⇒ page 222</u>.

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



#### Note

- ◆ Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue.
- Fit all cable ties in the original positions when installing.

Installation position of temperature sender before particulate filter -G495- :

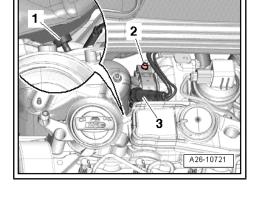
- · Angled section of pipe faces towards left side of vehicle.
- Angle -α- = approx. 7° to left.

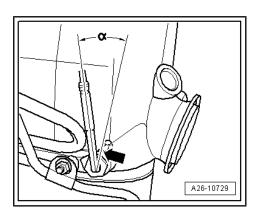


#### Note

Disregard -arrow-.

Install Lambda probe -G39- ⇒ Rep. Gr. 23





#### 2.4 Removing and installing exhaust gas temperature sender 4 -G648-

#### Removing

Unplug electrical connector -2- (orange) for exhaust gas temperature sender 4 -G648- and move wiring clear.



#### Note

Disregard -items 1, 3 and 4-.

Unscrew exhaust gas temperature sender 4 -G648- -item 1from exhaust pipe behind particulate filter.



## Note

Disregard -item 2-.

#### Installing

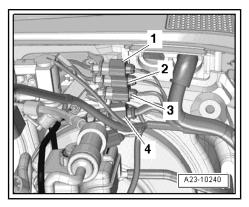
• Tightening torque ⇒ page 222.

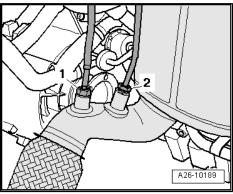
Installation is carried out in the reverse order; note the following:



## Note

Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue .







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#### 3 Exhaust gas recirculation system

#### Exhaust gas recirculation system

- To improve exhaust emission values, exhaust gas is recirculated to the combustion chambers, thus reducing the combustion chamber temperature.
- The exhaust gas recirculation system is activated by the engine control unit -J623- via the exhaust gas recirculation valve -N18- and the exhaust gas recirculation potentiometer -

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- The exhaust gas recirculation is switched off after approx 20 information in this document. Copyright by AUDI AG. minutes at idling speed.
- Restart engine or briefly increase engine speed above 1500 rpm when longer checks are necessary. Then repeat meas-

#### Cooling system for exhaust gas recirculation system

- To further improve the exhaust emission values, the exhaust gas recirculation system is equipped with a cooler that is connected into the engine cooling system.
- Under certain operating conditions, the flow of exhaust gas that is recirculated to the combustion chamber is routed via this cooler. The exhaust gas temperature is thereby reduced, further lowering the combustion temperature and improving the exhaust emission values.
- The engine control unit -J623- determines when the recirculated exhaust gas is routed via the cooler. The control unit actuates a vacuum unit via the exhaust gas recirculation cooler change-over valve -N345-, and the vacuum unit in turn operates the change-over flap for the exhaust gas recirculation cooler.

#### 3.1 Diagram of vacuum connections

⇒ "1.1 Diagram of vacuum connections", page 197.

#### Exhaust gas recirculation with exhaust gas recirculation cooler - exploded 3.2 view

## 1 - Vacuum line Do not alter shape

- 2 Nut
  - □ 9 Nm

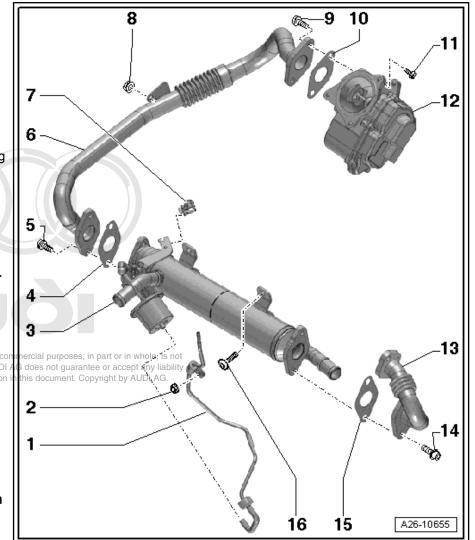
#### 3 - Exhaust gas recirculation cooler

- Checking change-over function ⇒ page 230
- Removing and installing ⇒ page 231
- 4 Gasket
  - □ Renew
- 5 Bolt
  - □ 20 Nm
- 6 Pipe for exhaust gas recirculation
- 7 Clip
- 8 Nut

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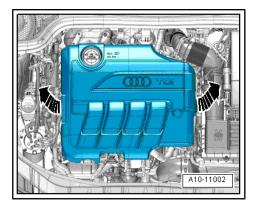
- - □ 20 Nm
- 10 Gasket
  - □ Renew
- 11 Bolt
  - □ 9 Nm
- 12 Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-
  - □ Removing and installing ⇒ page 228
- 13 Pipe for exhaust gas recirculation
- 14 Bolt
  - □ 20 Nm
- 15 Gasket
  - □ Renew
- 16 Bolt
  - □ 9 Nm



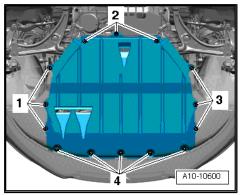
#### 3.3 Removing and installing exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

## Removing

Remove engine cover panel -arrows-.

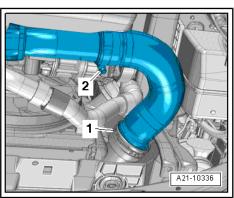


Release fasteners -1 ... 4- and remove centre noise insulation.



Release hose clip -2-, lift retaining clip -1- and remove air hose.





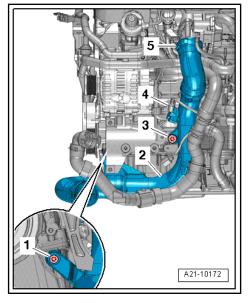
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- Remove bolts -1- and -3-.
- Slacken hose clip -5- at intake manifold flap motor -V157- , detach air pipe -2- but do not remove.



Note

Disregard -item 4-.

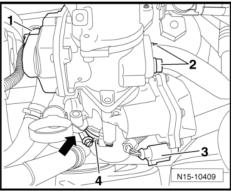


Unplug electrical connector -3- at intake manifold flap motor -

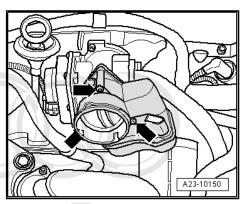


Note

Disregard -items 1, 2, 4- and -arrow-.



Unscrew bolts -arrows- and detach intake manifold flap motor -V157-.



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- Unplug electrical connector -1- on exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- .
- Remove bolts -2- and -3- and detach exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- .



#### Note

Disregard -item 4-.

#### Installing

Tightening torque ⇒ page 227.

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



#### Note

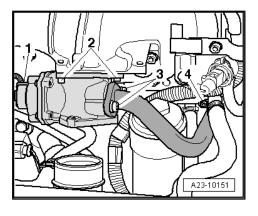
## Renew O-ring.

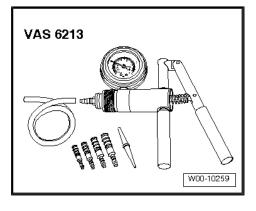
- Install intake manifold flap motor -V157- ⇒ Rep. Gr. 23.
- Install air pipe ⇒ page 208.
- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not Installeain hose with plug-in connector accept any liability
- Install noise insulation ⇒ Rep. Gr. 66.

# 3.4 Checking exhaust gas recirculation cooler change-over

#### Special tools and workshop equipment required

♦ Hand vacuum pump -VAS 6213-





VAS 6213

A26-10407

#### **Procedure**

- Detach heat shield sleeve.
- Disconnect vacuum hose from vacuum unit and connect hand vacuum pump -VAS 6213- in its place.
- Operate hand vacuum pump to produce a vacuum.
- The linkage of the exhaust gas recirculation cooler changeover should move -arrows-.

If the linkage does not move or only moves jerkily:

- The vacuum unit is defective.
- The change-over flap for exhaust gas recirculation is sticking.



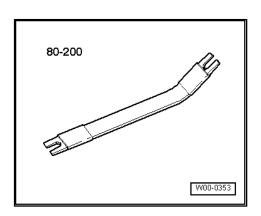
#### Note

Secure the heat insulation sleeve in the original position when installing.

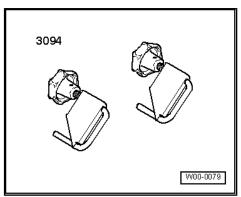


#### Special tools and workshop equipment required

♦ Removal lever -80 - 200-



Hose clamps for hoses up to 25 mm -3094-





Hose clip pliers -V.A.G 1921-

Drip tray for workshop hoist -VAS 6208-



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#### Removing

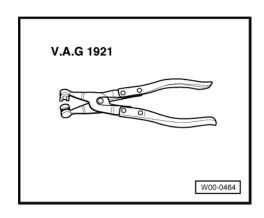
- Remove particulate filter ⇒ page 218.
- Remove air cleaner housing ⇒ Rep. Gr. 23.
- Detach securing clip -3- for gear selector cable from gearbox selector lever -1- and pull cable off pin -arrow-.

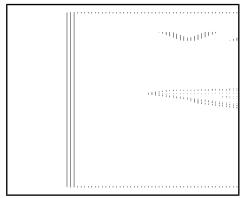
#### Metal gate relay lever:

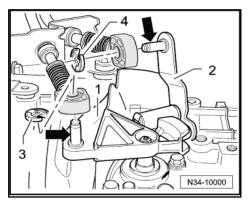
Detach securing clip -4- for gate selector cable from gate relay lever -2- and pull cable off pin -arrow-.

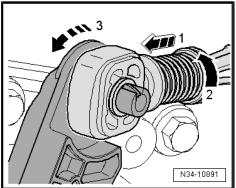
## Plastic gate relay lever:

- 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-.



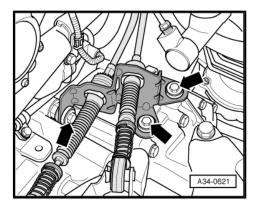






#### All vehicles (continued):

Remove cable support bracket -arrows- from gearbox and place to one side (selector cables remain fitted).

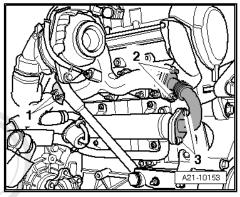


- Remove nuts -2- and bolts -3-.
- Detach exhaust gas recirculation pipe.



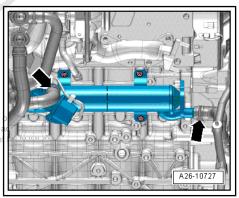
Note

Disregard -item 1-.



- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Clamp off coolant hoses using hose clamps -3094-, release hose clips -arrows- and disconnect coolant hoses from exhaust gas recirculation cooler.
- Detach heat insulation sleeve from vacuum unit.

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- Remove bolts -1- for exhaust gas recirculation pipe.
- Disconnect vacuum hose -2- from vacuum unit and move clear.
- Remove bolts -arrows- and detach exhaust gas recirculation cooler.

#### Installing

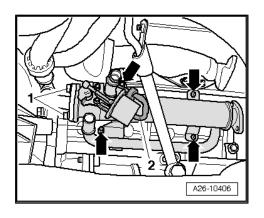
Tightening torque ⇒ page 227.

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



#### Note

- ◆ Renew gaskets, seals and self-locking nuts.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.
- Fit heat insulation sleeve in the original position when installing.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install particulate filter ⇒ page 218.
- Check coolant level ⇒ page 169.





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