

## Workshop Manual Audi A4 2001 ➤ Audi A4 Cabriolet 2003 ➤

6-cylinder TDI engine (2.7 ltr.; 3.0 ltr. 4-valve common rail), mechanics

Engine ID	ASB	BKN	BPP	BSG					
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Edition 04.2011



# Audi

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## List of Workshop Manual Repair Groups

### Repair Group

- 00 - Technical data
- 10 - Removing and installing engine
- 13 - Crankshaft group
- 15 - Cylinder head, valve gear
- 17 - Lubrication
- 19 - Cooling
- 21 - Turbocharging/supercharging
- 26 - Exhaust system



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

## Contents

<b>00 - Technical data</b> .....	<b>1</b>
<b>1 Engine number</b> .....	<b>1</b>
<b>2 Engine data</b> .....	<b>2</b>
<b>3 Safety precautions</b> .....	<b>3</b>
<b>4 General repair instructions</b> .....	<b>5</b>
4.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger .....	5
4.2 Checking for leaks in the fuel system .....	5
4.3 Foreign particles in engine .....	5
4.4 Contact corrosion! .....	5
4.5 Routing and attachment of pipes, hoses and wiring .....	6
4.6 Installing radiators, condensers and charge air coolers .....	6
4.7 Checking vacuum system .....	6
<b>10 - Removing and installing engine</b> .....	<b>7</b>
<b>1 Removing and installing engine - vehicles with manual gearbox</b> .....	<b>7</b>
1.1 Removing engine .....	7
1.2 Separating engine from manual gearbox .....	22
1.3 Installing engine .....	26
<b>2 Removing and installing engine - vehicles with multitronic gearbox</b> .....	<b>34</b>
2.1 Removing engine .....	34
2.2 Separating engine from multitronic gearbox .....	50
2.3 Installing engine .....	54
<b>3 Removing and installing engine - vehicles with automatic gearbox</b> .....	<b>61</b>
3.1 Removing engine .....	61
3.2 Separating engine and automatic gearbox .....	77
3.3 Installing engine .....	83
<b>4 Securing engine to engine and gearbox support</b> .....	<b>92</b>
<b>13 - Crankshaft group</b> .....	<b>95</b>
<b>1 Cylinder block (pulley end)</b> .....	<b>95</b>
1.1 Moving lock carrier into service position .....	95
1.2 Poly V-belt drive - exploded view .....	98
1.3 Removing and installing poly V-belt .....	101
1.4 Removing and installing tensioner for poly V-belt .....	103
1.5 Removing and installing idler roller for poly V-belt .....	104
1.6 Removing and installing vibration damper .....	106
1.7 Renewing crankshaft oil seal (pulley end) .....	106
1.8 Removing and installing sealing flange (front) .....	108
<b>2 Cylinder block (gearbox end)</b> .....	<b>112</b>
2.1 Vacuum pump - exploded view .....	112
2.2 Removing and installing vacuum pump .....	112
2.3 Dual-mass flywheel on vehicles with manual gearbox - exploded view .....	115
2.4 Removing and installing dual-mass flywheel .....	115
2.5 Extracting and driving in needle bearing for dual-mass flywheel .....	117
2.6 Flywheel for vehicles with multitronic gearbox - exploded view .....	119
2.7 Removing and installing damper unit - vehicles with multitronic gearbox .....	119
2.8 Removing and installing flywheel - vehicles with multitronic gearbox .....	120
2.9 Drive plate - exploded view .....	122
2.10 Removing and installing drive plate .....	122
2.11 Renewing crankshaft oil seal (gearbox end) .....	123
<b>3 Crankshaft</b> .....	<b>126</b>



3.1	Crankshaft - exploded view	126
3.2	Crankshaft dimensions	128
3.3	Measuring axial clearance	128
3.4	Measuring radial clearance	129
<b>4</b>	<b>Pistons and conrods</b>	<b>130</b>
4.1	Pistons and conrods - exploded view	130
4.2	Checking piston projection at TDC	133
4.3	Piston and cylinder dimensions	135
4.4	Checking radial clearance of conrod bearings	135
<b>15</b>	<b>Cylinder head, valve gear</b>	<b>136</b>
<b>1</b>	<b>Chain drive</b>	<b>136</b>
1.1	Timing chain covers - exploded view	136
1.2	Removing and installing timing chain covers	137
1.3	Camshaft timing chain - exploded view	143
1.4	Removing and installing camshaft timing chain	145
1.5	Removing camshaft timing chain from camshafts	153
1.6	Drive chain for valve gear - exploded view	162
1.7	Removing and installing drive chain for valve gear	163
1.8	Drive chain for oil pump and balance shaft - exploded view	165
1.9	Removing and installing drive chain for oil pump and balance shaft	166
1.10	Balance shaft - exploded view	170
1.11	Removing and installing balance shaft	171
<b>2</b>	<b>Cylinder head</b>	<b>175</b>
2.1	Cylinder head - exploded view	175
2.2	Cylinder head cover - exploded view	179
2.3	Removing and installing cylinder head cover	181
2.4	Removing cylinder head - vehicles up to 09.2005	186
2.5	Removing cylinder head - vehicles from 09.2005 onwards	189
2.6	Installing cylinder head	193
2.7	Checking compression	197
<b>3</b>	<b>Valve gear</b>	<b>200</b>
3.1	Valve gear - exploded view	200
3.2	Checking axial clearance of camshafts	202
3.3	Renewing camshaft oil seal	203
3.4	Removing and installing camshafts - cylinder head (left-side)	207
3.5	Removing and installing camshafts - cylinder head (right-side)	214
3.6	Renewing valve stem oil seals with cylinder head installed	220
3.7	Renewing valve stem oil seals with cylinder head removed	223
3.8	Checking hydraulic valve compensation elements	226
3.9	Valve dimensions	227
3.10	Machining valve seats	227
3.11	Checking valve guides	227
3.12	Checking valves	228
<b>17</b>	<b>Lubrication</b>	<b>229</b>
<b>1</b>	<b>Lubrication system</b>	<b>229</b>
1.1	Oil pump, sump (bottom section) - exploded view	229
1.2	Removing and installing sump (bottom section)	230
1.3	Removing and installing oil pump	233
1.4	Sump (top section) - exploded view	236
1.5	Removing and installing sump (top section)	237
1.6	Engine oil cooler, pressure control valve and oil filter housing - exploded view	240
1.7	Removing and installing engine oil cooler	241
1.8	Removing and installing oil filter housing	243

1.9	Removing and installing pressure control valve for crankcase breather system	246
1.10	Removing and installing mounting plate for engine oil cooler, pressure control valve and oil filter housing	247
1.11	Removing and installing oil pressure switch F1	248
1.12	Checking oil pressure	250
1.13	Engine oil	251
1.14	Checking oil level	251
<b>19</b>	<b>- Cooling</b>	<b>252</b>
<b>1</b>	<b>Cooling system</b>	<b>252</b>
1.1	Draining and filling cooling system	253
1.2	Coolant pump and thermostat - exploded view	260
1.3	Removing and installing coolant pump	260
1.4	Removing and installing hose connection with thermostat	262
1.5	Removing and installing coolant temperature sender G62	264
1.6	Removing and installing coolant pipe (front)	264
1.7	Removing and installing coolant pipe (left-side)	266
1.8	Removing and installing coolant pipe (right-side)	271
1.9	Removing and installing coolant pipe (rear)	276
1.10	Removing and installing radiator	280
1.11	Removing and installing radiator fan (left-side)	286
1.12	Removing and installing radiator fan (right-side)	286
1.13	Checking cooling system for leaks	289
<b>21</b>	<b>- Turbocharging/supercharging</b>	<b>291</b>
<b>1</b>	<b>Turbocharger and charge air cooler</b>	<b>291</b>
1.1	Turbocharger for vehicles with 2.7 ltr. engine - exploded view	291
1.2	Removing and installing turbocharger on vehicles with 2.7 ltr. engine	293
1.3	Removing and installing turbocharger 1 control unit J724 - vehicles with 2.7 ltr. engine	298
1.4	Removing and installing intermediate flange on vehicles with 2.7 ltr. engine	309
1.5	Turbocharger for vehicles with 3.0 ltr. engine - exploded view	310
1.6	Removing and installing turbocharger on vehicles with 3.0 ltr. engine	312
1.7	Removing and installing turbocharger 1 control unit J724 - vehicles with 3.0 ltr. engine	317
1.8	Removing and installing intermediate flange on vehicles with 3.0 ltr. engine	326
1.9	Charge air cooler - exploded view	327
1.10	Removing and installing charge air cooler	328
1.11	Removing and installing charge pressure sender G31	329
<b>26</b>	<b>- Exhaust system</b>	<b>330</b>
<b>1</b>	<b>Exhaust system on vehicles without particulate filter</b>	<b>330</b>
1.1	Exhaust system - exploded view	330
1.2	Separating Y-pipe and rear silencers	333
1.3	Renewing tailpipe	334
1.4	Removing and installing starter catalytic converter	334
1.5	Removing and installing front exhaust pipe with catalytic converter	338
1.6	Stress-free alignment of exhaust system	340
1.7	Aligning tailpipes	341
<b>2</b>	<b>Exhaust system on vehicles with particulate filter</b>	<b>342</b>
2.1	Exhaust system - exploded view	342
2.2	Separating Y-pipe and rear silencers	348
2.3	Renewing tailpipe	349
2.4	Removing and installing starter catalytic converter	350
2.5	Removing and installing front exhaust pipe	355
2.6	Removing and installing particulate filter with catalytic converter - vehicles with front-wheel drive	357

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2.7	Removing and installing particulate filter with catalytic converter - vehicles with four-wheel drive	358
2.8	Stress-free alignment of exhaust system	359
2.9	Aligning tailpipes	360
<b>3</b>	<b>Exhaust manifolds and intermediate pipes</b>	<b>362</b>
3.1	Exhaust manifold - exploded view	362
3.2	Removing and installing exhaust manifold (left-side)	363
3.3	Removing and installing exhaust manifold (right-side)	365
3.4	Removing and installing intermediate pipe (left-side)	368
3.5	Removing and installing intermediate pipe (right-side)	370
3.6	Checking exhaust system for leaks	370
<b>4</b>	<b>Exhaust gas temperature control</b>	<b>371</b>
4.1	Removing and installing exhaust gas temperature sender 1 G235 - vehicles with 3.0 ltr. engine	371
4.2	Removing and installing exhaust gas temperature sender 2 for bank 1 G448	372
4.3	Removing and installing temperature sender before particulate filter G506	374
<b>5</b>	<b>Exhaust gas recirculation system</b>	<b>375</b>
5.1	Exhaust gas recirculation system - exploded view	375
5.2	Removing and installing mechanical exhaust gas recirculation valve	376
5.3	Removing and installing exhaust gas recirculation cooler	376



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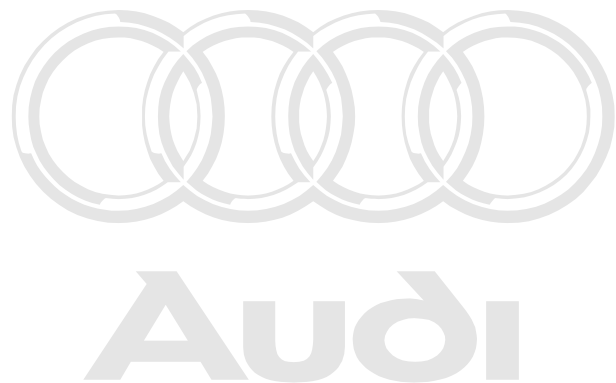
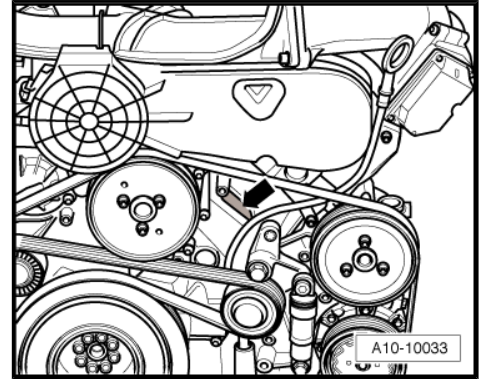
## 00 – Technical data

### 1 Engine number

- ◆ The engine number („engine code“ and „serial number“) can be found at the front below the toothed belt for the high-pressure pump (left-side) -arrow-.
- ◆ There is also a sticker on the intake manifold showing the „engine code“ and „serial number“.
- ◆ The engine code is also included on the vehicle data sticker.

 **Note**

*On some versions the engine number is concealed by an idler roller for the poly-V belt. Removing idler roller for poly V-belt ⇒ [page 104](#).*



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## 2 Engine data

Code letters		ASB	BKN	BPP
Capacity	ltr.	2.967	2.967	2.698
Power output	kW at rpm	171/4000	150/3500 ... 4500	132/3300
Torque	Nm at rpm	450/1400 ... 3250	450/1400 ... 3150	380/1400 ... 3300
Bore	Ø in mm	83.0	83.0	83.0
Stroke	mm	91.4	91.4	83.1
Compression ratio		17.5	17.5	17.5
CN	at least	51	51	51
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes	yes
Exhaust gas temperature control		3 senders	3 senders	2 senders
Turbocharging/supercharging		Turbocharger	Turbocharger	Turbocharger
Glow plugs		Steel glow plugs	Steel glow plugs	Steel glow plugs
Charge air cooling		yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		optional	optional	yes

Code letters		BSG		
Capacity	ltr.	2.698		
Power output	kW at rpm	120/4000		
Torque	Nm at rpm	380/1500		
Bore	Ø in mm	83.0		
Stroke	mm	83.1		
Compression ratio		17.5		
CN	at least	51		
Firing order		1-4-3-6-2-5		
Exhaust gas recirculation		yes		
Exhaust gas temperature control		2 senders		
Turbocharging/supercharging		Turbocharger		
Glow plugs		Steel glow plugs		
Charge air cooling		yes		
Lambda control		1 Lambda probe		
Particulate filter		yes		



### Note


*Audi A4 models with a 2.7 or 3.0 ltr. TDI engine are always equipped with steel glow plugs.*

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### 3 Safety precautions


When working on the fuel system note the following warnings:

 <b>WARNING</b>
<ul style="list-style-type: none"><li>◆ <i>The fuel system is pressurised. Before opening the system place a clean cloth around the connection. Then release pressure by carefully loosening the connection.</i></li><li>◆ <i>Wear protective gloves.</i></li><li>◆ <i>Wear safety goggles.</i></li></ul>

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:
  - Connect vehicle diagnostic, testing and information system - VAS 5051B- .
  - Start „Vehicle self-diagnosis“ mode.
  - Interrogate fault memory.

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 <b>Caution</b>
<p><i>To prevent irreparable damage to the electronic components when disconnecting the battery:</i></p> <ul style="list-style-type: none"><li>◆ <i>Observe notes on procedure for disconnecting the battery.</i></li><li>◆ <i>Always switch off the ignition before disconnecting the battery.</i></li></ul>

- Disconnect battery ⇒ Rep. gr. 27 .

When working on the cooling system note the following warnings:

 <b>WARNING</b>
<p><i>Hot steam/hot coolant can escape - risk of scalding.</i></p> <ul style="list-style-type: none"><li>◆ <i>The cooling system is under pressure when the engine is hot.</i></li><li>◆ <i>To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.</i></li></ul>



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



**WARNING**

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

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

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

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## 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, when working on the fuel supply system, the injection system or the turbocharger, please observe the following basic rules carefully:

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Plug open lines and connections with suitable protective caps immediately.
- ◆ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.

### 4.2 Checking for leaks in the fuel system

- Start the engine and let it run at medium speed for a few minutes.
- Switch off ignition.
- Check the entire fuel system for leaks.
- If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
- Then carry out a road test with at least one full-power acceleration.
- Then check high-pressure part of fuel system again for leakage.

### 4.3 Foreign particles in engine

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

### 4.4 Contact corrosion!

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

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

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



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

**Note the following:**

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

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

Mark 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.

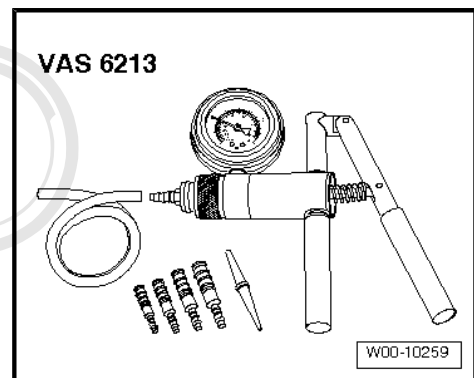
## 4.6 Installing radiators, condensers and charge air coolers

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

## 4.7 Checking vacuum system

### Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-



### Procedure

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

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## 10 – Removing and installing engine

### 1 Removing and installing engine - vehicles with manual gearbox

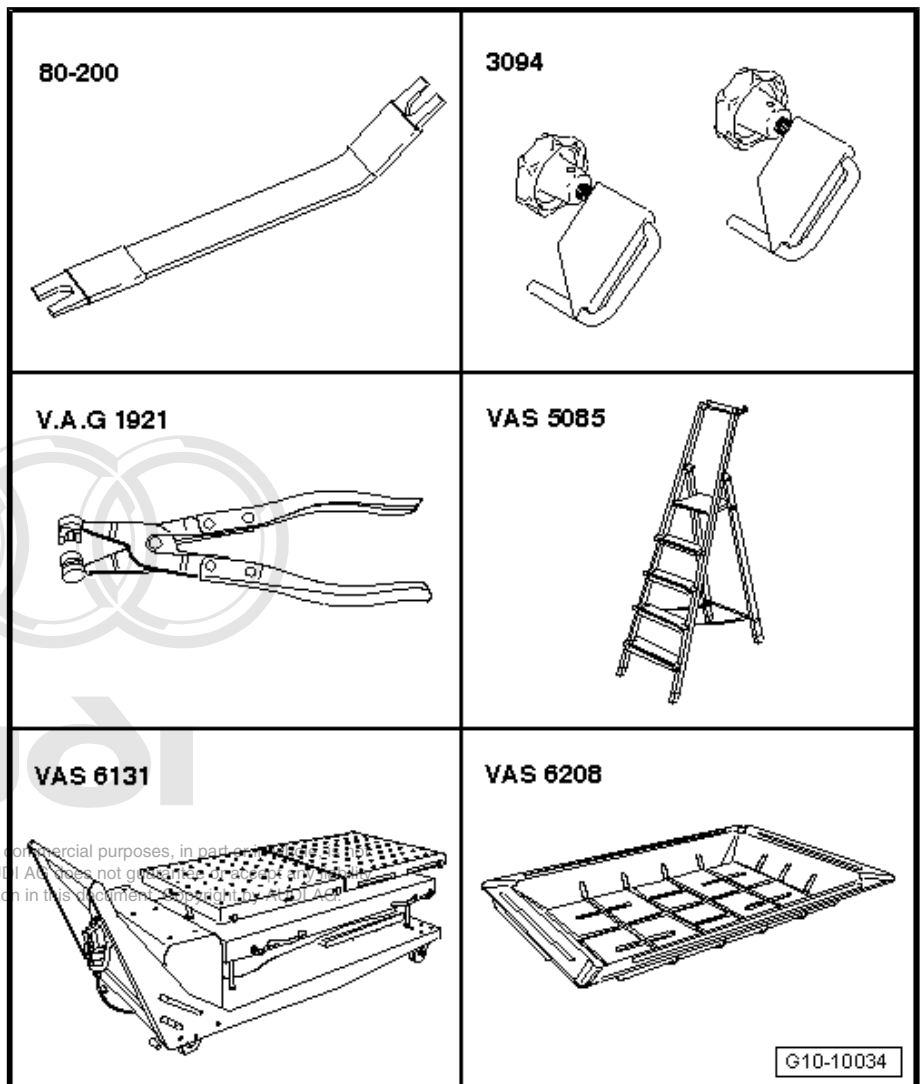
#### Note

- ◆ *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- ◆ *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*
- ◆ *Collect drained coolant in a clean container for re-use or disposal.*

#### 1.1 Removing engine

##### Special tools and workshop equipment required

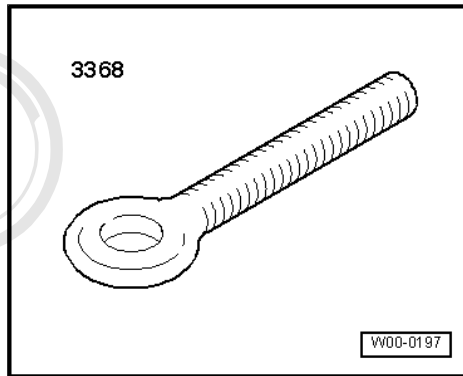
- ◆ Removal lever -80 - 200-
- ◆ Hose clamps for hoses up to 25 mm -3094-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Stepladder -VAS 5085-
- ◆ Scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10-
- ◆ Drip tray for workshop hoist -VAS 6208-



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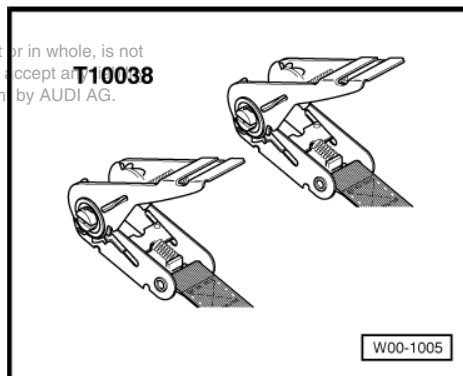


◆ Eye-head bolt -3368-



◆ Tensioning strap -T10038-

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**Note**

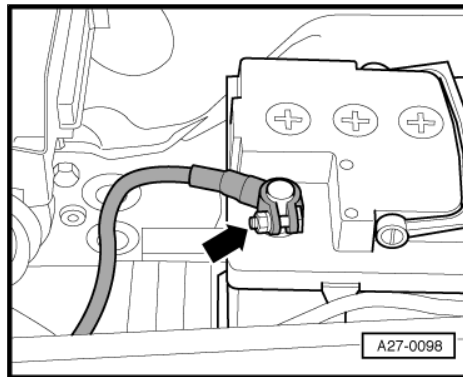
*If the engine is going to be separated from the gearbox (after the entire assembly is removed), you will additionally need supplementary set -VAS 6131/11- and -VAS 6131/12- .*

**Procedure**

- Discharge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a .

**Caution**

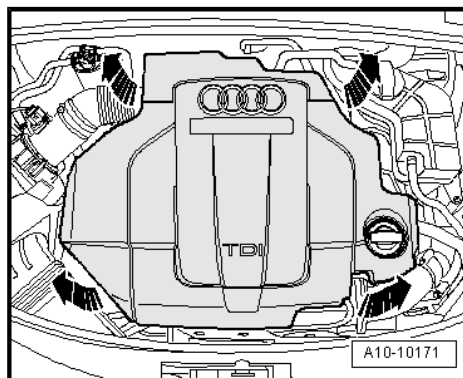
*Observe notes on procedure for disconnecting the battery → Rep. gr. 27 .*



- With ignition switched off, disconnect battery earth cable -arrow-.
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

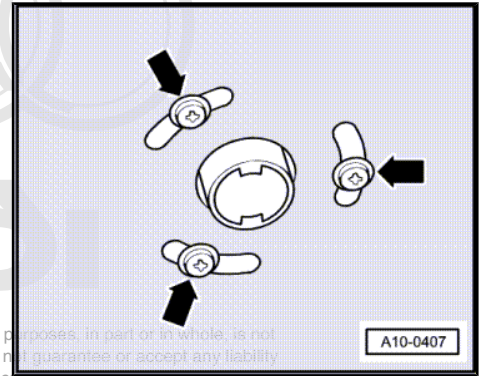
**WARNING**

*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*

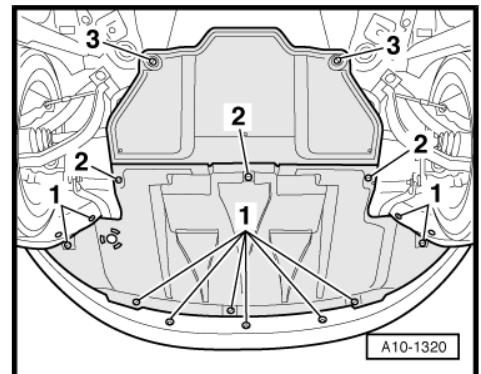


- Open filler cap on coolant expansion tank.

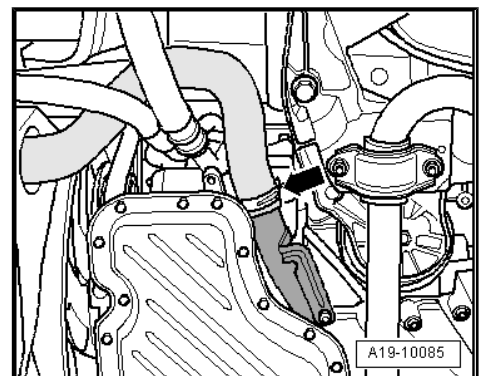
- Remove both front wheels.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.



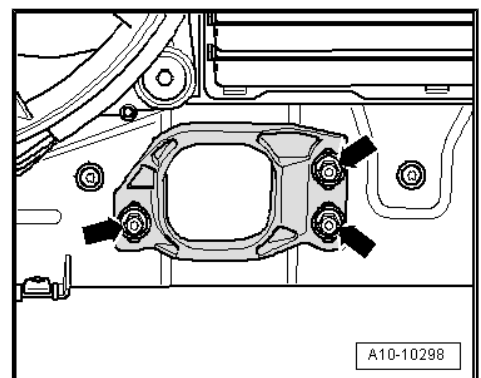
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



- Remove nuts -arrows- on stop for torque reaction support.



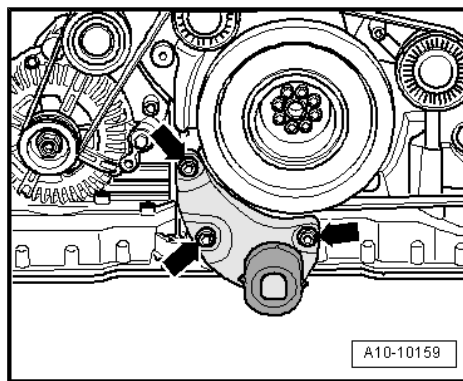


- Unscrew bolts -arrows- and remove torque reaction support together with stop for torque reaction support.

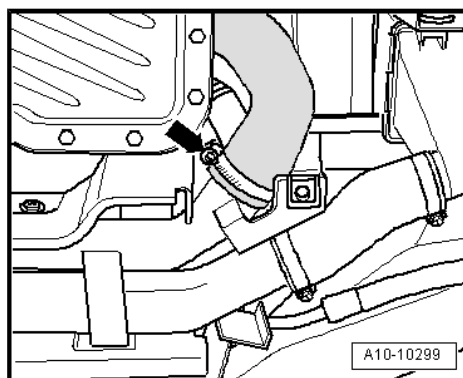


**Note**

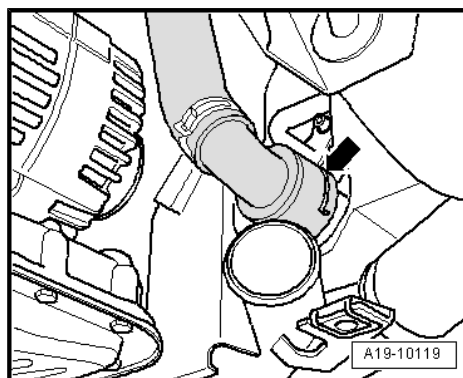
Use a shortened hexagon key to slacken off the bolts.



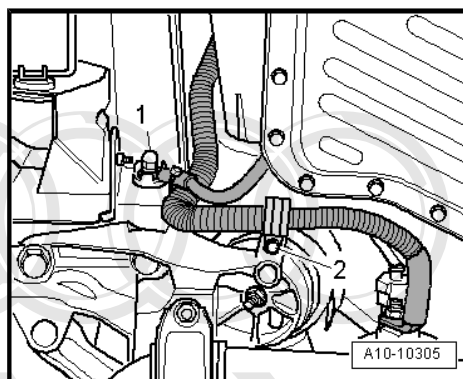
- Disconnect air intake hose -arrow- from air pipe.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Detach coolant hose (bottom right) from radiator -arrow-.



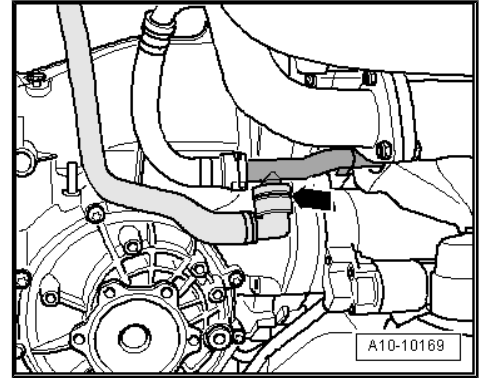
- Unbolt earth cable -1- at longitudinal member (right-side).
- Unbolt retainer -2- from console for engine mounting.



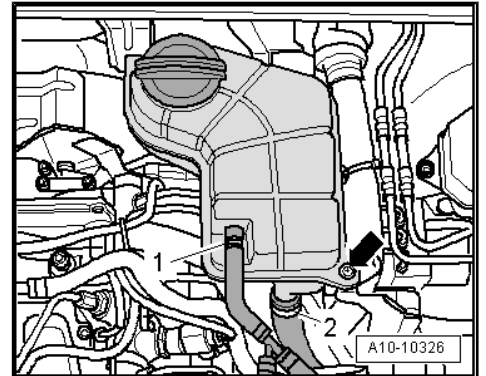
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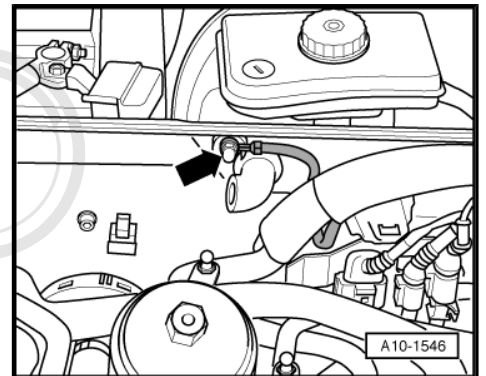
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose from coolant pipe (right-side) -arrow- and drain off remaining coolant.



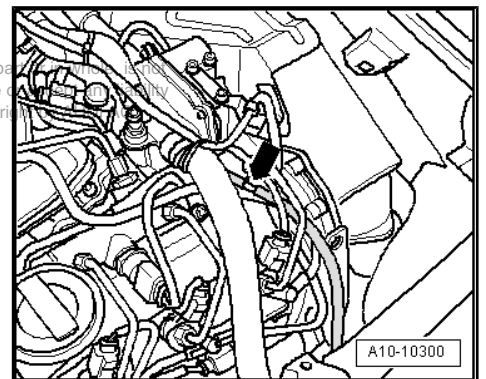
- Disconnect coolant hoses -1- and -2- at coolant expansion tank.
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).



- Unscrew earth connection at plenum chamber partition panel -arrow-.



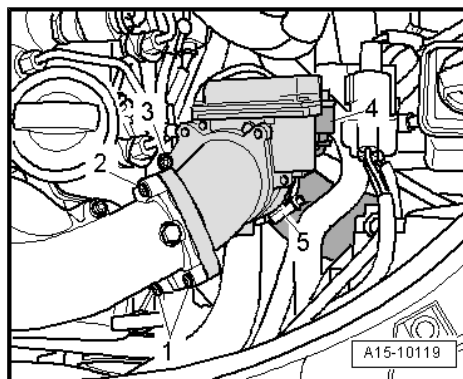
- Disconnect vacuum hose going to vacuum reservoir -arrow-.



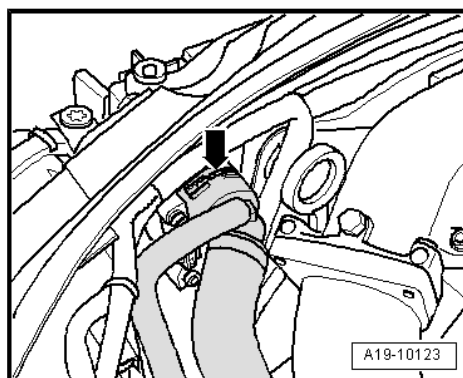
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- Unplug electrical connector -4-.
- Disconnect air intake hose -5-.
- Remove bolts -1 ... 3- and detach throttle valve module -J338- from intake connecting pipe.



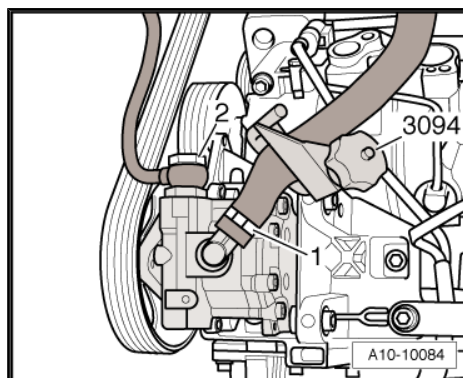
- Disconnect coolant hose at top left of radiator -arrow-.



**Note**

*Lay a cloth under the hydraulic lines to catch any escaping hydraulic fluid.*

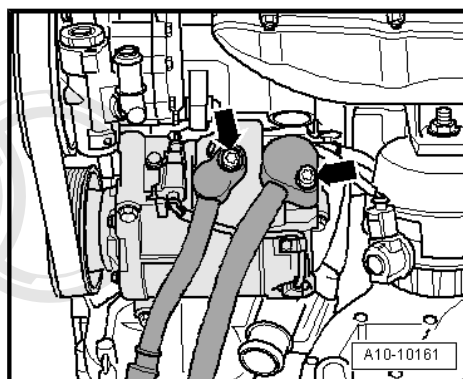
- Clamp off hydraulic hose for power steering pump using a hose clamp -3094- .
- Disconnect hydraulic hose -1- from power steering pump.
- Disconnect hydraulic pressure line -2- from power steering pump and lay aside on top of longitudinal member.



**Note**

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

- Remove bolts -arrows-.



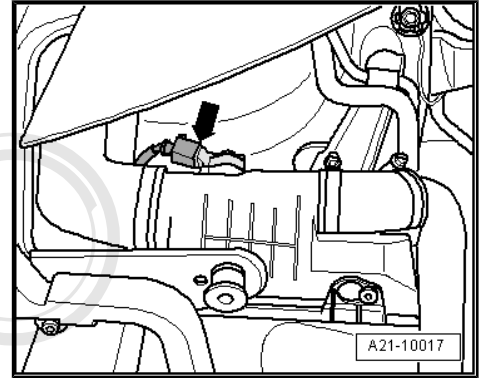
**Note**

*The refrigerant lines are disconnected from the air conditioner compressor at a later stage.*

- Unplug electrical connector -arrow- for charge pressure sender -G31- at charge air cooler (left-side).

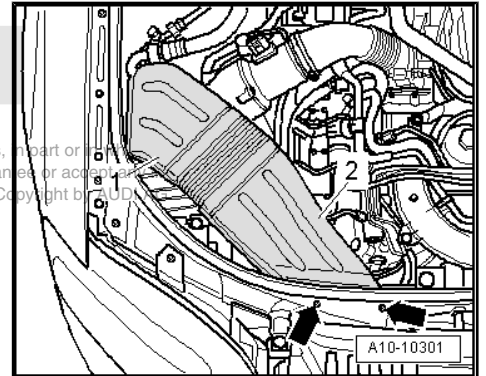
 **Note**

*Shown in illustration with headlight removed.*

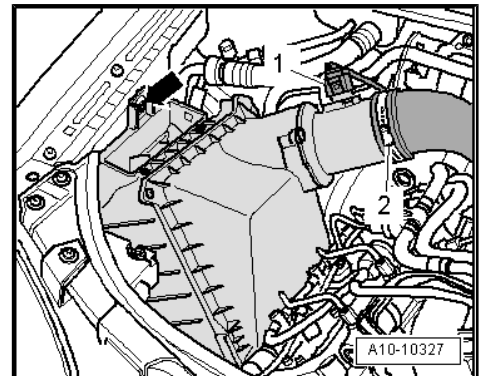


- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.

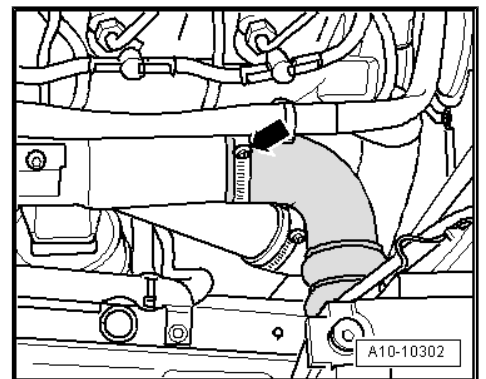
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- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake hose -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



- Disconnect air intake hose -arrow- from air pipe.





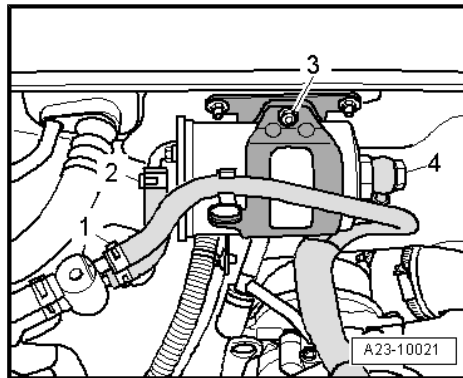
- Lay a clean cloth under the separating point to catch escaping fuel.



**Caution**

Observe rules for cleanliness when working on the injection system ⇒ **page 5**.

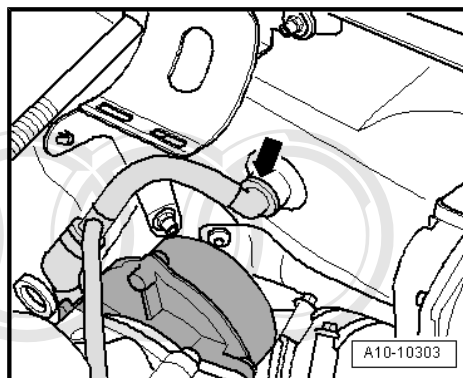
- Disconnect fuel return hose -1-.
- Unbolt fuel supply hose -4- from fuel filter.
- Unscrew retaining nut -3-, open retainer and place fuel filter to one side.



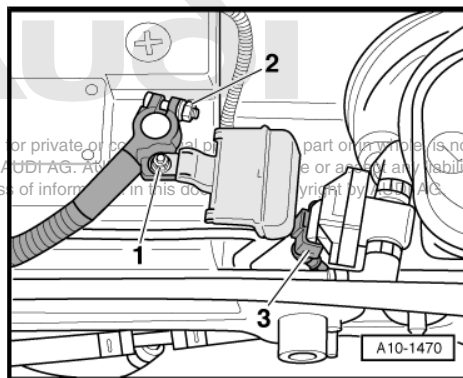
**Note**

Disregard -item 2-.

- Detach vacuum hose going to brake servo -arrow- at plenum chamber partition panel.



- Unscrew nut -1- and detach strip fuse at positive terminal.
- Disconnect positive cable -2- at positive battery terminal.
- Pull out positive cable forwards through plenum chamber partition panel.
- Move wiring harness clear and place on top of engine.



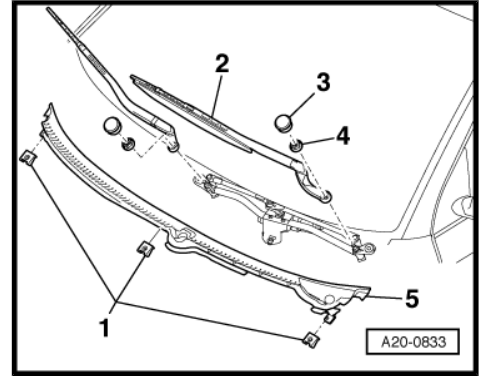
**Note**

Disregard -item 3-.

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

 **Note**

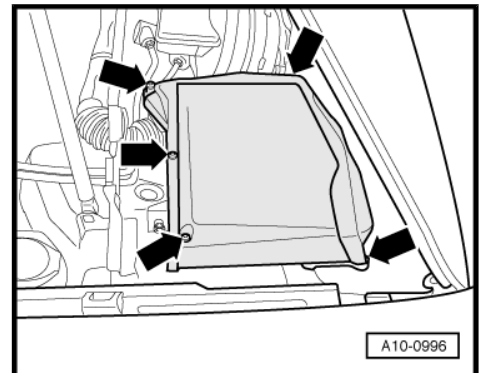
Use puller (commercially available) to remove wiper arm if necessary.



 **Caution**

To avoid cracking the cowl panel trim -5- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel trim and pull the trim vertically up out of the windscreen surround, starting from the edge of the windscreen.

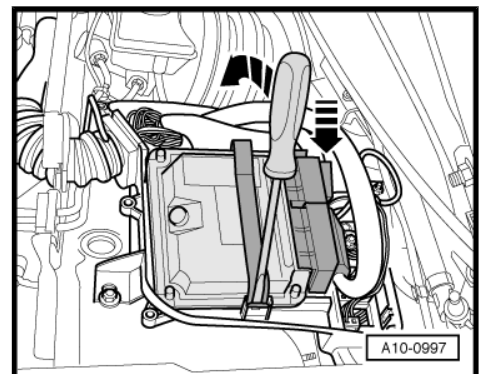
- Pull off retaining clips -1- and detach cowl panel trim -5-.
- Remove cover for electronics box in plenum chamber -arrows-.



- Using a screwdriver, carefully lever out retaining strap -arrow- and remove engine control unit from electronics box.

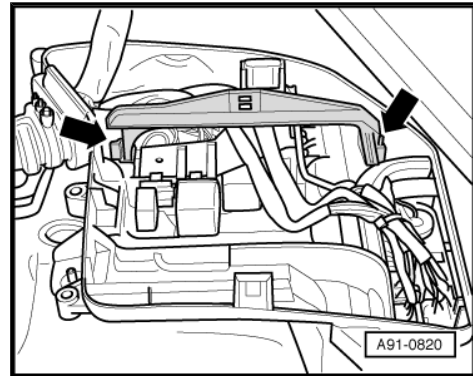
 **Note**

The engine control unit remains connected to the wiring harness.

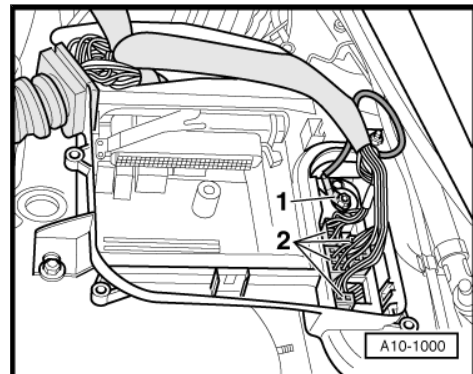




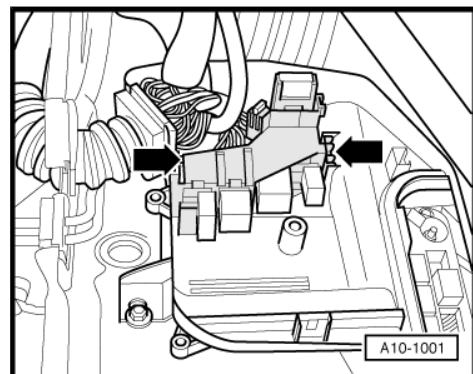
- Release retaining hooks -arrows- outwards and remove retaining strap.



- Unplug all electrical connectors at connector point -2-.
- Unscrew electrical wiring -1-.
- Move wiring harness clear.



- Release retainers -arrows- and push auxiliary relay carrier in electronics box upwards to remove.
- Disengage engine wiring harness at electronics box and at plenum chamber partition panel.



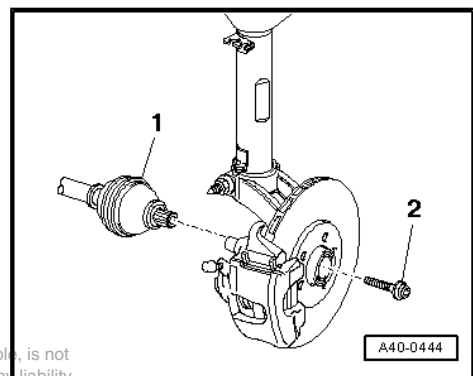
- Have a 2nd mechanic press the brake pedal.



**Caution**

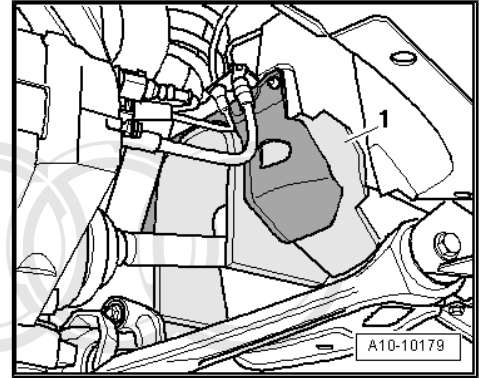
*When slackening the flange bolt securing the drive shaft, the wheel bearing must not be under load (vehicle must not be standing on its wheels).*

- Unscrew flange bolt -2- from drive shaft -1- (left and right).



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- Remove noise insulation -1- in wheel housing (left and right).

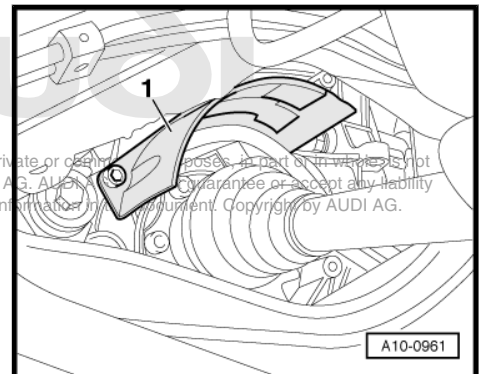


- Unbolt heat shield -1- for drive shaft (left-side).
- Unbolt drive shafts (left and right) from gearbox flange shafts.

**i** Note

*The drive shafts are removed at a later stage.*

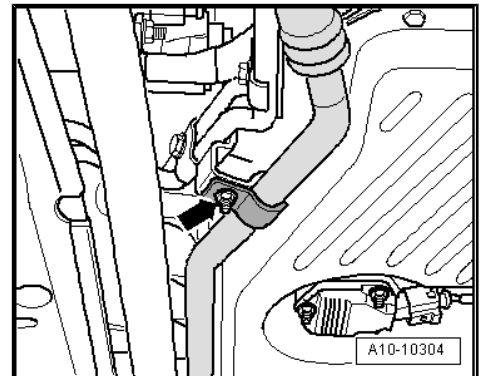
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**i** Note

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

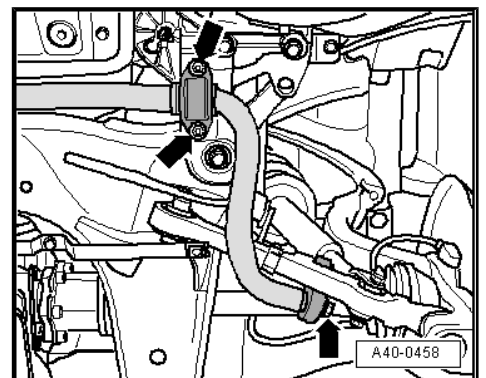
- Unbolt retainer for refrigerant pipe (right-side) from sump -arrow-.
- Detach refrigerant lines from AC compressor.
- Tie up refrigerant line leading to reservoir (right side of vehicle) to body.



**i** Note

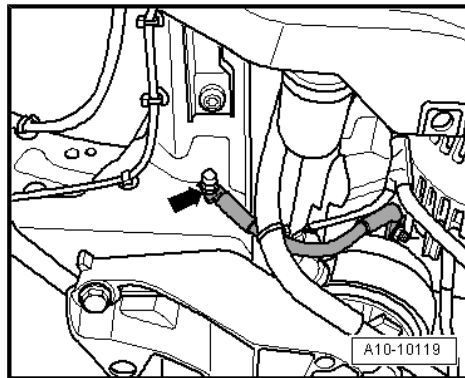
*Seal open pipes and connections at air conditioner compressor with suitable caps (to prevent ingress of dirt and moisture).*

- Unscrew nuts and bolts -arrows- evenly on both sides of vehicle.
- Take out anti-roll bar.

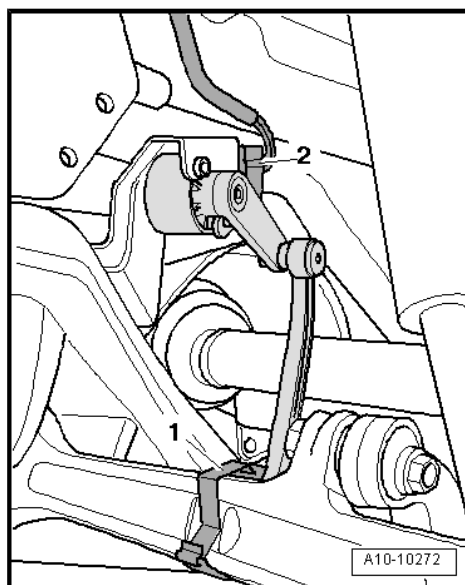




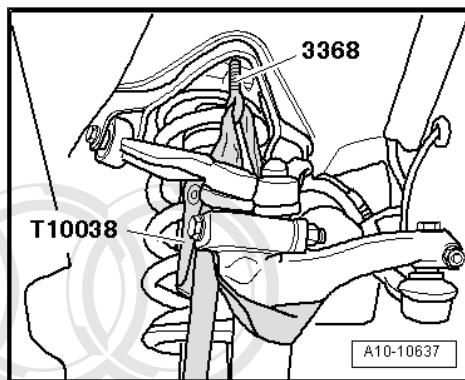
- Unbolt earth cable -arrow- at longitudinal member (right-side).



- If fitted, unplug electrical connector -2- at front left vehicle level sender -G78- .
- Unclip retaining clip -1- on operating rod for front left vehicle level sender -G78- at track control link (bottom).



- Working from engine compartment, remove outer securing bolt for suspension strut on both sides of vehicle.
- Screw eye-head bolt -3368- from below into bore in suspension turret on both sides of vehicle.



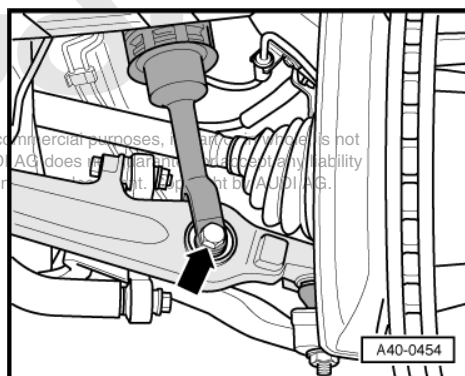
**Caution**

*To avoid damaging the bonnet when it is shut, screw in eye-head bolt -3368- only until it is flush with the top surface of the suspension turret.*

- Tie up wheel bearing housing on each side using tensioning strap -T10038- as illustrated.

**Caution**

*To prevent damage to the joints on the upper links, the weight of the wheel bearing housings must be supported before slackening the bottom securing bolts for the suspension struts.*



- Unbolt suspension strut from track control link -arrow-.



- Unscrew nuts -1- and -2- on bolt connections securing track control link and guide link.

 **Note**

*The bolts are removed from the subframe at a later stage.*

- Repeat procedure on other side of vehicle.

**Vehicles without particulate filter:**

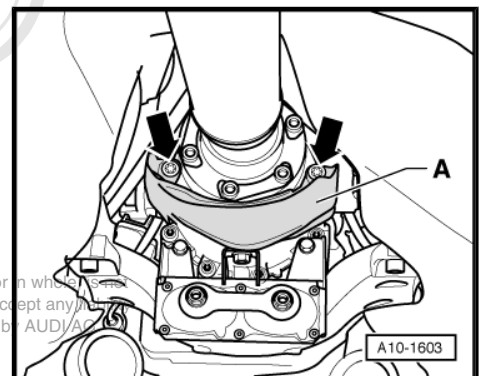
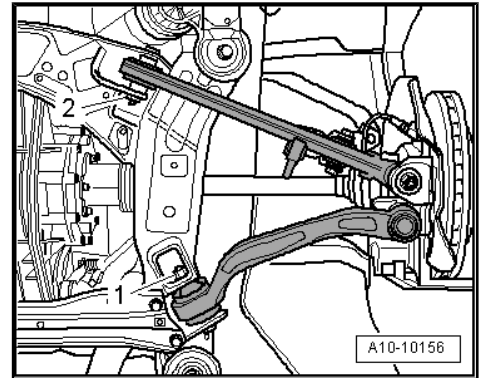
- Remove front exhaust pipe together with catalytic converter ⇒ [page 338](#) .

**Vehicles with particulate filter:**

- Remove front exhaust pipe ⇒ [page 355](#) .
- Remove particulate filter ⇒ [page 358](#) .

**All vehicles (continued):**

- Unscrew heat shield -A- for propshaft -arrows-.
- Unscrew bolts at gearbox/propshaft flange.
- Push propshaft back towards rear final drive. The constant velocity joints can be moved axially.
- Tie up propshaft to body.



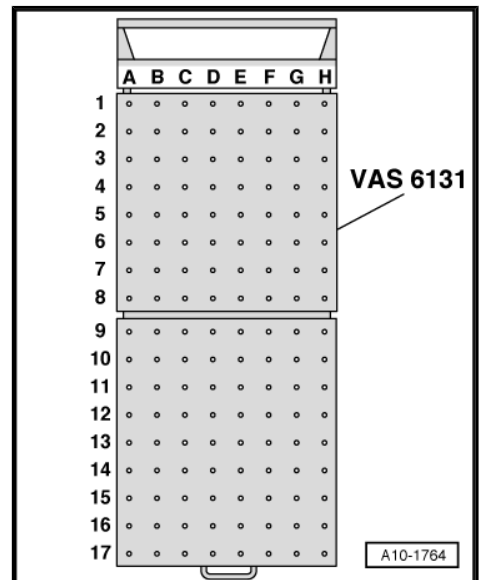
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**Set up the scissor-type assembly platform as follows:**

- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- as follows:

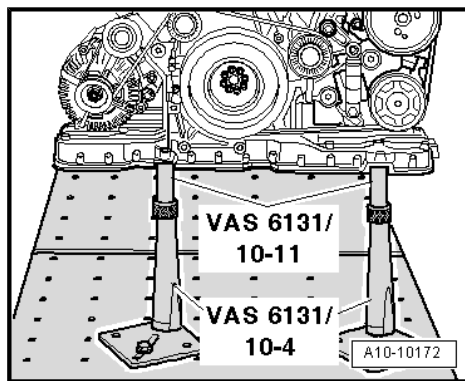
Platform coordinates	Parts from support set for Audi -VAS 6131/10-			
B3	/10-1	/10-4	/10-5	/10-11
F3	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
C15	/10-1	/10-3	/10-5	/10-7
F15	/10-1	/10-3	/10-5	/10-7

- Initially tighten the support elements on the assembly platform only hand-tight.
- Adjust the scissor-type assembly platform -VAS 6131 A- so that it is horizontal.
- Take note of spirit level (bubble gauge).
- Place scissor-type assembly platform -VAS 6131 A- under engine/gearbox assembly.

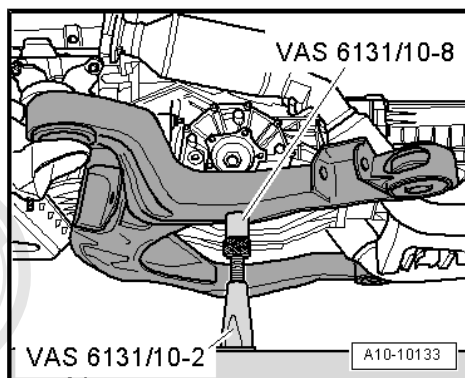




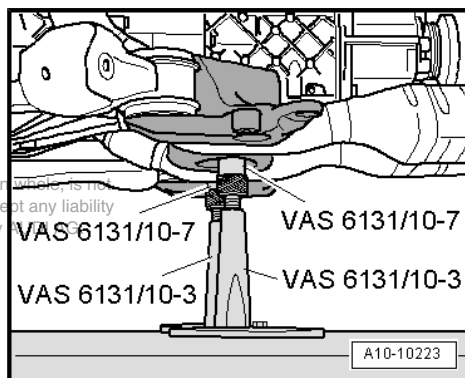
- Position support elements from -VAS 6131/10- at front of engine, as shown in illustration.
- Make sure that threaded spindles are screwed in completely.



- Position support elements from -VAS 6131/10- at left and right of subframe, as shown in the illustration.



- Position the support elements from -VAS 6131/10- at left and right of tunnel cross member, as shown in the illustration.
- Turn all spindles for the support elements upwards until all locating lugs make contact with the mounting points.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A-



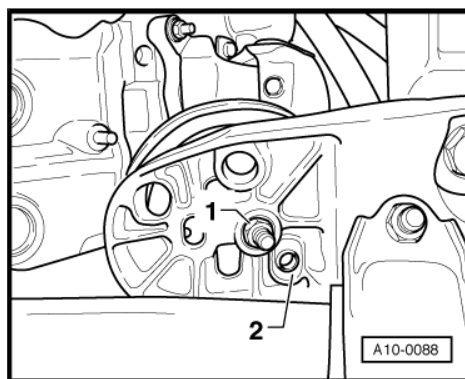
- Mark positions of bolt connection -1- and locating sleeve -2- on bottom of engine mounting (right-side).



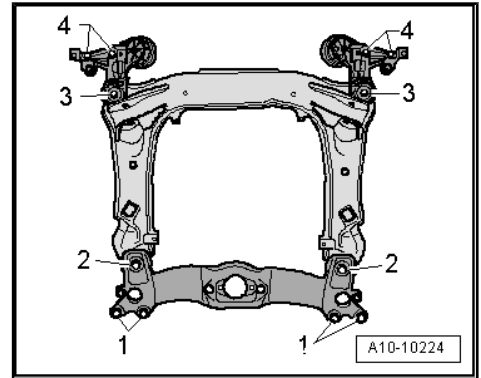
**Note**

*Different mounting holes are provided for the different engine versions.*

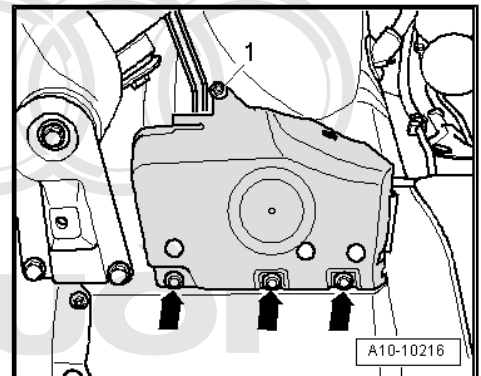
- Unscrew nuts -1- (bottom) at engine mountings (left and right).



- Mark the installation position of the subframe and the two consoles for engine mountings on the longitudinal members with a felt-tip pen.
- Unscrew bolts -1 ... 4- in diagonal sequence and in stages.
- Take out consoles for engine mounting (left and right).

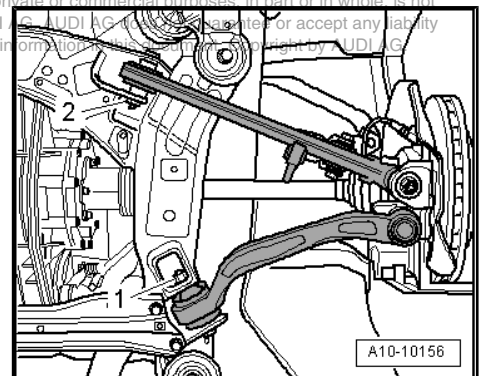


- Detach rear section of wheel housing liner => Rep. gr. 66 .
- Remove fasteners -arrows-.
- Unscrew nut -1- and remove cover behind wheel housing.




- Remove bolts for guide link -1- and track control link -2- from subframe.

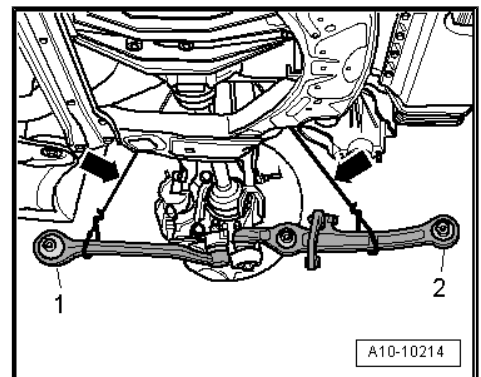
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- Pivot guide link -1- and track control link -2- outwards.

 **Caution**

*The guide link and track control link must not be allowed to hang down without support. Tie up both links to wheel bearing housing as illustrated -arrows-.*



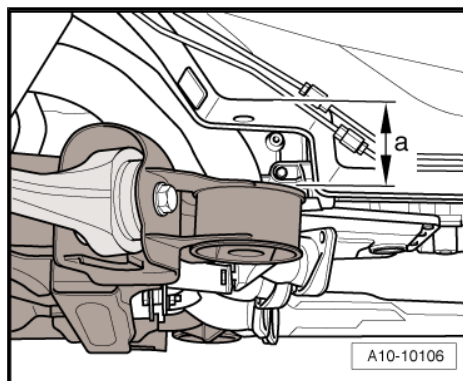
- Pivot wheel bearing housing outwards and remove drive shaft.
- Repeat procedure on other side of vehicle.

 **Note**

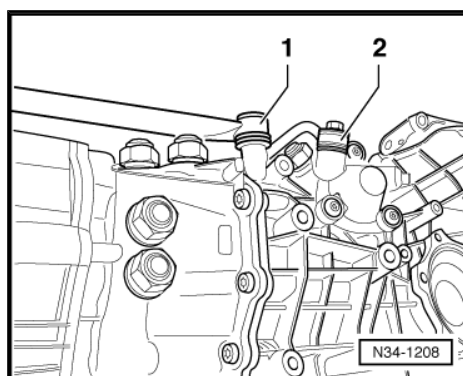
- ◆ Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.
- ◆ Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering to avoid damage.



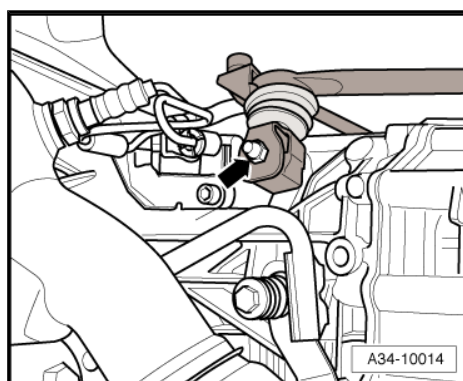
- Lower the engine/gearbox assembly using scissor-type assembly platform -VAS 6131 A- initially only as far as distance -a-.
- Dimension -a- = max. 60 mm.



- Unscrew connecting rod -2- of selector rod.
- Unscrew hexagon socket head bolt for push rod -1-.

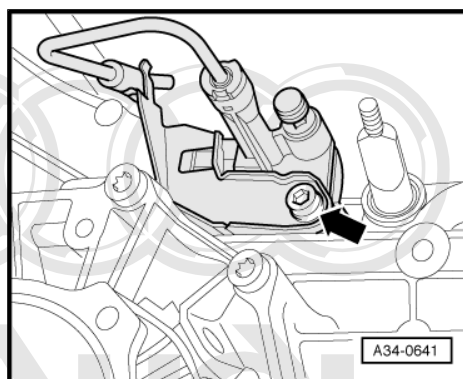


- Unscrew nut -arrow- and pull gearbox selector lever off selector shaft.



- Remove clutch slave cylinder -arrow-. Do not open pipes.
- Tie up clutch slave cylinder together with selector linkage.

**⚠ Caution**  
*Do not press clutch pedal after removing slave cylinder. The slave cylinder will be irreparably damaged if a force of more than approx. 300 N is applied to the clutch pedal.*



- Lower engine/gearbox assembly.
- Pull out scissor-type assembly platform -VAS 6131 A- with engine/gearbox assembly from beneath vehicle.

## 1.2 Separating engine from manual gearbox

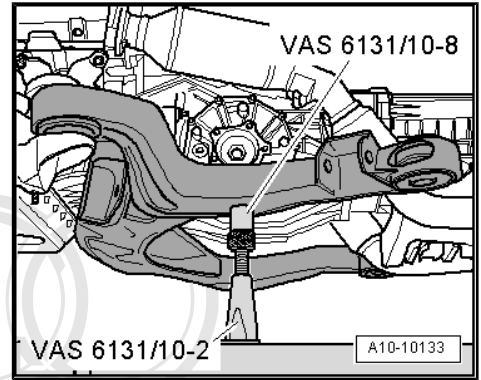
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### Special tools and workshop equipment required

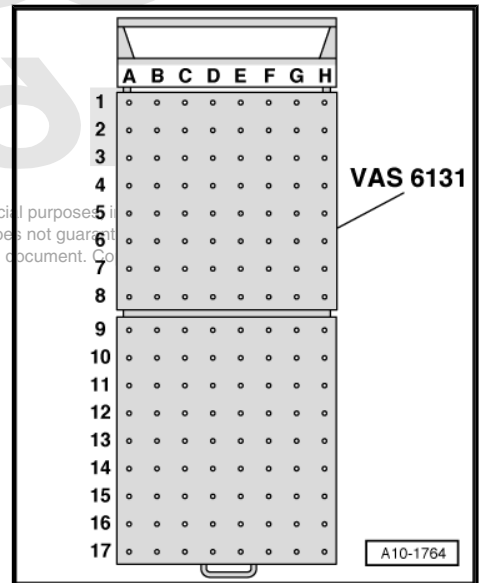
- ◆ Support set for Audi -VAS 6131/10-, supplementary set -VAS 6131/11- and -VAS 6131/12-

**Procedure**

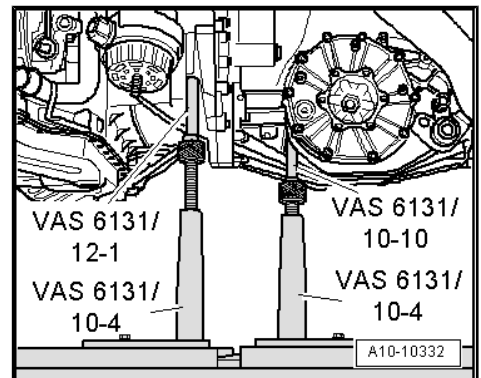
- Engine/gearbox assembly removed and secured to scissor-type assembly platform -VAS 6131 A-
- Screw down spindles of support elements from -VAS 6131/10- (left and right) at subframe as far as possible.
- Remove locating lugs from spindles.
- Remove subframe to the side.
- Unscrew the two base plates for support elements (for subframe) on scissor-type assembly platform -VAS 6131 A- .
- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- , support set -VAS 6131/11- and supplementary set -VAS 6131/12- as follows:



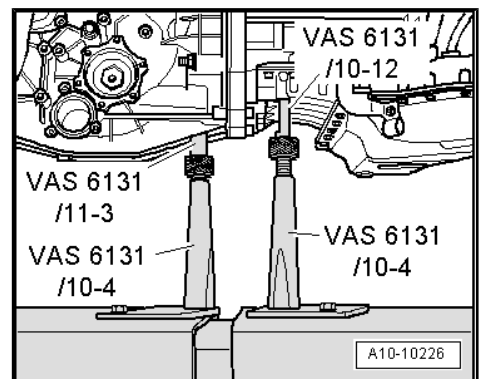
Platform coordinates	Parts of support set for Audi -VAS 6131/10- , support set -VAS 6131/11- and supplementary set -VAS 6131/12-			
B3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
F3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
B7	/10-1	/10-4	/10-5	/12-1
F7	/10-1	/10-4	/10-5	/10-12
C10	/10-1	/10-4	/10-5	/10-10
F10	/10-1	/10-4	/10-5	/11-3
C15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
F15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
• <sup>1)</sup> Support elements remain unchanged.				



- Position support elements from -VAS 6131/10- and -VAS 6131/12- on left side of engine/gearbox assembly, as shown in illustration.

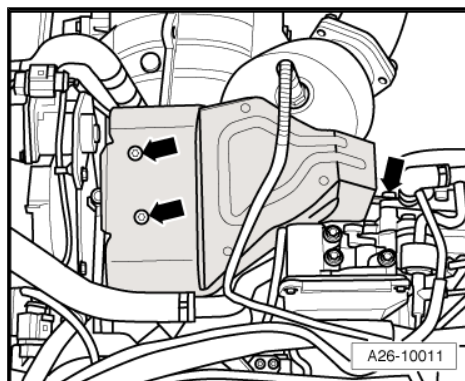


- Place support elements from -VAS 6131/10- and -VAS 6131/11- at right of engine/gearbox assembly, as shown in illustration.
- Turn spindles for the support elements upwards until all locating lugs make contact with the mounting points.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .

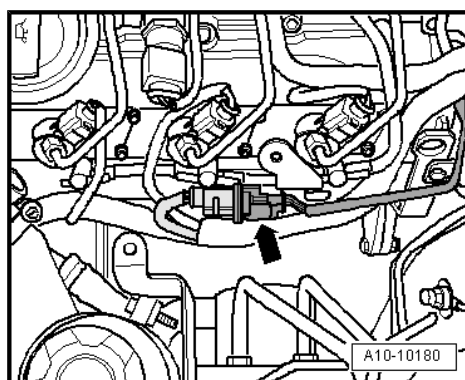




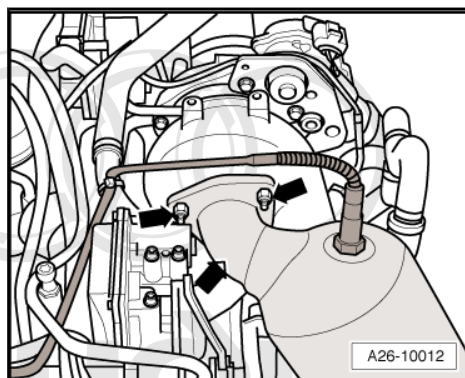
- Remove heat shield for turbocharger -arrows-.



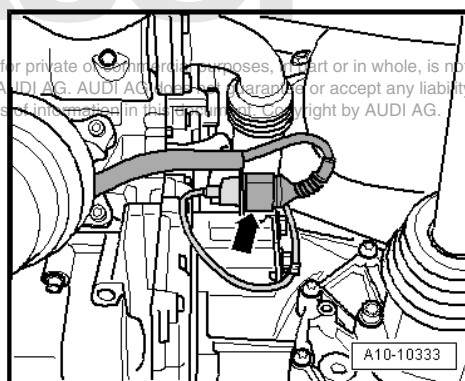
- If fitted: unplug electrical connector -arrow- for Lambda probe -G39- and move wiring clear.



- Unscrew nuts -arrows- and remove starter catalytic converter.

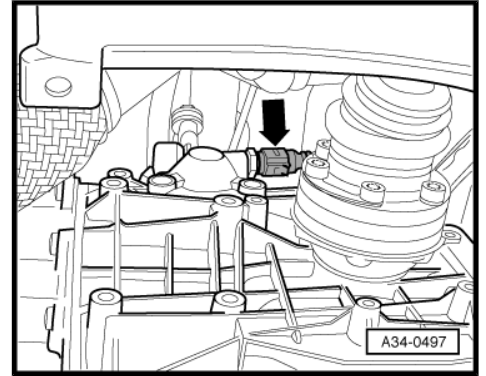


- Unplug electrical connector -arrow- for engine speed sender -G28- and move wiring clear.

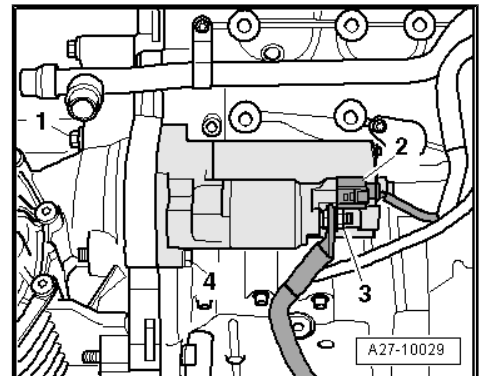


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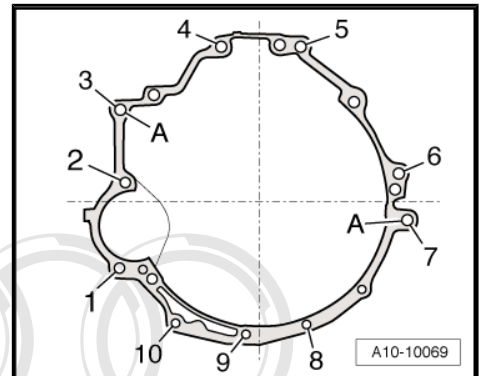
- Unplug electrical connector -arrow- for reversing light switch - F4- on right side of gearbox.



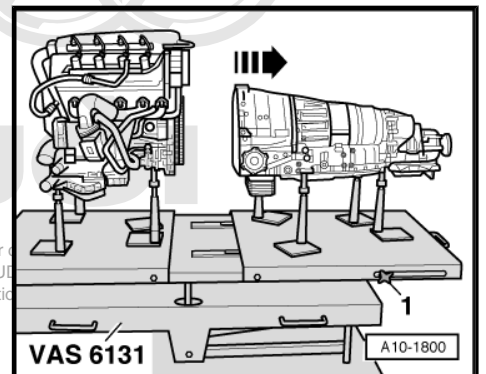
- Detach electrical wires -2- and -3- at starter.
- Unscrew bolt -1- and nut -4- and remove starter.



- Remove engine/gearbox securing bolts -3 ... 10-.



- Loosen clamping bolts -1- on sides of scissor-type assembly platform -VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



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## 1.3 Installing engine



### Note

- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Renew bolts which are tightened to a specified angle as well as seals, gaskets and O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Install engine supports.
- When fitting a new clutch plate together with a used pressure plate (self-adjusting clutch), the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If this is not done, the pressure plate will operate with reduced clamping force, causing clutch slip ⇒ Rep. gr. 30 .



### Note

- ◆ *If the clutch plate is not being replaced, it is not necessary to reset the adjuster ring.*
- ◆ *New SAC pressure plates are already pre-set accordingly, and do not have to be reset.*
- Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines -G 000 100- to the splines. Do not lubricate guide sleeve.
- Make sure that clutch plate is properly centred.
- Check clutch release bearing for wear and make sure that plastic ring is securely seated; renew clutch release bearing if necessary ⇒ Rep. gr. 30 .
- Check whether dowel sleeves for centring the engine/gearbox assembly are fitted in the cylinder block; install dowel sleeves if necessary.
- Press intermediate plate between engine and gearbox onto dowel sleeves.
- Bolt gearbox to engine.



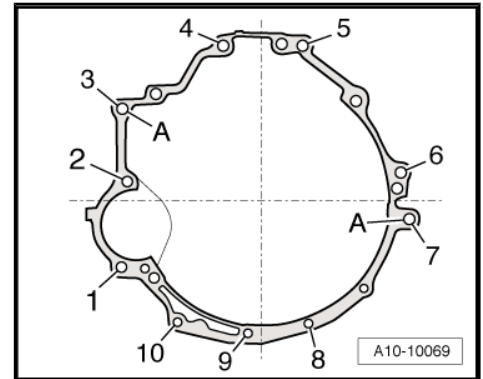
 **Note**

- ◆ *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 %.*

**Securing engine to gearbox**

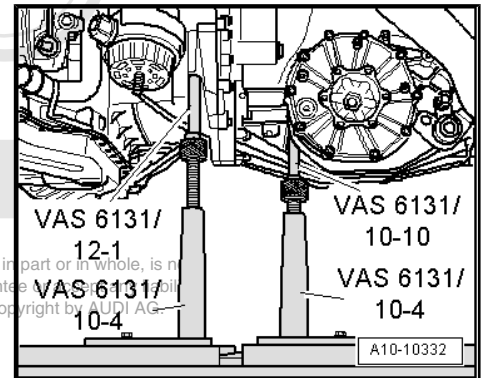
Item	Bolt	Nm
1, 2	M12x135	65 <sup>1)</sup>
3, 4, 5	M12x105	65
6, 7	M12x120	65
8, 9, 10	M10x80	45
A	Dowel sleeves for centralising	

• <sup>1)</sup> Property class 10.9.

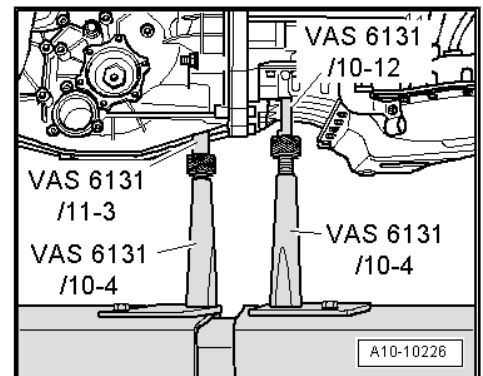


Remaining installation steps are carried out in reverse sequence; note the following:

- Install starter catalytic converter: vehicles without particulate filter => [page 334](#) , vehicles with particulate filter => [page 350](#) .
- The threaded holes in the flange shaft for the propshaft on the gearbox must be cleaned of remaining locking fluid with a thread tap before assembling.
- Screw down spindles of support elements on left side of engine/gearbox assembly.
- Unscrew both base plates for support elements (left-side) at scissor-type assembly platform -VAS 6131 A- .



- Screw down spindles of support elements on right side of engine/gearbox assembly.
- Unscrew both base plates for support elements (right-side) at scissor-type assembly platform -VAS 6131 A- .



 **Note**

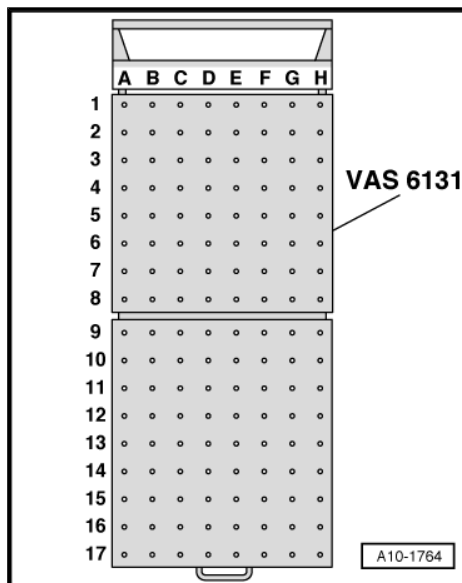
*The mounting points for engine (front) and tunnel cross member remain unchanged.*



- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- as follows:

Platform coordinates	Parts from support set for Audi -VAS 6131/10-			
B3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
F3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8 <sup>2)</sup>
G10	/10-1	/10-2	/10-5	/10-8 <sup>2)</sup>
C15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
F15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7

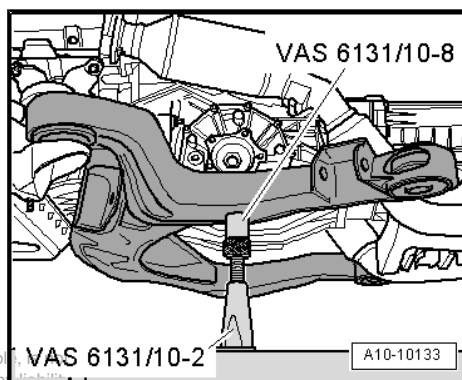
- <sup>1)</sup> Support elements remain unchanged.
- <sup>2)</sup> Secure support elements only after installing the sub-frame.



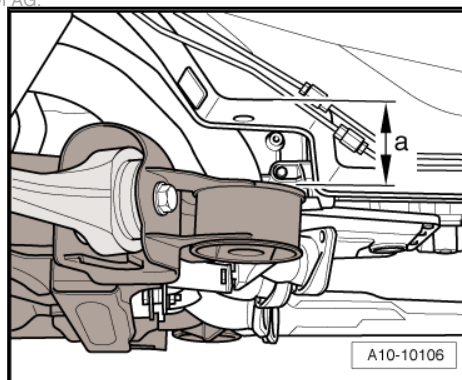
- Fit subframe onto the two support elements -VAS 6131/10-8- .
- Screw up the spindles for support elements on both sides.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .



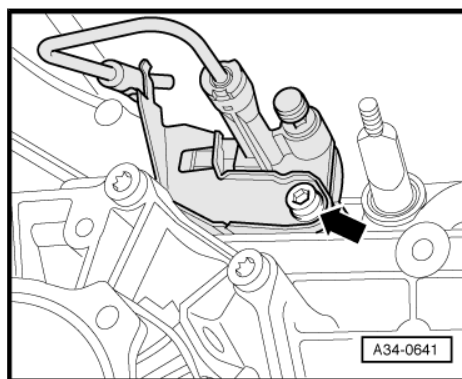
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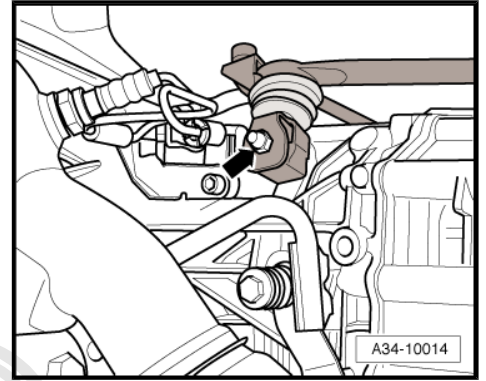
- Slowly guide engine/gearbox assembly with subframe into body from below using scissor-type assembly platform -VAS 6131 A- until distance between subframe and body is -a-.
- Dimension -a- = max. 60 mm.



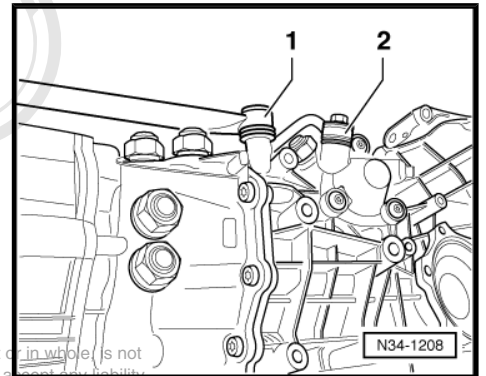
- Secure slave cylinder with new bolt -arrow-; procedure => Rep. gr. 30 .



- Install gearbox selector lever -arrow-.



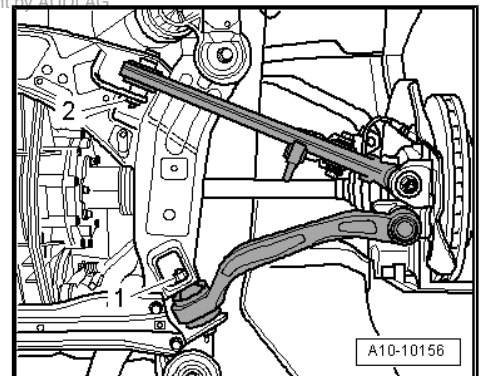
- Secure connecting rod -2- of selector rod.
- Screw in hexagon socket head bolt for push rod -1-.



- Insert drive shafts in splines of wheel bearing housing (left and right).
- Bolt guide link -1- and track control link -2- loosely onto sub-frame.

 **Note**

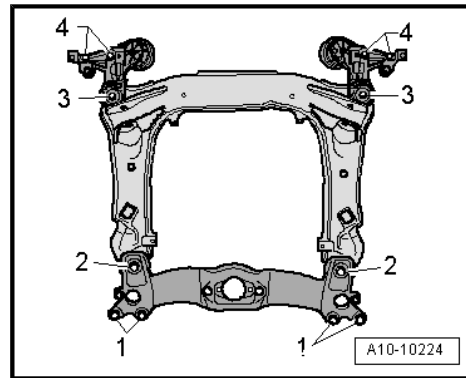
*Wait until vehicle is standing on ground before tightening bolts to final setting.*





- Raise subframe via scissor-type assembly platform - VAS 6131 A- until subframe makes contact with body.
- Adjust the subframe, consoles for engine mountings and tunnel cross member according to the markings made on the longitudinal members during removal.
- Only tighten bolts for subframe, consoles for engine mountings and tunnel cross member to specified torque (do not turn further); tighten bolts to final setting only after performing wheel alignment check.

- 1 - 65 Nm
- 2 - 115 Nm
- 3 - 115 Nm
- 4 - 75 Nm



**WARNING**

*The vehicle must not be driven at this stage.*

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

- Install propshaft ⇒ Rear final drive 01R and 0AR; Rep. gr. 39 .

**Vehicles without particulate filter:**

- Install front exhaust pipe together with catalytic converter ⇒ [page 338](#) .
- Align exhaust system so it is free of stress ⇒ [page 340](#) .

**Vehicles with particulate filter:**

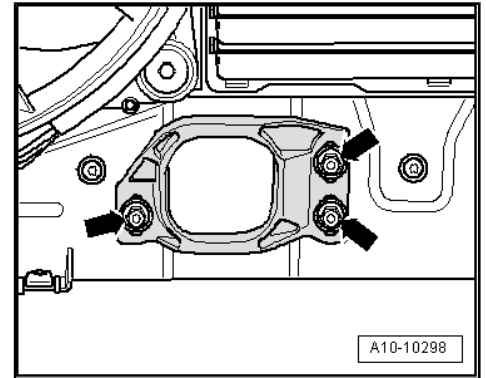
- Install particulate filter ⇒ [page 358](#) .
- Install front exhaust pipe ⇒ [page 355](#) .
- Align exhaust system so it is free of stress ⇒ [page 359](#) .

**All vehicles (continued):**

- Install refrigerant lines ⇒ Rep. gr. 87 .
- Install drive shafts ⇒ Rep. gr. 40 .
- Install guide links, track control links, anti-roll bar and suspension struts ⇒ Rep. gr. 40 .

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- Install stop for torque reaction support and torque reaction support.
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten nuts -arrows-.
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe notes on procedures required after connecting battery ⇒ Rep. gr. 27 .



**Caution**

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

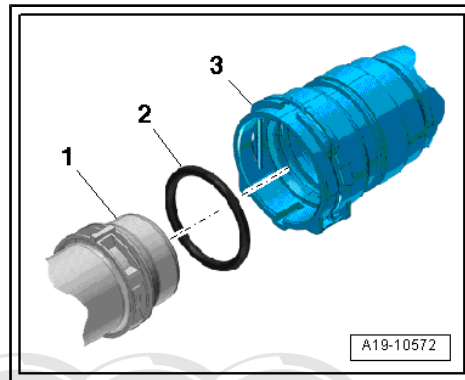
- Install and adjust wiper arms ⇒ Rep. gr. 92 .
- Check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .



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- Remove old O-ring -2- from coolant hose -3-.
- Lubricate new O-ring with coolant additive and fit O-ring in coolant hose.
- Press coolant hose onto radiator -1- until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.
- Fill cooling system ⇒ [page 255](#) .



**Note**

- ◆ *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- ◆ *Contaminated or dirty coolant must not be used again.*
- Before starting engine, top up hydraulic fluid in power steering reservoir and bleed steering system ⇒ Rep. gr. 48 .



**Note**

*The power steering pump must not be run when dry.*

- Adjust subframe and the two consoles for engine mountings ⇒ Rep. gr. 40 .
- Perform wheel alignment check ⇒ Rep. gr. 44 .



**WARNING**

***Tighten bolts for subframe to final setting after performing wheel alignment check.***

- Charge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a .
- Check fuel system for leaks ⇒ [page 5](#) .

**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 %.*

Component		Nm
Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Except for the following:		
Terminal B+ to starter		16
Engine support to cylinder block		40
Console for engine mounting to longitudinal member		75
Engine mounting to console for engine mounting		23
Drive shaft heat shield to gearbox		23
Torque reaction support to engine		40
Stop for torque reaction support to lock carrier		28
Hydraulic pressure pipe to power steering pump		47
Throttle valve module -J338- to intake manifold		9
Hose clips (9 mm wide)		3
Hose clips (13 mm wide)		5.5

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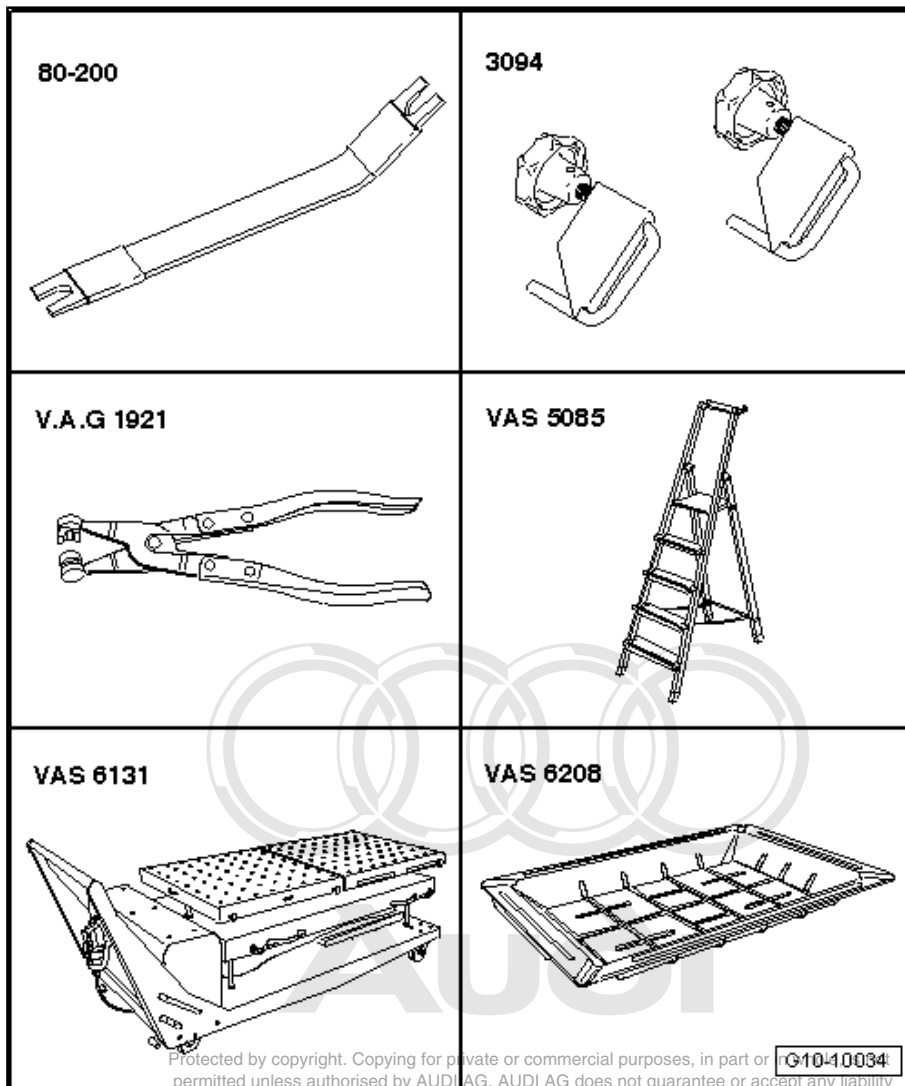


## 2 Removing and installing engine - vehicles with multitronic gearbox

### 2.1 Removing engine

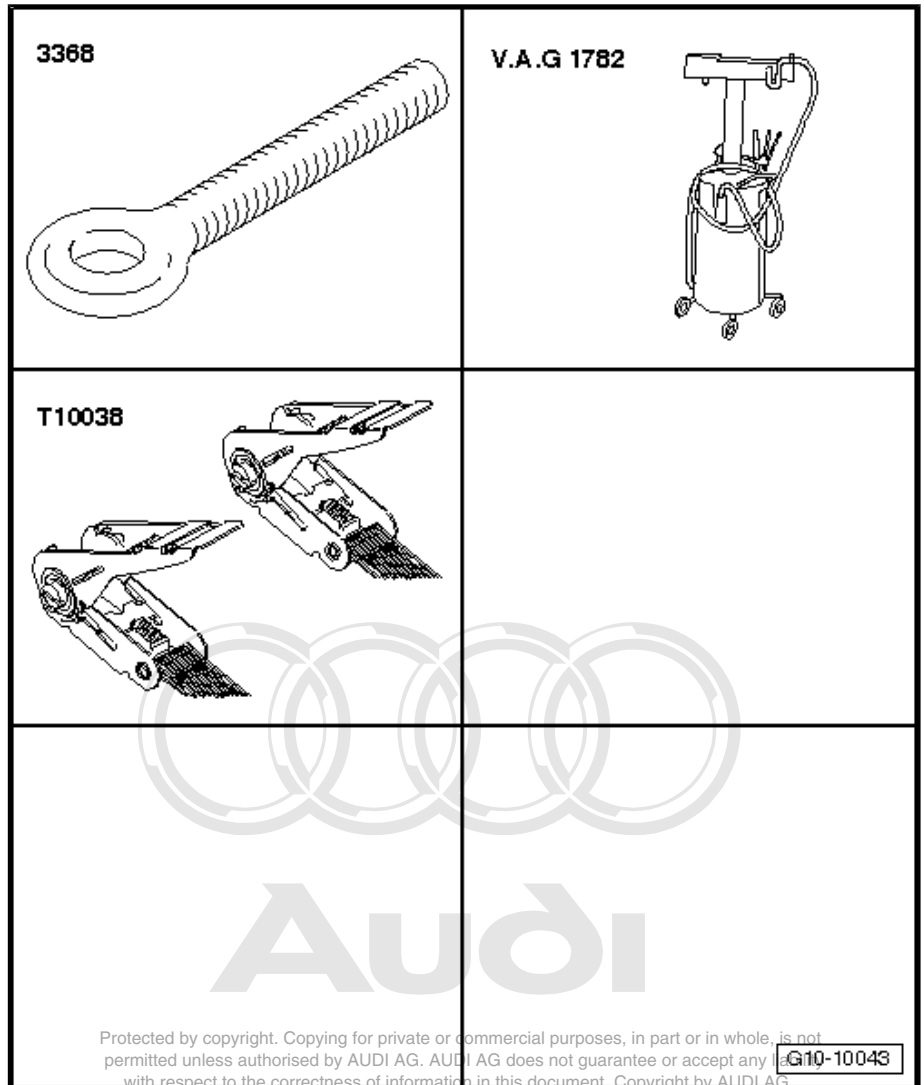
#### Special tools and workshop equipment required

- ◆ Removal lever -80 - 200-
- ◆ Hose clamps up to Ø 25 mm -3094-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Stepladder -VAS 5085-
- ◆ Scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- and supplementary set -VAS 6131/13-
- ◆ Drip tray for workshop hoist -VAS 6208-





- ◆ Eye-head bolt -3368-
- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Tensioning strap -T10038-



 **Note**

*If the engine is going to be separated from the gearbox (after the entire assembly is removed), you will additionally need supplementary set -VAS 6131/11- and -VAS 6131/12- .*

**Procedure**

- Move selector lever to position „N“.
- Discharge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a .

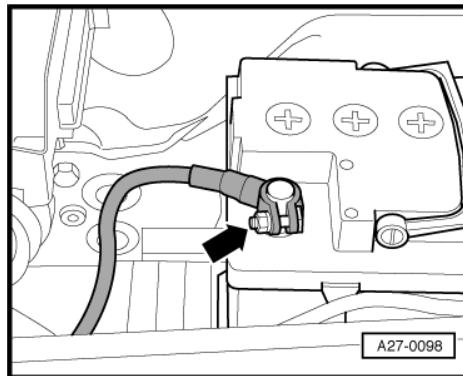


**Caution**

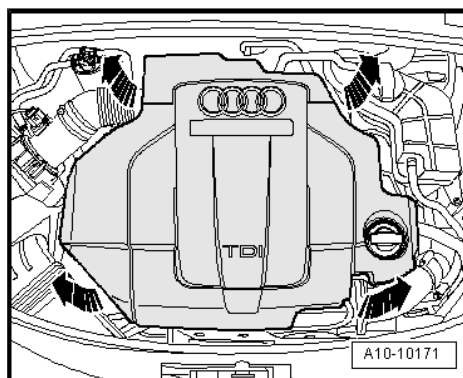
*Observe notes on procedure for disconnecting the battery ⇒ Rep. gr. 27 .*



- With ignition switched off, disconnect battery earth cable -arrow-.



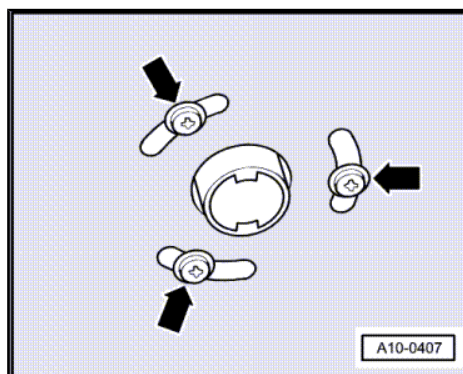
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



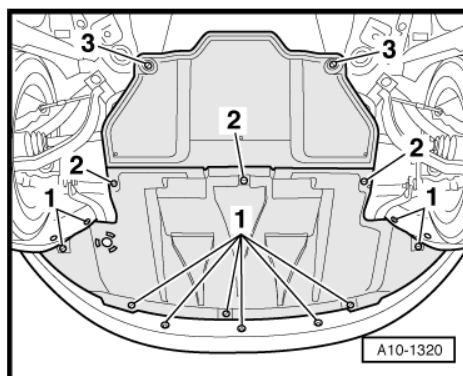
**WARNING**

*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Remove both front wheels.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.

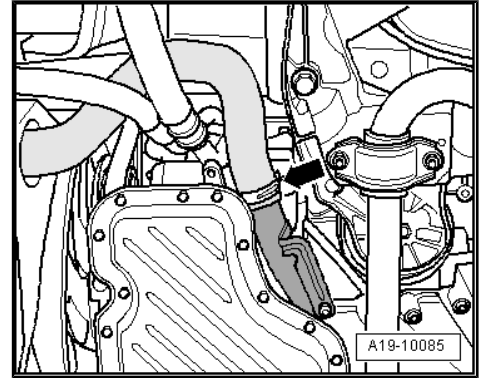


- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



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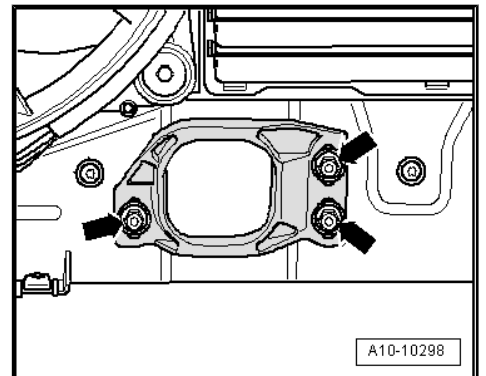
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



- Remove nuts -arrows- on stop for torque reaction support.



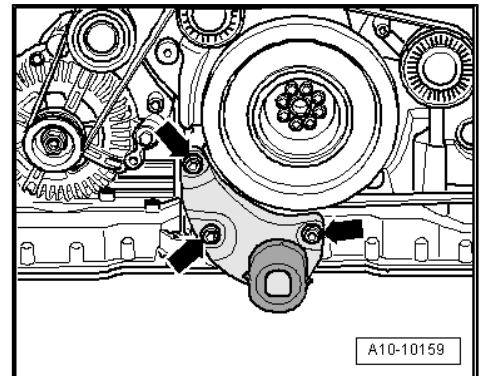
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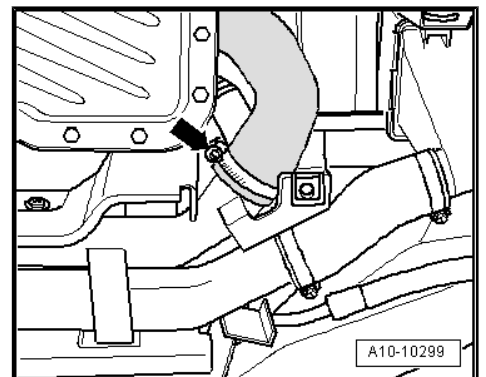
- Unscrew bolts -arrows- and remove torque reaction support together with stop for torque reaction support.

 **Note**

*Use a shortened hexagon key to slacken off the bolts.*

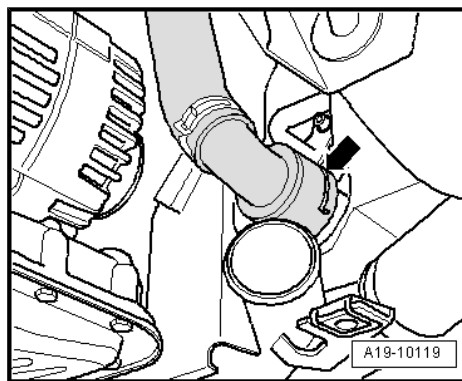


- Disconnect air intake hose -arrow- from air pipe.





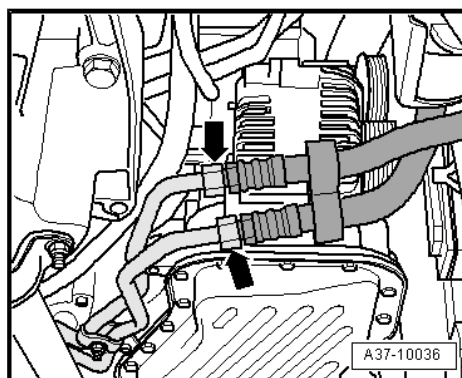
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Detach coolant hose (bottom right) from radiator -arrow-.



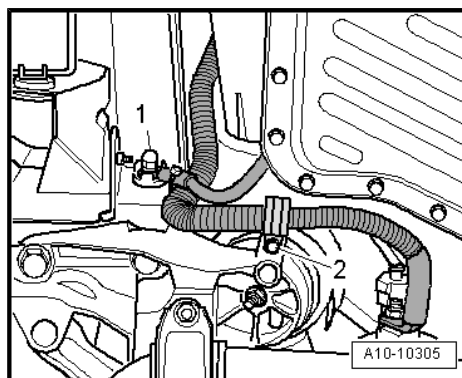
**i** Note

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

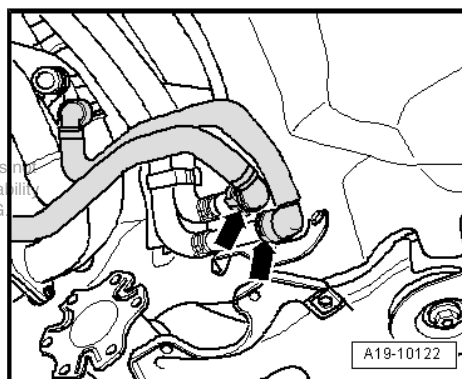
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Disconnect ATF lines -arrows- at connections on right side of engine.



- Unbolt earth cable -1- at longitudinal member (right-side).
- Unbolt retainer -2- from console for engine mounting.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hoses -arrows- behind engine (right-side) and drain off remaining coolant.

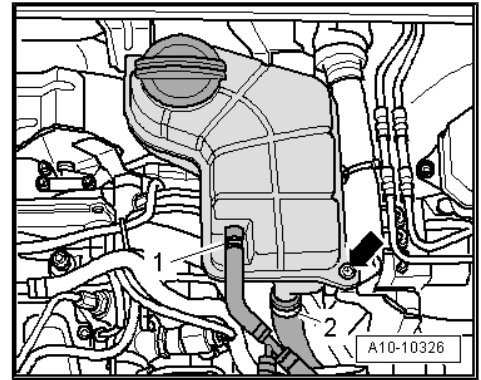


**i** Note

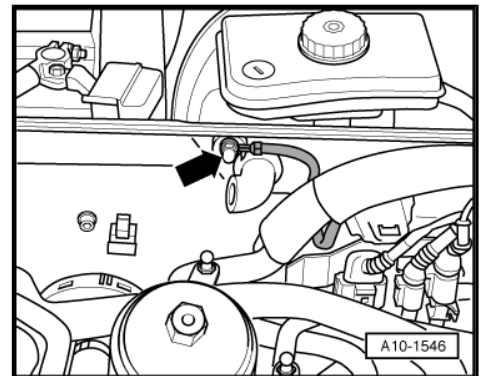
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Shown in illustration with gearbox removed.

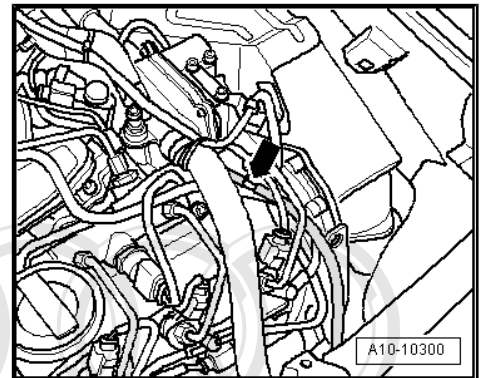
- Disconnect coolant hoses -1- and -2- at coolant expansion tank.
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).



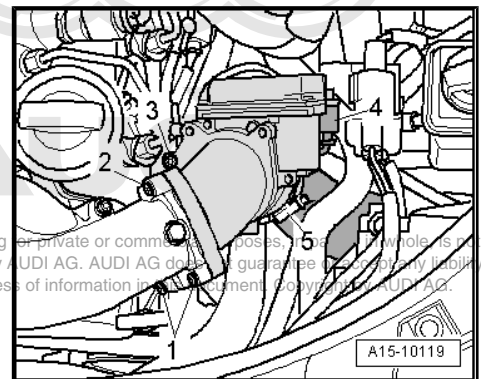
- Unscrew earth connection at plenum chamber partition panel -arrow-.



- Disconnect vacuum hose going to vacuum reservoir -arrow-.



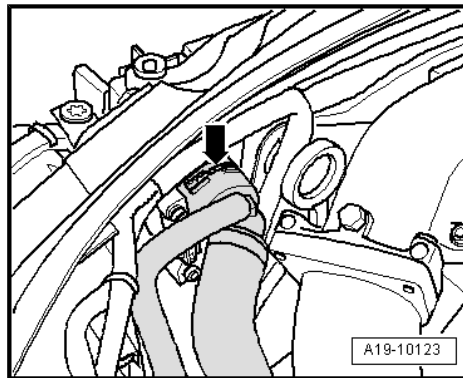
- Unplug electrical connector -4-.
- Detach air hose -5-.
- Remove bolts -1 ... 3- and detach throttle valve module -J338- from intake connecting pipe.



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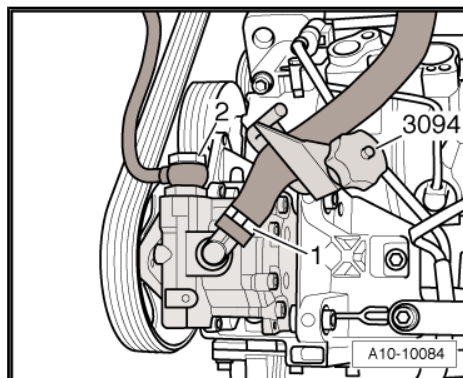
- Disconnect coolant hose at top left of radiator -arrow-.



**Note**

*Lay a cloth under the hydraulic lines to catch any escaping hydraulic fluid.*

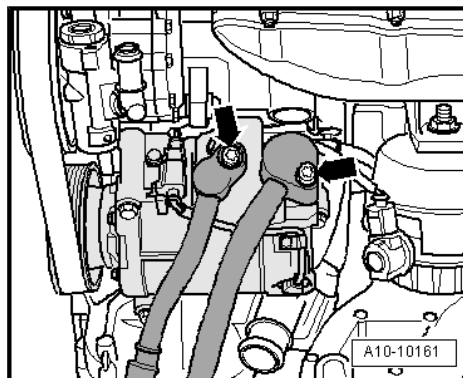
- Clamp off hydraulic hose for power steering pump using a hose clamp -3094- .
- Disconnect hydraulic hose -1- from power steering pump.
- Disconnect hydraulic pressure line -2- from power steering pump and lay aside on top of longitudinal member.



**Note**

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

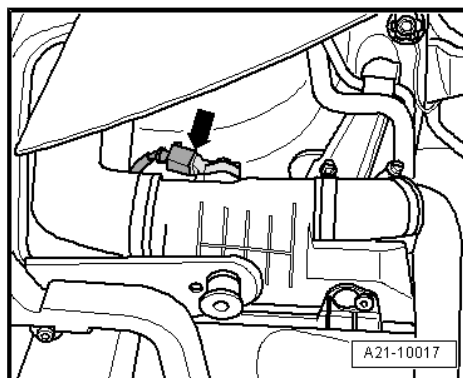
- Remove bolts -arrows-.



**Note**

*The refrigerant lines are disconnected from the air conditioner compressor at a later stage.*

- Unplug electrical connector -arrow- for charge pressure sender -G31- at charge air cooler (left-side).
- Move wiring clear.

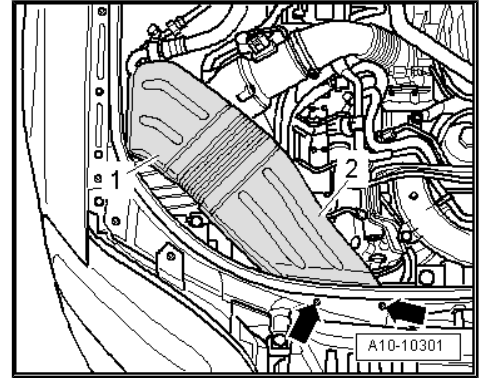


**Note**

*Shown in illustration with headlight removed.*

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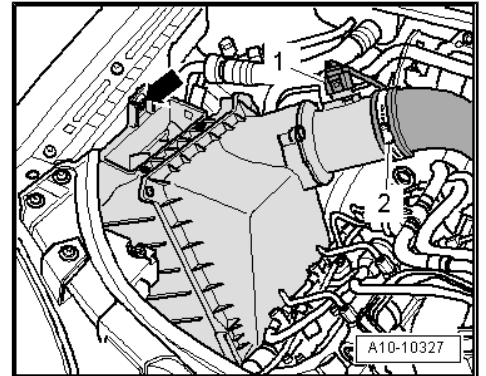
- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.



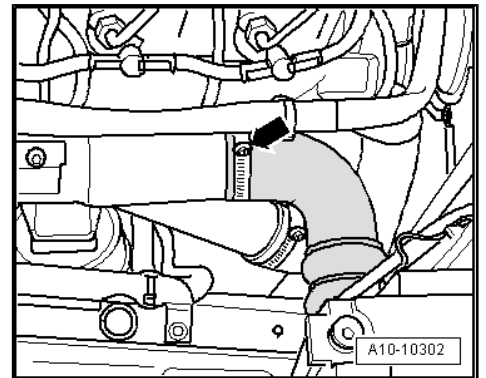
- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake hose -2- at air mass meter.

- Detach clip -arrow- and remove air cleaner housing together with air mass meter.


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- Disconnect air intake hose -arrow- from air pipe.

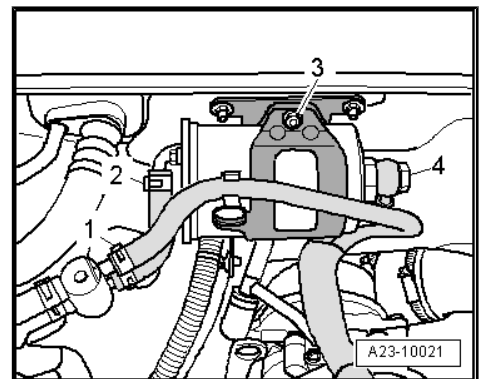


- Lay a clean cloth under the separating point to catch escaping fuel.



**Caution**

*Observe rules for cleanliness when working on the injection system => page 5.*



- Disconnect fuel return hose -1-.
- Unbolt fuel supply hose -4- from fuel filter.
- Unscrew retaining nut -3-, open retainer and place fuel filter to one side.

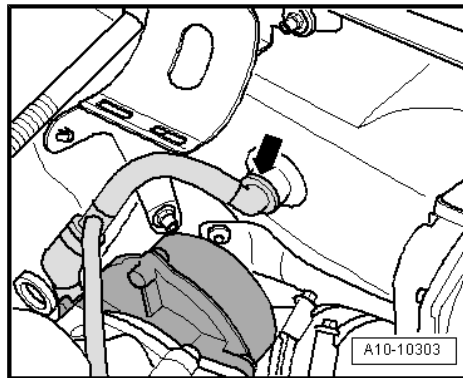


**Note**

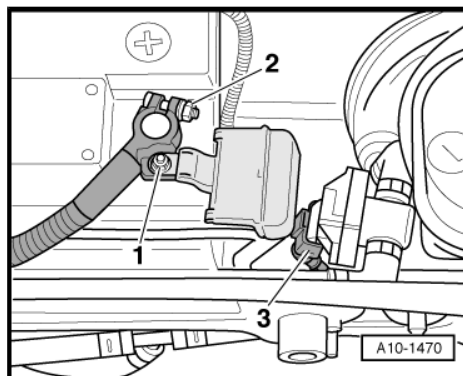
*Disregard -item 2-.*



- Detach vacuum hose going to brake servo -arrow- at plenum chamber partition panel.



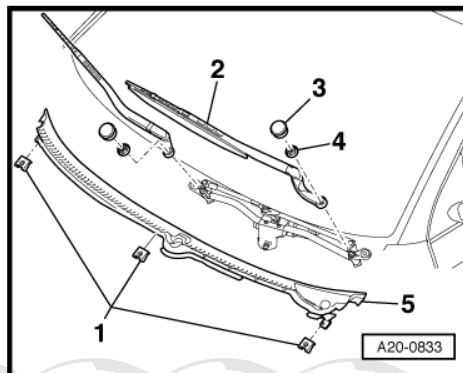
- Unscrew nut -1- and detach strip fuse at positive terminal.
- Disconnect positive cable -2- at positive battery terminal.
- Pull out positive cable forwards through plenum chamber partition panel.
- Move wiring harness clear and place on top of engine.



**Note**

Disregard -item 3-.

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



**Note**

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



**Caution**

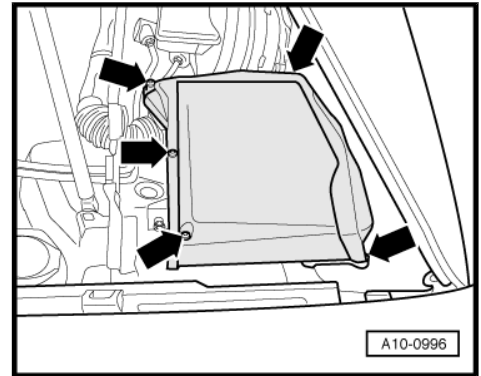
**To avoid cracking the cowl panel trim -5- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel trim and pull the trim vertically up out of the windscreen surround, starting from the edge of the windscreen.**

- Pull off retaining clips -1- and detach cowl panel trim -5-.

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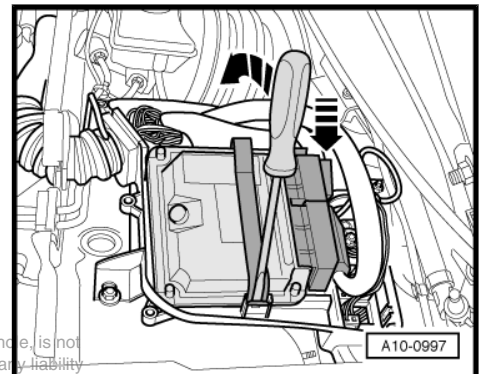
- Remove cover for electronics box in plenum chamber -arrows-.



- Using a screwdriver, carefully lever out retaining strap -arrow- and remove engine control unit from electronics box.

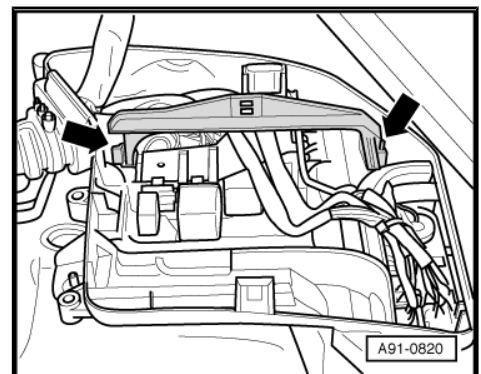
 **Note**

*The engine control unit remains connected to the wiring harness.*

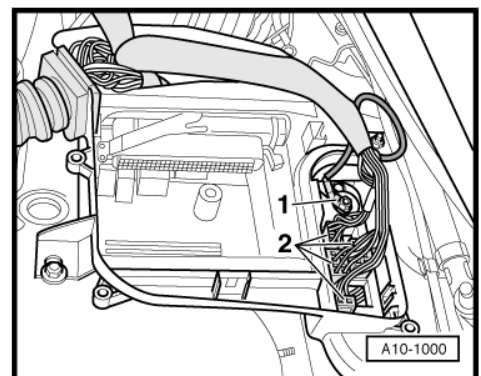


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- Release retaining hooks -arrows- outwards and remove retaining strap.

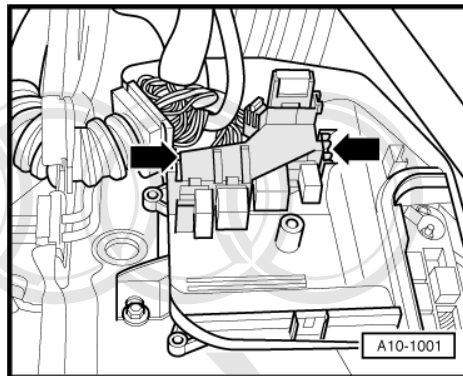


- Unplug all electrical connectors at connector point -2-.
- Unscrew electrical wiring -1-.
- Move wiring harness clear.





- Release retainers -arrows- and push auxiliary relay carrier in electronics box upwards to remove.
- Disengage engine wiring harness at electronics box and at plenum chamber partition panel.
- Move engine wiring harness clear and lay on top of engine.



- Have a 2nd mechanic press the brake pedal.

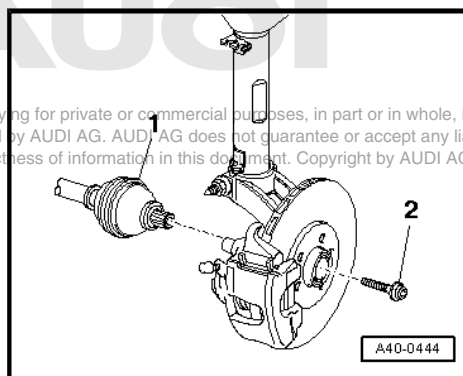


**Caution**

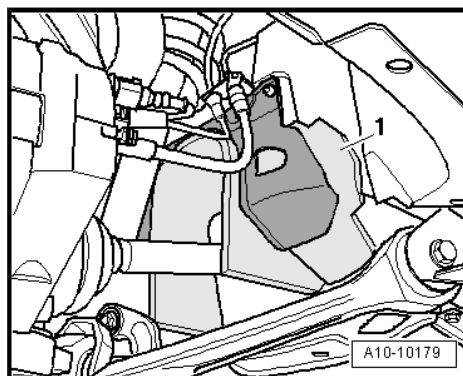
**When slackening the flange bolt securing the drive shaft, the wheel bearing must not be under load (vehicle must not be standing on its wheels).**

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- Unscrew flange bolt -2- from drive shaft -1- (left and right).



- Remove noise insulation -1- in wheel housing (left and right).

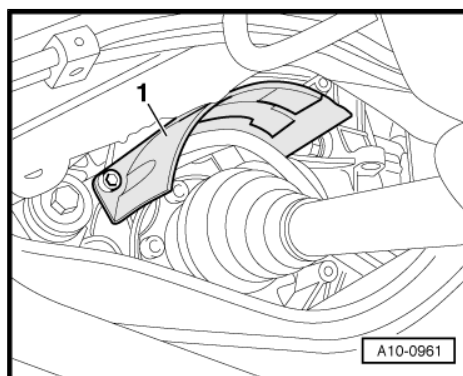


- Unbolt heat shield -1- for drive shaft (left-side).
- Unbolt drive shafts (left and right) from gearbox flange shafts.



**Note**

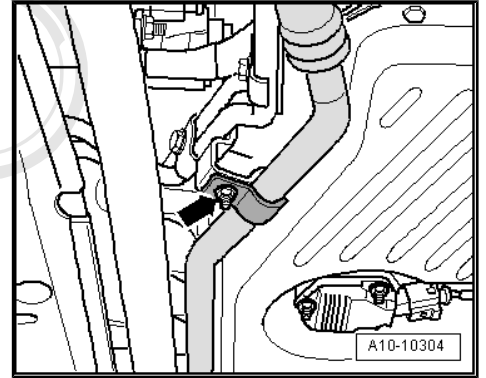
*The drive shafts are removed at a later stage.*



 **Note**

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

- Unbolt retainer for refrigerant pipe (right-side) from sump -arrow-.
- Detach refrigerant lines from AC compressor.
- Tie up refrigerant line leading to reservoir (right side of vehicle) to body.

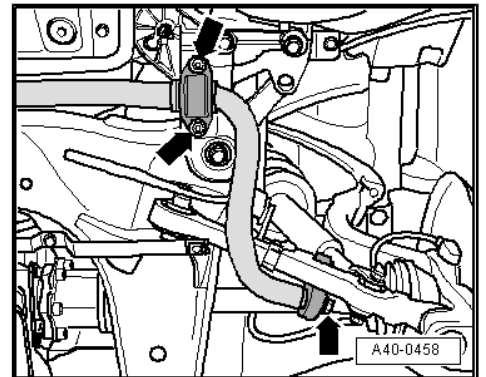


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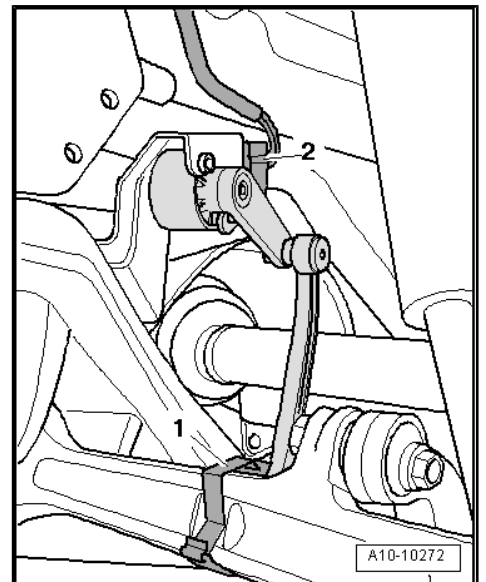
 **Note**

*Seal open pipes and connections at air conditioner compressor with suitable caps (to prevent ingress of dirt and moisture).*

- Unscrew nuts and bolts -arrows- evenly on both sides of vehicle.
- Take out anti-roll bar.



- If fitted, unplug electrical connector -2- at front left vehicle level sender -G78- .
- Unclip retaining clip -1- on operating rod for front left vehicle level sender -G78- at track control link (bottom).



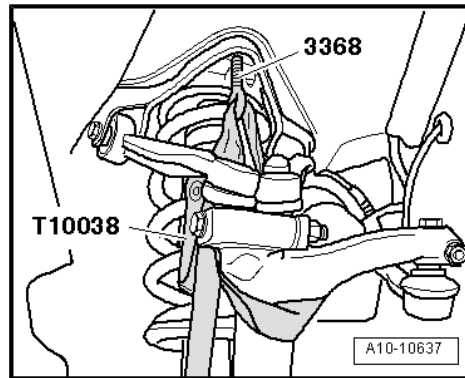


- Working from engine compartment, remove outer securing bolt for suspension strut on both sides of vehicle.
- Screw eye-head bolt -3368- from below into bore in suspension turret on both sides of vehicle.



**Caution**

*To avoid damaging the bonnet when it is shut, screw in eye-head bolt -3368- only until it is flush with the top surface of the suspension turret.*

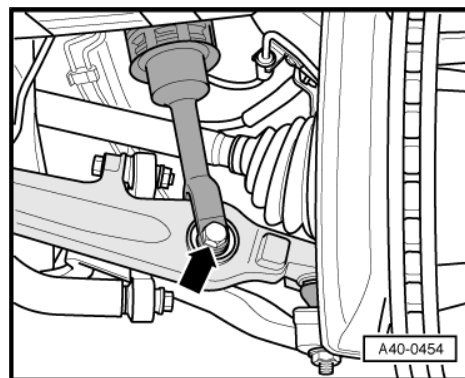


- Tie up wheel bearing housing on each side using tensioning strap -T10038- as illustrated.



**Caution**

*To prevent damage to the joints on the upper links, the weight of the wheel bearing housings must be supported before slackening the bottom securing bolts for the suspension struts.*



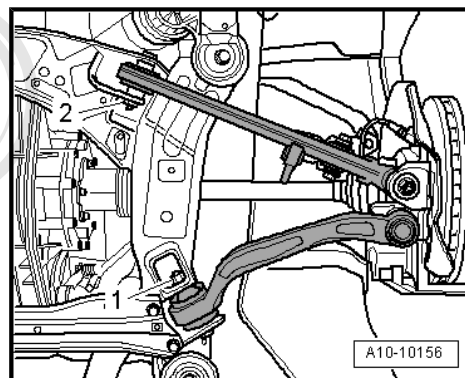
- Unbolt suspension strut from track control link -arrow-.
- Unscrew nuts -1- and -2- on bolt connections securing track control link and guide link.



**Note**

*The bolts are removed from the subframe at a later stage.*

- Repeat procedure on other side of vehicle.



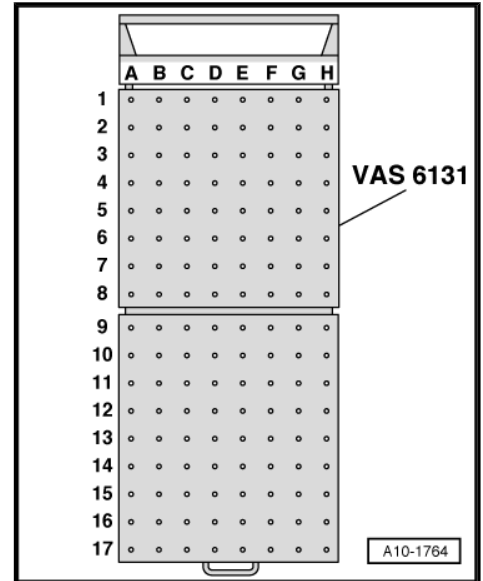
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**Set up the scissor-type assembly platform as follows:**

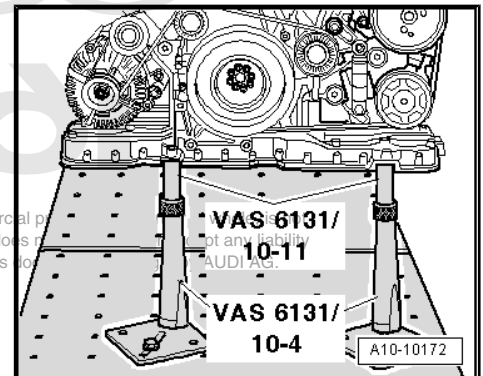
- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- and supplementary set -VAS 6131/13- as follows:

Platform coordinates	Parts of support set for Audi -VAS 6131/10- and supplementary set -VAS 6131/13-			
B3	/10-1	/10-4	/10-5	/10-11
F3	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
C15	/10-1	/10-3	/10-5	/10-7
F15	/10-1	/10-3	/10-5	/10-7
D17	/10-1	/10-3	/10-5	/13-2

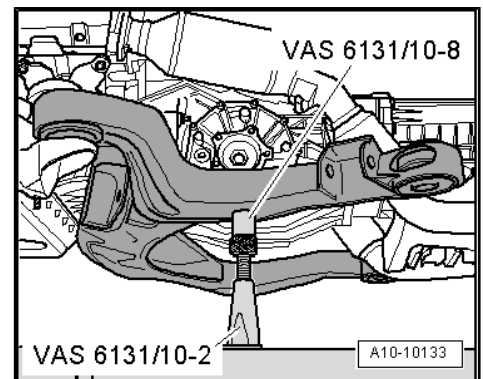
- Initially tighten the support elements on the assembly platform only hand-tight.
- Adjust the scissor-type assembly platform -VAS 6131 A- so that it is horizontal.
- Take note of spirit level (bubble gauge).
- Place scissor-type assembly platform -VAS 6131 A- under engine/gearbox assembly.
- Position support elements from -VAS 6131/10- at front of engine, as shown in illustration.
- Make sure that threaded spindles are screwed in completely.



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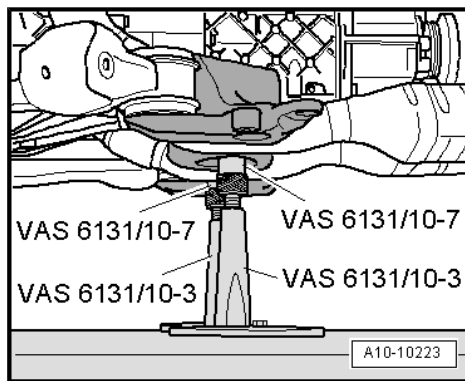


- Position support elements from -VAS 6131/10- at left and right of subframe, as shown in the illustration.

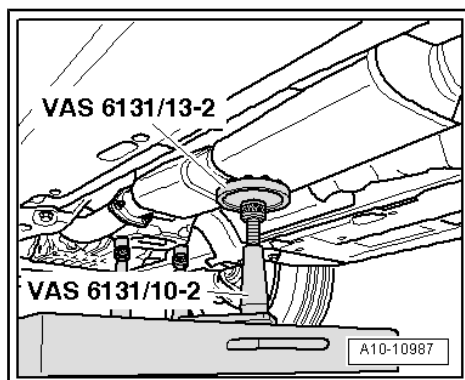




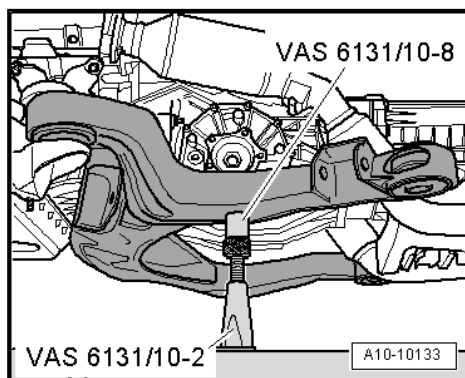
- Position the support elements from -VAS 6131/10- at left and right of tunnel cross member, as shown in the illustration.
- Turn all spindles for the support elements upwards until all locating lugs make contact with the mounting points.



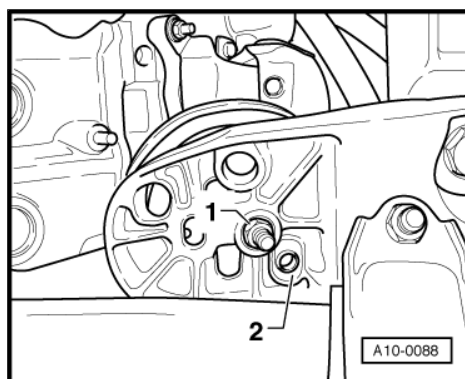
- Position support elements from -VAS 6131/10- and -VAS 6131/13- at rear of gearbox, as shown in illustration.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .



- Screw both spindles (at subframe) 2 turns upwards.



- Mark positions of bolt connection -1- and locating sleeve -2- on bottom of engine mounting (right-side).



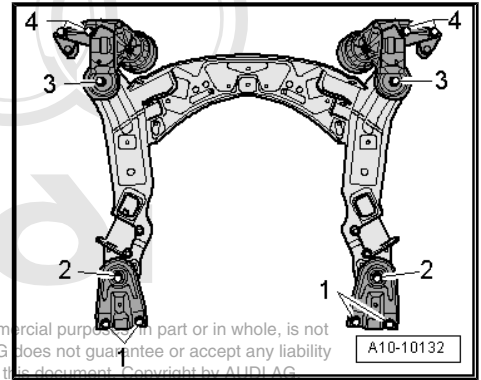
**Note**

*Different mounting holes are provided for the different engine versions.*

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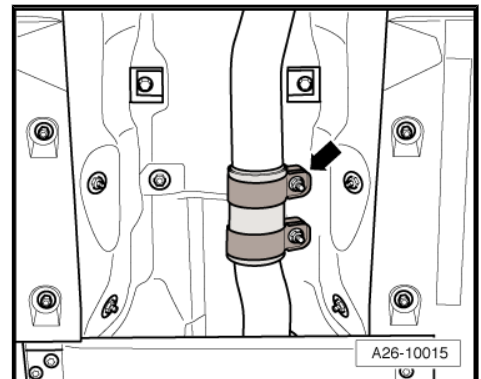
- Unscrew nuts -1- (bottom) at engine mountings (left and right).

- Remove bolts -1-.
- Mark the installation position of the subframe and the two consoles for engine mountings on the longitudinal members with a felt-tip pen.
- Unscrew bolts -2, 3, 4- in diagonal sequence and in stages.
- Take out consoles for engine mounting (left and right).

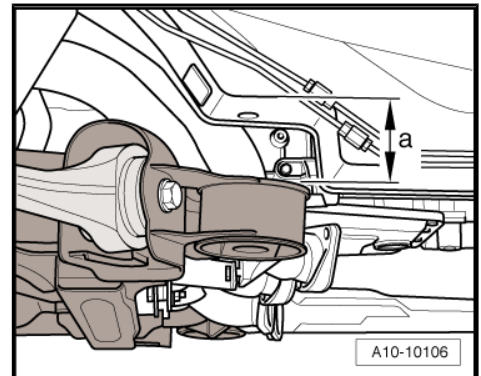


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- Disconnect exhaust system at clamp -arrow-.



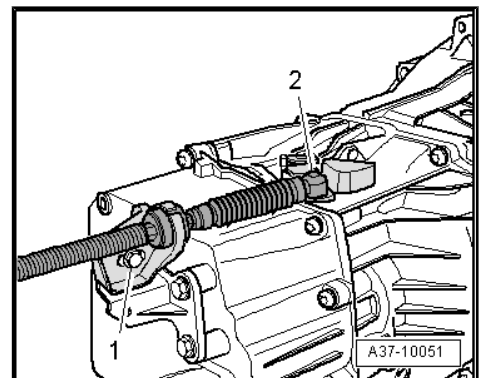
- Lower the engine/gearbox assembly using scissor-type assembly platform -VAS 6131 A- initially only as far as distance -a-.
- Distance -a- = 80 mm.



- Mark installation position of support bracket for selector lever cable.
- Unscrew bolt -1- for support bracket for selector lever cable.
- Push ball socket -2- of selector lever cable off gearbox selector lever.

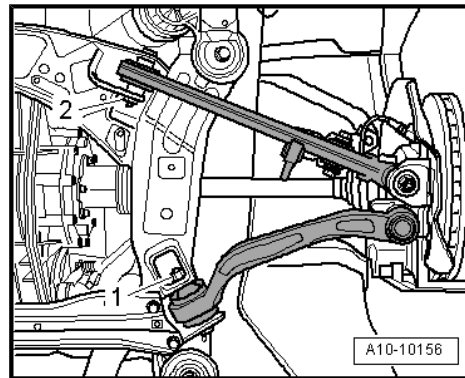
 **Note**

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





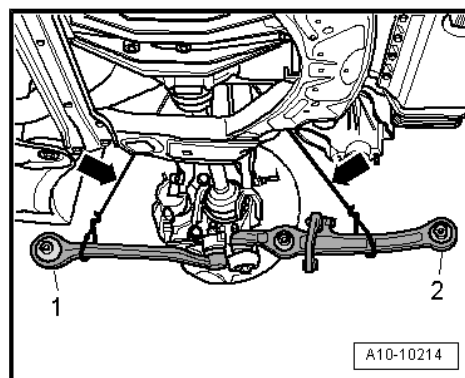
- Remove bolts for guide link -1- and track control link -2- from subframe.



- Pivot guide link -1- and track control link -2- outwards.

**Caution**

*The guide link and track control link must not be allowed to hang down without support. Tie up both links to wheel bearing housing as illustrated -arrows-.*



- Pivot wheel bearing housing outwards and remove drive shaft.
- Repeat procedure on other side of vehicle.

**Note**

- ◆ Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.
- ◆ Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering to avoid damage.

- Lower engine/gearbox assembly gradually.

## 2.2 Separating engine from multitronic gearbox

### Special tools and workshop equipment required

- ◆ Support set for Audi -VAS 6131/10- with supplementary set -VAS 6131/11- and -VAS 6131/12-

### Procedure

**Note**

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

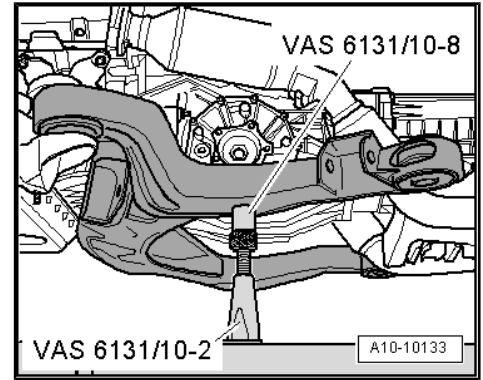
- Engine/gearbox assembly removed and secured to scissor-type assembly platform -VAS 6131 A-



- Screw down spindles of the support elements (left and right) at subframe as far as possible.
- Remove locating lugs from spindles.
- Remove subframe to the side.
- Unscrew the two base plates for support elements (for subframe) on scissor-type assembly platform -VAS 6131 A- .

 **Note**

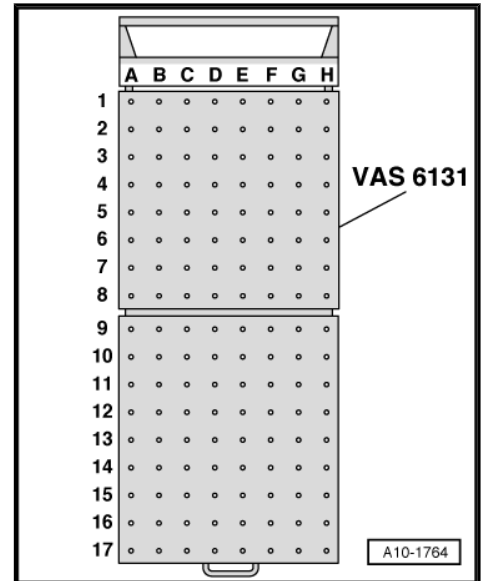
*The mounting points for engine (front) and gearbox (rear) remain unchanged.*



- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- and -VAS 6131/12- as follows:

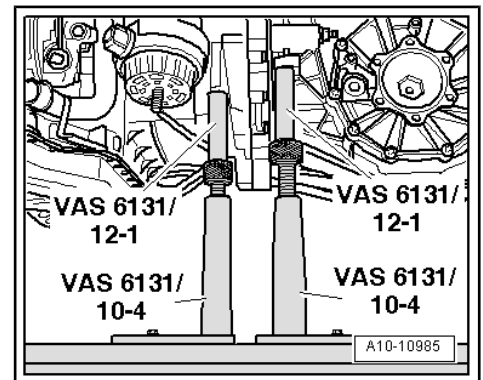
Platform coordinates	Parts of support set for Audi -VAS 6131/10- and -VAS 6131/12-			
B3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
F3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
B7	/10-1	/10-4	/10-5	/12-1
F7	/10-1	/10-4	/10-5	/11-2
C10	/10-1	/10-4	/10-5	/12-1
F10	/10-1	/12-2	/10-5	/12-1
C15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
F15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
D17 <sup>1)</sup>	/10-1	/10-3	/10-5	/13-2

• <sup>1)</sup> Support elements remain unchanged.

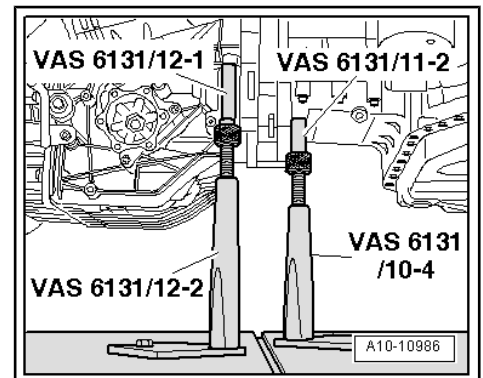


- Position the support elements from -VAS 6131/10- and -VAS 6131/12- at left of engine/gearbox assembly as shown in illustration.

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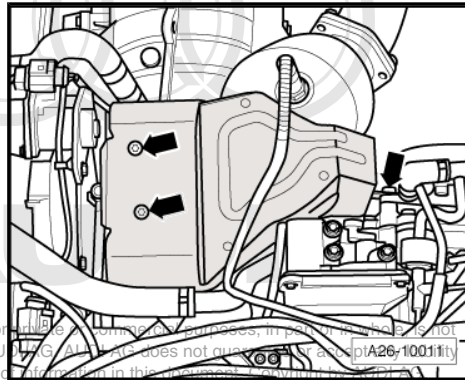


- Position the support elements from -VAS 6131/10- and -VAS 6131/12- at right of engine/gearbox assembly as shown in illustration.
- Turn spindles for the support elements upwards until all locating lugs make contact with the mounting points.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .



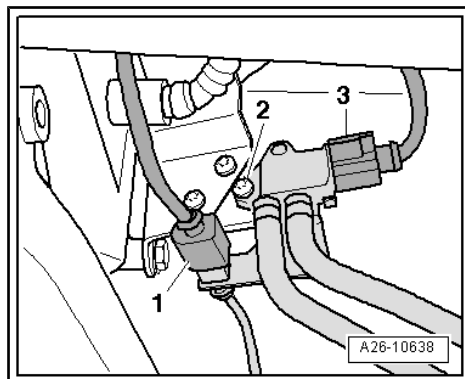


- Remove heat shield for turbocharger -arrows-.

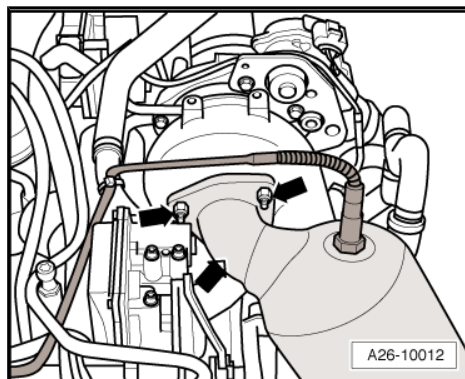


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- Detach electrical connector -1- from bracket and unplug.
- Unplug electrical connector -3-.
- Remove bolt -2- and detach exhaust gas pressure sensor 1 - G450- from bracket.



- Unscrew nuts -arrows- at starter catalytic converter/turbocharger.



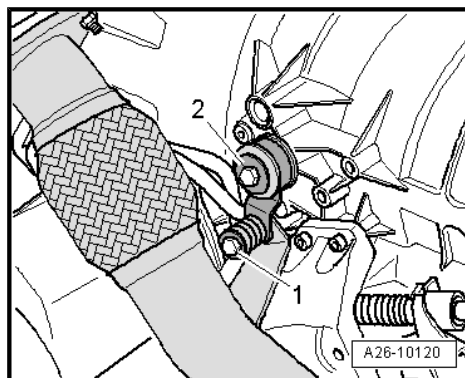
- Remove bolt -1- on bracket for starter catalytic converter.



**Note**

*Disregard -item 2-.*

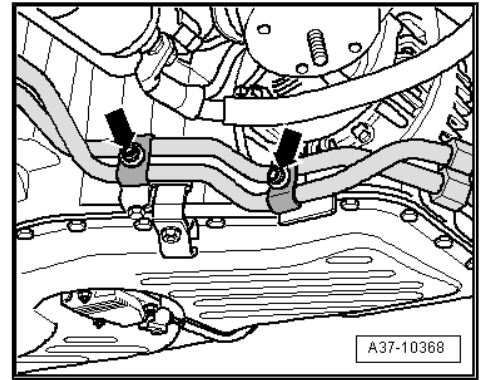
- Detach starter catalytic converter together with particulate filter.



 **Note**

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

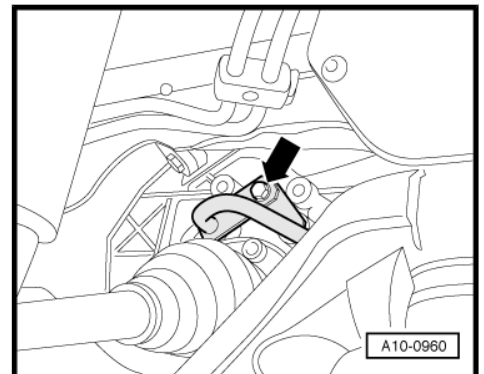
- Unbolt brackets -arrows- for ATF lines at sump (top section).



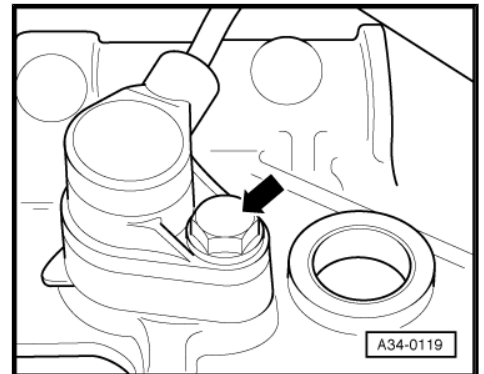
 **Note**

Lay a cloth under the ATF lines to catch escaping ATF fluid.

- Remove bolt -arrow-.
- Detach ATF lines from gearbox.



- Unbolt engine speed sender -G28- from gearbox -arrow-.



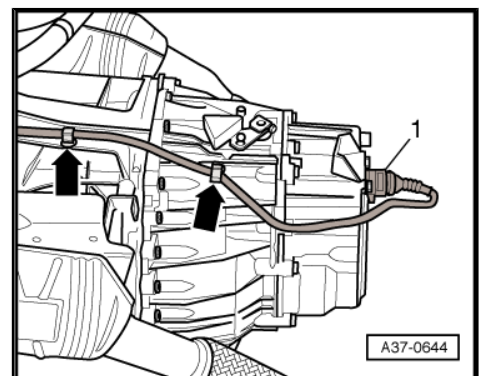
**Caution**

**Risk of damage to gearbox control unit because of static discharge.**

- ◆ **Do NOT touch connector contacts in gearbox connector with your hands.**

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- Release electrical connector -1- and detach from gearbox.
- Move clear engine wiring harness -arrows-.



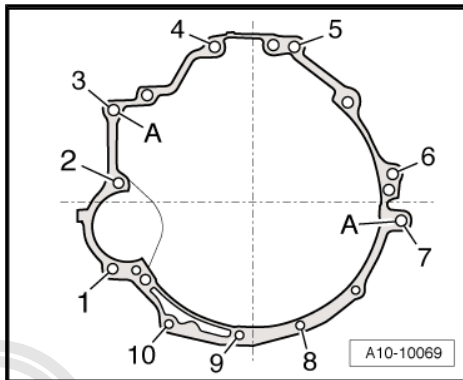


- Remove engine/gearbox securing bolts -1 ... 10-

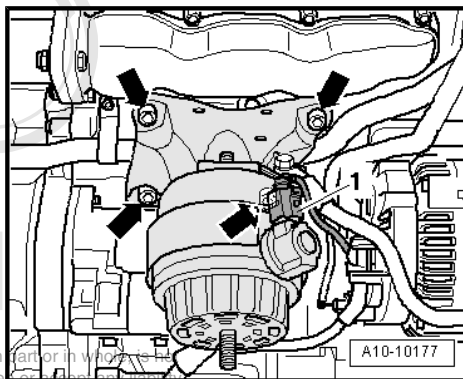


**Note**

*Starter remains in installation position.*

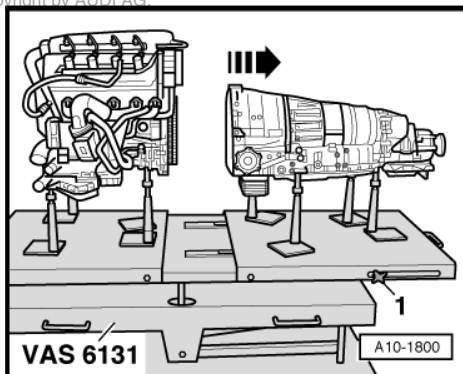


- Unplug electrical connector -1- at engine mounting (left and right).
- Move wiring clear at console for engine mounting.
- Remove bolts -arrows- and detach engine supports (left and right).



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- Loosen clamping bolts -1- on sides of scissor-type assembly platform -VAS 6131 A- and pull rear section of platform together with gearbox towards the rear -arrow-; simultaneously separate the torque converter from the drive plate through the opening.



## 2.3 Installing engine

### Procedure



**Note**

- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Renew bolts which are tightened to a specified angle as well as seals, gaskets and O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *Fit all cable ties in the original positions when installing.*
- Check that dowel sleeves for centring engine and gearbox are fitted in the cylinder block; install missing dowel sleeves.
- Clean input shaft splines on gearbox and splines of damper unit on flywheel; remove corrosion and apply only a very thin coating of grease for clutch plate splines -G 000 100- to the splines. Remove any excess grease.

- Press intermediate plate between engine and gearbox onto dowel sleeves.
- Secure gearbox to engine with new bolts.

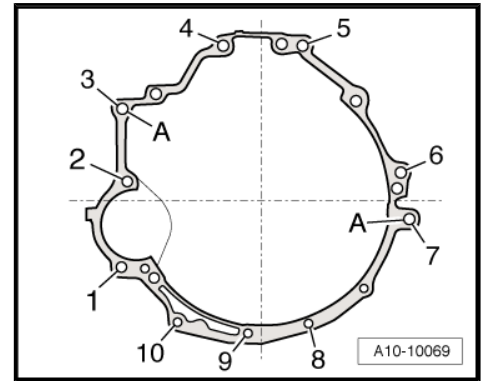
 **Note**

- ◆ *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 %.*

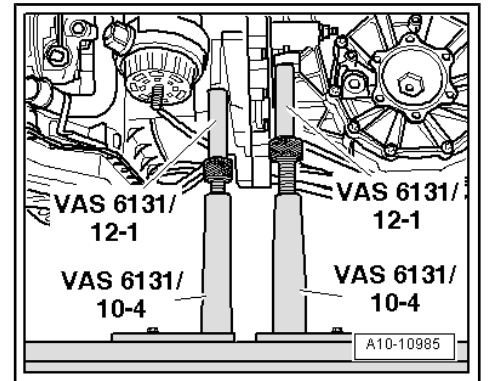
**Securing engine to gearbox**

Item	Bolt <sup>1)</sup>	Nm
1 2)	M10x80	65
2 2)	M10x100	65
3, 4, 5, 6	M12x100	65
7, 8, 9	M10x80	45
A	Dowel sleeves for centralising	

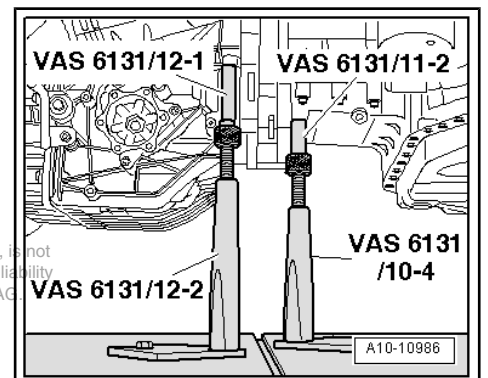
- <sup>1)</sup> Renew bolts for securing engine to gearbox.
- <sup>2)</sup> Property class 10.9.



- Secure ATF lines ⇒ Rep. gr. 37 .
- Install starter catalytic converter with particulate filter ⇒ [page 350](#) .
- Screw down spindles of support elements on left side of engine/gearbox assembly.
- Unscrew base plate for support element (left-side) at scissor-type assembly platform -VAS 6131 A- .



- Screw down spindles of support elements on right side of engine/gearbox assembly.
- Screw spindle for support element (right-side) at engine downwards.
- Unscrew base plates for support element (right-side) at scissor-type assembly platform -VAS 6131 A- .



 **Note**

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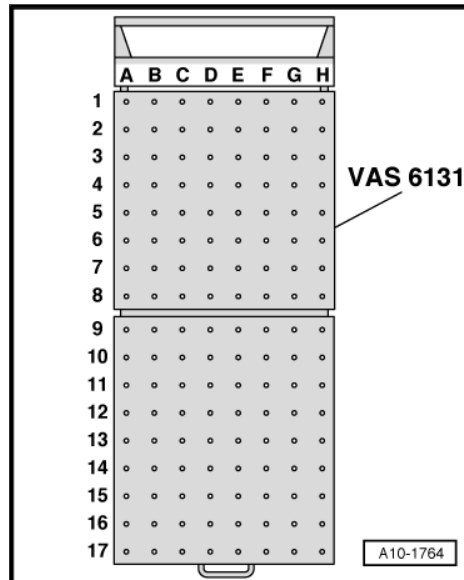
*The mounting points for engine (front) and gearbox (rear) remain unchanged.*



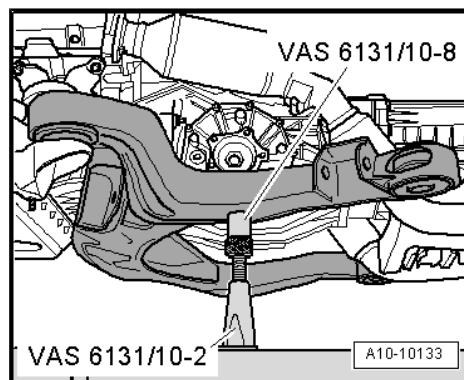
- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- as follows:

Platform coordinates	Parts of support set for Audi -VAS 6131/10-			
B3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
F3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8 <sup>2)</sup>
G10	/10-1	/10-2	/10-5	/10-8 <sup>2)</sup>
C15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
F15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-7
D17 <sup>1)</sup>	/10-1	/10-3	/10-5	/13-2

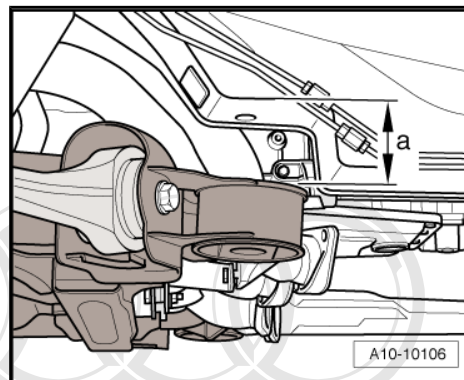
- <sup>1)</sup> Support elements remain unchanged.
- <sup>2)</sup> Secure support elements only after installing the subframe.



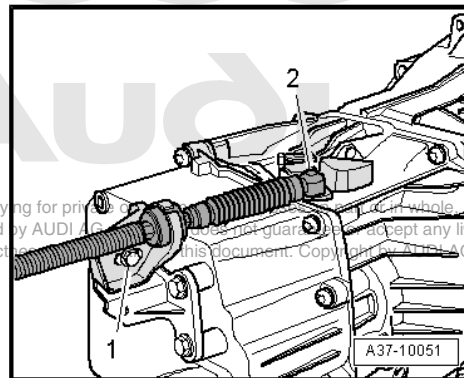
- Fit subframe onto the two support elements -VAS 6131/10-8-.
- Screw up the spindles for support elements on both sides.



- Slowly guide engine/gearbox assembly into body from below using scissor-type assembly platform -VAS 6131 A- until distance between subframe and body is -a-.
- Distance -a- = 80 mm.
- Bring torque reaction support with stop for torque reaction support into position between lock carrier and engine.



- Push ball socket -2- of selector lever cable onto gearbox selector lever.
- Attach cable support bracket -1- to gearbox according to marking.
- Insert drive shafts in splines of wheel bearing housing (left and right).

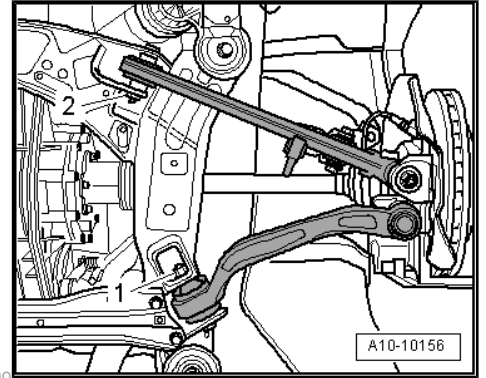


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- Bolt guide link -1- and track control link -2- loosely onto subframe.

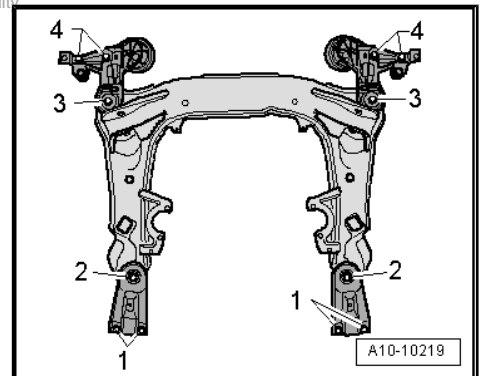
 **Note**

*Wait until vehicle is standing on ground before tightening bolts to final setting.*



- Adjust the subframe according to the markings made on the longitudinal members during removal.
- Only tighten bolts for subframe and consoles for engine mountings to the specified torque (do not turn further); tighten bolts only after performing wheel alignment check.

- 1 - 65 Nm
- 2 - 110 Nm
- 3 - 110 Nm
- 4 - 75 Nm

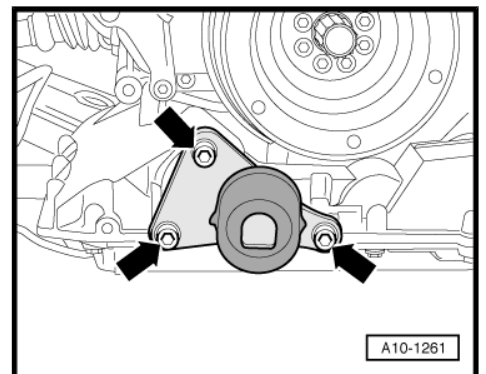


**WARNING**

*The vehicle must not be driven at this stage.*

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

- Align exhaust system so it is free of stress ⇒ [page 340](#) .
- Install refrigerant lines ⇒ Rep. gr. 87 .
- Install drive shafts ⇒ Rep. gr. 40 .
- Install guide links, track control links, anti-roll bar and suspension struts ⇒ Rep. gr. 40 .
- Tighten bolts -arrows- for torque reaction support.



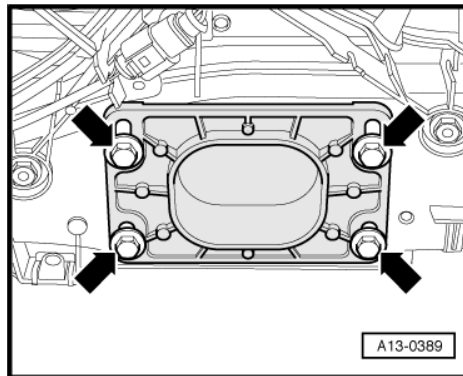


- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten bolts -arrows-.
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe notes on procedures required after connecting battery ⇒ Rep. gr. 27 .

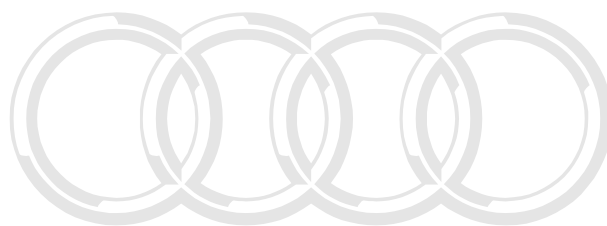


**Caution**

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



- Install and adjust wiper arms ⇒ Rep. gr. 92 .
- Check adjustment of selector lever cable ⇒ Rep. gr. 37 .
- Check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .
- Bleed fuel system ⇒ Rep. gr. 24 .

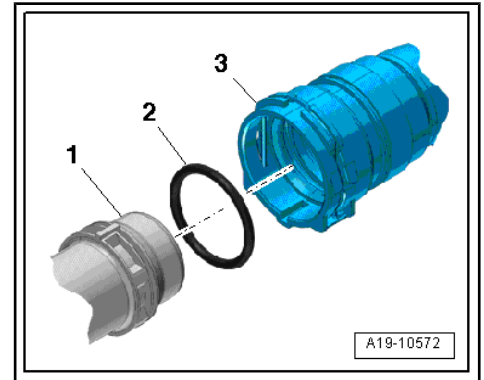


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- Remove old O-ring -2- from coolant hose -3-.
- Lubricate new O-ring with coolant additive and fit O-ring in coolant hose.
- Press coolant hose onto radiator -1- until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.
- Fill cooling system ⇒ [page 255](#) .



 **Note**

- ◆ *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- ◆ *Contaminated or dirty coolant must not be used again.*
- Top up power steering fluid and bleed steering system ⇒ Rep. gr. 48 .
- Check ATF level ⇒ Rep. gr. 37 .
- Adjust subframe and the two consoles for engine mountings ⇒ Rep. gr. 40 .
- Perform wheel alignment check ⇒ Rep. gr. 44 .



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***Tighten bolts for subframe to final setting after performing wheel alignment check.***

- Charge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a .

**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 %.*



Component		Nm
Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Except for the following:		
Terminal B+ to starter		16
Engine support to cylinder block		40
Console for engine mounting to longitudinal member		75
Engine mounting to console for engine mounting		23
Drive shaft heat shield to gearbox		23
Torque reaction support to engine		40
Stop for torque reaction support to lock carrier		28
Hydraulic pressure line to power steering pump		47
Fuel hose to fuel line		22
Hose clips (9 mm wide)		3



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### 3 Removing and installing engine - vehicles with automatic gearbox

**i** Note

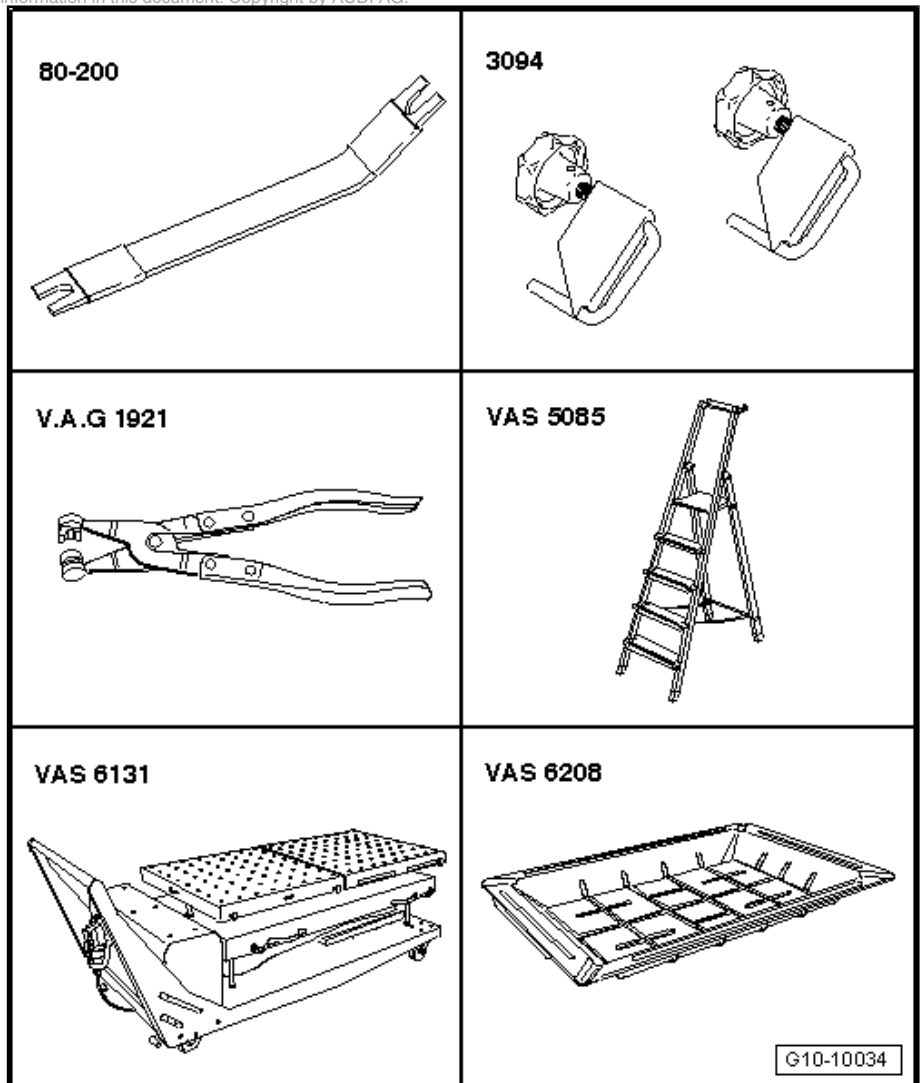
- ◆ *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- ◆ *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*
- ◆ *Collect drained coolant in a clean container for re-use or disposal.*

#### 3.1 Removing engine

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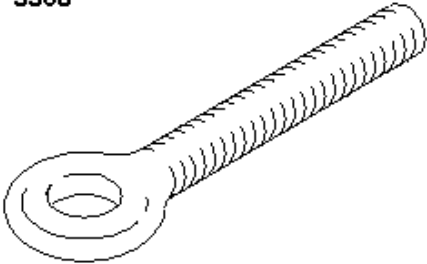
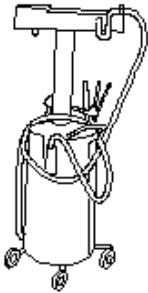
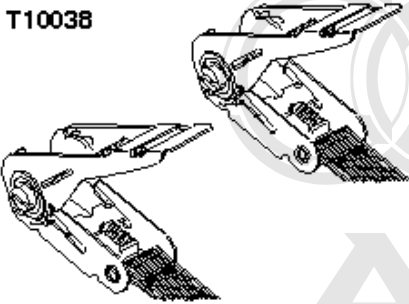
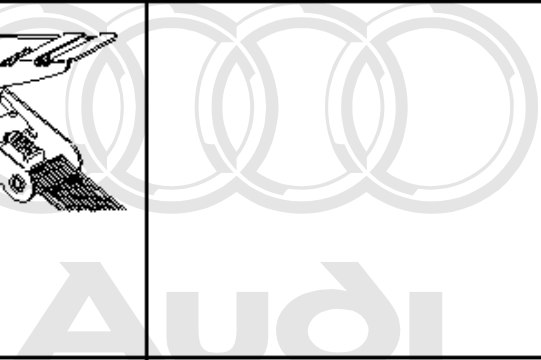
##### Special tools and workshop equipment required

- ◆ Removal lever -80 - 200-
- ◆ Hose clamps up to Ø 25 mm -3094-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Stepladder -VAS 5085-
- ◆ Scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- and additionally 1x adapter -VAS 6131/10-12-
- ◆ Drip tray for workshop hoist -VAS 6208-





- ◆ Eye-head bolt -3368-
- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Tensioning strap -T10038-

<b>3368</b> 	<b>V.A.G 1782</b> 
<b>T10038</b> 	
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### Note

*If the engine is going to be separated from the gearbox (after the entire assembly is removed), you will additionally need supplementary set -VAS 6131/11- and -VAS 6131/12- .*

### Procedure

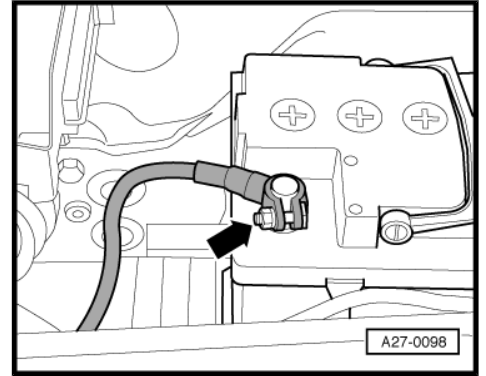
- Move selector lever to position „N“.
- Discharge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a .



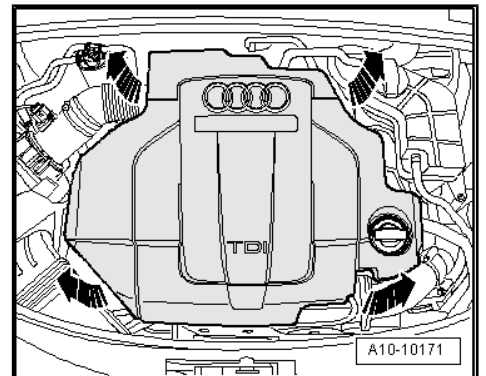
### Caution


*Observe notes on procedure for disconnecting the battery ⇒ Rep. gr. 27 .*

- With ignition switched off, disconnect battery earth cable -arrow-.



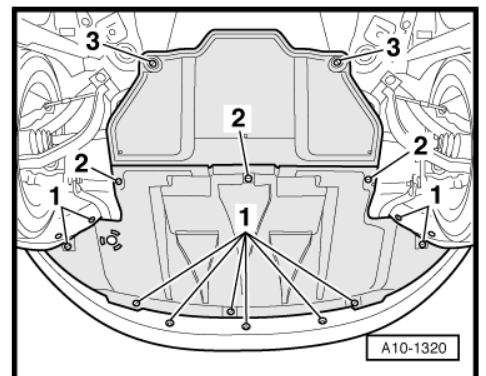
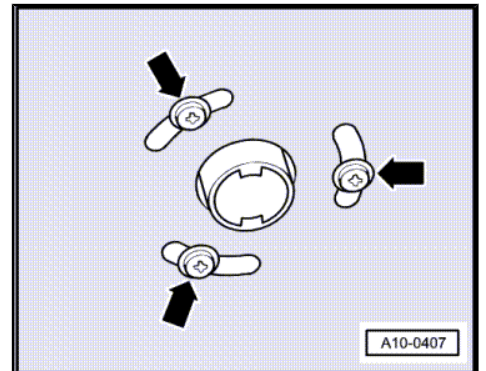
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



 **WARNING**

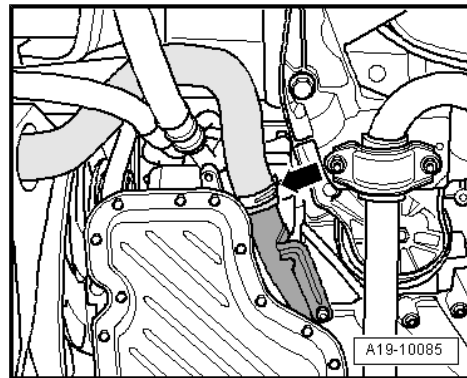
*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Remove both front wheels.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.

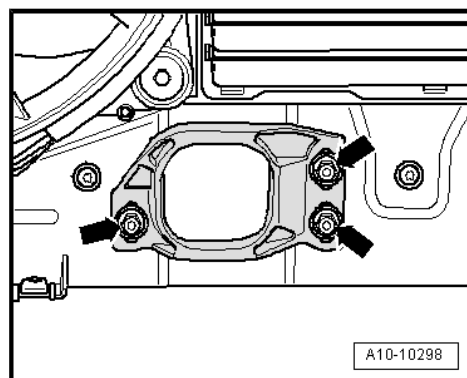




- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



- Remove nuts -arrows- on stop for torque reaction support.

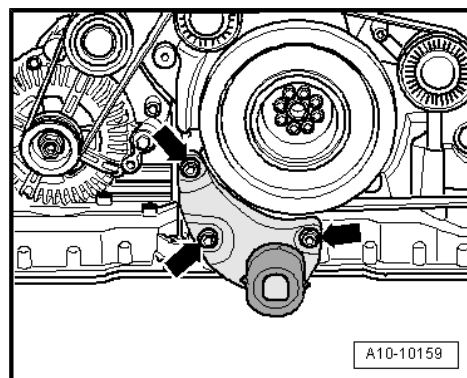


- Unscrew bolts -arrows- and remove torque reaction support together with stop for torque reaction support.

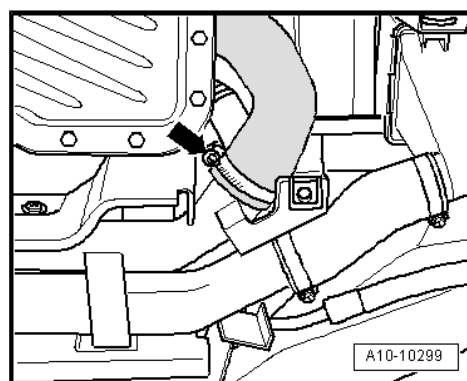


**Note**

*Use a shortened hexagon key to slacken off the bolts.*

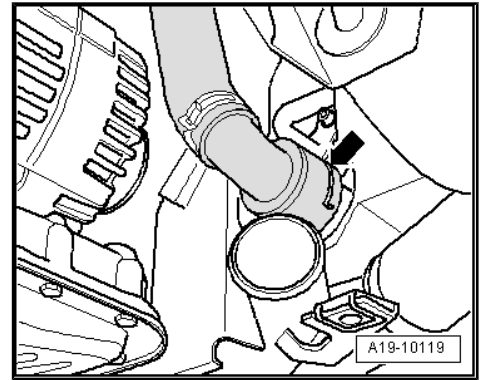
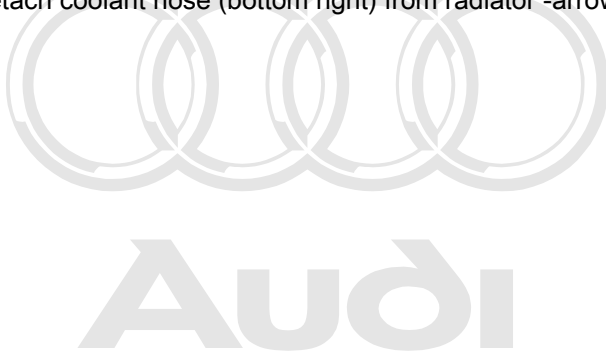


- Disconnect air intake hose -arrow- from air pipe.



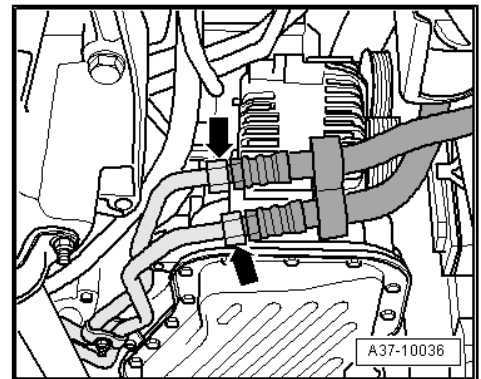
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- Place drip tray for workshop hoist -VAS 6208- under engine.
- Detach coolant hose (bottom right) from radiator -arrow-.

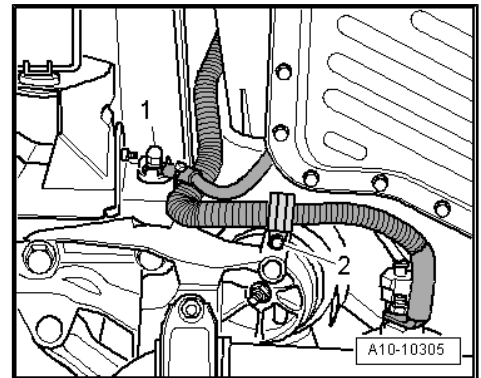


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*Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. gr. 37.*

- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Disconnect ATF lines -arrows- at connections on right side of engine.



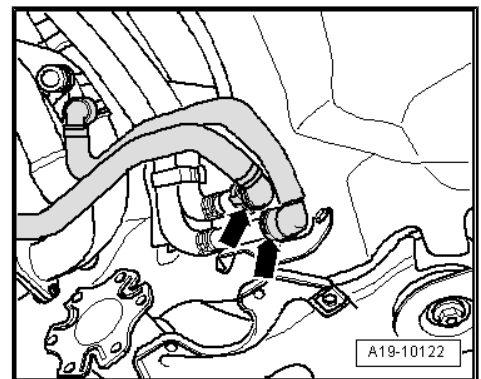
- Unbolt earth cable -1- at longitudinal member (right-side).
- Unbolt retainer -2- from console for engine mounting.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hoses -arrows- behind engine (right-side) and drain off remaining coolant.

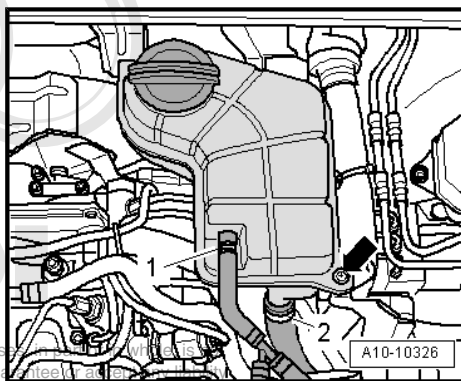
**i** Note

*Shown in illustration with gearbox removed.*



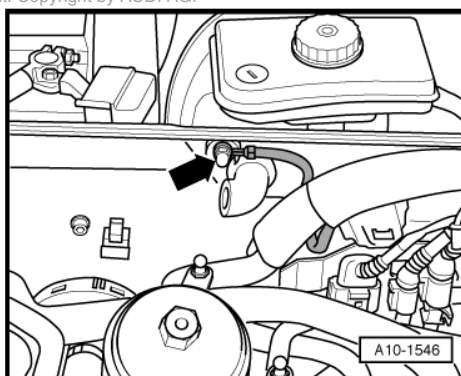


- Disconnect coolant hoses -1- and -2- at coolant expansion tank.
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).

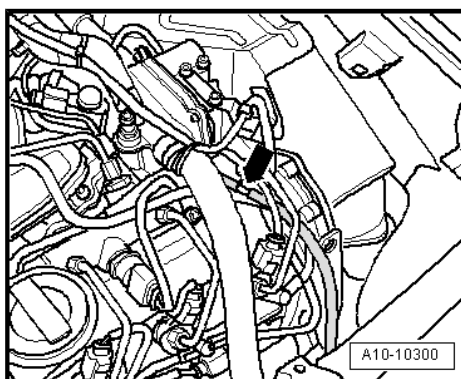


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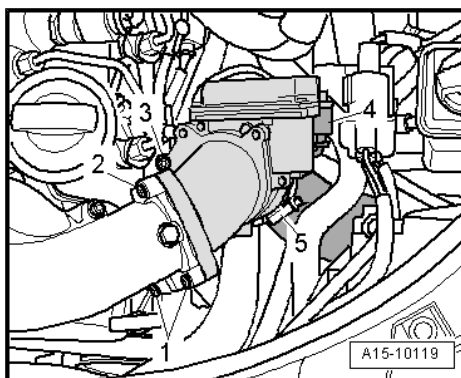
- Unscrew earth connection at plenum chamber partition panel -arrow-.



- Disconnect vacuum hose going to vacuum reservoir -arrow-.

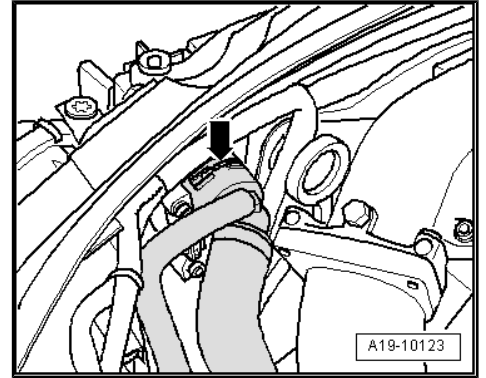


- Unplug electrical connector -4-.
- Detach air hose -5-.
- Remove bolts -1 ... 3- and detach throttle valve module -J338- from intake connecting pipe.





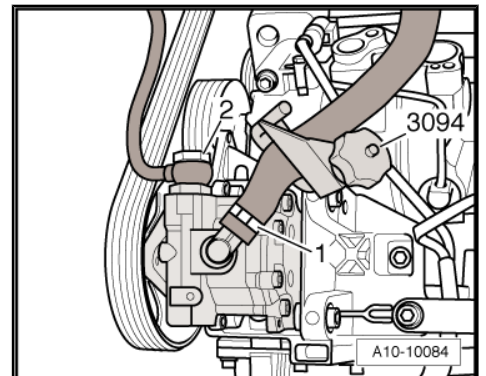
- Disconnect coolant hose at top left of radiator -arrow-.



 **Note**

*Lay a cloth under the hydraulic lines to catch any escaping hydraulic fluid.*

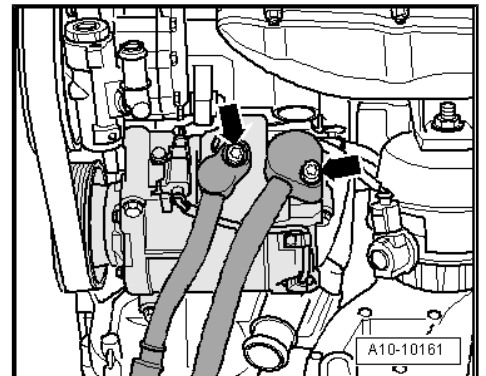
- Clamp off hydraulic hose for power steering pump using a hose clamp -3094- .
- Disconnect hydraulic hose -1- from power steering pump.
- Disconnect hydraulic pressure line -2- from power steering pump and lay aside on top of longitudinal member.



 **Note**

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

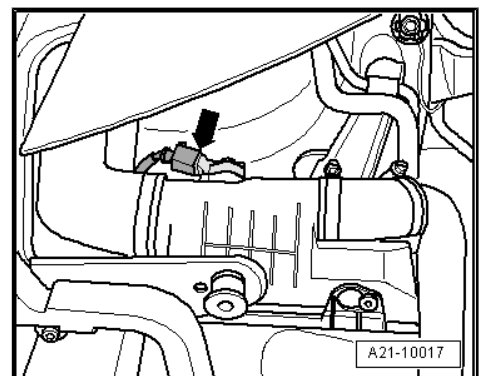
- Remove bolts -arrows-.



 **Note**

*The refrigerant lines are disconnected from the air conditioner compressor at a later stage.*

- Unplug electrical connector -arrow- for charge pressure sender -G31- at charge air cooler (left-side).
- Move wiring clear.



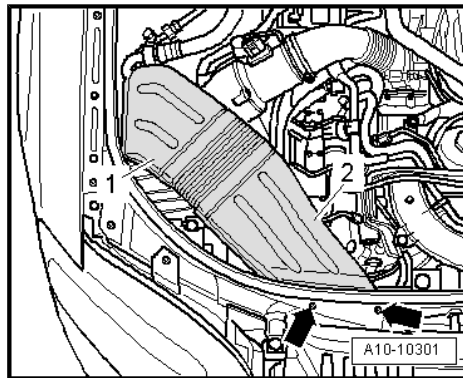
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 **Note**

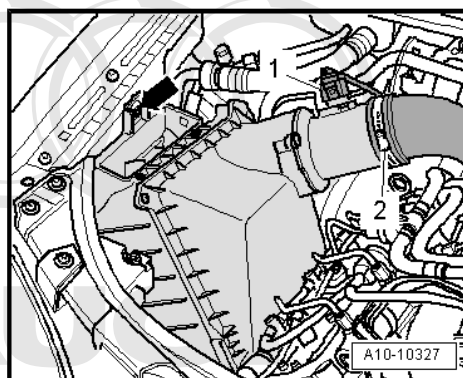
*Shown in illustration with headlight removed.*



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

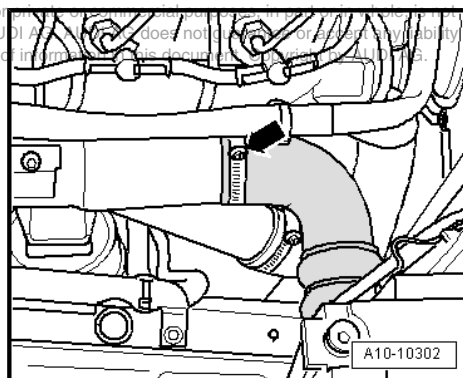


- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake hose -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



- Disconnect air intake hose -arrow- from air pipe.

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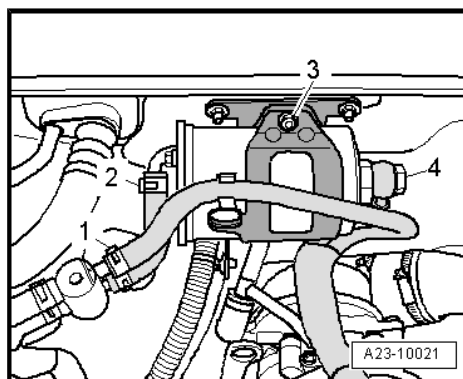


- Lay a clean cloth under the separating point to catch escaping fuel.

**Caution**

*Observe rules for cleanliness when working on the injection system => page 5 .*

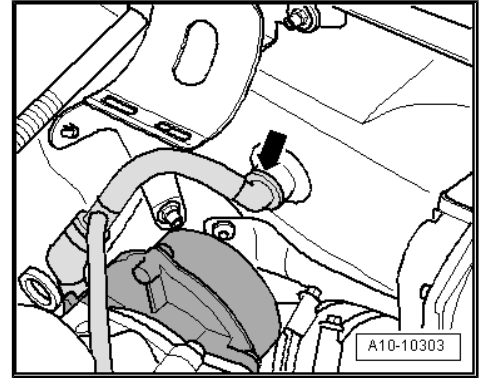
- Disconnect fuel return hose -1-.
- Unbolt fuel supply hose -4- from fuel filter.
- Unscrew retaining nut -3-, open retainer and place fuel filter to one side.



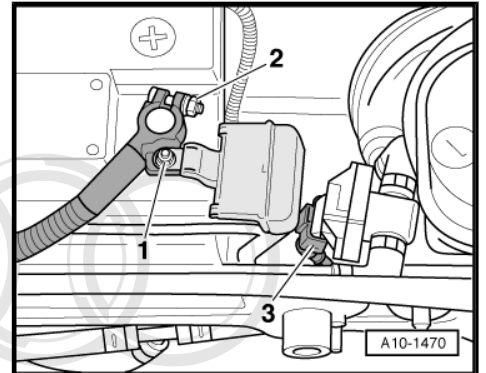
**Note**

*Disregard -item 2-.*

- Detach vacuum hose going to brake servo -arrow- at plenum chamber partition panel.



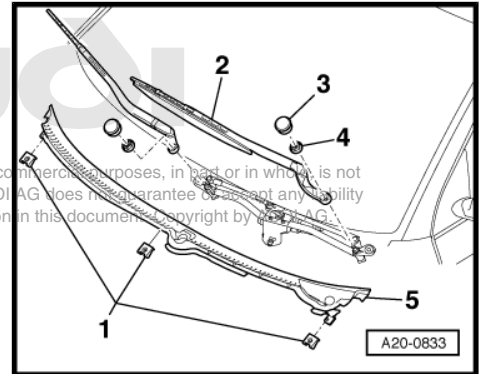
- Unscrew nut -1- and detach strip fuse at positive terminal.
- Disconnect positive cable -2- at positive battery terminal.
- Pull out positive cable forwards through plenum chamber partition panel.
- Move wiring harness clear and place on top of engine.



 **Note**

*Disregard -item 3-.*

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



 **Note**

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



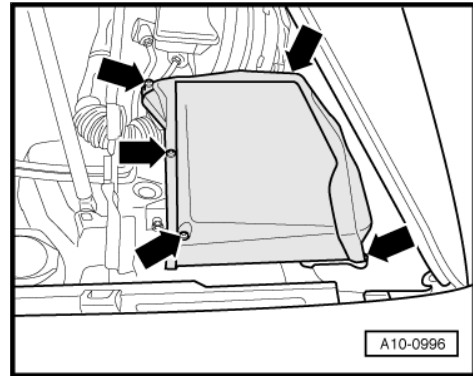
**Caution**

***To avoid cracking the cowl panel trim -5- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel trim and pull the trim vertically up out of the windscreen surround, starting from the edge of the windscreen.***

- Pull off retaining clips -1- and detach cowl panel trim -5-.



- Remove cover for electronics box in plenum chamber -arrows-.

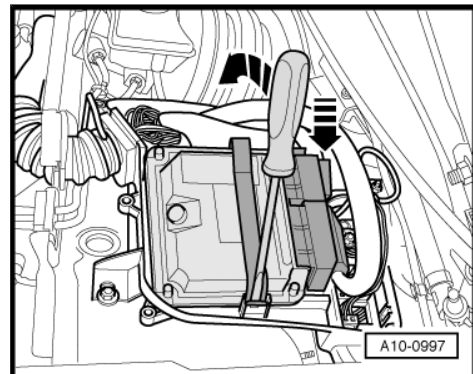


- Using a screwdriver, carefully lever out retaining strap -arrow- and remove engine control unit from electronics box.

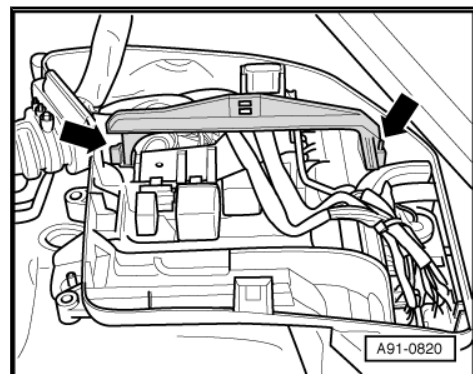


**Note**

*The engine control unit remains connected to the wiring harness.*



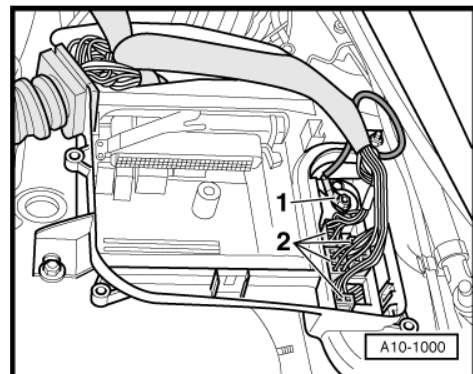
- Release retaining hooks -arrows- outwards and remove retaining strap.



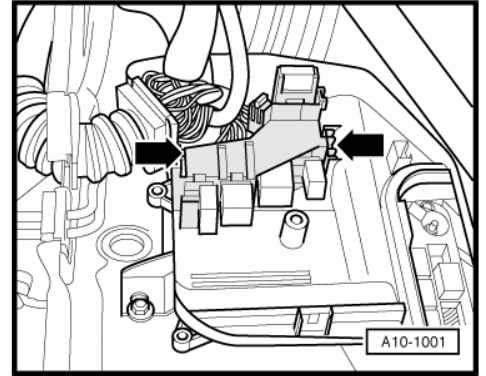
- Unplug all electrical connectors at connector point -2-.

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- Unscrew electrical wiring -1-.
- Move wiring harness clear.



- Release retainers -arrows- and push auxiliary relay carrier in electronics box upwards to remove.
- Disengage engine wiring harness at electronics box and at plenum chamber partition panel.



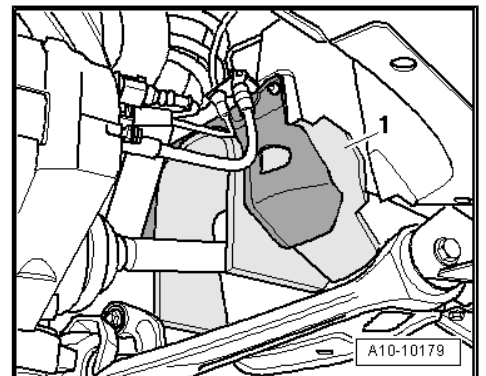
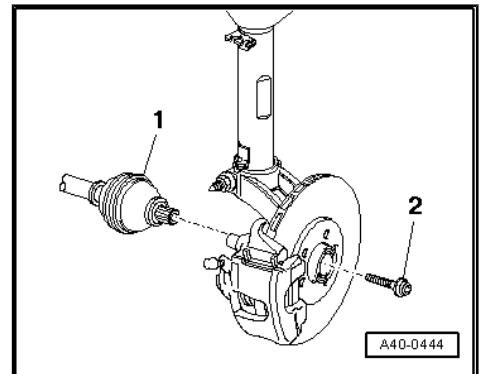
- Have a 2nd mechanic press the brake pedal.



**Caution**

*When slackening the flange bolt securing the drive shaft, the wheel bearing must not be under load (vehicle must not be standing on its wheels).*

- Unscrew flange bolt -2- from drive shaft -1- (left and right).
- Remove noise insulation -1- in wheel housing (left and right).

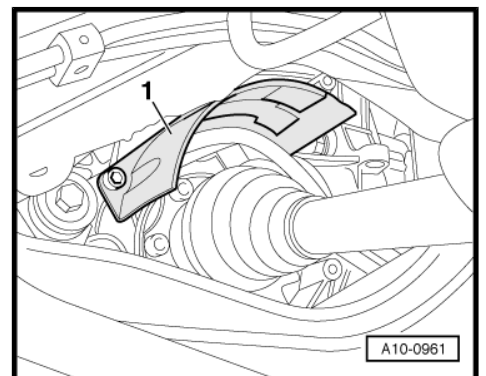


- Unbolt heat shield -1- for drive shaft (left-side).
- Unbolt drive shafts (left and right) from gearbox flange shafts.



**Note**

*The drive shafts are removed at a later stage.*



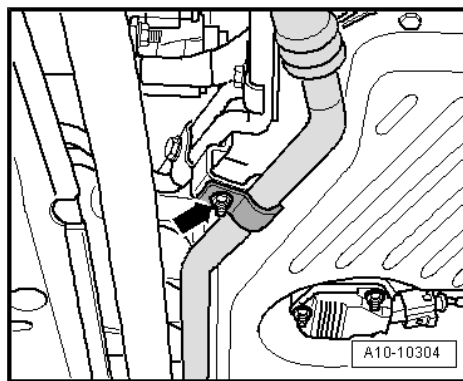
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**Note**

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

- Unbolt retainer for refrigerant pipe (right-side) from sump -arrow-.
- Detach refrigerant lines from AC compressor.
- Tie up refrigerant line leading to reservoir (right side of vehicle) to body.



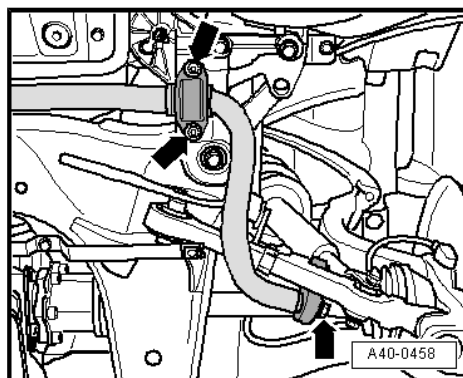
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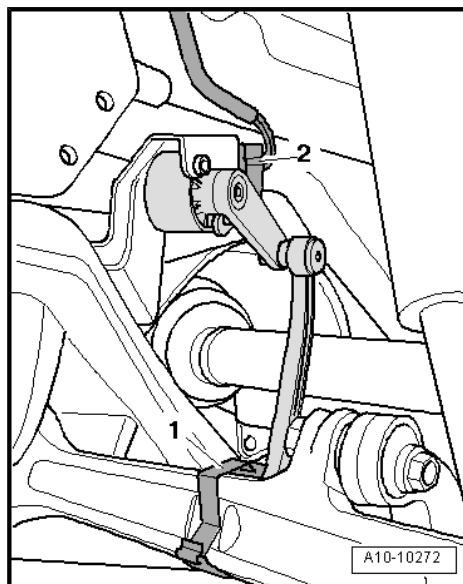
**Note**

Seal open pipes and connections at air conditioner compressor with suitable caps (to prevent ingress of dirt and moisture).

- Unscrew nuts and bolts -arrows- evenly on both sides of vehicle.
- Take out anti-roll bar.



- If fitted, unplug electrical connector -2- at front left vehicle level sender -G78- .
- Unclip retaining clip -1- on operating rod for front left vehicle level sender -G78- at track control link (bottom).

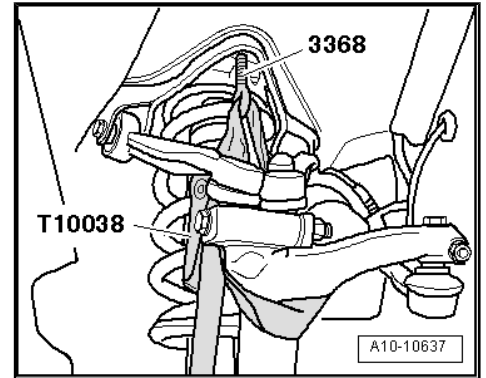


- Working from engine compartment, remove outer securing bolt for suspension strut on both sides of vehicle.
- Screw eye-head bolt -3368- from below into bore in suspension turret on both sides of vehicle.



**Caution**

*To avoid damaging the bonnet when it is shut, screw in eye-head bolt -3368- only until it is flush with the top surface of the suspension turret.*

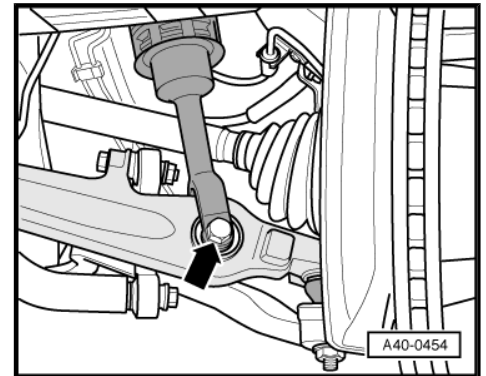


- Tie up wheel bearing housing on each side using tensioning strap -T10038- as illustrated.



**Caution**

*To prevent damage to the joints on the upper links, the weight of the wheel bearing housings must be supported before slackening the bottom securing bolts for the suspension struts.*



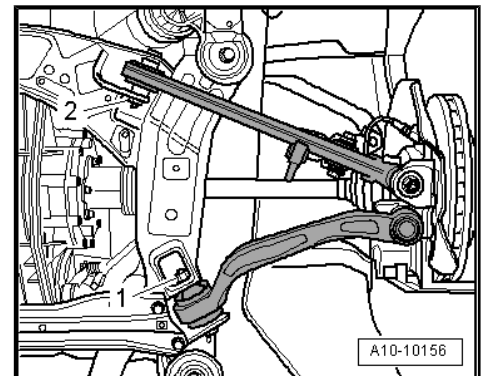
- Unbolt suspension strut from track control link -arrow-.

- Unscrew nuts -1- and -2- on bolt connections securing track control link and guide link.



**Note**

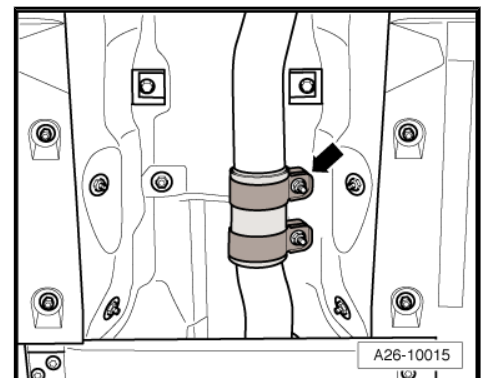
*The bolts are removed from the subframe at a later stage.*



- Repeat procedure on other side of vehicle.

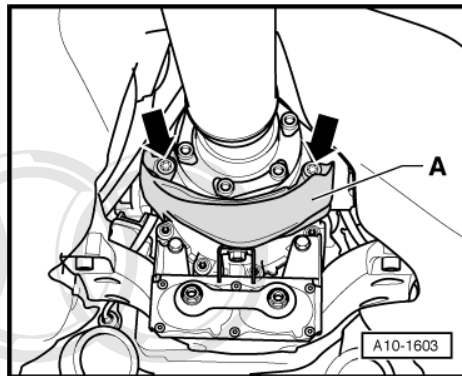
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- Disconnect exhaust system at clamp -arrow-.





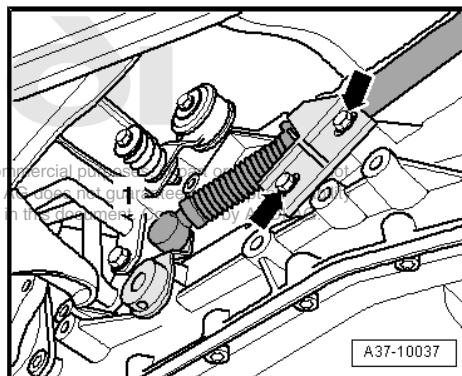
- Unscrew heat shield -A- for propshaft -arrows-.
- Unscrew bolts at gearbox/propshaft flange.
- Push propshaft back towards rear drive. The constant velocity joints can be moved axially.
- Tie up propshaft to body.



**Note**

Mark installation position of support bracket for selector lever cable with a felt-tip pen.

- Push ball socket -1- of selector lever cable off gearbox selector lever.
- Unbolt cable support bracket from gearbox -arrows-.
- Move selector lever cable clear.



**Note**

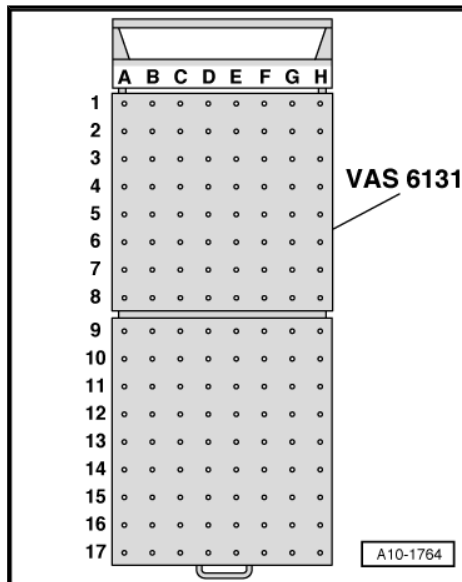
Shown in illustration with gearbox support removed.

**Set up the scissor-type assembly platform as follows:**

- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- as follows:

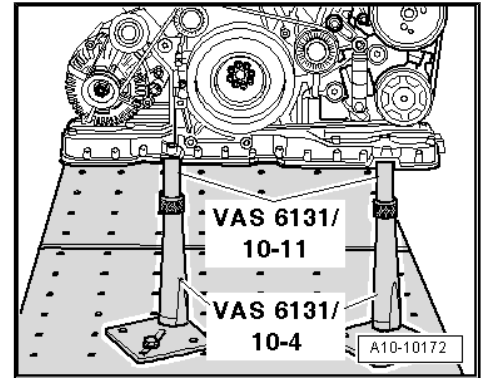
Platform coordinates	Parts from support set for Audi -VAS 6131/10-			
B3	/10-1	/10-4	/10-5	/10-11
F3	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
C15	/10-1	/10-3	/10-5	/10-12
F15	/10-1	/10-3	/10-5	/10-12

- Initially tighten the support elements on the assembly platform only hand-tight.
- Adjust the scissor-type assembly platform -VAS 6131 A- so that it is horizontal.
- Take note of spirit level (bubble gauge).
- Place scissor-type assembly platform -VAS 6131 A- under engine/gearbox assembly.

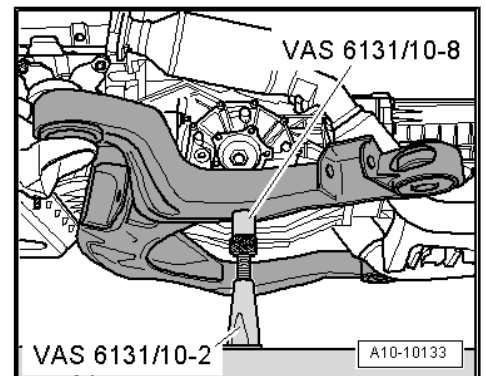




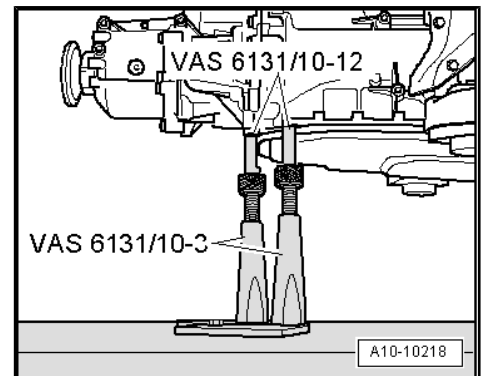
- Position support elements from -VAS 6131/10- at front of engine, as shown in illustration.
- Make sure that threaded spindles are screwed in completely.



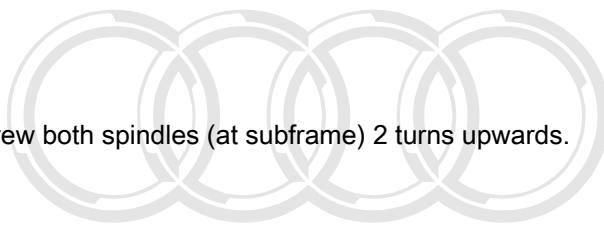
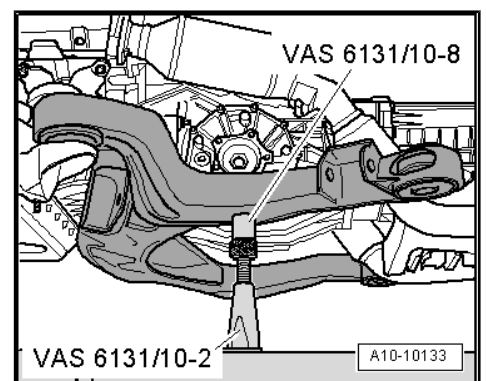
- Position support elements from -VAS 6131/10- at left and right of subframe, as shown in the illustration.



- Position support elements from -VAS 6131/10- at rear of gear box, as shown in illustration.
- Turn all spindles for the support elements upwards until all locating lugs make contact with the mounting points.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .



- Screw both spindles (at subframe) 2 turns upwards.

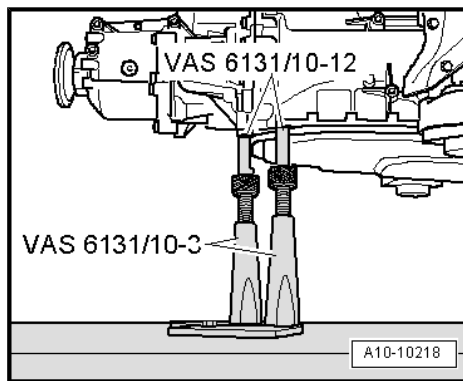


**Audi**

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- Screw both spindles (at gearbox) 4 turns upwards.



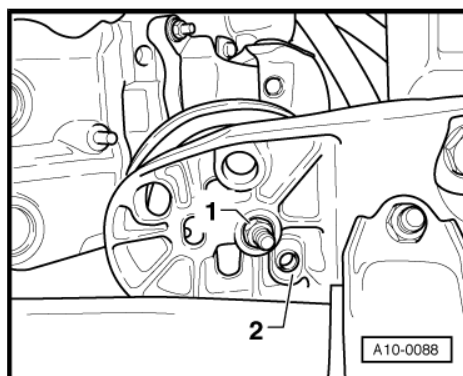
- Mark positions of bolt connection -1- and locating sleeve -2- on bottom of engine mounting (right-side).



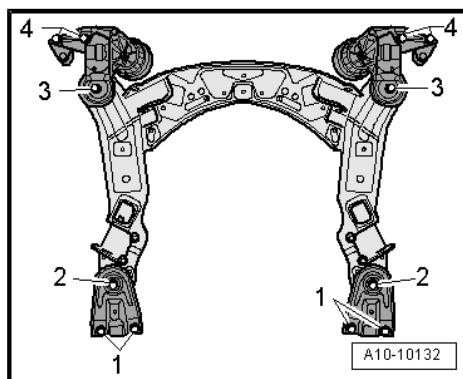
**Note**

*Different mounting holes are provided for the different engine versions.*

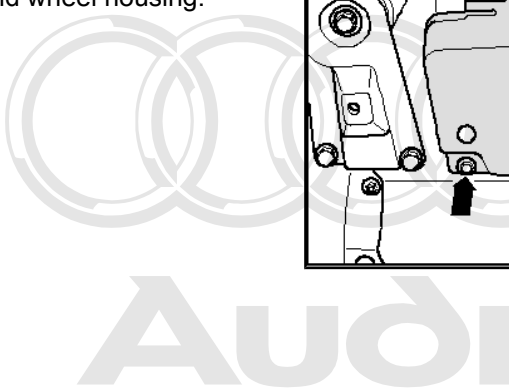
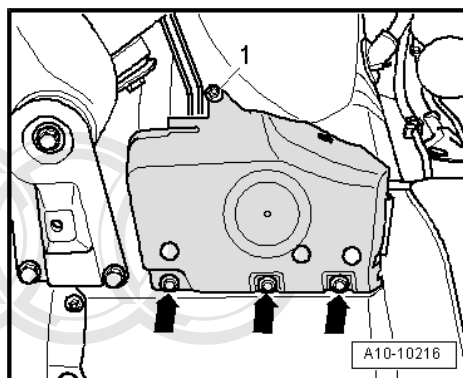
- Unscrew nuts -1- (bottom) at engine mountings (left and right).



- Remove bolts -1-.
- Mark the installation position of the subframe and the two consoles for engine mountings on the longitudinal members with a felt-tip pen.
- Unscrew bolts -2, 3, 4- in diagonal sequence and in stages.
- Take out consoles for engine mounting (left and right).

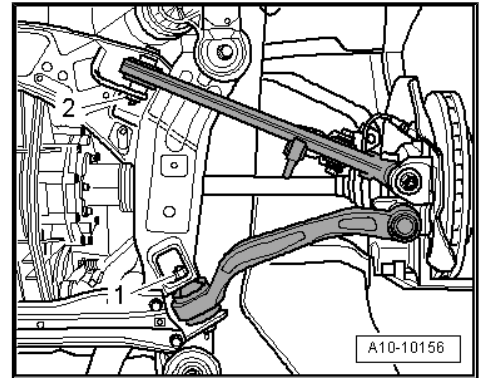


- Detach rear section of wheel housing liner ⇒ Rep. gr. 66 .
- Remove fasteners -arrows-.
- Unscrew nut -1- and remove cover behind wheel housing.




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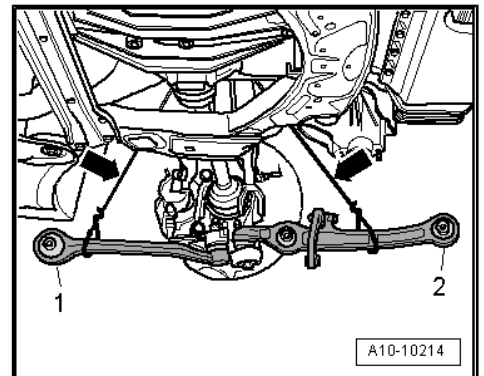
- Remove bolts for guide link -1- and track control link -2- from subframe.



- Pivot guide link -1- and track control link -2- outwards.

 **Caution**

*The guide link and track control link must not be allowed to hang down without support. Tie up both links to wheel bearing housing as illustrated -arrows-.*



- Pivot wheel bearing housing outwards and remove drive shaft.
  - Repeat procedure on other side of vehicle.
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 **Note**

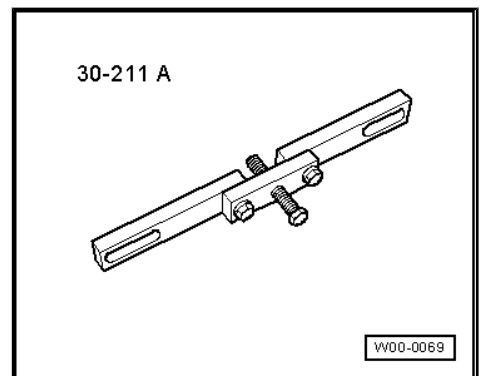
- ◆ Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.
- ◆ Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering to avoid damage.

- Lower engine/gearbox assembly gradually.

### 3.2 Separating engine and automatic gearbox

#### Special tools and workshop equipment required

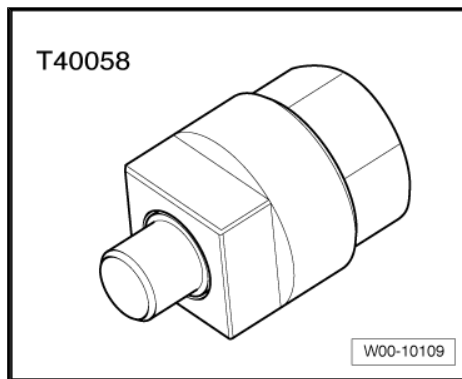
- ◆ Support bridge -30 - 211 A-



- ◆ Support set for Audi -VAS 6131/10- , supplementary set - VAS 6131/11- and -VAS 6131/12-



◆ Adapter -T40058-



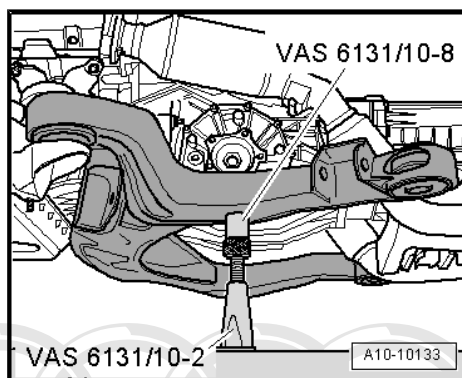
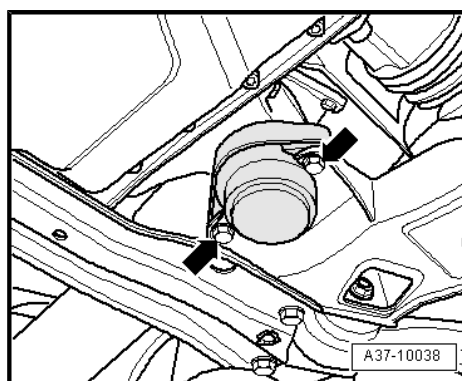
Procedure



Note

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

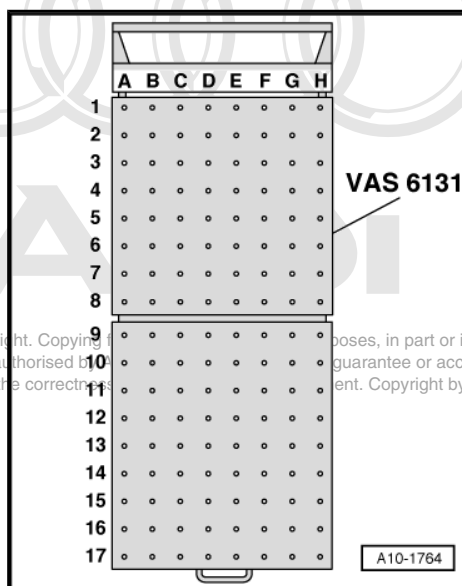
- Engine/gearbox assembly removed and secured to scissor-type assembly platform -VAS 6131 A-
- Remove bolts -arrows- for gearbox mountings (left and right).
- Screw down spindles of support elements from -VAS 6131/10- (left and right) at subframe as far as possible.
- Remove locating lugs from spindles.
- Remove subframe to the side.



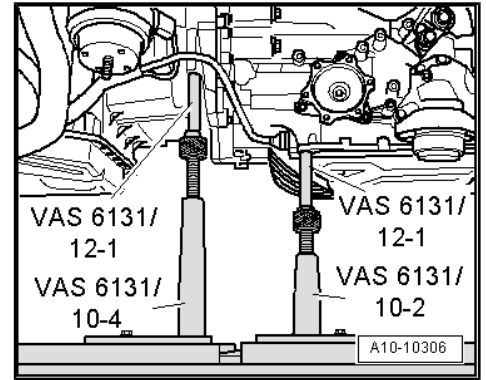
- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- , support set -VAS 6131/11- and supplementary set -VAS 6131/12- as follows:

Platform coordinates	Parts of support set for Audi -VAS 6131/10- , support set -VAS 6131/11- and supplementary set -VAS 6131/12-			
B3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
F3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
B7	/10-1	/10-4	/10-5	/12-1
F7	/10-1	/10-4	/10-5	/11-2
B10	/10-1	/10-2	/10-5	/12-1
G10	/10-1	/10-2	/10-5	/11-3
C15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-12
F15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-12

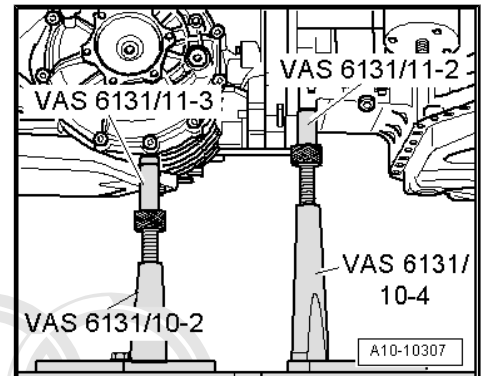
• <sup>1)</sup> Support elements remain unchanged.



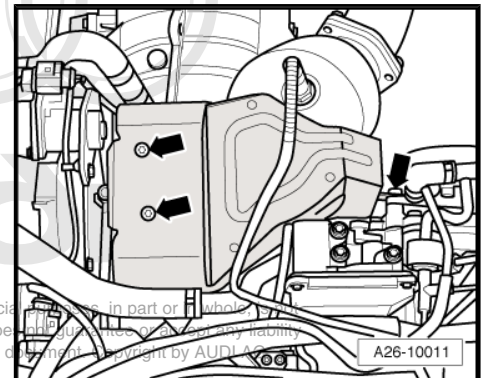
- Position support elements from -VAS 6131/10- and -VAS 6131/12- on left side of engine/gearbox assembly, as shown in illustration.



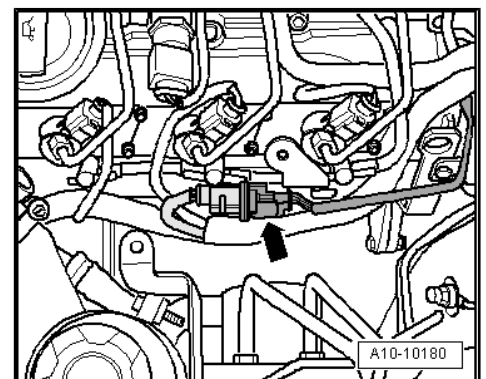
- Place support elements from -VAS 6131/10- and -VAS 6131/11- at right of engine/gearbox assembly, as shown in illustration.
- Turn spindles for the support elements upwards until all locating lugs make contact with the mounting points.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .



- Remove heat shield for turbocharger -arrows-.



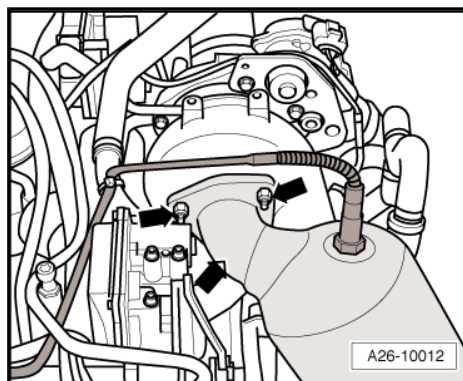
- Unplug electrical connector -arrow- for Lambda probe -G39- and move wiring clear.



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- Unscrew nuts -arrows- at starter catalytic converter/turbo-charger.



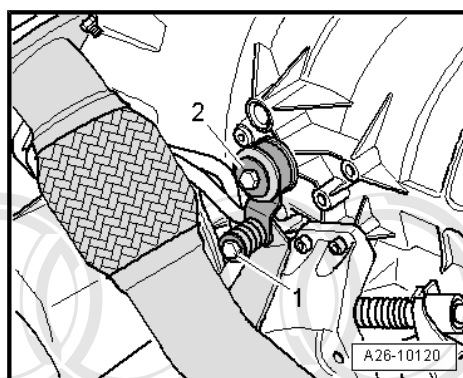
- Remove bolt -1- on bracket for starter catalytic converter.



**Note**

*Disregard -item 2-.*

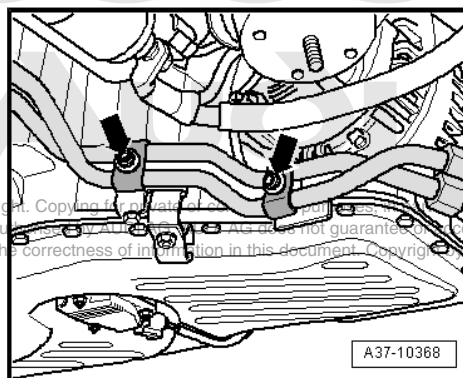
- Detach starter catalytic converter together with catalytic converter / particulate filter.



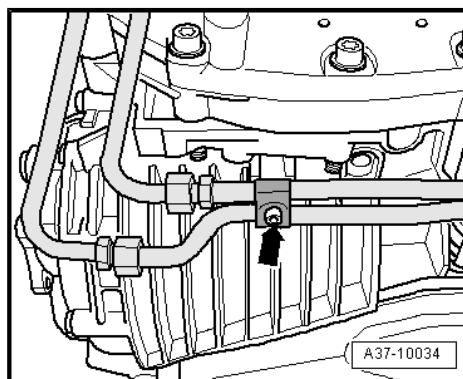
**Note**

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

- Unbolt brackets -arrows- for ATF lines at sump (top section).



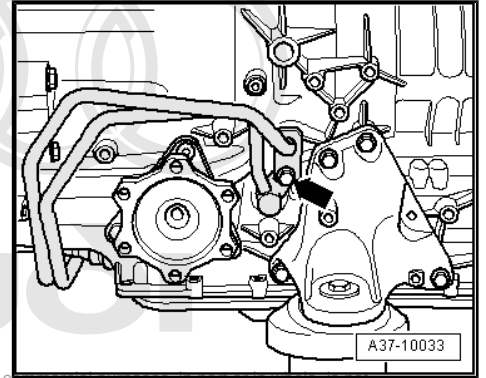
- Unbolt bracket -arrow- for ATF lines at gearbox (bottom).



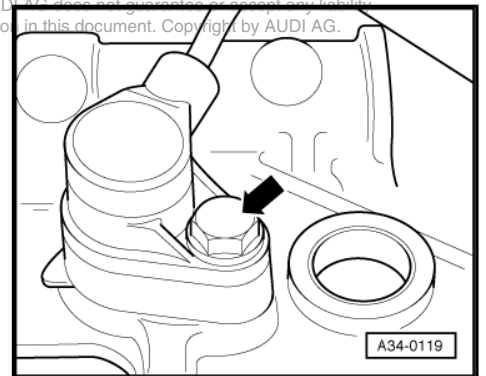
 **Note**

*Lay a cloth under the connection to catch escaping ATF.*

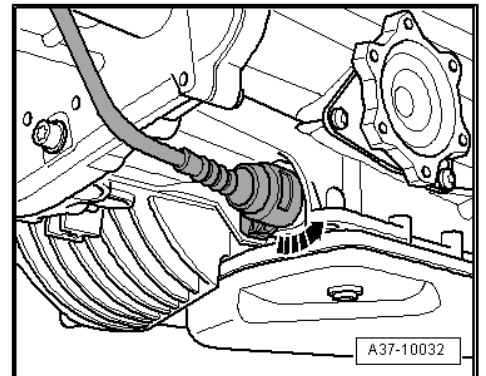
- Remove bolt -arrow-.
- Detach ATF lines from gearbox.



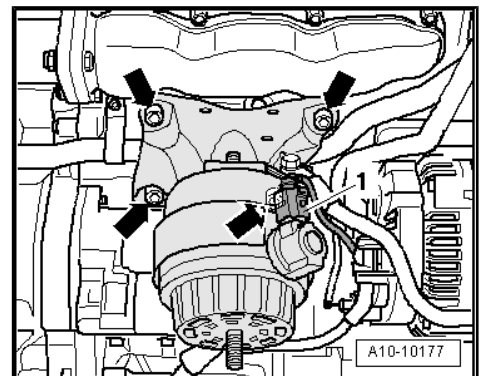
- Unbolt engine speed sender -G28- from gearbox -arrow-.



- Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

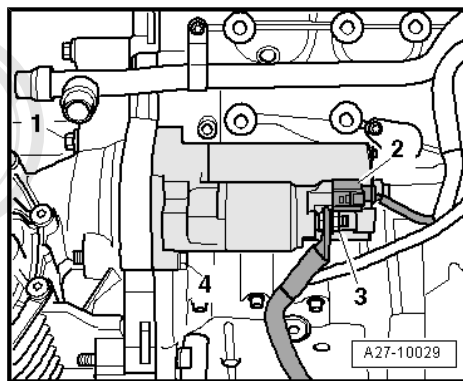


- Unplug electrical connector -1- at engine mounting (right-side).
- Move wiring clear at console for engine mounting.
- Remove bolts -arrows- and detach engine support (right-side).

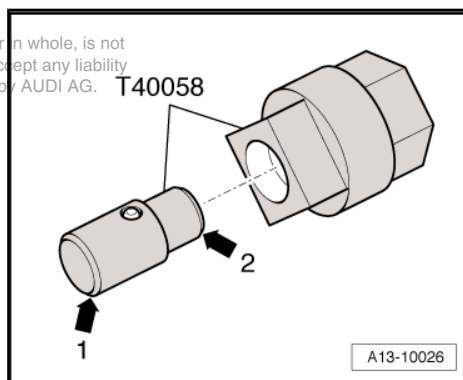




- Detach electrical wires -2- and -3- at starter.
- Remove bolts -1- and -4- and detach starter.



- Insert guide pin of adapter -T40058- with the larger-diameter section -arrow 1- facing towards the engine. The smaller-diameter section -arrow 2- faces the adapter.

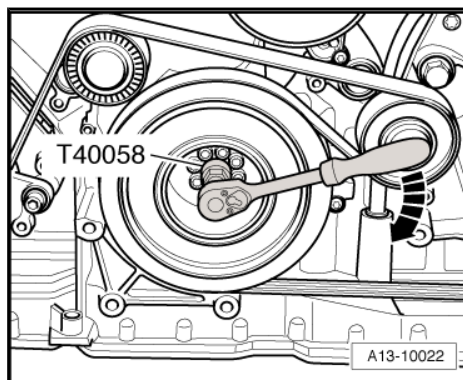


- When loosening torque converter bolts, counterhold crankshaft using adapter -T40058- .



**Note**

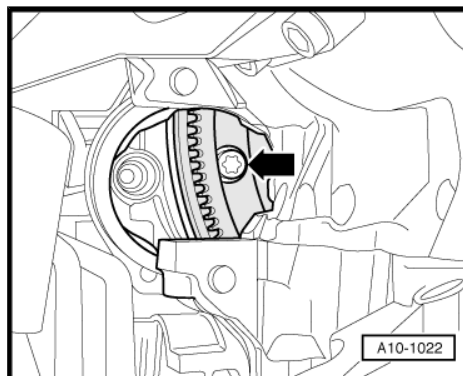
Disregard -arrow-.



**Caution**

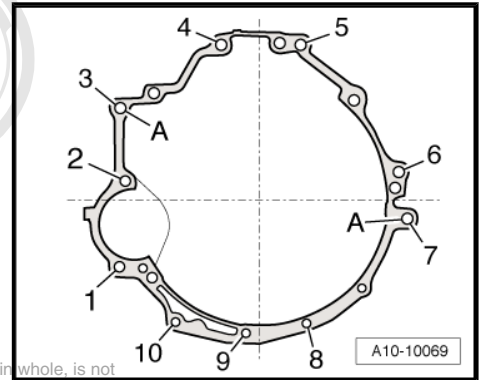
**Do not rotate crankshaft in opposite direction of engine rotation.**

- Unscrew 3 bolts -arrow- for torque converter, working through opening of removed starter (turn crankshaft  $\frac{1}{3}$  turn each time).

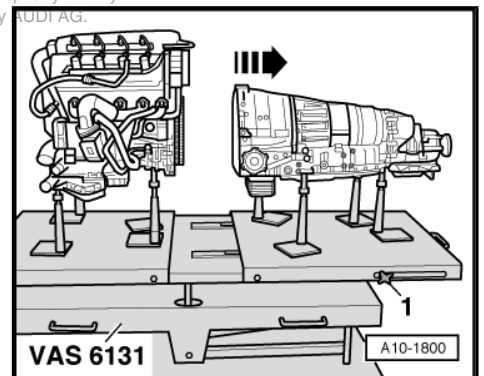




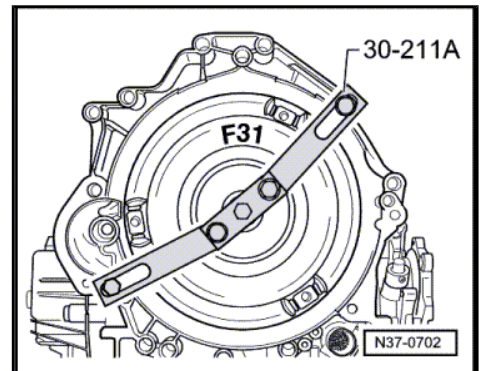
- Remove engine/gearbox securing bolts -3 ... 10-.



- Loosen clamping bolts -1- on sides of scissor-type assembly platform -VAS 6131 A- and pull rear section of platform together with gearbox towards the rear -arrow-; simultaneously separate the torque converter from the drive plate through the opening.



- Secure the torque converter in the gearbox using support bridge -30 - 211 A- to prevent it falling out.



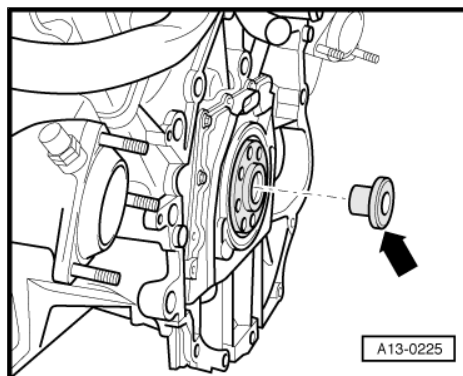
### 3.3 Installing engine

#### Note

- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Renew bolts which are tightened to a specified angle as well as seals and gaskets.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- ◆ *Fit all cable ties in the original positions when installing.*



- Before installing an exchange engine in a vehicle with automatic gearbox, check whether the centralising bush -arrow- for the torque converter is fitted at the rear of the crankshaft.



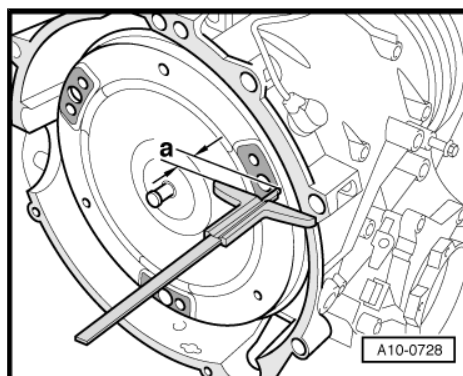
### Checking installation depth of torque converter

If the torque converter has been correctly installed, the distance -a- between the contact surfaces at the threaded holes in the torque converter and the joint surface on the torque converter bell-housing for automatic gearbox 09L is at least 19 mm.



#### Caution

*If the torque converter is not installed correctly, the drive lugs of the torque converter and the ATF pump will be seriously damaged when the gearbox is joined to the engine.*



# Audi

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- Before bringing engine and gearbox together, turn torque converter and drive plate on engine so that the holes for one securing bolt are in line with the opening for the starter motor -arrow-.
- To secure torque converter on drive plate, use only new ribbed bolts of the correct type (same as original equipment) as specified in ⇒ Electronic parts catalogue .



**Caution**

***Do not rotate crankshaft in opposite direction of engine rotation.***

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- Tighten 3 bolts for torque converter through opening for starter motor (turn crankshaft  $\frac{1}{3}$  turn each time).
- Bolt gearbox to engine.



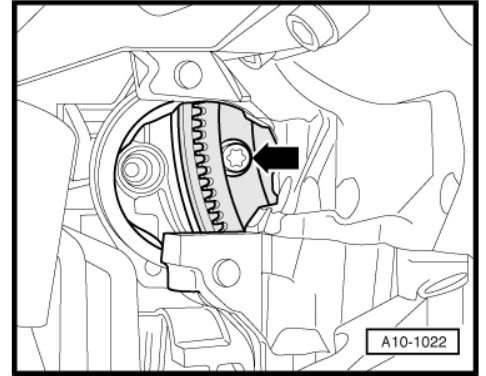
**Caution**

***Before and during tightening of bolts on engine/gearbox flange, continually check that the torque converter behind the drive plate can be turned. If the converter cannot be turned, it must be assumed that it has not been installed correctly and the drive lugs of the ATF pump and consequently the gearbox will be damaged when the bolts are finally tightened.***



**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%.*

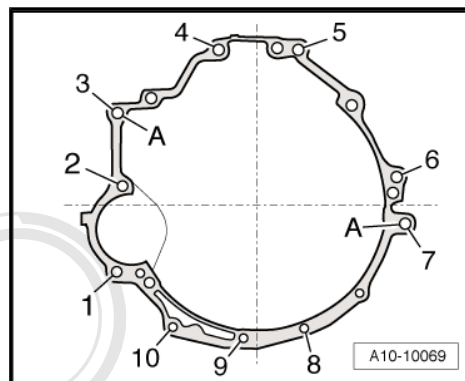




Securing engine to gearbox

Item	Bolt	Nm
1	M10x80	65 <sup>1)</sup>
2	M10x100	65 <sup>1)</sup>
3	M12x100	65
4, 5	M12x110	65
6, 7	M12x120	65
8, 9, 10	M10x80	45
A	Dowel sleeves for centralising	

• <sup>1)</sup> Property class 10.9.



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

- Secure ATF lines ⇒ Rep. gr. 37 .

**Vehicles without particulate filter:**

- Install starter catalytic converter with catalytic converter ⇒ [page 334](#) .

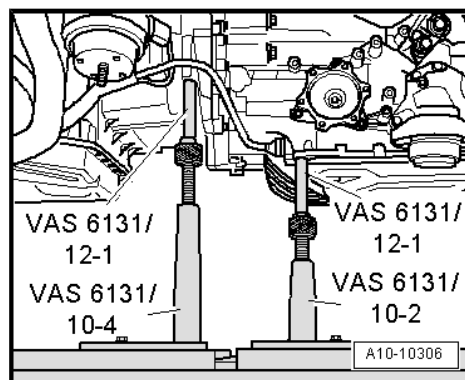
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**Vehicles with particulate filter:**

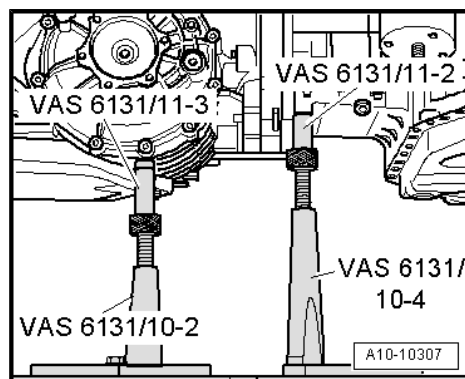
- Install starter catalytic converter with particulate filter ⇒ [page 350](#) .

**All vehicles (continued):**

- The threaded holes in the flange shaft for the propshaft on the gearbox must be cleaned of remaining locking fluid with a thread tap before assembling.
- Screw down spindles of support elements on left side of engine/gearbox assembly.
- Unscrew both base plates for support elements (left-side) at scissor-type assembly platform -VAS 6131 A- .



- Screw down spindles of support elements on right side of engine/gearbox assembly.
- Unscrew both base plates for support elements (right-side) at scissor-type assembly platform -VAS 6131 A- .



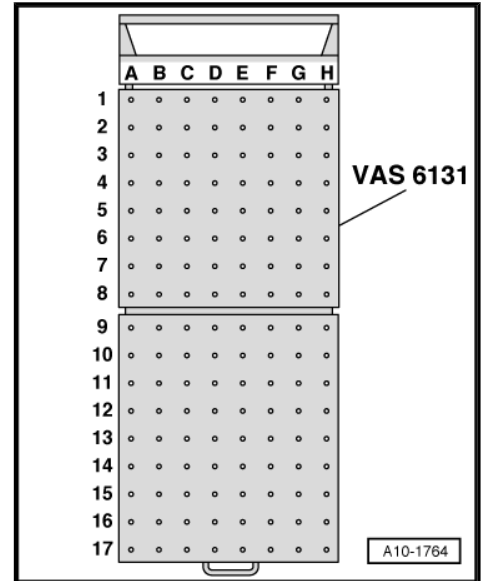
**Note**

*The mounting points for engine (front) and gearbox (rear) remain unchanged.*

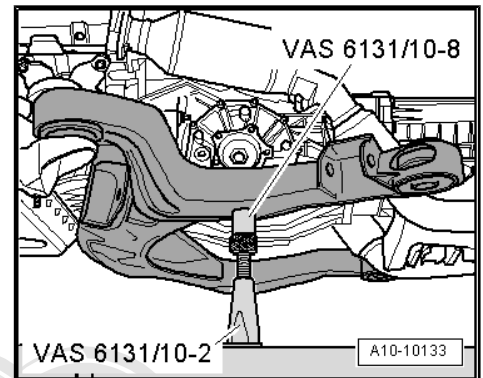
- Set up scissor-type assembly platform -VAS 6131 A- with support set for Audi -VAS 6131/10- as follows:

Platform coordinates	Parts from support set for Audi -VAS 6131/10-			
B3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
F3 <sup>1)</sup>	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8 <sup>2)</sup>
G10	/10-1	/10-2	/10-5	/10-8 <sup>2)</sup>
C15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-12
F15 <sup>1)</sup>	/10-1	/10-3	/10-5	/10-12

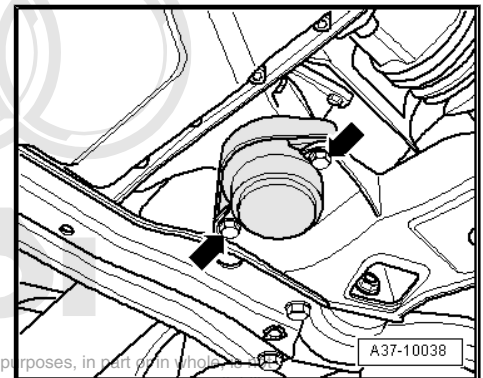
- <sup>1)</sup> Support elements remain unchanged.
- <sup>2)</sup> Secure support elements only after installing the sub-frame.



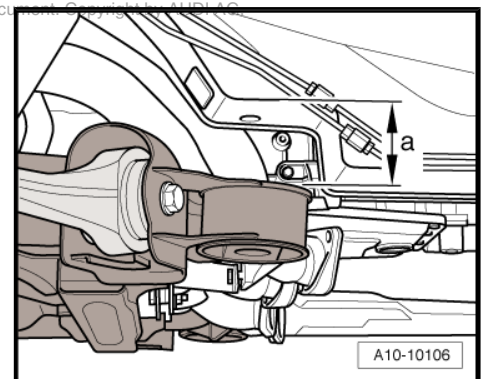
- Fit subframe onto the two support elements -VAS 6131/10-8- .
- Screw up the spindles for support elements on both sides.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131 A- .



- Secure gearbox mountings to subframe -arrows-.

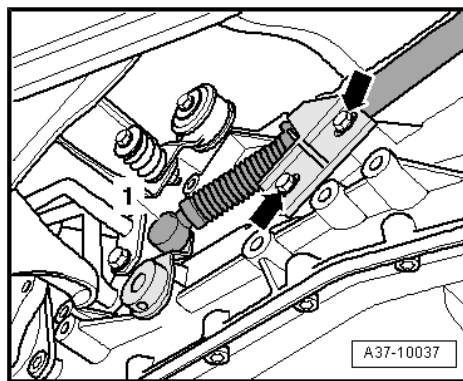


- Slowly guide engine/gearbox assembly into body from below using scissor-type assembly platform -VAS 6131 A- until distance between subframe and body is -a-.
- Distance -a- = 60 mm.

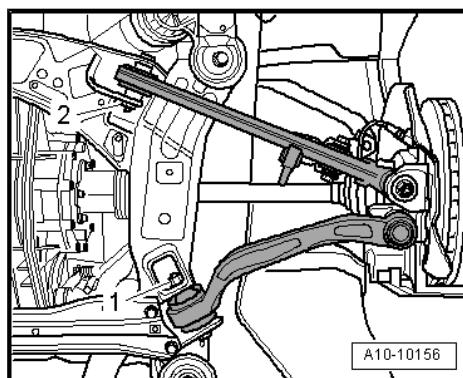




- Push ball socket -1- of selector lever cable onto gearbox selector lever.
- Attach cable support bracket to gearbox according to markings -arrows-.



- Insert drive shafts in splines of wheel bearing housing (left and right).
- Bolt guide link -1- and track control link -2- loosely onto subframe.

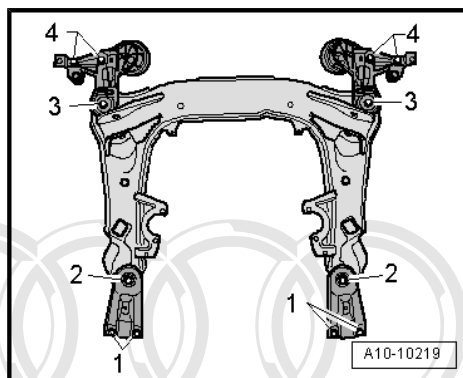


**Note**

*Wait until vehicle is standing on ground before tightening bolts to final setting.*

- Adjust the subframe according to the markings made on the longitudinal members during removal.
- Tighten bolts for subframe and consoles for engine mountings only to specified torque (do not turn further); the bolts are only fully tightened after performing the wheel alignment check.

- 1 - 65 Nm
- 2 - 115 Nm
- 3 - 115 Nm
- 4 - 75 Nm



**WARNING**

*The vehicle must not be driven at this stage.*

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

- Install propshaft ⇒ Rear final drive 01R and 0AR; Rep. gr. 39 .
- Align exhaust system so it is free of stress: vehicles without particulate filter ⇒ [page 340](#) , vehicles with particulate filter ⇒ [page 359](#) .
- Install refrigerant lines ⇒ Rep. gr. 87 .
- Install drive shafts ⇒ Rep. gr. 40 .
- Install guide links, track control links, anti-roll bar and suspension struts ⇒ Rep. gr. 40 .

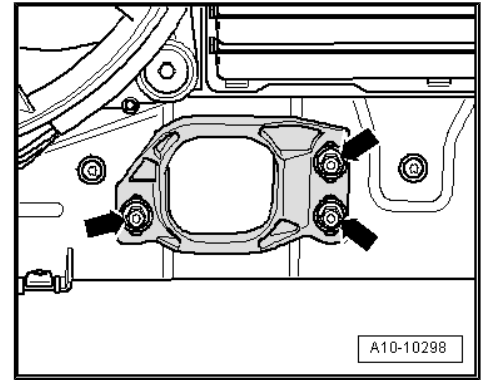
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- Install stop for torque reaction support and torque reaction support.
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight and tighten nuts -arrows-.
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe notes on procedures required after connecting battery ⇒ Rep. gr. 27 .



**Caution**

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



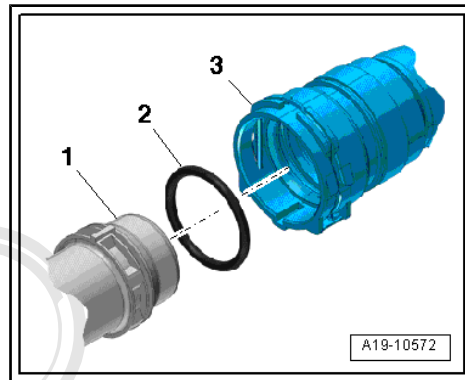
- Install and adjust wiper arms ⇒ Rep. gr. 92 .
- Install selector lever cable and check adjustment if necessary ⇒ Rep. gr. 37 .
- Check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .

**Audi**

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- Remove old O-ring -2- from coolant hose -3-.
- Lubricate new O-ring with coolant additive and fit O-ring in coolant hose.
- Press coolant hose onto radiator -1- until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.
- Fill cooling system ⇒ [page 255](#) .



#### Note

- ◆ *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- ◆ *Contaminated or dirty coolant must not be used again.*
- Before starting engine, top up hydraulic fluid in power steering reservoir and bleed steering system ⇒ Rep. gr. 48 .



#### Note

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*The power steering pump must not be run when dry.*

- Check ATF level ⇒ Rep. gr. 37 .
- Adjust subframe and the two consoles for engine mountings ⇒ Rep. gr. 40 .
- Perform wheel alignment check ⇒ Rep. gr. 44 .



#### WARNING

***Tighten bolts for subframe to final setting after performing wheel alignment check.***

- Charge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a .
- Check fuel system for leaks ⇒ [page 5](#) .

#### 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 %.*



Component	Nm	
Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Except for the following:		
Drive plate to torque converter	85 <sup>1)</sup>	
Terminal B+ to starter	16	
Engine support to cylinder block	40	
Gearbox mounting to subframe	23	
Console for engine mounting to longitudinal member	75	
Engine mounting to console for engine mounting	23	
Drive shaft heat shield to gearbox	23	
Torque reaction support to engine	40	
Stop for torque reaction support to lock carrier	28	
Hydraulic pressure pipe to power steering pump	47	
Throttle valve module -J338- to intake manifold	9	
Hose clips (9 mm wide)	3	
Hose clips (13 mm wide)	5.5	
<ul style="list-style-type: none"> <li><sup>1)</sup> Renew bolts.</li> </ul>		

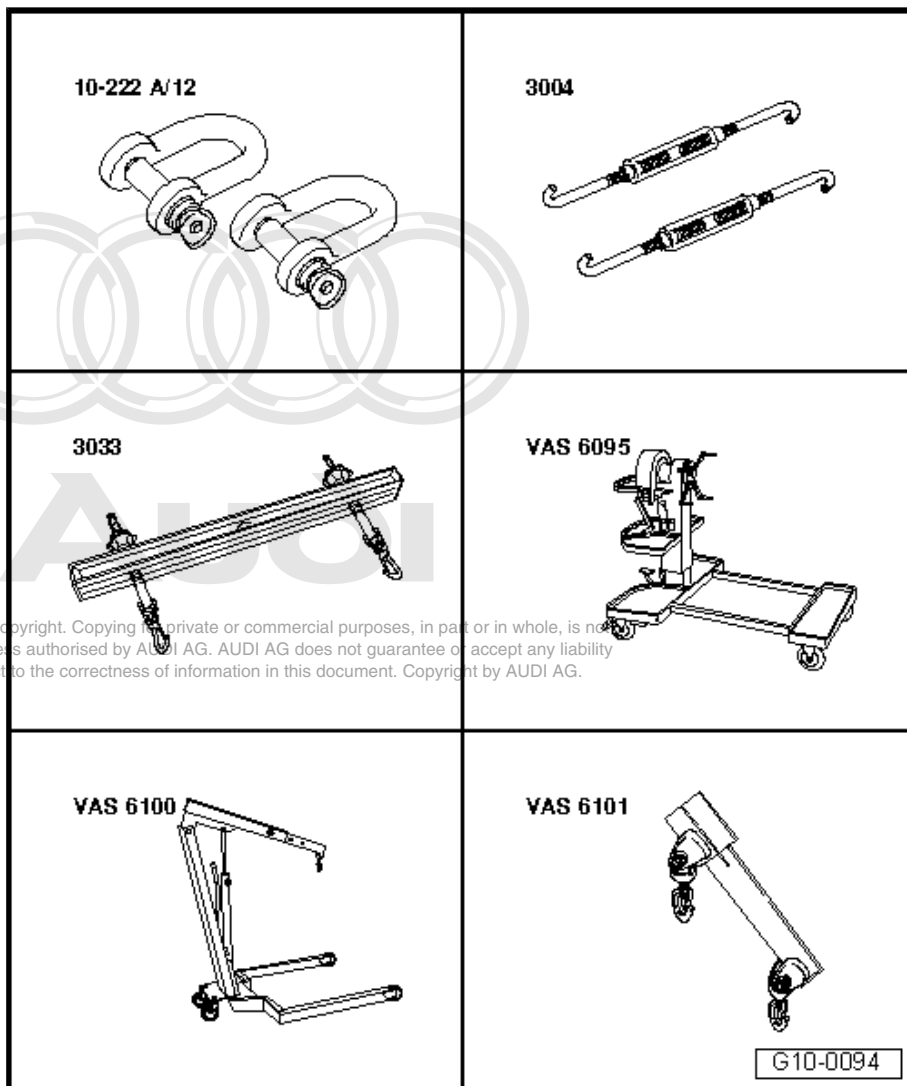
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## 4 Securing engine to engine and gearbox support

### Special tools and workshop equipment required

- ◆ Shackle -10 - 222 A /12-
- ◆ Hook -3004-
- ◆ Lifting tackle -3033-
- ◆ Engine and gearbox support -VAS 6095- with bracket for V6 TDI engine -VAS 6095/1-4-
- ◆ Workshop hoist - VAS 6100-
- ◆ Lift arm extension (workshop hoist) -VAS 6101-



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### Procedure

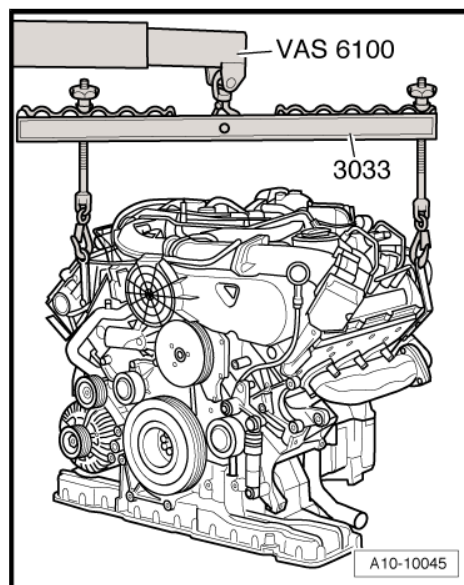
- Engine separated from gearbox ⇒ [page 22](#) .



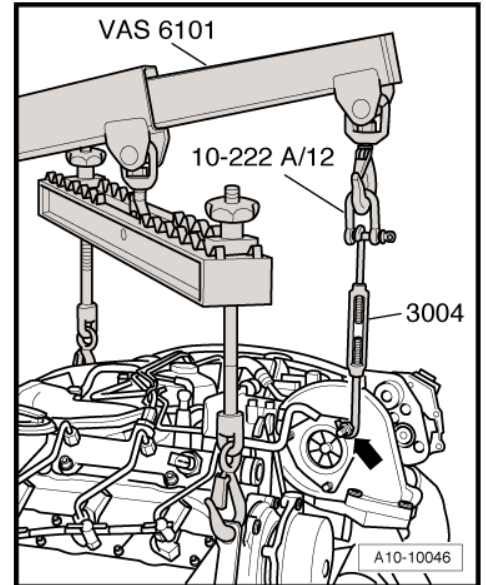
### Note

For better accessibility with workshop hoist -VAS 6100- it is advisable to remove the sliding bar from scissor-type assembly platform -VAS 6131 A- .

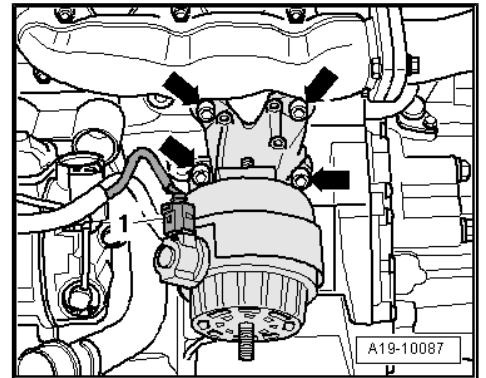
- Attach lifting tackle -3033- to workshop hoist -VAS 6100- as shown in the illustration.



- Screw a nut -arrow- about 4 turns onto stud on turbocharger.
- Attach lift arm extension -VAS 6101- to workshop hoist -VAS 6100- .
- Connect lift arm extension -VAS 6101- to shackle -10 - 222 A / 12- and engage hook -3004- on stud.
- Tension hook -3004- so that engine is taken up horizontally.
- Lift engine off the support elements on scissor-type assembly platform -VAS 6131 A- .

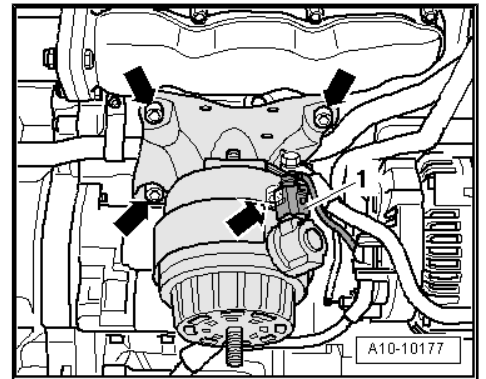


- Unplug electrical connector -1- at engine mounting (left-side).
- If necessary, move wiring clear at console for engine mounting.
- Remove bolts -arrows- and detach engine support (left-side).



#### Vehicles with manual gearbox or multitronic gearbox:

- Unplug electrical connector -1- at engine mounting (right-side).
- If necessary, move wiring clear at console for engine mounting.
- Remove bolts -arrows- and detach engine support (right-side).

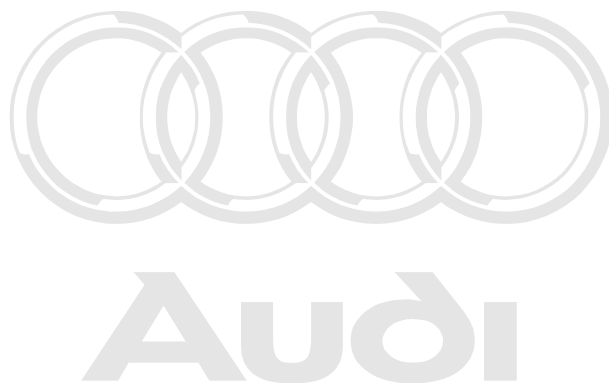
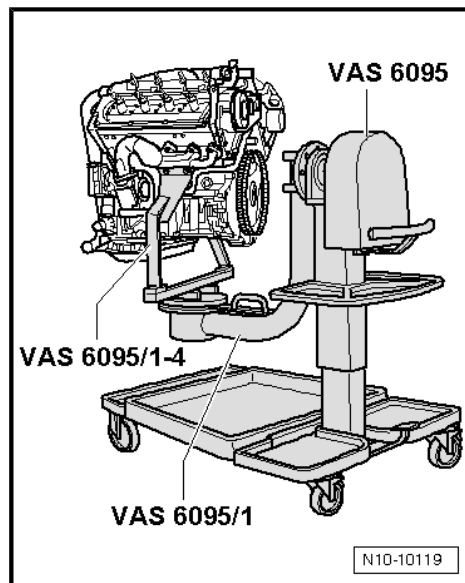


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**All vehicles (continued):**

- Using support bracket for V6 TDI engine -VAS 6095/1-4- , secure engine to engine and gearbox support -VAS 6095- (40 Nm) as shown in the illustration.



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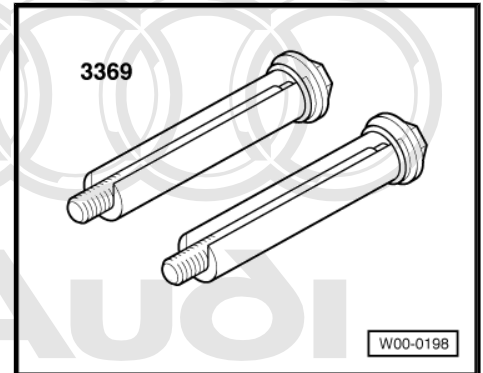
## 13 – Crankshaft group

### 1 Cylinder block (pulley end)

#### 1.1 Moving lock carrier into service position

##### Special tools and workshop equipment required

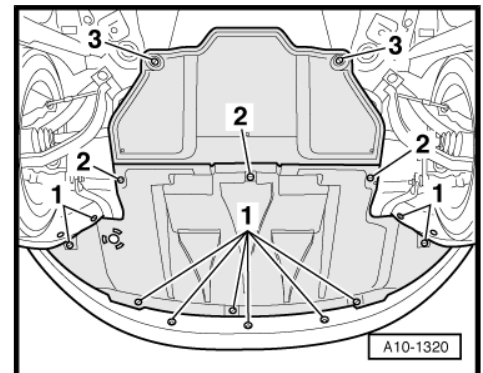
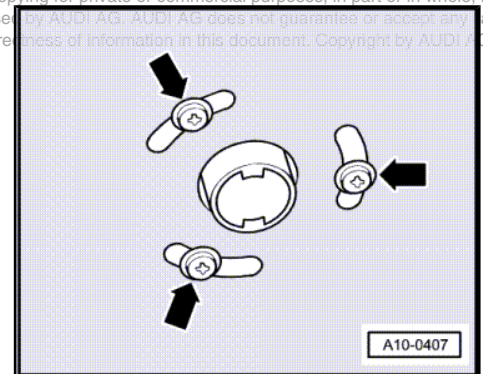
- ◆ Front-end service sleeves -3369-



##### Procedure

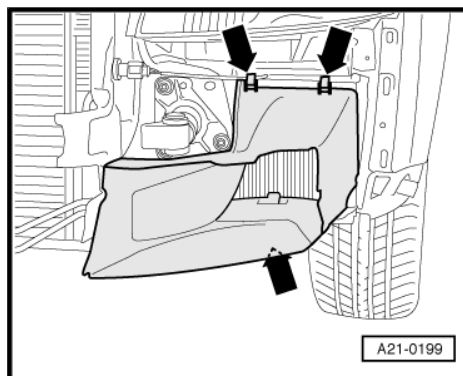
- Remove both front wheels.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Release quick-release fasteners -1- and -2- and take off front noise insulation. Leave rear noise insulation in position.
- Detach front sections of wheel housing liners (left and right) ⇒ Rep. gr. 66 .

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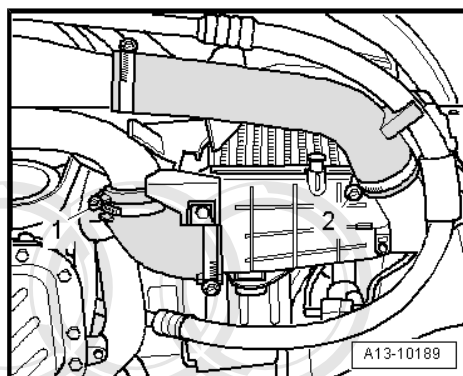




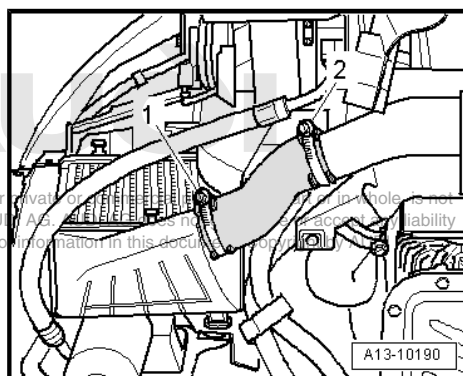
- Remove bumper cover (front) ⇒ Rep. gr. 63 .
- Remove air ducts in front of both charge air coolers -arrows-.



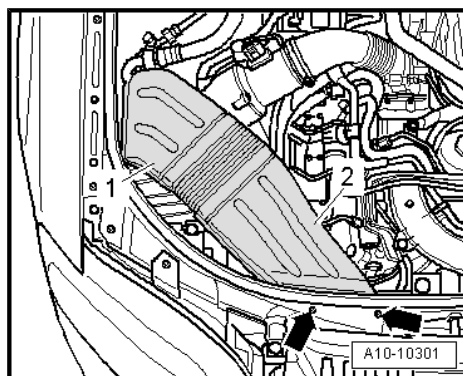
- Detach air intake hoses at the connections marked -1- and -2-.



- Loosen hose clips -1- and -2- and remove air intake hose.

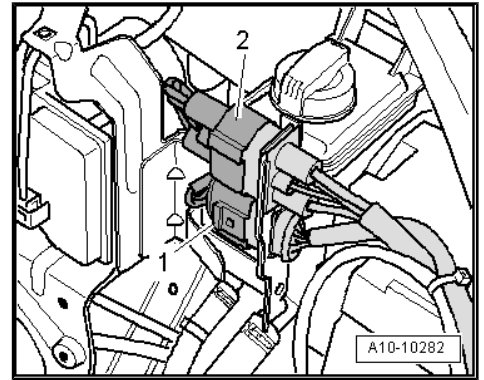


- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.

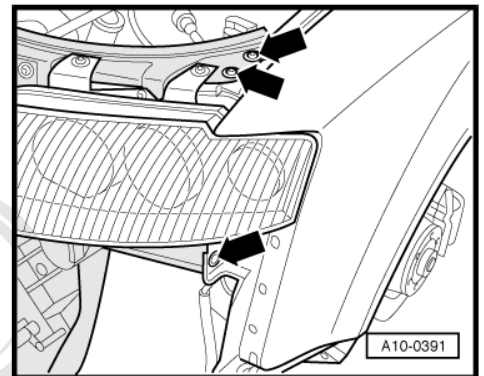


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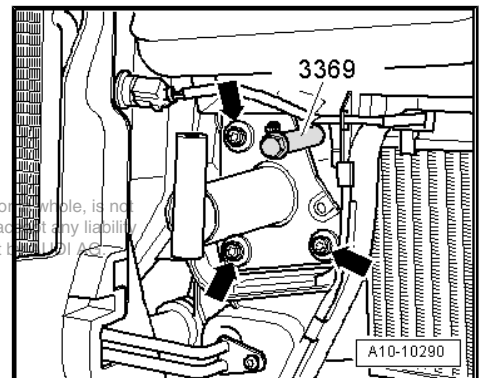
- Disengage the electrical connectors -1- and -2- from retainer and move wiring clear.



- Pull bonnet seal off lock carrier and wing panel flanges.
- Remove bolts (left and right) -arrows-.



- Screw in front-end service sleeves -3369- (left and right) in the holes.
- Unscrew bolts -arrows- from impact dampers (left and right).
- Carefully pull the lock carrier forward.



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## 1.2 Poly V-belt drive - exploded view

### 1 - Poly V-belt

- Before removing, mark direction of rotation with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.
- Removing and installing ⇒ [page 101](#)
- Check for wear
- When installing, make sure it is properly seated on pulleys.

### 2 - 20 Nm + 90°

- Property class 10.9
- Renew

### 3 - Shim

- Renew
- Must be fitted on all vehicles, even if no shim was fitted previously

### 4 - Cover for idler roller

### 5 - Alternator

- Removing and installing ⇒ Rep. gr. 27
- To facilitate attachment of alternator, knock back threaded bushes for alternator securing bolts slightly

### 6 - 23 Nm

### 7 - Cover for idler roller

### 8 - 23 Nm

- Property class 10.9

### 9 - Idler roller for poly V-belt

- Note installation position

### 10 - Bolt

- Tightening torque and sequence ⇒ [page 100](#)

### 11 - Bracket for alternator and idler roller

### 12 - 23 Nm

- Property class 10.9

### 13 - Idler roller for poly V-belt

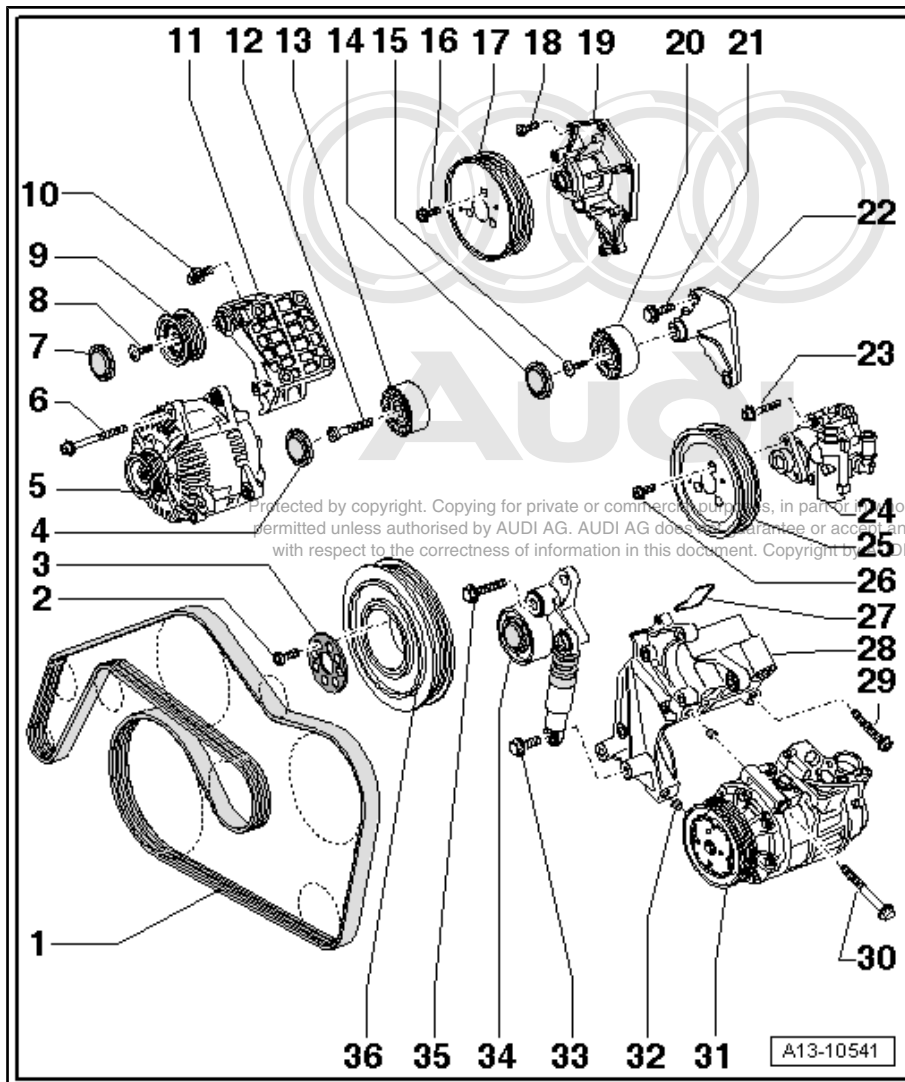
- Note installation position

### 14 - Cover for idler roller

- On vehicles with additional idler roller

### 15 - 23 Nm

- Property class 10.9
- On vehicles with additional idler roller



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## 16 - 23 Nm

### 17 - Poly V-belt pulley for coolant pump

- Counterhold with pin wrench -3212- when loosening and tightening ⇒ [page 101](#) .
- Installation position: marking „vorne“ (front) faces in direction of travel.

## 18 - 9 Nm

### 19 - Coolant pump

- Removing and installing ⇒ [page 260](#)

### 20 - Idler roller for poly V-belt

- Only applicable on new versions:
- Removing and installing ⇒ [page 104](#)

## 21 - 23 Nm

- On vehicles with additional idler roller

### 22 - Bracket for idler roller

- On vehicles with additional idler roller

## 23 - 23 Nm

### 24 - Power steering pump

- Removing and installing ⇒ Rep. gr. 48

### 25 - Poly V-belt pulley for power steering pump

- Counterhold with pin wrench -3212- when loosening and tightening ⇒ [page 101](#) .
- Installation position: marking „vorne“ (front) faces in direction of travel.

## 26 - 22 Nm

### 27 - Gasket

- Renew

### 28 - Bracket for ancillaries

## 29 - 40 Nm

## 30 - 25 Nm

### 31 - Air conditioner compressor


- Do not unscrew or disconnect refrigerant hoses or pipes.
- Removing and installing ⇒ Rep. gr. 87
- When installing check dowel sleeves -item 32-

### 32 - Dowel sleeve

- 2x
- Check for correct seating in bracket

## 33 - 23 Nm

### 34 - Poly V-belt tensioner


 **Caution**

***Depending on the vehicle version, an M10 or an M11 thread may have been used for the securing thread in the crankcase for the tensioner. It is very important that the correct bolt and tensioner to the crankcase is used. ⇒ Electronic parts catalogue***



- Removing and installing ⇒ [page 103](#)

### 35 - Bolt

 **Caution**  
*Different threads in crankcase.*

*Before installation, check whether thread is M10 or M11 version.*

*Use appropriate bolt size. Risk of damage to engine.*

*It is very important that the correct bolt and tensioner to the crankcase is used. ⇒ **Electronic parts catalogue***

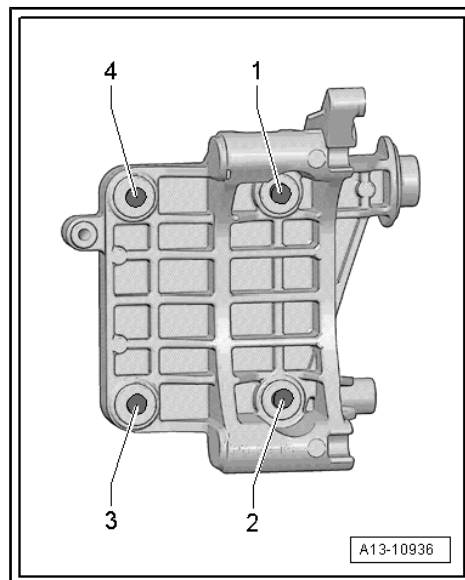
- Bolt with M10 thread: 50 Nm + turn 90° further
- Bolt with M11 thread: 60 Nm + turn 90° further
- Renew

### 36 - Vibration damper

- With poly V-belt pulley
- Removing and installing ⇒ [page 106](#)

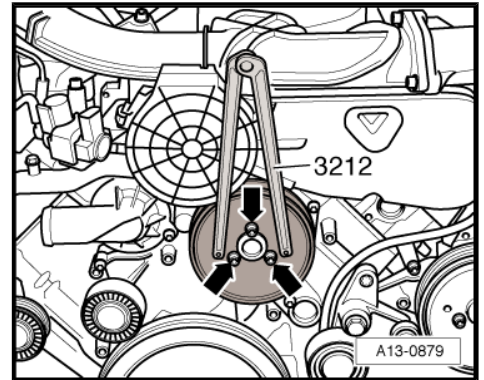
### Bracket for alternator and idler roller - tightening torque and sequence

- Fit bolts in the sequence -1 ... 4-
- Tighten bolts in the sequence -1 ... 4- to 40 Nm.



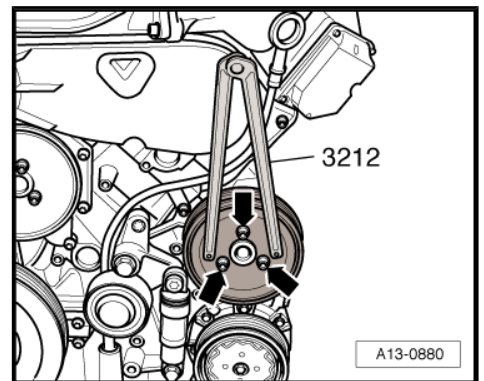
### Loosening poly V-belt pulley for coolant pump

- Poly V-belt removed.
- Counterhold using pin wrench -3212- when loosening bolts -arrows- on poly V-belt pulley for coolant pump.



### Loosening poly V-belt pulley for power steering pump

- Poly V-belt removed.
- Counterhold using pin wrench -3212- when loosening bolts -arrows- on poly V-belt pulley for power steering pump.

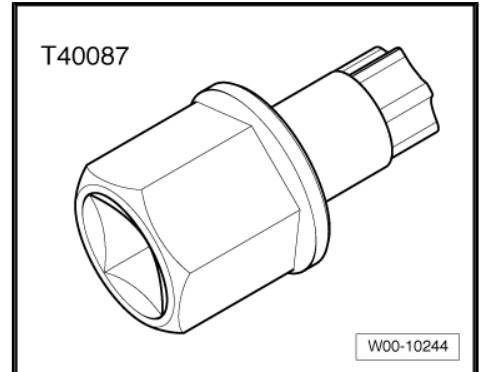


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## 1.3 Removing and installing poly V-belt

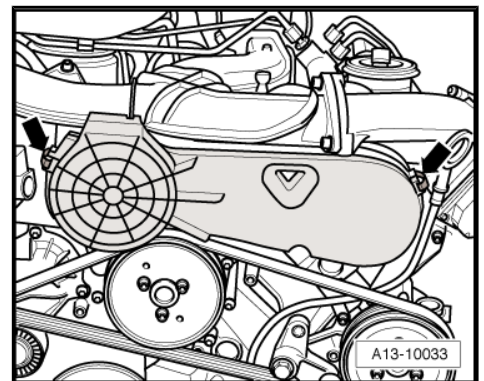
### Special tools and workshop equipment required

- ◆ Socket Torx T 60 -T40087-



### Removing

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Loosen clamps -arrows-.
- Pivot toothed belt cover forward and disengage retaining pegs on bottom side of toothed belt cover.

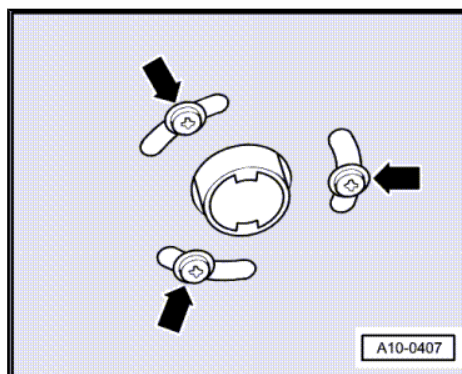
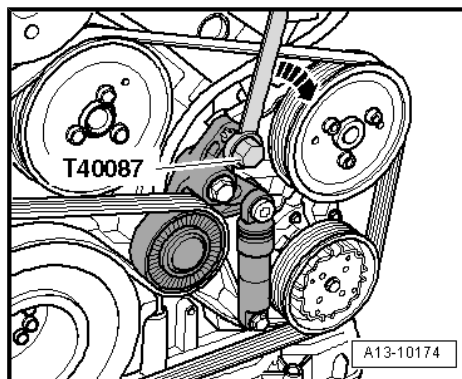




**Note**

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

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using socket Torx T 60 -T40087- and a long, straight-handled ring spanner or open-end spanner.
- Remove poly V-belt from tensioning roller.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.

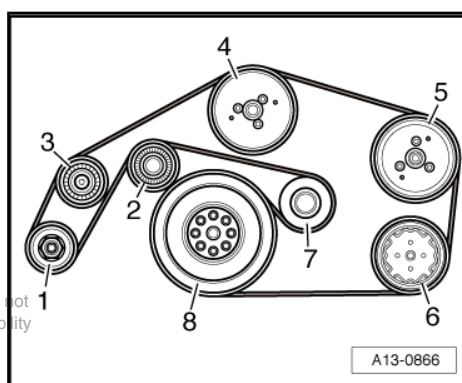
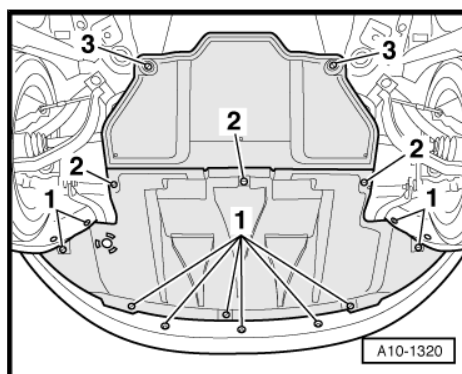


- Release quick-release fasteners -1- and -2- and take off front noise insulation.
- Remove poly V-belt.

**Installing**

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

- Fit poly V-belt on pulleys.



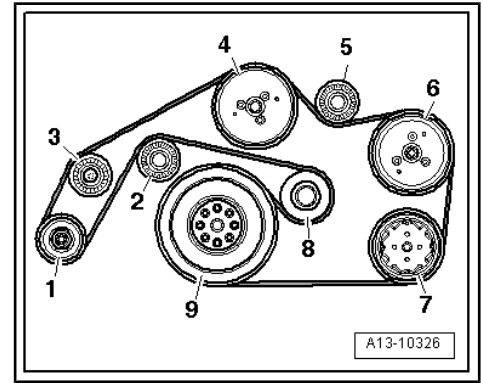
**Vehicles without additional idler roller:**

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

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**Vehicles with additional idler roller:**

- 1 - Alternator
- 2 - Idler roller
- 3 - Idler roller
- 4 - Coolant pump
- 5 - Idler roller
- 6 - Power steering pump
- 7 - Air conditioner compressor
- 8 - Poly V-belt tensioner
- 9 - Crankshaft



**All vehicles (continued):**

 **Note**

*When installing poly V-belt, make sure it is properly seated on pulleys.*

- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Start engine and check that belt runs properly.

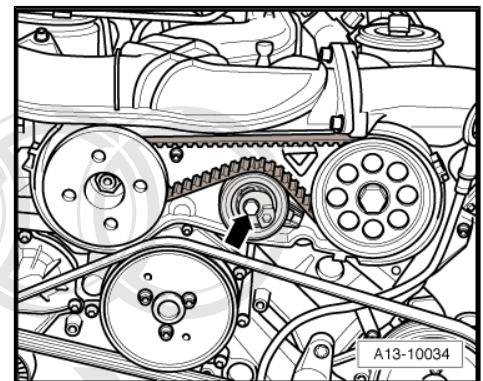
## 1.4 Removing and installing tensioner for poly V-belt

### Removing

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove poly V-belt ⇒ [page 101](#) .
- Unscrew bolt -arrow- and detach tensioning roller.

 **Note**

*The toothed belt remains installed.*



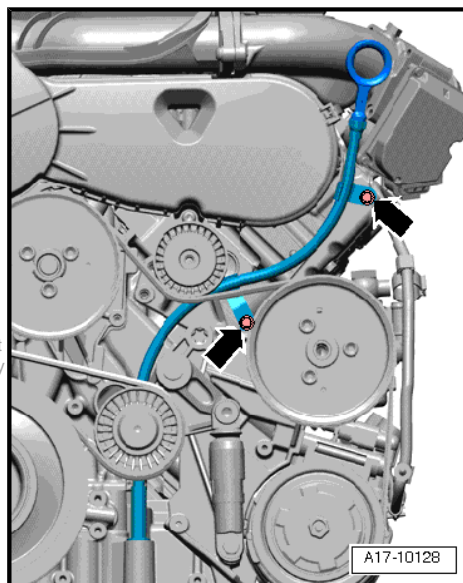
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- Remove bolts -arrows- and lift out guide tube for oil dipstick.



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- Remove bolts -arrows- for poly V-belt tensioner.
- Swivel poly V-belt tensioner and pull top bolt -top arrow- out of tensioner.
- Take out poly V-belt tensioner downwards.

#### Installing

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



#### Note

- ◆ *Renew O-ring.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

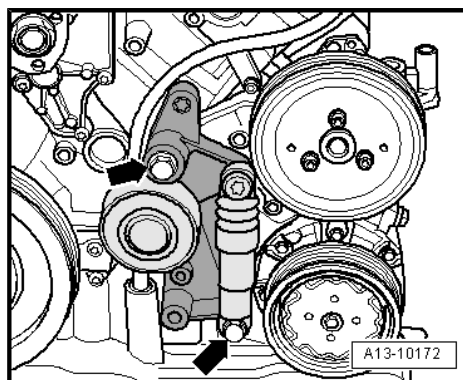
- Install poly V-belt ⇒ [page 101](#) .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Tightening torques ⇒ [page 98](#)

#### Further tightening torques

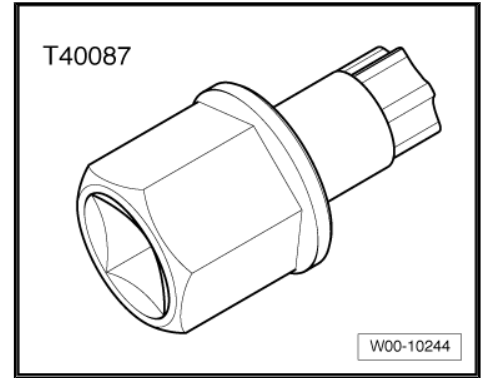
Component	Nm
Guide tube for oil dipstick to engine	9

## 1.5 Removing and installing idler roller for poly V-belt

Special tools and workshop equipment required

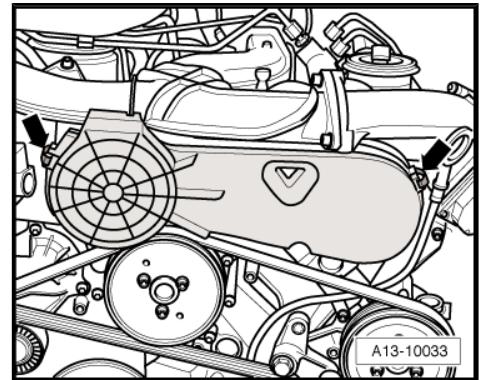


- ◆ Socket Torx T 60 -T40087-

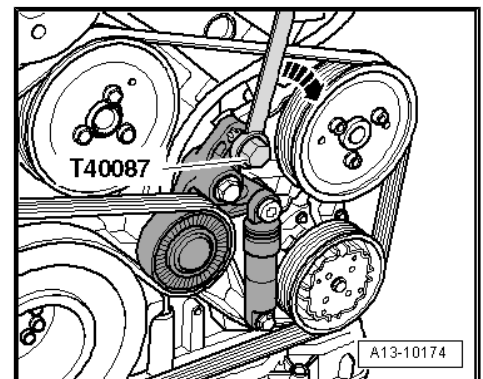


### Removing

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Loosen clamps -arrows-.
- Pivot toothed belt cover forward and disengage retaining pegs on bottom side of toothed belt cover.



- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using socket Torx T 60 -T40087- and a long, straight-handled ring spanner or open-end spanner.
- Remove poly V-belt from tensioning roller.



- Unscrew bolts -arrows- and detach idler roller from front sealing flange.

### Installing

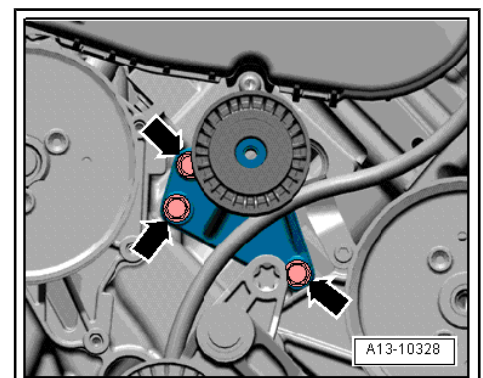
Installation is carried out in the reverse order; note the following:

- Install poly V-belt ⇒ [page 101](#) .

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- Install intake manifold (top section) ⇒ Rep. gr. 23

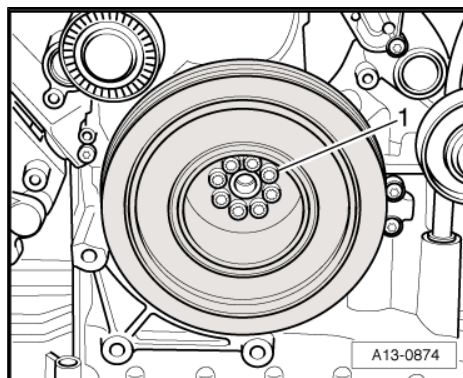
- ◆ Tightening torque ⇒ [page 98](#)



## 1.6 Removing and installing vibration damper

### Removing

- Move lock carrier to service position ⇒ [page 95](#) .
- Remove poly V-belt ⇒ [page 101](#) .
- Mark position of vibration damper for re-installation.
- Unscrew bolts -1- and remove vibration damper.

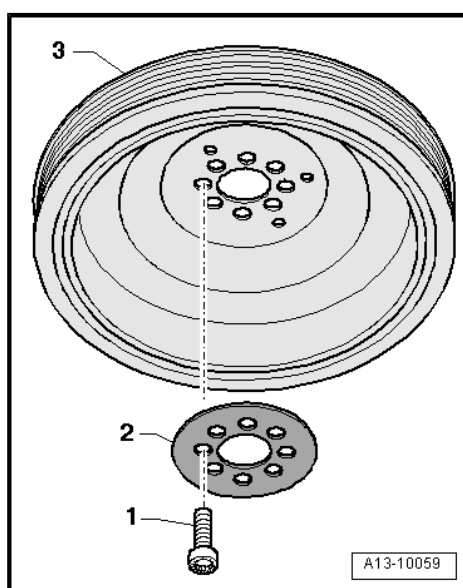


### Installing

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

#### Note

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
  - ◆ *Renew bolts -1- for vibration damper.*
- Install vibration damper -3- with new shim -2-.



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**The shim must be installed on all vehicles, even if no shim was fitted previously.**

- Install poly V-belt ⇒ [page 101](#) .
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .
- Tightening torque ⇒ [page 98](#)

### Further tightening torques

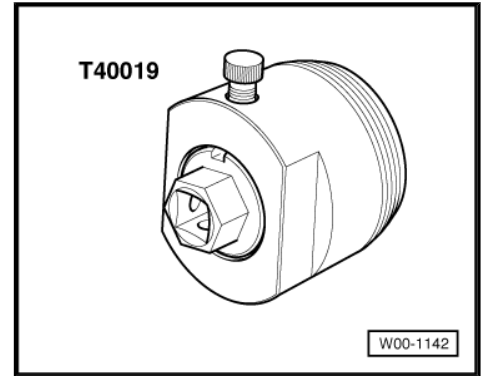
Component		Nm
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

## 1.7 Renewing crankshaft oil seal (pulley end)

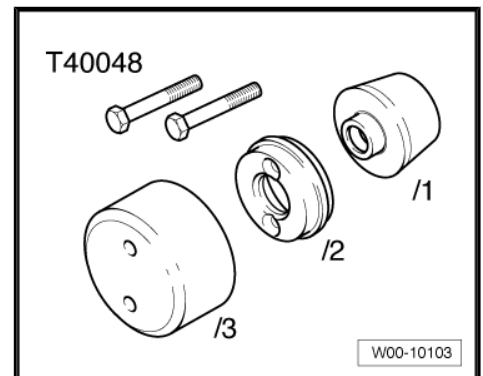
### Special tools and workshop equipment required



◆ Oil seal extractor -T40019-

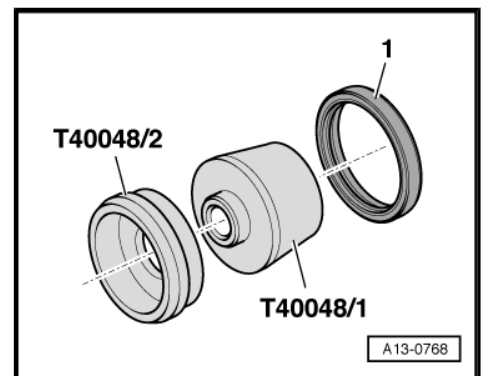
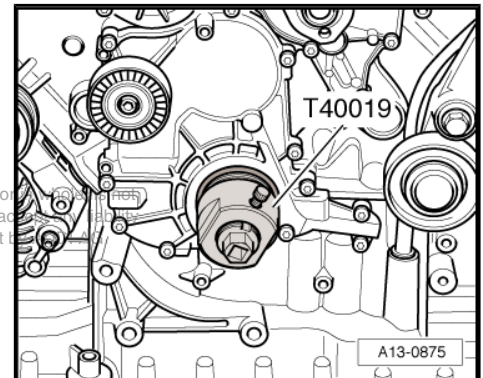


◆ Assembly appliance -T40048- with -T40048/4-



**Procedure**

- Move lock carrier to service position ⇒ [page 95](#) .
- Remove poly V-belt ⇒ [page 101](#) .
- Remove vibration damper ⇒ [page 106](#) .
- Adjust the inner part of oil seal extractor -T40019- so it is flush with the outer part and lock in position with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice. Remove oil seal with pliers.
- Clean contact surface and sealing surface.
- Fit assembly aid -T40048/1- onto assembly sleeve -T40048/2- and slide oil seal -1- onto assembly sleeve.
- Take off assembly aid.



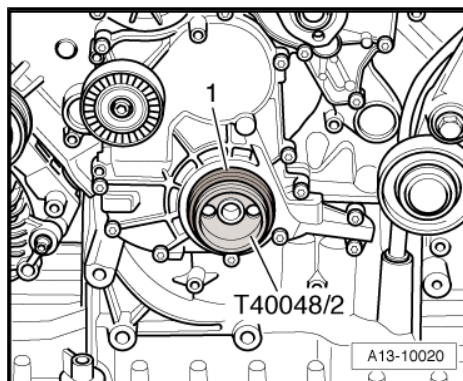


- Fit assembly sleeve -T40048/2- on crankshaft and push oil seal -1- into sealing flange (front).



**Note**

Leave assembly sleeve -T40048/2- in position on crankshaft for pressing in seal.



- Apply press sleeve -T40048/4- (installation depth 5 mm) to crankshaft using M8×55 mm bolts -arrows-.
- Screw in bolts hand-tight to start with.
- Tighten bolts alternately, 1/2 turn at a time, to press in oil seal onto stop.

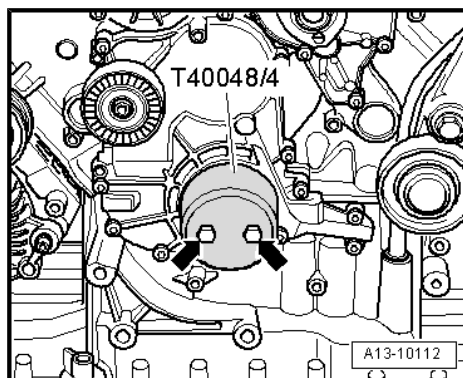
Remaining installation steps are carried out in reverse sequence; note the following:

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**Note**

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- Install vibration damper ⇒ [page 106](#) .
  - Install poly V-belt ⇒ [page 101](#) .
  - Install lock carrier with attachments ⇒ Rep. gr. 50 .
  - Install bumper cover (front) ⇒ Rep. gr. 63 .



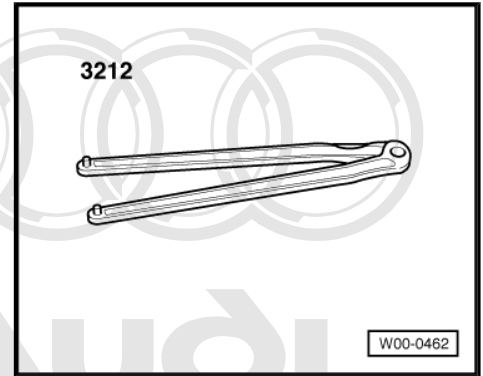
**Tightening torques**

Component		Nm
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

## 1.8 Removing and installing sealing flange (front)

Special tools and workshop equipment required

- ◆ Pin wrench -3212-

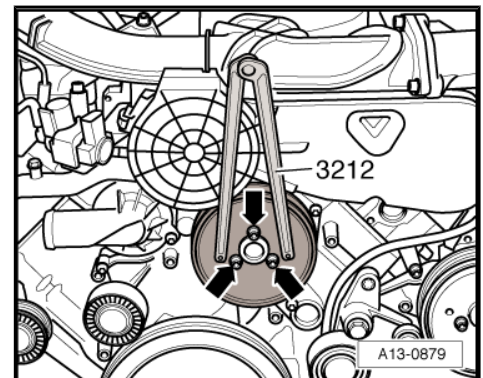


- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Electronic parts catalogue

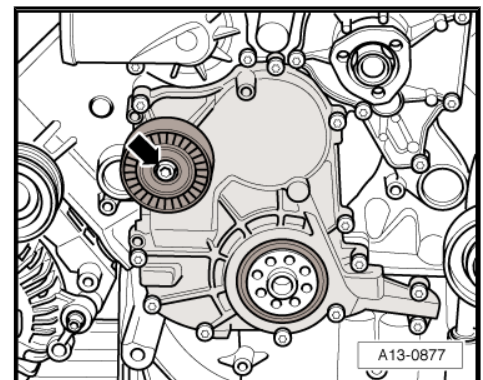
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### Removing

- Drain off coolant ⇒ [page 253](#) .
- Move lock carrier to service position ⇒ [page 95](#) .
- Remove poly V-belt ⇒ [page 101](#) .
- Remove coolant pipe (right-side) ⇒ [page 271](#) .
- Unbolt coolant pump pulley -arrows- (counterhold with pin wrench -3212- ).
- Remove vibration damper ⇒ [page 106](#) .

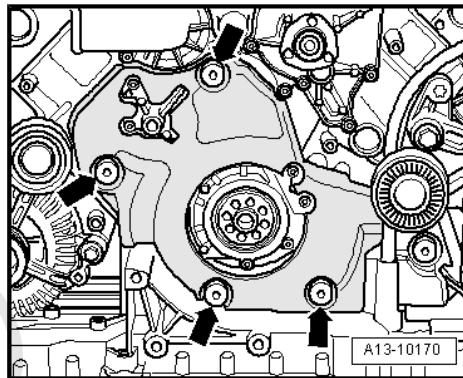


- Pry off cover from idler roller for poly V-belt.
- Unscrew bolt -arrow- and detach idler roller from front sealing flange.





- Detach noise insulation panel from sealing flange (front -arrows-).



- Remove bolts.
- Pull off front sealing flange (right-side first -arrow 1-, then left-side -arrow 2-).
- Drive out oil seal with sealing flange removed.

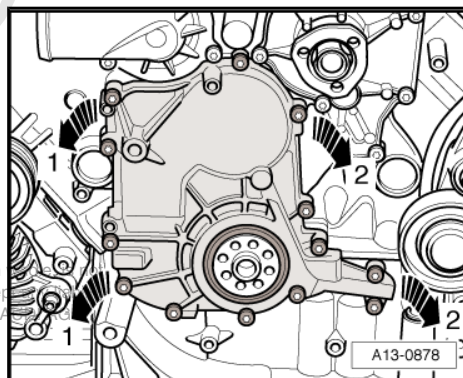
### Installing



#### Note

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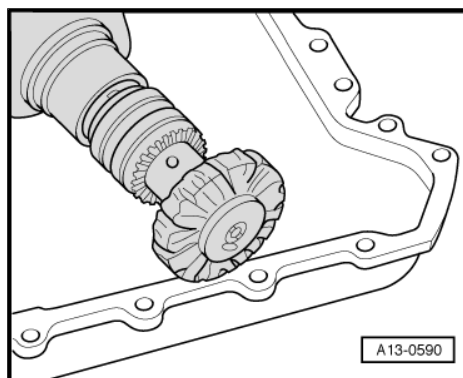
- ◆ *Renew gaskets, seals and O-rings.*
  - ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- Remove old sealant from grooves in sealing flange and from sealing surfaces.



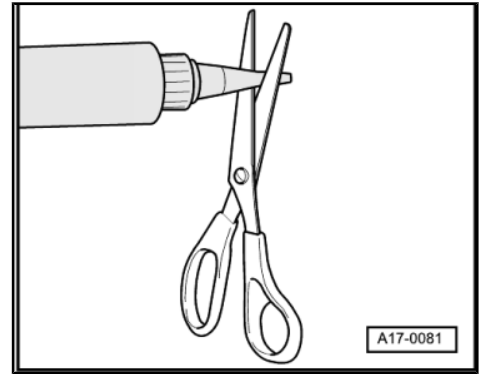
#### WARNING

***Wear safety goggles.***

- Remove remaining sealant from sealing flange and cylinder block/sump (top section) with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



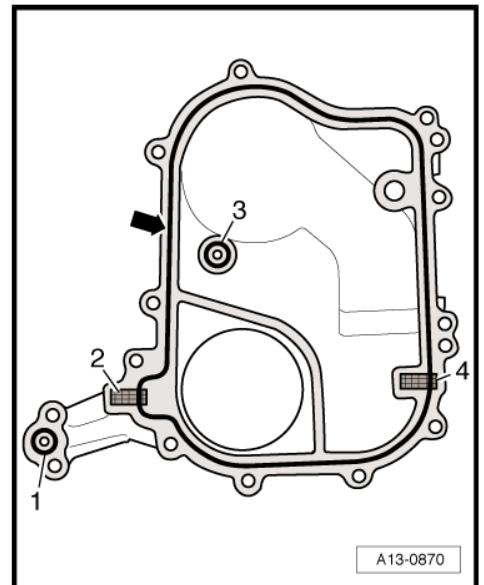
- Cut off tube nozzle at front marking (diameter of nozzle approx. 1.5 mm).



- Install sealing elements -2- and -4- and O-rings -1- and -3-.
- Apply bead of sealant -arrow- onto clean sealing surface of front sealing flange as illustrated.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.

 **Note**

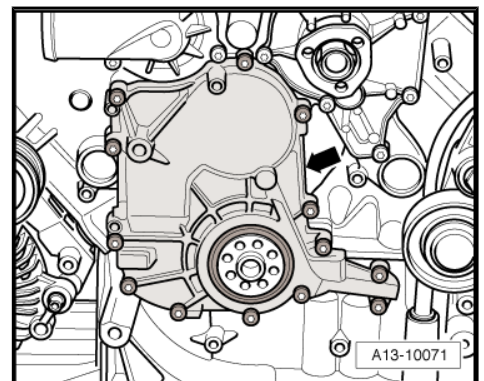
- ◆ *The sealant bead must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ◆ *The front sealing flange must be installed within 5 minutes after applying sealant.*



- Tighten bolts securing front sealing flange -arrow- in diagonal sequence and in stages.

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

- Install crankshaft oil seal (pulley end) ⇒ [page 106](#) .
- Install vibration damper ⇒ [page 106](#) .
- Install coolant pipe (right-side) ⇒ [page 271](#) .
- Install poly V-belt ⇒ [page 101](#) .
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .
- Fill cooling system ⇒ [page 255](#) .



**Tightening torques**

Component	Nm	
Front sealing flange to cylinder block	9	
Noise insulation to engine	9	
Idler roller to sealing flange	23	
Poly V-belt pulley to coolant pump	23	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

## 2 Cylinder block (gearbox end)

### 2.1 Vacuum pump - exploded view

1 - 9 Nm

2 - Vacuum pump

- ❑ Removing and installing  
⇒ [page 112](#)

3 - Vacuum hose

- ❑ To brake servo
- ❑ Secure with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue

4 - Vacuum hose

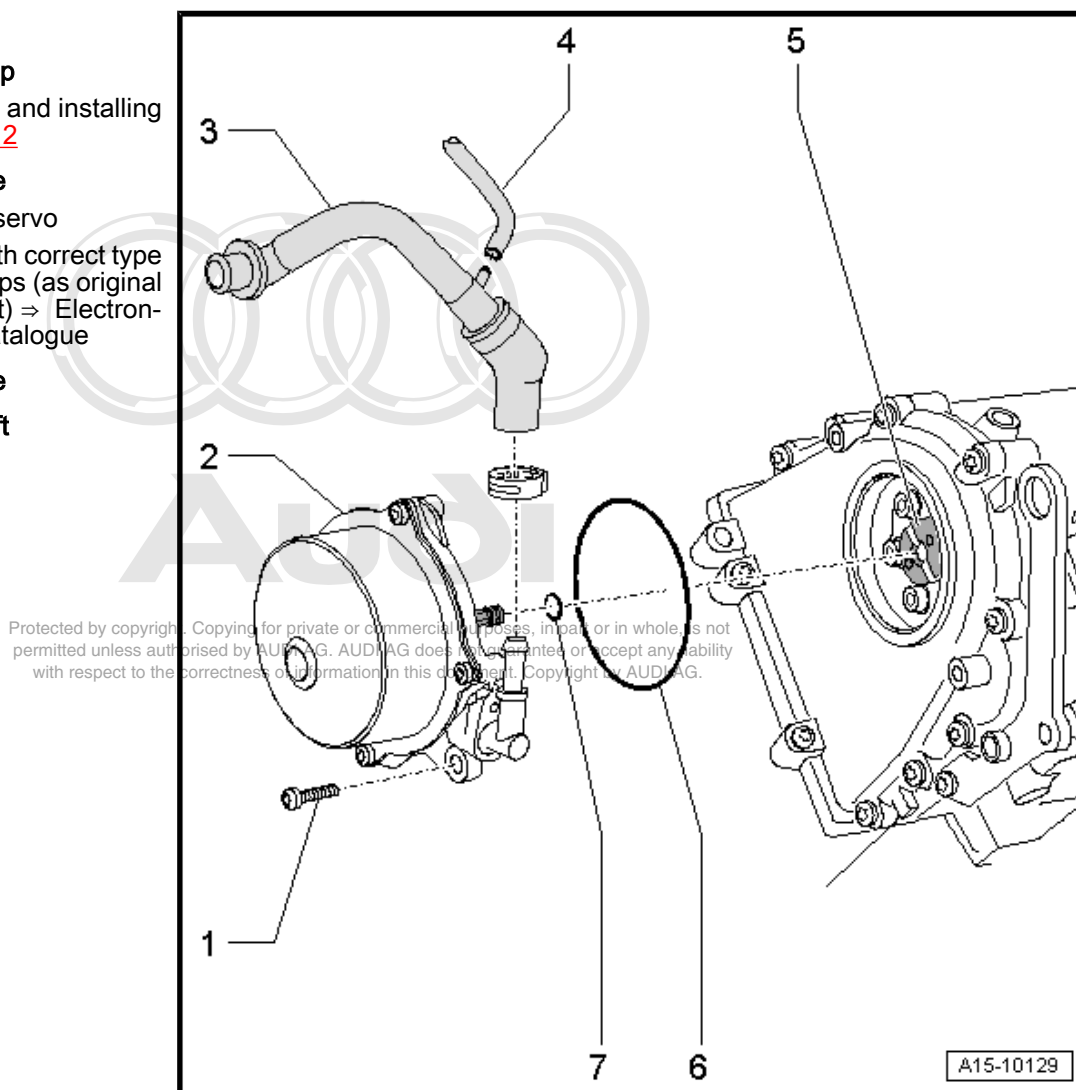
5 - Inlet camshaft

6 - O-ring

- ❑ Renew

7 - O-ring

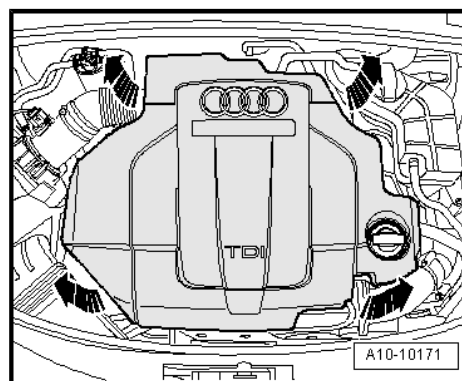
- ❑ Renew



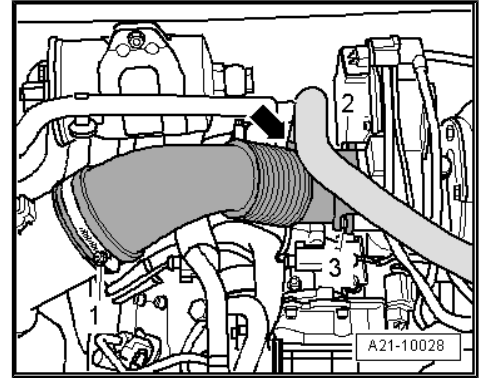
### 2.2 Removing and installing vacuum pump

#### Removing

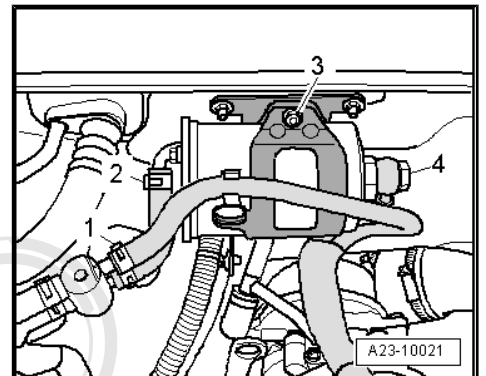
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



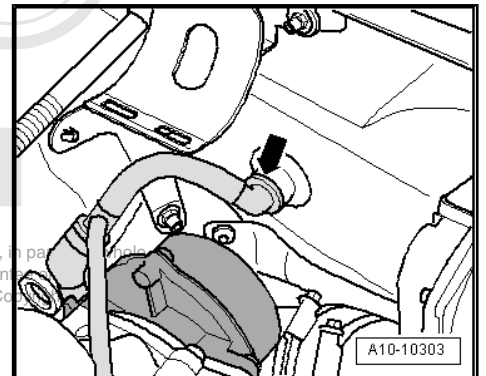
- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Release hose clip -1- and detach air pipe at air mass meter -G70- and at turbocharger.



- Remove retaining nut -3-, open retainer and move fuel filter to one side (with fuel lines -1, 2, 4- attached).



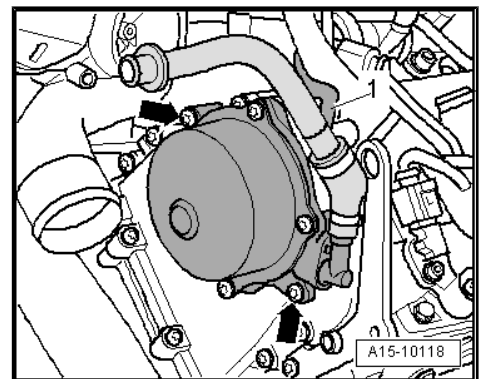
- Detach vacuum hose going to brake servo -arrow- at plenum chamber partition panel.



- Detach vacuum hose -1- from hose connection.
- Remove bolts -arrows- and detach vacuum pump.

 **Note**

*Shown in illustration with engine removed.*





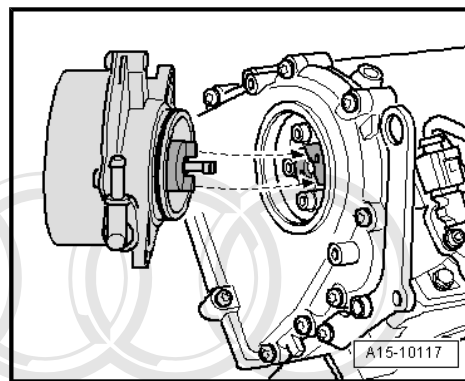
## Installing

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



### Note

- ◆ *Renew O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Set drive lugs of vacuum pump so they engage in slots on camshaft when pump is fitted -arrow-.



## Tightening torques

Component	Nm
Vacuum pump to timing chain cover	9
Retainer for fuel lines to bracket	9
Air pipe to turbocharger	9

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## 2.3 Dual-mass flywheel on vehicles with manual gearbox - exploded view



Servicing clutch ⇒ Rep. gr. 30

### 1 - Dual-mass flywheel

- Removing and installing ⇒ [page 115](#)



### 2 - 60 Nm + 90°

- Renew

### 3 - Needle bearing

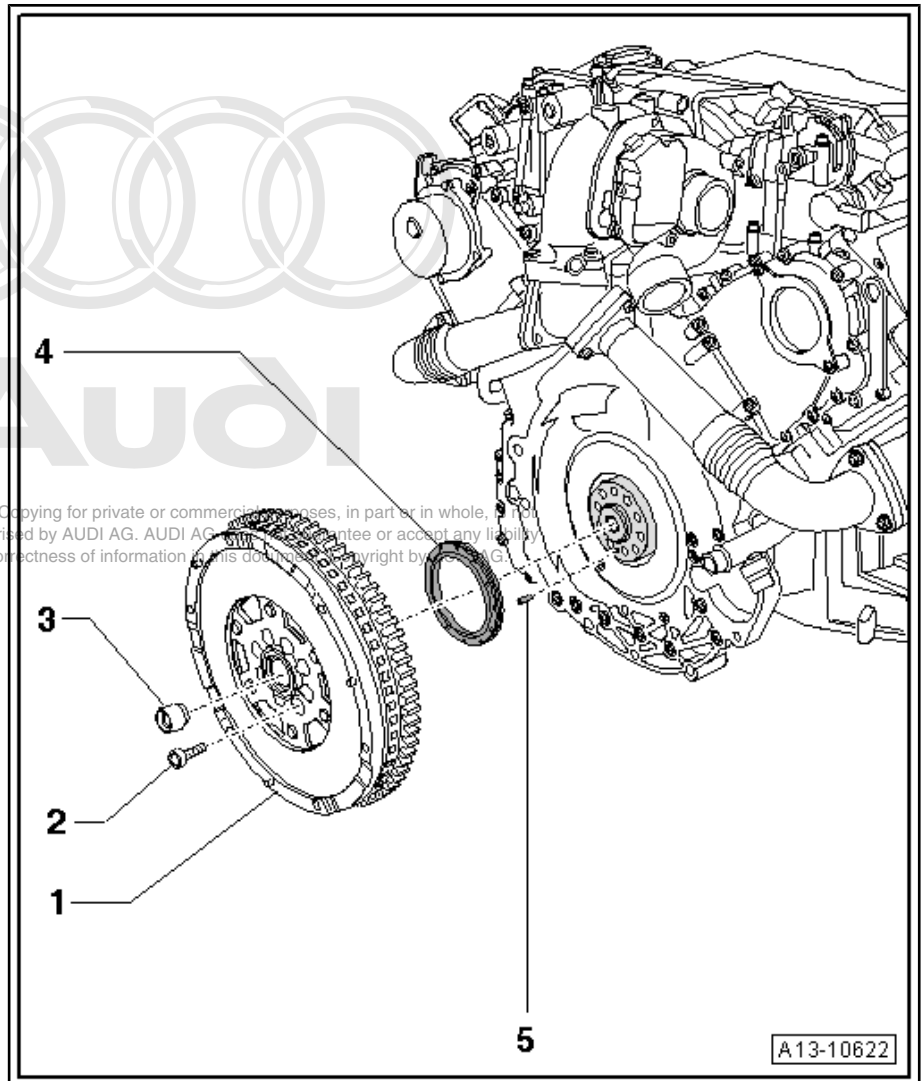
- Extracting and driving in ⇒ [page 117](#)

### 4 - Crankshaft oil seal (gearbox end)

- Renewing ⇒ [page 123](#)

### 5 - Dowel sleeve

- Allocation ⇒ [Electronic parts catalogue](#)

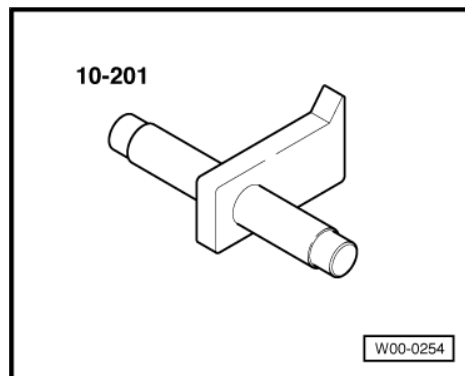


## 2.4 Removing and installing dual-mass flywheel

Special tools and workshop equipment required

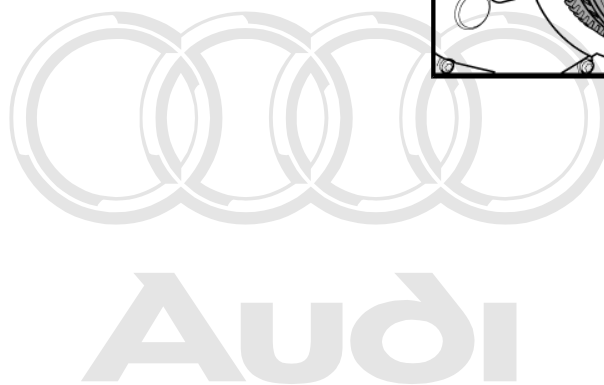
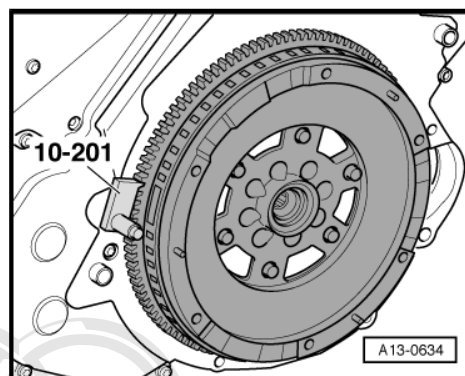


◆ Counterhold tool -10 - 201-



**Removing**

- Gearbox removed.
- Remove clutch pressure plate ⇒ Rep. gr. 30 .
- Mark installation position of dual-mass flywheel on crankshaft.
- Attach counterhold tool -10 - 201- in order to loosen bolts.

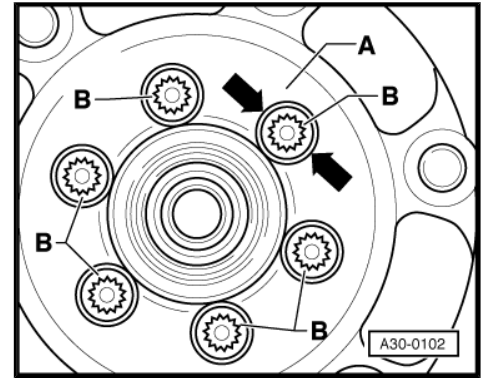


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 **Note**

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

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



**Installing**

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

 **Note**

A needle bearing is fitted in the dual-mass flywheel; knock in the needle bearing when fitting a new flywheel ⇒ [page 117](#).

- Use new securing bolts.
- Reverse position of counterhold tool -10 - 201- in order to tighten bolts.
- Install clutch pressure plate ⇒ Rep. gr. 30 .

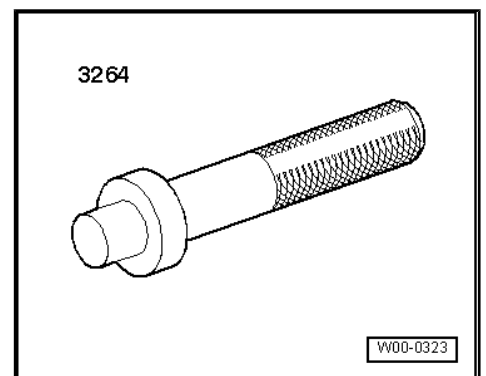
**Tightening torque**

Component	Nm
Dual-mass flywheel to crankshaft	60 + 90° 1)2)
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>	

## 2.5 Extracting and driving in needle bearing for dual-mass flywheel

**Special tools and workshop equipment required**

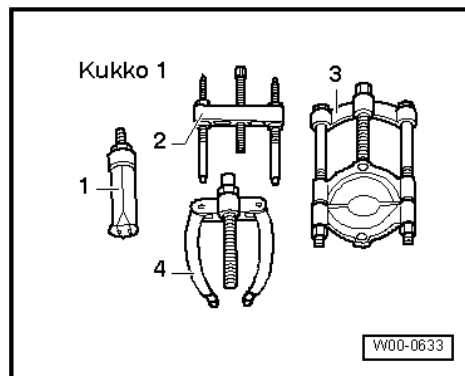
- ◆ Punch -3264-



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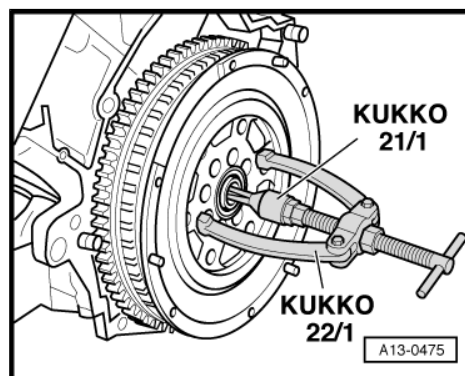
◆ -1- Internal puller Kukko 21/1



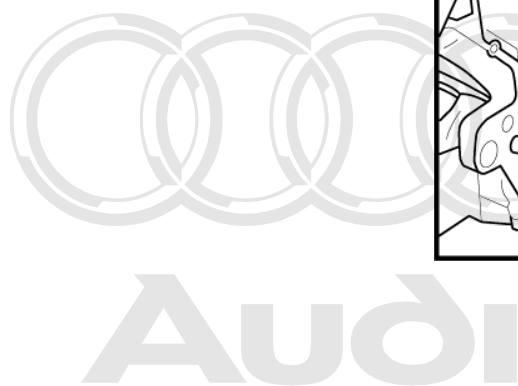
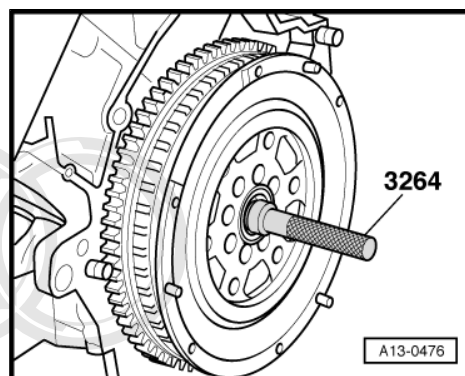
◆ -4- Counter-support Kukko 22/1

**Procedure**

- Gearbox removed.
- Remove clutch pressure plate ⇒ Rep. gr. 30 .
- Remove needle bearing using internal puller Kukko 21/1 and counter-support Kukko 22/1.



- Drive needle bearing into dual-mass flywheel as far as the stop using punch -3264- .
- Install clutch pressure plate ⇒ Rep. gr. 30 .



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## 2.6 Flywheel for vehicles with multitronic gearbox - exploded view

### 1 - Damper unit

- Removing and installing  
⇒ [page 119](#)

### 2 - 22 Nm

- Tighten in diagonal sequence

### 3 - Flywheel

- Removing and installing  
⇒ [page 120](#)

### 4 - Crankshaft oil seal (gearbox end)

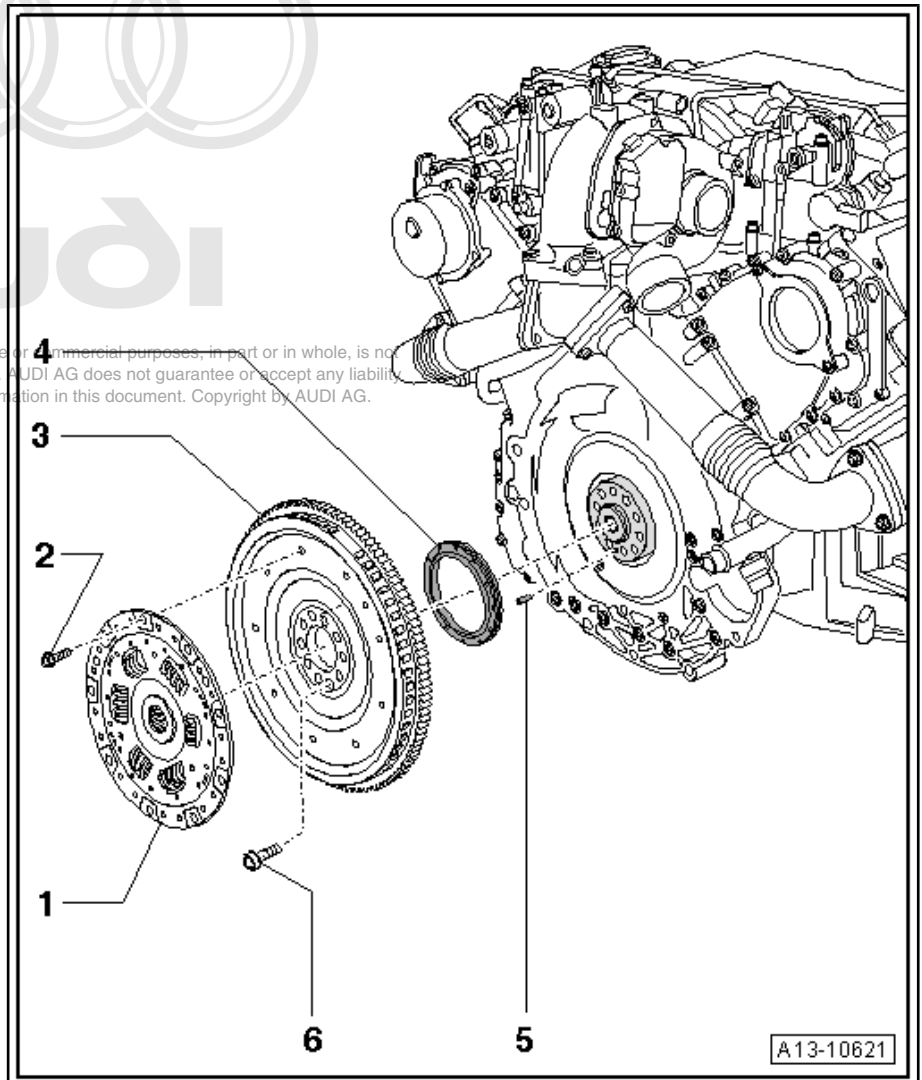
- Renewing ⇒ [page 123](#)

### 5 - Dowel sleeve

- Allocation ⇒ Electronic parts catalogue

### 6 - 60 Nm + 90°

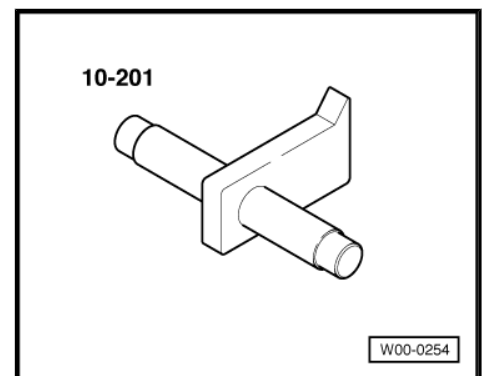
- Renew



## 2.7 Removing and installing damper unit - vehicles with multitronic gearbox

### Special tools and workshop equipment required

- ◆ Counterhold tool -10 - 201-

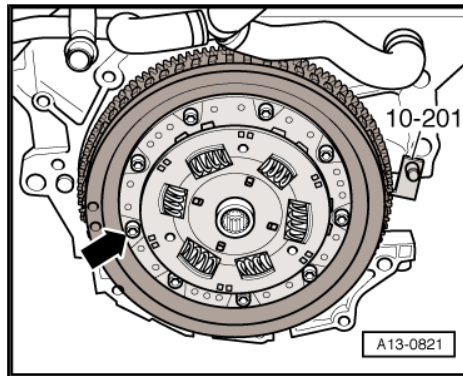




### Removing

Proceed as follows:

- Gearbox removed.
- Insert counterhold tool -10 - 201- to slacken bolts -arrow-.



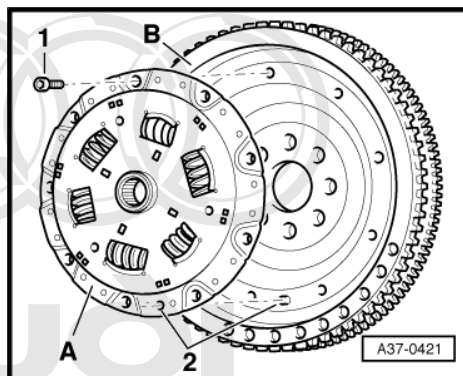
- Remove bolts -1- and detach damper unit -A- from flywheel -B-.

### Installing

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

 **Note**

*The part number of the damper unit is assigned to the gearbox code letters; for correct allocation refer to ⇒ Electronic parts catalogue .*



- Fit counterhold tool -10 - 201- the other way round to tighten bolts.
- Align damper unit -A- on flywheel -B-.
- The installation markings -2- must align.
- Screw in bolts by hand until they make contact and tighten in diagonal sequence.

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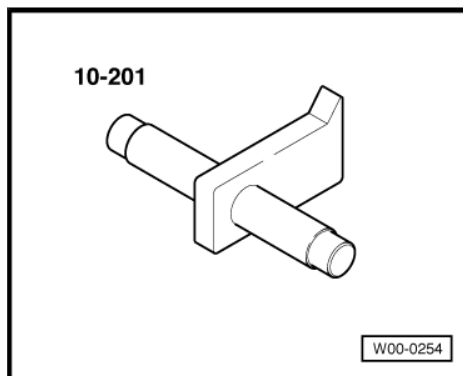
### Tightening torque

Component	Nm
Damper unit to flywheel	22

## 2.8 Removing and installing flywheel - vehicles with multitronic gearbox

### Special tools and workshop equipment required

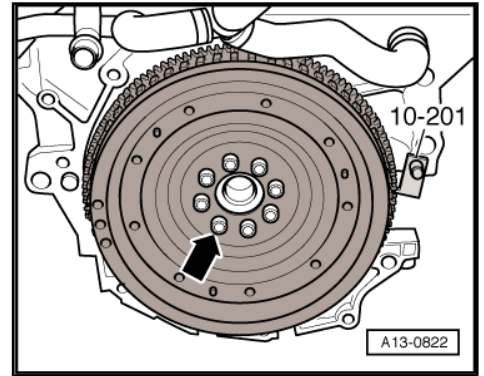
- ◆ Counterhold tool -10 - 201-



## Removing

Proceed as follows:

- Gearbox removed.
- Remove damper unit ⇒ [page 119](#) .
- Mark position of flywheel on crankshaft for re-installation.
- Insert counterhold tool -10 - 201- to slacken bolts.
- Remove bolts -arrow- and remove flywheel.



## Installing

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

### Note

*Renew bolts for flywheel.*

- Fit counterhold tool -10 - 201- the other way round to tighten bolts.
- Install damper unit ⇒ [page 119](#) .

## Tightening torque

Component	Nm
Flywheel to crankshaft	60 + 90° 1)2)
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>	

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## 2.9 Drive plate - exploded view

### 1 - Drive plate

- ❑ Removing and installing  
⇒ [page 122](#)

### 2 - Washer

- ❑ Thickness 1.5 mm

### 3 - 30 Nm + 90°

- ❑ Renew

### 4 - Dowel sleeve

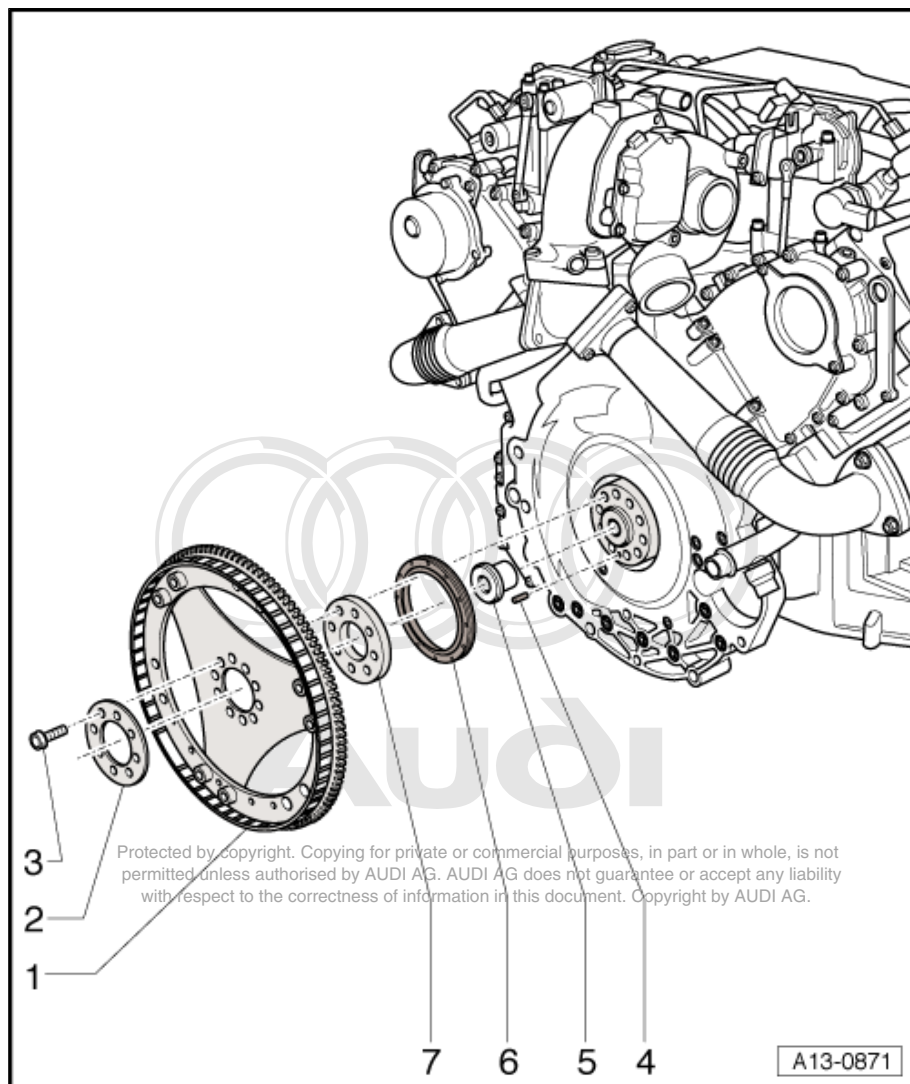
### 5 - Centring sleeve for torque converter

### 6 - Crankshaft oil seal (gearbox end)

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

### 7 - Shim

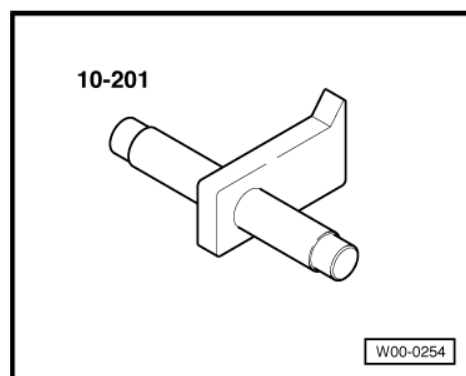
- ❑ Thickness 1.5 mm



## 2.10 Removing and installing drive plate

### Special tools and workshop equipment required

- ◆ Counterhold tool -10 - 201-





## Removing

- Engine/gearbox removed.
- Mark installation position of drive plate on crankshaft.
- Attach counterhold tool -10 - 201- in order to loosen bolts.
- Unbolt drive plate.
- Take out shim located behind.

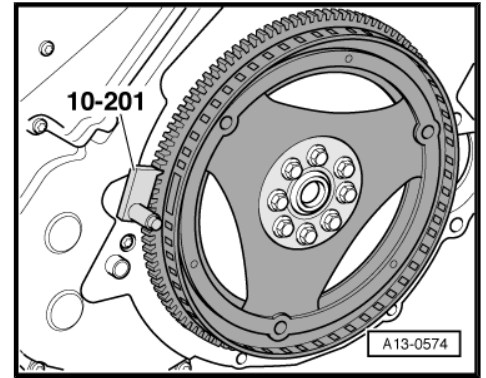
## Installing

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

- Fit shim (1.5 mm) onto crankshaft.
- Install drive plate with washer (1.5 mm).
- Use new securing bolts.
- Reverse position of counterhold tool -10 - 201- in order to tighten bolts.

## Tightening torque

Component	Nm
Drive plate to crankshaft	30 + 90° 1)2)
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>	

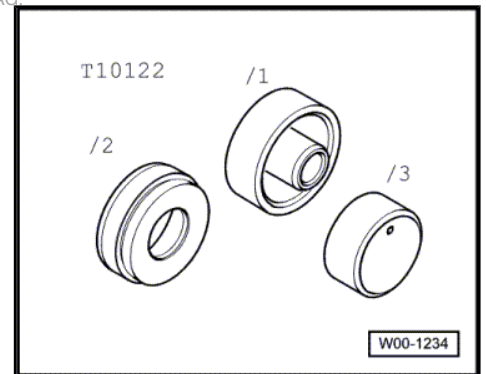


## 2.11 Renewing crankshaft oil seal (gearbox end)

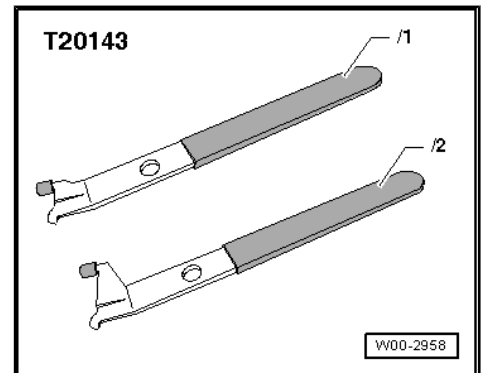
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**Special tools and workshop equipment required**

- ◆ Fitting tool -T10122-



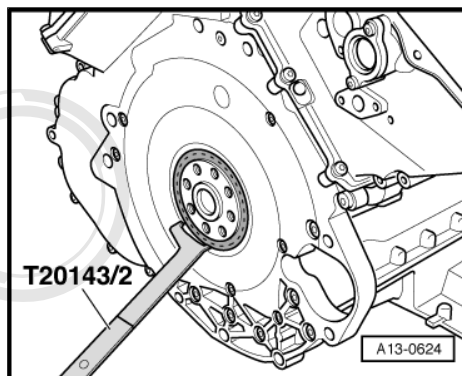
- ◆ Extractor tool -T20143-



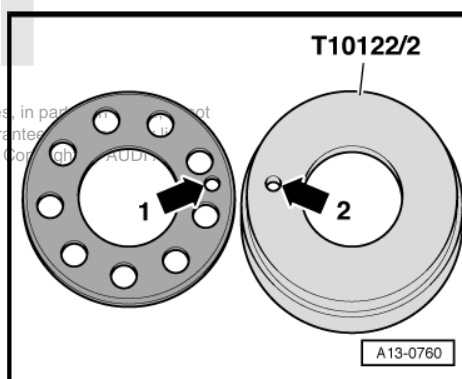


### Procedure

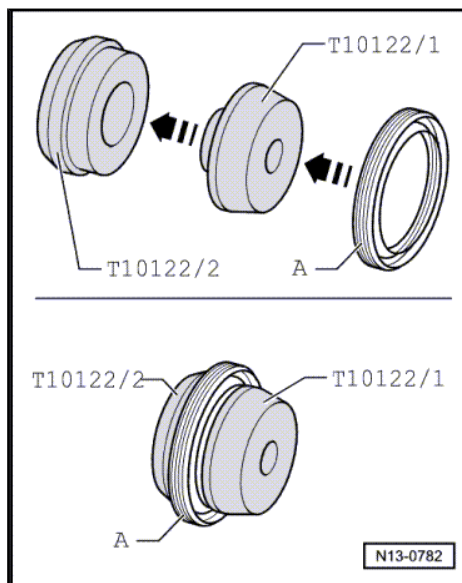
- Engine/gearbox removed.
- Remove dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Remove flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Remove drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Pry out oil seal using extractor tool -T20143/2- .



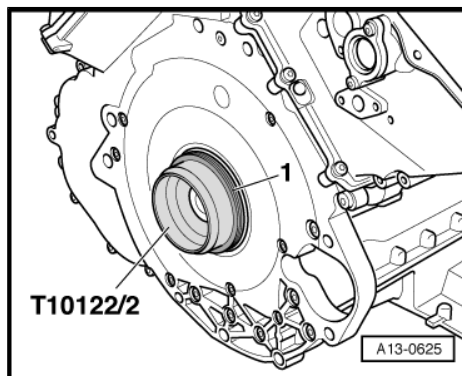
- Modify assembly sleeve -T10122/2- by drilling an 8 mm Ø hole -arrow 2- for the dowel sleeve.
- Use hole -arrow 1- in washer as a drilling template.



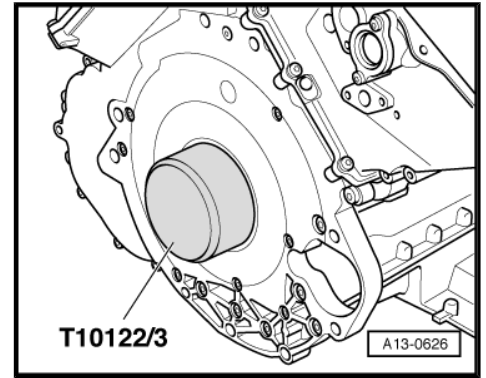
- Clean running surface and sealing surface.
- Fit assembly aid -T10122/1- onto assembly sleeve -T10122/2- and slide oil seal -A- onto assembly sleeve.
- Take off assembly aid.



- Fit assembly sleeve with oil seal onto crankshaft.



- Press in the oil seal with thrust sleeve -T10122/3- evenly so that it is flush all round.
- Install dual-mass flywheel (vehicles with manual gearbox)  
⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox  
⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox)  
⇒ [page 122](#) .



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## 3 Crankshaft



### Note

When performing assembly work, secure engine to engine and gearbox support -VAS 6095- ⇒ [page 92](#) .

### 3.1 Crankshaft - exploded view

#### 1 - Crankshaft

- Measuring axial clearance ⇒ [page 128](#)
- Measuring radial clearance ⇒ [page 129](#)
- Crankshaft dimensions ⇒ [page 128](#)

#### 2 - Dowel sleeve

- 2x
- Insert in cylinder block

#### 3 - Retaining frame

- Installing ⇒ [page 127](#)

#### 4 - Bolt

- Renew
- Tightening sequence ⇒ [page 127](#)

#### 5 - Thrust washer

- Only fitted on 3rd crankshaft bearing
- Oil groove faces outwards
- Note location
- Measuring axial clearance of crankshaft ⇒ [page 128](#)

#### 6 - Bearing shell

- For retaining frame
- Renew used bearing shells
- Install new bearing shells for retaining frame with correct coloured markings ⇒ [page 128](#)

#### 7 - Centring sleeve for torque converter

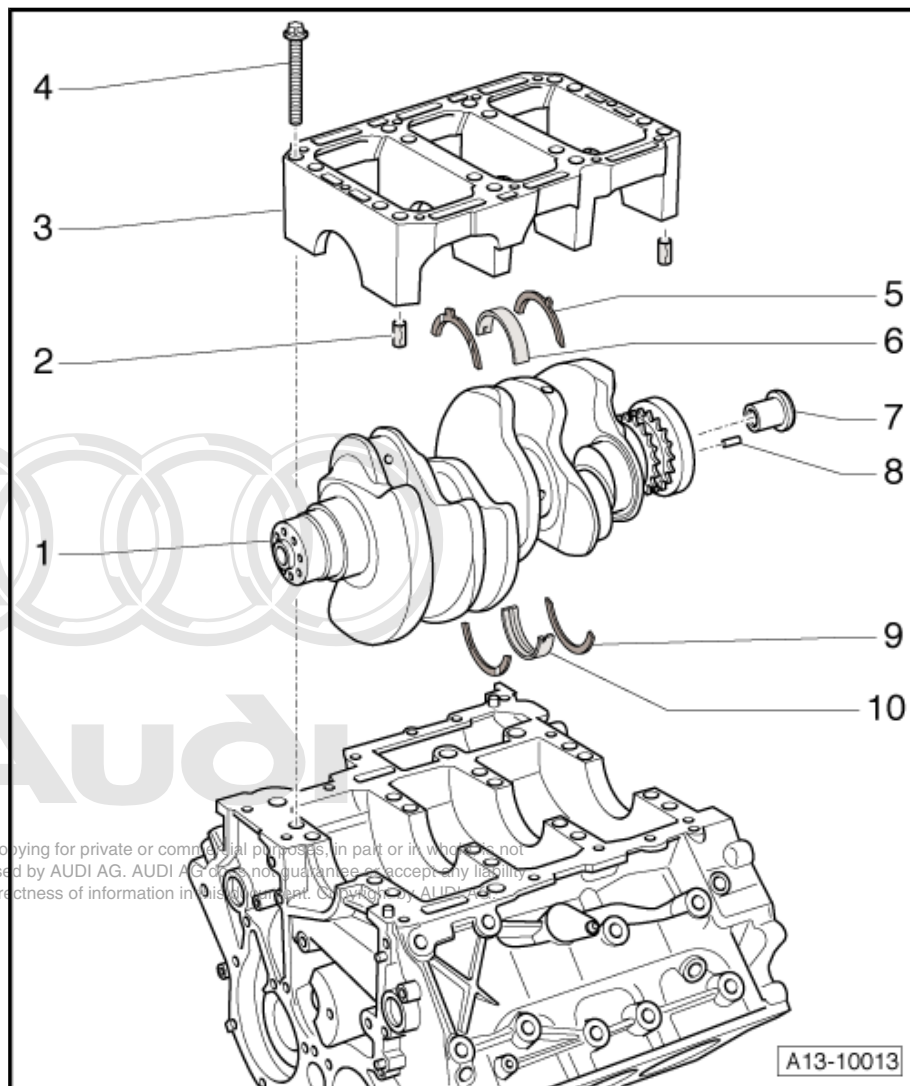
- For vehicles with automatic gearbox ⇒ [page 128](#)

#### 8 - Dowel pin

- Check that pin is firmly seated in crankshaft

#### 9 - Thrust washer

- Only fitted on 3rd crankshaft bearing
- Oil groove faces outwards
- Note location
- Measuring axial clearance of crankshaft ⇒ [page 128](#)

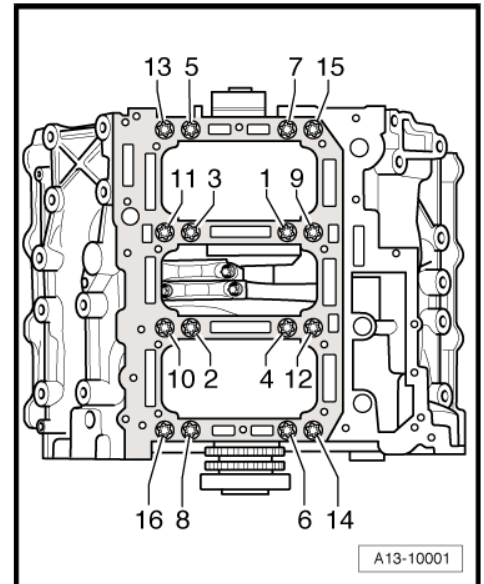


## 10 - Bearing shell

- For cylinder block (with oil groove)
- Renew used bearing shells
- Install new bearing shells for the cylinder block with the correct coloured markings => [page 127](#)

### Installing retaining frame

- Renew bolts -1 ... 16-.
- Fit both dowel sleeves into cylinder block.
- Tighten securing bolts for retaining frame in the following sequence:
  1. Tighten bolts -1 ... 16- to 30 Nm with torque wrench.
  2. Tighten bolts -1 ... 16- to 50 Nm with torque wrench.
  3. Turn bolts -1 ... 16- 90° further using a rigid wrench.



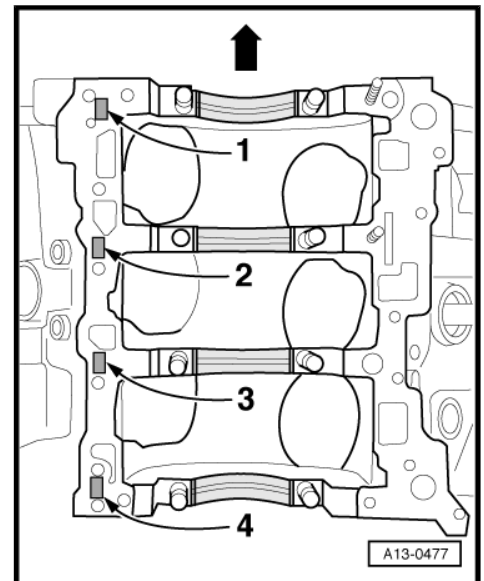
### Matching crankshaft bearing shells to bearings in cylinder block

Bearing shells of the correct thickness are matched to the bearings in the cylinder block at the factory. Coloured dots on the bearing shells are used to identify the bearing shell thickness.

- The -arrow- points to pulley end.

The allocation of the bearing shells to the cylinder block is identified by a code letter next to the relevant bearing.

Letter on cylinder block	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue



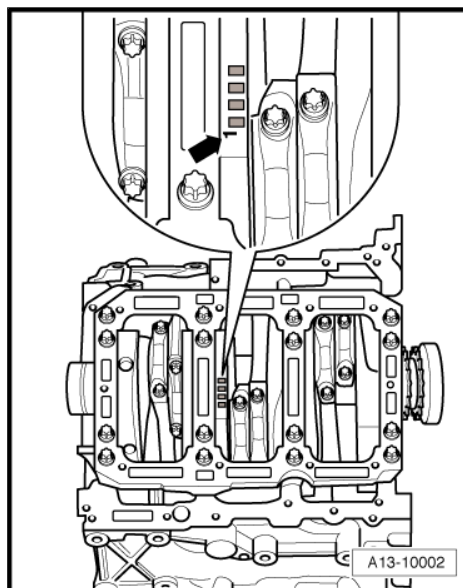
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### Matching crankshaft bearing shells to bearings in retaining frame

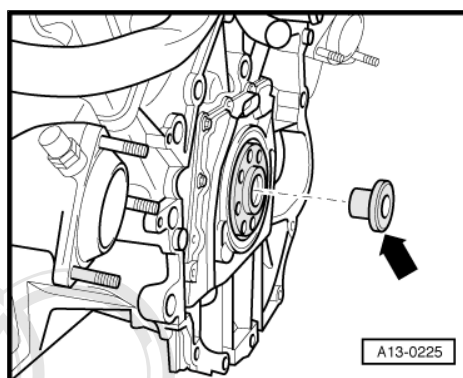
- ◆ Bearing shells of the correct thickness are assigned to the bearing caps at the factory. Coloured dots on the bearing shells are used to identify the bearing shell thickness.
- ◆ The correct allocation of bearing shells to crankshaft is indicated by a sequence of letters on the crankshaft web. The number „1“ -arrow- preceding the sequence of letters indicates the colour code for No. 1 bearing.

Letter on crankshaft	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue



### Centring sleeve for torque converter

- On vehicles with automatic gearbox, check that centring sleeve -arrow- is fitted in rear of crankshaft. Drive in centring sleeve if necessary.



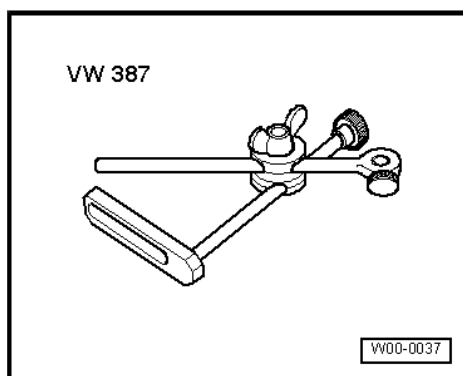
## 3.2 Crankshaft dimensions

Honing dimension (in mm)	Crankshaft main bearing journal Ø	Crankshaft conrod journal Ø
Basic dimension	65.000 - 0.022 - 0.042	60.000 - 0.022 - 0.042

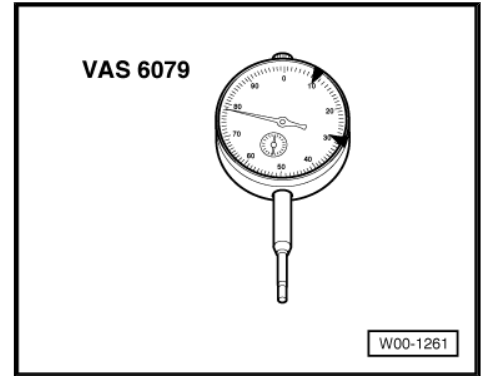
## 3.3 Measuring axial clearance

### Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-



◆ Dial gauge -VAS 6079-



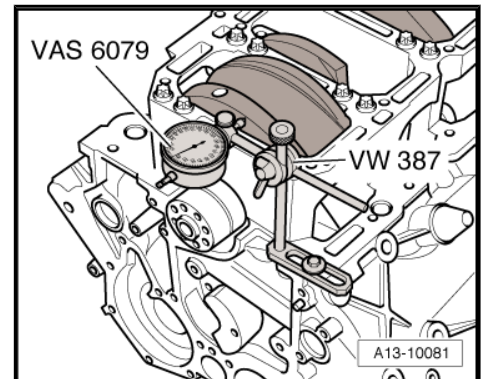
**Procedure**

– Bolt dial gauge with universal dial gauge bracket VW 387 onto cylinder block and apply gauge against crank web.

- Push crankshaft against dial gauge by hand and set gauge to „0“.
- Push crankshaft away from dial gauge and read off value.

Axial clearance:

- New: 0.090 ... 0.215 mm.
- Wear limit: 0.280 mm.



### 3.4 Measuring radial clearance

#### Special tools and workshop equipment required

◆ Plastigage

**Procedure**

- Remove retaining frame and clean bearing journals.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or bearing shell.
- The Plastigage must be positioned in the centre of the bearing shell
- Fit retaining frame and tighten to 30 Nm without rotating crankshaft.
- Remove retaining frame once more.
- Compare width of Plastigage with measurement scale:

Radial clearance:

- New: 0.018 ... 0.045 mm.
- Wear limit: 0.10 mm.

## 4 Pistons and conrods

### 4.1 Pistons and conrods - exploded view



#### Note

Oil spray jet for piston cooling ⇒ [page 131](#) .

#### 1 - Conrod bolts, 30 Nm + turn 90° further

- Renew
- Lubricate threads and contact surface
- To measure radial clearance, tighten to 30 Nm but do not turn further

#### 2 - Conrod bearing cap

- Do not interchange
- Mark cylinder allocation in colour -B- ⇒ [page 132](#)
- Installation position: Note position of lugs on casting -A-

#### 3 - Bearing shells

- Note installation position
- Renew used bearing shells
- Measuring radial clearance ⇒ [page 135](#)
- For measuring radial clearance, tighten bolts -item 1- to 30 Nm but do not turn further

#### 4 - Conrod

- Only renew as a complete set
- Mark cylinder allocation in colour -B- ⇒ [page 132](#)
- Installation position: Note position of lugs on casting -A-
- Axial clearance for each conrod pair (when new): 0.20 ... 0.44 mm

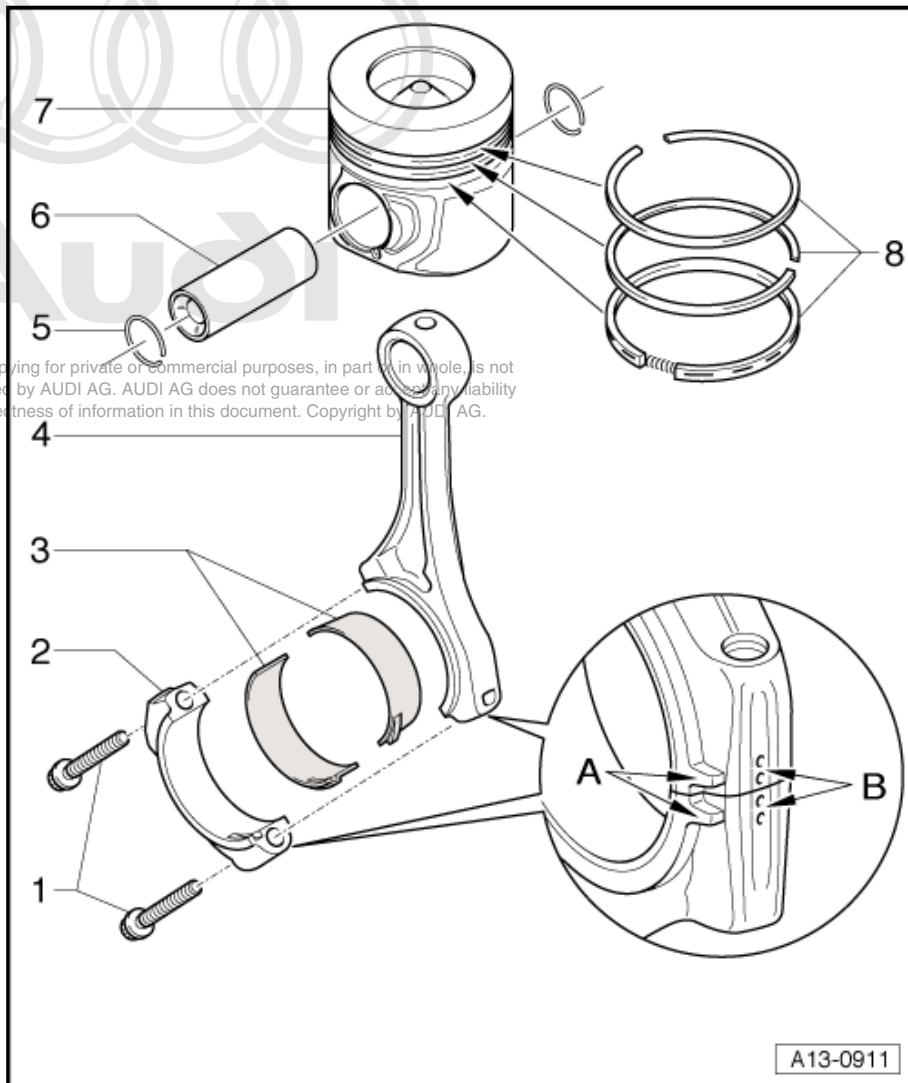
#### 5 - Circlip

#### 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
- Mark installation position and cylinder number ⇒ [page 132](#)





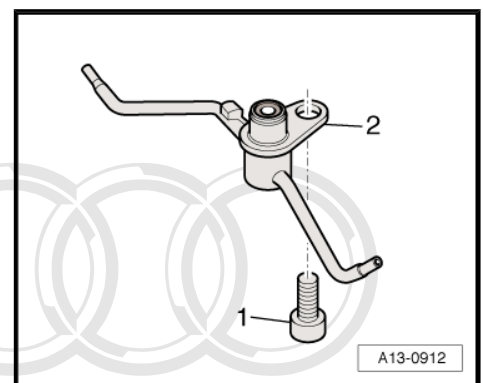
- Checking ⇒ [page 132](#)
- Install using piston ring clamp
- If cracking is visible on piston skirt, renew piston
- Piston and cylinder dimensions ⇒ [page 135](#)
- Checking piston projection at TDC ⇒ [page 133](#)
- Checking cylinder bore ⇒ [page 132](#)

### 8 - Piston rings

- Offset gaps by 120°
- Use piston ring pliers to remove and install
- „TOP“ must face towards piston crown
- Checking ring gap ⇒ [page 131](#)
- Checking ring-to-groove clearance ⇒ [page 131](#)

### Oil spray jet for piston cooling

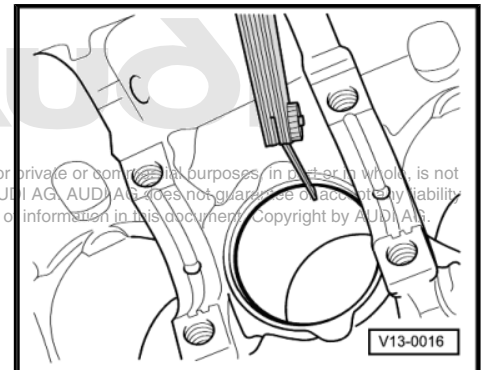
- 1 - Bolt, 9 Nm
- 2 - Oil spray jet with spray nozzle valve for piston cooling



### Checking piston ring gap

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

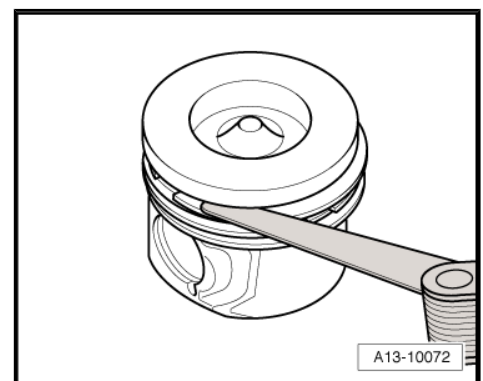
Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.25 ... 0.38	0.80
2nd compression ring	0.70 ... 0.90	1.30
Oil scraper ring	0.40 (maximum)	0.70



### Checking ring-to-groove clearance

- Clean groove in piston before checking clearance.

Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.120 ... 0.160	0.175
2nd compression ring	0.020 ... 0.090	0.115
Oil scraper ring	0.020... 0.090	0.115



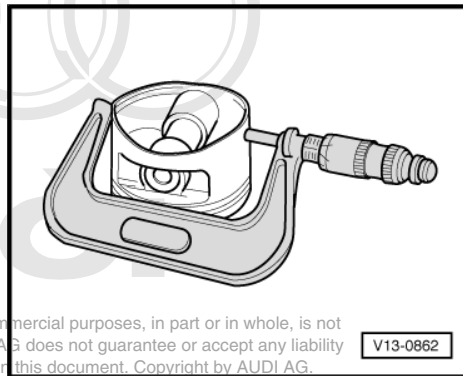


### Checking piston

- Using a micrometer (75 ... 100 mm), measure approx. 10 mm from the lower edge, perpendicular to the piston pin axis.
- Maximum deviation from nominal dimension: 0.05 mm.

Nominal dimension

⇒ „4.3 Piston and cylinder dimensions“, page 135 .



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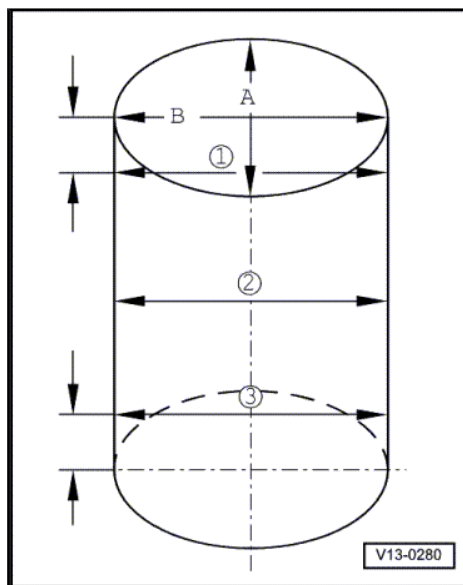
V13-0862

### Checking cylinder bore

- Use 50 ... 100 mm internal dial gauge to take measurements at 3 points in transverse direction -A- and longitudinal direction -B-.
- Maximum deviation from nominal dimension: 0.08 mm.

Nominal dimension

⇒ „4.3 Piston and cylinder dimensions“, page 135 .



V13-0280

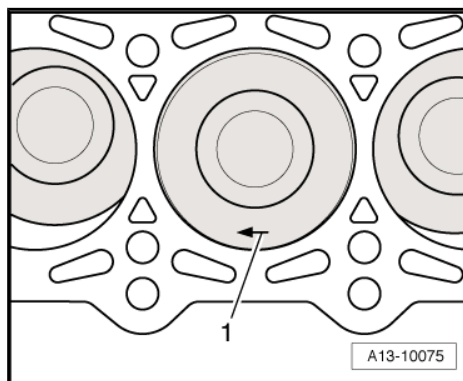
### Installation position of pistons

- Installation position: Arrow -item 1- on piston crown points to pulley end.



#### Note

- ◆ If used pistons are being re-installed, use chalk or waterproof felt-tip pen to mark installation position and cylinder number on piston crown.
- ◆ Do not use a centre punch or scribe, as this would damage the coating of the piston crown.



A13-10075

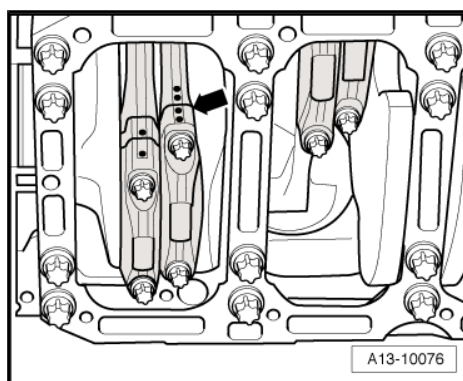
### Marking conrods

- Before removing, mark mating positions of conrods and conrod bearing caps with coloured pen -arrow-.



#### Note

- ◆ Only renew conrods as a complete set.
- ◆ Do not interchange conrod bearings.



A13-10076

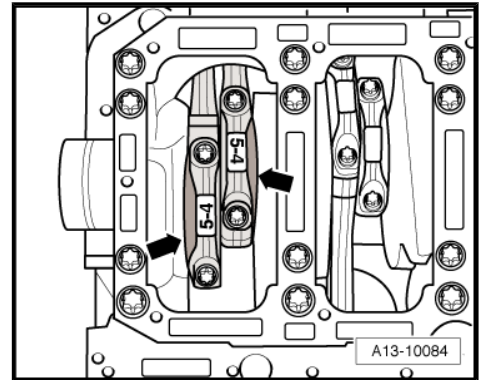
### Conrod installation position

The larger contact shoulder on the conrod -arrows- faces towards the adjacent main bearing.



*Illustration shows front pair of conrods.*

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## 4.2 Checking piston projection at TDC

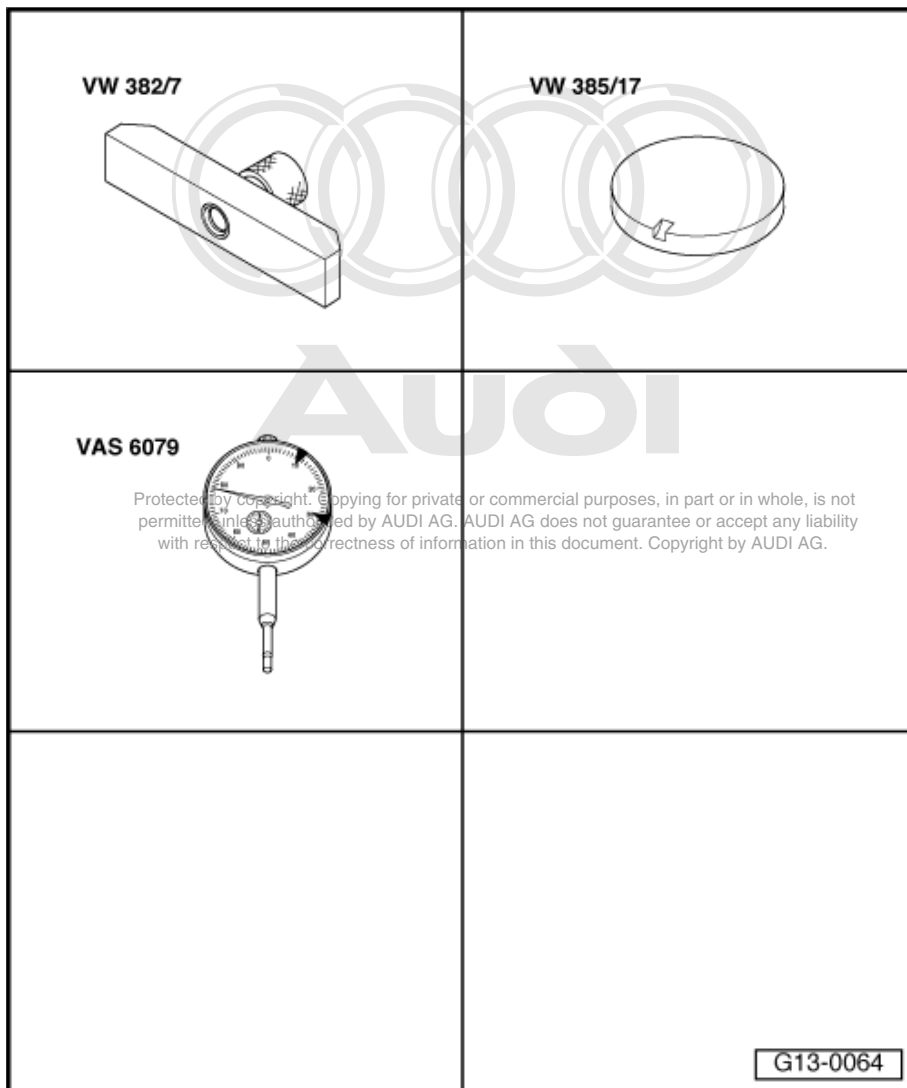


- ◆ *Piston projection at TDC must be measured when installing new pistons or a short engine. Depending upon piston projection, install the corresponding cylinder head gasket according to the table below:*
- ◆ *If the measured values for piston projection are not the same for all pistons, use the highest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



**Special tools and workshop equipment required**

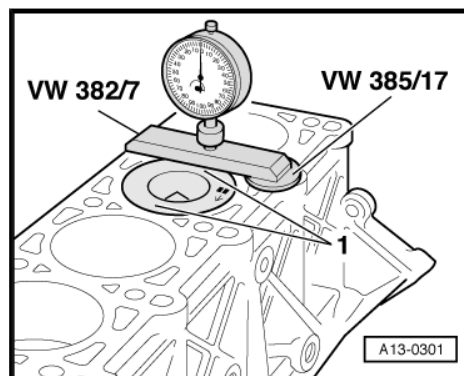
- ◆ Measuring bridge - VW 382/7- from measuring tool -VW 382-
- ◆ Measuring plate - VW 385/17- from universal measuring tool -VW 385-
- ◆ Dial gauge -VAS 6079-



**Procedure**

- Set up dial gauge -VAS 6079- with measuring bridge -VW 382/7- and measuring plate -VW 385/17- .
- Measure piston projection at two points -1- for each piston.

Piston projection above top surface of cylinder block	Identification (No. of holes)
0.39 ... 0.49 mm	1
0.49 ... 0.54 mm	2
0.54 ... 0.65 mm	3

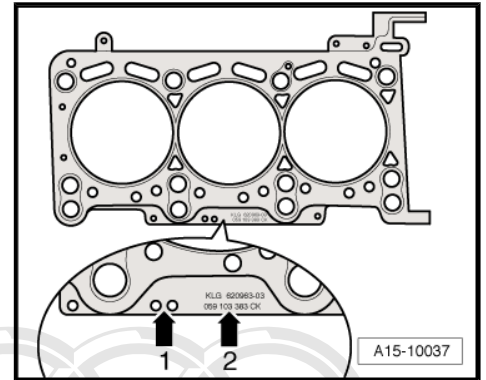


### Identification of cylinder head gasket

- 1 - Holes
- 2 - Part No.

#### Note

*The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*



### 4.3 Piston and cylinder dimensions

Honing dimension (in mm)	Piston Ø	Cylinder bore Ø
Basic dimension	82.939 ... 82.951 <sup>1)</sup>	83.006 ... 83.014
Repair oversize	82.979 ... 82.991 <sup>1)</sup>	83.046 ... 83.054
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Dimensions not including coating (thickness 0.02 mm). The coating will wear down in service.</li> </ul>		

### 4.4 Checking radial clearance of conrod bearings

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#### 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 bearing shell.
- Fit conrod bearing cap and tighten to 30 Nm. Do not rotate crankshaft.
- Remove conrod bearing cap once more.
- Compare width of Plastigage with measurement scale:

#### Radial clearance:

- New: 0.015 ... 0.062 mm.
- Wear limit: 0.12 mm.
- Renew conrod bolts.

## 15 – Cylinder head, valve gear

### 1 Chain drive

#### 1.1 Timing chain covers - exploded view

**1 - Crankshaft oil seal (gearbox end)**

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

**2 - Dowel sleeve**

- 2x

**3 - Bolt**

- Renew
- Note correct sequence when tightening  
⇒ [page 140](#)

**4 - O-ring**

- Renew

**5 - Cover plate**

**6 - 9 Nm**

**7 - Heat shield**

**8 - 9 Nm**

**9 - Bolt**

- Renew
- Note correct sequence when tightening  
⇒ [page 140](#)

**10 - Timing chain cover (left-side)**

- Removing and installing  
⇒ [page 137](#)

**11 - Gasket**

- Renew

**12 - Bolt**

- Renew
- Note correct sequence when tightening ⇒ [page 142](#)

**13 - Timing chain cover (right-side)**

- Removing and installing ⇒ [page 137](#)

**14 - Gasket**

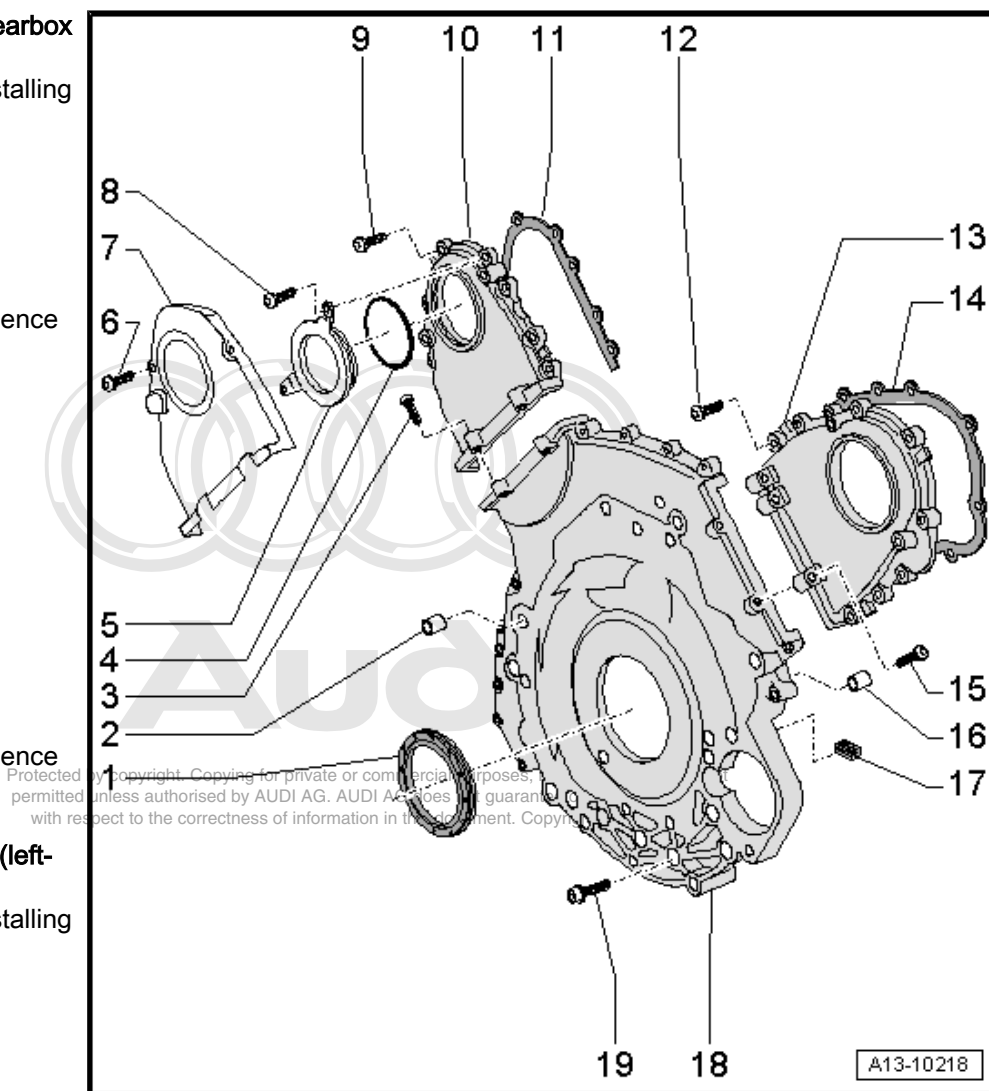
- Renew

**15 - Bolt**

- Renew
- Note correct sequence when tightening ⇒ [page 142](#)

**16 - Dowel sleeve**

- 2x



## 17 - Sealing element

- 2x

## 18 - Timing chain cover (bottom)

- Removing and installing ⇒ [page 137](#)

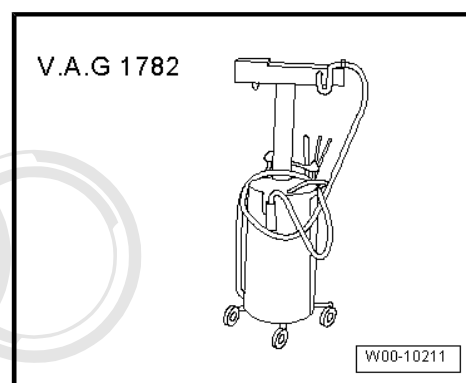
## 19 - M6: 9 Nm; M8: 23 Nm

- Note correct sequence when tightening ⇒ [page 140](#)

## 1.2 Removing and installing timing chain covers

### Special tools and workshop equipment required

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



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

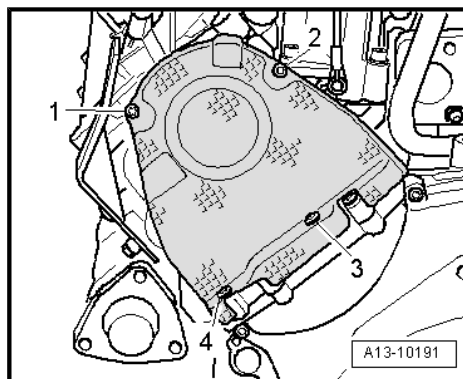
### Removing

- Gearbox removed.
- Remove dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Remove flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Remove drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.
- Remove starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) ; vehicles with particulate filter ⇒ [page 350](#) .
- Remove vacuum pump ⇒ [page 112](#) .
- Remove coolant pipe (rear) ⇒ [page 276](#) .
- Remove turbocharger ⇒ [page 312](#) .
- Remove intermediate pipe: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#) .

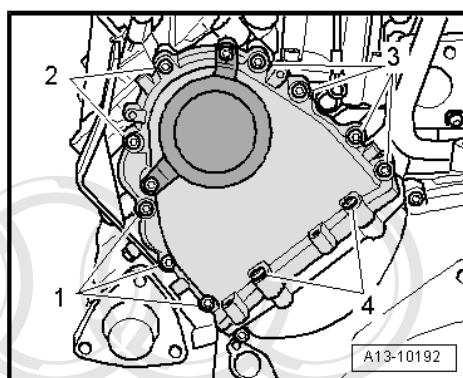
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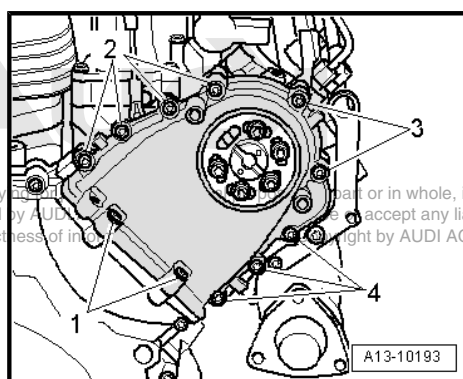
- Unscrew bolts -1 ... 4- and remove heat shield.



- Remove bolts -1 ... 4- and detach timing chain cover (left-side).



- Remove bolts -1 ... 4- and detach timing chain cover (right-side).



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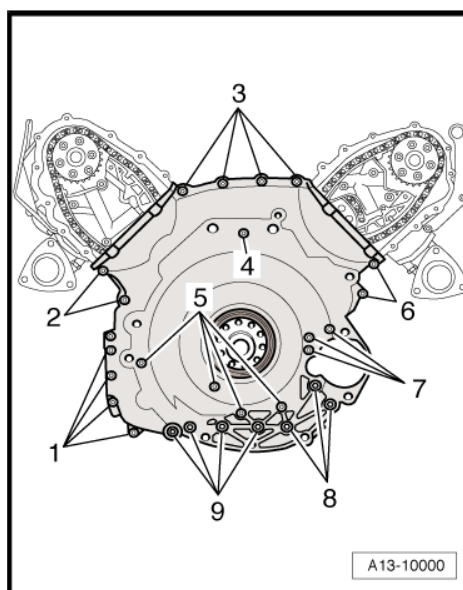
- Unscrew bolts -1 ... 9- and remove timing chain cover (bottom).
- Press out crankshaft oil seal (rear) from timing chain cover (bottom).

**Installing**



**Note**

- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Remove old sealant from grooves in timing chain covers and from sealing surfaces.







**WARNING**

*Wear safety goggles.*

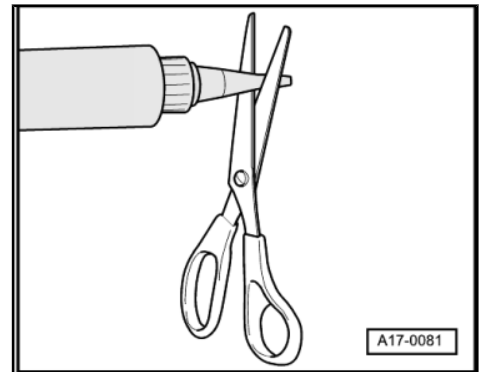
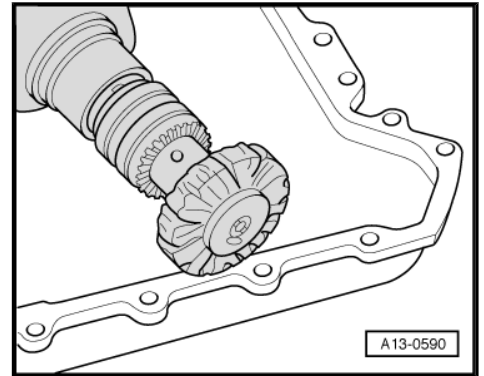
- Remove remaining sealant on timing chain covers and cylinder block / cylinder head using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.

- Cut off tube nozzle at front marking (diameter of nozzle approx. 1.5 mm).



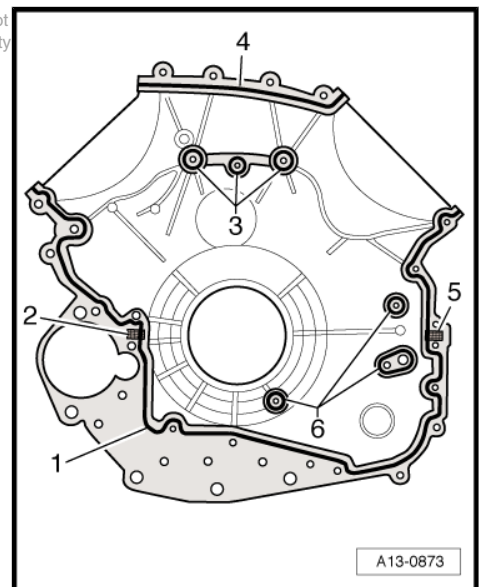
**Note**

- ◆ *The sealant beads must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ◆ *The timing chain covers must be installed within 5 minutes after applying the sealant.*



**Timing chain cover (bottom)**

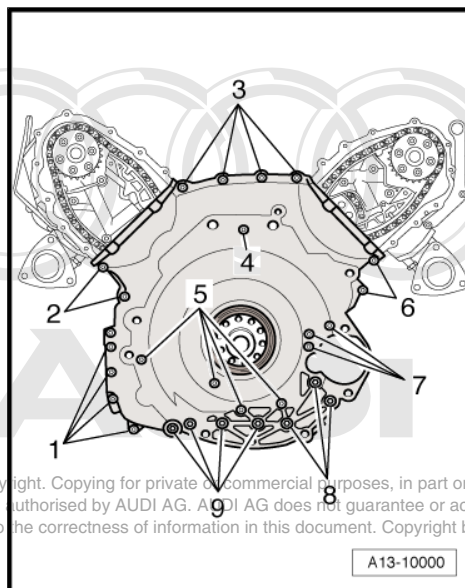
- Insert sealing elements **2** and **5**.
- Apply beads of sealant **-1-** and **-4-** onto clean sealing surfaces of timing chain cover (bottom) as illustrated.
- The grooves on the sealing surfaces must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.
- The beads of sealant around drillings **-3-** and **-6-** must be 1.5 ... 2.0 mm thick.
- Check whether the two dowel sleeves are fitted in the cylinder block; install if necessary.





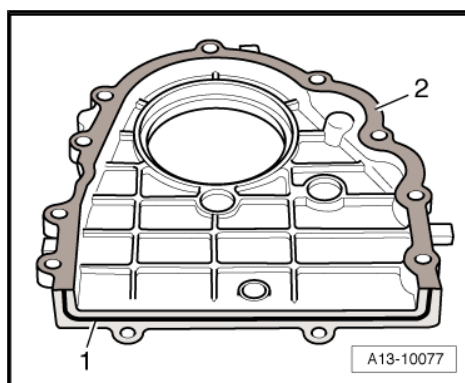
- Fit timing chain cover (bottom) and tighten bolts as follows:

Stage	Tightening
I	- Pre-tighten bolts -1 ... 9- to 5 Nm in diagonal sequence starting from inside and working outwards.
II	- Tighten bolts -1 ... 7- to 9 Nm in diagonal sequence starting from inside and working outwards.
III	- Tighten bolts -8- and -9- to 23 Nm.



### Timing chain cover (left-side)

- Apply bead of sealant onto clean sealing surface of timing chain cover (left-side) as illustrated.
- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.
- Fit gasket -2-.

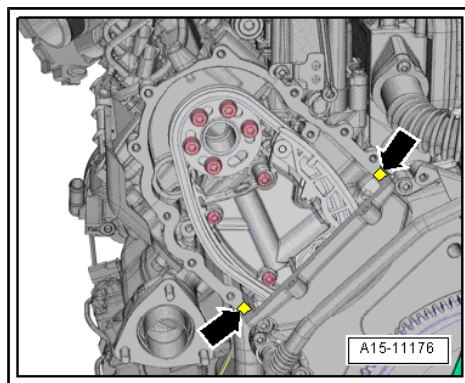


- Apply a bead of sealant (∅ 3 mm) at each joint between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

**Caution**

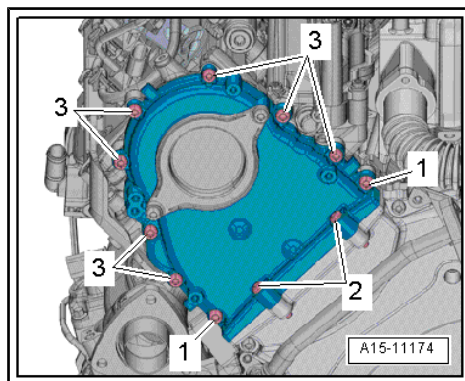
*Make sure lubrication system is not clogged by excess sealant.*

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

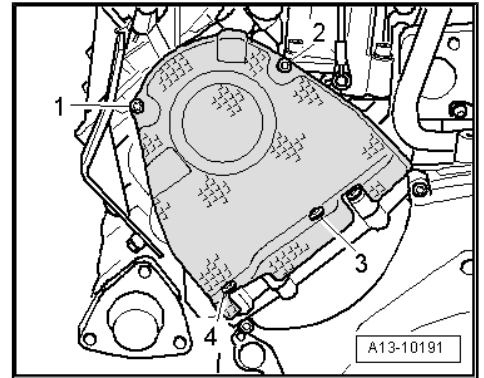


- Fit timing chain cover (left-side) and tighten bolts as follows:

Stage	Bolts	Tightening torque
1.	-1-	3 Nm
2.	-2-	9 Nm
3.	-1-	9 Nm
4.	-3-	9 Nm in diagonal sequence

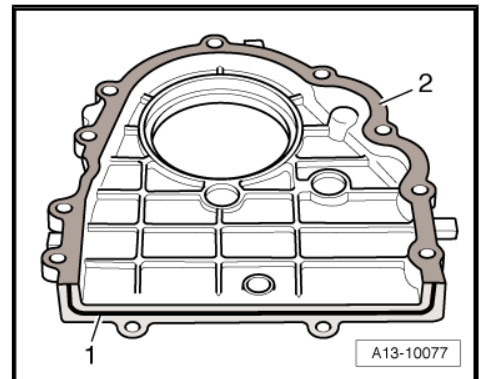


- Secure heat shield with bolts -1 ... 4-



#### Timing chain cover (right-side)

- Apply bead of sealant onto clean sealing surfaces of timing chain cover (right-side) as illustrated.
- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.
- Fit gasket -2-.



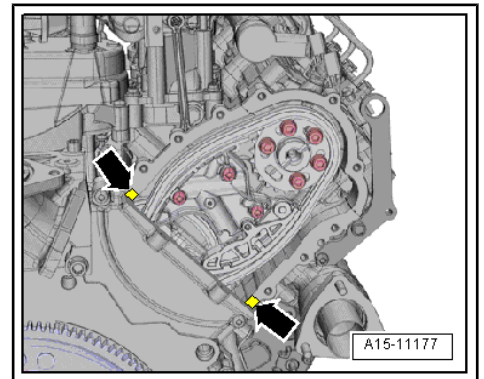
- Apply a bead of sealant ( $\varnothing$  3 mm) at each joint between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.



#### Caution

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

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



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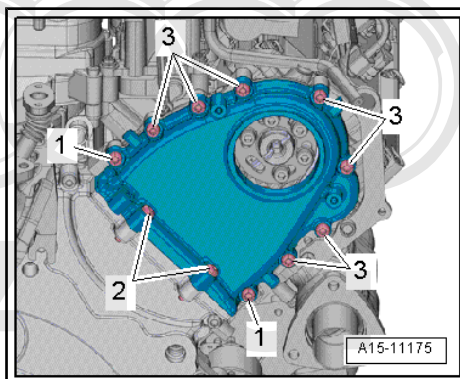


– Fit timing chain cover (right) and tighten bolts as follows:

Stage	Bolts	Tightening torque
1.	-1-	3 Nm
2.	-2-	9 Nm
3.	-1-	9 Nm
4.	-3-	9 Nm in diagonal sequence

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

- Install intermediate pipe: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#) .
- Install turbocharger ⇒ [page 312](#) .
- Install coolant pipe (rear) ⇒ [page 276](#) .
- Install vacuum pump ⇒ [page 112](#) .
- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .
- Install crankshaft oil seal (gearbox end) ⇒ [page 123](#) .
- Install dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .



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#### Tightening torques

Component		Nm
Timing chain cover (bottom) to engine	M6	9
	M8	23

### 1.3 Camshaft timing chain - exploded view

#### Camshaft timing chain (left-side)

1 - 5 Nm + 90°

- Renew

2 - Thrust washer for drive sprocket

3 - Drive sprocket for timing chain (left-side)

4 - 5 Nm + 90°

- Renew

5 - Chain tensioner for timing chain (left-side)

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

6 - Chain sprocket for inlet camshaft

- Side with lettering faces towards gearbox

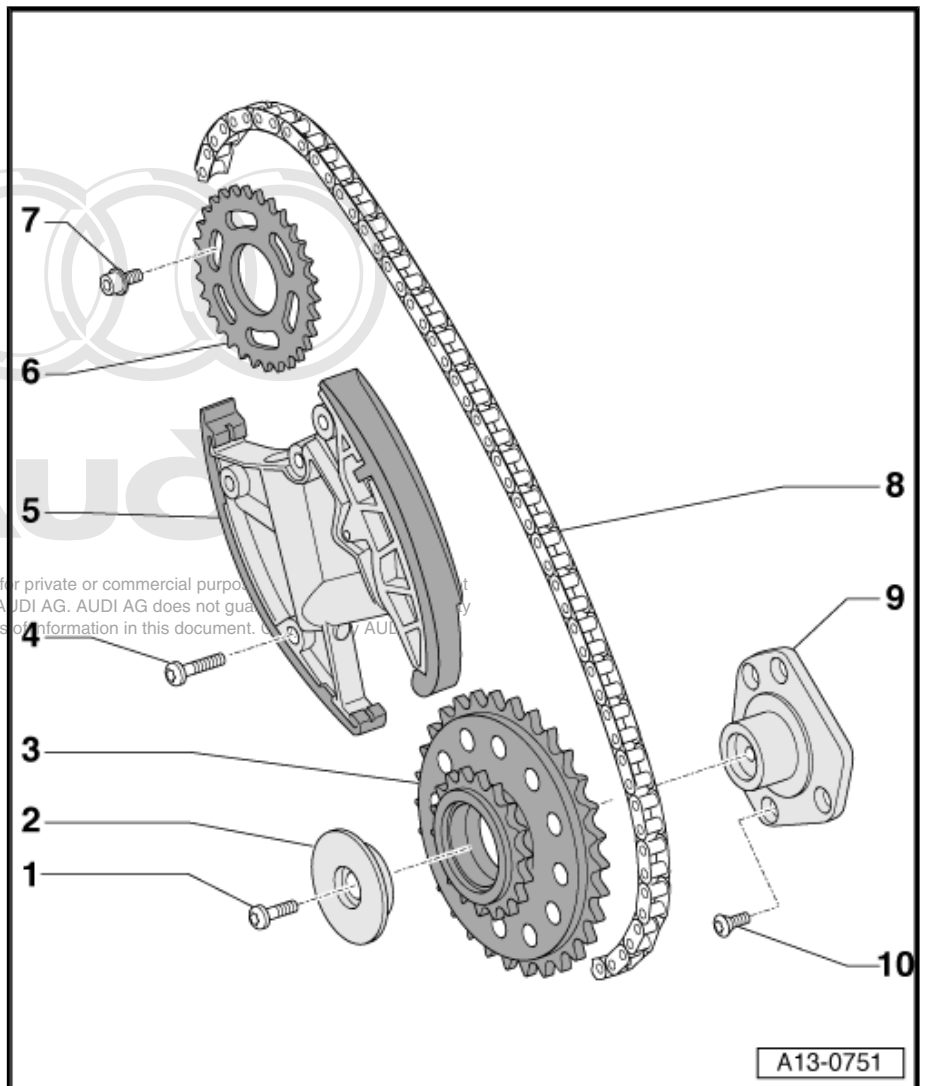
7 - 23 Nm

8 - Camshaft timing chain (left-side)

- Before removing, mark running direction with paint
- Removing and installing  
⇒ [page 145](#)
- Removing from camshafts ⇒ [page 153](#)

9 - Bearing bracket for drive sprocket

10 - 9 Nm



#### Camshaft timing chain (right-side)



1 - 45 Nm

2 - Bearing mounting for drive sprocket

3 - Camshaft timing chain (right-side)

- Before removing, mark running direction with paint
- Removing and installing ⇒ [page 145](#)
- Removing from camshafts ⇒ [page 153](#)

4 - Chain sprocket for inlet camshaft

- Side with lettering faces towards gearbox

5 - 23 Nm

6 - Chain tensioner for timing chain (right-side)

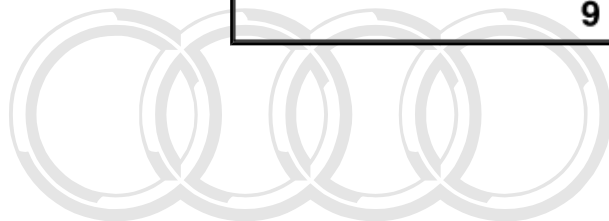
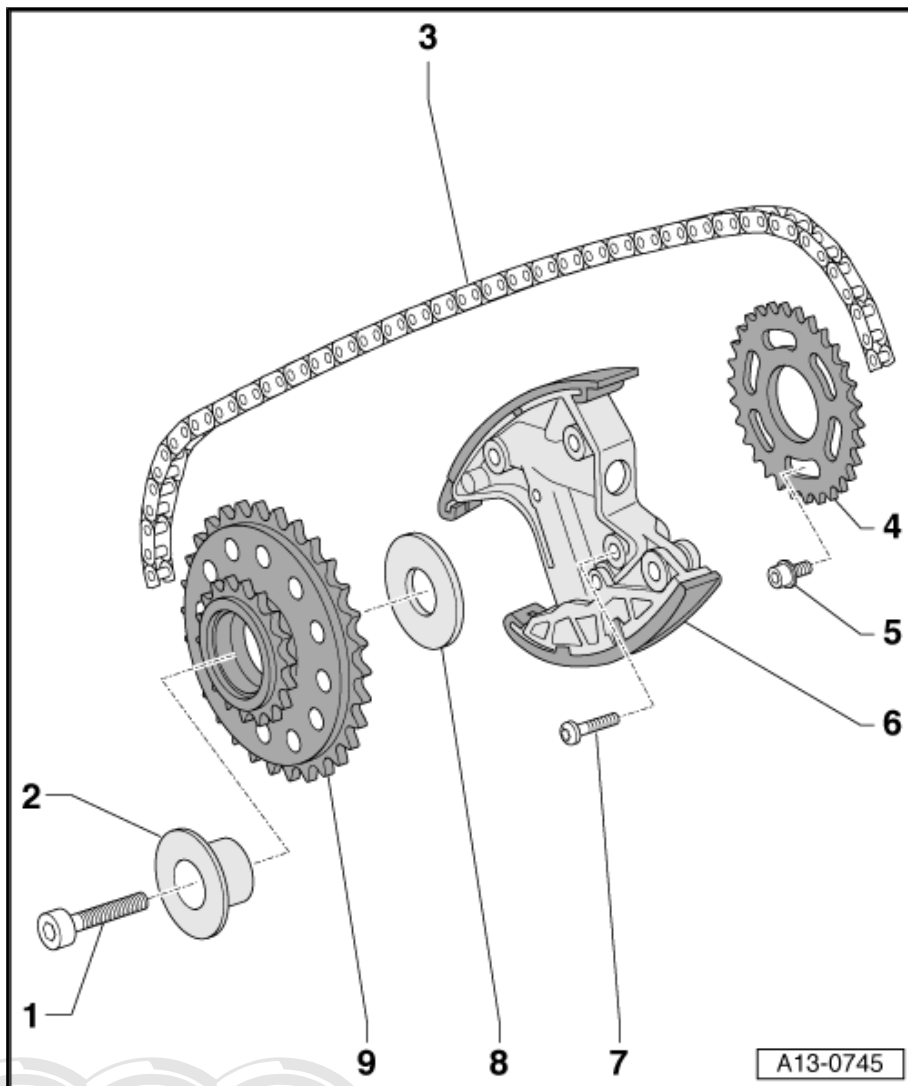
- Removing and installing ⇒ [page 153](#)

7 - 5 Nm + 90°

- Renew

8 - Thrust washer for drive sprocket

9 - Drive sprocket for timing chain (right-side)



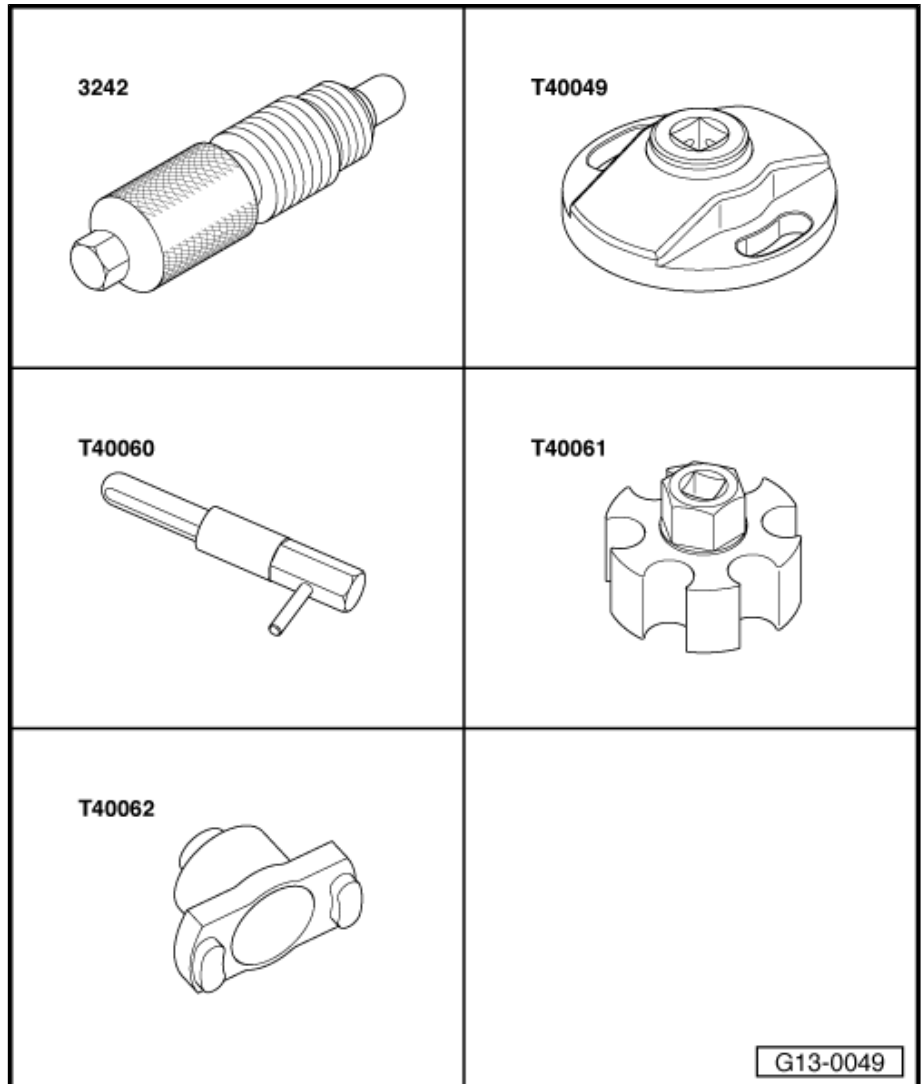
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## 1.4 Removing and installing camshaft timing chain

### Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Special wrench -T40049-
- ◆ 2x Adjustment pin -T40060-
- ◆ Adapter -T40061-
- ◆ Adapter -T40062-
- ◆ Drill bit 3.3 mm Ø (2x)



### Removing



#### Caution

*The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed. Otherwise the valves may strike the pistons, causing damage to valves and piston crowns.*

- Gearbox removed.
- Remove dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Remove flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Remove drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Remove timing chain covers ⇒ [page 137](#) .

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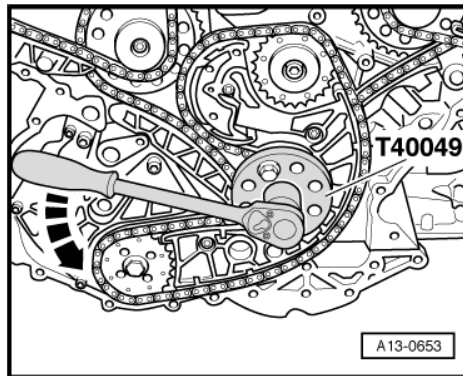


- Attach special wrench -T40049- to rear of crankshaft: on vehicles with automatic gearbox secure wrench with two old drive plate bolts; on vehicles with manual gearbox use two bolts M10x19 to secure wrench.



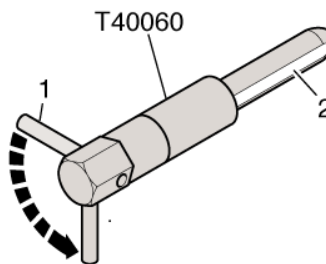
**Caution**

**Do not use bolts for dual-mass flywheel to secure wrench -T40049- ; these bolts are too long and can damage the camshaft timing chains when they are screwed in.**



**Note**

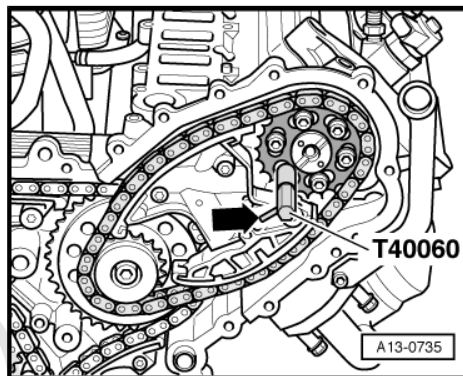
- ◆ The adjustment pin -T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.
- ◆ The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and the centre of the camshaft.
- ◆ To obtain the correct TDC position, the side pin -1- must then be turned 90° -arrow- so it is in line with the imaginary line between the adjustment pin and the centre of the camshaft.



**Caution**

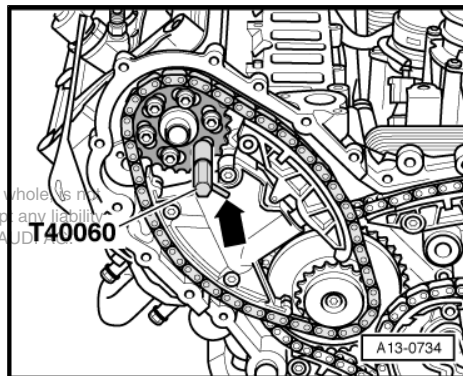
**Do not rotate crankshaft in opposite direction of engine rotation.**

- Turn crankshaft in normal direction of rotation to TDC position:
- It should be possible to lock camshafts with adjustment pin -T40060- .
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



Cylinder bank 1 (right-side):

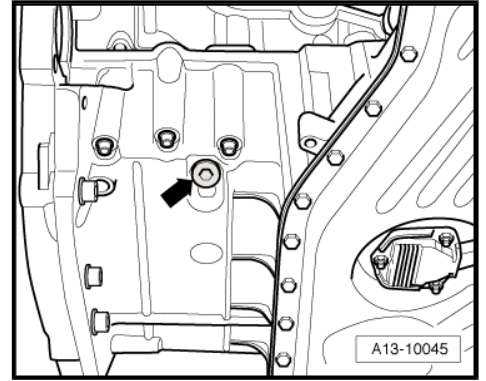
Cylinder bank 2 (left-side):



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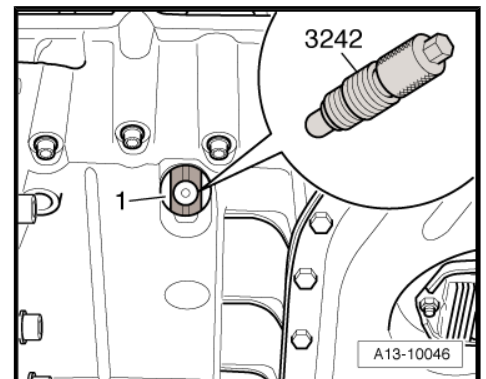
- Unscrew plug -arrow- from sump (top section).



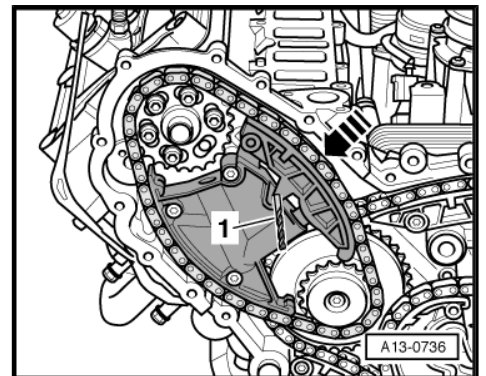
**WARNING**

*To avoid any risk of injury, do not rotate the crankshaft while feeling for the TDC hole with your finger.*

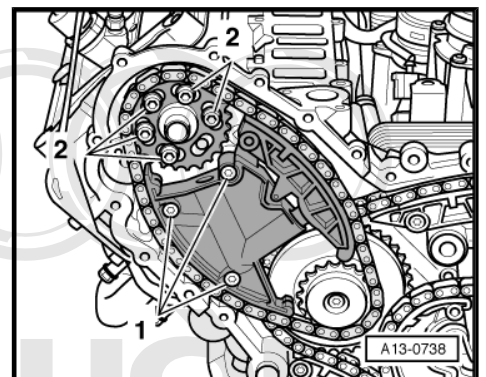
- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



- Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.
- Press guide rail of chain tensioner for timing chain (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.
- Mark running direction of timing chain (left-side) with paint.
- Remove adjustment pin -T40060- from both camshafts.



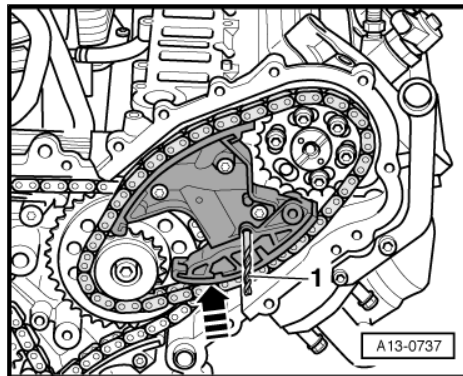
- Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.
- Take off camshaft sprocket, chain tensioner and timing chain (left-side).



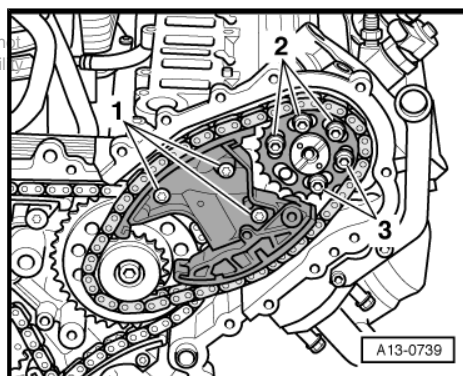
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- Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.
- Press guide rail of chain tensioner for timing chain (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.
- Mark running direction of timing chain (right-side) with paint.
- Remove adjustment pin -T40060- from both camshafts.



- Unscrew bolts -1- from chain tensioner and also -2- and -3- from camshaft sprocket.
- Take off camshaft sprocket, chain tensioner and timing chain (right-side).



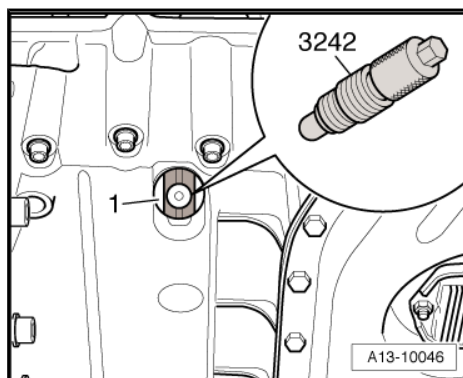
### Installing

- Crankshaft -1- locked in TDC position with locking pin -3242- .
- Drive chain for valve gear installed ⇒ [page 163](#)



### Note

- ◆ Renew seal.
- ◆ Renew the bolts tightened with specified tightening angle.

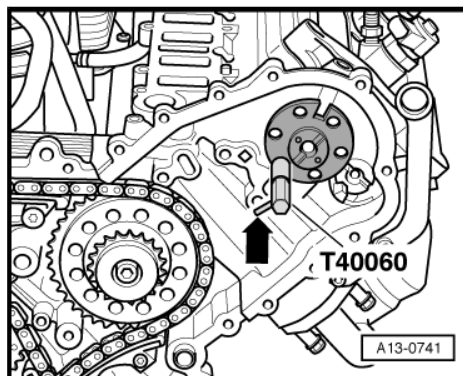


### Caution

**The crankshaft must not be at TDC at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.**

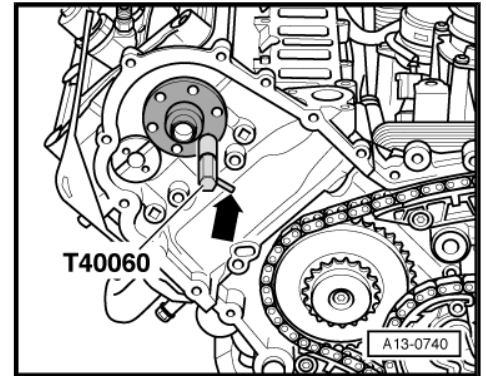
- Check that camshafts on both cylinder heads are positioned at TDC.
- It should be possible to lock camshafts with adjustment pin -T40060- .
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

Cylinder bank 1 (right-side):



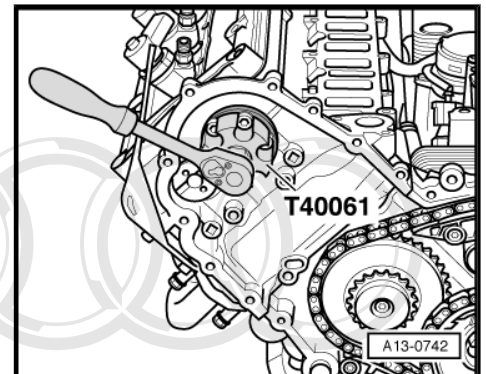
Cylinder bank 2 (left-side):

- Remove adjustment pin -T40060- from both camshafts.



 **Note**

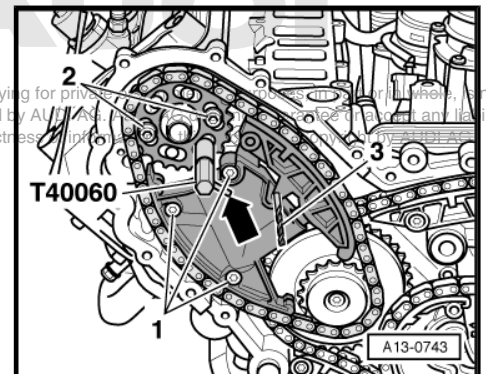
*If the adjustment pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter -T40061-. To do so, screw securing bolts for camshaft sprocket into camshaft.*



 **Caution**

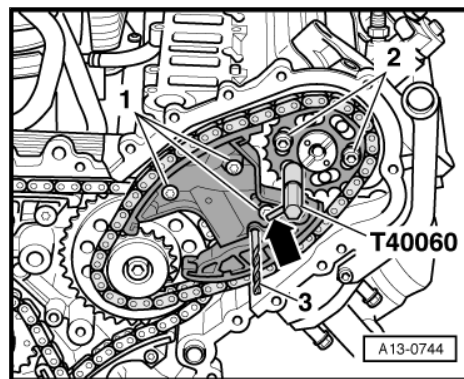
**The crankshaft must not be at TDC at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.**

- Install timing chain (left-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (left-side) with adjustment pin -T40060- .
- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Pull drill bit -3- from locating hole, this releases the chain tensioner (left-side).

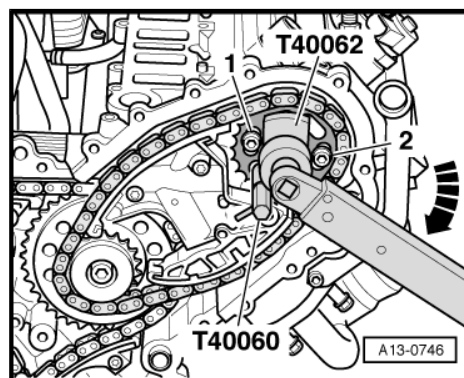




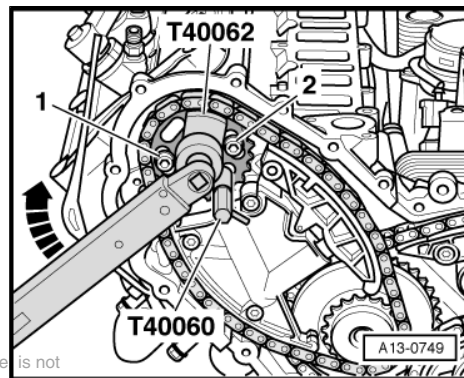
- Install timing chain (right-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (right-side) with adjustment pin -T40060- .
- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Pull drill bit -3- out of locating hole; this releases the chain tensioner (right-side).



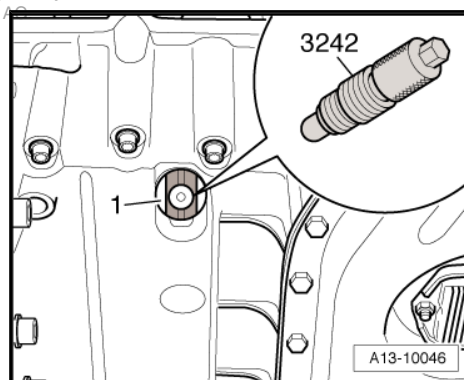
- Using a torque wrench and adapter -T40062- , apply a torque of 30 Nm to camshaft sprocket (right-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out adjustment pin -T40060- .
- Tighten remaining bolts for sprocket (right-side).



- Using a torque wrench and adapter -T40062- , apply a torque of 15 Nm to camshaft sprocket (left-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out adjustment pin -T40060- .
- Tighten remaining bolts for sprocket (left-side).



- Remove locking pin -3242- .



### Checking valve timing



#### Caution

*Do not rotate crankshaft in opposite direction of engine rotation.*

- Using special wrench -T40049- , turn crankshaft two rotations in normal direction of rotation -arrow- until crankshaft is just before TDC again.

- While turning in this direction, lock crankshaft -1- with locking pin -3242- . Tighten locking pin to 20 Nm.



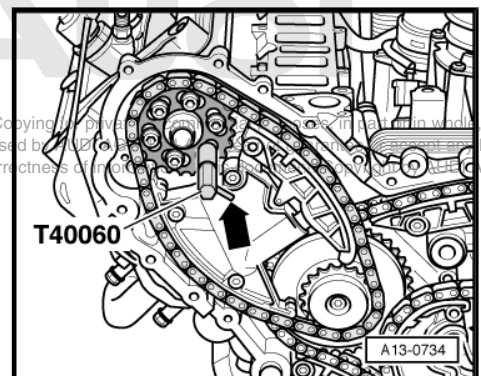
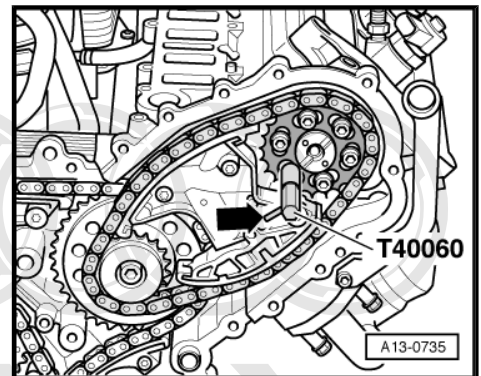
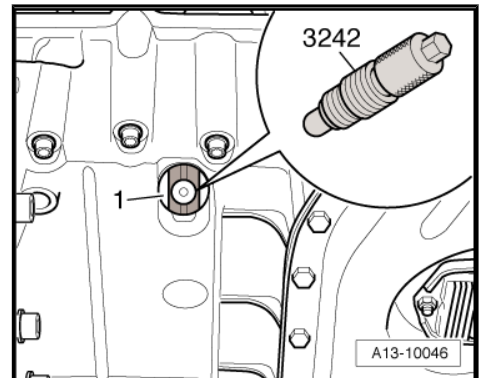
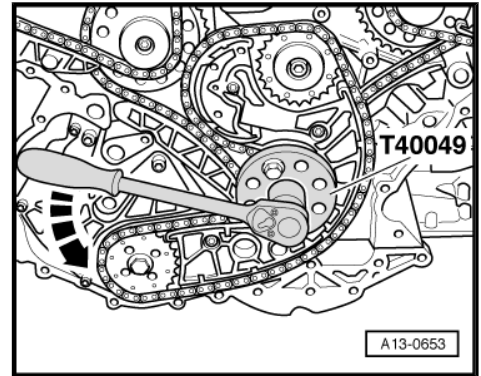
#### Caution

*If the crankshaft has been rotated even only slightly beyond the TDC position, turn it back approx. 10° so you can then reset it to TDC by turning in the normal direction of rotation.*

- Check that it is now possible to lock the camshafts with adjustment pin -T40060- .
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

Cylinder bank 1 (right-side):

Cylinder bank 2 (left-side):



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## Adjusting valve timing

If the adjustment pin cannot be inserted in one of the camshafts:

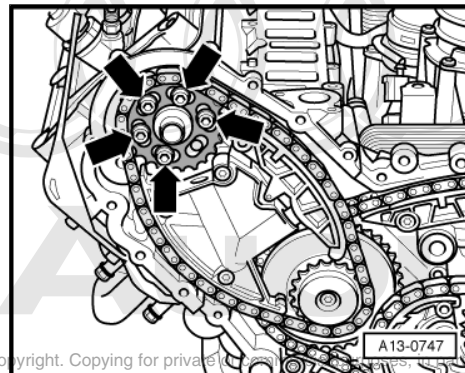
- Loosen all bolts -arrows- on the relevant sprocket approx. 1 turn.
- Apply adapter -T40061- to the heads of the loosened bolts.
- Turn camshaft slightly backwards and forwards with adapter -T40061- until adjustment pin -T40060- can be inserted.
- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- With adapter -T40061- and adjustment pin -T40060- still in position, tighten bolts on sprocket to approx: 5 Nm.
- Remove adjustment pin -T40060- and adapter -T40061- .
- Tighten bolts on sprocket to final torque.
- Repeat this procedure on the other cylinder bank if necessary.
- Remove locking pin -3242- .
- Check valve timing once again ⇒ [page 151](#) .

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

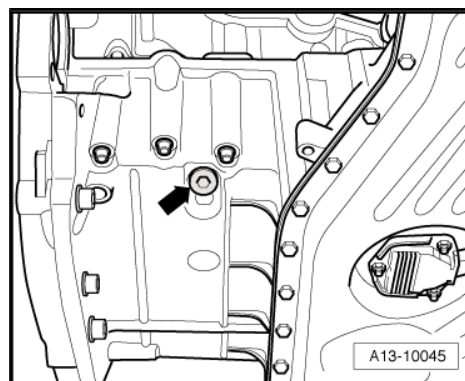
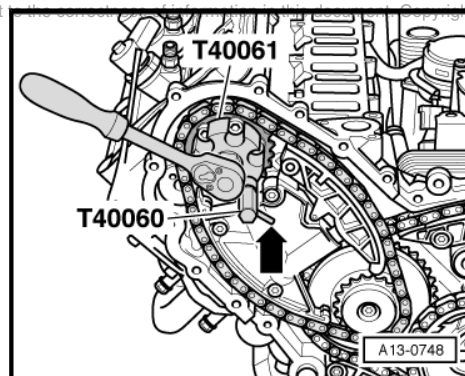
- Screw plug -arrow- for TDC mark into top section of sump with a new seal.
- Install timing chain covers ⇒ [page 138](#) .
- Install dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .

## Tightening torques

Component	Nm
Chain tensioner to cylinder head	5 + 90° 1)2)
Camshaft sprocket to camshaft	23
Screw plug in top section of sump	35
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>	



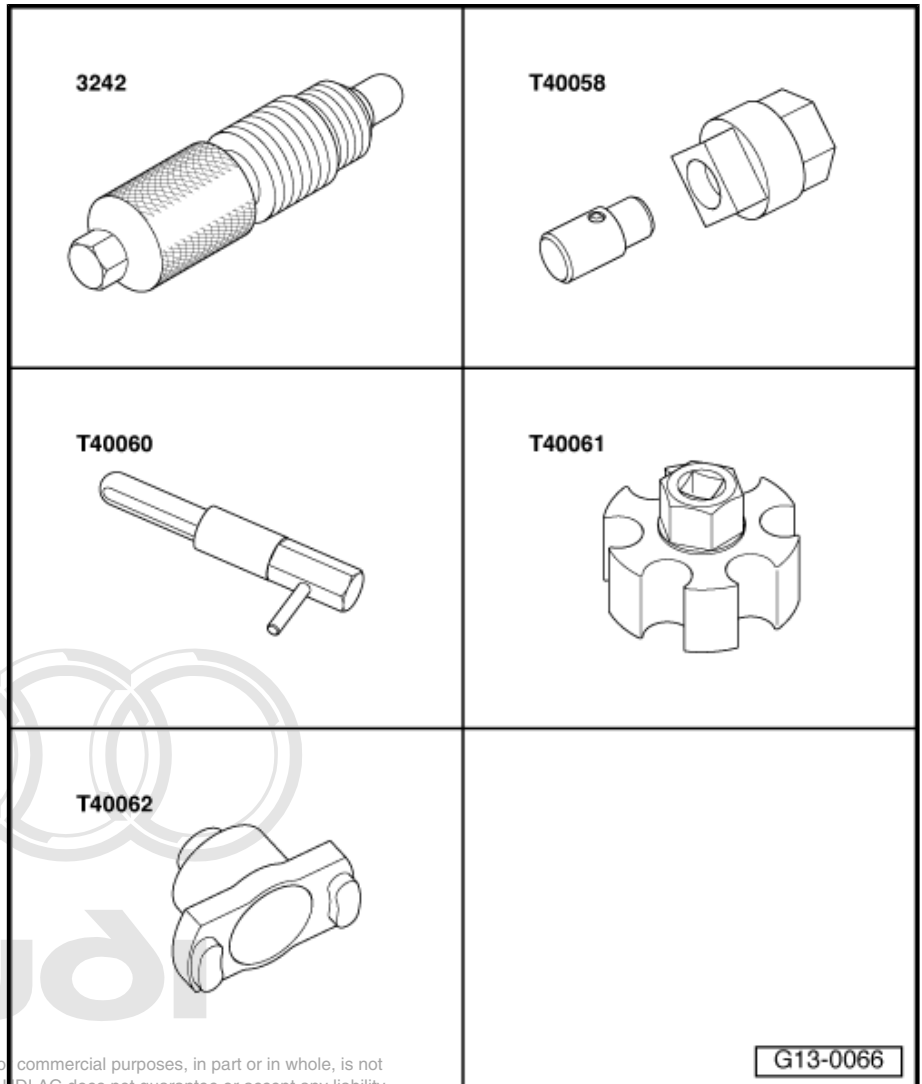
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## 1.5 Removing camshaft timing chain from camshafts

### Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Adapter -T40058-
- ◆ 2x Adjustment pin -T40060-
- ◆ Adapter -T40061-
- ◆ Adapter -T40062-
- ◆ Drill bit 3.3 mm Ø (2x)



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### Note

- ◆ *When working on one cylinder head only, it is not necessary to remove the timing chain cover on the opposite cylinder head as well. In this case it is only necessary to remove the vacuum pump or the sealing cap, because the timing chain on this cylinder head stays in place.*
- ◆ *However, the valve timing for both cylinder heads must be adjusted in all cases as described below.*

### Removing

- Engine and gearbox in vehicle
- Drain off coolant ⇒ [page 253](#) .
- Remove starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) ; vehicles with particulate filter ⇒ [page 350](#) .
- Remove vacuum pump ⇒ [page 112](#) .



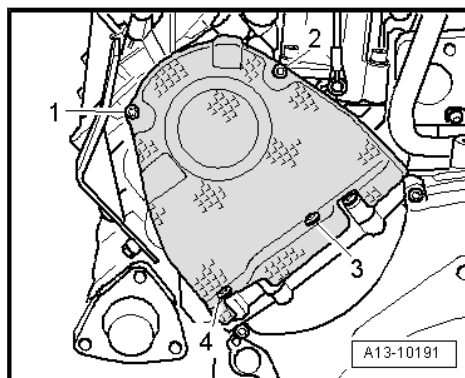
- Remove coolant pipe (rear) => [page 276](#) .



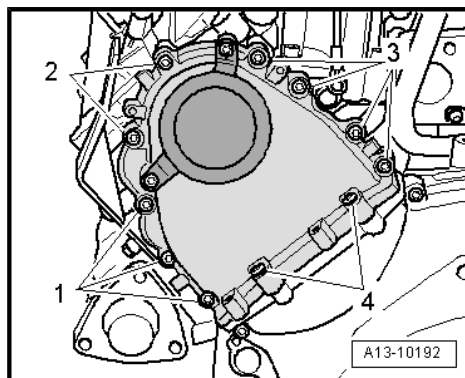
**Note**

*For illustration purposes, the following work on the timing chains is shown from the rear with the engine removed*

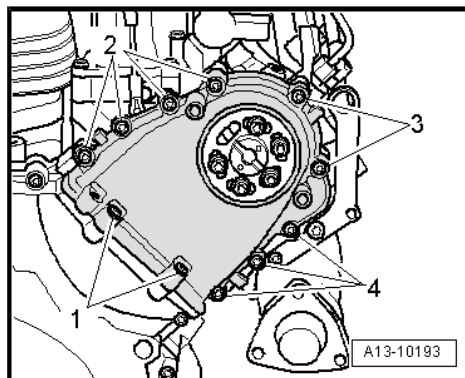
- Unscrew bolts -1 ... 4- and remove heat shield.



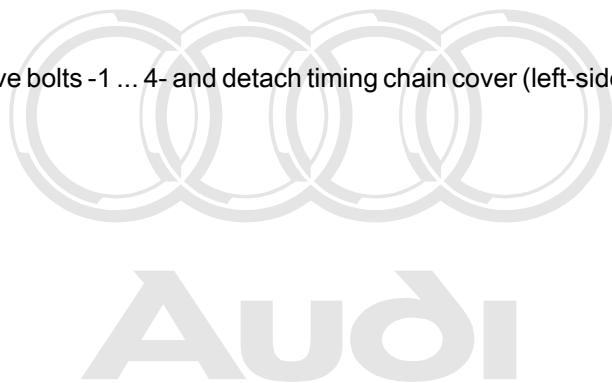
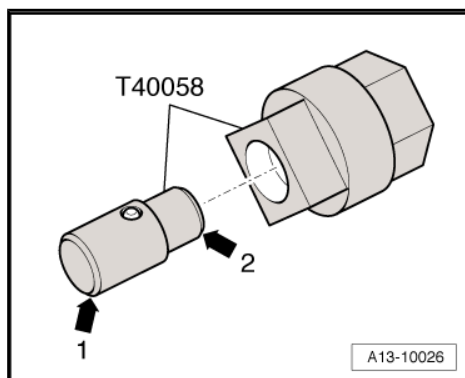
- Remove bolts -1 ... 4- and detach timing chain cover (left-side).



- Remove bolts -1 ... 4- and detach timing chain cover (right-side).



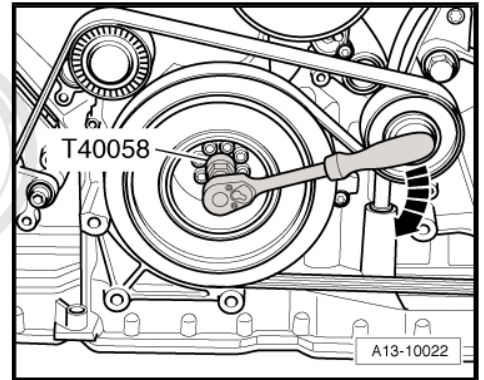
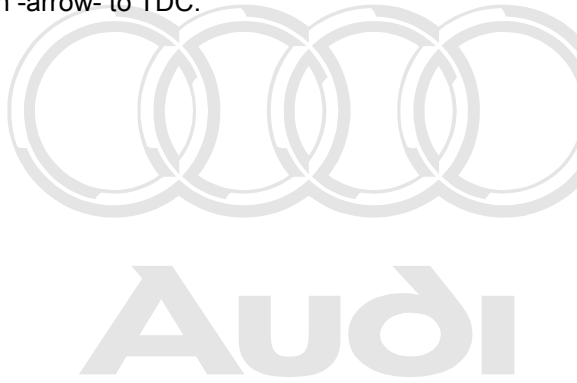
- Insert guide pin of adapter -T40058- with the larger-diameter section -arrow 1- pointing towards the engine. The smaller-diameter section -arrow 2- faces the adapter.



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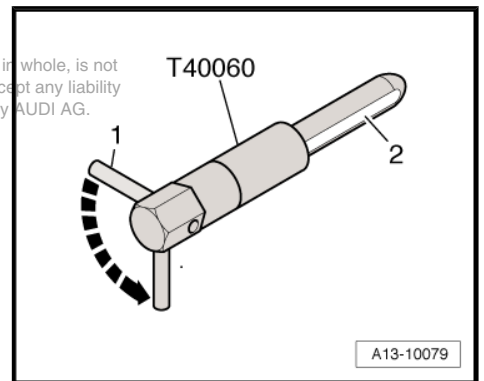
- Using adapter -T40058- turn the crankshaft in the normal direction of rotation -arrow- to TDC.



**Note**

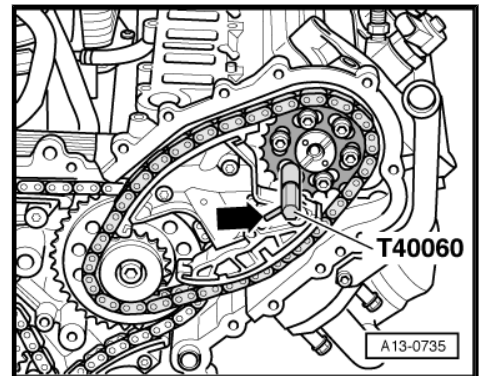
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- ◆ *The adjustment pin -T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- ◆ *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and the centre of the camshaft.*
- ◆ *To obtain the correct TDC position, the side pin -1- must then be turned 90° -arrow- so it is in line with the imaginary line between the adjustment pin and the centre of the camshaft.*

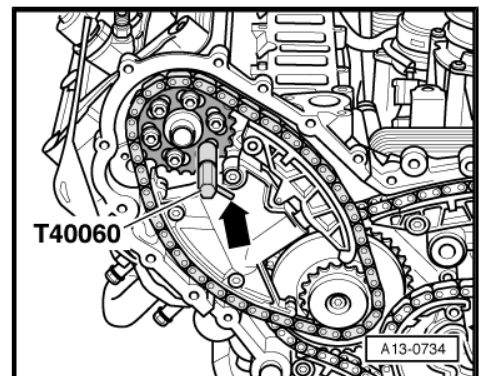


- Check that camshafts on both cylinder heads are positioned at TDC.
- It should be possible to lock camshafts with adjustment pin - T40060- .
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

Cylinder bank 1 (right-side):

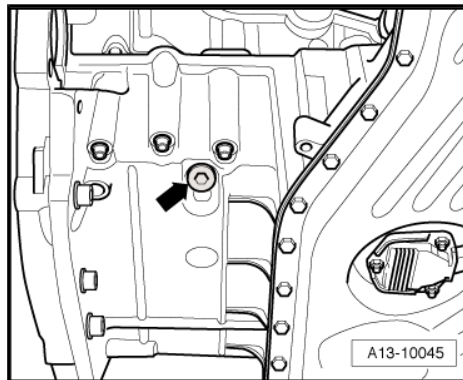


Cylinder bank 2 (left-side):





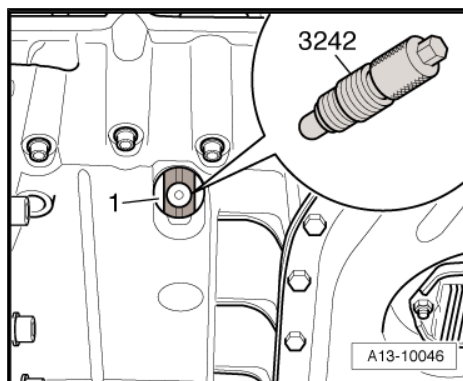
- Lay a cloth beneath sump (top section) to catch engine oil.
- Unscrew plug -arrow- from sump (top section).



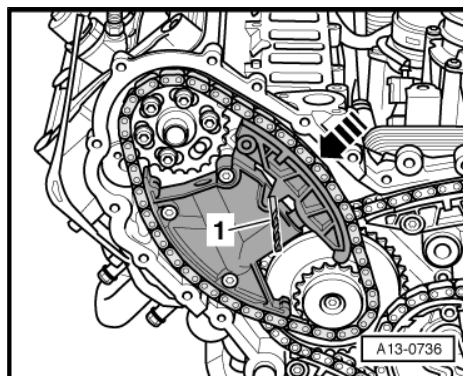
**⚠ WARNING**

*To avoid any risk of injury, do not rotate the crankshaft while feeling for the TDC hole with your finger.*

- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.
- Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.
- Press guide rail of chain tensioner for timing chain (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.

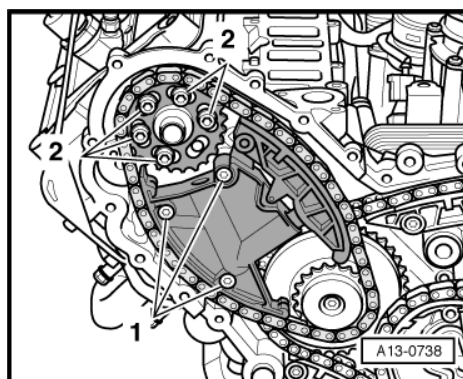


- Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.
- Remove camshaft sprocket and chain tensioner (left-side)

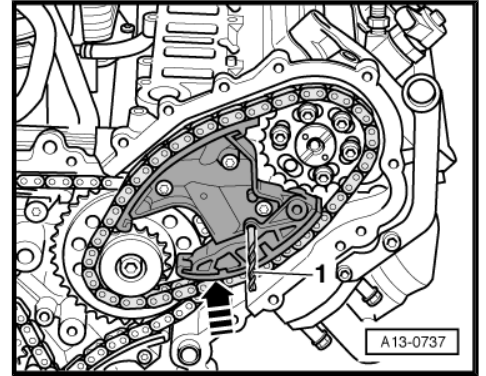


**i Note**

*Cover chain tensioner opening with a cloth or similar to stop small parts dropping in.* 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.



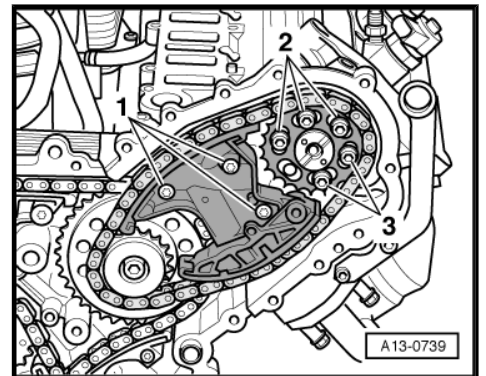
- Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.
- Press guide rail of chain tensioner for timing chain (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.



- Unscrew bolts -1- from chain tensioner and also -2- and -3- from camshaft sprocket.
- Remove camshaft sprocket and chain tensioner (right-side).

 **Note**

*Cover chain tensioner opening with a cloth or similar to stop small parts dropping in.*



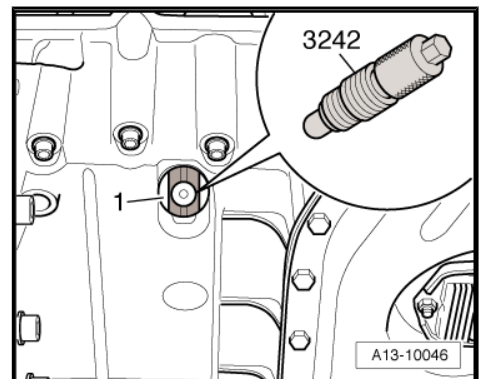
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**Installing**

- Crankshaft -1- locked in TDC position with locking pin -3242- .

 **Note**

- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Renew the bolts tightened with specified tightening angle.*

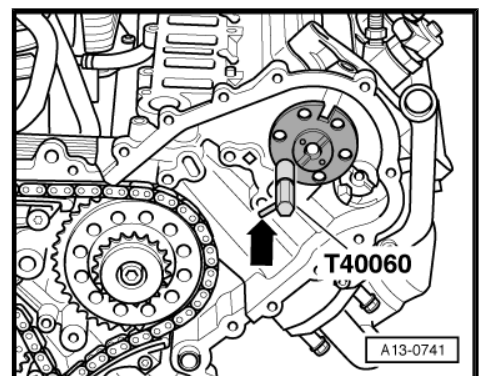


 **Caution**

***The crankshaft must not be at TDC at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.***

- Check that camshafts on both cylinder heads are positioned at TDC.
- It should be possible to lock camshafts with adjustment pin -T40060- .
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

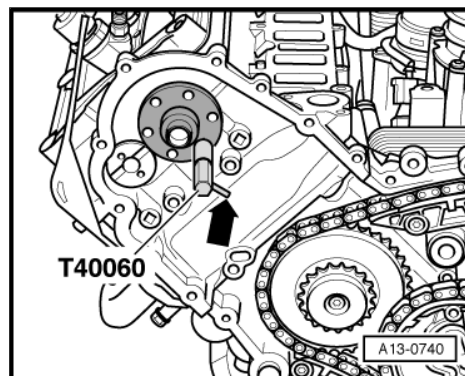
Cylinder bank 1 (right-side):





Cylinder bank 2 (left-side):

- Remove adjustment pin -T40060- from both camshafts.



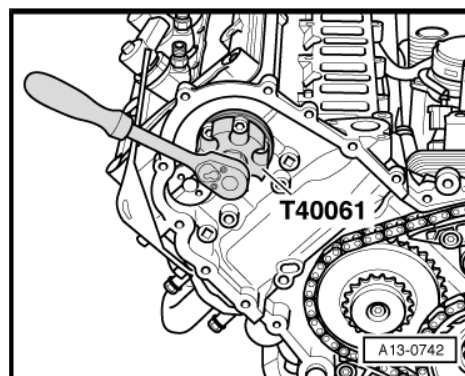
### Note

*If the adjustment pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter -T40061- . To do so, screw securing bolts for camshaft sprocket into camshaft.*

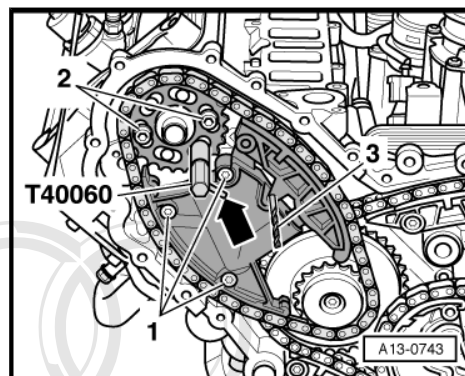


### Caution

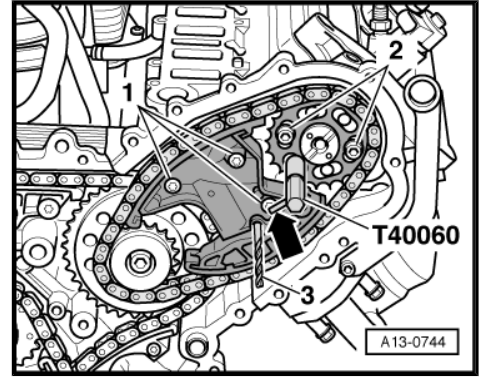
***The crankshaft must not be at TDC at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.***



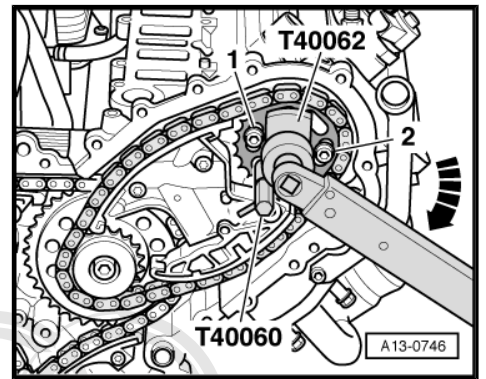
- Install timing chain (left-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (left-side) with adjustment pin -T40060- .
- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Pull drill bit -3- from locating hole, this releases the chain tensioner (left-side).



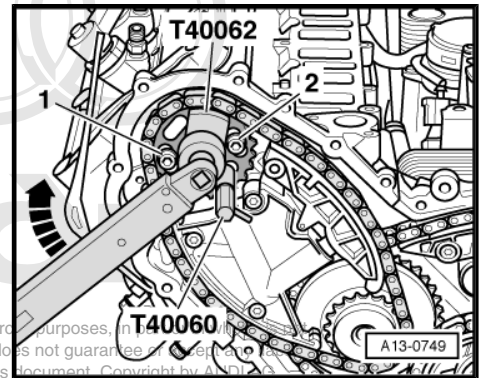
- Install timing chain (right-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (right-side) with adjustment pin -T40060- .
- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Pull drill bit -3- out of locating hole; this releases the chain tensioner (right-side).



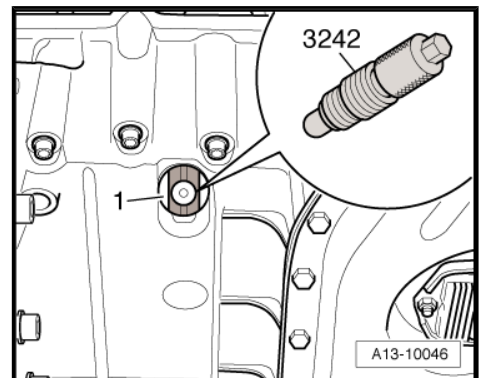
- Using a torque wrench and adapter -T40062- , apply a torque of 30 Nm to camshaft sprocket (right-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out adjustment pin -T40060- .
- Tighten remaining bolts for sprocket (right-side).



- Using a torque wrench and adapter -T40062- , apply a torque of 15 Nm to camshaft sprocket (left-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out adjustment pin -T40060- .
- Tighten remaining bolts for sprocket (left-side).



- Remove locking pin -3242- .



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### Checking valve timing



**Caution**

*Do not rotate crankshaft in opposite direction of engine rotation.*

- Turn crankshaft two rotations in normal direction of rotation -arrow- until the crankshaft is just before TDC again.

- While turning in this direction, lock crankshaft -1- with locking pin -3242- . Tighten locking pin to 20 Nm.

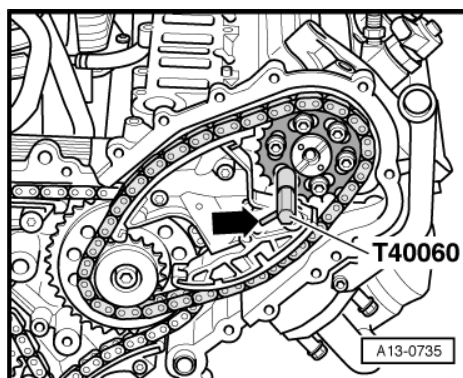
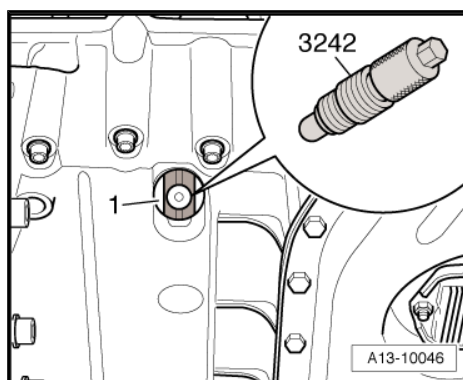
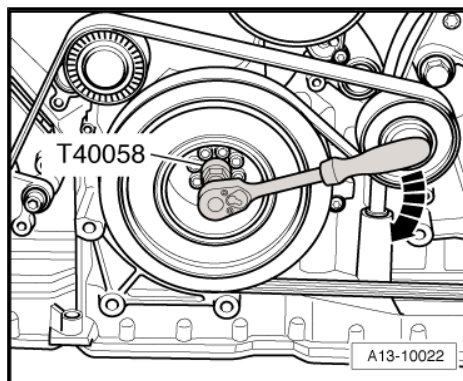


**Caution**

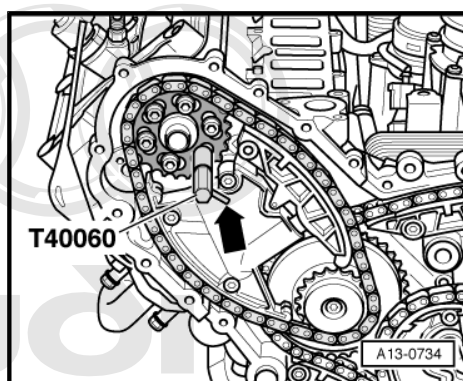
*If the crankshaft has been rotated even only slightly beyond the TDC position, turn it back approx. 10° so you can then reset it to TDC by turning in the normal direction of rotation.*

- Check that it is now possible to lock the camshafts with adjustment pin -T40060- .
- The side pin -arrow- in each adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

Cylinder bank 1 (right-side):



Cylinder bank 2 (left-side):

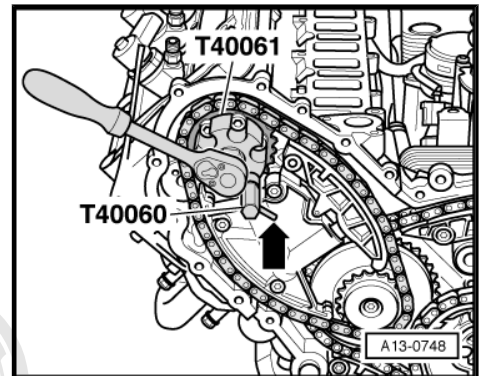
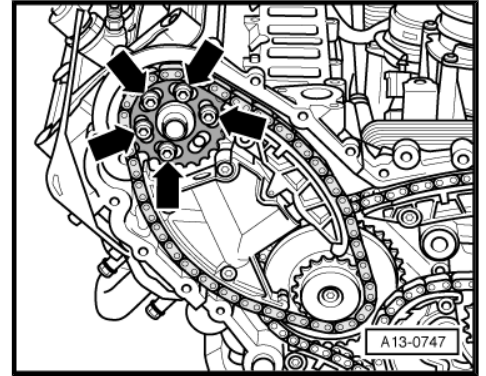


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## Adjusting valve timing

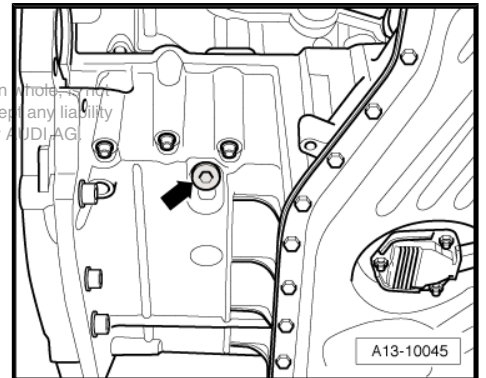
If the adjustment pin cannot be inserted in one of the camshafts:

- Loosen all bolts -arrows- on the relevant sprocket approx. 1 turn.
- Apply adapter -T40061- to the heads of the loosened bolts.
- Turn camshaft slightly backwards and forwards with adapter -T40061- until adjustment pin -T40060- can be inserted.
- The side pin -arrow- on the adjustment pin -T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- With adapter -T40061- and adjustment pin -T40060- still in position, tighten bolts on sprocket to approx: 5 Nm.
- Remove adjustment pin -T40060- and adapter -T40061- .
- Tighten bolts on sprocket to final torque.
- Repeat this procedure on the other cylinder bank if necessary.
- Remove locking pin -3242- .
- Check valve timing once again ⇒ [page 160](#) .



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

- Screw plug -arrow- for TDC mark into top section of sump with a new seal.
- Install timing chain covers ⇒ [page 138](#) .
- Install coolant pipe (rear) ⇒ [page 276](#) .
- Install vacuum pump ⇒ [page 112](#) .
- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .
- Fill cooling system ⇒ [page 255](#) .



## Tightening torques

Component	Nm
Chain tensioner to cylinder head	5 + 90° 1)2)
Camshaft sprocket to camshaft	23
Screw plug in top section of sump	35
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>	



## 1.6 Drive chain for valve gear - exploded view

1 - Bearing mounting for drive sprocket

2 - 45 Nm

3 - Mounting pin, 12 Nm

- Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue

4 - 5 Nm + 90°

- Renew

5 - Thrust washer for drive sprocket

6 - Drive sprocket for timing chain (left-side)

7 - Mounting pin, 12 Nm

- Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue

8 - Drive chain for valve gear

- Before removing, mark running direction with paint
- Removing and installing ⇒ [page 163](#)

9 - Guide rail

10 - Mounting pin, 12 Nm

- Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue

11 - 9 Nm

12 - Bearing bracket for drive sprocket

13 - Thrust washer

14 - Drive sprocket for timing chain (right-side)

15 - Mounting pin, 12 Nm

- Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue

16 - O-ring

- Renew

17 - Chain tensioner

18 - 12 Nm

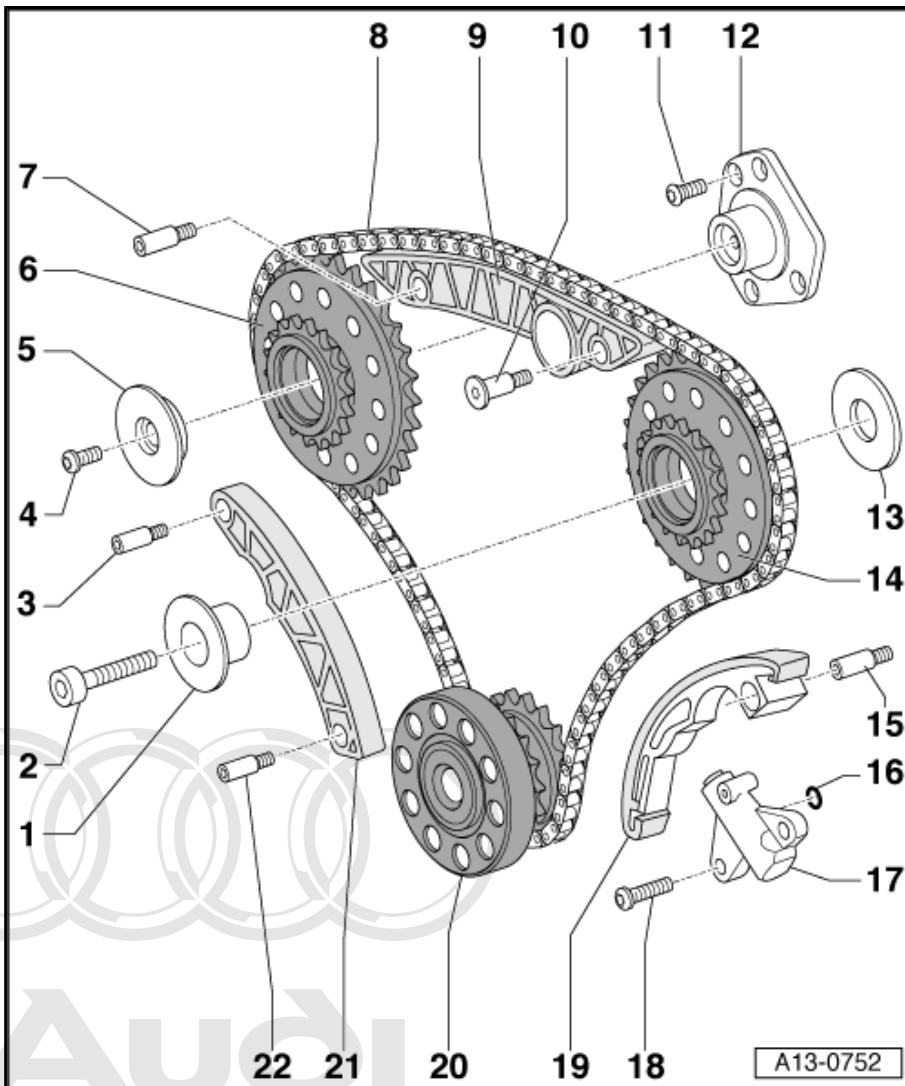
19 - Guide rail for chain tensioner

20 - Crankshaft

21 - Guide rail

- Note installation position

22 - Mounting pin, 9 Nm



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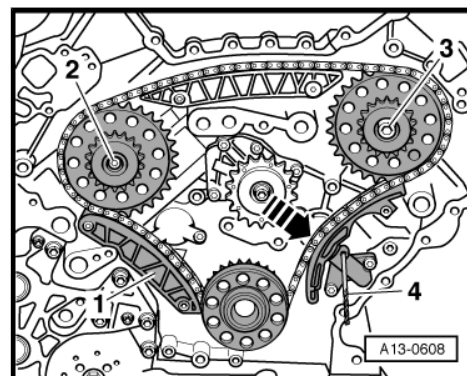
## 1.7 Removing and installing drive chain for valve gear

### Special tools and workshop equipment required

- ◆ Drill bit,  $\varnothing$  3.3 mm

### Removing

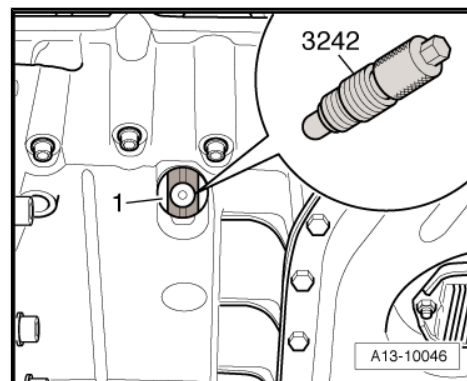
- Gearbox removed.
- Remove dual-mass flywheel (vehicles with manual gearbox) [⇒ page 115](#).
- Remove flywheel (on a vehicle with multitronic gearbox [⇒ page 120](#)).
- Remove drive plate (vehicles with automatic gearbox) [⇒ page 122](#).
- Remove timing chain covers [⇒ page 137](#).
- Remove camshaft timing chains [⇒ page 145](#).
- Remove chain for oil pump and balance shaft [⇒ page 166](#).
- Wrap insulating tape around tip and shaft of 3.3 mm  $\varnothing$  drill bit to avoid cuts.
- Press guide rail of chain tensioner for drive chain in direction of -arrow- and lock chain tensioner by inserting 3.3 mm  $\varnothing$  drill bit -item 4-.
- Mark running direction of chain with paint.
- Remove bolts -2- and -3- and detach chain sprockets together with drive chain and guide rail -1-.



### Installing

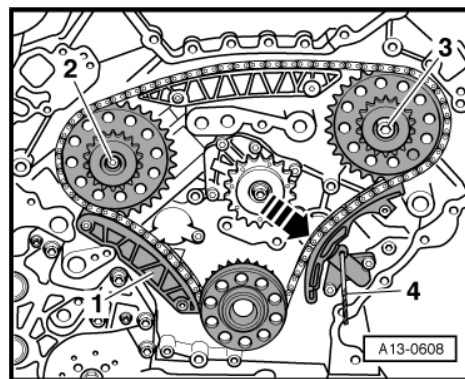
Installation is carried out in the reverse order; note the following:

- Crankshaft -1- locked in TDC position with locking pin -3242-.





- First install sprocket for camshaft timing chain (left-side) -2-.
- Install guide rail -1- with drive chain fitted.
- Now install sprocket for camshaft timing chain (right-side) -3-.
- Push guide rail of chain tensioner for drive chain in direction of -arrow- and pull drill bit -4- out of chain tensioner.
- Install chain for oil pump and balance shaft ⇒ [page 166](#)
- Install camshaft timing chains ⇒ [page 145](#) .
- Install timing chain covers ⇒ [page 138](#) .
- Install dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .



#### Tightening torques

Component	Nm
Drive chain sprocket (left-side) to bearing bracket	5 + 90° 1)2)
Drive chain sprocket (right-side) to cylinder block	45
<ul style="list-style-type: none"><li>• 1) Renew bolts.</li><li>• 2) 90° = one quarter turn.</li></ul>	



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## 1.8 Drive chain for oil pump and balance shaft - exploded view

1 - 9 Nm

### 2 - Chain tensioner

- With guide rail
- Removing and installing  
 ⇒ „1.9 Removing and installing drive chain for oil pump and balance shaft“, page 166

### 3 - Thrust washer

### 4 - Compression spring

5 - 23 Nm

### 6 - Chain sprocket for balance shaft

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- Side with lettering faces towards gearbox
- Removing and installing  
 ⇒ „1.9 Removing and installing drive chain for oil pump and balance shaft“, page 166

### 7 - Chain for oil pump and balance shaft

- Before removing, mark running direction with paint
- Removing and installing  
 ⇒ page 166

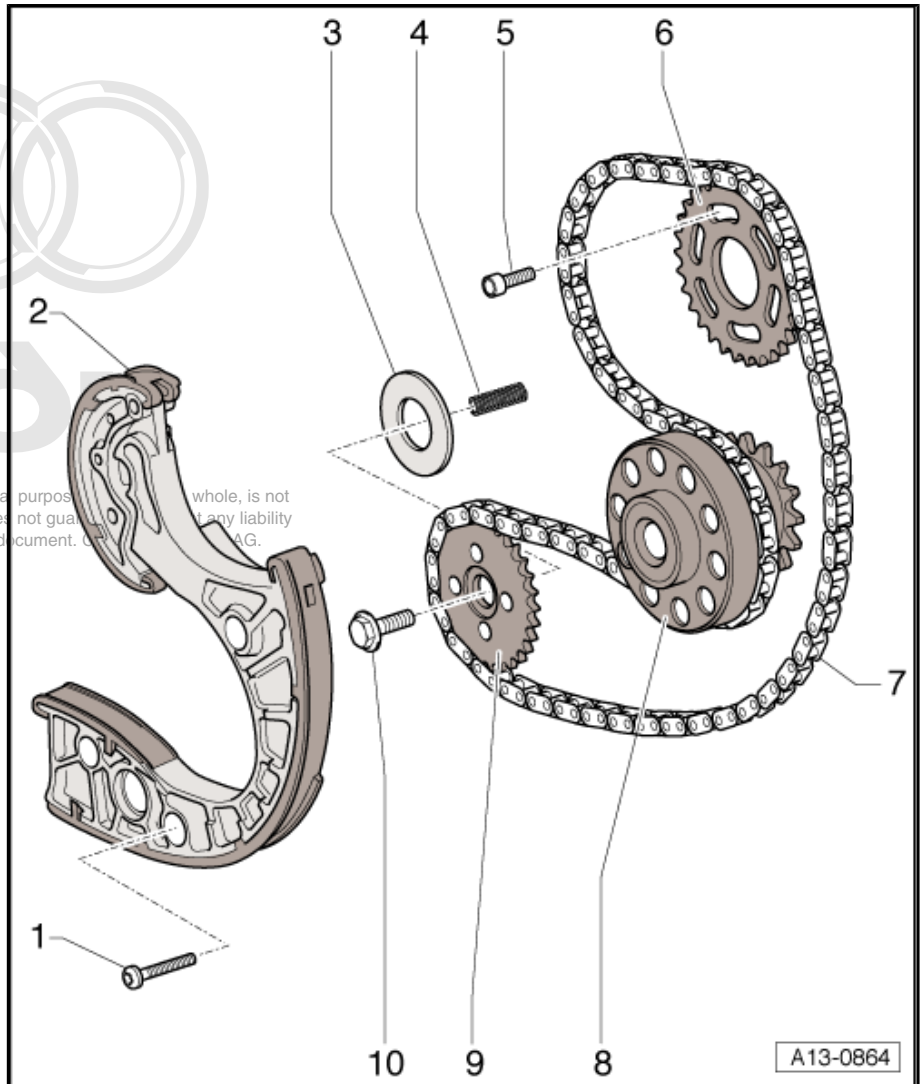
### 8 - Crankshaft

### 9 - Chain sprocket for oil pump

- Installation position:  
 Side with lettering faces engine

10 - 62 Nm

- If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.

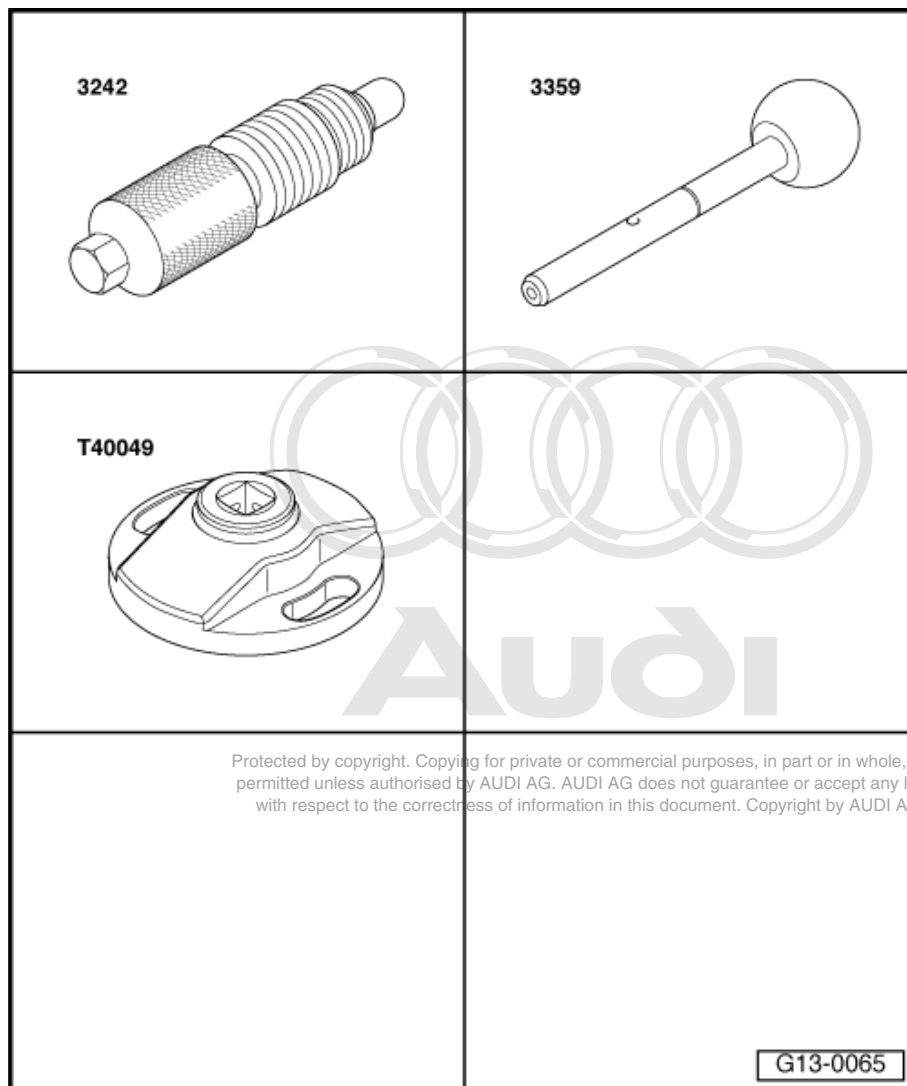




## 1.9 Removing and installing drive chain for oil pump and balance shaft

### Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Diesel injection pump locking pin -3359-
- ◆ Special wrench -T40049-
- ◆ Drill bit,  $\varnothing$  3.3 mm



### Removing

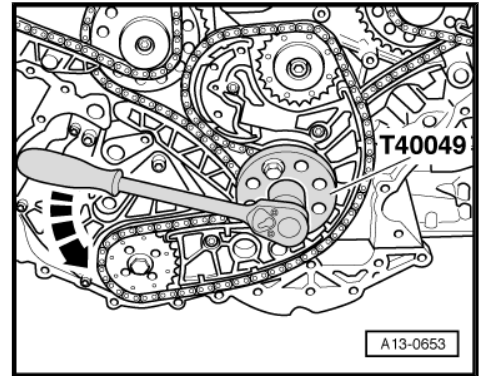
- Gearbox removed.
- Remove dual-mass flywheel (vehicles with manual gearbox)  
⇒ [page 115](#) .
- Remove flywheel (on a vehicle with multitronic gearbox  
⇒ [page 120](#) ).
- Remove drive plate (vehicles with automatic gearbox)  
⇒ [page 122](#) .
- Remove timing chain covers ⇒ [page 137](#) .

- Attach special wrench -T40049- to rear of crankshaft: on vehicles with automatic gearbox secure wrench with two old drive plate bolts; on vehicles with manual gearbox use two bolts M10x19 to secure wrench.

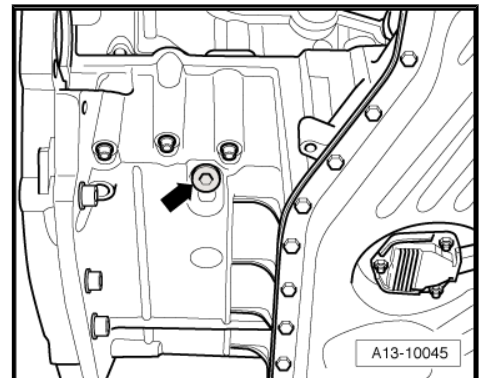


**Caution**

*Do not use bolts for dual-mass flywheel to secure wrench - T40049- ; these bolts are too long and can damage the camshaft timing chains when they are screwed in.*



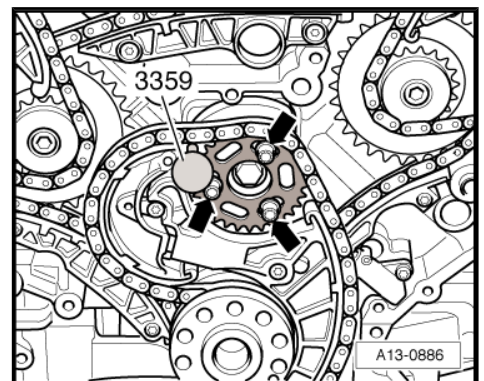
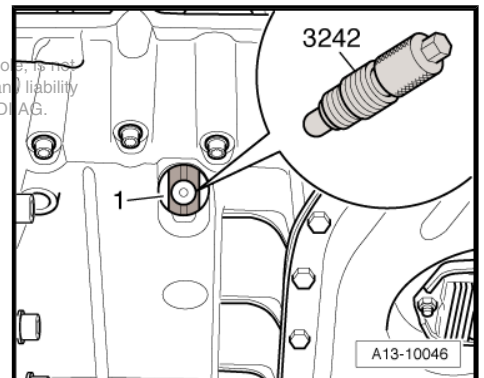
- Unscrew plug -arrow- from sump (top section).



**WARNING**

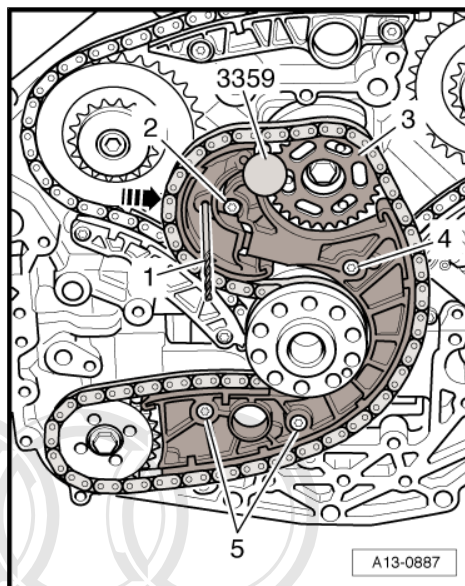
*To avoid any risk of injury, do not rotate the crankshaft while feeling for the TDC hole with your finger.*

- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.
- Mark running direction of chain for oil pump and balance shaft with paint.
- Lock balance shaft with diesel injection pump locking pin -3359- and loosen bolts -arrows- for balance shaft sprocket.



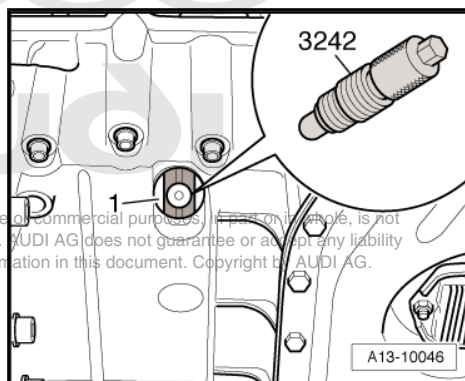


- Wrap insulating tape around tip and shaft of 3.3 mm Ø drill bit to avoid cuts.
- Press guide rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting 3.3 mm Ø drill bit -item 1-.
- Remove bolts -2, 4, 5- and take out chain tensioner, balance shaft sprocket -3- and chain.



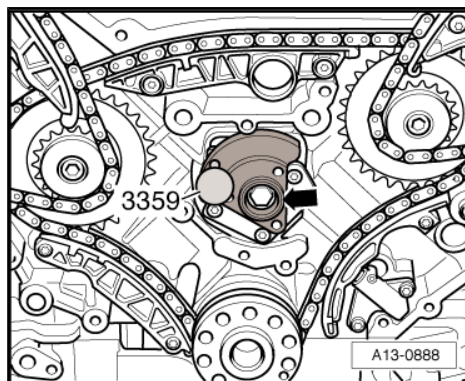
### Installing

- Crankshaft -1- locked in TDC position with locking pin -3242- .

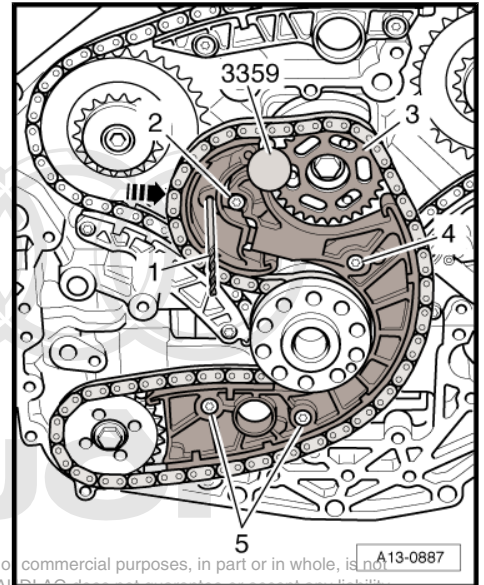


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- Lock balance shaft -arrow- with diesel injection pump locking pin -3359-

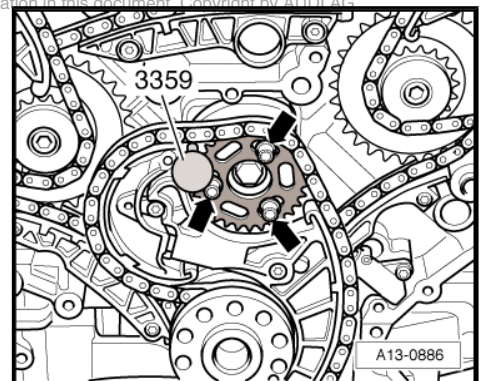


- Install chain tensioner with chain and balance shaft sprocket.
- The elongated holes in the sprocket -3- must be aligned centrally over the tapped holes in the balance shaft.
- Tighten bolts -2, 4, 5- for chain tensioner.

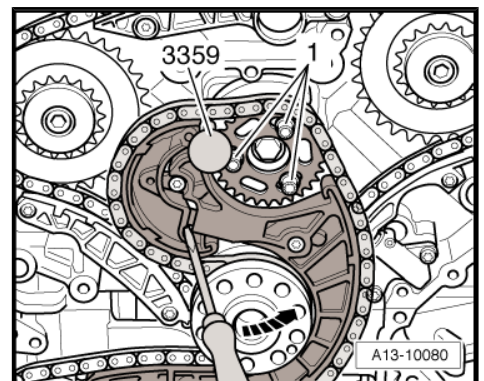


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- Screw in bolts -arrows- for chain sprocket, but do not tighten.
- It should just be possible to turn the sprocket on the balance shaft without axial movement.



- Pull drill bit out of locating hole to release chain tensioner.
- Press against guide rail of chain tensioner in direction of -arrow- using a screwdriver, and at the same time tighten bolts -1- securing chain sprocket.
- Pull diesel injection pump locking pin -3359- out of balance shaft.



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

- Install timing chain covers ⇒ [page 138](#) .
- Install dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox) ⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .

### Tightening torques

Component	Nm
Chain tensioner to cylinder block	9
Chain sprocket for balance shaft to balance weight	23



## 1.10 Balance shaft - exploded view

**1 - Sleeve bearing**

**2 - 60 Nm**

- ❑ Counterhold with diesel injection pump locking pin -3359- when loosening and tightening

**3 - Balance weight (gearbox end)**

**4 - 9 Nm**

**5 - Bearing plate**

**6 - Balance weight (pulley end)**

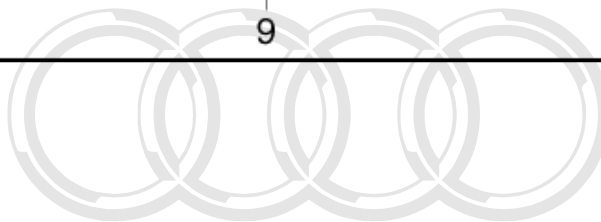
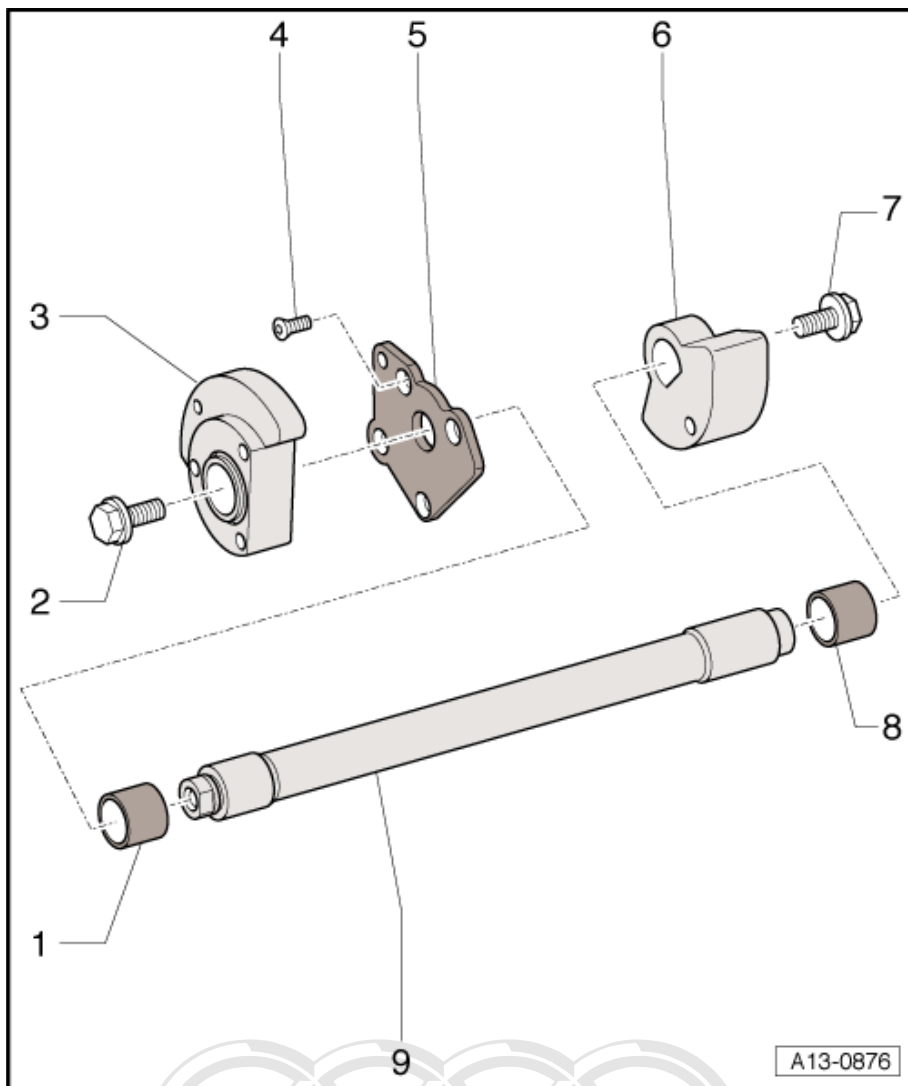
**7 - 60 Nm**

- ❑ Counterhold with diesel injection pump locking pin -3359- when loosening and tightening

**8 - Sleeve bearing**

**9 - Balance shaft**

- ❑ Removing and installing  
⇒ [page 171](#)



**Audi**

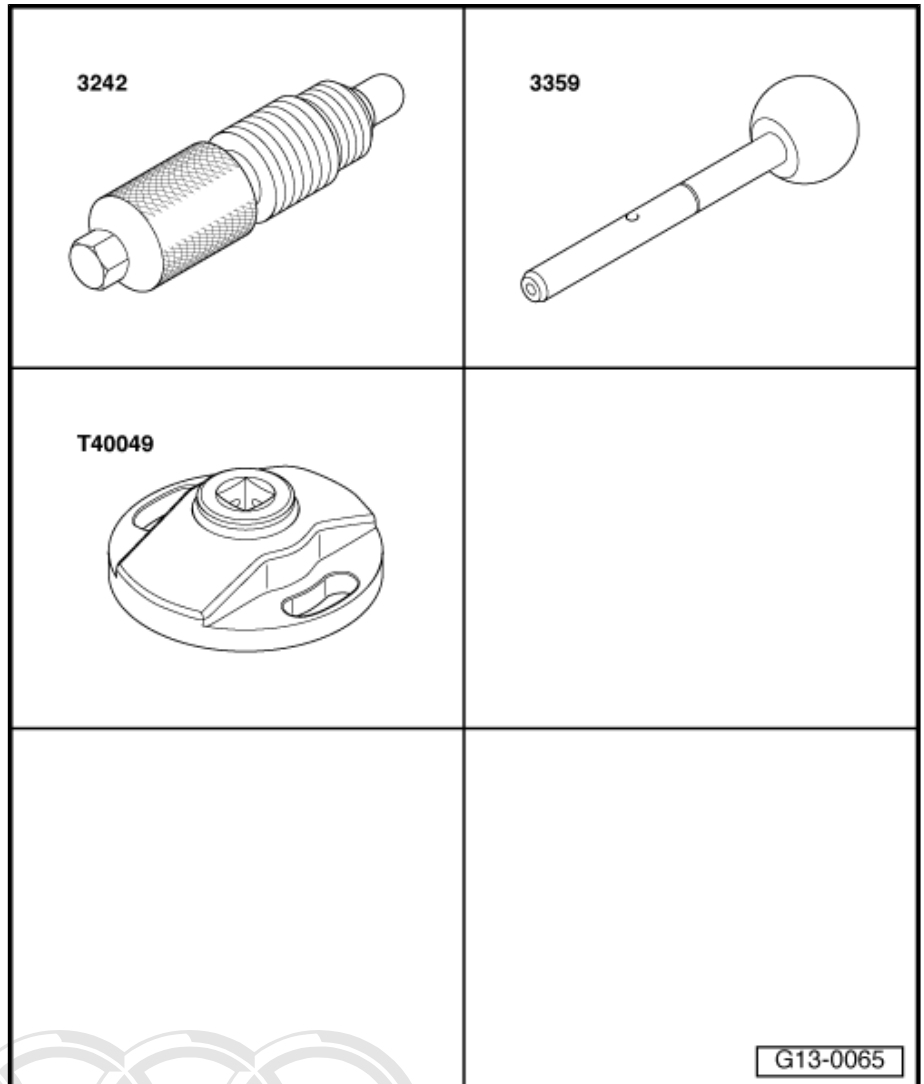
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## 1.11 Removing and installing balance shaft

### Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Diesel injection pump locking pin -3359-
- ◆ Special wrench -T40049-



### Removing

- Engine oil drained.
- Engine/gearbox assembly removed, separated and engine in position on scissor-type assembly platform -VAS 6131 A- : vehicles with manual gearbox ⇒ [page 22](#) ; vehicles with multitronic gearbox ⇒ [page 50](#) , vehicles with automatic gearbox ⇒ [page 77](#) .
- Remove sealing flange (front) ⇒ [page 108](#) .
- Remove dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Remove flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Remove drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Remove timing chain covers ⇒ [page 137](#) .



- Attach special wrench -T40049- to rear of crankshaft: on vehicles with automatic gearbox secure wrench with two old drive plate bolts; on vehicles with manual gearbox use two bolts M10x19 to secure wrench.



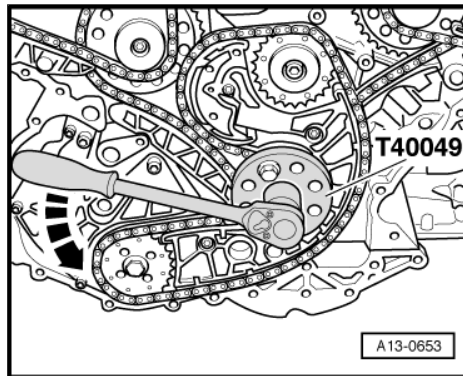
**Note**

Disregard -arrow-.

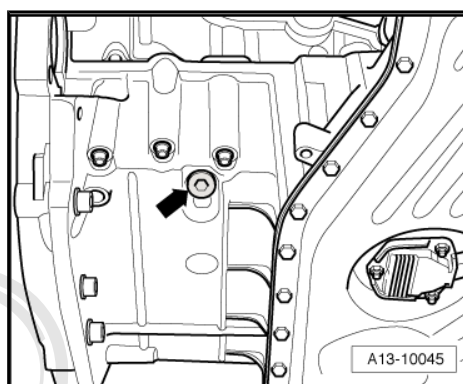


**Caution**

**Do not use bolts for dual-mass flywheel to secure wrench -T40049- ; these bolts are too long and can damage the camshaft timing chains when they are screwed in.**



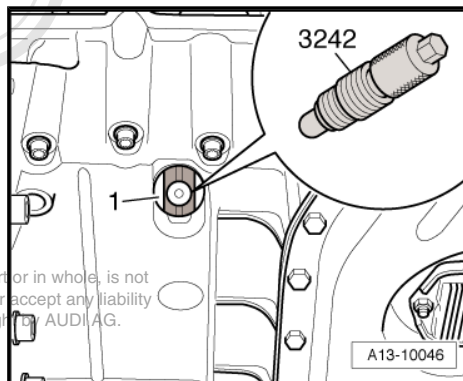
- Unscrew plug -arrow- from sump (top section).



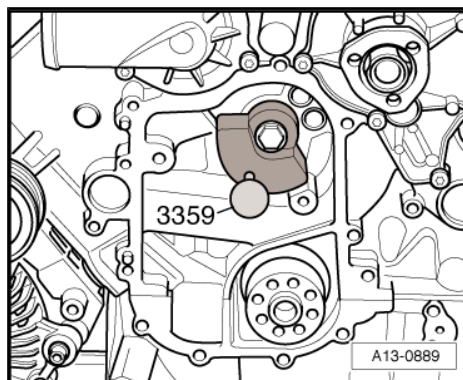
**WARNING**

**To avoid any risk of injury, do not rotate the crankshaft while feeling for the TDC hole with your finger.**

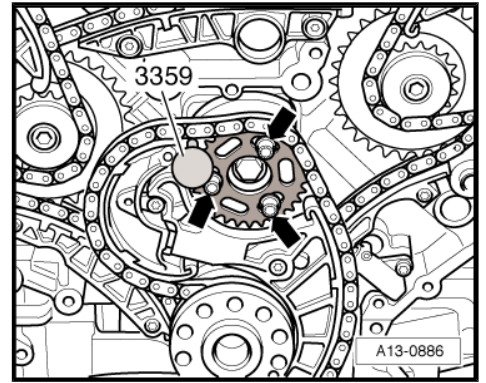
- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



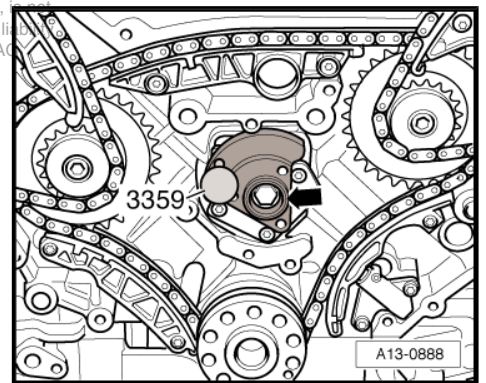
- Lock balance shaft at front of engine with diesel injection pump locking pin -3359-
- Unscrew bolt and detach balance weight from balance shaft.



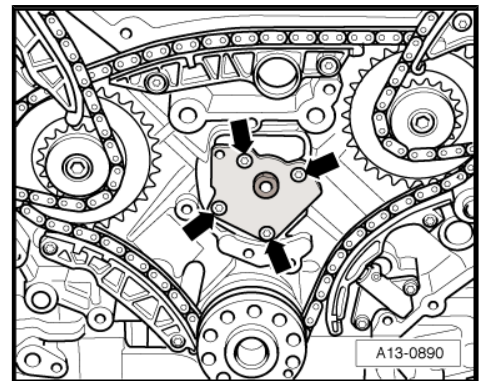
- Lock balance shaft at rear of engine with diesel injection pump locking pin -3359-
- Unscrew bolts -arrows- and detach chain sprocket from balance weight.



- Unscrew bolt -arrow- and detach balance weight from balance shaft.



- Unscrew bolts -arrows- and detach bearing plate for balance shaft.
- Pull balance shaft out of cylinder block.

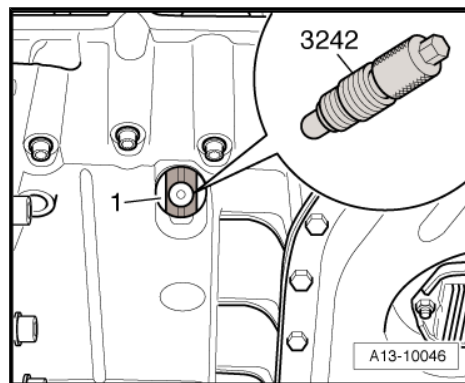




### Installing

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

- Crankshaft -1- locked in TDC position with locking pin -3242- .
- Install chain for oil pump and balance shaft ⇒ [page 166](#)
- Install timing chain covers ⇒ [page 138](#) .
- Install dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Install sealing flange (front) ⇒ [page 108](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .



### Tightening torques

Component	Nm
Bearing plate to cylinder block	9
Balance weight to balance shaft	60



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## 2 Cylinder head

### Note

*Audi A4 models with a 2.7 or 3.0 ltr. TDI engine are always equipped with steel glow plugs.*

### 2.1 Cylinder head - exploded view

#### Note

*The diagram shows the cylinder head on cylinder bank 2 (left-side).*

#### 1 - Cylinder head

- To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- Removing: vehicles up to 09.2005  
⇒ [page 186](#) ; vehicles from 09.2005 onwards  
⇒ [page 189](#)
- Checking for distortion  
⇒ [page 177](#)
- Cylinder heads must not be machined on diesel engines
- Installing ⇒ [page 193](#)
- If renewed, change coolant and engine oil

#### 2 - Toothed belt drive sprocket

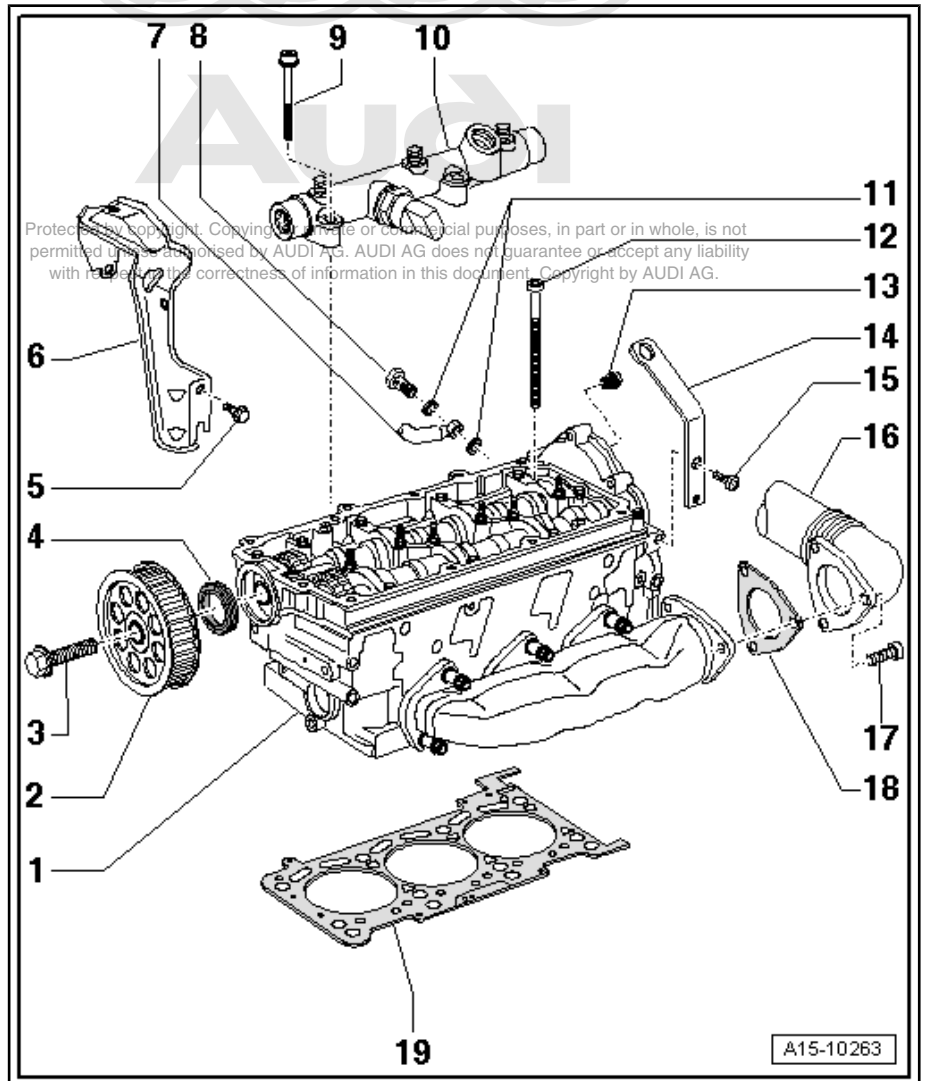
- Use counterhold tool -3036- when loosening and tightening central bolt ⇒ [page 176](#)
- Pulling off: vehicles up to 02.2006  
⇒ [page 177](#) ; vehicles from 02.2006 onwards  
⇒ [page 177](#)

#### 3 - 75 Nm

- Use counterhold tool -3036- when loosening and tightening  
⇒ [page 176](#)

#### 4 - Oil seal for toothed belt sprocket for high-pressure pump

- Renewing ⇒ [page 203](#)





5 - 9 Nm

6 - Bracket for intake connecting pipe

7 - Coolant pipe

8 - Banjo bolt, 15.5 Nm

9 - 23 Nm

10 - Fuel rail

- Observe rules for cleanliness ⇒ [page 5](#)
- Do not attempt to bend high-pressure pipes to a different shape
- Tightening high-pressure pipe connections at fuel rails: vehicles up to 09.2005 ⇒ [page 180](#) ; vehicles from 09.2005 onwards ⇒ [page 180](#)

11 - Seals

- Renew

12 - Cylinder head bolt

- Renew
- Observe correct sequence when loosening: vehicles up to 09.2005 ⇒ [page 189](#) , vehicles from 09.2005 onwards ⇒ [page 192](#)
- Note correct sequence when tightening ⇒ [page 197](#)

13 - Pressure limiting valve, 25 Nm

- Not applicable to more recent versions

14 - Lifting eye

15 - M6: 9 Nm; M8: 23 Nm

16 - Intermediate pipe (left-side)

- Removing and installing ⇒ [page 368](#)

17 - 30 Nm + 90°

- Type of connection differs depending on version ⇒ [page 178](#)

18 - Gasket

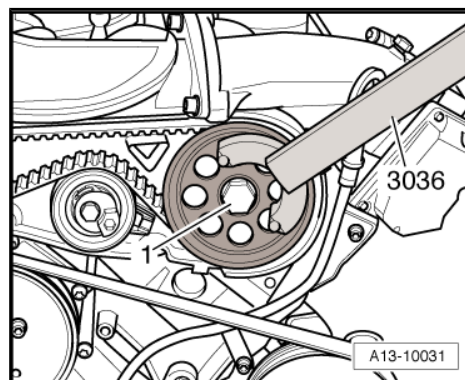
- Renew

19 - Cylinder head gasket

- Renewing: vehicles up to 09.2005 ⇒ [page 186](#) ; vehicles from 09.2005 onwards ⇒ [page 189](#)
- Identification ⇒ [page 177](#)
- Installation position: part number must face cylinder head
- If renewed, change coolant and engine oil

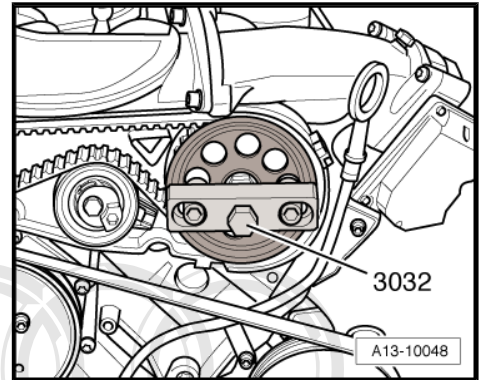
**Loosening and tightening central bolt for toothed belt drive sprocket**

- Use counterhold tool -3036- when loosening and tightening central bolt -1-



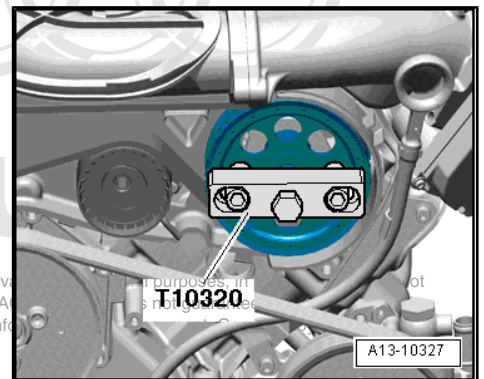
### Pulling off toothed belt drive sprocket (versions up to 02.2006)

- Use puller -3032- to pull off toothed belt drive sprocket.



### Pulling off toothed belt drive sprocket (versions from 02.2006 onwards)

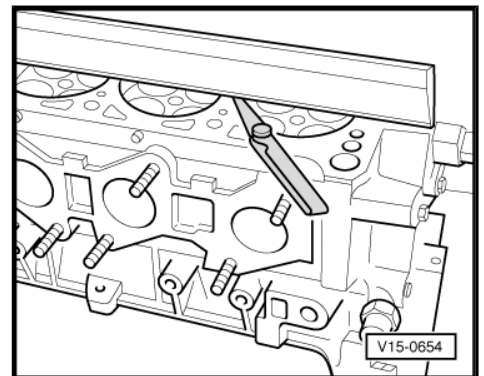
- Use puller -T10320- to pull off toothed belt drive sprocket.



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### Checking cylinder head for distortion

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



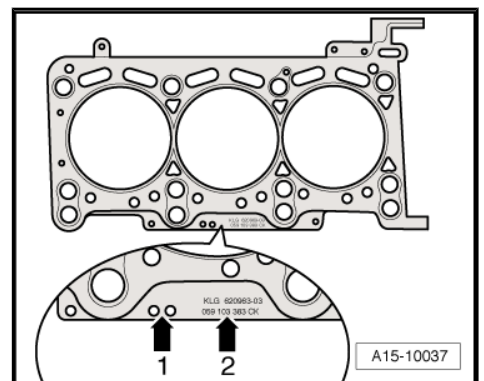
### Identification of cylinder head gasket

- 1 - Holes
- 2 - Part number



#### Note

*The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*





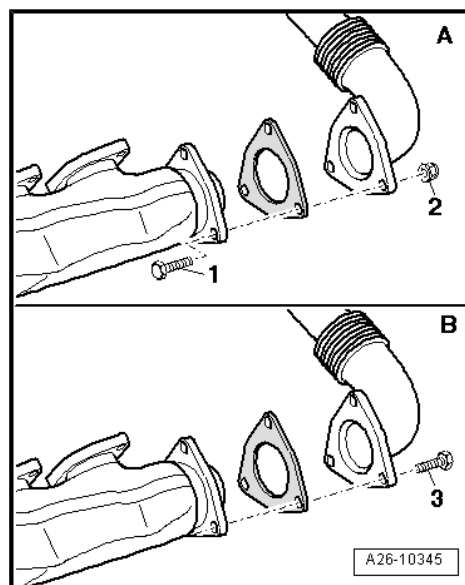
### Securing intermediate pipe to exhaust manifold

A - Exhaust manifold (sheet metal version)

- Fitted with bolts -1- and nuts -2-.
- Renew bolts and nuts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

B - Exhaust manifold (cast version)

- Fitted with bolts -3-.
- Renew bolts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .



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## 2.2 Cylinder head cover - exploded view



Note

Diagram shows cylinder head cover on cylinder bank 2 (left-side).

1 - 9 Nm

2 - Bracket for intake connecting pipe

3 - 9 Nm

4 - O-ring

- Renew

5 - Oil filler neck

- To remove: Lift tab, turn oil filler neck anti-clockwise and take out

6 - Seal

7 - Seal

- Renew if damaged or leaking

8 - Filler cap

9 - 5 Nm

10 - Fuel return line

- Observe rules for cleanliness ⇒ [page 5](#)

11 - Fuel rail

- With high-pressure pipes
- Observe rules for cleanliness ⇒ [page 5](#)
- Do not attempt to bend high-pressure pipes to a different shape
- Tightening high-pressure pipe connections at fuel rails ⇒ [page 180](#)
- Tightening high-pressure pipe connections at injectors ⇒ [page 180](#)

12 - 23 Nm

13 - O-ring

- Renew

14 - 9 Nm

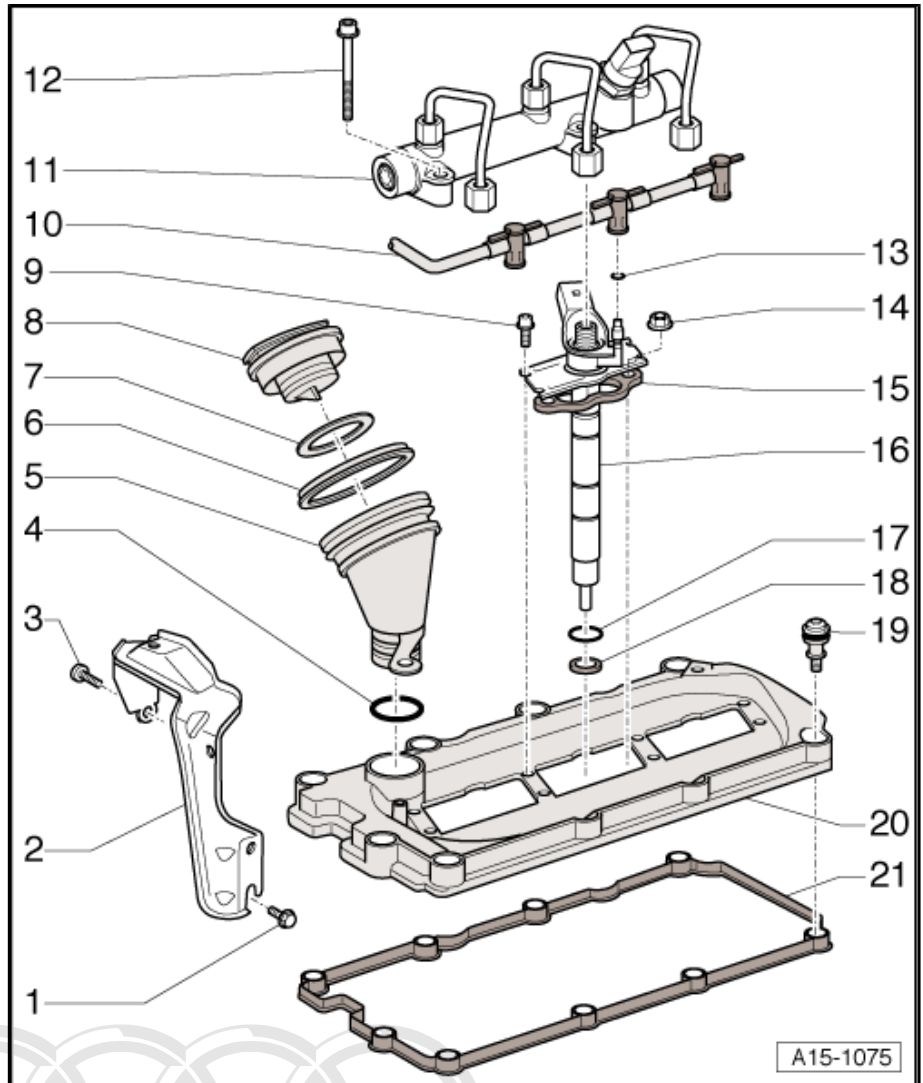
- Tighten alternately in stages

15 - Clamping piece

- Must be renewed if injector is renewed

16 - Injector

- Observe rules for cleanliness ⇒ [page 5](#)
- Removing and installing ⇒ „2.3 Removing and installing cylinder head cover“, [page 181](#)
- When an injector is renewed, also renew the high-pressure pipe and clamping piece at the same time



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**17 - O-ring**

- Renew

**18 - Copper seal**

- Renew

**19 - Special bolt, 9 Nm**

- Renew if damaged or leaking
- Tighten in stages and in diagonal sequence

**20 - Cylinder head cover**

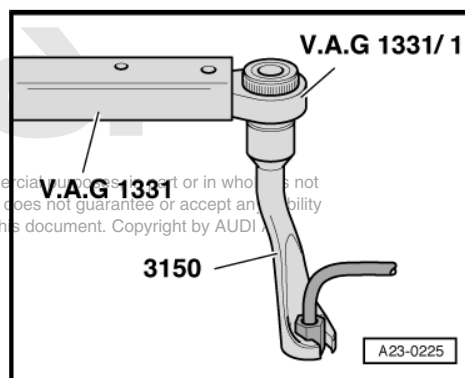
- Removing and installing ⇒ [page 181](#)

**21 - Gasket for cylinder head cover**

- Renew if damaged or leaking

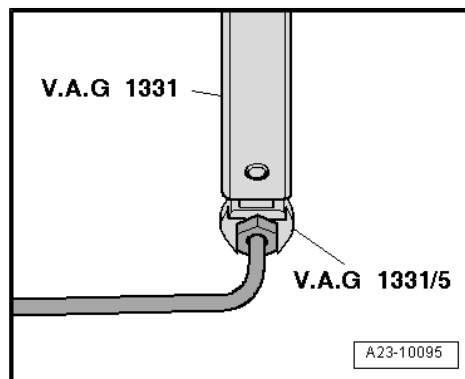
**Tightening high-pressure pipe connections at fuel rails - vehicles up to 09.2005**

- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 14 mm -3150- .
- Tightening torque: 25 Nm.



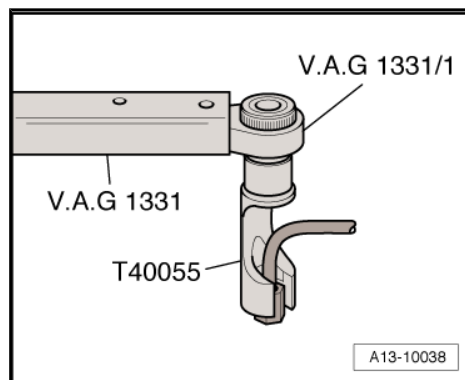
**Tightening high-pressure pipe connections at fuel rails - vehicles from 09.2005 onwards**

- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes, use torque wrench -V.A.G 1331- and tool insert, AF 19 -V.A.G 1331/5- .
- Tightening torque: 25 Nm.



**Tightening high-pressure pipes at injectors**

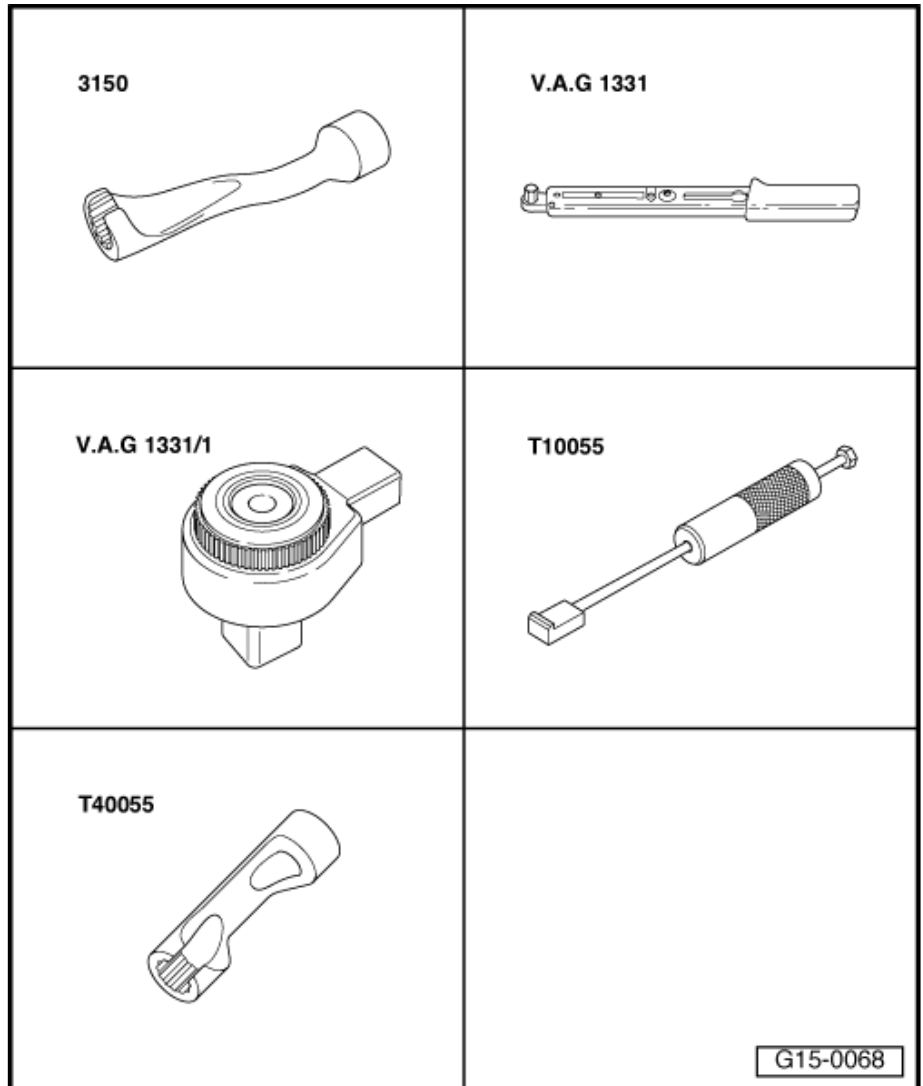
- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket -T40055- .
- Tightening torque: 25 Nm.



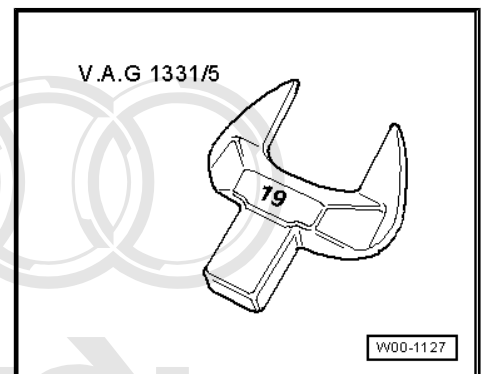
## 2.3 Removing and installing cylinder head cover

### Special tools and workshop equipment required

- ◆ Socket, 14 mm -3150- for vehicles up to 09.2005
- ◆ Torque wrench - V.A.G 1331-
- ◆ Ratchet -V.A.G 1331/1-
- ◆ Puller -T10055- with - T10055/1-
- ◆ Socket -T40055-



- ◆ Tool insert, AF 19 -V.A.G 1331/5- for vehicles from 09.2005 onwards





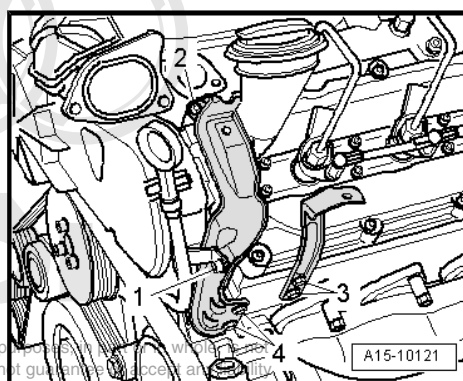
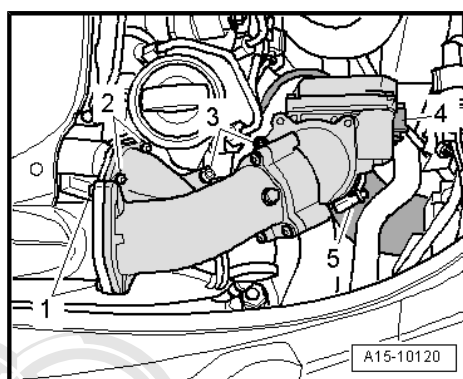
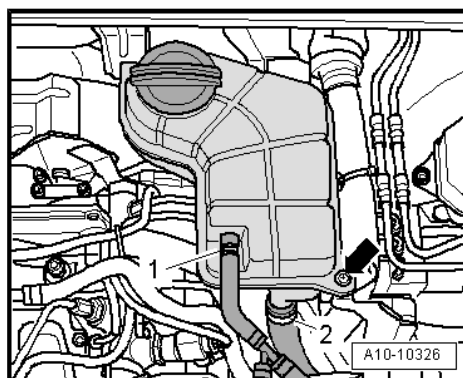
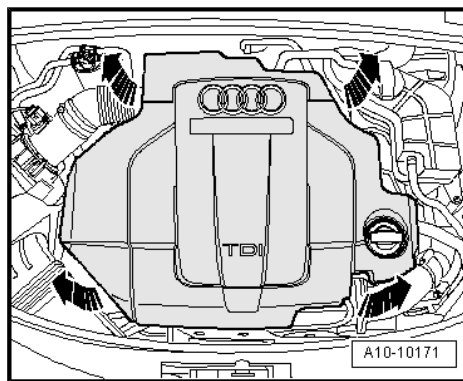
### Removing



#### Note

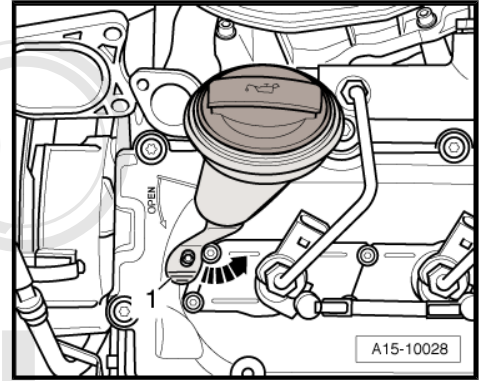
*The following description shows the removal and installation of the left cylinder head cover. The procedure for the other side is the same, except that some steps are not required.*

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.
- Unplug electrical connector -4-.
- Disconnect air intake hose -5-.
- Remove bolts -1 ... 3- and detach throttle valve module -J338- together with intake connecting pipe.
- Remove bolts -1 ... 4- and detach bracket for intake connecting pipe from cylinder head.



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- Remove oil filler neck. To do so, lift tab -1- and turn oil filler neck anti-clockwise -arrow-.

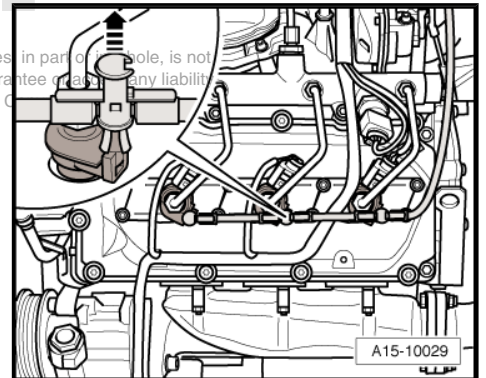


**Caution**

*Observe rules for cleanliness when working on the injection system ⇒ page 5.*

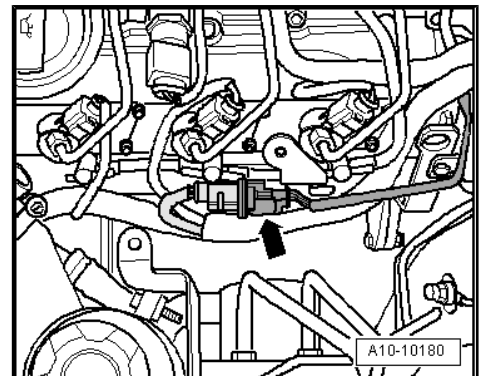
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- Pull release pins upwards -arrow- and pull return line connections off injectors.
- Mark high-pressure pipes to ensure they are re-connected to the same injectors.

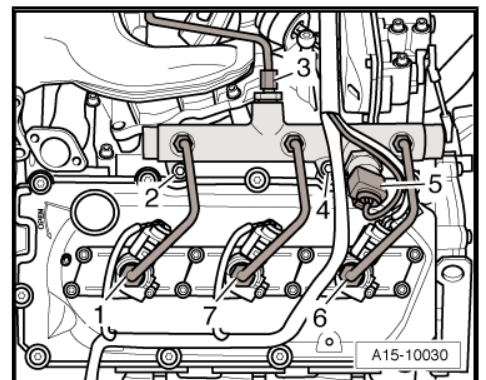


**Vehicles up to 09.2005:**

- Remove electrical connector -arrow- for Lambda probe -G39- from retainer.
- Unplug electrical connector and move wiring clear.
- Detach bracket for electrical connector for Lambda probe -G39- from cylinder head cover.



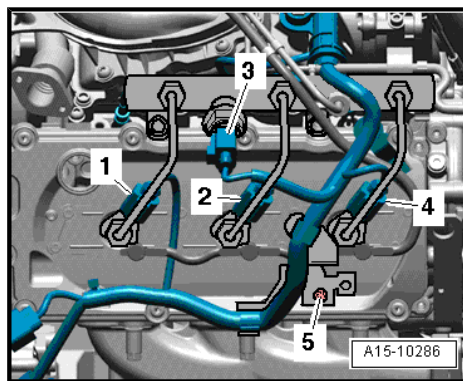
- Unplug electrical connectors -5- at fuel rail and injectors.
- Move clear electrical wiring harness at fuel rail.
- Loosen union nuts for injector pipes -1, 6, 7- using socket -T40055- .
- Loosen union nut for high-pressure pipe -3- at fuel rail.
- Remove bolts -2- and -4- and detach fuel rail.



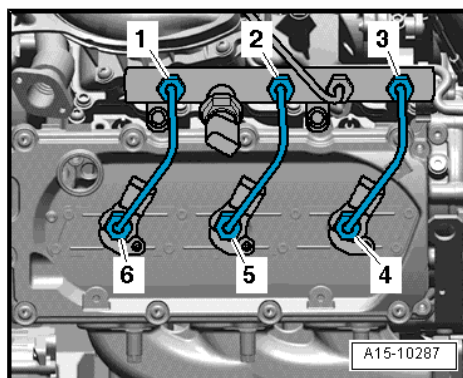


**Vehicles from 09.2005 onwards:**

- Unbolt bracket -5- for wiring harness at cylinder head cover.
- Unplug electrical connectors -1 ... 4- at fuel rail and injectors.
- Move electrical wiring harness clear.

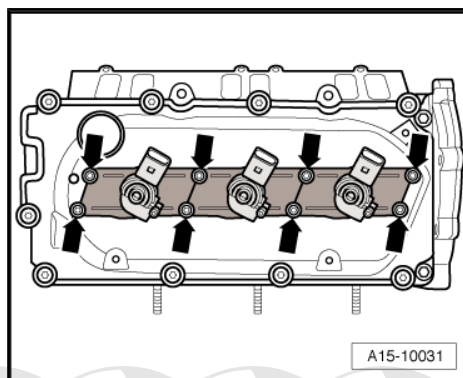


- Loosen union nuts for high-pressure pipes -1 ... 6- using tool insert, AF 19 -V.A.G 1331/5- and socket -T40055- .
- Detach high-pressure pipes.

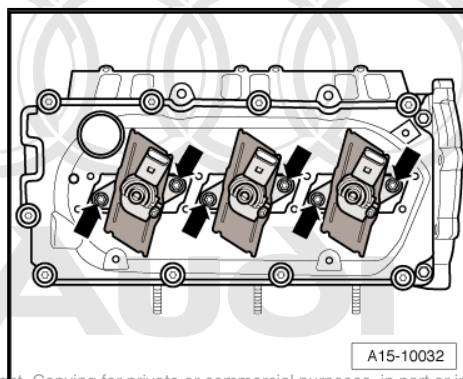


**All vehicles (continued):**

- Unbolt covers for injectors -arrows-.
- Pull covers upwards and turn them 1/4 turn (90°).



- Unbolt injectors -arrows-.



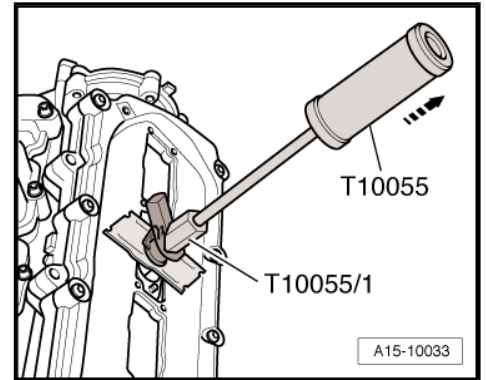
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- Pull out injectors using puller -T10055- with adapter -T10055/1- .



#### Caution

- ◆ *Mark cylinder numbers on injector units.*
- ◆ *Used injectors must always be re-installed on the same cylinder.*



- Loosen cylinder head cover bolts -arrows- in diagonal sequence.
- Remove bolts and take off cylinder head cover.

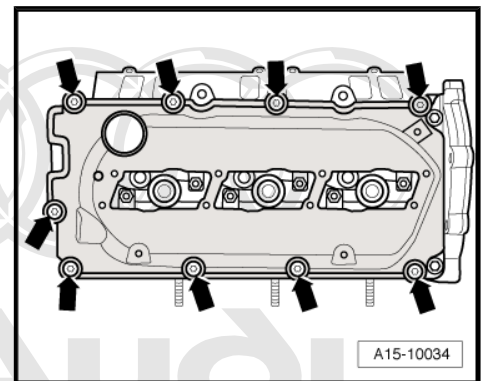
#### Installing

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



#### Note

- ◆ *Renew gaskets and bolts for cylinder head cover if damaged.*
- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*



- Tighten cylinder head cover bolts diagonally and in stages.

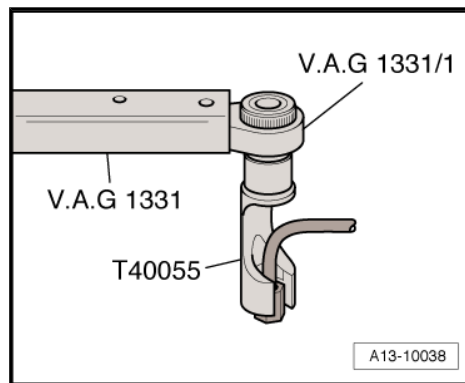
#### Instructions for installing injectors:

- Before installation, make sure the injectors and their surroundings are clean. If necessary use a clean cloth to wipe out the injector slot, taking care not to cause damage (do not use sharp-edged tools).
- Always install new seals and gaskets. Lubricate all seals and gaskets lightly with engine oil or assembly oil before installing.
- The injectors must be completely undamaged. To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.
- When an injector is renewed, also renew the injector pipe and clamping piece at the same time.
- Used injectors and injector pipes may only be re-installed on the same cylinder.

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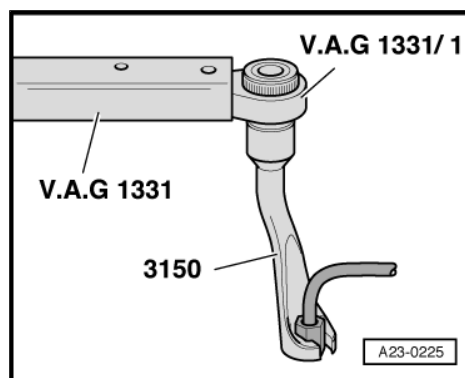


- Install injectors.
- Tighten union nuts on high-pressure pipes hand-tight to start with.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket -T40055- .



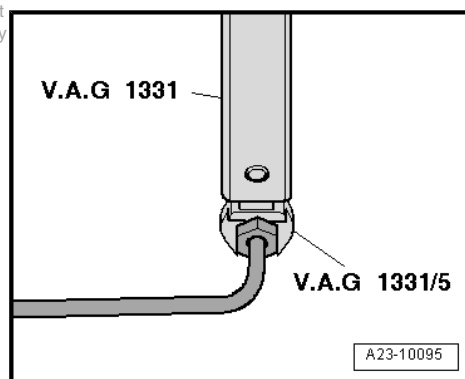
**Vehicles up to 09.2005:**

- To tighten unions of high-pressure pipes at fuel rails, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket (14 mm) -3150- .



**Vehicles from 09.2005 onwards:**

- To tighten unions of high-pressure pipes at fuel rails, use torque wrench -V.A.G 1331- and tool insert (AF 19) -V.A.G 1331/5- .



**All vehicles (continued):**

- Check fuel system for leaks ⇒ [page 5](#) .

**Tightening torques**

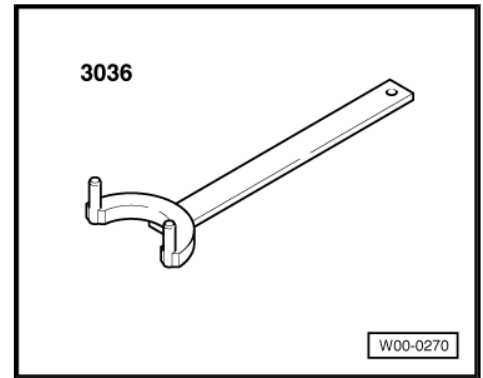
Component	Nm
Cylinder head cover to cylinder head	9
Injector in cylinder head	9
Cover for injector to cylinder head	5
Fuel rail to cylinder head	23
High-pressure pipes and injector pipes	25
Bracket for intake connecting pipe to cylinder head	9
Throttle valve module -J338- with intake connecting pipe to:	
Intake manifold	9
Bracket	9
Hose clips (13 mm wide)	5.5

**2.4 Removing cylinder head - vehicles up to 09.2005**

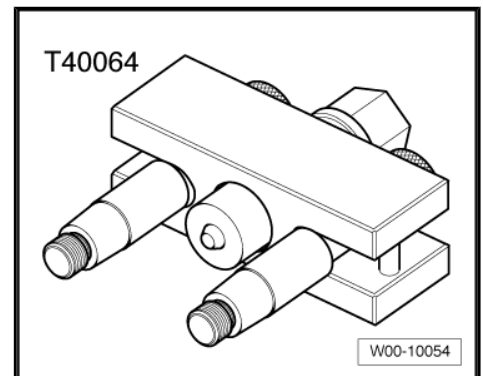
**Special tools and workshop equipment required**



◆ Counterhold tool -3036-

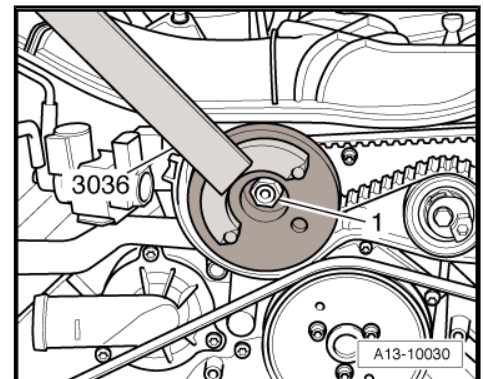


◆ Puller -T40064-

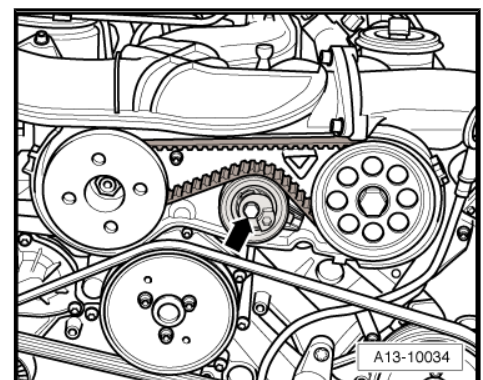


**Removing**

- Drain off coolant ⇒ [page 253](#) .
- Move lock carrier to service position ⇒ [page 95](#) .
- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Loosen central nut -1- for high-pressure pump shaft using counterhold tool -3036- .
- Remove damper weight.



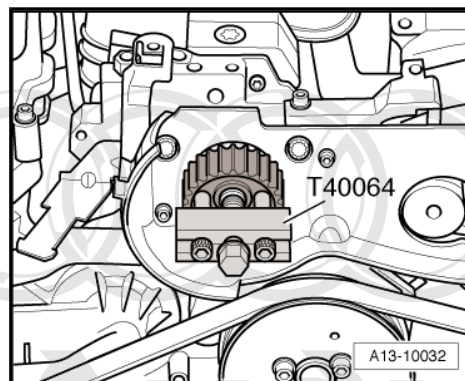
- Remove tensioning roller for toothed belt for high-pressure pump -arrow-.



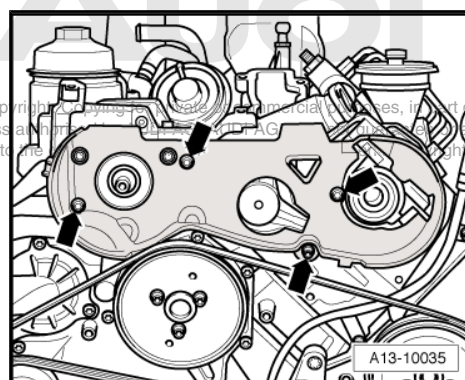
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- Use puller -T40064- to pull off belt sprocket for high-pressure pump.



- Remove bolts -arrows- and detach toothed belt cover (rear).



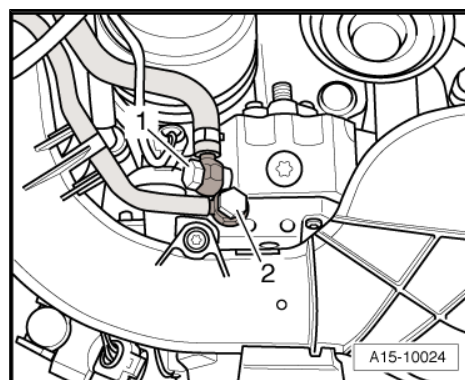
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#### Cylinder head (right-side):

- Disconnect fuel supply line -2- and fuel return line -1- from high-pressure pump and move lines clear to the side.

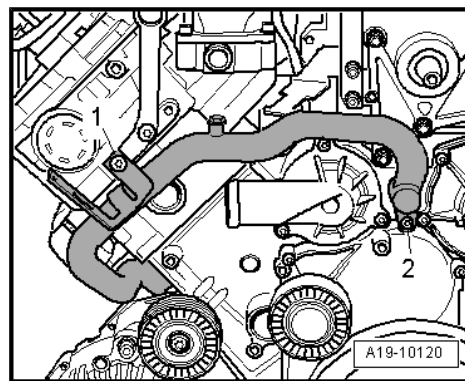
#### Continuation for both sides:

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left or right) ⇒ Rep. gr. 23 .
- Remove timing chain from camshaft ⇒ [page 153](#) on relevant cylinder bank.
- Remove intermediate pipe: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#) .
- Remove cylinder head cover (left or right) ⇒ [page 181](#) .




#### Cylinder head (right-side):

- Remove bolts -1- and -2-.
- Pull coolant pipe (right-side) forwards out of cylinder block and detach coolant pipe.



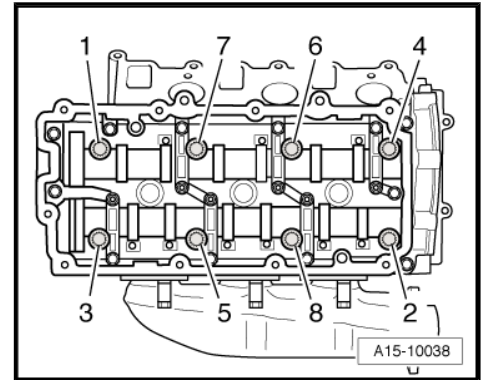
**Continuation for both sides:**

- Loosen cylinder head bolts in the sequence shown.
- Remove bolts and carefully detach cylinder head.



**Caution**

*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 beyond the gasket surface.*



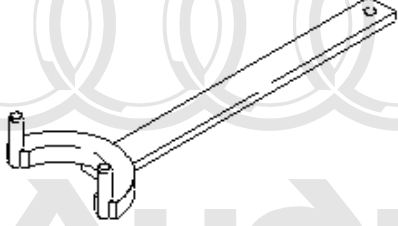
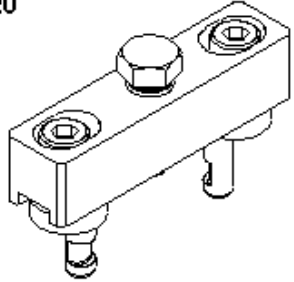
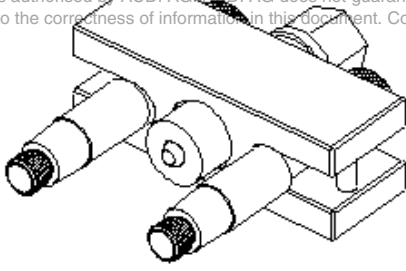
 **Note**

*Audi A4 models with a 2.7 or 3.0 ltr. TDI engine are always equipped with steel glow plugs.*

## 2.5 Removing cylinder head - vehicles from 09.2005 onwards

**Special tools and workshop equipment required**

- ◆ Counterhold tool -3036-
- ◆ Puller -T10320-
- ◆ Puller -T40064-

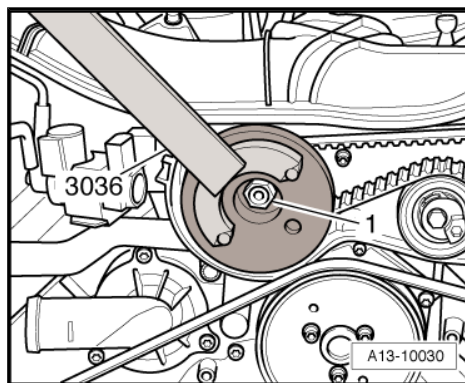
<p><b>3036</b></p> 	<p><b>T10320</b></p> 
<p><b>T40064</b></p> 	
<div style="border: 1px solid black; display: inline-block; padding: 2px 5px;">G15-10038</div>	

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### Removing

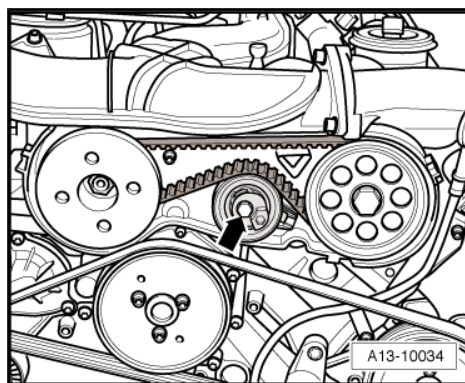
- Drain off coolant ⇒ [page 253](#) .
- Move lock carrier to service position ⇒ [page 95](#) .
- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Loosen central nut -1- for high-pressure pump shaft using counterhold tool -3036- .
- Remove damper weight.



### Vehicles up to 02.2006:

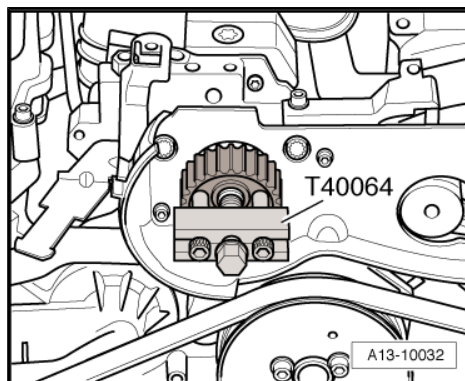
- Remove tensioning roller for toothed belt for high-pressure pump -arrow-.

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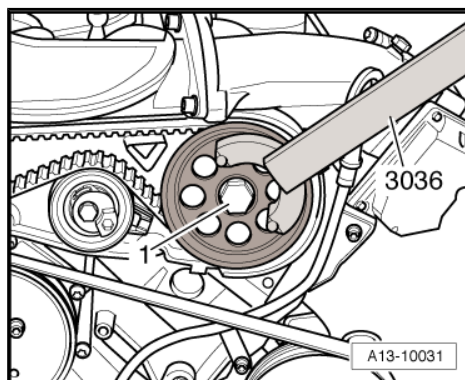
### All vehicles (continued):

- Use puller -T40064- to pull off belt sprocket for high-pressure pump.

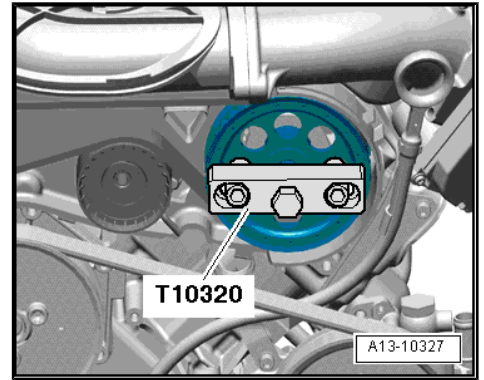


### Vehicles from 02.2006 onwards:

- Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool -3036- .

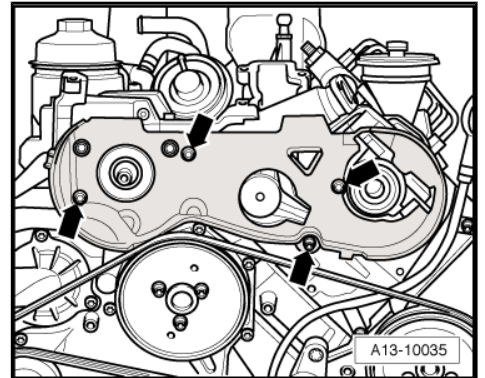


- Use puller -T10320- to pull off toothed belt drive sprocket.



#### All vehicles (continued):

- Remove bolts -arrows- and detach toothed belt cover (rear).

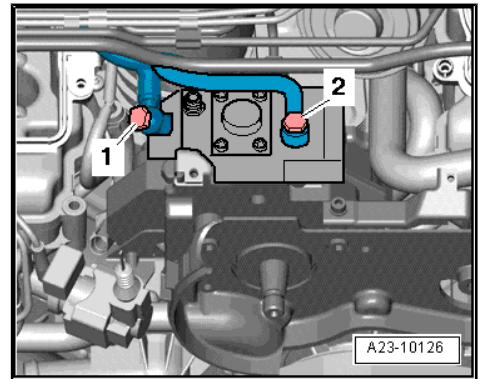


#### Cylinder head (right-side):

- Disconnect fuel supply line -2- and fuel return line -1- from high-pressure pump and move lines clear to the side.

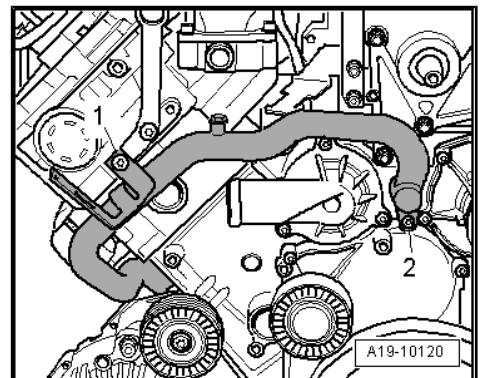
#### Continuation for both sides:

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left or right) ⇒ Rep. gr. 23 .
- Remove timing chain from camshaft ⇒ [page 153](#) on relevant cylinder bank.
- Remove intermediate pipe: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#) .
- Remove cylinder head cover (left or right) ⇒ [page 181](#) .



#### Cylinder head (right-side):

- Remove bolts -1- and -2-.
- Pull coolant pipe (right-side) forwards out of cylinder block and detach coolant pipe.





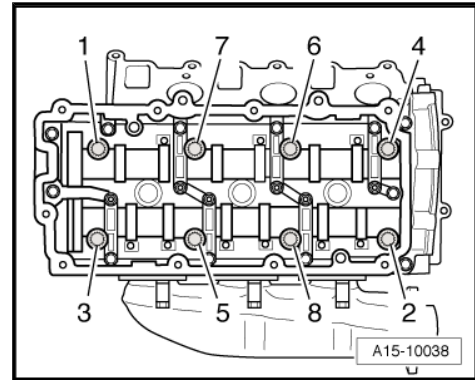
**Continuation for both sides:**

- Loosen cylinder head bolts in the sequence shown.
- Remove bolts and carefully detach cylinder head.



**Caution**

*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 beyond the gasket surface.*



**Note**

*Audi A4 models with a 2.7 or 3.0 ltr. TDI engine are always equipped with steel glow plugs.*



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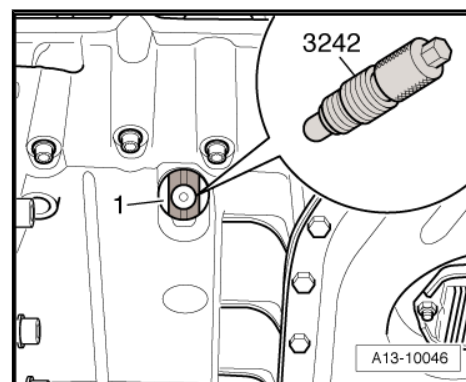
## 2.6 Installing cylinder head

### Note

- ◆ *The cylinder heads of diesel engines must not be machined.*
- ◆ *Renew the cylinder head bolts.*
- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Renew bolts which are tightened to a specified angle as well as seals and gaskets.*
- ◆ *If repairing, carefully remove any remaining gasket material from the cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces.*
- ◆ *Carefully remove any remaining emery and abrasive material.*
- ◆ *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.*
- ◆ *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- ◆ *Handle gasket very carefully. Damage to the silicone coating or the indented area will lead to leaks.*
- ◆ *The plastic protectors fitted to protect the open valves should not be removed until the cylinder head is ready to be fitted.*
- ◆ *When installing an exchange cylinder head with fitted camshafts, oil the contact surfaces between the roller rocker fingers and cams.*
- ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge 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.*

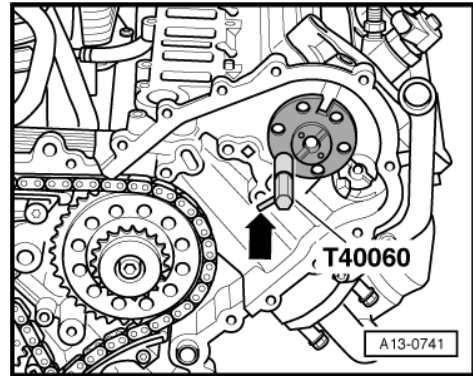
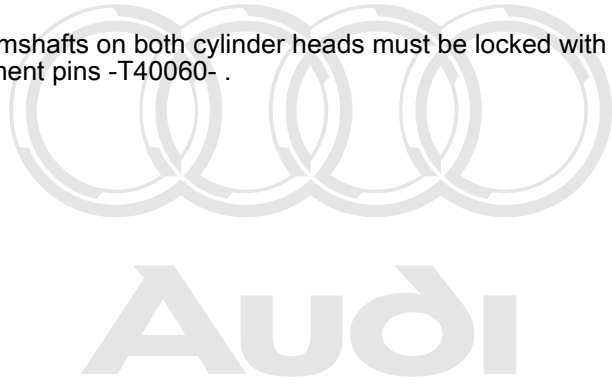
Installation is carried out in the reverse order; note the following:

- Set crankshaft and camshafts to TDC before fitting cylinder head:
- Locking pin -3242- must be screwed in with crankshaft at TDC position -1-.





- The camshafts on both cylinder heads must be locked with adjustment pins -T40060- .



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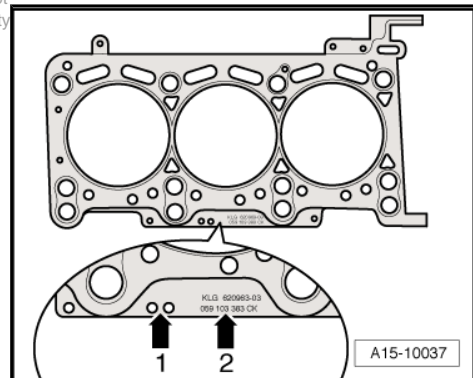
– **Note identification markings on cylinder head gasket:**

- 1 - Holes
- 2 - Part number



**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 133](#) .
- ◆ The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.

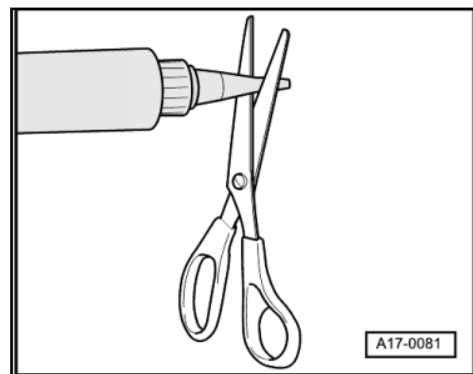


- Clean surfaces; they must be free of oil and grease.



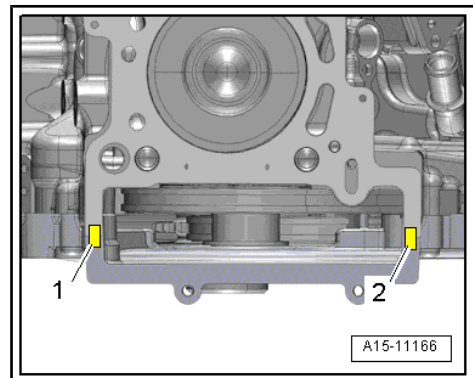
**Note**

- ◆ Note the use-by date of the sealant.
- ◆ Cut off nozzle of tube at front marking (nozzle Ø approx. 5 mm).
- ◆ After applying sealant, components must be installed and secured within 15 minutes.



**Cylinder head (left-side):**

- Apply sealant beads -1- and -2- onto clean sealing surface of cylinder block and timing chain cover (bottom) as illustrated.





- Apply sealant according to dimensions given.
- a = 7 mm
- b = 7 mm
- c = 7 mm
- Place cylinder head gasket in position.

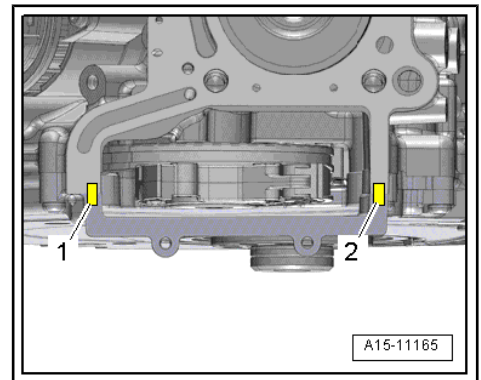
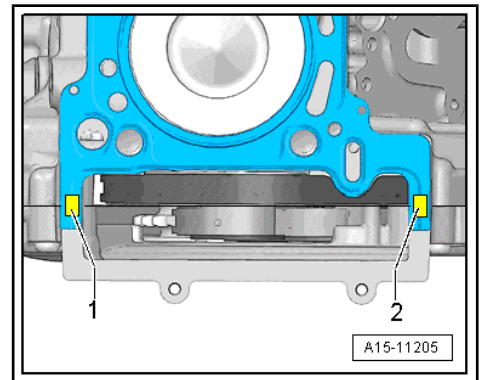
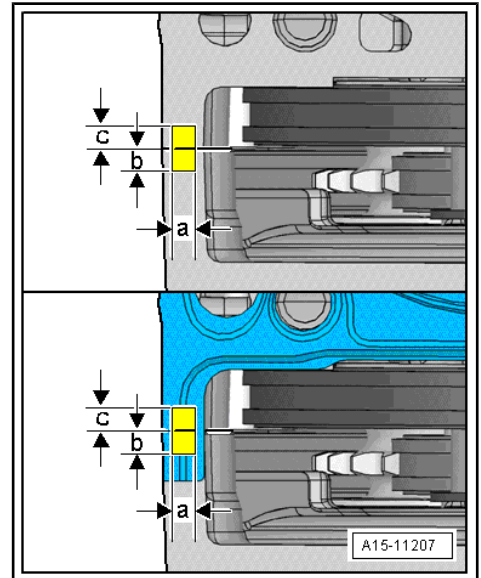
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- Apply sealant beads -1- and -2- onto cylinder head gasket as shown in illustration.

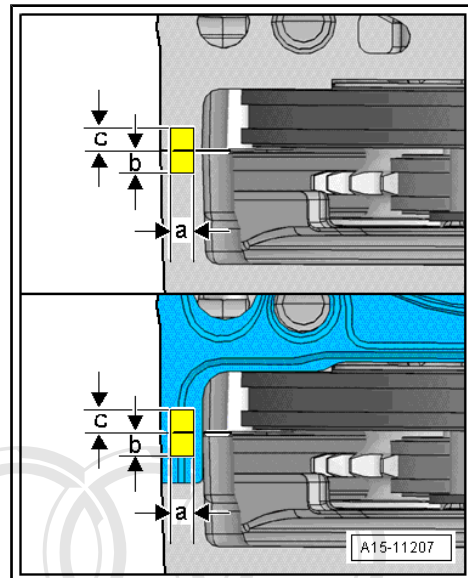
**Cylinder head (right-side):**

- Apply sealant beads -1- and -2- onto clean sealing surface of cylinder block and timing chain cover (bottom) as illustrated.

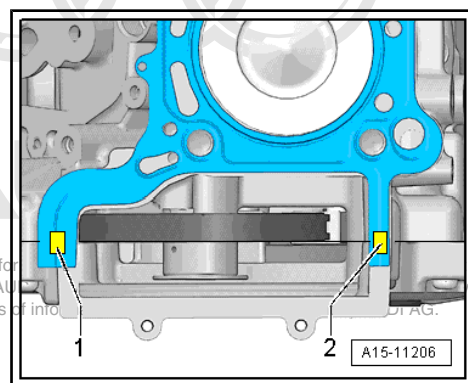




- Apply sealant according to dimensions given.
- a = 7 mm
- b = 7 mm
- c = 7 mm
- Place cylinder head gasket in position.



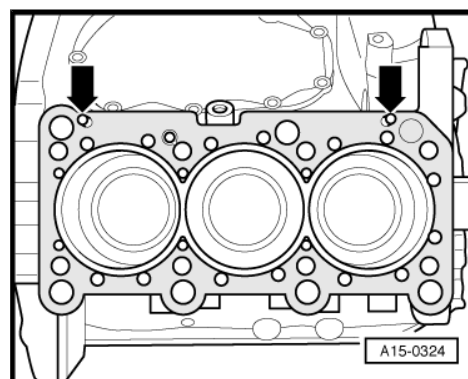
- Apply sealant beads -1- and -2- onto cylinder head gasket as shown in illustration.



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**Continuation for both sides:**

- Pay attention to dowel sleeves -arrows- in cylinder block.
- Note installation position of cylinder head gasket: the word „oben“ (top) or the part number should face towards the cylinder head.
- Fit cylinder head.
- Insert new cylinder head bolts and tighten hand-tight.

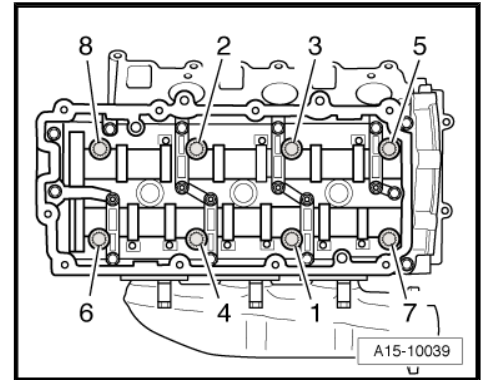


– Tighten cylinder head bolts as follows in the sequence shown:

1. Tighten with torque wrench to 35 Nm.
2. Tighten with torque wrench to 60 Nm.
3. Use rigid wrench to turn 90° further.
4. Use rigid wrench to turn 90° further.

 **Note**

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



- Install cylinder head cover (left or right) ⇒ [page 181](#) .
- Install camshaft timing chains ⇒ [page 148](#) .
- Install intermediate pipe: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#) .
- Install bottom section of intake manifold (left or right) ⇒ Rep. gr. 23 .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .

**Cylinder head (left-side):**

- Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .

**Continuation for both sides:**

- Change engine oil ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .
- Fill cooling system with fresh coolant ⇒ [page 255](#) .
- Check fuel system for leaks ⇒ [page 5](#) .

**Tightening torques**

Component	Nm
Coolant line to cylinder head	15.5
Coolant pipe (right-side) to cylinder head	9
Toothed belt cover (rear) to engine	9
Fuel supply and return lines to high-pressure pump	25
Hose clips	3
	5

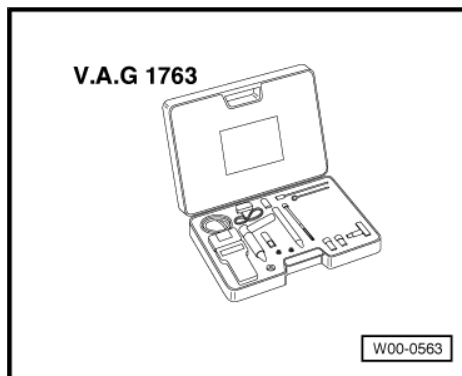
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## 2.7 Checking compression

### Special tools and workshop equipment required

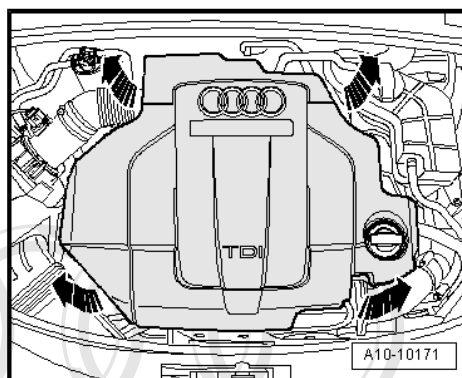


- ◆ Compression tester -V.A.G 1763- with adapter -V.A.G 1763/8-

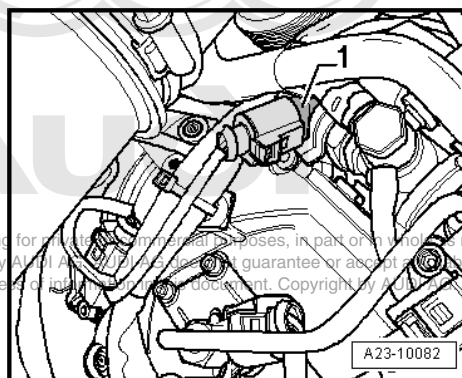


### Procedure


- Engine oil temperature approx. 80 °C
- Battery voltage at least 12.5 V.
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
- Unplug electrical connectors on glow plugs.



- Unplug electrical connector at fuel pressure regulating valve - N276- -item 1- at fuel rail (cylinder bank 1, right-side).
- Briefly start engine to relieve fuel pressure in fuel rail.



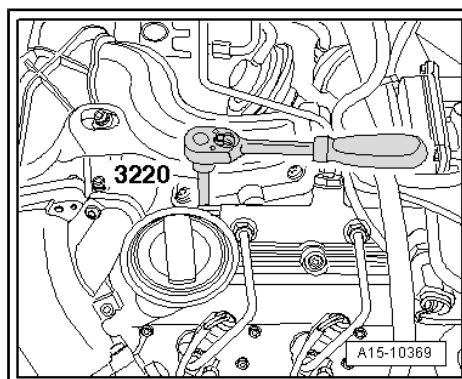
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**Caution**

*It is very important to observe all notes on removing the glow plugs ⇒ Rep. gr. 28 .*

- Remove all glow plugs ⇒ Rep. gr. 28 .



- Screw in adapter -V.A.G 1763/8- in place of the glow plugs and connect compression tester -V.A.G 1763- .

 **Note**

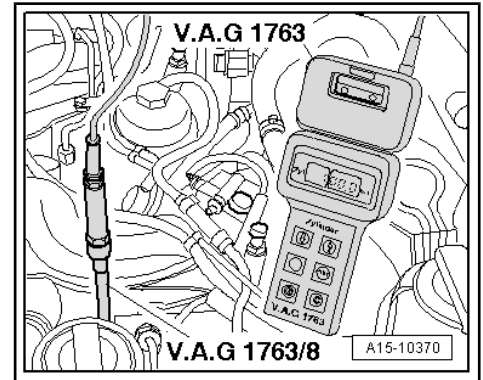
*Using the compression tester ⇒ Operating instructions .*

- Have a 2nd mechanic operate starter until tester shows no further pressure increase.

Compression pressure	bar
When new	28 ... 33
Wear limit	21
Difference between cylinders	5 (maximum)

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

- Install glow plugs ⇒ Rep. gr. 28 .
- Finally, interrogate and erase fault memory for engine control unit, as faults are stored when electrical connectors are unplugged ⇒ Vehicle diagnostic tester.



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### 3 Valve gear



**Note**

- ◆ After installing camshafts, wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ◆ After working on the valve gear, turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.

#### 3.1 Valve gear - exploded view



**Note**

The following diagrams show the cylinder head on cylinder bank 2 (left-side).

**1 - Valve**

- Do not machine, only grinding-in is permitted
- Mark installation position for re-installation
- Checking ⇒ [page 228](#)
- Valve dimensions ⇒ [page 227](#)
- Checking valve guides ⇒ [page 227](#)

**2 - Cylinder head**

- See note ⇒ [page 200](#)
- Checking valve guides ⇒ [page 227](#)
- Machining valve seats ⇒ [page 227](#)

**3 - Valve stem oil seal**

- Renewing: with cylinder head installed ⇒ [page 220](#), with cylinder head removed ⇒ [page 223](#)

**4 - Valve spring**

**5 - Valve spring plate**

**6 - Valve cotters**

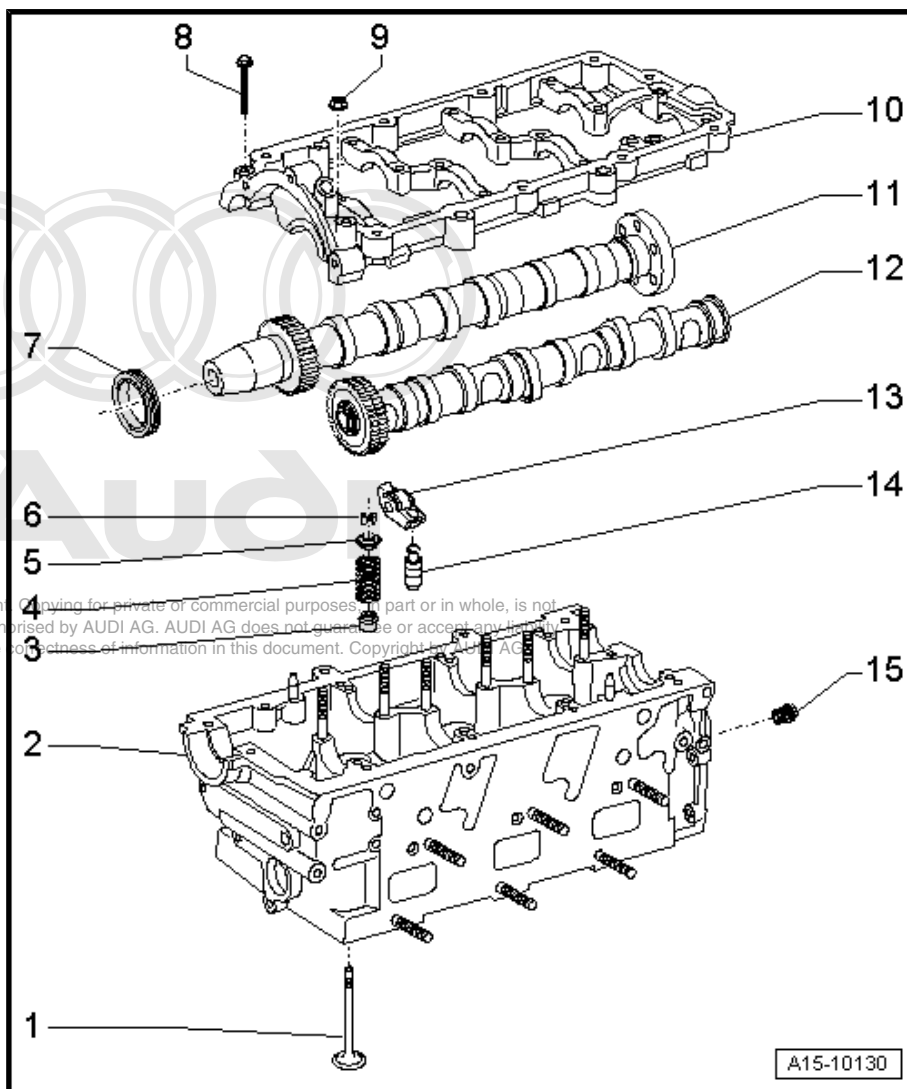
**7 - Camshaft oil seal**

- Renewing ⇒ [page 203](#)

**8 - Bolt**

- Retaining frame on cylinder head (left-side) - tightening torque and sequence ⇒ [page 201](#)

- Retaining frame on cylinder head (right-side) - tightening torque and sequence ⇒ [page 202](#)



**9 - Nut**

- Retaining frame on cylinder head (left-side) - tightening torque and sequence ⇒ [page 201](#)
- Retaining frame on cylinder head (right-side) - tightening torque and sequence ⇒ [page 202](#)

**10 - Retaining frame**

- With integrated camshaft bearings
- Removing and installing: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#)

**11 - Inlet camshaft**

- Removing and installing: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#)
- Checking axial clearance ⇒ [page 202](#)
- Check radial clearance with Plastigage (roller rocker fingers removed)
- Radial clearance (new): 0.035 ... 0.085 mm
- Radial clearance: wear limit: 0.1 mm
- Runout: max. 0.01 mm

**12 - Exhaust camshaft**

- Removing and installing: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#)
- Checking axial clearance ⇒ [page 202](#)
- Check radial clearance with Plastigage (roller rocker fingers removed)
- Radial clearance (new): 0.035 ... 0.085 mm
- Radial clearance: wear limit: 0.1 mm
- Runout: max. 0.01 mm

**13 - Roller rocker finger**

- Mark installation position with a coloured pen
- Do not interchange
- Check roller bearings for ease of movement
- Lubricate contact surfaces before installing

**14 - Hydraulic valve compensation element**

- Mark installation position with a coloured pen
- Checking ⇒ [page 226](#)
- Lubricate contact surfaces before installing

**15 - Pressure limiting valve, 25 Nm**

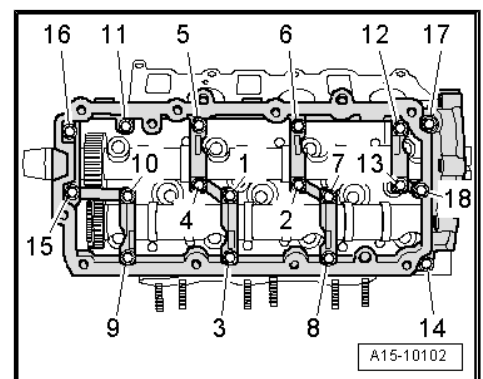
- Not applicable to more recent versions

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**Retaining frame on cylinder head (left-side) - tightening torque and sequence**

– Tighten bolts and nuts in 2 stages in the sequence shown:

Stage	Bolts/nuts	Tightening torque
1.	-1 ... 18-	Screw in by hand until they make contact • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 ... 18-	9 Nm

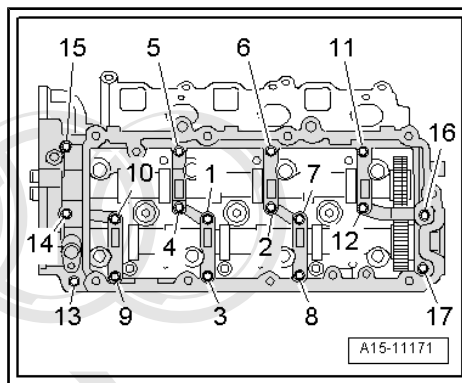




### Retaining frame on cylinder head (right-side) - tightening torque and sequence

– Tighten bolts and nuts in 2 stages in the sequence shown:

Stage	Bolts/nuts	Tightening torque
1.	-1 ... 17-	Screw in by hand until they make contact <ul style="list-style-type: none"> <li>The retaining frame should make contact with the cylinder head over the full surface</li> </ul>
2.	-1 ... 17-	9 Nm

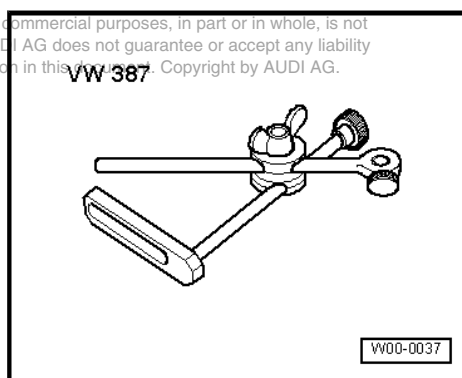


## 3.2 Checking axial clearance of camshafts

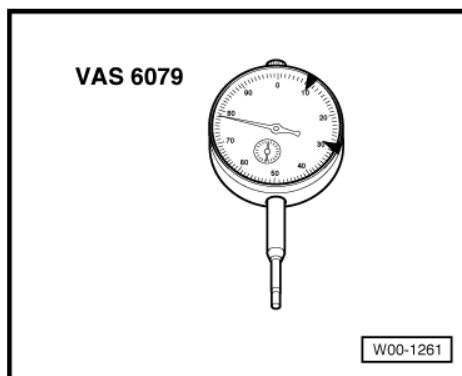
### Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387

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- ◆ Dial gauge -VAS 6079-

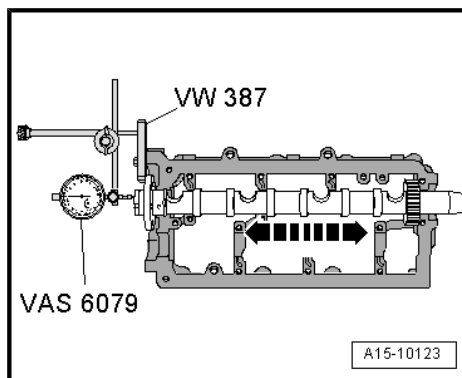


### Procedure

– Perform measurement with retaining frame removed.

Axial clearance (inlet camshaft)

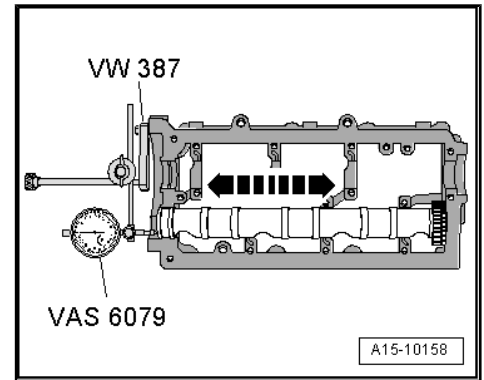
- Specification: 0.03 ... 0.08 mm.
- Wear limit: 0.12 mm.





Axial clearance (exhaust camshaft)

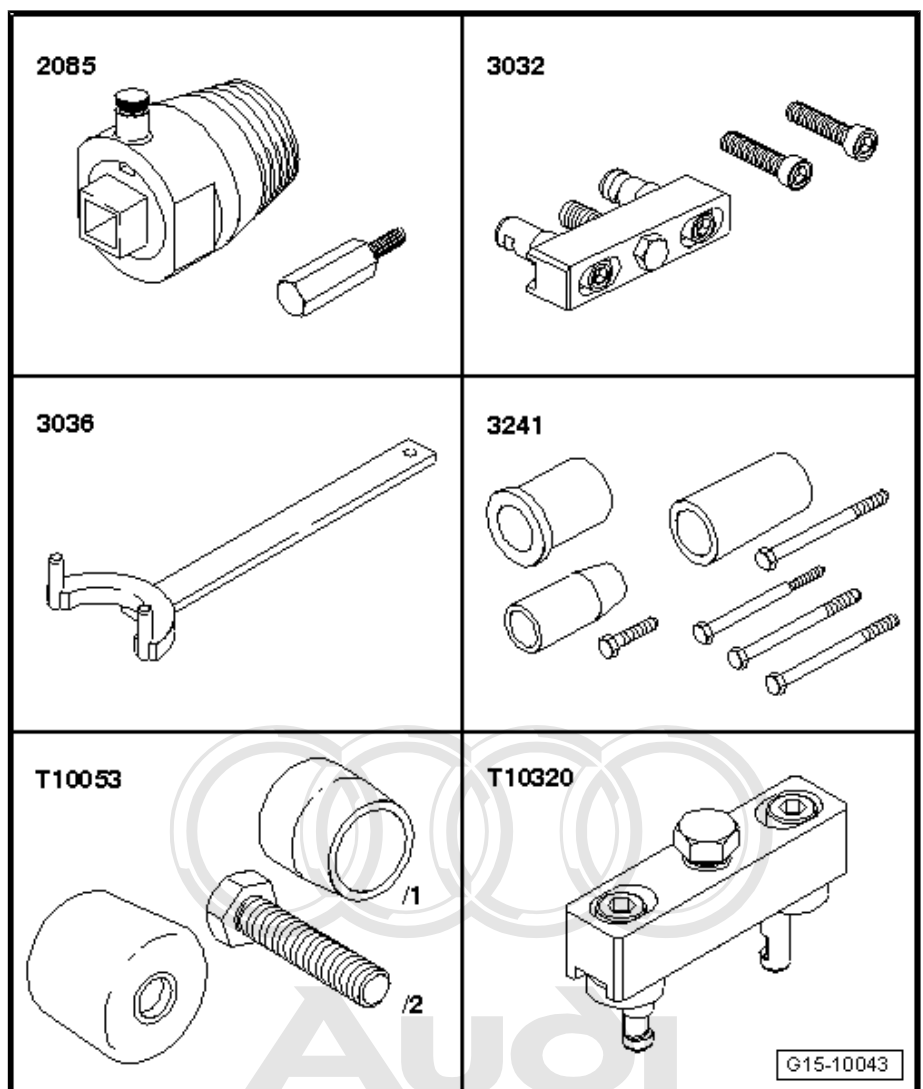
- Specification: 0.03 ... 0.08 mm.
- Wear limit: 0.12 mm.



### 3.3 Renewing camshaft oil seal

#### Special tools and workshop equipment required

- ◆ Oil seal extractor -2085-
- ◆ Puller -3032- for vehicles up to 02.2006
- ◆ Counterhold tool -3036-
- ◆ Hexagon bolt M10 x 1.25 x 40, (from fitting sleeves -3241- )
- ◆ Assembly tool -T10053-
- ◆ Puller -T10320- for vehicles from 02.2006 onwards

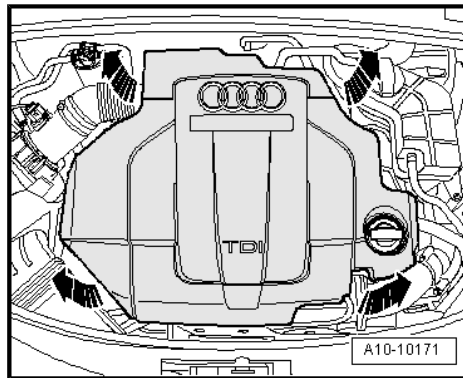


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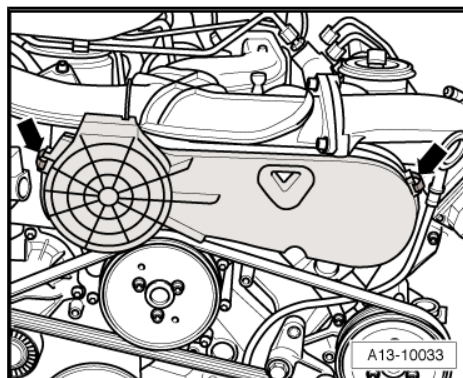


### Procedure

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



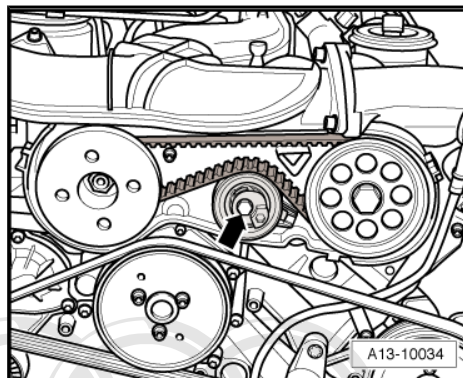
- Loosen clamps -arrows-.
- Pivot toothed belt cover forward and disengage retaining pegs on bottom side of toothed belt cover.
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .



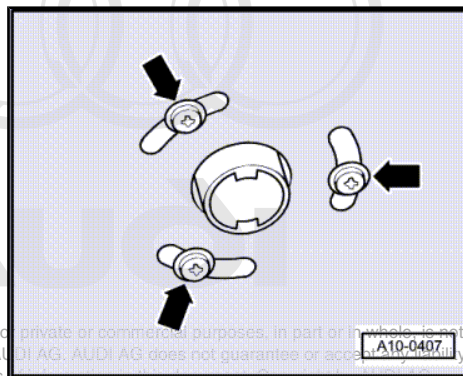
### Note

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

- Loosen bolt -arrow- for tensioning roller approx. 2 turns.

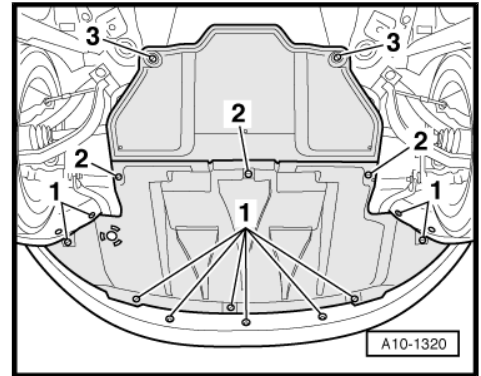


- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.

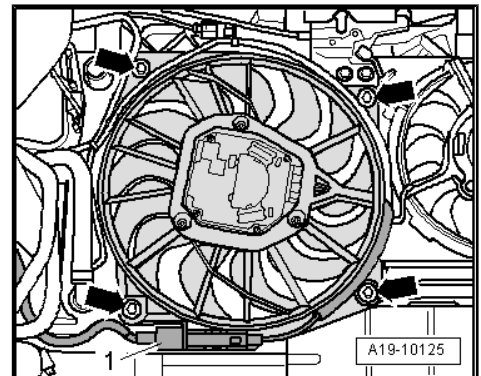


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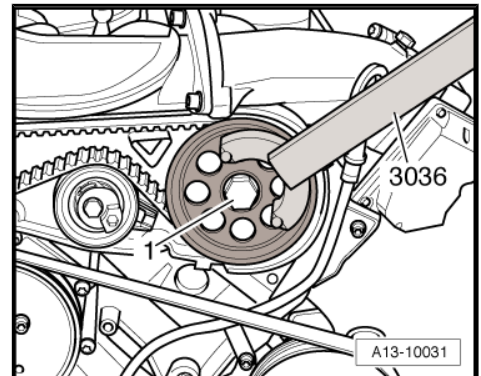
- Release quick-release fasteners -1- and -2- and take off front noise insulation. Leave rear noise insulation in position.



- Unplug electrical connector -1-.
- Move wiring harness clear at radiator fan (left-side).
- Remove bolts -arrows-.
- Lower radiator fan (left-side) slightly and tie up on lock carrier.

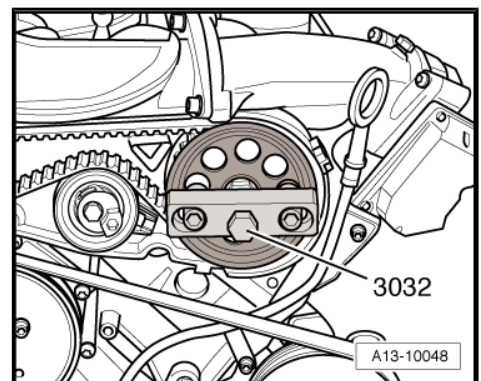


- Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool -3036- .



**Vehicles up to 02.2006:**

- Use puller -3032- to pull off toothed belt drive sprocket.



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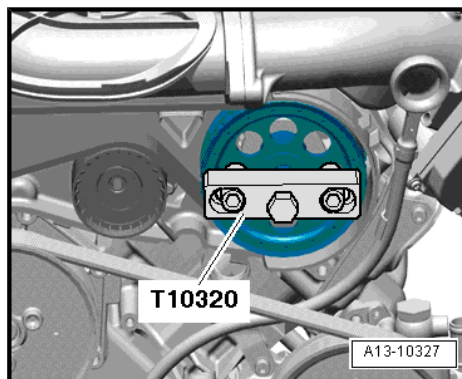


**Vehicles from 02.2006 onwards:**

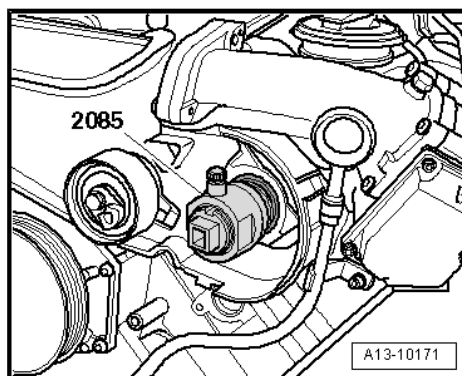
- Use puller -T10320- to pull off toothed belt drive sprocket.

**All vehicles (continued):**

- Take off toothed belt drive sprocket together with toothed belt.



- Unscrew inner section of oil seal extractor -2085- three turns out of outer section and lock inner section 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 seal.
- Clean running surface and sealing surface.

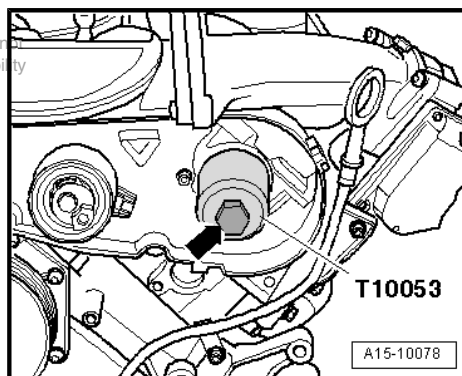


- Press in new oil seal as far as stop using press sleeve from -T10053- and hexagon bolt M10 x 1.25 x 40 -arrow- (from fitting sleeves -3241-).

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

- Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Install radiator fan (left-side) ⇒ [page 286](#) .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .



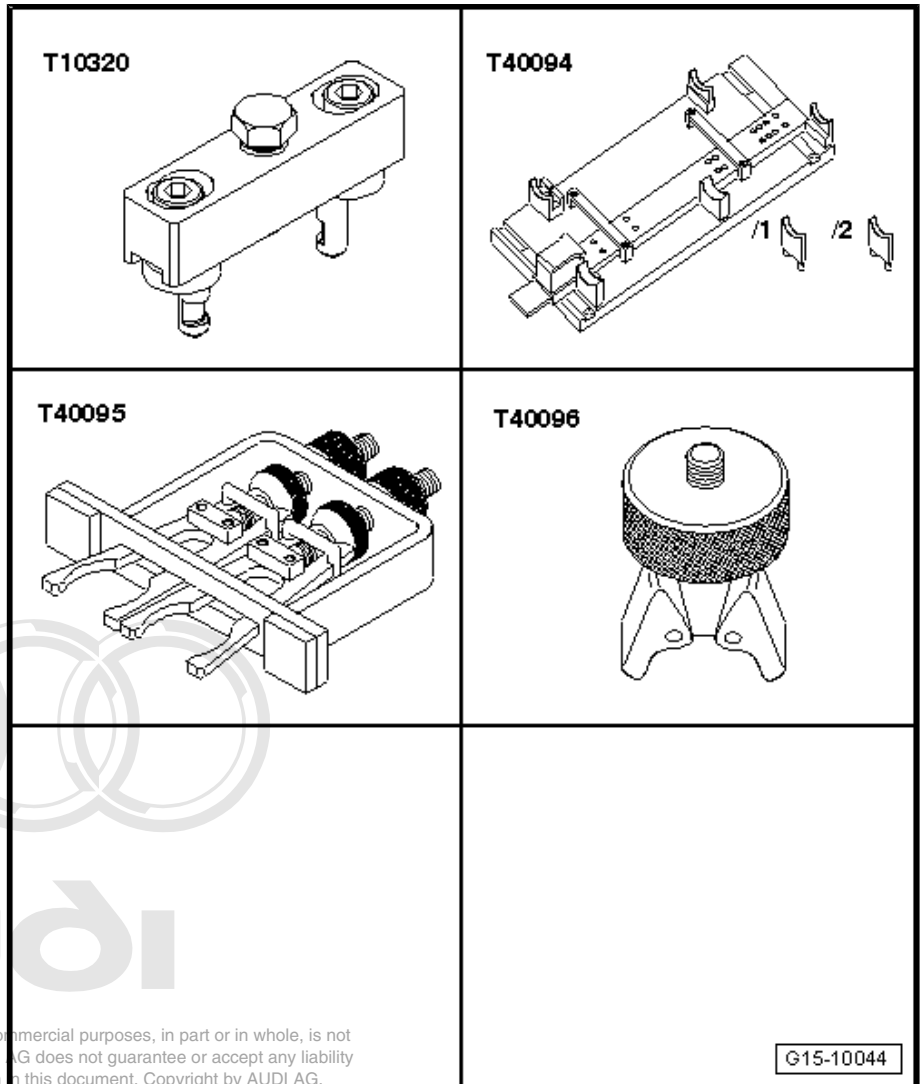
**Tightening torque**

Component	Nm
Toothed belt drive sprocket to camshaft	75

### 3.4 Removing and installing camshafts - cylinder head (left-side)

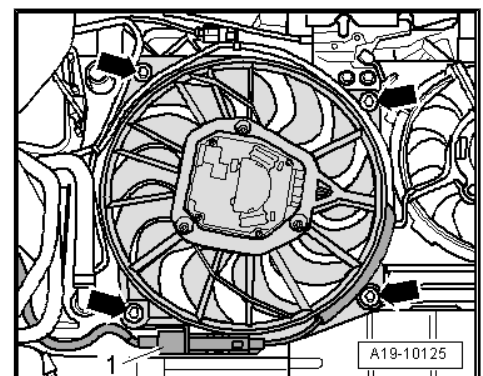
#### Special tools and workshop equipment required

- ◆ Puller -T10320- for vehicles from 09.2005 onwards
- ◆ Camshaft fitting tool - T40094-
- ◆ Camshaft fitting tool - T40095-
- ◆ Camshaft fitting tool - T40096-
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Electronic parts catalogue



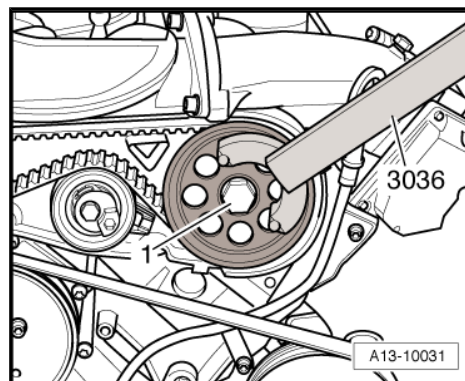
#### Removing

- Remove camshaft timing chain (left-side) from camshafts ⇒ [page 153](#) .
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Unplug electrical connector -1-.
- Move wiring harness clear at radiator fan (left-side).
- Remove bolts -arrows-.
- Lower radiator fan (left-side) slightly and tie up on lock carrier.



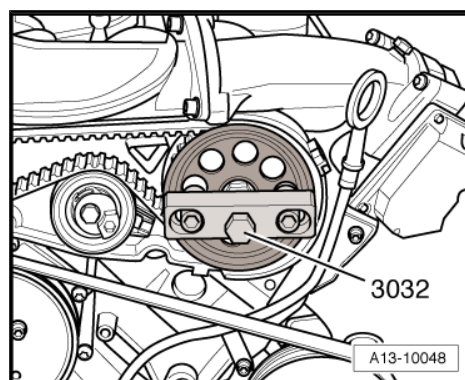


- Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool -3036- .



**Vehicles up to 02.2006:**

- Use puller -3032- to pull off toothed belt drive sprocket.

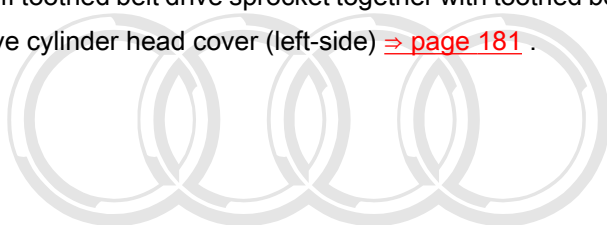
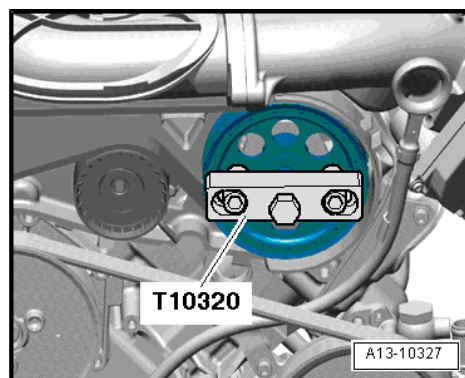


**Vehicles from 02.2006 onwards:**

- Use puller -T10320- to pull off toothed belt drive sprocket.

**All vehicles (continued):**

- Take off toothed belt drive sprocket together with toothed belt.
- Remove cylinder head cover (left-side) ⇒ [page 181](#) .



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- Unscrew retaining frame bolts and nuts in the sequence -18 ... 1-.

 **Note**

*Make sure you do not damage roller rocker fingers and compensation elements when removing camshafts.*

- Carefully remove retaining frame and camshafts.

**Installing**



**Caution**

*The camshafts **MUST** be installed using the camshaft fitting tool -T40094- as described in the following, as the thrust bearings in the retaining frame would otherwise be destroyed. The cylinder head would then have to be renewed.*

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**WARNING**

*Wear safety goggles.*

- Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.



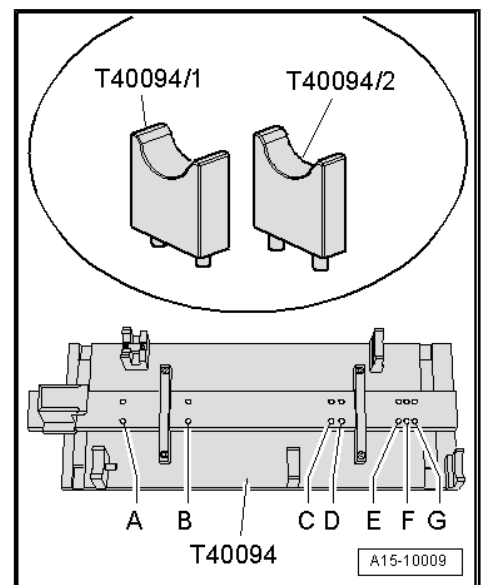
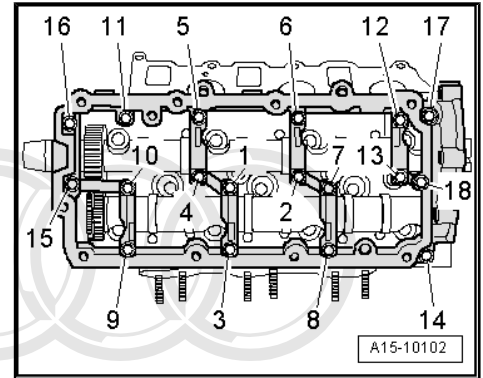
**Caution**

*Make sure that no sealant residue gets into the cylinder head or the bearings.*

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

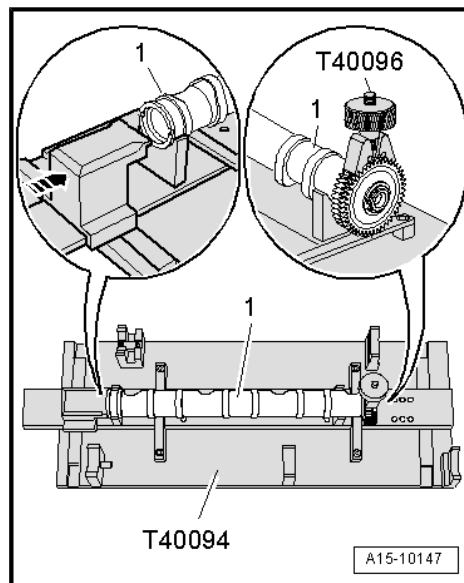
Set up camshaft fitting tool -T40094- as follows:

- Insert support -T40094/2- in position -A-.
- Insert support -T40094/1- in position -D-.

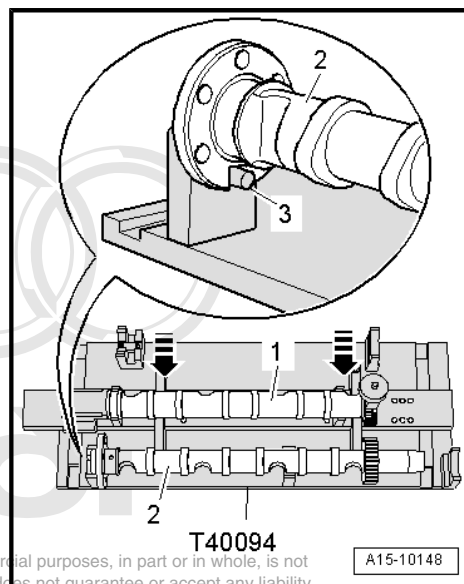




- Place exhaust camshaft -1- in supports -T40094/1- and -T40094/2- .
- Turn exhaust camshaft in such a way that it can be locked in „TDC“ position using locking device -arrow-.
- Place camshaft fitting tool -T40096- on teeth of exhaust camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).
- Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

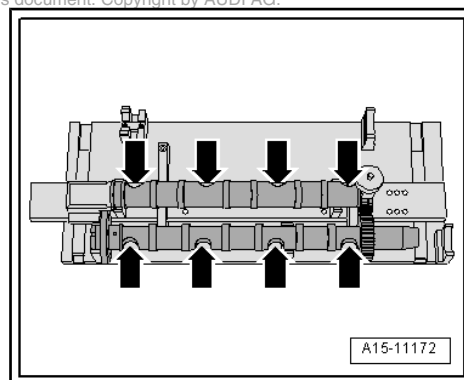


- Place inlet camshaft -2- in camshaft fitting tool -T40094- .
- The locating pin -3- must engage in the slot on the inlet camshaft.
- Slide exhaust camshaft -1- towards inlet camshaft -arrows- until gear teeth engage.



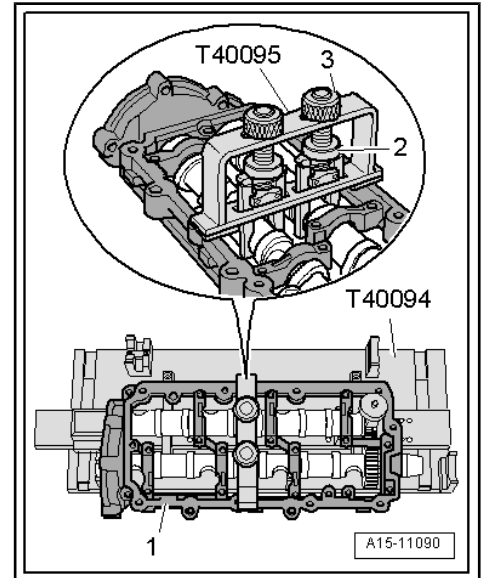
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- Check that camshafts are in correct position:
- Recesses -arrows- on both camshafts must point outwards.

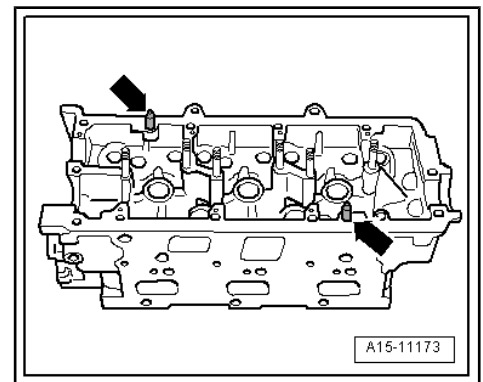




- Fit retaining frame -1- on both camshafts.
- All camshaft bearings must be seated on the camshafts.
- Attach camshaft fitting tool -T40095- to camshafts (align arms of bracket as required and tighten knurled nuts -2-).
- Apply tension to camshafts by tightening the knurled nuts -3- upwards.



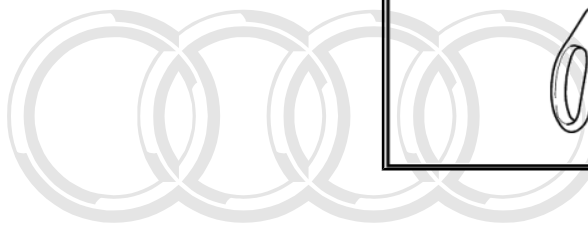
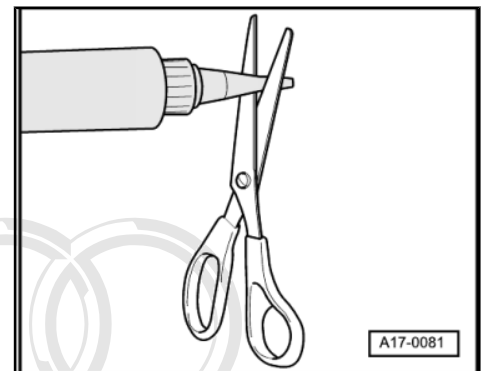
- Check if dowel pins -arrows- are fitted in cylinder head. Install missing dowel pins.



 **Note**

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

- Cut off nozzle of tube at front marking (nozzle  $\varnothing$  approx. 1.5 mm).



**Audi**

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**Note**

For illustration purposes, the retaining frame is shown without the camshafts.

- Turn retaining frame upside down.

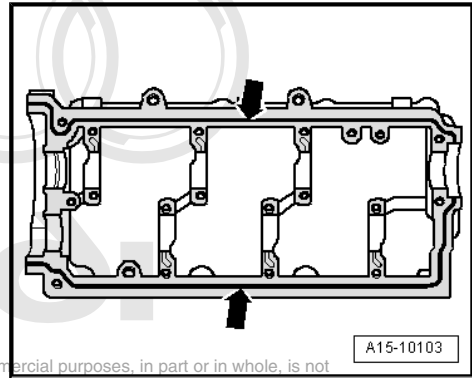


**Caution**

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

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

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- Apply beads of sealant -arrows- onto clean sealing surfaces of retaining frame as shown in illustration.
- The grooves on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 ... 2.0 mm above the sealing surface.



**Note**

The retaining frame must be installed within 5 minutes after applying the sealant.



**Caution**

**Risk of damage to engine.**

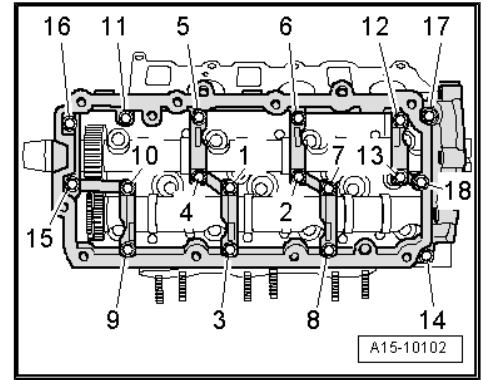
- ◆ **Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.**

- Fit retaining frame together with both camshafts and camshaft fitting tool -T40095- onto cylinder head.
- Tighten bolts for retaining frame ⇒ [page 201](#) .
- Remove camshaft fitting tool -T40095- and -T40096- .

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

 **Note**

- ◆ *After installing camshafts, wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).*
  - ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.*
- Install cylinder head cover (left-side) ⇒ [page 181](#) .
  - Renew camshaft oil seal ⇒ [page 203](#) .
  - Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
  - Install radiator fan (left-side) ⇒ [page 286](#) .
  - Install intake manifold (top section) ⇒ Rep. gr. 23 .
  - Install camshaft timing chain ⇒ [page 157](#) .



**Tightening torque**

Component	Nm
Retaining frame to cylinder head	9



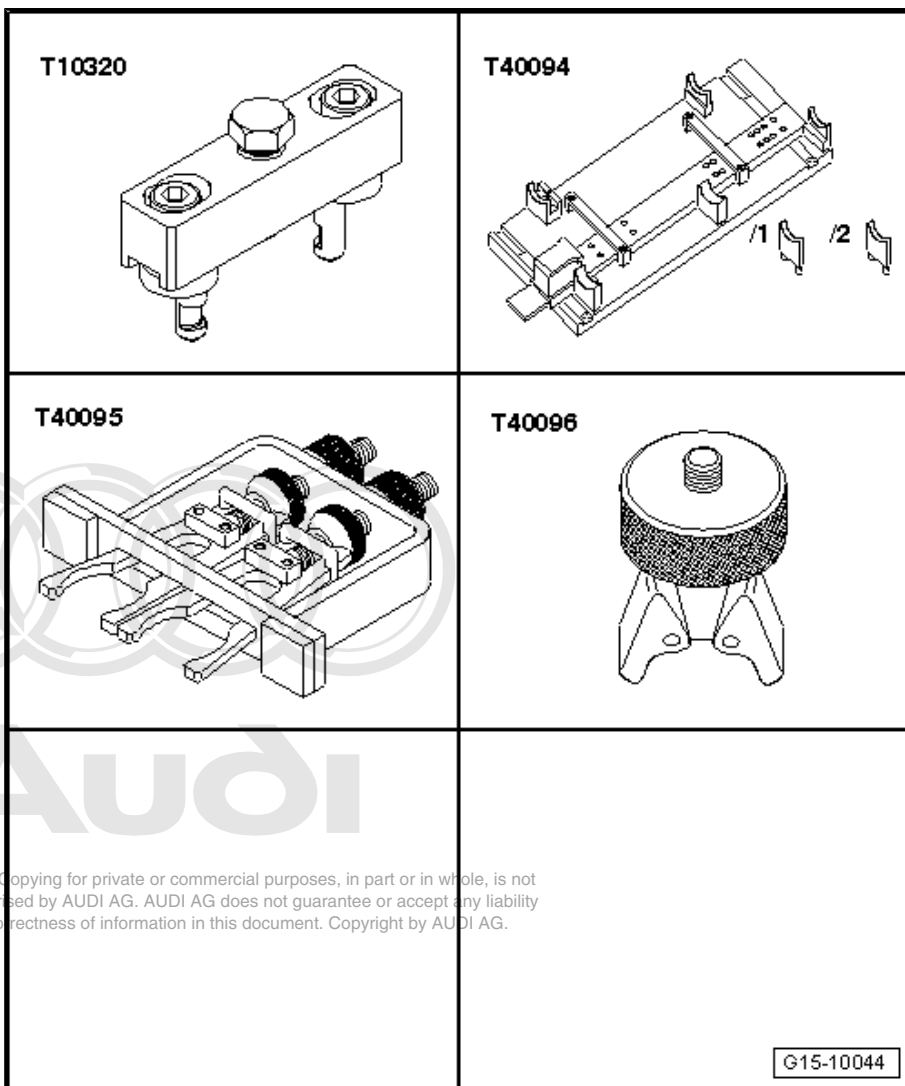
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### 3.5 Removing and installing camshafts - cylinder head (right-side)

#### Special tools and workshop equipment required

- ◆ Puller -T10320- for vehicles from 09.2005 onwards
- ◆ Camshaft fitting tool - T40094-
- ◆ Camshaft fitting tool - T40095-
- ◆ Camshaft fitting tool - T40096-
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant → Electronic parts catalogue



#### Removing

- Remove camshaft timing chain (right-side) from camshafts ⇒ [page 153](#) .
- Remove cylinder head cover (right-side) ⇒ [page 181](#) .

- Unscrew retaining frame bolts and nuts in the sequence -17 ... 1-.

 **Note**

*Make sure you do not damage roller rocker fingers and compensation elements when removing camshafts.*

- Carefully remove retaining frame and camshafts.

**Installing**



**Caution**

*The camshafts **MUST** be installed using the camshaft fitting tool -T40094- as described in the following, as the thrust bearings in the retaining frame would otherwise be destroyed. The cylinder head would then have to be renewed.*



**WARNING**

*Wear safety goggles.*

- Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.



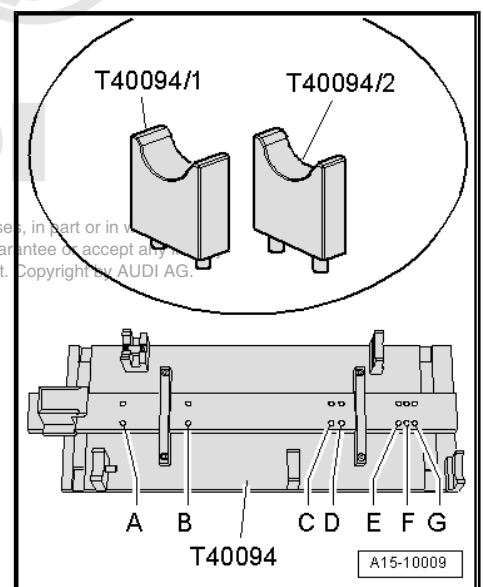
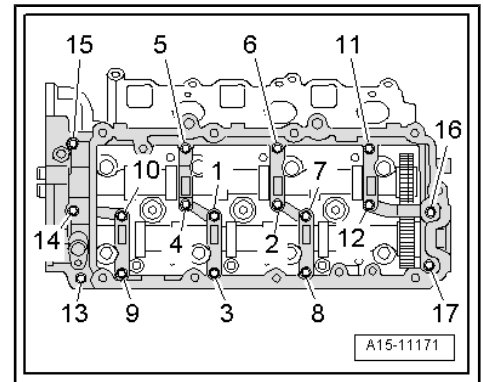
**Caution**

*Make sure that no sealant residue gets into the cylinder head or the bearings.*

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

Set up camshaft fitting tool -T40094- as follows:

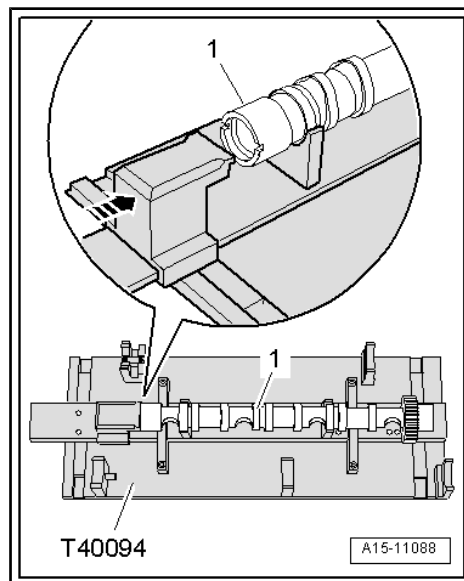
- Insert support -T40094/2- in position -B-.
- Insert support -T40094/1- in position -C-.



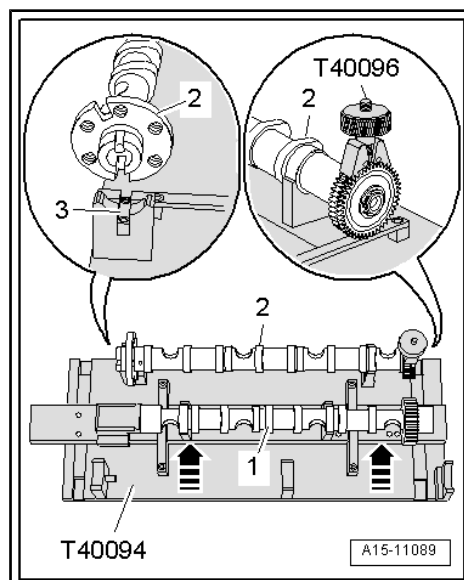
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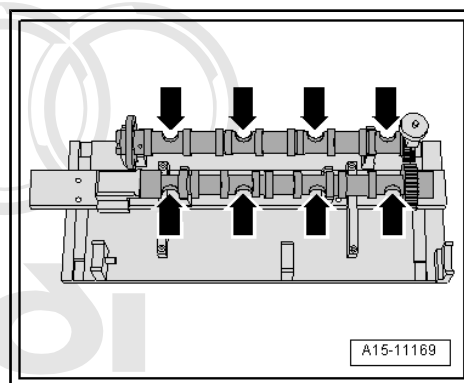
- Place exhaust camshaft -1- in supports -T40094/1- and -T40094/2- .
- Turn exhaust camshaft in such a way that it can be locked in „TDC“ position using locking device -arrow-.



- Place inlet camshaft -2- in camshaft fitting tool -T40094- .
- The locating bar -3- must engage in the groove on the inlet camshaft.
- Place camshaft fitting tool -T40096- on teeth of inlet 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).
- Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.
- Slide exhaust camshaft -1- towards inlet camshaft -arrows- until gear teeth engage.

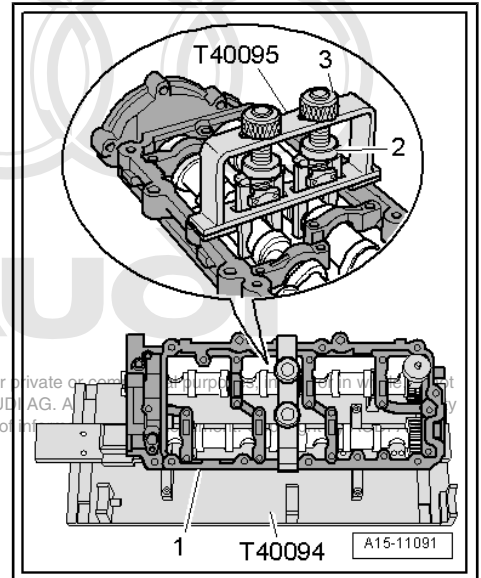


- Check that camshafts are in correct position:
- Recesses -arrows- on both camshafts must point outwards.

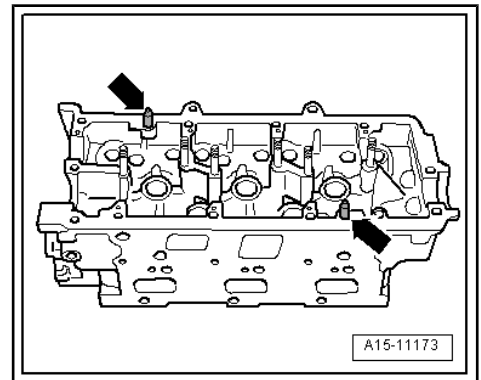


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- Fit retaining frame -1- on both camshafts.
- All camshaft bearings must be seated on the camshafts.
- Attach camshaft fitting tool -T40095- to camshafts (align arms of bracket as required and tighten knurled nuts -2-).
- Apply tension to camshafts by tightening the knurled nuts -3- upwards.



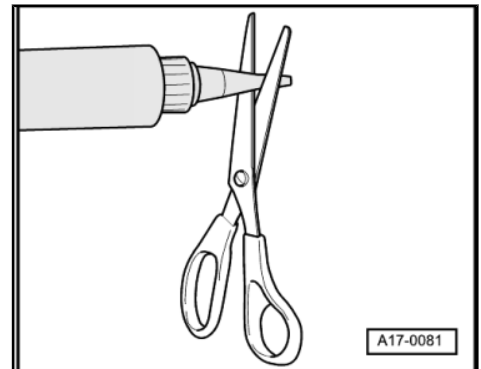
- Check if dowel pins -arrows- are fitted in cylinder head. Install missing dowel pins.



 **Note**

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

- Cut off nozzle of tube at front marking (nozzle  $\varnothing$  approx. 1.5 mm).





**Note**

*For illustration purposes, the retaining frame is shown without the camshafts.*

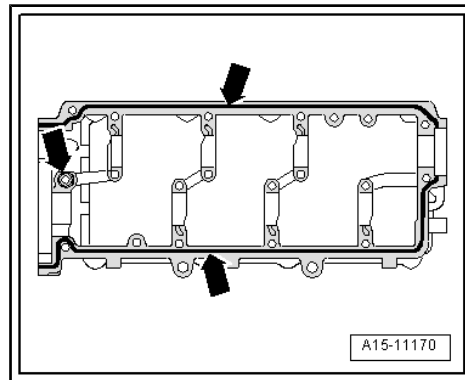
- Turn retaining frame upside down.



**Caution**

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

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



- Apply beads of sealant -arrows- onto clean sealing surfaces of retaining frame as shown in illustration.
- The grooves on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 ... 2.0 mm above the sealing surface.



**Note**

*The retaining frame must be installed within 5 minutes after applying the sealant.*



**Caution**

***Risk of damage to engine.***

- ◆ ***Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.***

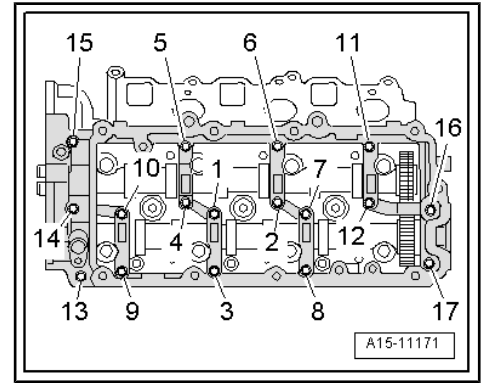


- Fit retaining frame together with both camshafts and camshaft fitting tool -T40095- onto cylinder head.
- Tighten bolts for retaining frame ⇒ [page 202](#) .
- Remove camshaft fitting tool -T40095- and -T40096- .

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

 **Note**

- ◆ *After installing camshafts, wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).*
  - ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.*
- Install cylinder head cover (right-side) ⇒ [page 181](#) .
  - Renew sealing cap (front) on cylinder head.
  - Using a suitable drift, knock in new sealing cap (core plug) until flush.
  - Install camshaft timing chain ⇒ [page 157](#) .



**Tightening torque**

Component	Nm
Retaining frame to cylinder head	9



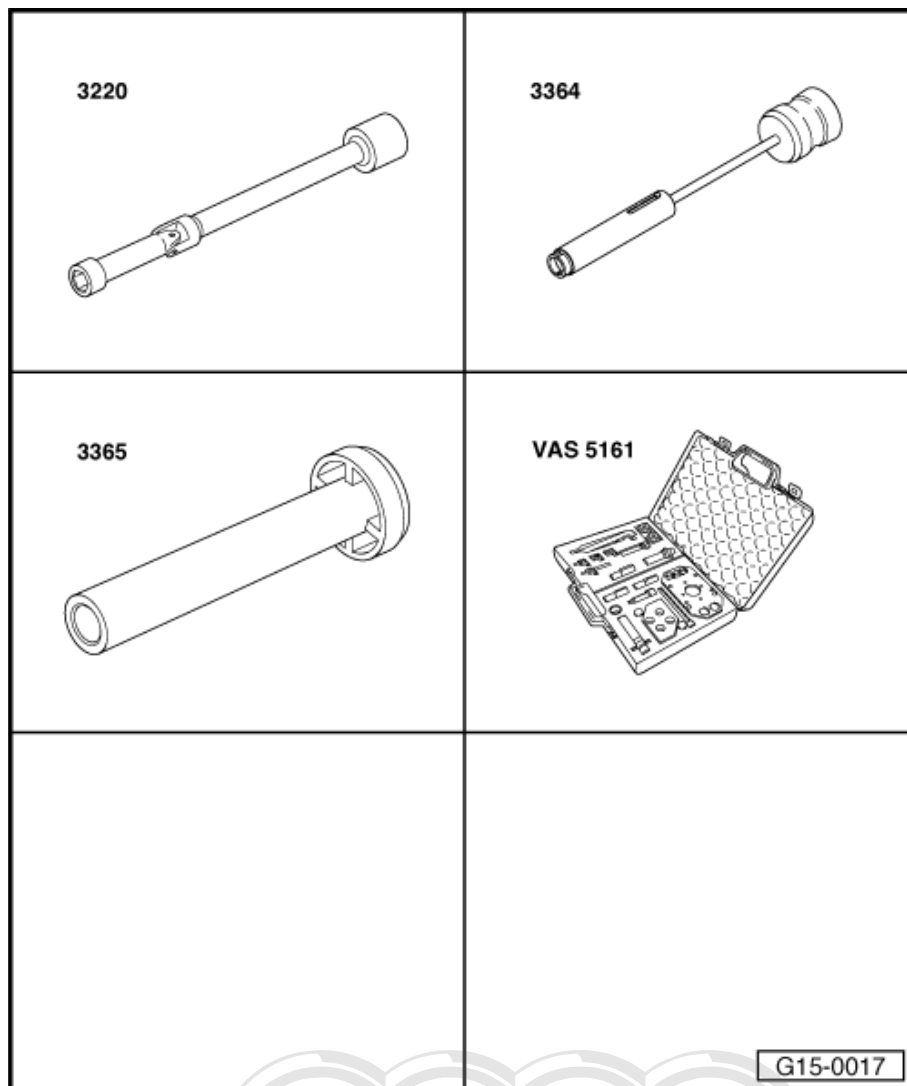
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### 3.6 Renewing valve stem oil seals with cylinder head installed

#### Special tools and workshop equipment required

- ◆ U/J extension and socket, 10 mm -3220-
- ◆ Valve stem seal puller -3364-
- ◆ 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-



#### Procedure

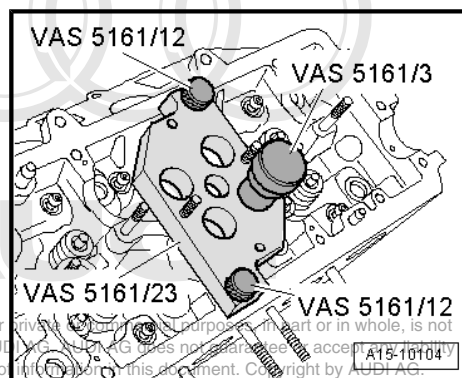
- Remove camshafts: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#) .
- Mark fitting location of roller rocker fingers for re-installation and remove.



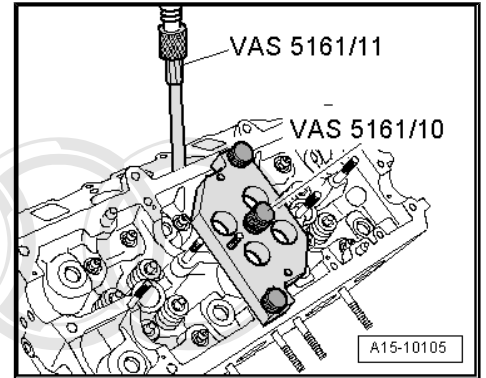
#### Note

*Audi A4 models with a 2.7 or 3.0 ltr. TDI engine are always equipped with steel glow plugs.*

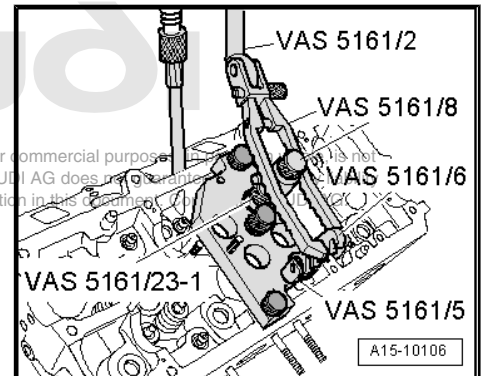
- Remove all glow plugs using U/J extension and socket, 10 mm -3220- .
- Fit guide plate -VAS 5161/23- onto cylinder head.
- Secure guide plate using knurled screws -VAS 5161/12- .
- Insert punch -VAS 5161/3- into guide plate and knock sticking valve cotters loose using a plastic hammer.



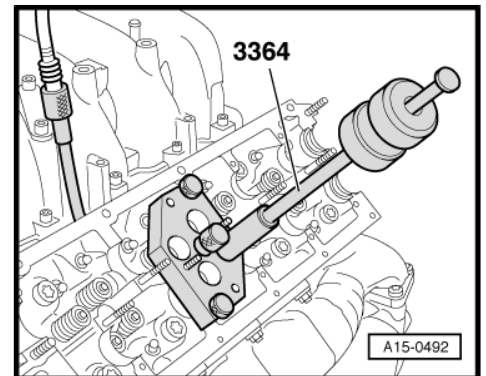
- Screw sealing pin -VAS 5161/10- into guide plate.
- Screw adapter -VAS 5161/11- hand-tight into the glow plug thread of the relevant cylinder.



- 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.

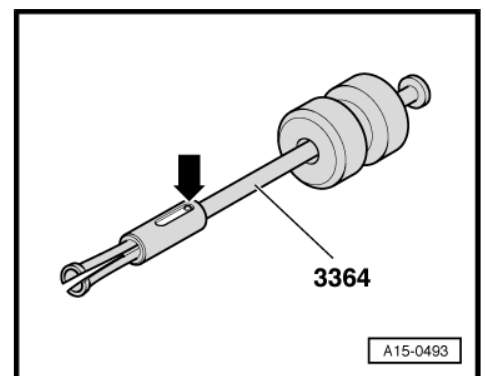


- Minimum pressure: 6 bar
- Hook pressure fork -VAS 5161/2- into snap-in device and press assembly cartridge downwards.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve crotters.
- Move knurled screw back and forth slightly; the valve crotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take off assembly cartridge with knurled spacer ring.
- Remove valve spring plate and valve spring.
- Remove valve stem oil seals using the valve stem seal puller -3364- .



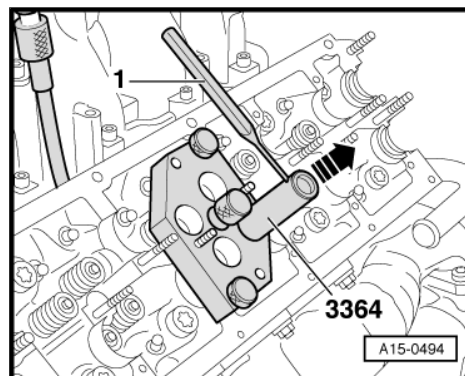
If the puller cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

- Knock out pin -arrow- of puller using a punch and remove the extractor attachment.





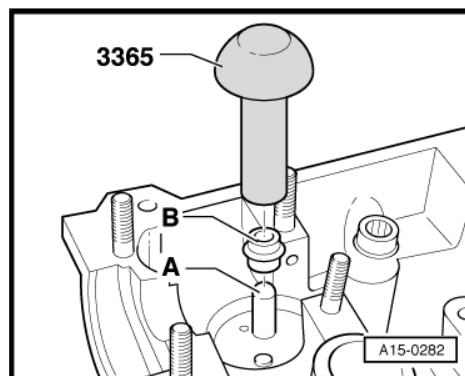
- Apply lower part of puller to valve stem oil seal.
- Secure puller with a punch -1- or other suitable tool as shown in the illustration.
- Apply a suitable tool to puller and pull out valve stem oil seal -arrow-.



**Note**

*A plastic sleeve -A- is included with the new valve stem oil seals.*

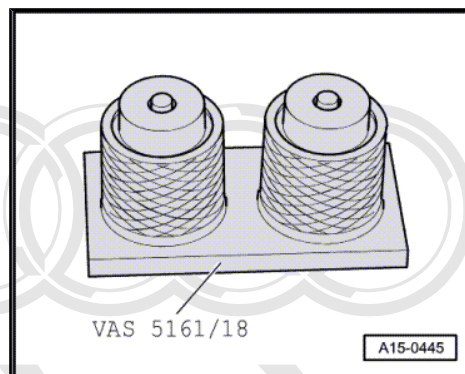
- Fit plastic sleeve -A- onto the valve stem to prevent damage to the new valve stem oil seal -B-.
- Lightly lubricate sealing lip of valve stem oil seal.
- Slip valve stem oil seal over plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool -3365- .
- Remove plastic sleeve.
- If valve cotters have been removed from assembly cartridge -VAS 5161/8- , they need to be put into insertion device for valve cotters -VAS 5161/18- first.



**Note**

*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.

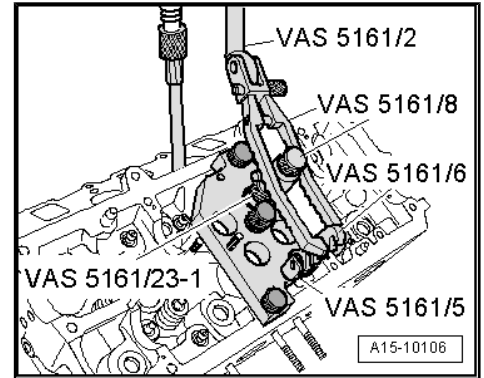


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- Re-insert assembly cartridge into guide plate -VAS 5161/23- .
- Push pressure fork down and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotteners.
- Release pressure fork with knurled screw still in pulled position.

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

- Install glow plugs ⇒ Rep. gr. 28 .
- Install camshafts: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#) .



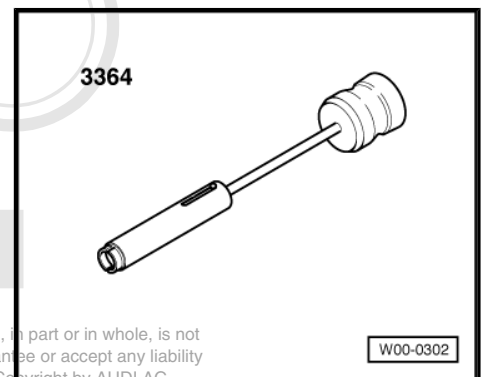
 **Note**

- ◆ *Audi A4 models with a 2.7 or 3.0 ltr. TDI engine are always equipped with steel glow plugs.*
- ◆ *Engine is not to be rotated for approx. 30 minutes after installing camshafts. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).*
- ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

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

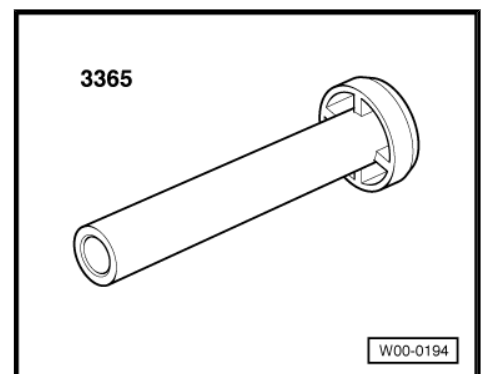
#### Special tools and workshop equipment required

- ◆ Valve stem seal puller -3364-



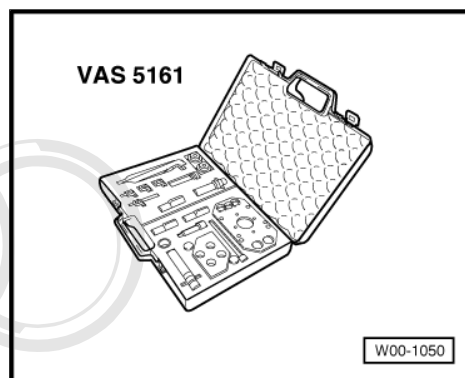
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- ◆ Valve stem seal fitting tool -3365-



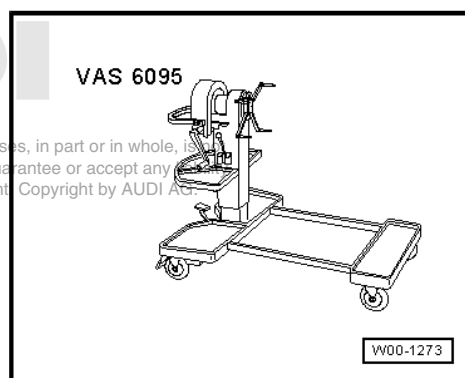


- ◆ Removal and installation device for valve cotters -VAS 5161- with knurled spacer ring -VAS 5161/23-1- and guide plate -VAS 5161/23-



- ◆ Engine and gearbox support -VAS 6095-

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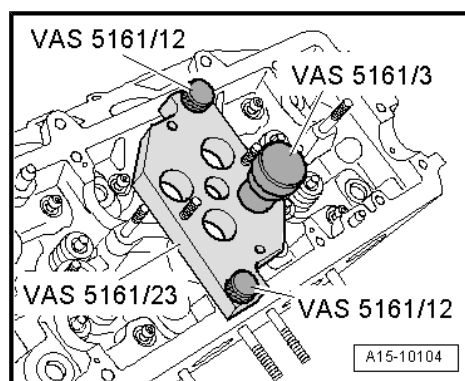
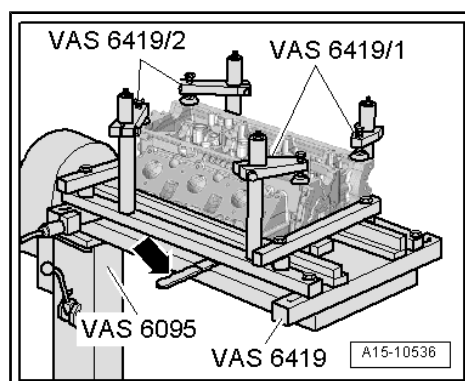


- ◆ Tensioning device -VAS 6419-

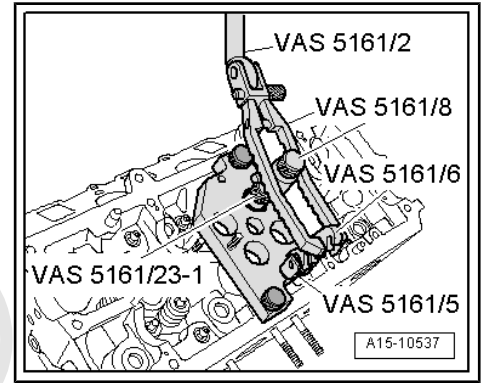
### Procedure

Proceed as follows:

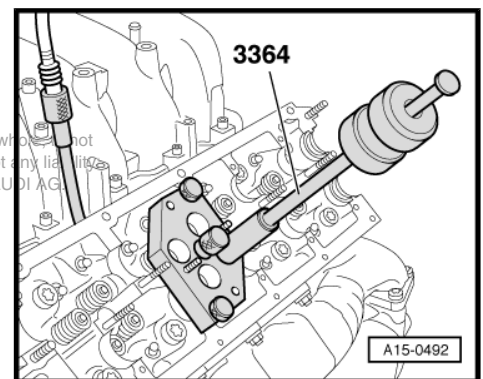
- Remove camshafts: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#) .
- Attach tensioning device -VAS 6419- to engine and gearbox support -VAS 6095- .
- Secure cylinder head in tensioning device -VAS 6419- as illustrated.
- Connect compressed air line to tensioning device -VAS 6419- .
- Using lever -arrow-, slide air pad under cylinder where valve stem oil seals are to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.
- Mark fitting location of roller rocker fingers for re-installation and remove.
- Fit guide plate -VAS 5161/23- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12- .
- Apply drift -VAS 5161/3- to guide plate and use plastic-headed hammer to release sticking valve cotters.



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take 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- .



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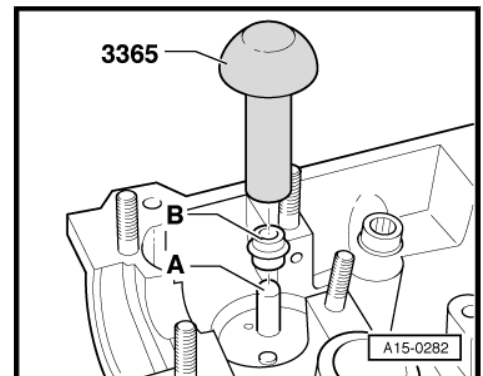


**Caution**

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

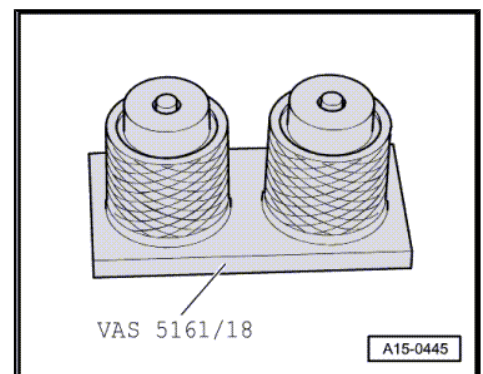
- ◆ ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***

- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool -3365- .
- 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.



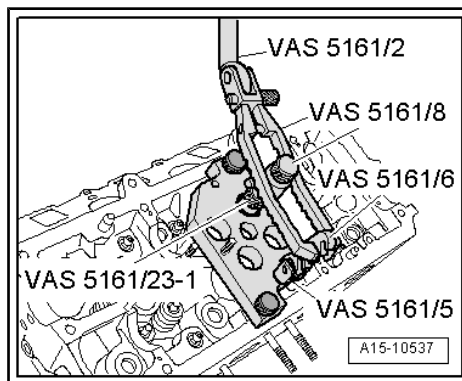


- Insert assembly cartridge in guide plate -VAS 5161/23- again.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release the pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

### Assembling

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

- Install camshafts: cylinder head (left-side) ⇒ [page 207](#) , cylinder head (right-side) ⇒ [page 214](#) .



## 3.8 Checking hydraulic valve compensation elements

### Special tools and workshop equipment required

- ◆ Feeler gauge



### Note

- ◆ Hydraulic compensation elements cannot be serviced.

- ◆ Irregular valve noises when starting engine are normal.

### Procedure

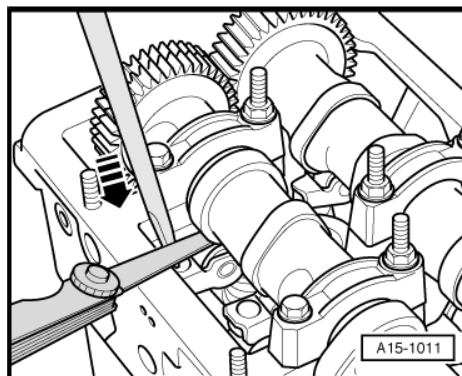
- Start engine and run until coolant temperature reaches approx. 80 °C.
- Increase engine speed to approx. 2500 rpm for 2 minutes (perform road test if necessary).

If the hydraulic tappets are still noisy, locate defective tappet as follows:

- Remove cylinder head cover (left or right) ⇒ [page 181](#) .
- Rotate crankshaft until cam of hydraulic compensation element to be checked faces upwards. The procedure is:
  - ◆ Vehicles with manual gearbox: push vehicle forwards with 4th gear engaged and ignition switched off.
  - ◆ Vehicles with multitronic or automatic gearbox: remove noise insulation and rotate crankshaft in clockwise direction via central bolt for vibration damper.
- Determine clearance between cam and roller rocker finger.
- Press roller rocker finger down -arrow- using a screwdriver.

If it is possible to insert a feeler gauge of 0.20 mm between camshaft and roller rocker finger:

- Renew hydraulic compensation element: left-side ⇒ [page 207](#) , right-side ⇒ [page 214](#) .



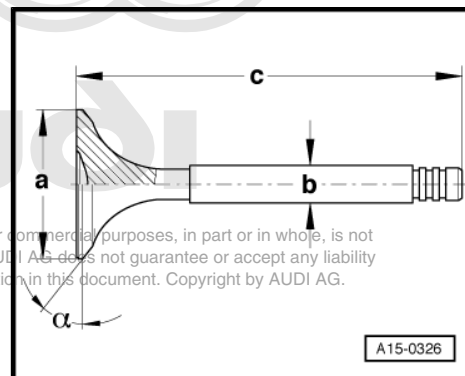


### 3.9 Valve dimensions

**i** Note

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

Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.60 ... 28.80	26.70 ... 26.90
∅ b	mm	5.968 ... 5.982	5.958 ... 5.972
c	mm	97.25 ... 97.45	97.35 ... 97.55
α	∠°	45° 10'	45° 10'



**WARNING**

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

### 3.10 Machining valve seats

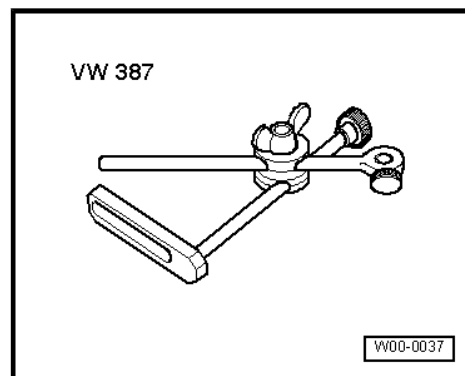
**i** Note

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

### 3.11 Checking valve guides

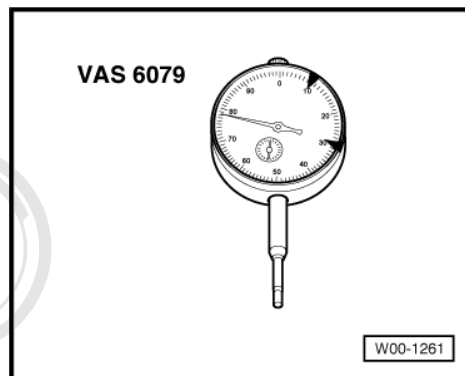
**Special tools and workshop equipment required**

- ◆ Universal dial gauge bracket -VW 387-





◆ Dial gauge -VAS 6079-



**Procedure**

- Insert valve into valve guide.
- End of valve stem must be flush with valve guide.



**Note**

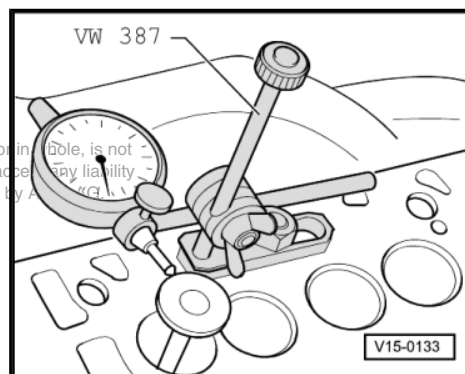
*Only insert inlet valve into inlet guide and exhaust valve into exhaust guide, as the stem diameters are different.*

- Determine amount of sideways play:
- Wear limit: 1.0 mm.



**Note**

- ◆ *If the wear limit is exceeded, repeat the measurement with new valves. Renew cylinder head if wear limit is still exceeded. Valve guides cannot be renewed.*
- ◆ *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*



### 3.12 Checking valves

- Visually inspect for scoring on valve stem and on seating surface.

If scoring is clearly visible:

- Renew the relevant valve.

# 17 – Lubrication

## 1 Lubrication system



### Note

- ◆ *If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned carefully, and the engine oil cooler must be renewed in order to prevent further damage occurring later.*
- ◆ *The oil level must not be above max. mark on dipstick – danger of damage to catalytic converter.*
- ◆ *Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.*
- ◆ *Oil spray jet for piston cooling ⇒ [page 230](#).*

### 1.1 Oil pump, sump (bottom section) - exploded view

#### 1 - 8 Nm + 90°

- Renew
- Tighten in stages and in diagonal sequence

#### 2 - 8 Nm + 90°

- Self-locking
- Renew

#### 3 - Baffle plate

#### 4 - Oil pump

- Do not dismantle
- With pressure relief valve for cold condition (11 bar) and pressure control valve (3.5 bar)
- Removing and installing ⇒ [page 233](#)

#### 5 - 23 Nm

#### 6 - Dowel sleeves

#### 7 - Oil pump drive shaft

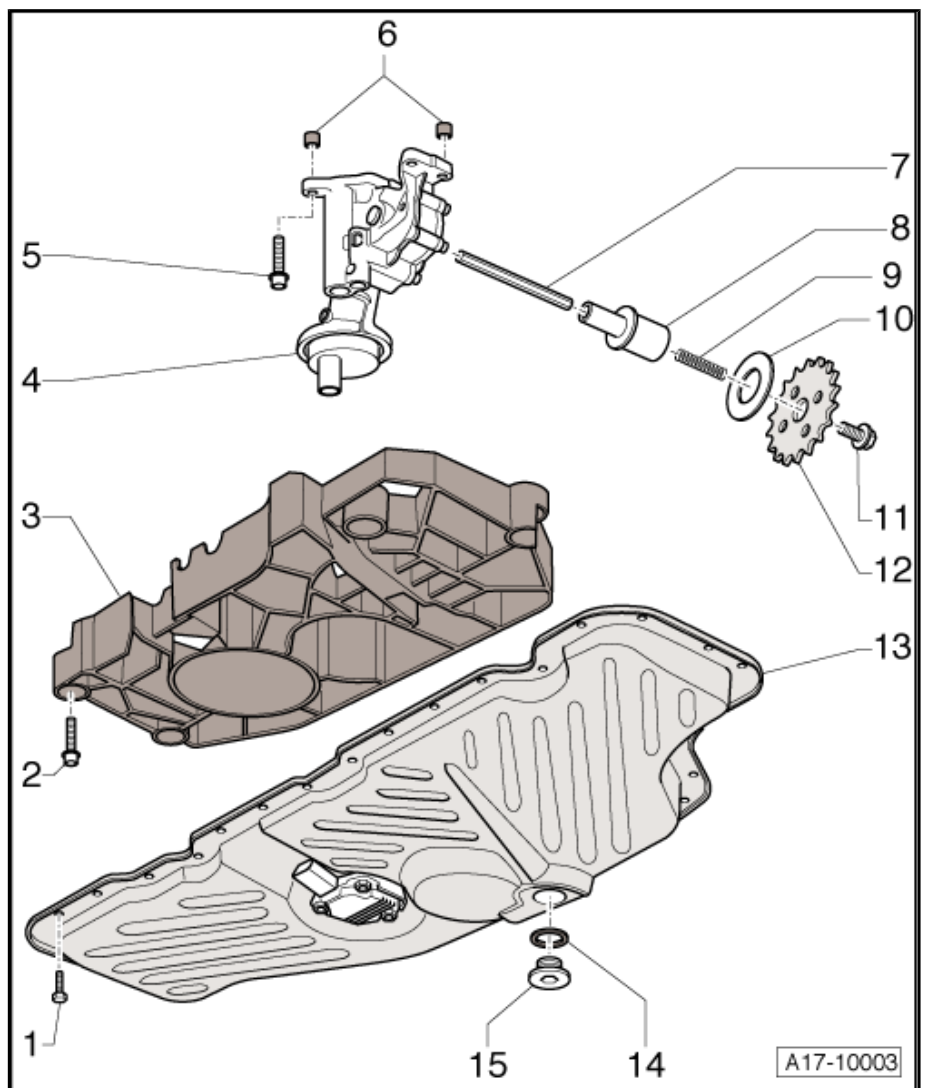
#### 8 - Coupling

#### 9 - Compression spring

#### 10 - Thrust washer

#### 11 - 64 Nm

- Property class 10.9
- To loosen, use pin wrench -3212- to counterhold chain sprocket
- If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.



A17-10003



## 12 - Chain sprocket for oil pump

- ❑ Installation position: Side with lettering faces engine

## 13 - Sump (bottom section)

- ❑ Removing and installing ⇒ [page 230](#)
- ❑ With oil level and oil temperature sender -G266-
- ❑ Removing and installing oil level and oil temperature sender -G266- ⇒ [page 230](#)

## 14 - Seal

- ❑ Renew

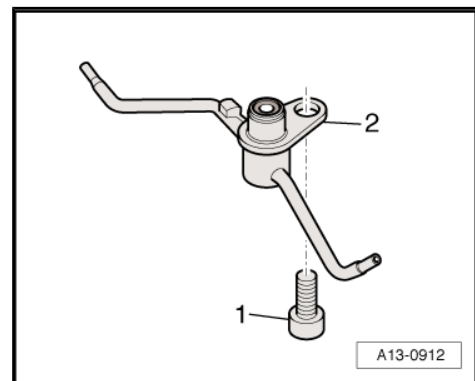
## 15 - Oil drain plug

- ❑ M14 - 30 Nm
- ❑ M24 - 50 Nm

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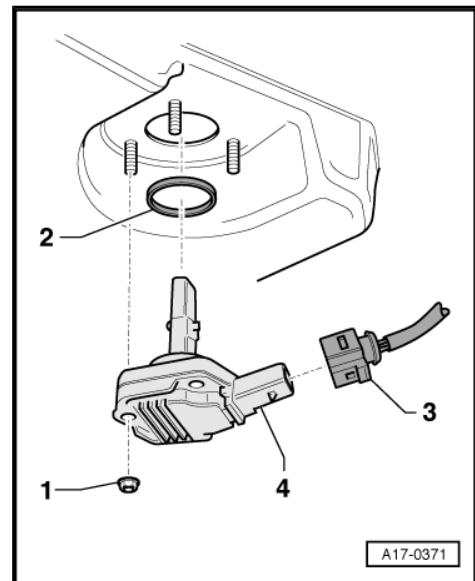
## Oil spray jet for piston cooling

- 1 - Bolt, 9 Nm
- 2 - Oil spray jet with spray nozzle valve for piston cooling



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

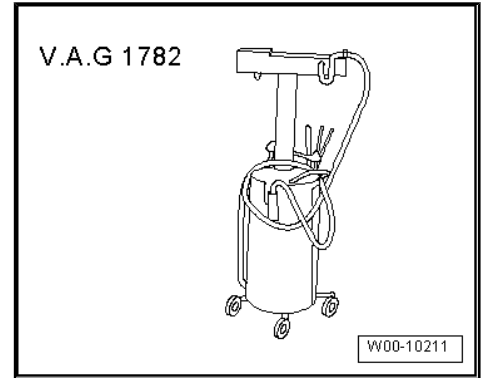
- 1 - Nut, 9 Nm
- 2 - Seal; renew
- 3 - Electrical connector
- 4 - Oil level and oil temperature sender -G266-



## 1.2 Removing and installing sump (bottom section)

Special tools and workshop equipment required

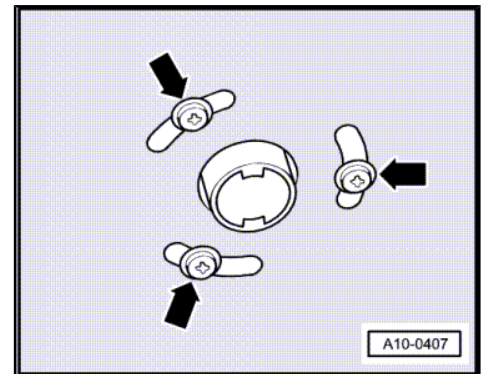
- ◆ Used oil collection and extraction unit -V.A.G 1782-



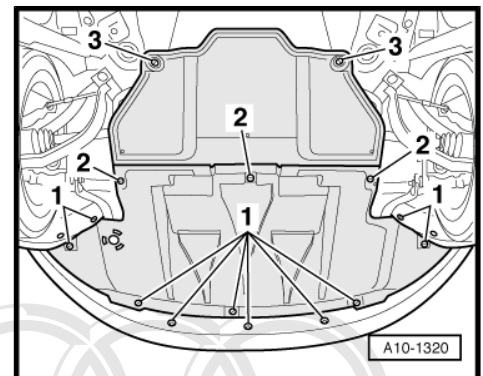
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant → Electronic parts catalogue

### Removing

- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.



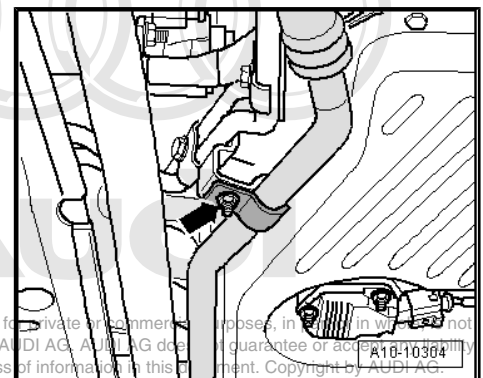
- Release quick-release fasteners -1- and -2- and take off front noise insulation. Leave rear noise insulation in position.
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.



### Note

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

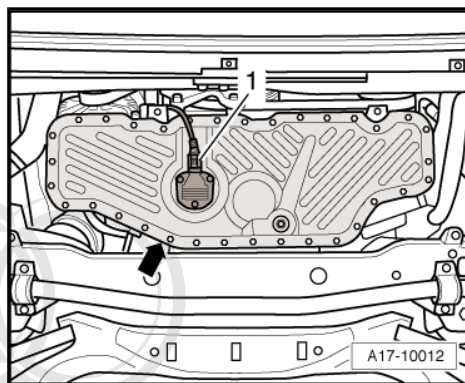
- Unbolt retainer for refrigerant pipe (right-side) from sump -arrow-.



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- Unplug electrical connector at oil level and oil temperature sender -G266- -item 1-.
- Unbolt sump (bottom section) -arrow-.



### Installing



#### Note

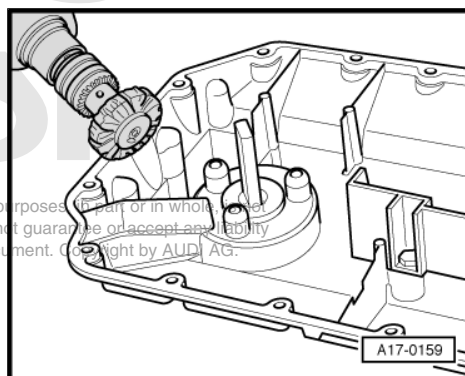
*Renew seals.*



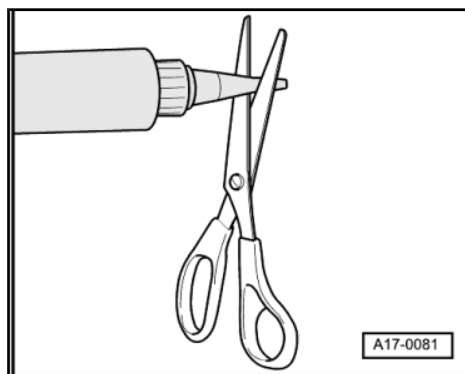
#### WARNING

*Wear safety goggles.*

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- Remove sealant residue from bottom and top sections of sump with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.
- Cut off tube nozzle at front marking (diameter of nozzle approx. 2 mm).



- Apply bead of sealant -arrow- onto clean sealing surface of sump (bottom section) as illustrated.
- Width of sealant bead: 2 mm.

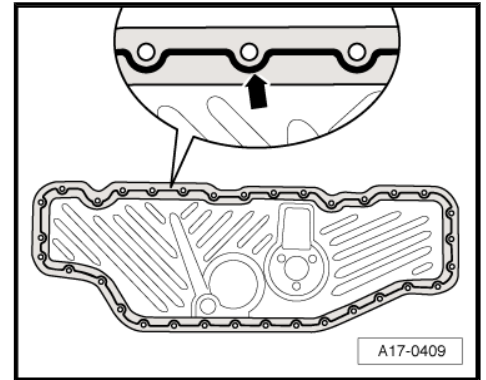
 **Note**

- ◆ *The sealant bead must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ◆ *The sump (bottom section) must be installed within 5 minutes after applying sealant.*

- Fit sump (bottom section) and tighten all bolts initially to 5 Nm in diagonal sequence.
- Tighten bolts on sump (bottom section) in diagonal sequence.
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .

**Tightening torques**

Component		Nm
Sump (bottom section) to sump (top section)		8 + 90° 1)2)
Oil drain plug	M14	30
	M24	50
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>		



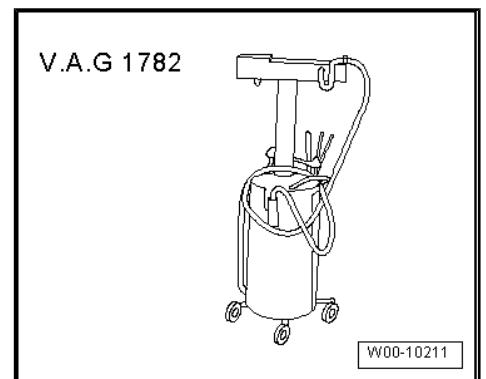
### 1.3 Removing and installing oil pump

**Special tools and workshop equipment required**

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

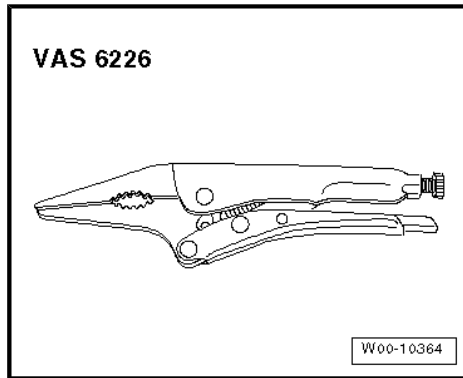


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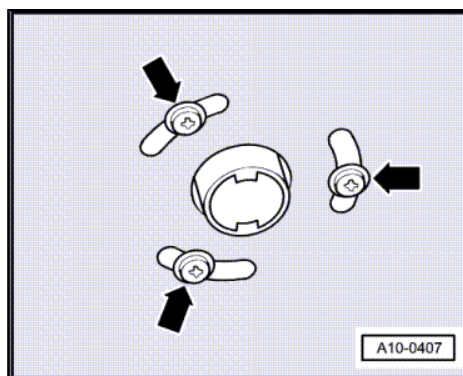


- ◆ Long-nose grip pliers -VAS 6226-

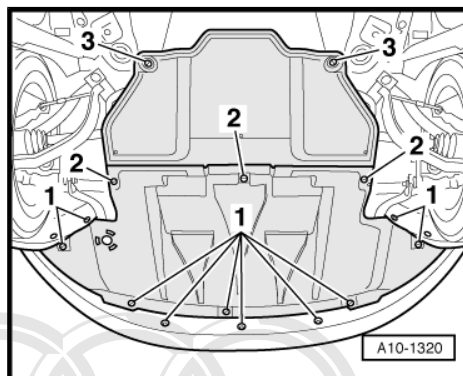


### Removing

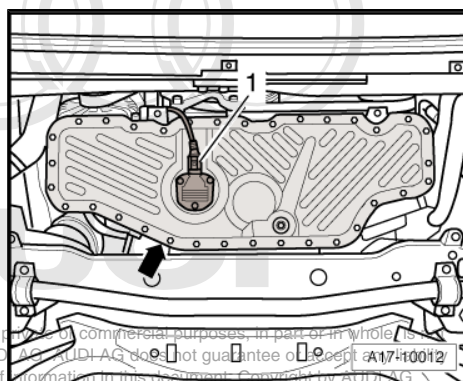
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.



- Release quick-release fasteners -1- and -2- and take off front noise insulation. Leave rear noise insulation in position.



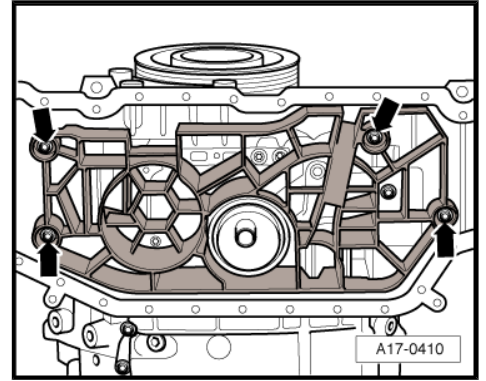
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.
- Unplug electrical connector at oil level and oil temperature sender -G266- -item 1-.
- Unbolt sump (bottom section) -arrow-.



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- Detach baffle plate -arrows-.

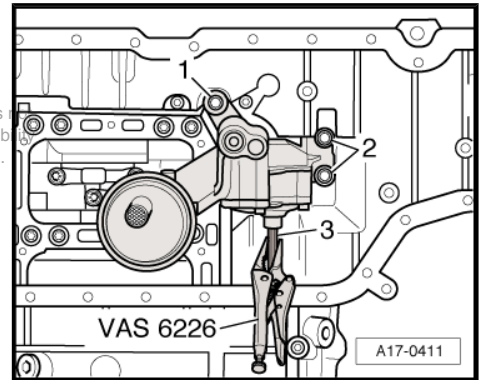


- Unscrew bolts -1- and -2-.
- Hold oil pump drive shaft -3- firmly with long-nose grip pliers - VAS 6226- and push shaft back against spring pressure.
- Take out oil pump.

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**i Note**

*Oil pump drive shaft remains in position.*



**Installing**

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

**i Note**

*Renew seals and O-rings.*

- Check that the two dowel sleeves are fitted in the oil pump; install if necessary.
- Install sump (bottom section) ⇒ [page 232](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .

**Tightening torques**

Component	Nm
Oil pump to sump (top section)	23
Baffle plate to sump (top section)	8 + 90° 1)2)
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) 90° = one quarter turn.</li> </ul>	

## 1.4 Sump (top section) - exploded view

### 1 - Sump (top section)

- ❑ Removing and installing  
⇒ [page 237](#)

### 2 - Torque reaction support

3 - 40 Nm

### 4 - 9 Nm

- ❑ Tighten in stages and in diagonal sequence

### 5 - Crankshaft oil seal (pulley end)

- ❑ Renewing ⇒ [page 106](#)

### 6 - Cover

7 - 23 Nm

### 8 - Idler roller for poly V-belt

- ❑ Note installation position

### 9 - Sealing flange (front)

- ❑ Removing and installing  
⇒ [page 108](#)

### 10 - O-ring

- ❑ Renew

### 11 - Sealing element

- ❑ 2x

### 12 - O-rings

- ❑ Renew

13 - 9 Nm

14 - 9 Nm

### 15 - Guide tube for oil dipstick

### 16 - Seal

- ❑ Renew

### 17 - Seal

- ❑ Renew

18 - 15 Nm

- ❑ Tighten in stages and in diagonal sequence

19 - 45 Nm

### 20 - Seal

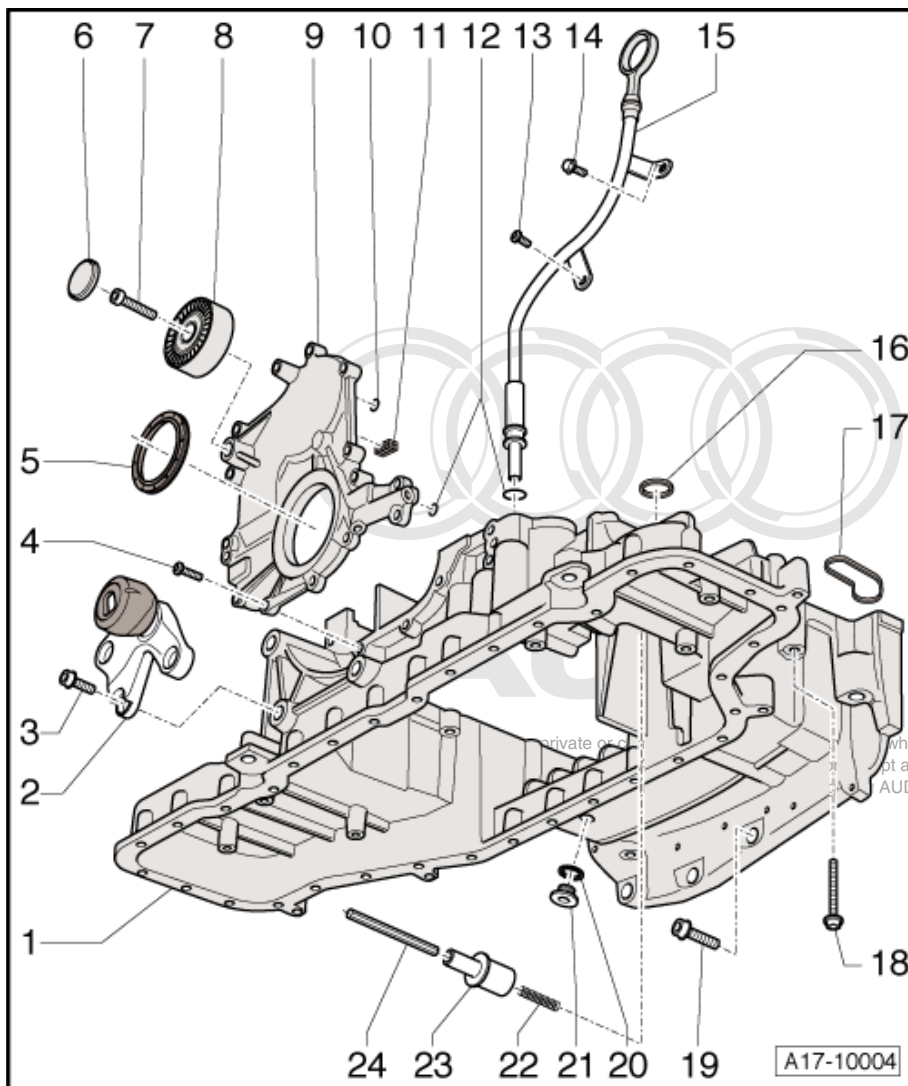
- ❑ Renew

### 21 - Plug for TDC drilling, 35 Nm

### 22 - Compression spring

### 23 - Coupling

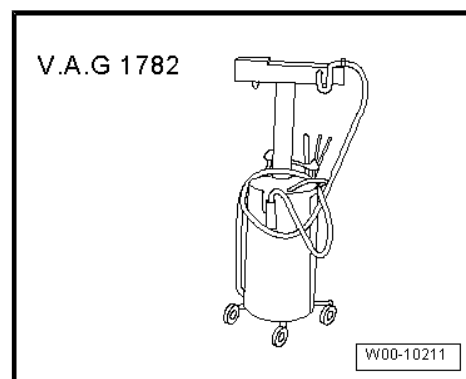
### 24 - Oil pump drive shaft



## 1.5 Removing and installing sump (top section)

### Special tools and workshop equipment required

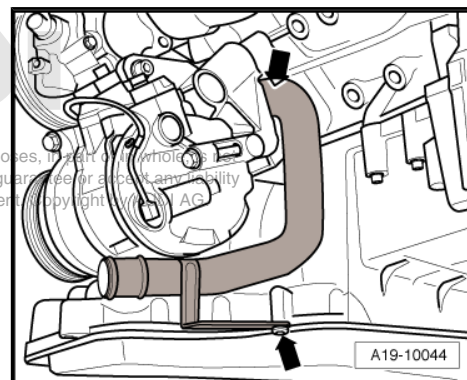
- ◆ Used oil collection and extraction unit -V.A.G 1782-



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

### Removing

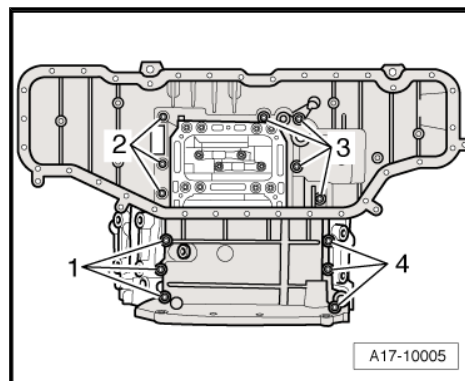
- Engine secured to engine and gearbox support ⇒ [page 92](#) .
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.
- Remove dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Remove flywheel (on a vehicle with multitronic gearbox) ⇒ [page 120](#) ).
- Remove drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Remove timing chain covers ⇒ [page 137](#) .
- Remove chain for oil pump and balance shaft ⇒ [page 166](#) .
- Remove sealing flange (front) ⇒ [page 108](#) .
- Remove sump (bottom section) ⇒ [page 230](#) .
- Remove oil pump ⇒ [page 233](#) .
- Remove bolts -arrows- and take off coolant pipe (left-side).



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- Remove bolts -1 ... 4- for sump (top section).
- Press sump (top section) off spring pins on cylinder block.



### Installing



#### Note

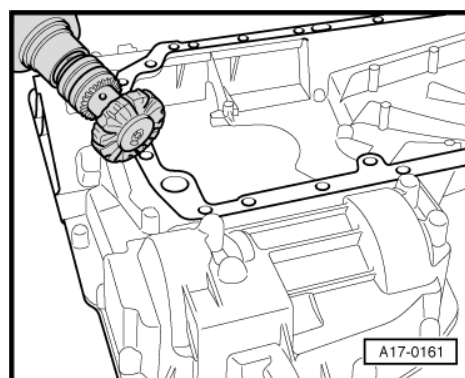
*Renew gaskets, seals and O-rings.*

- Remove old sealant from grooves on sump (top section) and from sealing surfaces.

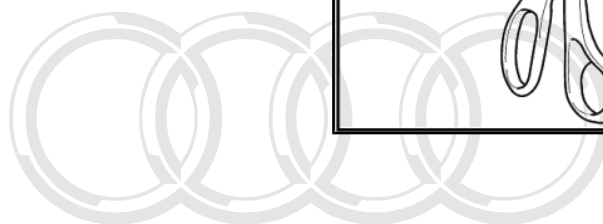
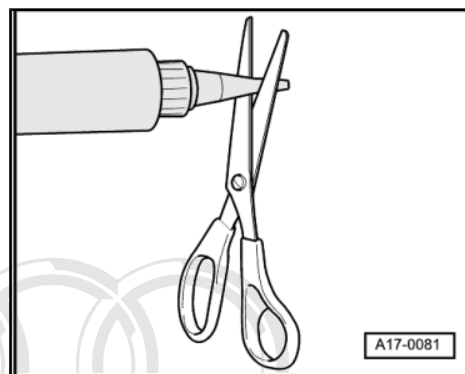


#### WARNING

*Wear safety goggles.*



- Remove sealant residue from sump (top section) and cylinder block with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.
- Cut off tube nozzle at front marking (diameter of nozzle approx. 2 mm).



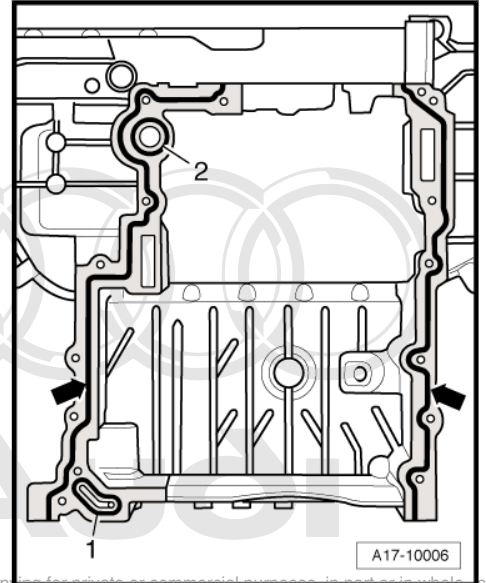
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- Install seals -1- and -2- in top section of sump.
- Apply beads of sealant -arrows- onto clean sealing surface of sump (top section) as illustrated.
- The grooves -arrows- on the sealing surfaces must be completely filled with sealant.
- The beads of sealant must project 1.5 ... 2.0 mm above the sealing surface.

**i Note**

- ◆ *The sealant beads must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ◆ *The sump (top section) must be installed within 5 minutes after applying sealant.*

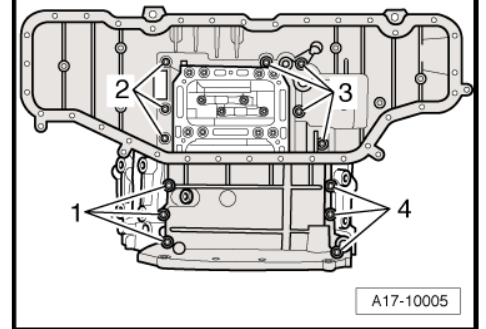


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- Fit sump (top section) and tighten bolts -1 ... 4- in diagonal sequence initially to 5 Nm.
- Tighten bolts -1 ... 4- in diagonal sequence to final torque.

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

- Install oil pump ⇒ [page 233](#) .
- Install sump (bottom section) ⇒ [page 232](#) .
- Install sealing flange (front) ⇒ [page 110](#) .
- Install chain for oil pump and balance shaft ⇒ [page 166](#)
- Install timing chain covers ⇒ [page 138](#) .
- Install dual-mass flywheel (vehicles with manual gearbox) ⇒ [page 115](#) .
- Install flywheel (on a vehicle with multitronic gearbox ⇒ [page 120](#) ).
- Install drive plate (vehicles with automatic gearbox) ⇒ [page 122](#) .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .



**Tightening torques**

Component	Nm
Sump (top section) to cylinder block	15
Coolant pipe to:	
Sump (top section)	9
Bracket for air conditioner compressor	9

## 1.6 Engine oil cooler, pressure control valve and oil filter housing - exploded view

### 1 - Mounting plate

- For engine oil cooler, pressure control valve of crankcase breather system, oil filter housing
- Removing and installing ⇒ [page 247](#)

### 2 - 9 Nm

### 3 - Seal

- Renew

### 4 - Oil pressure switch - F1-, 0.9 bar

- Grey insulation
- Checking ⇒ [page 250](#)
- Removing and installing ⇒ [page 248](#)
- Tighten to 20 Nm

### 5 - O-rings

- Renew

### 6 - Seal

- Renew

### 7 - O-ring

- Renew

### 8 - 9 Nm

### 9 - Oil supply line

- To turbocharger

### 10 - O-ring

- Renew

### 11 - Oil filter element

- Removing and installing ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805

### 12 - Seal

- Renew

### 13 - Sealing cap, 35 Nm

### 14 - 9 Nm

### 15 - Retaining clip

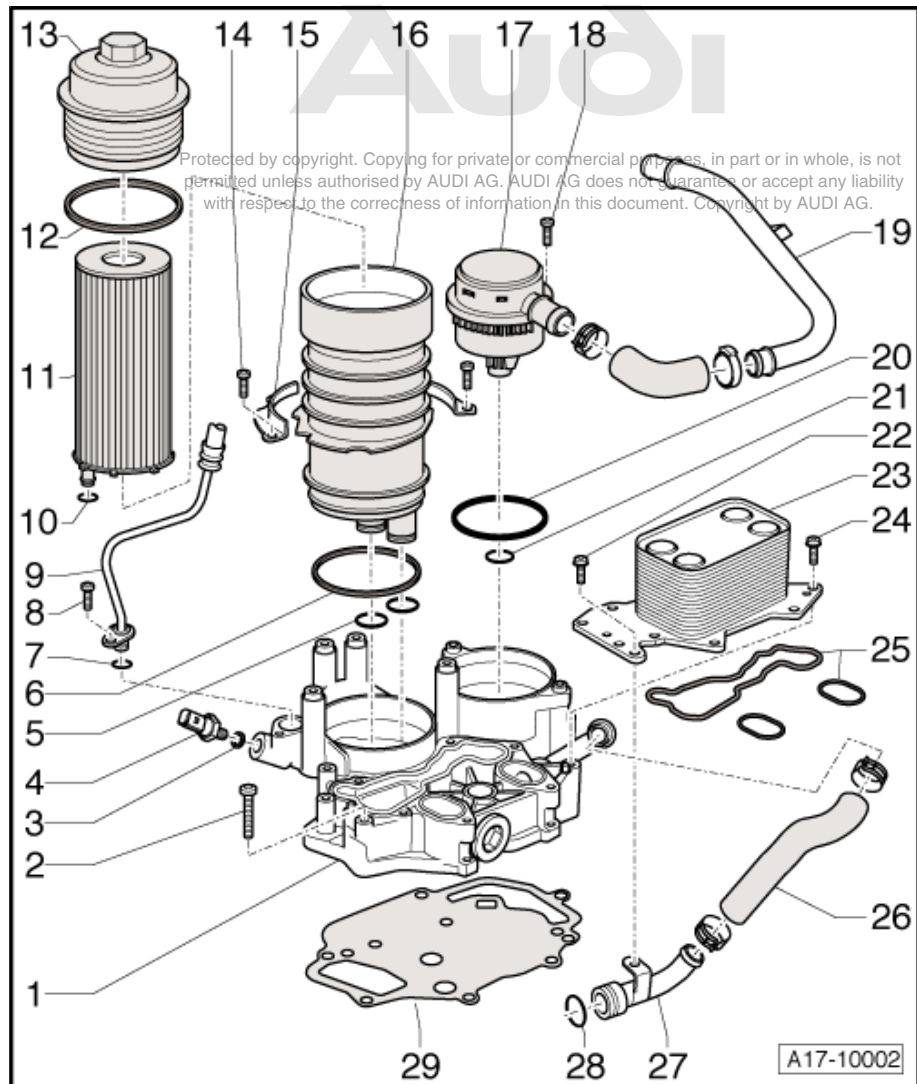
- For oil filter housing

### 16 - Oil filter housing

- Removing and installing ⇒ [page 243](#)
- With oil filter bypass valve, 2.0 ... 3.0 bar (pressure differential upstream/downstream of filter)

### 17 - Pressure control valve for crankcase breather system

- Removing and installing ⇒ [page 246](#)



18 - 9 Nm

19 - Crankcase breather pipe

20 - O-ring

- Renew

21 - O-ring

- Renew

22 - 9 Nm

23 - Engine oil cooler

- See note ⇒ [page 229](#)
- Removing and installing ⇒ [page 241](#)
- With oil cooler bypass valve, 2.0 ... 3.0 bar (pressure differential upstream/downstream of engine oil cooler)

24 - 9 Nm

25 - Seals

- Renew

26 - Coolant hose

27 - Coolant pipe (front)

28 - O-ring

- Renew

29 - Gasket

- Renew

## 1.7 Removing and installing engine oil cooler

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### Removing

- Drain off coolant ⇒ [page 253](#) .
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Remove high-pressure pump ⇒ Rep. gr. 23 .
- Remove exhaust gas recirculation cooler ⇒ [page 376](#) .



- Spread out rags round engine oil cooler to catch escaping oil.
- Remove bolts -1 ... 4- and detach engine oil cooler.

### Installing

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



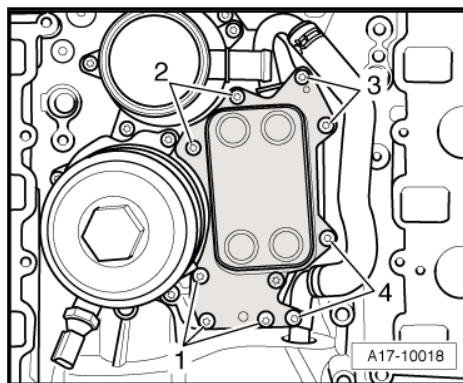
### Note

*Renew seals and O-ring for top coolant pipe.*

- Install exhaust gas recirculation cooler ⇒ [page 376](#) .
- Install high-pressure pump ⇒ Rep. gr. 23 .
- Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Install bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .
- Fill cooling system ⇒ [page 255](#) .

### Tightening torques

Component	Nm
Engine oil cooler to mounting plate	9
Coolant pipe (top) to engine oil cooler	9



# Audi

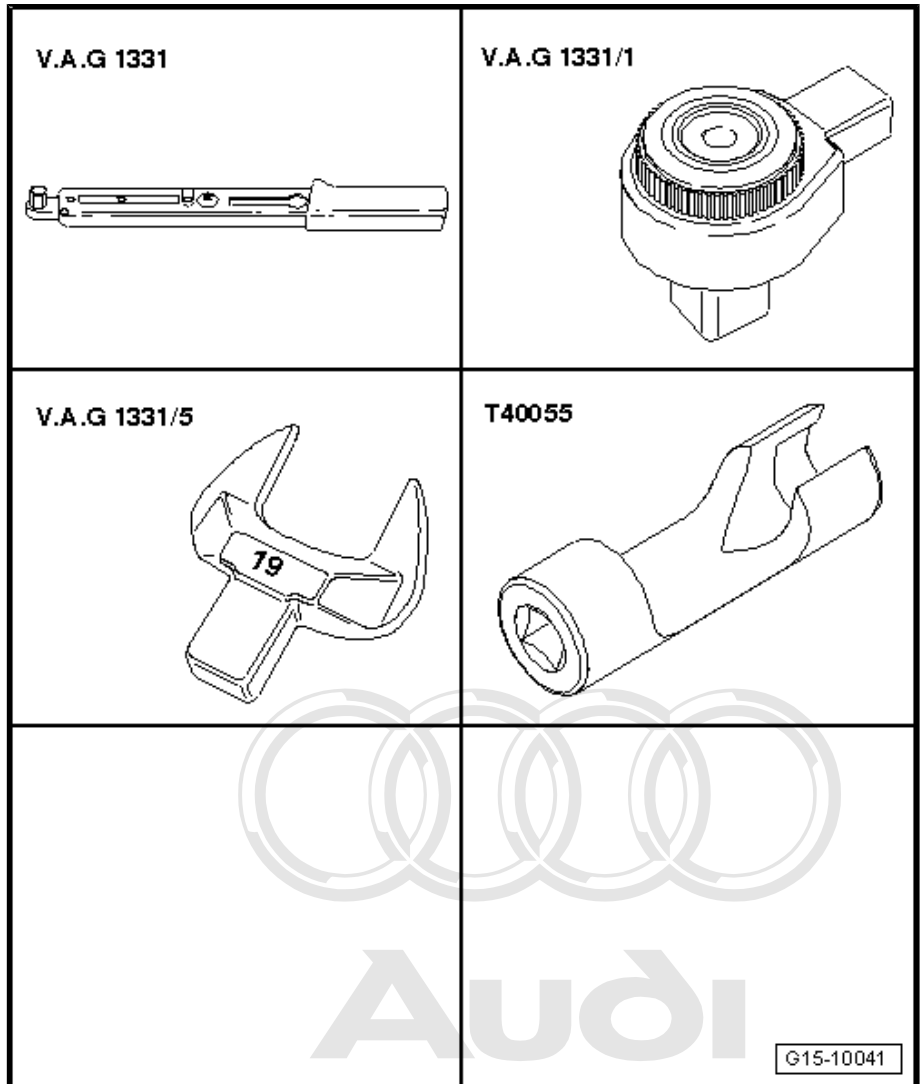
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## 1.8 Removing and installing oil filter housing

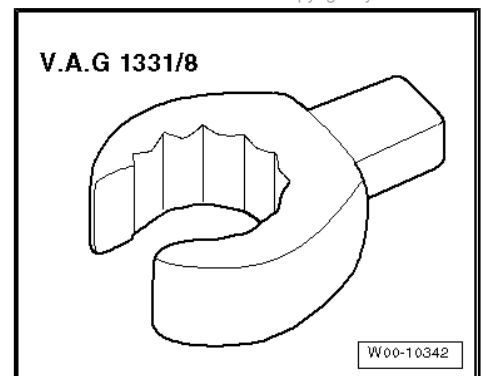
### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-
- ◆ Ratchet -V.A.G 1331/1-
- ◆ Tool insert, AF 19 -V.A.G 1331/5- for vehicles from 09.2005 onwards
- ◆ Socket -T40055- for vehicles from 09.2005 onwards



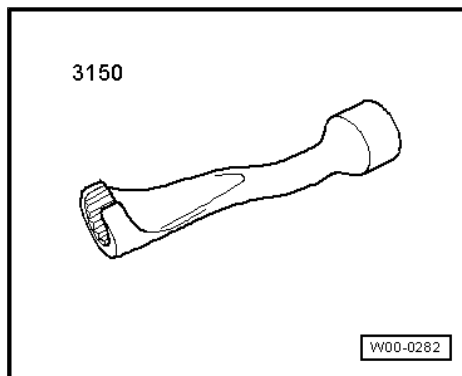
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- ◆ Socket insert AF 14, flared ring spanner -V.A.G 1331/8- for vehicles up to 09.2005



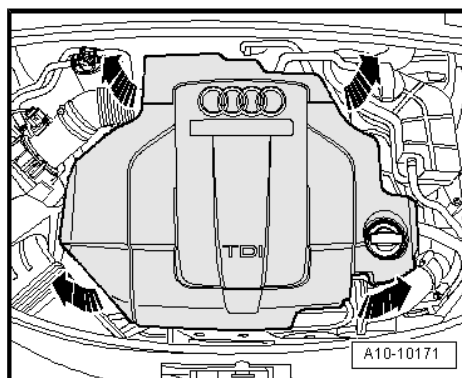


- ◆ Socket, 14 mm -3150- for vehicles up to 09.2005



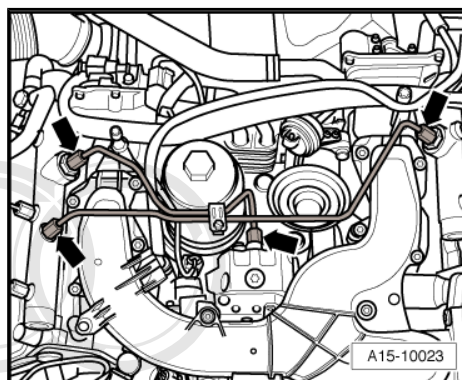
### Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



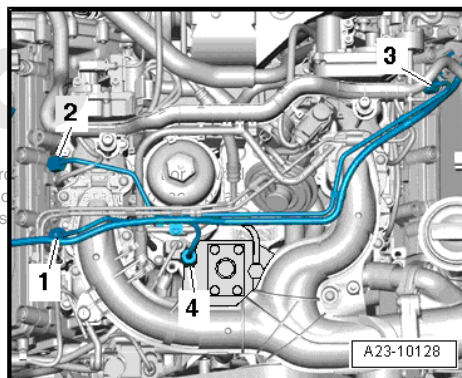
### Vehicles up to 09.2005:

- Unscrew union nuts -arrows- and detach high-pressure pipes.



### Vehicles from 09.2005 onwards:

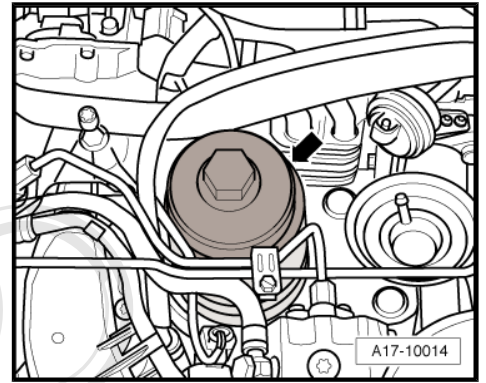
- Unscrew union nuts -1 ... 4- and detach high-pressure pipes.



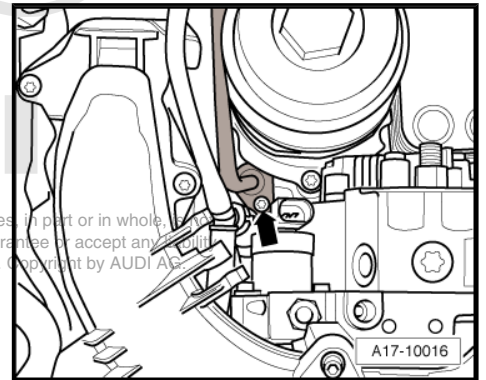
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**All vehicles (continued):**

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Loosen sealing cap -arrow- using 32 mm socket. Take off sealing cap together with oil filter element.
- Pull oil filter element off sealing cap.

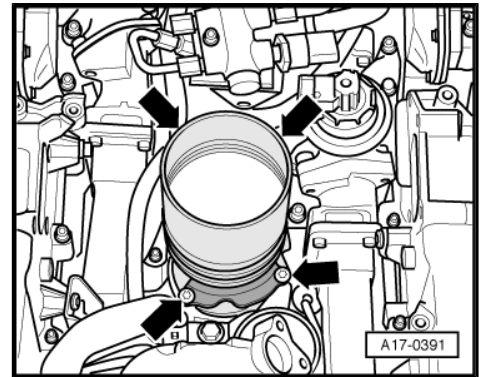


- Disconnect oil supply line -arrow- from mounting plate.



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- Unbolt retaining clip -arrows-.
- Spread out rags round oil filter housing to catch escaping oil.
- Pull out oil filter housing.



**Installing**

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

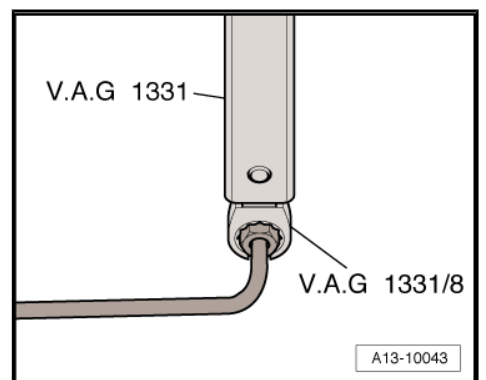


*Renew gaskets, seals and O-rings.*

- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.

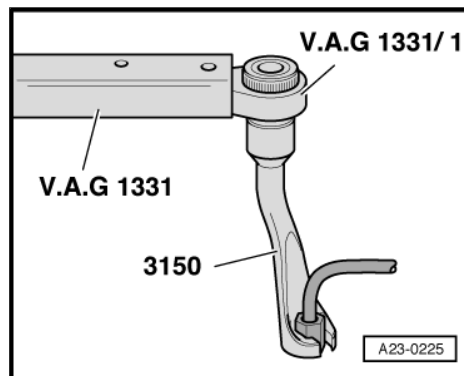
**Vehicles up to 09.2005:**

- To tighten union of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with socket insert AF 14, flared ring spanner -V.A.G 1331/8- .



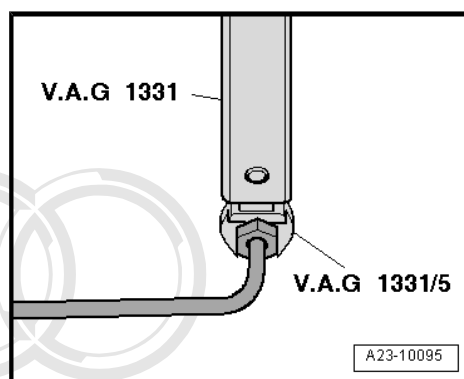


- To tighten unions of high-pressure pipes to fuel rails, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket (14 mm) -3150- .



**Vehicles from 09.2005 onwards:**

- To tighten unions of high-pressure pipes to fuel rails, use torque wrench -V.A.G 1331- and tool insert (AF 19) -V.A.G 1331/5- .



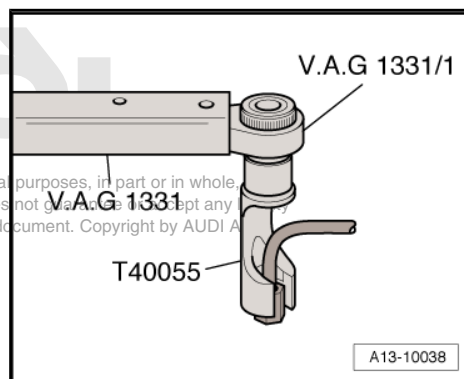
- To tighten union of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket -T40055- , 17 mm.

**All vehicles (continued):**

- Check fuel system for leaks ⇒ [page 5](#) .

**Tightening torques**

Component	Nm
Oil filter housing to mounting plate	9
Oil supply line to mounting plate	9
Sealing cap on oil filter housing	35
High-pressure pipes	25



**1.9 Removing and installing pressure control valve for crankcase breather system**

**Removing**

- Drain off coolant ⇒ [page 253](#) .
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Remove coolant pipe (rear) ⇒ [page 276](#) .
- Remove exhaust gas recirculation cooler ⇒ [page 376](#) .

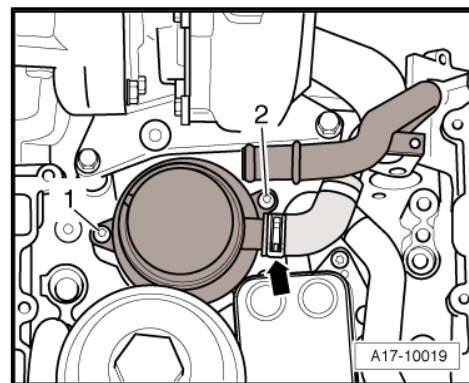
- Detach hose -arrow- from pressure control valve for crankcase breather system.
- Remove bolts -1- and -2-.
- Take out pressure control valve for crankcase breather system.

### Installing

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

#### Note

- ◆ *Renew O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Install exhaust gas recirculation cooler ⇒ [page 376](#) .
- Install coolant pipe (rear) ⇒ [page 276](#) .
- Install bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Fill cooling system ⇒ [page 255](#) .



### Tightening torque

Component	Nm
Pressure control valve for crankcase breather system to mounting plate	9

## 1.10 Removing and installing mounting plate for engine oil cooler, pressure control valve and oil filter housing

### Removing

- Drain off coolant ⇒ [page 253](#) .
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Remove coolant pipe (rear) ⇒ [page 276](#) .
- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Remove high-pressure pump ⇒ Rep. gr. 23 .
- Remove exhaust gas recirculation cooler ⇒ [page 376](#) .

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- Remove bolts -1 ... 8-
- Take out mounting plate with engine oil cooler, pressure control valve and oil filter housing.

### Installing

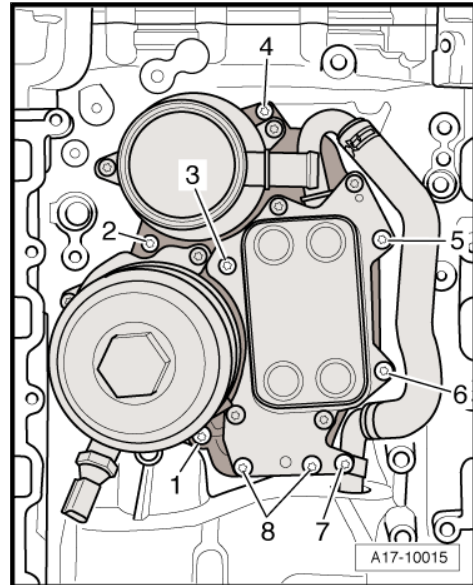
Installation is carried out in the reverse order; note the following:



### Note

*Renew gaskets, seals and O-rings.*

- Tighten bolts securing mounting plate from the inside outwards.
- Install exhaust gas recirculation cooler ⇒ [page 376](#) .
- Install high-pressure pump ⇒ Rep. gr. 23 .
- Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Install coolant pipe (rear) ⇒ [page 276](#) .
- Install bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805 .
- Fill cooling system ⇒ [page 255](#) .



### Tightening torque

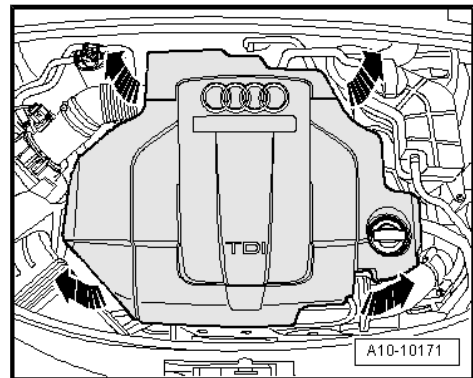
Component	Nm
Mounting plate to cylinder block	9

## 1.11 Removing and installing oil pressure switch -F1-

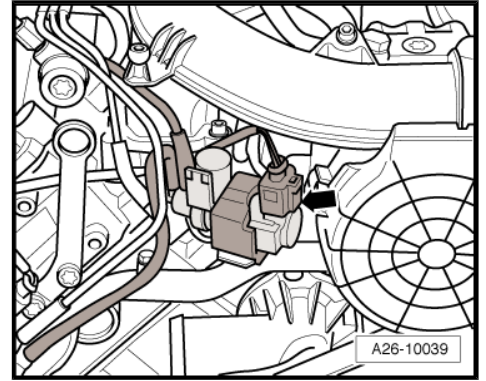
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### Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Detach exhaust gas recirculation valve -N18- -arrow- from re-  
tainer.



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

### Installing

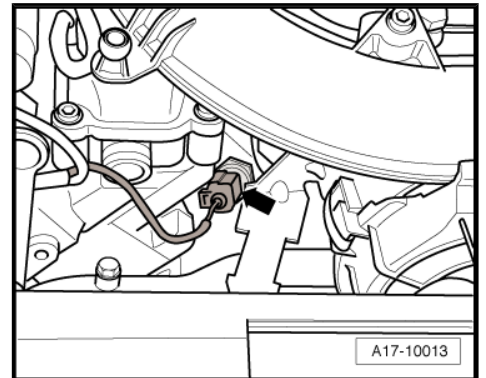
Installation is carried out in the reverse order; note the following:



*Renew seal.*

### Tightening torque

Component	Nm
Oil pressure switch -F1- to engine	20



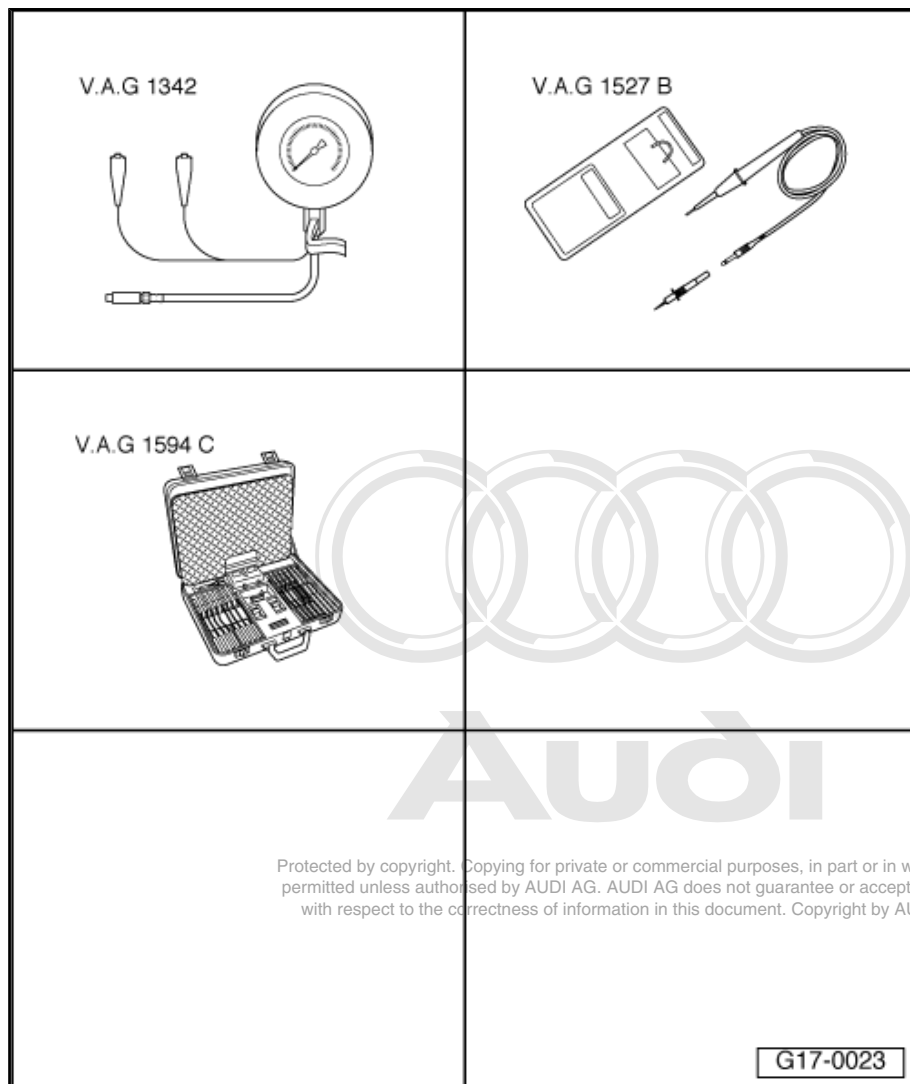
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## 1.12 Checking oil pressure

### 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 248](#) .
- Connect oil pressure tester -V.A.G 1342- to threaded hole for oil pressure switch.



- Screw oil pressure switch -2- into oil pressure tester - V.A.G 1342- .

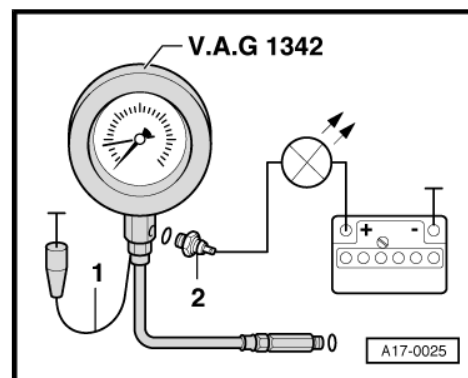
#### Checking oil pressure switch

- Connect brown wire -1- of oil pressure tester to earth (-).
- Connect voltage tester -V.A.G 1527B- with test leads from auxiliary measuring set -V.A.G 1594C- to oil pressure switch and battery positive (+).

- LED should not light up.

If LED lights up now:

- Renew oil pressure switch.
- Start engine.



#### Note

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

- LED should light up at 0.7 ... 1.1 bar.

If LED does not light up:

- Renew oil pressure switch.

#### Checking oil pressure

- Start engine.
- Minimum oil pressure at idling speed: 1.8 bar
- Minimum oil pressure at 2000 rpm: 4.0 bar

#### Assembling

- Install oil pressure switch -F1- ⇒ [page 248](#) .

### 1.13 Engine oil

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

### 1.14 Checking oil level

⇒ Maintenance ; Booklet 803 or ⇒ Maintenance ; Booklet 805

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## 19 – Cooling

### 1 Cooling system



#### WARNING

*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*



#### Note

- ◆ *The cooling system is under pressure when the engine is hot. If necessary, relieve pressure before commencing repair work.*
- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *The arrow markings on coolant pipes and on ends of hoses must align.*
- ◆ *The hose clips must be positioned at the white markings on the coolant hoses.*



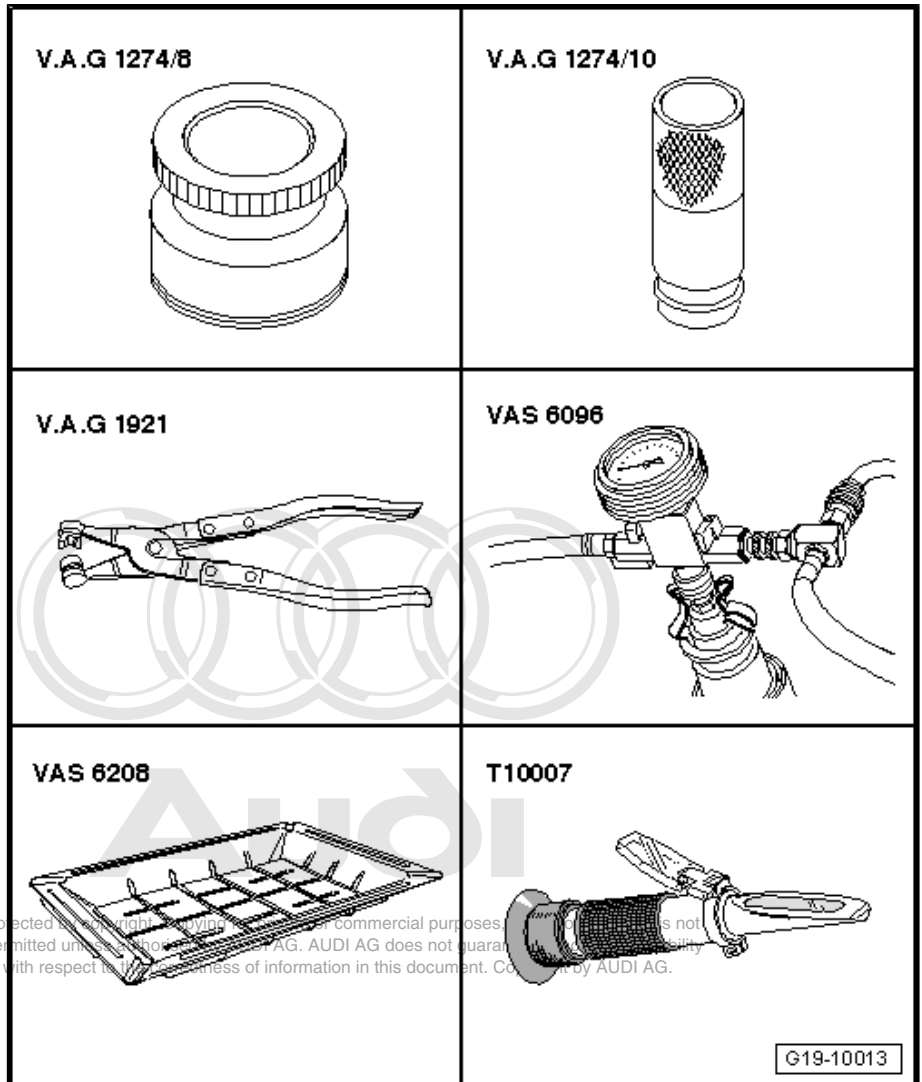
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## 1.1 Draining and filling cooling system

### Special tools and workshop equipment required

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



### Draining



#### Note

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



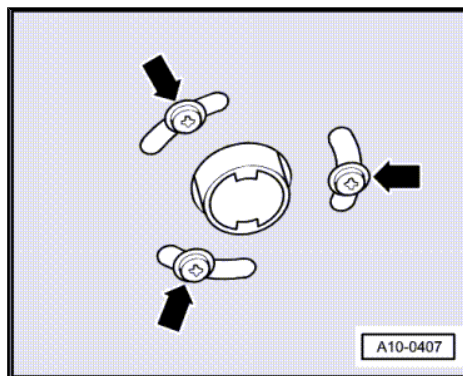
#### WARNING

*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*

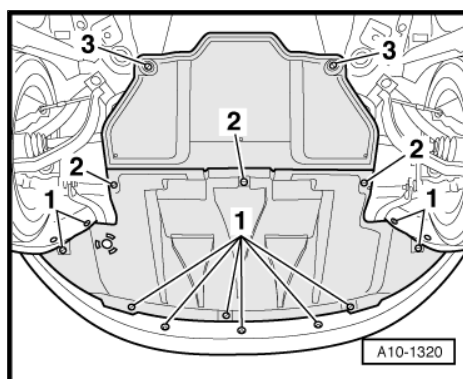
- Open filler cap on coolant expansion tank.



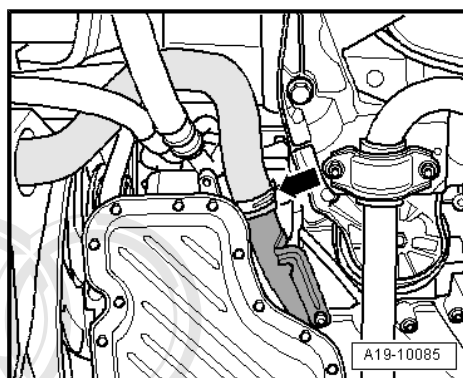
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.



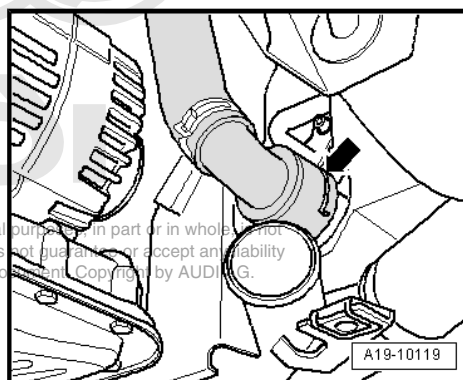
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



- Detach coolant hose (bottom right) from radiator -arrow-.



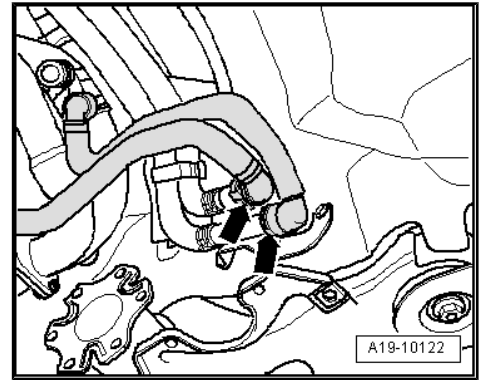
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- Disconnect coolant hoses -arrows- behind engine (right-side) and drain off remaining coolant.

### Filling

#### Note

- ◆ *The cooling system is filled all year round with a mixture of water and coolant additive. Mixture ratio ⇒ [page 255](#)*
- ◆ *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 255](#) 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  $-25^{\circ}\text{C}$  (in countries with arctic climate: down to about  $-35^{\circ}\text{C}$ ).*
- ◆ *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 for reasons of climate, the coolant concentration can be increased up to a maximum of 60% (this gives frost protection down to about  $-40^{\circ}\text{C}$ ). Otherwise frost protection decreases again and cooling efficiency also becomes worse.*
- ◆ *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

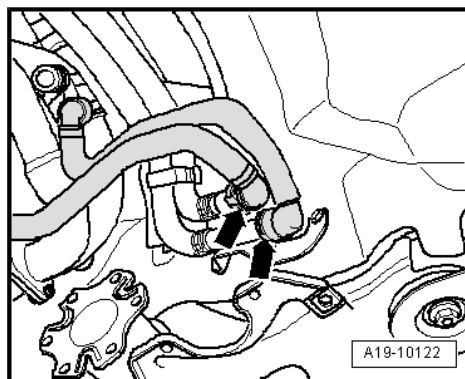
- Coolant (40 %) and water (60 %) for frost protection to  $-25^{\circ}\text{C}$
- Coolant (50 %) and water (50 %) for frost protection to  $-35^{\circ}\text{C}$
- Coolant (60 %) and water (40 %) for frost protection to  $-40^{\circ}\text{C}$
- ◆ Coolant ⇒ [Electronic parts catalogue](#)

#### Note

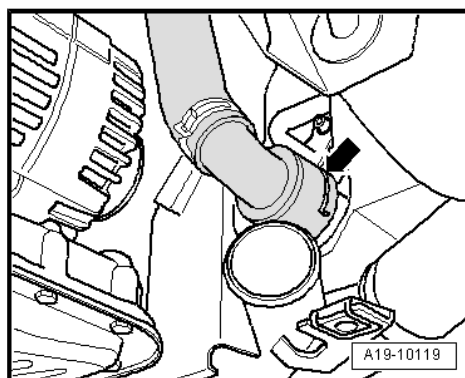
*Shown in illustration with gearbox removed.*



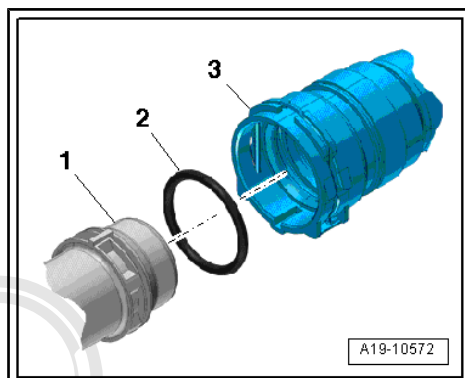
- Connect coolant hoses -arrows- with plug-in connector to coolant pipes (rear right).



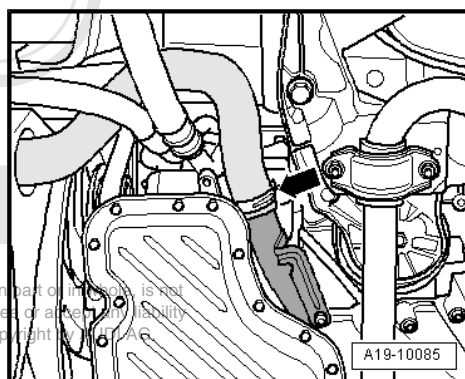
- Connect coolant hose -arrow- with plug-in connector to radiator.



- Always remove old O-ring -2- from coolant hose -3-.
- Lubricate new O-ring with coolant additive and fit O-ring in coolant hose.
- Press coolant hose onto radiator -1- or coolant pipe until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

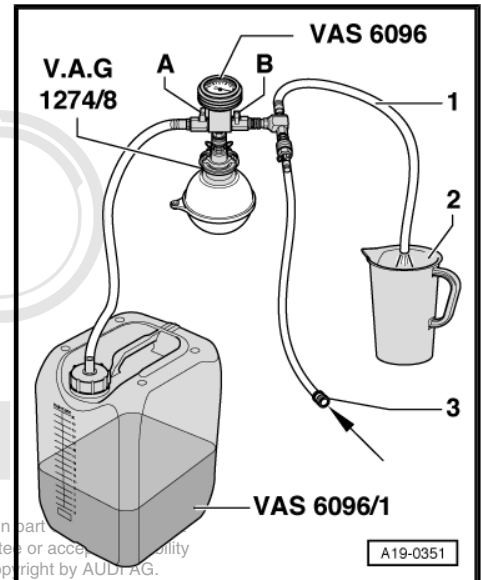


- Connect coolant hose -arrow- at coolant pipe (left-side).



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- Fill reservoir of -VAS 6096- with at least 12 litres of premixed coolant (according to recommended ratio):
- Screw adapter -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-. (The vented air draws along a small amount of coolant, which should be collected.)
- Close the two valves -A- and -B- by setting lever at right angle to direction of flow.
- Connect hose -3- to compressed air.
- Pressure: 6 ... 10 bar.

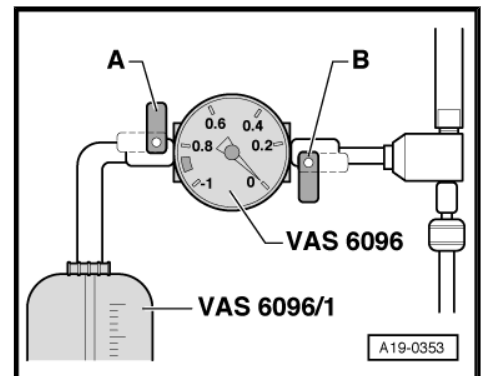


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- Open valve -B- by setting lever in direction of flow.

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

- The needle on the gauge should move into the green zone.
- Also briefly open valve -A- (turn lever in direction of flow) so that hose on charge unit reservoir -VAS 6096- can fill with coolant.
- Close valve -A- again.
- Leave valve -B- open for another 2 minutes.
- The suction jet pump will continue generating a vacuum in the cooling system.
- The needle on the gauge should remain in the green zone.
- Close valve -B-.
- The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.



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

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

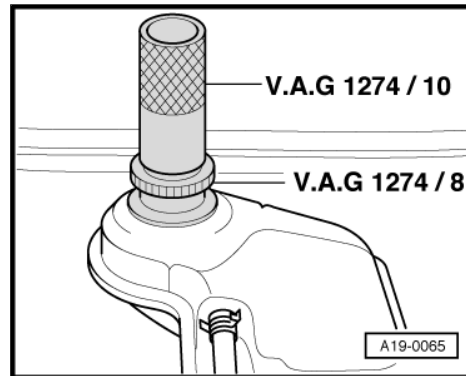
- Detach compressed air hose.
- Open valve -A-.

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

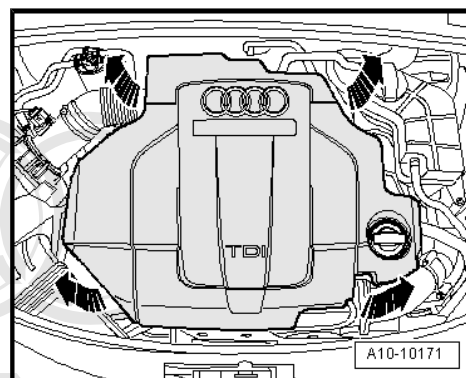
- Detach cooling system charge unit -VAS 6096- from expansion tank.



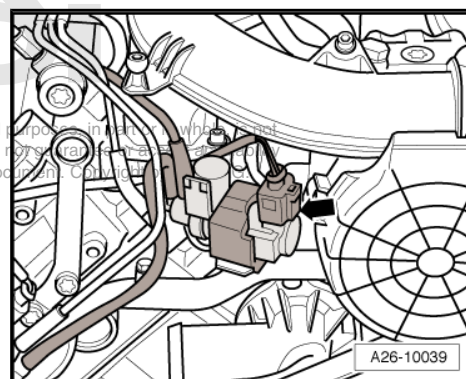
- Fit pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .



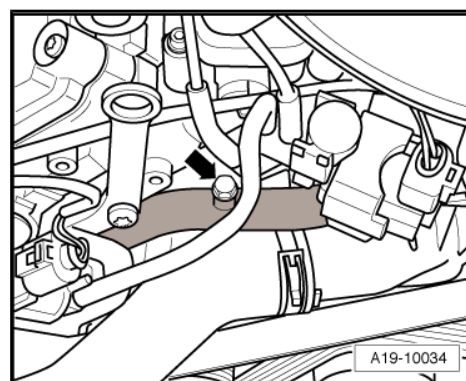
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Detach exhaust gas recirculation valve -N18- -arrow- from retainer.



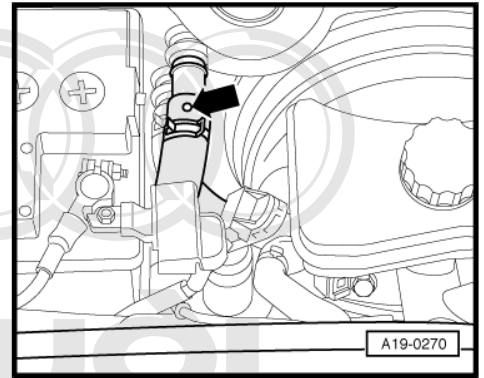
- Unscrew bleeder screw -arrow- at front of engine.
- Fill up with coolant until it comes out at bleeder hole with no air bubbles.
- Close the bleeder screw.



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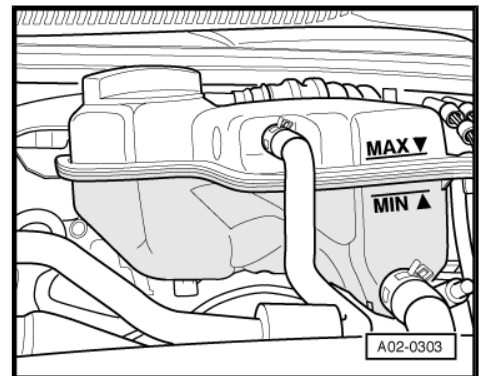
- Loosen coolant hose going to heat exchanger and pull back hose until bleeder hole in hose -arrow- is no longer blocked by the connection.
- Fill up with coolant until it flows out at bleeder hole in coolant hose.
- Push coolant hose onto connection and secure with hose clip.
- On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
- Tighten filler cap on expansion tank.
- Start engine.
- Set temperature to „HI“.
- Switch off air conditioner compressor (press **ECON** button).
- Run the engine for 3 minutes at 2000 rpm.
- Allow the engine to run at idling speed until the two large coolant hoses at main radiator become warm.
- Run the engine for 1 minute at 2000 rpm.
- Switch off ignition and allow engine to cool down.
- Check coolant level.
  - The coolant level must be at the MAX marking when the engine is cold.
  - The coolant level can be above the MAX marking when the engine is warm.



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**Tightening torque**

Component	Nm
Bleeder screw to coolant pipe	8



## 1.2 Coolant pump and thermostat - exploded view

1 - 23 Nm

2 - 9 Nm

3 - Coolant hose

- To radiator (bottom right)

4 - Hose connection with thermostat

- Removing and installing  
⇒ [page 262](#)

5 - Seal

- Renew

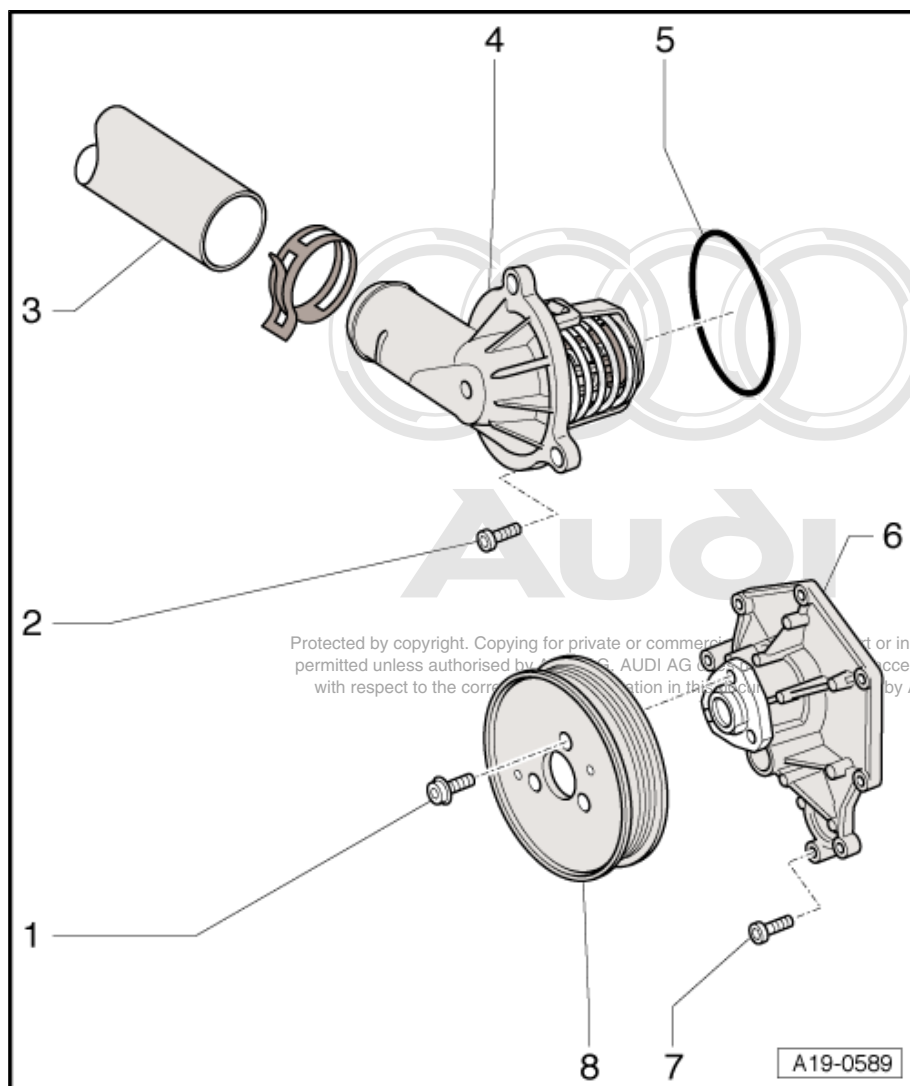
6 - Coolant pump

- Removing and installing  
⇒ [page 260](#)

7 - 9 Nm

8 - Poly V-belt pulley for coolant pump

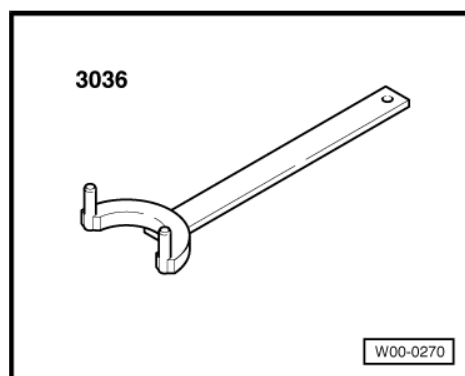
- Installation position:  
marking „vorne“ (front)  
faces in direction of travel.



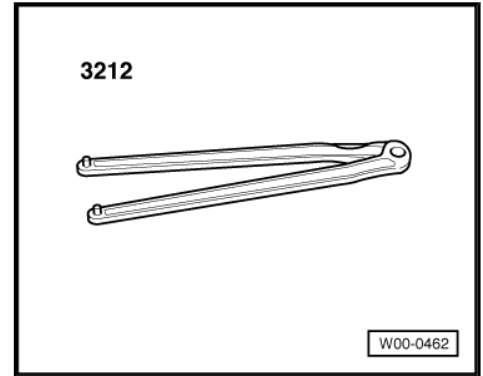
## 1.3 Removing and installing coolant pump

Special tools and workshop equipment required

- ◆ Counterhold tool -3036-

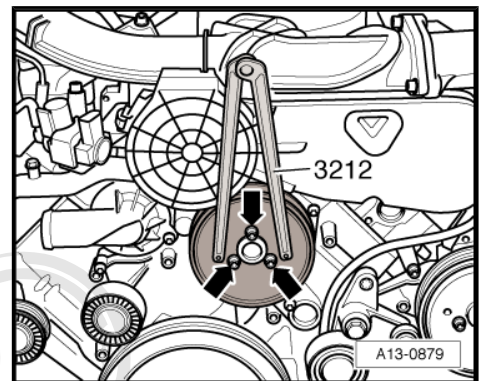
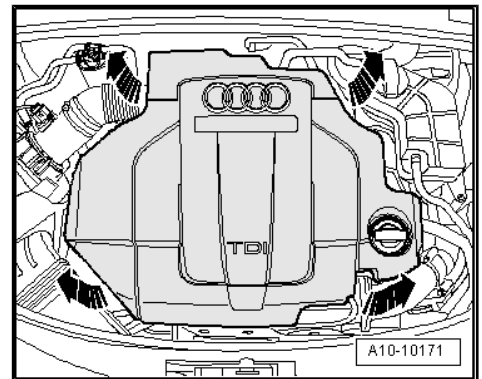


◆ Pin wrench -3212-



**Removing**

- Drain off coolant ⇒ [page 253](#) .
  - Move lock carrier to service position ⇒ [page 95](#) .
  - Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
  - Remove poly V-belt ⇒ [page 101](#) .
- 
- Unbolt coolant pump pulley -arrows- (counterhold with pin wrench -3212- ).



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- Unscrew bolts and take out coolant pump -arrow-

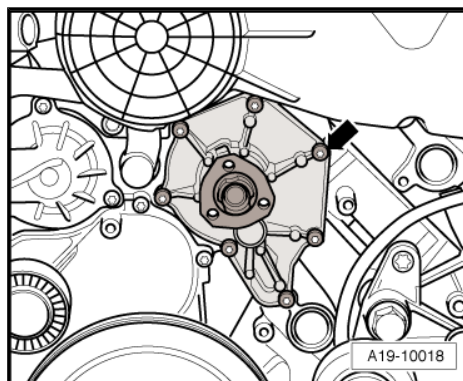
### Installing

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



#### Note

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*



- Clean sealing surface.
- Install poly V-belt ⇒ [page 101](#) .
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .
- Fill cooling system ⇒ [page 255](#) .

### Tightening torques

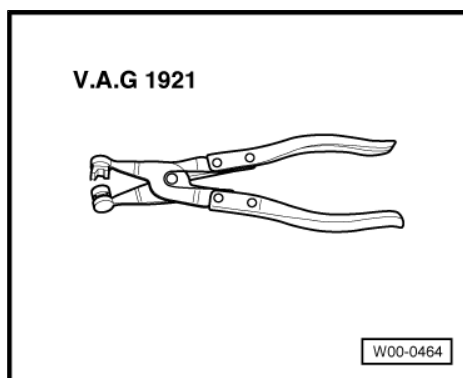
Component	Nm	
Coolant pump to cylinder block	9	
Poly V-belt pulley to coolant pump	23	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

## 1.4 Removing and installing hose connection with thermostat

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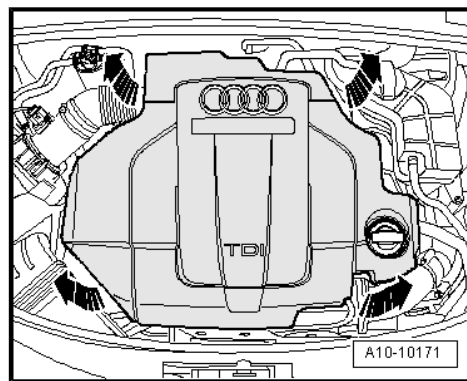
### Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-



## Removing

- Drain off coolant ⇒ [page 253](#) .
- Move lock carrier to service position ⇒ [page 95](#) .
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
- Remove poly V-belt ⇒ [page 101](#) .



- Disconnect coolant hose -1-.
- Unscrew bolts -arrows- and take out hose connection with thermostat.

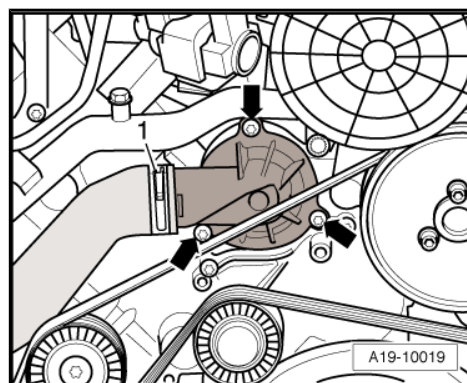
## Installing

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



### Note

- ◆ *Renew O-ring.*
  - ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- Clean sealing surface.
  - Install poly V-belt ⇒ [page 101](#) .
  - Install lock carrier with attachments ⇒ Rep. gr. 50 .
  - Install bumper cover (front) ⇒ Rep. gr. 63 .
  - Fill cooling system ⇒ [page 255](#) .



## Tightening torques

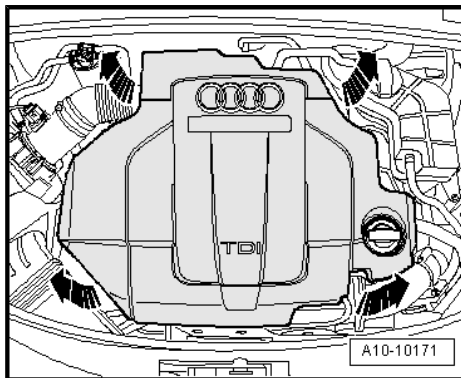
Component	Nm	
Hose connection with thermostat to engine	9	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

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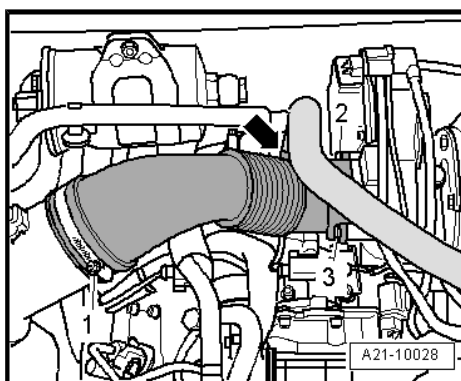
## 1.5 Removing and installing coolant temperature sender -G62-

### Removing

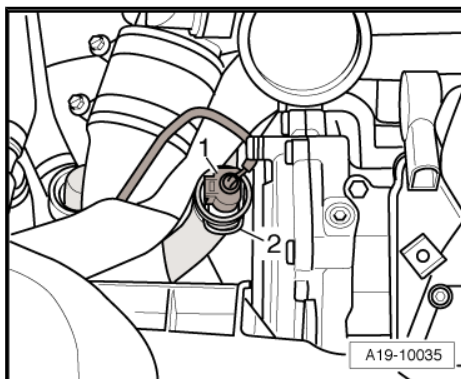
- Drain off coolant ⇒ [page 253](#) .
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Release hose clip -1- and detach air pipe at air mass meter -G70- and at turbocharger.



- Unplug electrical connector -1- at coolant temperature sender -G62- .
- Detach retaining clip -2- and remove coolant temperature sender -G62- .



### Installing

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

#### Note

- ◆ *Renew O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

- Fill cooling system ⇒ [page 255](#) .

### Tightening torque

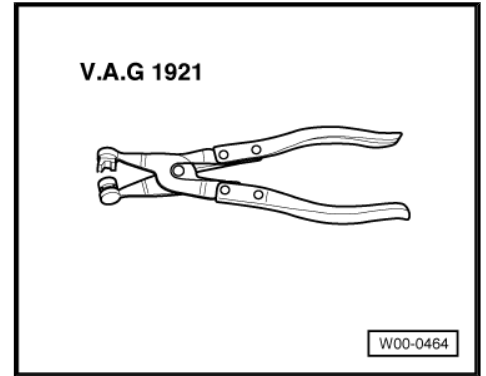
Component	Nm
Air pipe to turbocharger	9

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## 1.6 Removing and installing coolant pipe (front)

Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-



### Removing

- Drain off coolant ⇒ [page 253](#) .
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left-side) ⇒ Rep. gr. 23 .
- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Remove high-pressure pump ⇒ Rep. gr. 23 .
- Remove mechanical exhaust gas recirculation valve ⇒ [page 376](#) .
- Disconnect coolant hose -arrow-.
- Unscrew bolt -1- and pull coolant pipe (top) out of cylinder block.

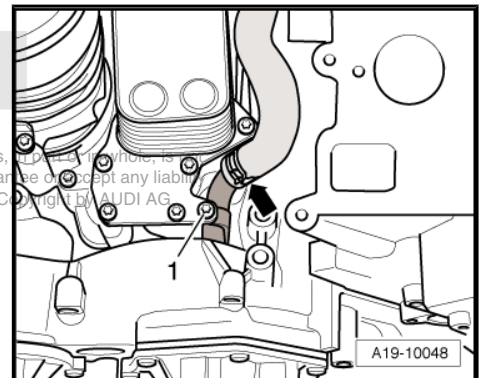
### Installing

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



#### Note

- ◆ *Renew O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Before installing, clean and smoothen sealing surface for O-ring.
- Lubricate new O-ring with »G12+« and slide onto coolant pipe.
- Install mechanical exhaust gas recirculation valve ⇒ [page 376](#) .
- Install high-pressure pump ⇒ Rep. gr. 23 .
- Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Install bottom section of intake manifold (left-side) ⇒ Rep. gr. 23 .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Fill cooling system ⇒ [page 255](#) .



### Tightening torque

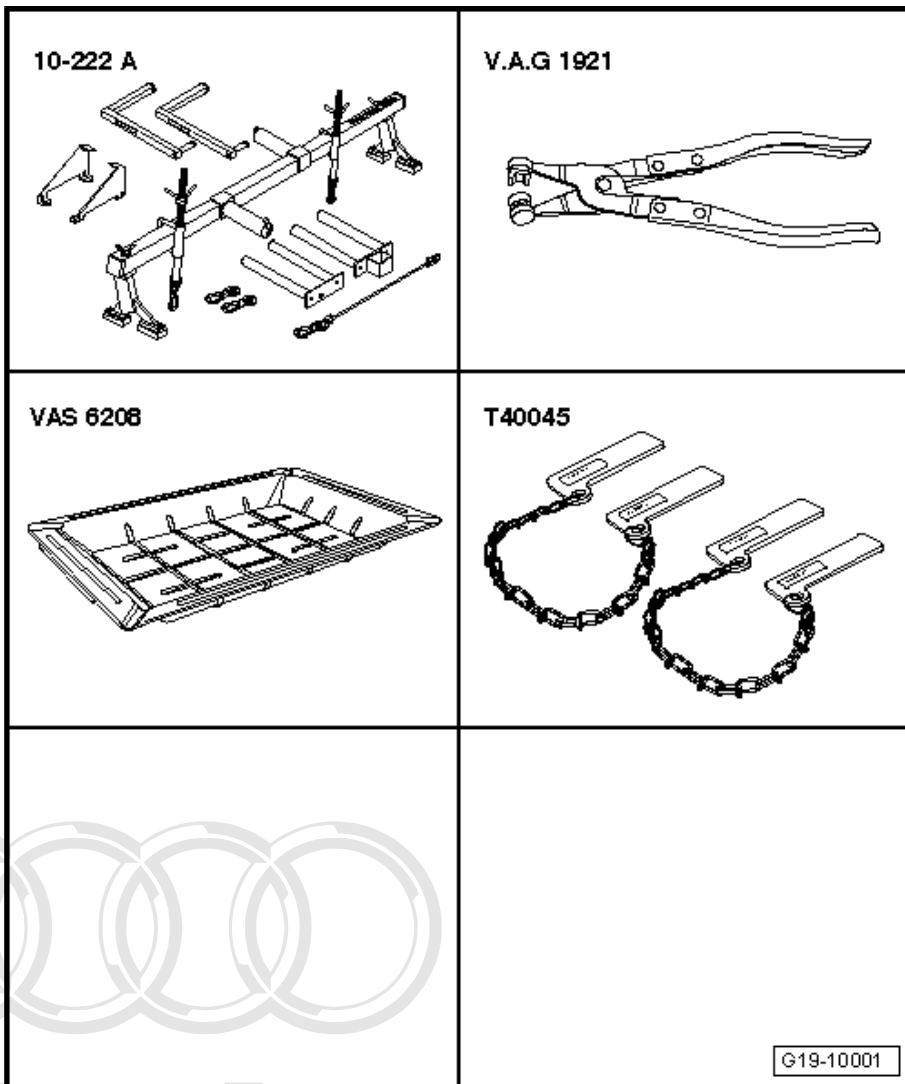
Component	Nm
Front coolant pipe to engine oil cooler	9



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

#### Special tools and workshop equipment required

- ◆ Support bracket -10 - 222 A-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Drip tray for workshop hoist -VAS 6208-
- ◆ Mud wing compensation plate -T40045-



#### Removing

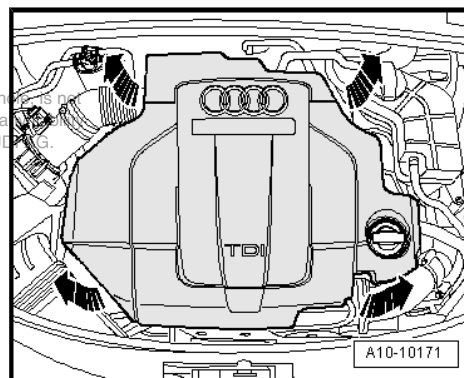


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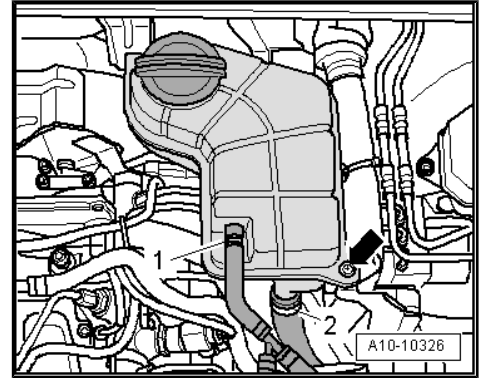
*All cable ties which are released or cut open when removing must be fitted in the same position when installing.*

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

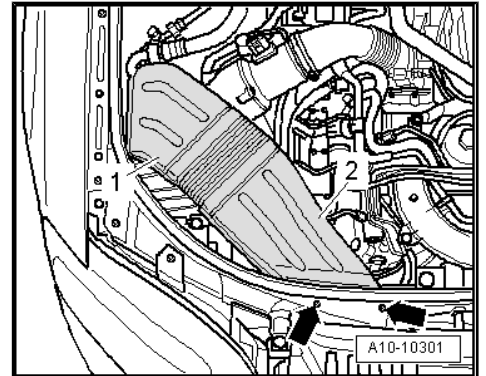




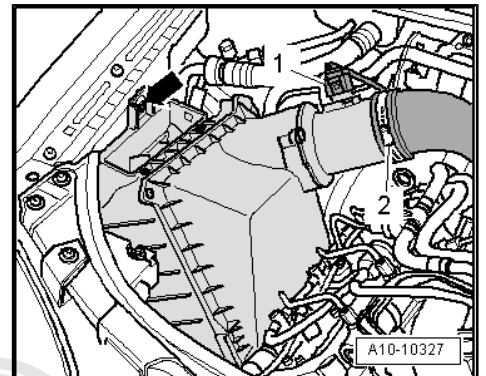
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.



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



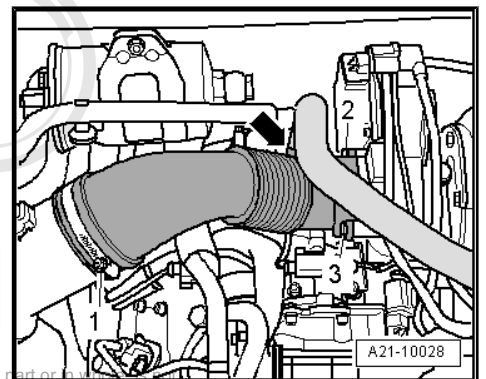
- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake pipe -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Disconnect air pipe from turbocharger.

 **Note**

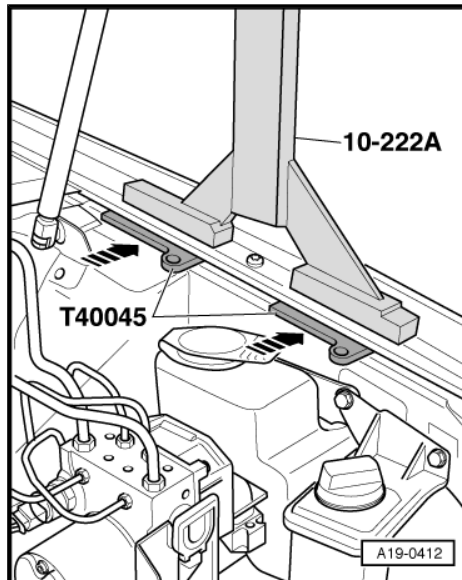
*Disregard -item 1-.*



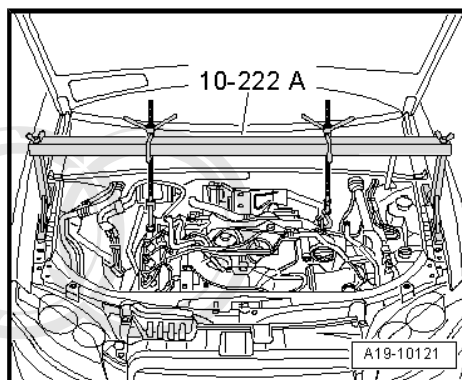
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- Detach rubber seals from edges of wing mounting flanges.
- Place compensation plates -10 - 222 A- on both sides between the wing mounting flange and the body flange underneath, so that the support bracket -T40045- does not damage the edges of the wings.
- Set up support bracket -10 - 222 A- on bolted flanges of wing panels. Spindles are located at the rear.



- Attach spindles of support bracket -10 - 222 A- to rear engine lifting eyes.
- Partly take up weight of engine with spindle of support bracket.

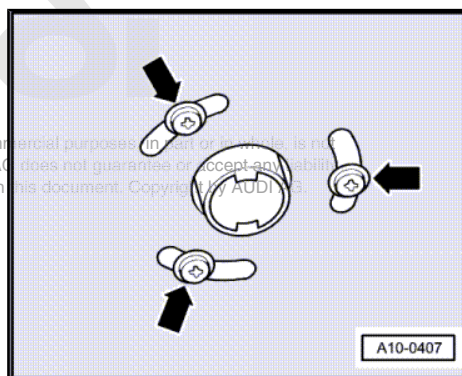




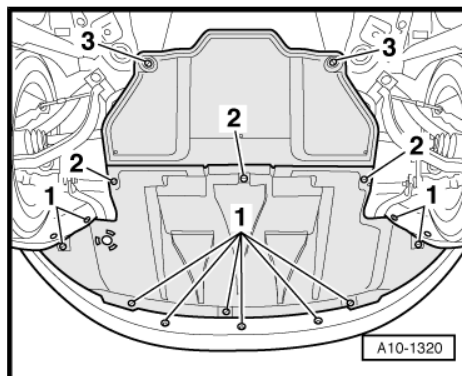
**WARNING**

*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.

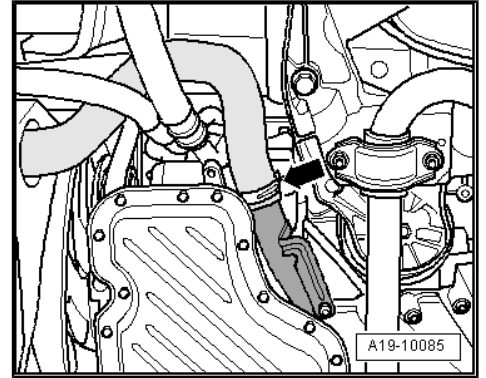


- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.

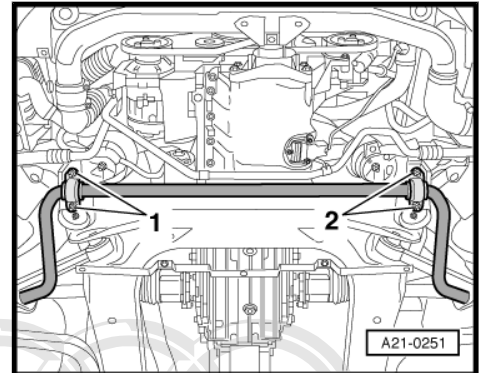


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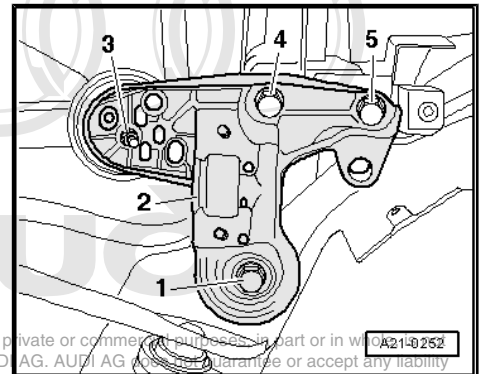
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



- Unbolt anti-roll bar mountings (left and right) -1- and -2-.

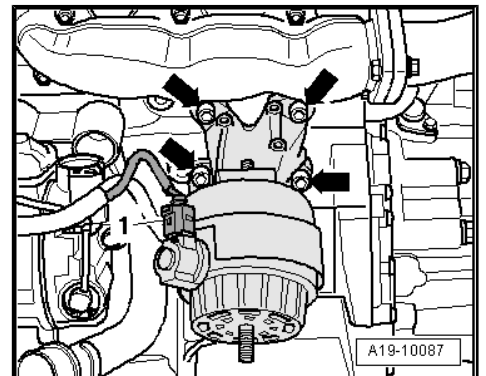


- Unscrew nut -3- at bottom of engine mounting (left-side).
- Unscrew bolts -4- and -5- on console for engine mounting (left-side).
- Unscrew front bolt -1- for subframe (left-side) and detach console for engine mounting -2- (left-side).



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- Unplug electrical connector -1- at engine mounting (left-side).
- Remove bolts -arrows- and detach engine support (left-side).





- Set aside wiring harness leading to automatic gearbox in vicinity of coolant pipe.
- Remove bolts -arrows- and take off coolant pipe (left-side).

### Installing

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

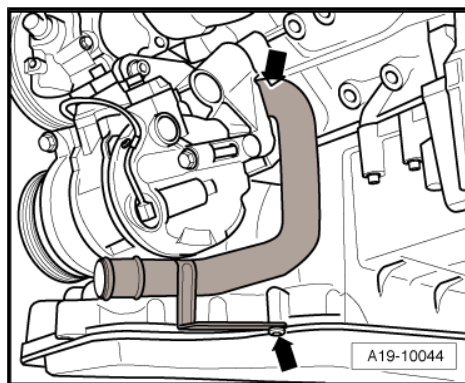


#### Note

- ◆ *Renew O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *Fit all cable ties in the original positions when installing.*
- Before installing, clean and smoothen sealing surface for O-ring.
- Lubricate new O-ring with »G12+« and slide onto coolant pipe.
- Install console for engine mounting with new bolts.
- Install anti-roll bar mountings with new nuts ⇒ Rep. gr. 40 .
- Fill cooling system ⇒ [page 255](#) .

### Tightening torques

Component	Nm	
Coolant pipe (left-side) to top section of sump and bracket for ancillaries	9	
Engine support to cylinder block	40	
Console for engine mounting to longitudinal member	75 <sup>1)</sup>	
Engine mounting to console for engine mounting	23	
Air pipe to turbocharger	9	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5
• <sup>1)</sup> Renew bolts.		



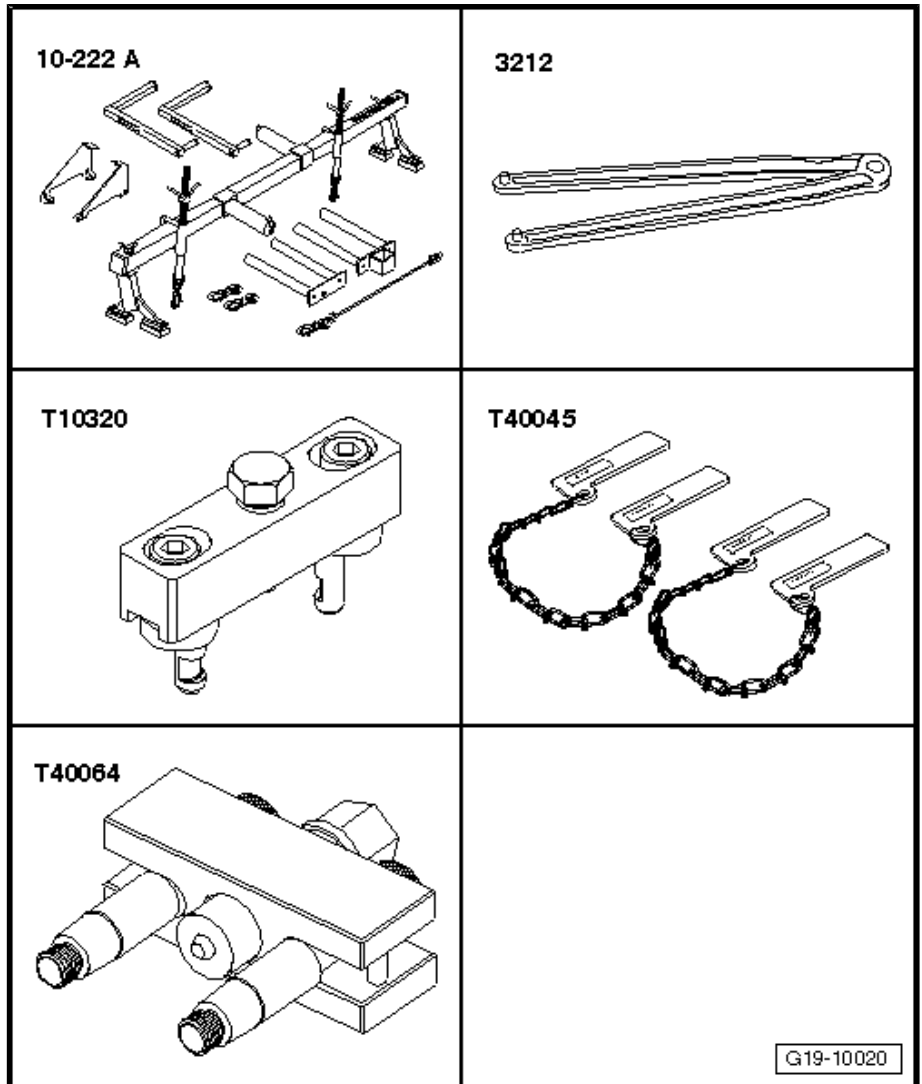
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## 1.8 Removing and installing coolant pipe (right-side)

### Special tools and workshop equipment required

- ◆ Support bracket -10 - 222 A-
- ◆ Pin wrench -3212-
- ◆ Puller -T10320- for vehicles from 02.2006 onwards
- ◆ Mud wing compensation plate -T40045-
- ◆ Puller -T40064-



### Removing



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



### Caution

**Observe notes on procedure for disconnecting the battery ⇒ Rep. gr. 27.**

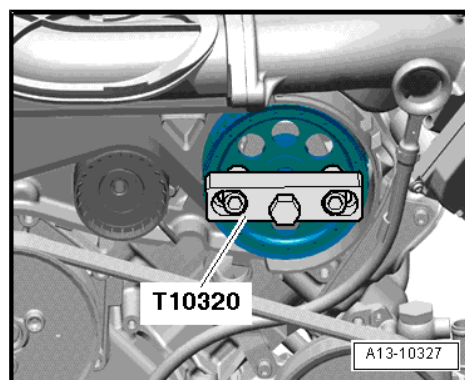
- Disconnect earth wire at battery with ignition switched off.
- Drain off coolant ⇒ [page 253](#).
- Move lock carrier to service position ⇒ [page 95](#).
- Remove poly V-belt ⇒ [page 101](#).



- Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .

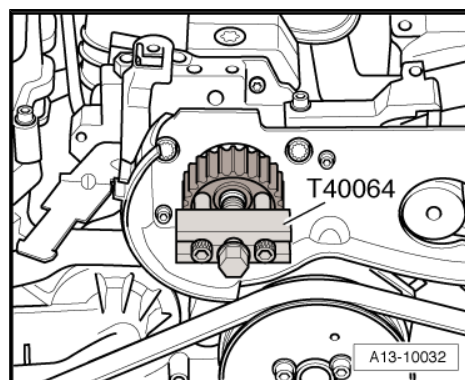
**Vehicles from 02.2006 onwards:**

- Use puller -T10320- to pull off toothed belt drive sprocket.

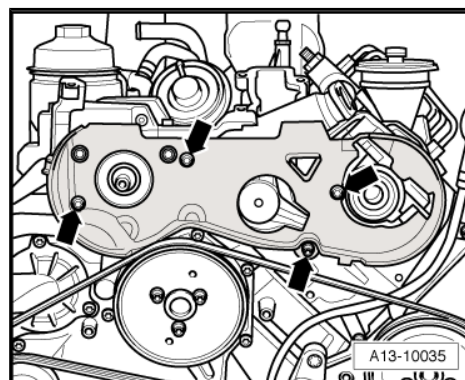


**All vehicles (continued):**

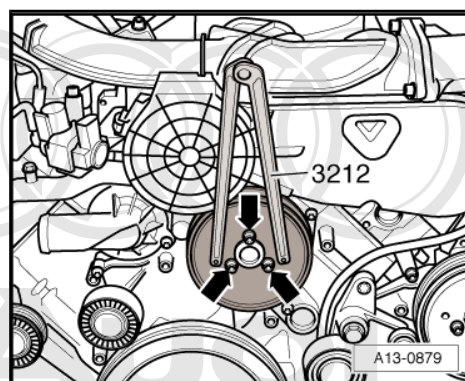
- Use puller -T40064- to pull off belt sprocket for high-pressure pump.



- Remove bolts -arrows- and detach toothed belt cover (rear).

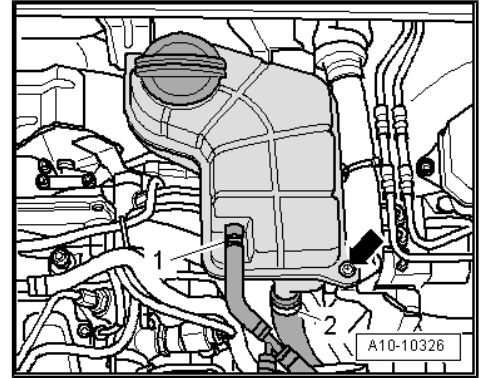


- Unbolt coolant pump pulley -arrows- (counterhold with pin wrench -3212- ).

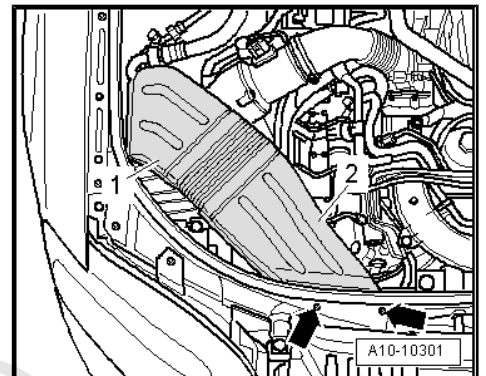


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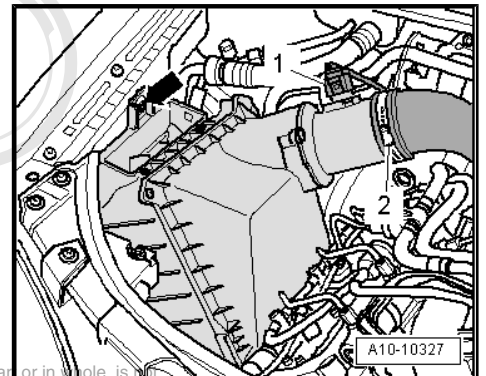
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.



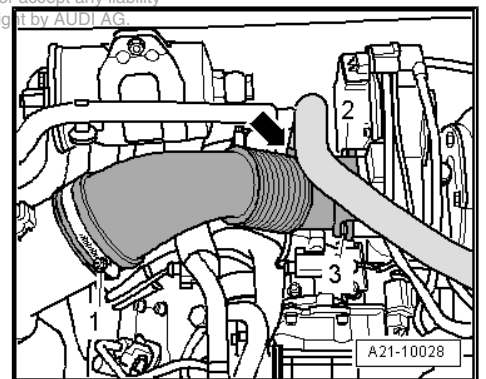
- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.



- Unplug electrical connector -1- at air mass meter -G70-.
- Detach air intake pipe -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Disconnect air pipe from turbocharger.

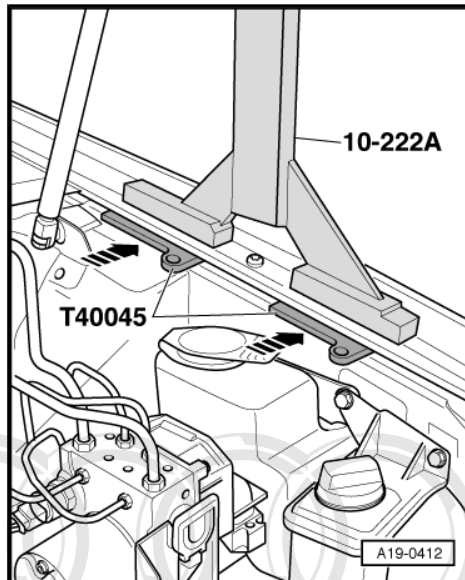


 **Note**

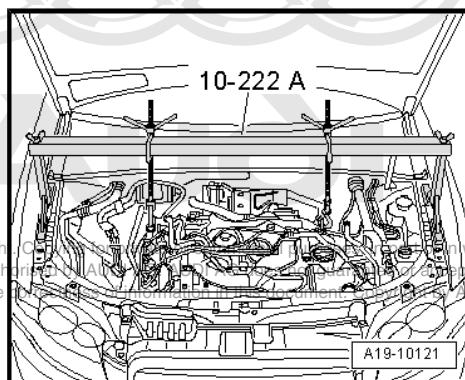
Disregard -item 1-.



- Detach rubber seals from edges of wing mounting flanges.
- Place compensation plates -10 - 222 A- on both sides between the wing mounting flange and the body flange underneath, so that the support bracket -T40045- does not damage the edges of the wings.
- Set up support bracket -10 - 222 A- on bolted flanges of wing panels. Spindles are located at the rear.

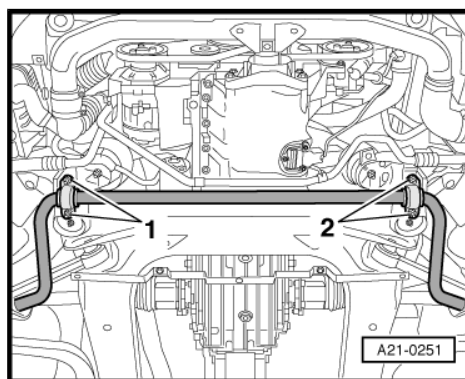


- Attach spindles of support bracket -10 - 222 A- to rear engine lifting eyes.
- Partly take up weight of engine with spindle of support bracket.

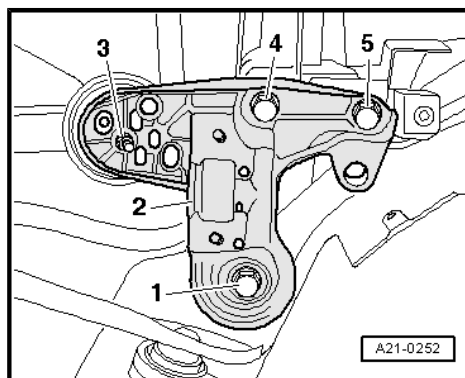


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- Unbolt anti-roll bar mountings (left and right) -1- and -2-.

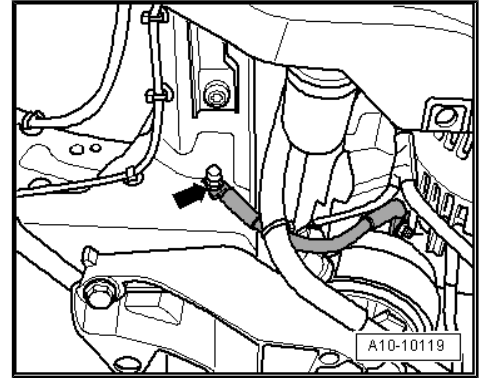


- Unscrew nut -3- at bottom of engine mounting (right-side).
- Unscrew bolts -4- and -5- on console for engine mounting (right-side).
- Unscrew front bolt -1- (right-side) for subframe and detach console for engine mounting -2- (right-side).

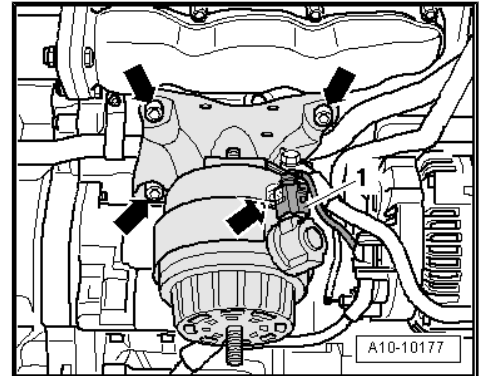




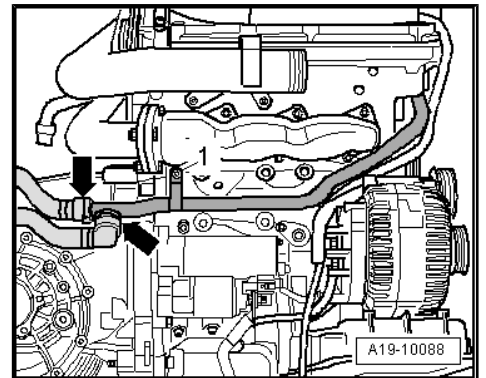
- Unbolt earth cable -arrow- at longitudinal member (right-side).
- Move wiring clear.



- Unplug electrical connector -1- at engine mounting (right-side).
- Remove bolts -arrows- and detach engine support (right-side).



- Move electrical wiring clear of coolant pipe (right-side).
- Remove bolt -1-.
- Disconnect coolant hoses at coolant pipe (right-side) -arrows-.



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- Remove bolts -1- and -2-.
- Pull coolant pipe (right-side) forwards out of cylinder block and detach coolant pipe.

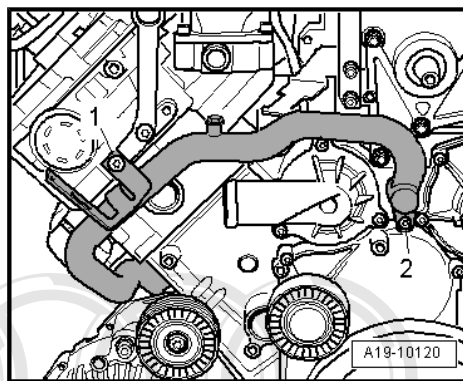
### Installing

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



#### Note

- ◆ Renew O-rings.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue*.
- ◆ To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- ◆ Fit all cable ties in the original positions when installing.



- Before installing, clean and smoothen sealing surface for O-ring.

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- Lubricate new O-ring with »G12+« and slide onto coolant pipe.
- Install console for engine mounting with new bolts.
- Install anti-roll bar mountings with new nuts ⇒ Rep. gr. 40 .
- Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
- Install poly V-belt ⇒ [page 101](#) .
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .
- Fill cooling system ⇒ [page 255](#) .

### Tightening torques

Component	Nm	
Coolant pipe (right-side) to engine	9	
Engine support to cylinder block	40	
Console for engine mounting to longitudinal member	75 <sup>1)</sup>	
Engine mounting to console for engine mounting	23	
Air pipe to turbocharger	9	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5
• <sup>1)</sup> Renew bolts.		

## 1.9 Removing and installing coolant pipe (rear)

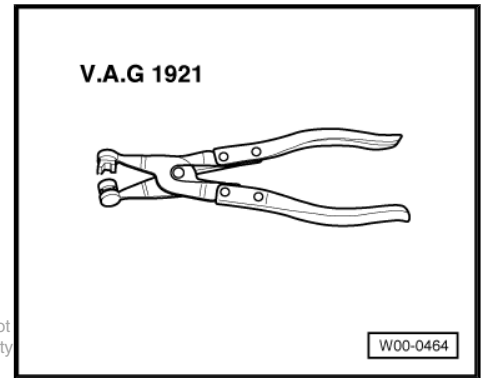
Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-



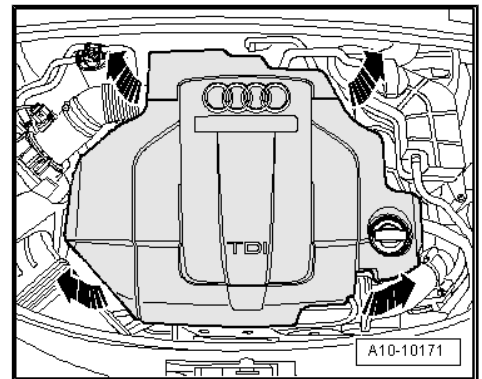
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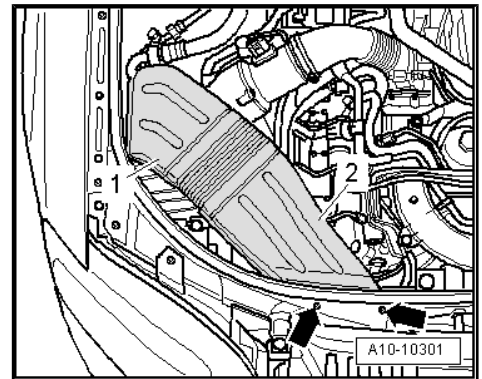


## Removing

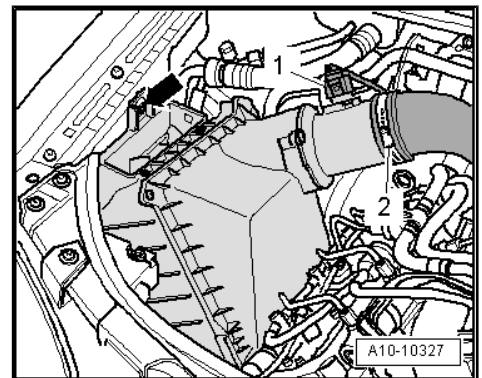
- Drain off coolant ⇒ [page 253](#) .
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



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



- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake pipe -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



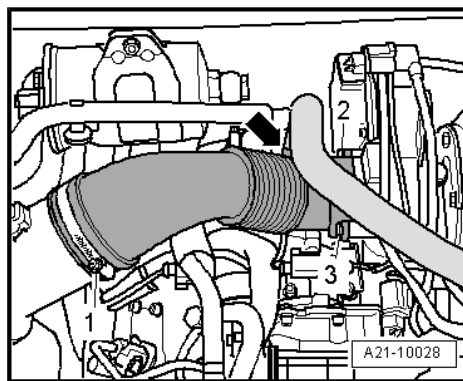


- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Disconnect air pipe from turbocharger.

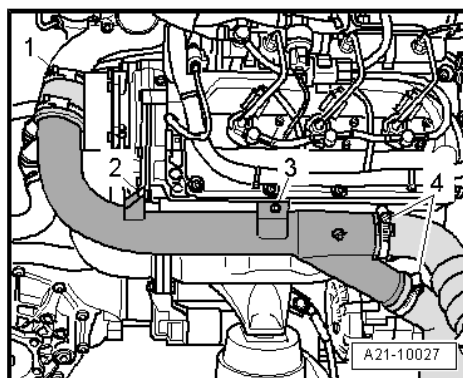


**Note**

*Disregard -item 1-.*



- Unscrew bolts -2- and -3- and disconnect air pipe from hoses -1- and -4-.

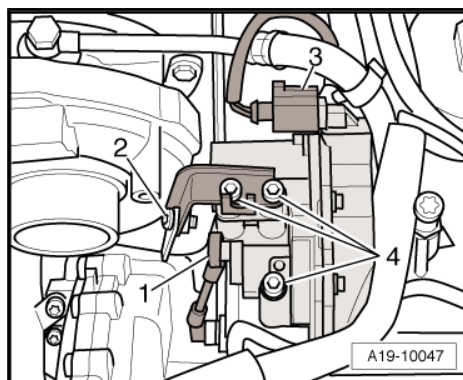


- Detach electrical connector -3- at intake manifold flap motor -V157- .
- Remove bolts -2- and -4- and move intake manifold flap motor -V157- clear to the side (with connecting rod installed).



**Note**

*In order to prevent damage to the intake manifold flap motor -V157- , the connecting rod -1- is not detached.*



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- Unplug electrical connector -1- at coolant temperature sender -G62- .
- Remove bolt -2-.
- Disconnect coolant hoses -arrows- and take out coolant pipe (rear).

### Installing

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

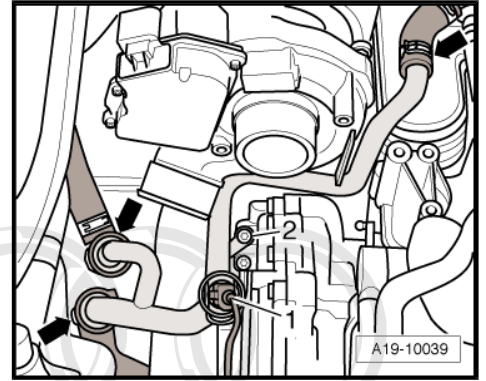
#### Note

- ◆ *Renew O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

- Fill cooling system ⇒ [page 255](#) .

### Tightening torques

Component	Nm	
Coolant pipe (rear) to cylinder head	9	
Bracket to cylinder head	9	
Intake manifold flap motor -V157- to intake manifold (bottom section)	9	
Air pipe to turbocharger	9	
Air pipe to bracket	9	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5



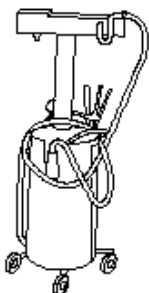
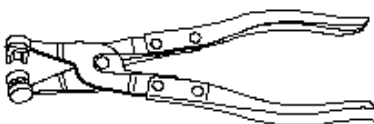
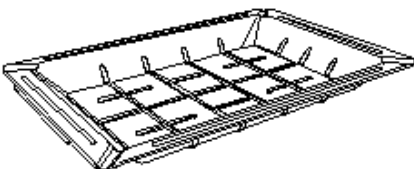

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## 1.10 Removing and installing radiator

### Special tools and workshop equipment required

- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Drip tray for workshop hoist -VAS 6208-

<p>V.A.G 1782</p> 	<p>V.A.G 1921</p> 
<p>VAS 6208</p> 	
	 <p style="text-align: right;">G19-10003</p>

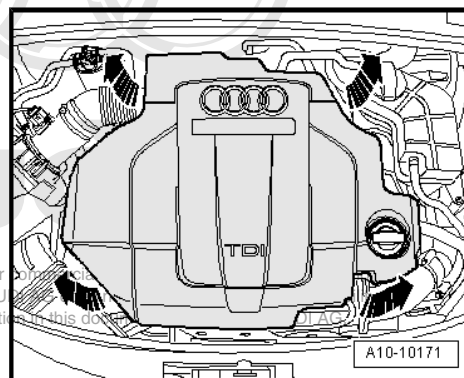
### Removing



#### 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.*

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-

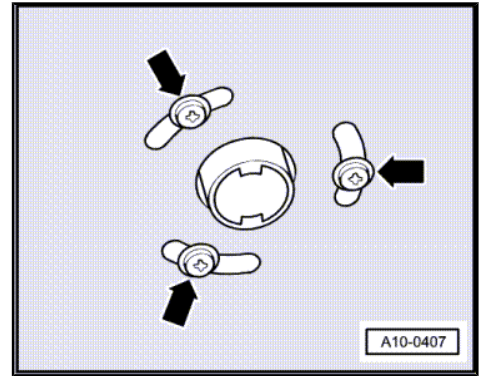


#### WARNING

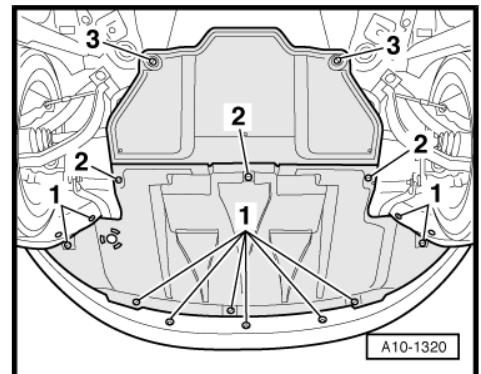
**Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.**

- Open filler cap on coolant expansion tank.

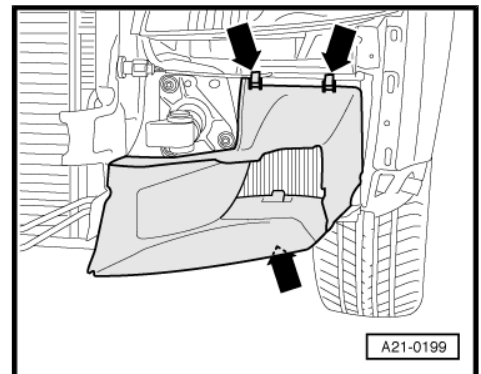
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.



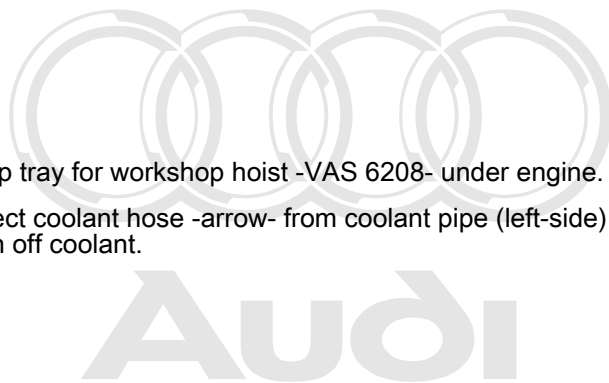
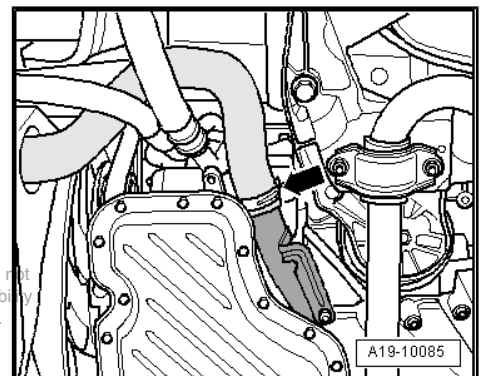
- Release quick-release fasteners -1- and -2- and take off front noise insulation. Leave rear noise insulation in position.



- Remove bumper cover (front) => Rep. gr. 63 .
- Remove air ducts in front of both charge air coolers -arrows-.



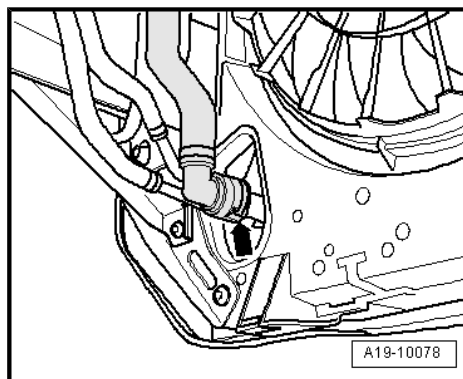
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



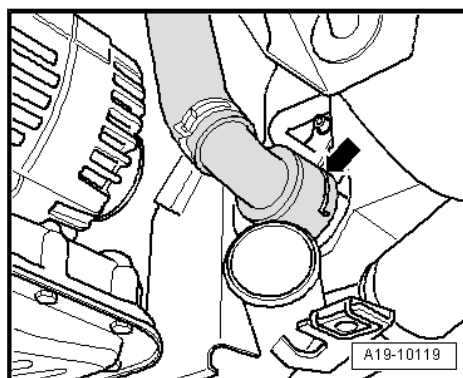
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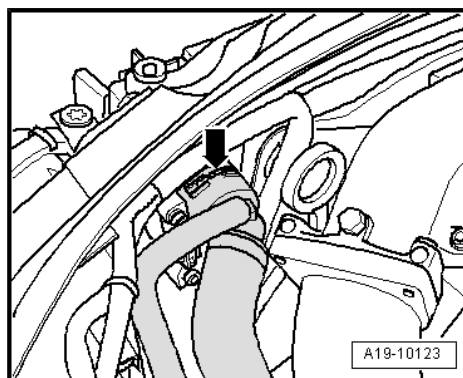
- Detach coolant hose -arrow- at bottom left of radiator.



- Detach coolant hose (bottom right) from radiator -arrow-.



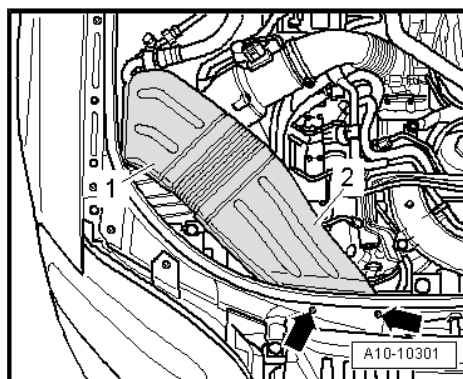
- Detach coolant hose at top left of radiator -arrow-.



**Vehicles with automatic gearbox:**

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

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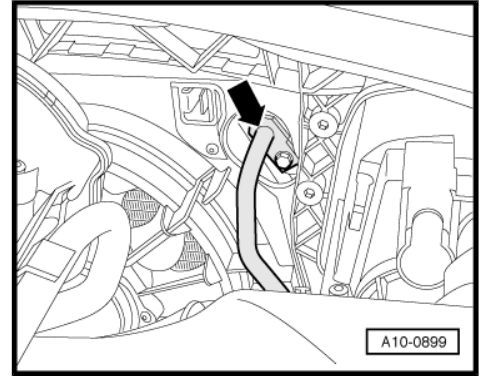




 **Note**

Observe rules for cleanliness when working on automatic gear-box ⇒ Rep. gr. 37 .

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

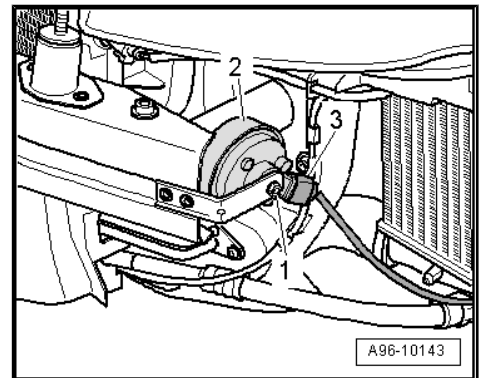


**All vehicles (continued):**

- Unplug electrical connectors (left and right) -3- for horns -2-.

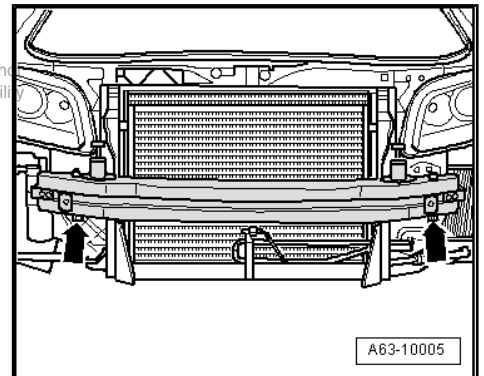
 **Note**

Disregard -item 1-.

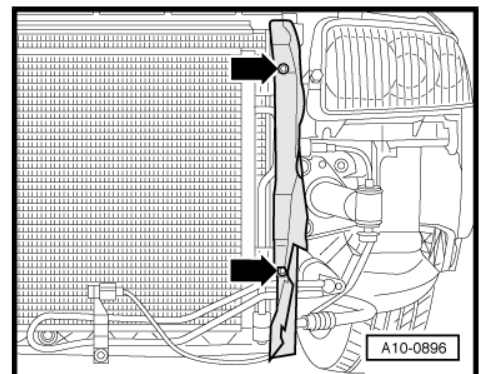


- Remove bumper -arrows-.

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- Unbolt air cowls (left and right) at radiator -arrows-.



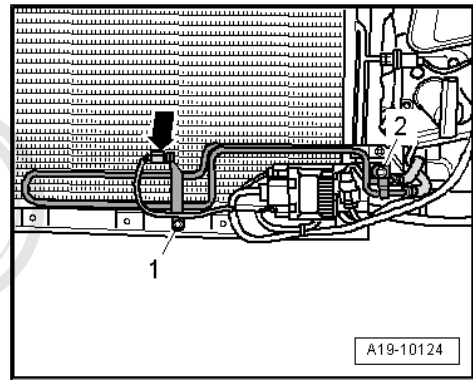


- Unclip ambient temperature sensor -G17- -arrow- from bracket.
- Unscrew bolts -1- and -2- for power steering cooling pipe; the hydraulic hoses remain attached.



**WARNING**

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



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

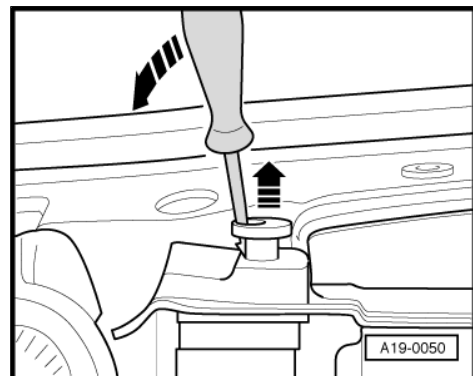
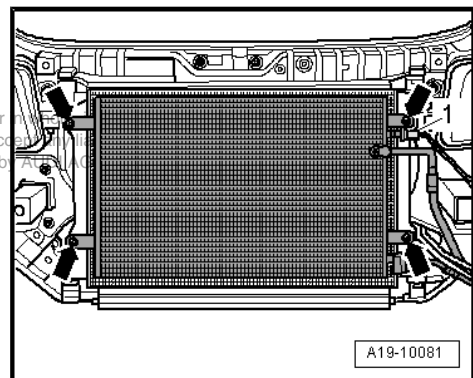


**Note**

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

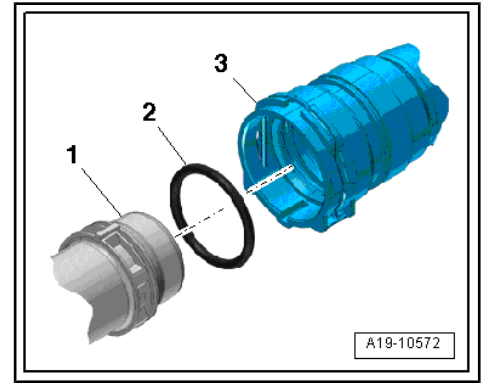
- Pivot condenser downwards with pipes/hoses attached.
- Release two retaining pins for radiator and pull out upwards -arrows-.
- Swivel radiator forwards and lift off.



## Installing

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

- Remove old O-ring -2- from coolant hose -3-.
- Lubricate new O-ring with coolant additive and fit O-ring in coolant hose.
- Press coolant hose onto radiator -1- until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.
- Secure ATF lines ⇒ Rep. gr. 37 .
- Install front bumper ⇒ Rep. gr. 63 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .
- Fill cooling system ⇒ [page 255](#) .



### Note

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

- Check ATF level ⇒ Rep. gr. 37 .

## Tightening torques

Component	Nm
Condenser to lock carrier	6
Power steering cooling pipe to condenser	9

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## 1.11 Removing and installing radiator fan (left-side)

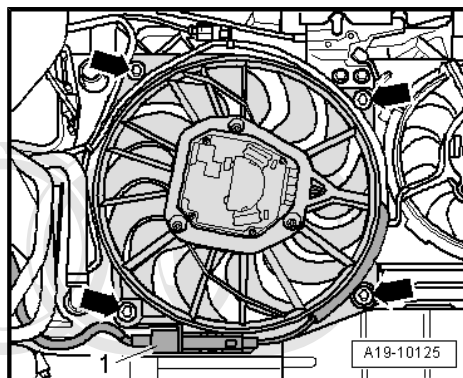
### Removing



#### Note

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

- Move lock carrier to service position ⇒ [page 95](#) .
- Unplug electrical connector -1-.
- Move wiring harness clear at radiator fan (left-side).
- Remove bolts -arrows-.
- Detach radiator fan (left-side).



### Installing

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

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#### Note

- ◆ *Fit all cable ties in the original positions when installing.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Electronic parts catalogue](#) .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

- Install lock carrier with attachments ⇒ Rep. gr. 50 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .

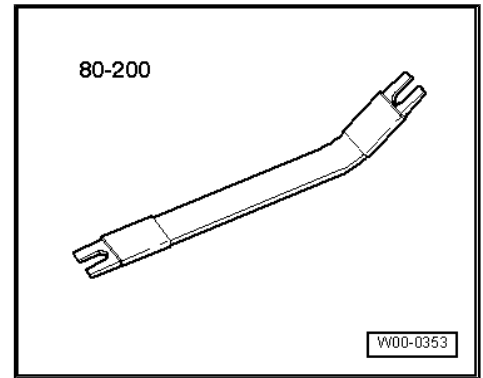
### Tightening torques

Component	Nm	
Radiator fan (left-side) to lock carrier	3	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

## 1.12 Removing and installing radiator fan (right-side)

Special tools and workshop equipment required

◆ Removal lever -80 - 200-

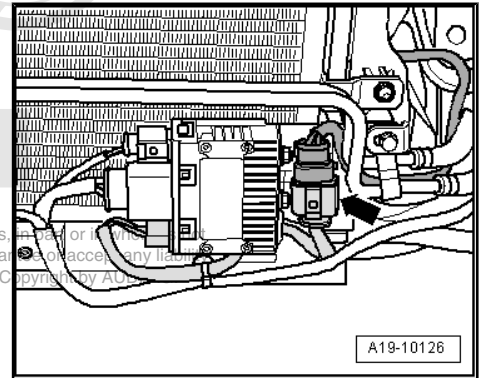


## Removing

 **Note**

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

- Move lock carrier to service position ⇒ [page 95](#) .
- Unplug electrical connector -arrow-.
- Move clear electrical wiring for radiator fan (right-side).



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- Remove securing bolt -1-.
- Turn radiator fan assembly (right-side) in direction of -arrow- and remove.

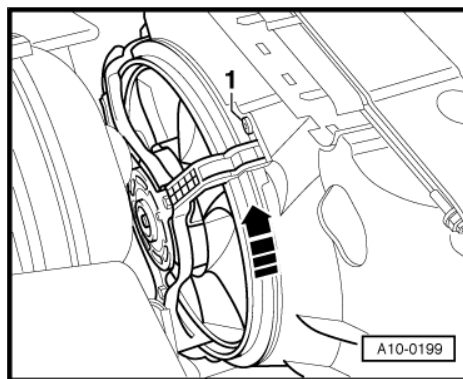
**Installing**

Install in reverse order.



**Note**

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
  - ◆ *Fit all cable ties in the original positions when installing.*
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
  - Install bumper cover (front) ⇒ Rep. gr. 63 .



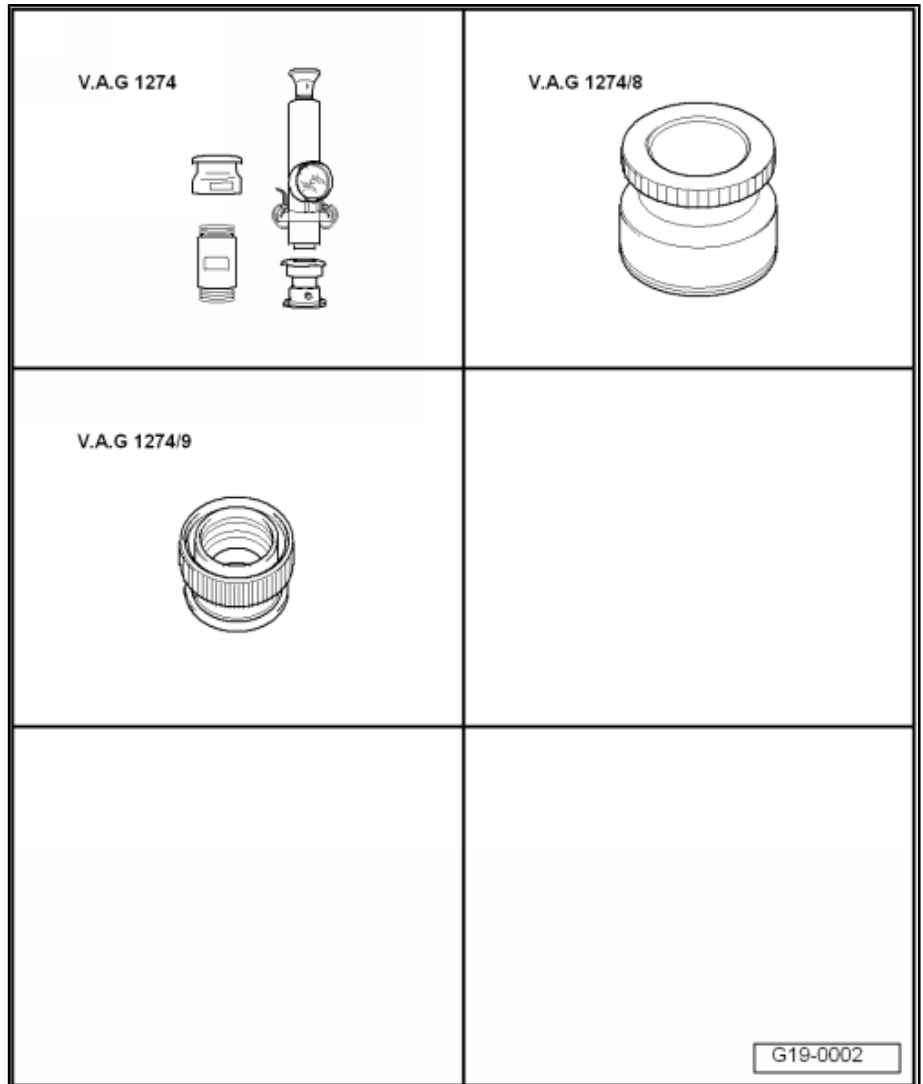
**Tightening torques**

Component	Nm
Retaining bolt for radiator fan (right-side)	4.5
Hose clips	Width 9 mm 3
	Width 13 mm 5.5

## 1.13 Checking cooling system for leaks

### Special tools and workshop equipment required

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



### Procedure

- Engine must be warm.



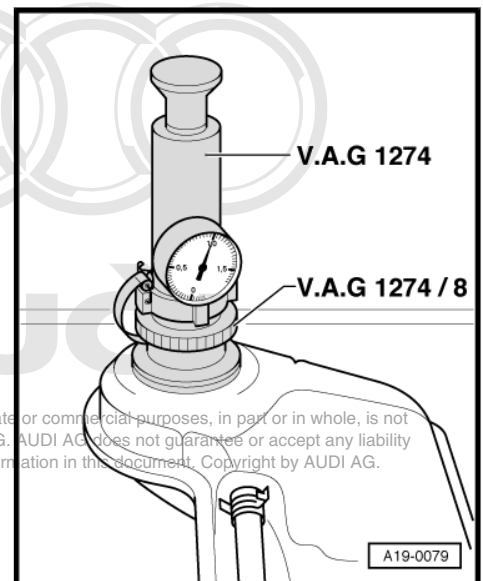
#### WARNING

*Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.*

- Open filler cap on coolant expansion tank.
- Attach cooling system tester -V.A.G 1274- with adapter - V.A.G 1274/8- to coolant expansion tank.
- Use hand pump on cooling system tester to create a pressure of approx. 1.0 bar.

If the pressure drops:

- Trace leak and repair.



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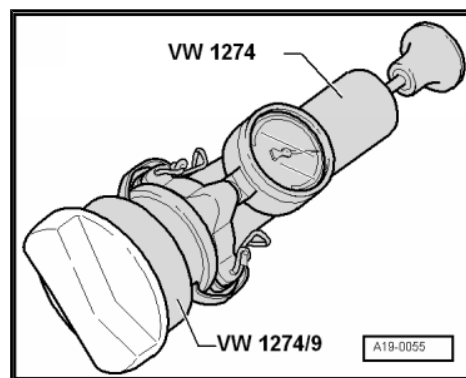


### Checking pressure relief valve in filler cap

- Attach cooling system tester -V.A.G 1274- with adapter - V.A.G 1274/9- to filler cap.
- Use hand pump on cooling system tester to create pressure.
- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

If the pressure relief valve does not open as described:

- Renew filler cap.



# Audi

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## 21 – Turbocharging/supercharging

### 1 Turbocharger and charge air cooler

– Observe rules for cleanliness ⇒ [page 5](#) .

#### 1.1 Turbocharger for vehicles with 2.7 ltr. engine - exploded view

##### 1 - 30 Nm + 90°

- Type of connection differs depending on version ⇒ [page 293](#)

##### 2 - Intermediate pipe

- Removing and installing: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#)

##### 3 - 30 Nm + 90°

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

##### 4 - Gasket

- Renew

##### 5 - 25 Nm

##### 6 - Intermediate flange

- Removing and installing ⇒ [page 309](#)

##### 7 - Seal

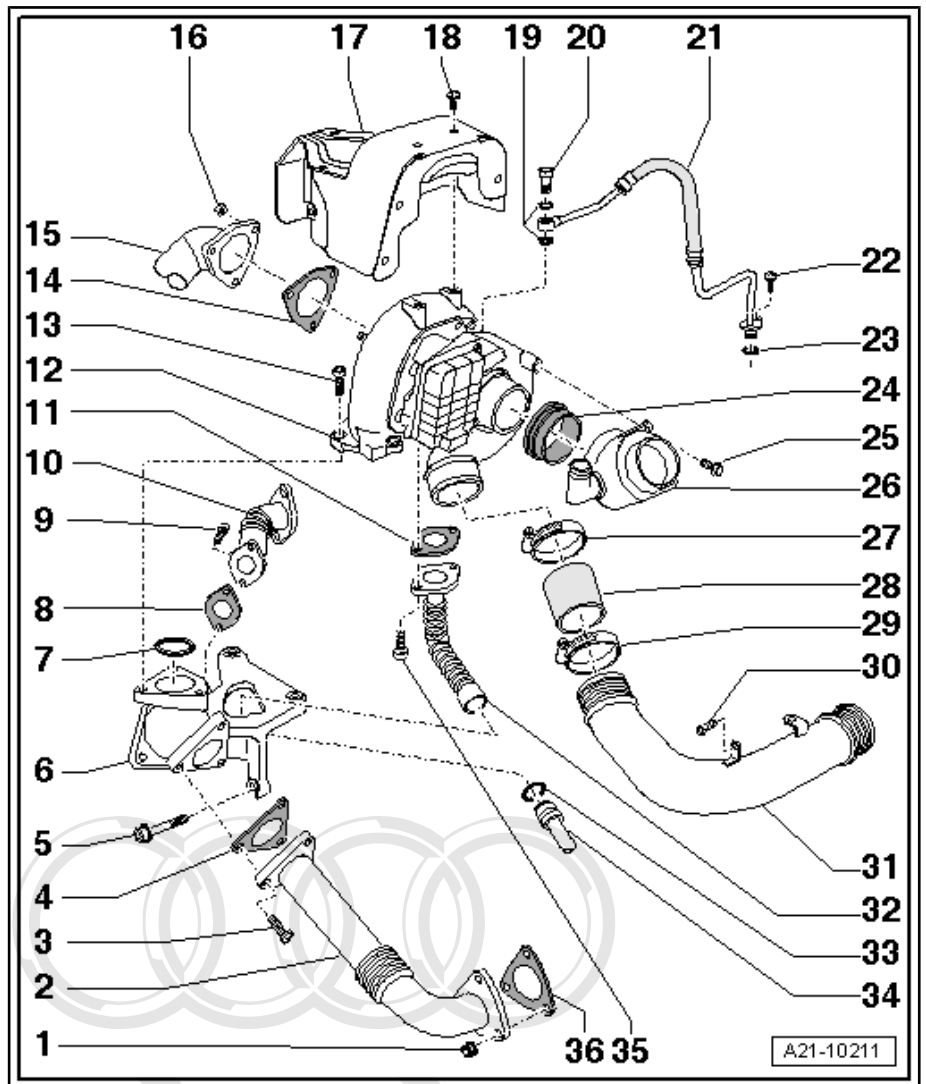
- Renew

##### 8 - Gasket

- Renew

##### 9 - 9 Nm

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue



##### 10 - Connecting pipe to change-over flap for exhaust gas recirculation cooler

##### 11 - Gasket

- Renew

##### 12 - Turbocharger

- With turbocharger 1 control unit -J724-
- Removing and installing turbocharger ⇒ [page 293](#)
- Removing and installing turbocharger 1 control unit -J724- ⇒ [page 298](#)

##### 13 - 30 Nm + 90°

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

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#### 14 - Gasket

- Renew

#### 15 - Starter catalytic converter

- Removing and installing: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .

#### 16 - 23 Nm

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

#### 17 - Heat shield for turbocharger

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#### 18 - 9 Nm

#### 19 - Seals

- Renew

#### 20 - Banjo bolt, 15 Nm

#### 21 - Oil supply line

- From cylinder block

#### 22 - 9 Nm

#### 23 - O-ring

- Renew

#### 24 - Seal

- Renew if damaged

#### 25 - 9 Nm

#### 26 - Connecting piece for air intake hose

- From air mass meter -G70- to turbocharger

#### 27 - Hose clip, 5.5 Nm

- Reinforced

#### 28 - Air hose

- From turbocharger to air pipe (right-side)
- Must be free of oil and grease when installing

#### 29 - Hose clip, 5.5 Nm

- Reinforced

#### 30 - 9 Nm

#### 31 - Air pipe (right-side)

#### 32 - Top section of oil return line

From turbocharger

#### 33 - O-ring

- Renew

#### 34 - Bottom section of oil return line

- To cylinder block

#### 35 - 9 Nm

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

#### 36 - Gasket

- Renew

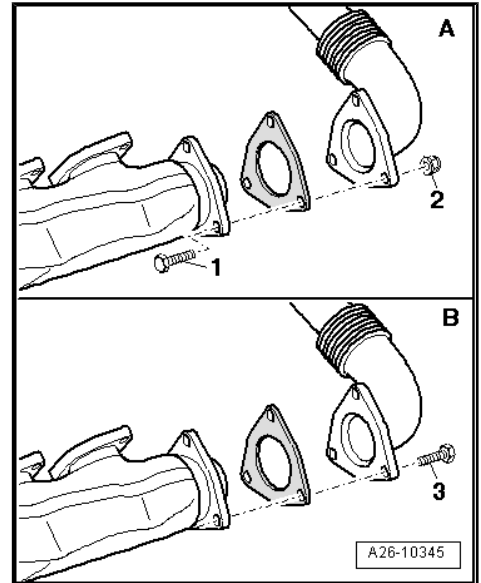
### Securing intermediate pipe to exhaust manifold

A - Exhaust manifold (sheet metal version)

- Fitted with bolts -1- and nuts -2-.
- Renew bolts and nuts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

B - Exhaust manifold (cast version)

- Fitted with bolts -3-.
- Renew bolts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .



## 1.2 Removing and installing turbocharger on vehicles with 2.7 ltr. engine

### Removing

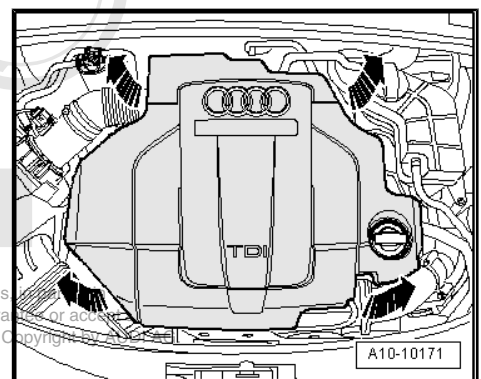


#### Caution

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

- ◆ *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- ◆ *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- ◆ *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

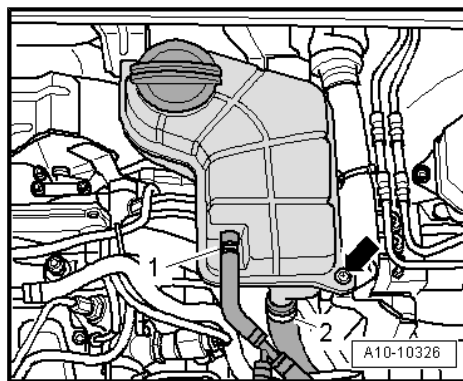
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



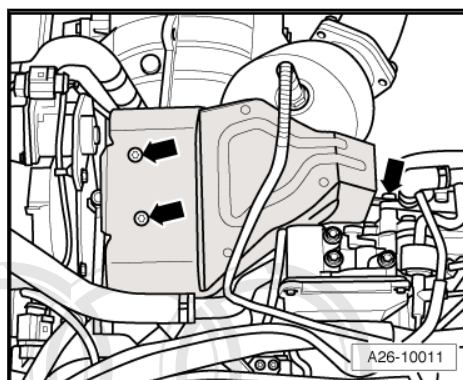
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- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.



- Remove heat shield for turbocharger -arrows-.



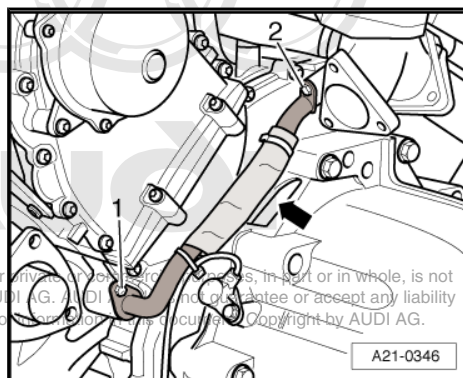
- Cover opening -arrow- in gearbox to prevent small parts from dropping in.



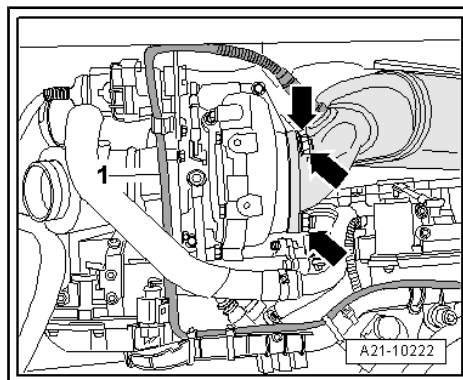
**Note**

- ◆ Shown in illustration with intermediate pipe removed.
- ◆ Disregard items marked -1- and -2-.

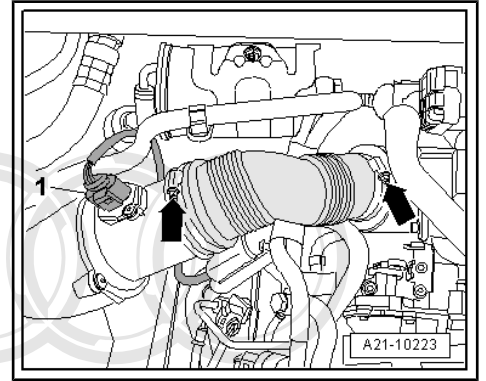
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- Move electrical wiring -1- to Lambda probe clear.
- Unscrew nuts -arrows- securing starter catalytic converter to turbocharger and pull starter catalytic converter to the side.



- Remove air hose -arrows-.
- Unplug electrical connector -1- at air mass meter -G70- .

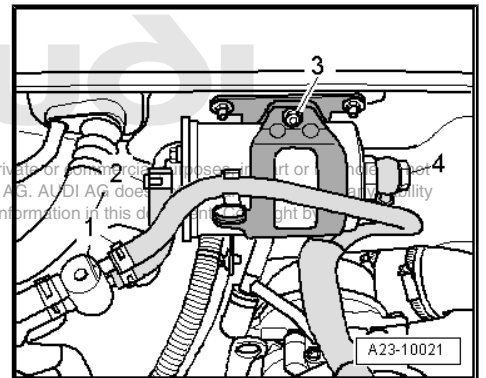


- Unscrew nut -3-, open retainer and place fuel filter to one side with fuel lines connected.

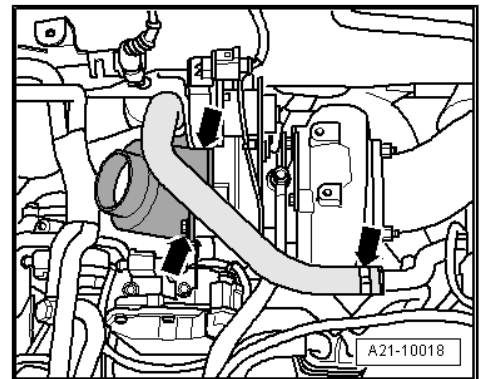
 **Note**

- ◆ *Shown in illustration with intermediate pipe removed.*
- ◆ *Disregard -items 1, 2, 4-.*

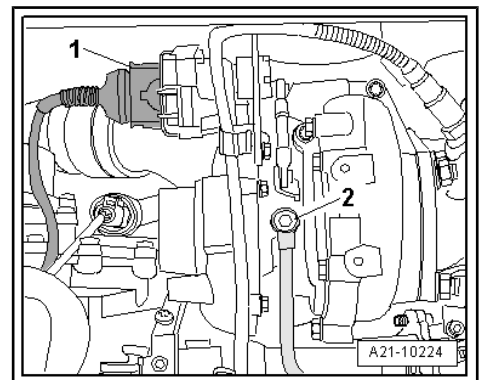
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- Unbolt air intake connection -left arrows- and move it aside with air intake hose connected -right arrow-.

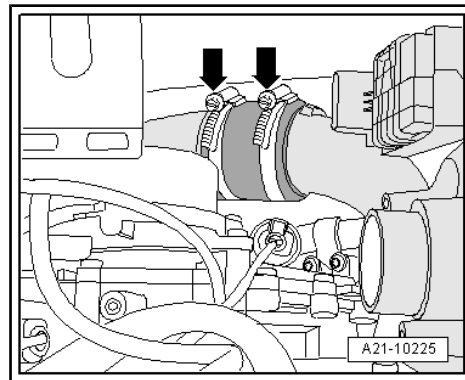


- Unplug electrical connector-1- at turbocharger 1 control motor -V280- .
- Unscrew oil supply line -2- from turbocharger.

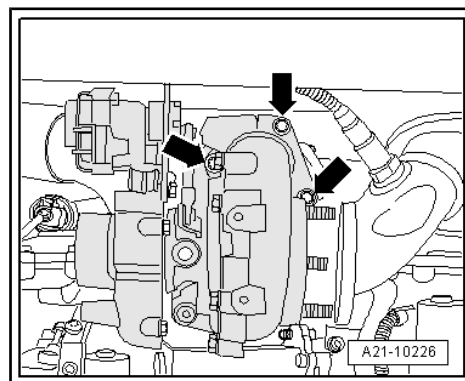




- Release hose clips -arrows- securing connecting hose between turbocharger and air intake pipe and push to one side.
- Push connecting hose onto hose connection on turbocharger.



- Remove bolts -arrows-.



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**Caution**

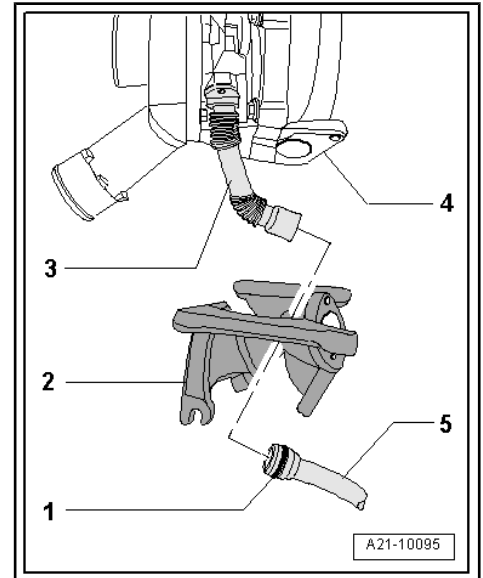
- ◆ *The top section of the oil return line -3- is secured to the turbocharger and must be detached carefully from the bottom section of the oil return line -5-.*
- ◆ *To avoid bending the two pipes of the oil return line, move the turbocharger -4- slightly backwards and forwards while pulling it off upwards and towards one side.*

- 1 - O-ring
- 2 - Intermediate flange



**Note**

*After removing the turbocharger, do not put it down so it rests on the upper section of the oil return line.*

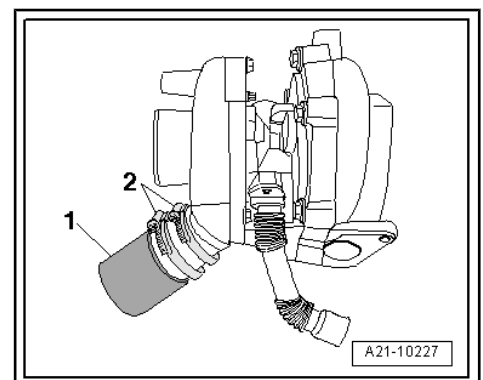


**Installing**



**Note**

- ◆ *Renew gaskets, seals and O-rings.*
  - ◆ *Fit all heat insulation sleeves in the original position when installing.*
  - ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
  - ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
  - ◆ *After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.*
- Prepare turbocharger for installation by fitting connecting hose -1- and two hose clips -2- onto hose connection on turbocharger.

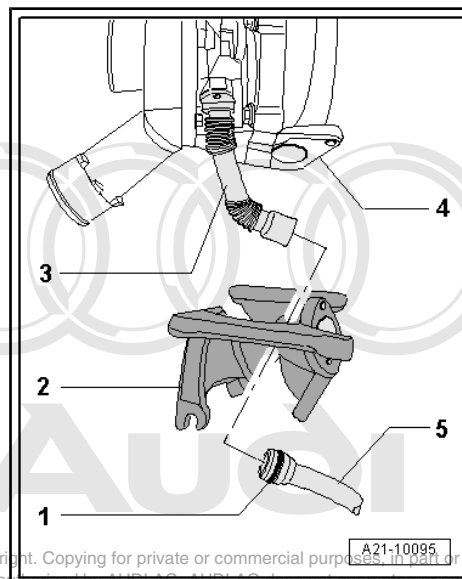




- Fit new O-ring -1- on bottom section of oil return line -5-.
- Lightly lubricate O-ring and internal sealing surface of top section of oil return line -3- with oil.
- When fitting turbocharger -4-, guide top section of oil return line -3- through intermediate flange -2- and towards bottom section of oil return line -5-.
- Carefully push top section of oil return line onto bottom section of oil return line.

**Caution**

*Take care not to damage O-ring.*



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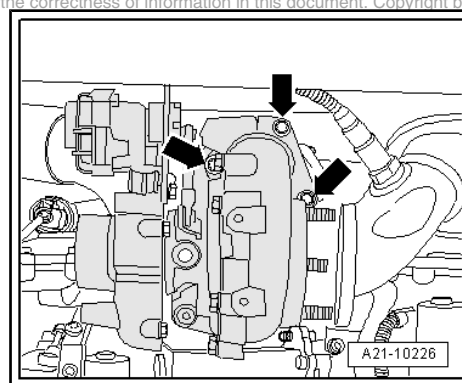
- Secure turbocharger with bolts -arrows-.

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

- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .
- Install fuel filter ⇒ Rep. gr. 20 .

**Tightening torques**

Component	Nm	
Turbocharger to intermediate flange	30 + 90° 1)2)3)	
Oil supply line to turbocharger	15	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• 3) 90° = one quarter turn.</li> </ul>		



### 1.3 Removing and installing turbocharger 1 control unit -J724- - vehicles with 2.7 ltr. engine

**Special tools and workshop equipment required**

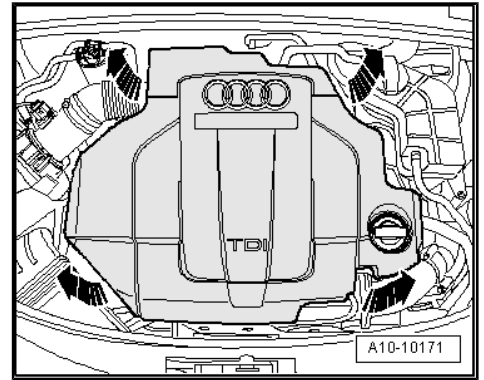
- ◆ Tester -VAS 6395/1-
- ◆ Connection lead -VAS 6395/2-
- ◆ Stop plate -VAS 6395/3-



## Removing

Proceed as follows:

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

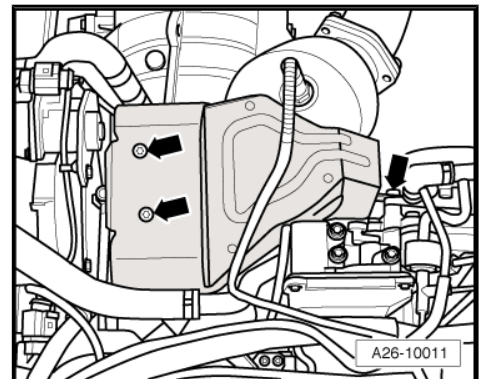


- Remove bolts -arrows- and detach heat shield for turbocharger.

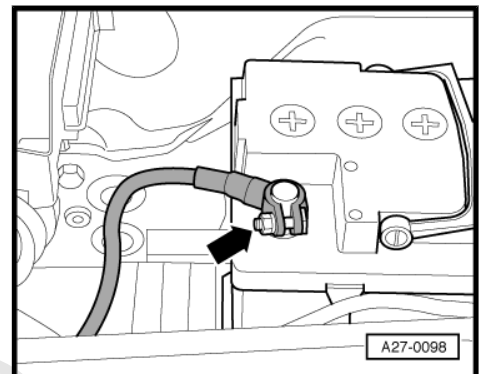


### Note

*The bottom bolt -right arrow- does not have to be completely removed.*



- Connect tester -VAS 6395/1- with connecting wire -VAS 6395/2- to positive battery terminal -arrow- and negative battery terminal.



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### Checking software version of tester -VAS 6395/1- :



#### Caution

**Risk of damage to turbocharger 1 control unit -J724- .**

- ◆ **Before continuing, check whether the correct software version is loaded in the tester -VAS 6395/1- . To do so, proceed as follows:**

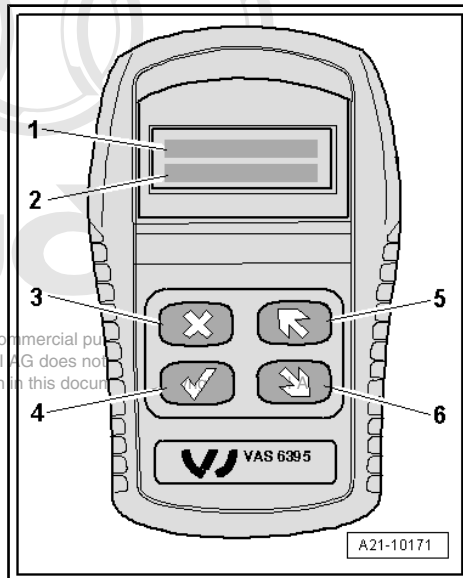
Display on -VAS 6395/1- (2 seconds after connecting to power supply) if correct software version is loaded:

- 1 - > 1. START
- 2 - 2. NEXT [>]



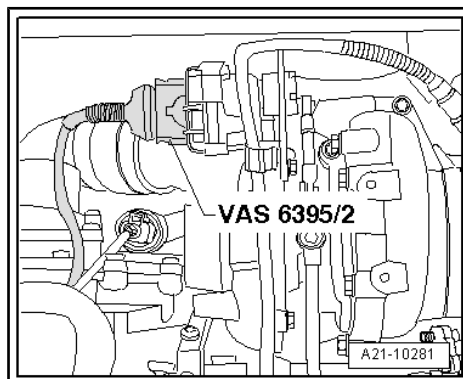
#### Note

- ◆ *If the following appears on the display, an incorrect software version has been loaded:*
- ◆ 1. >TEST
- ◆ 2. LEARN
- ◆ *If this is the case, download the correct software version from the „Audi ServiceNet“ under „Workshop Equipment“.*



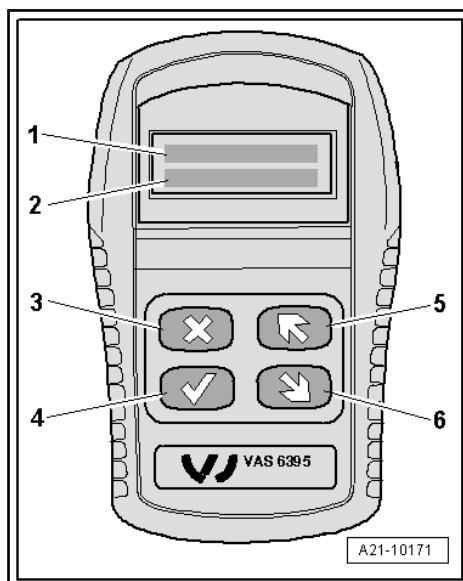
### Continuation of procedure:

- Unplug electrical connector for turbocharger 1 control unit -J724- .
- Connect connection lead -VAS 6395/2- to turbocharger 1 control unit -J724- and to tester -VAS 6395/1- .



Display on -VAS 6395/1- :


- 1 - > 1. START
  - 2 - 2. NEXT [>]
- To continue, press  button -item 4-.
  - The tester -VAS 6395/1- runs through the adjustment range of the turbocharger 1 control unit -J724- and checks that the end positions are reached; display indicates „CHECK“.

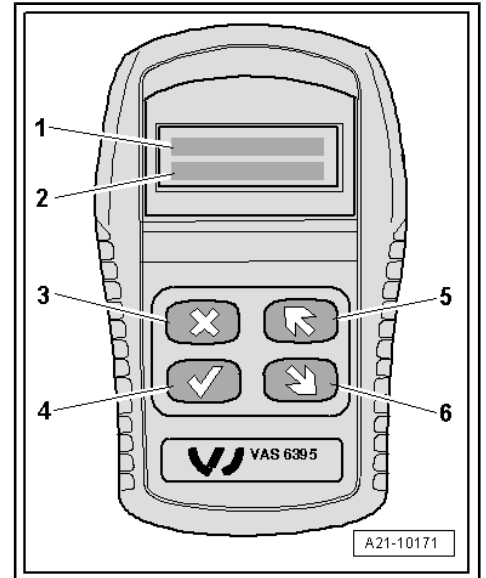


Display on -VAS 6395/1- :


- 1 -
- 2 - [OK]

 **Note**

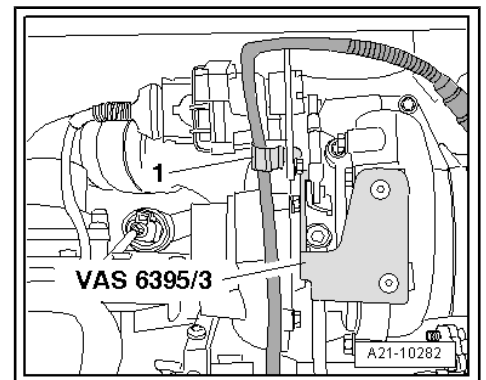
- ◆ If the display indicates „[OK]“, the adjustment range of the turbocharger 1 control unit -J724- is stored.
- ◆ If the display shows „FAULT [OK]“, tap gently several times on the housing of turbocharger 1 control unit -J724- with the handle of a screwdriver and repeat the check by pressing  button -item 4-.




- Unclip retaining clip -1- and move electrical wire clear.
- Secure stop plate -VAS 6395/3- with bolts for heat shield. Tightening torque: 8 Nm.

 **Caution**

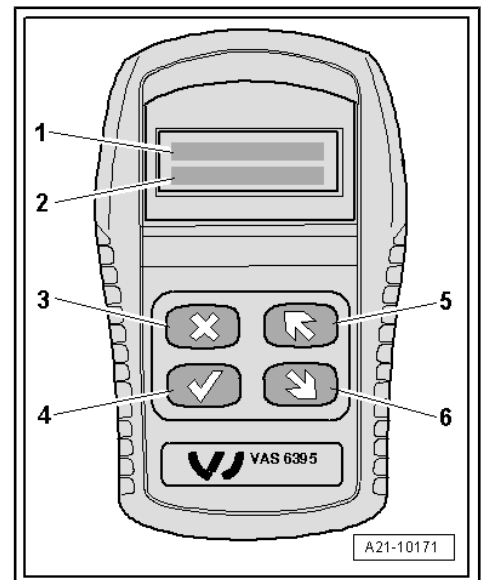
*The stop plate -VAS 6395/3- must not be loosened until the work sequence has been completed.*



- To continue, press  button -item 4-.
- The turbocharger 1 control unit -J724- moves back and forth between the stops several times to determine the voltage value.
- Then the turbocharger 1 control unit -J724- moves into installation position.
- While the voltage value is being determined, keep tapping gently on the housing of turbocharger 1 control unit -J724- until the display indicates the following:

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- 1 - X.XXX V
  - 2 - [↑][↓][OK]
- Note voltage value.
  - Specification: 3.3 ... 3.7 V



 **Note**



*If the display indicates „FAULT [OK]“ or the voltage is less than 3.3 V or greater than 3.7 V, unplug tester -VAS 6395/1- and repeat the complete procedure ⇒ [page 300](#).*

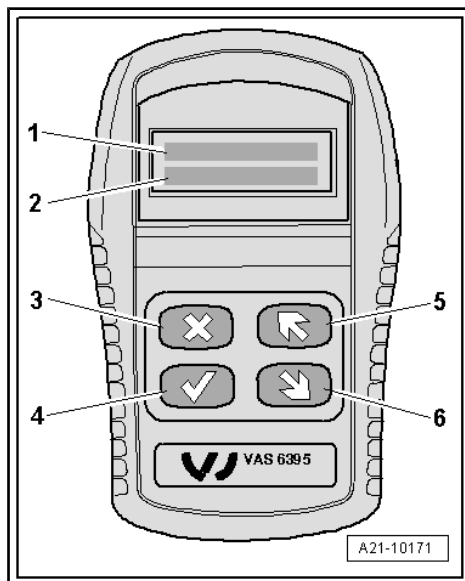


Display on -VAS 6395/1- :

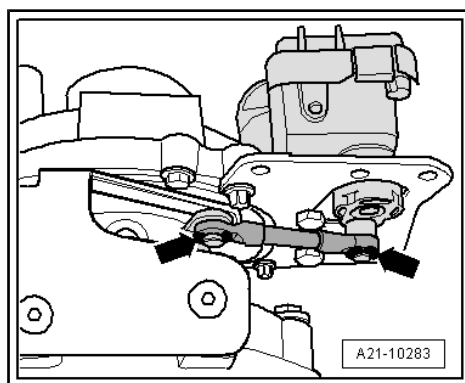
1 - X.XXX V

2 - [↑][↓][OK]

- By pressing buttons  -item 5- and  -item 6-, adjust turbo-charger 1 control unit -J724- so that coupling rod can be accessed easily for removal.





- Unclip circlips -arrows- and dispose of them, detach coupling rod.

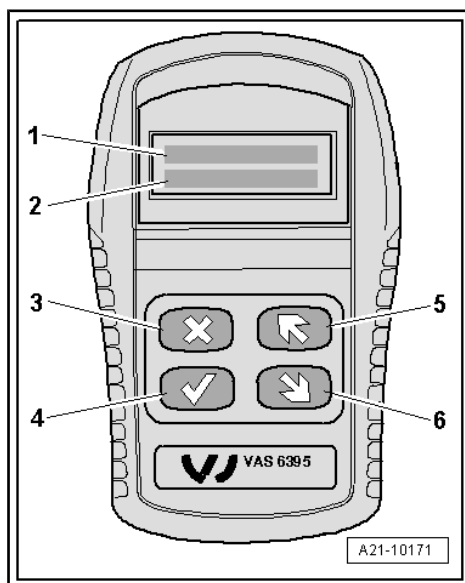
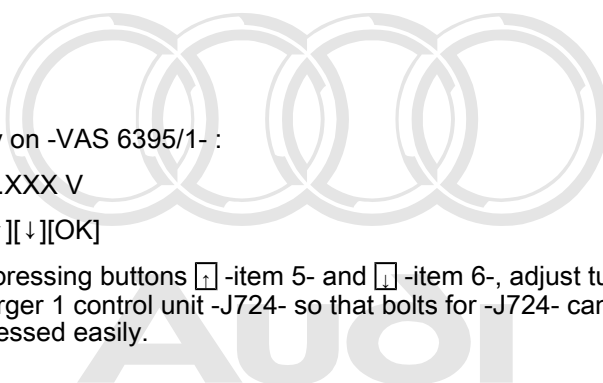


Display on -VAS 6395/1- :

1 - X.XXX V

2 - [↑][↓][OK]

- By pressing buttons  -item 5- and  -item 6-, adjust turbo-charger 1 control unit -J724- so that bolts for -J724- can be accessed easily.



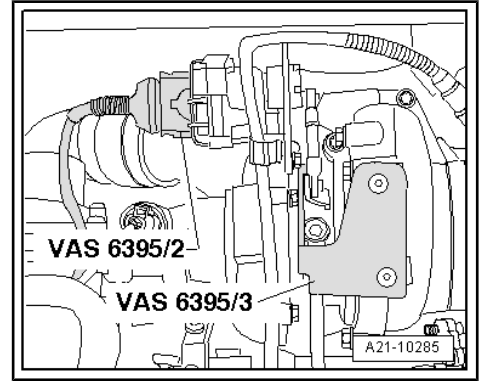
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- Disconnect connection lead -VAS 6395/2- from turbocharger 1 control unit -J724- .



**Caution**

*Power supply for tester -VAS 6395/1- must remain connected.*

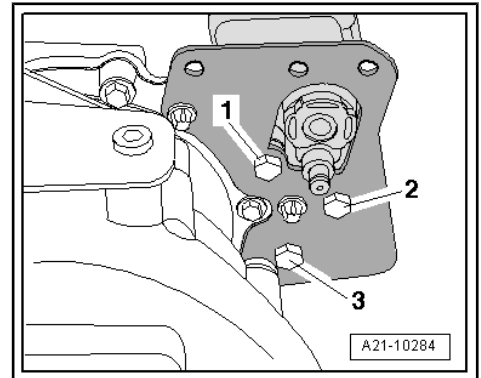


- Remove bolts -1, 2, 3- and dispose of them.
- Remove old turbocharger 1 control unit -J724- and dispose of it.

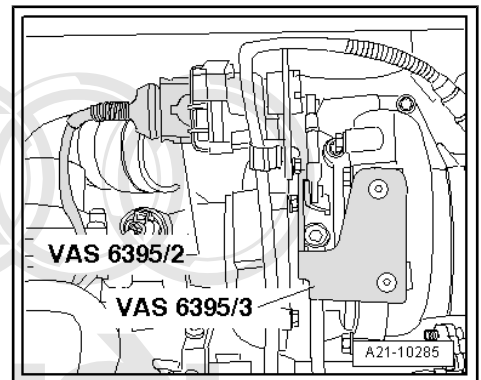


**Caution**

*Check that the three insulating washers are fitted between turbocharger 1 control unit -J724- and the bracket.*



- Install new turbocharger 1 control unit -J724- in reverse sequence of removal.
- Fit new bolts as follows:
  - 1- M6x15 with tapered shank
  - 2- M6x15 with tapered shank
  - 3- M6x15
- Initially hand-tighten bolts.
- Turbocharger 1 control unit -J724- must rest on retaining plate so there is no play; it must still be possible to move control unit by hand.
- Connect connection lead -VAS 6395/2- to new turbocharger 1 control unit -J724- .



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- To continue, press button -item 4-.

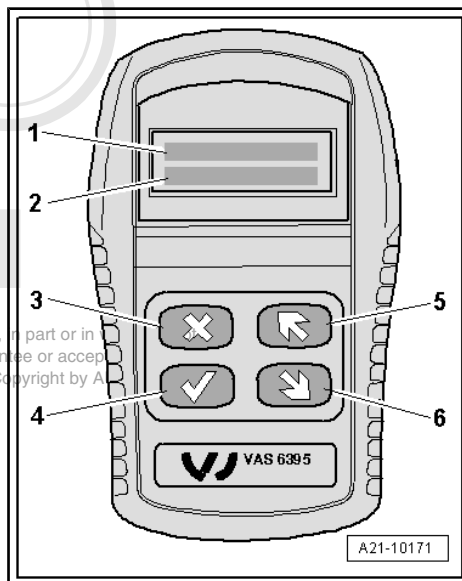
Display on -VAS 6395/1- :

1 - > 1. START

2 - 2. NEXT [>]

- Select menu item „NEXT“ with button -item 6-.

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- To continue, press button -item 4-.

Display on -VAS 6395/1- :

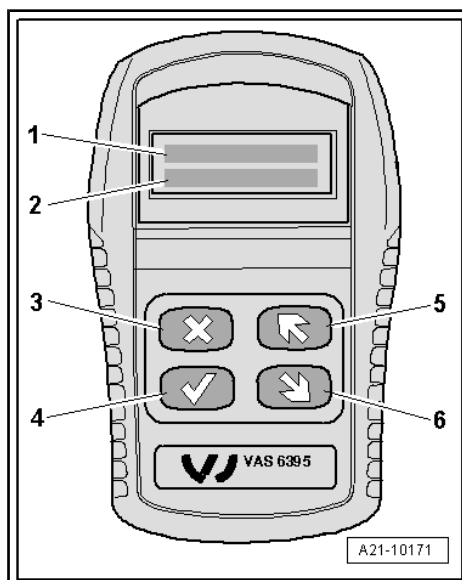
1 - X.XXX V

2 - [OK]



**Note**

- ◆ If the display indicates „CHECK“, the adjustment range of the new turbocharger 1 control unit -J724- must be checked ⇒ [page 306](#) .
- ◆ If the display indicates „FAULT“, the new turbocharger 1 control unit -J724- must be renewed for a second time.



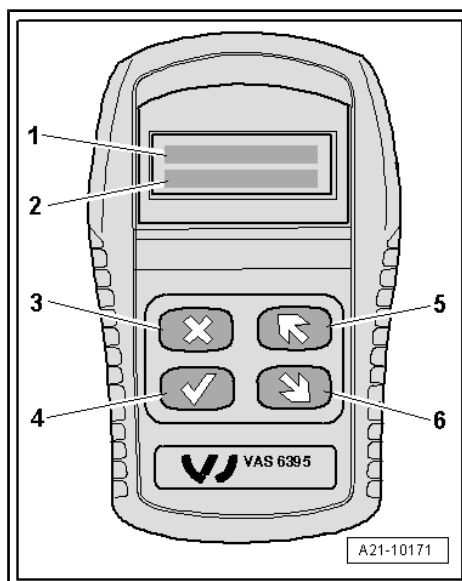
- To continue, press button -item 4-.


- Turbocharger 1 control unit -J724- runs through the adjustment range.

Display on -VAS 6395/1- :

1 -

2 - [OK]



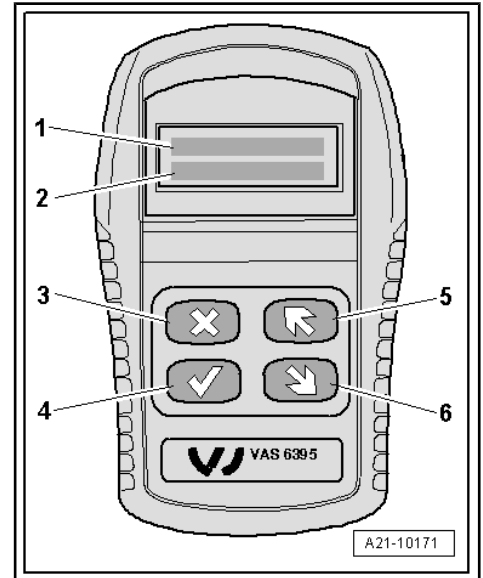
- To continue, press  button -item 4-.

Display on -VAS 6395/1- :

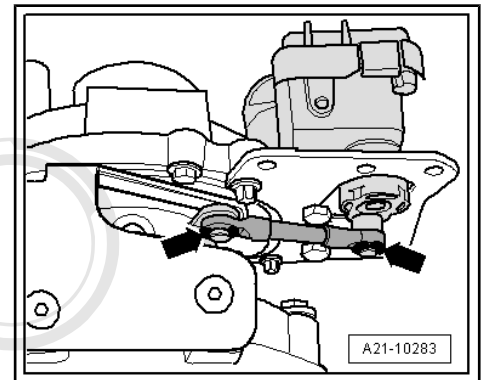
1- X.XXX V

2- [OK]

- Turbocharger 1 control unit -J724- moves into installation position.

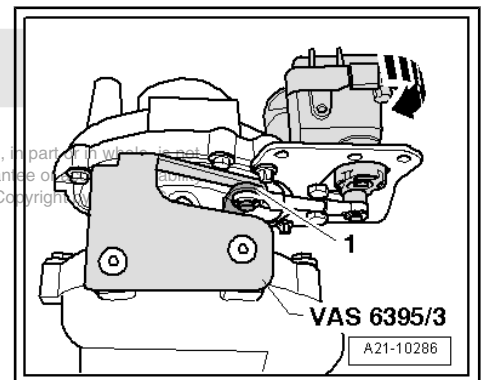


- Insert coupling rod.
- Installation position: The thicker eyelet is fitted onto the shaft of turbocharger 1 control unit -J724- .
- Fit circlips -arrows-.
- The circlips must engage audibly.

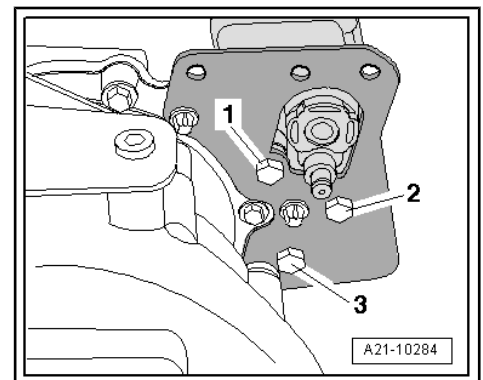


- Press turbocharger 1 control unit -J724- towards the rear without applying force -arrow- until lever -1- rests lightly on stop plate -VAS 6395/3- .
- Hold -J724- in this position.

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- Tighten bolts -1, 2, 3- to 5 Nm.





- To continue, press button -item 4-.
- Turbocharger 1 control unit -J724- moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

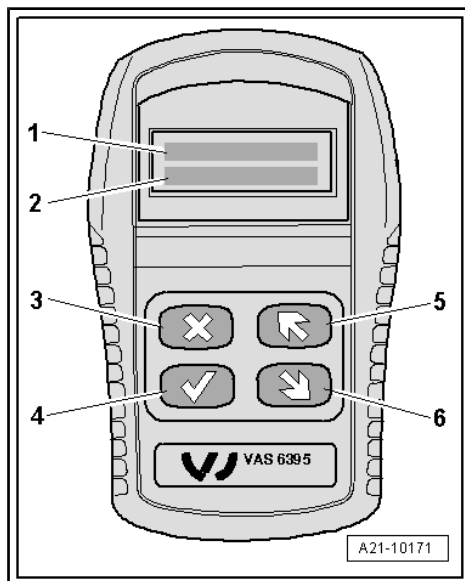
Display on -VAS 6395/1- :

- 1 - X.XXX V (voltage determined with first measurement)
- 2 - [OK]



**Note**

- ◆ If [OK] is indicated on display, terminate adjustment ⇒ [page 307](#) .
- ◆ If „CHECK“ is indicated on display, proceed as follows.



**Procedure if display indicates „CHECK“:**

Display on -VAS 6395/1- :

- 1 - [ <<< ]
- 2 - CHECK

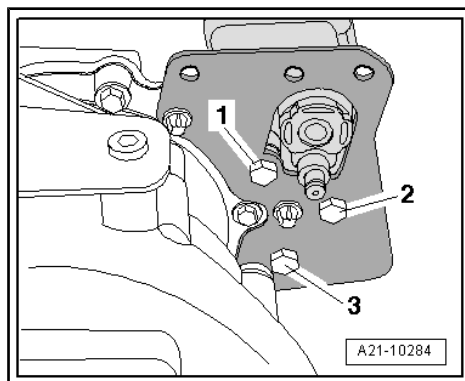
Or

- 1 - [ >>> ]
- 2 - CHECK




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- Loosen bolts -1, 2, 3- until turbocharger 1 control unit -J724- can just be moved by applying light force in the direction stated:
- If display indicates [ <<< ], move -J724- slightly in direction of travel.
- If display indicates [ >>> ], move -J724- slightly towards rear of vehicle.
- Tighten bolts -1, 2, 3- to 5 Nm.

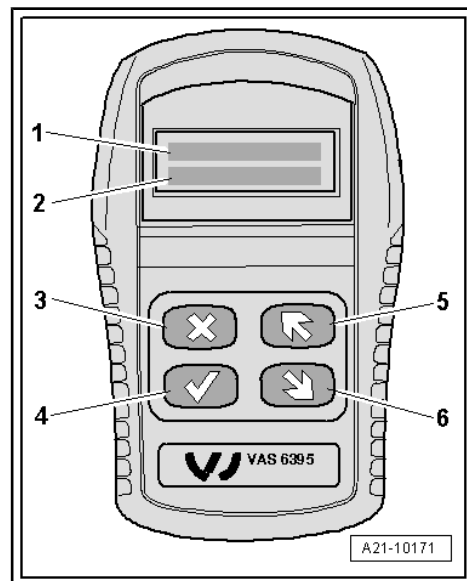




- To continue, press  button -item 4-.
- Turbocharger 1 control unit -J724- again moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

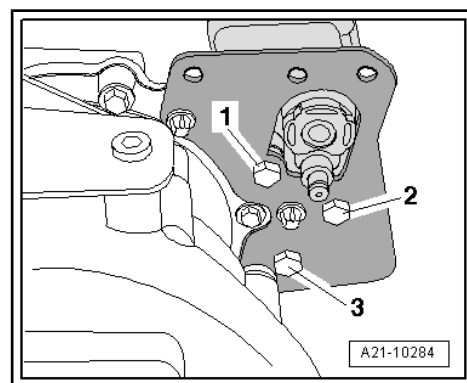
Display on -VAS 6395/1- :

- 1 - X.XXX V (voltage determined with first measurement)
- 2 - [OK]



#### Terminating adjustment:

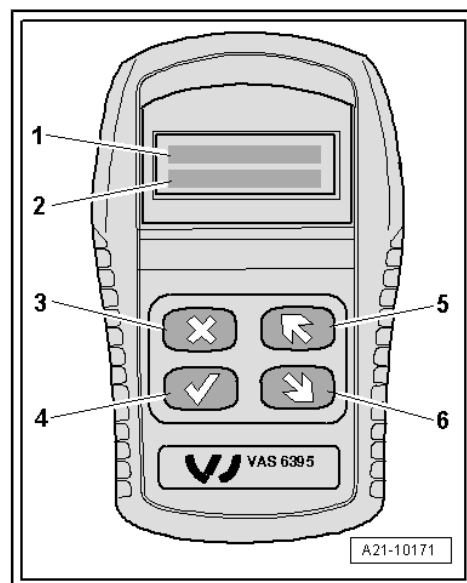
- Tighten bolts -1, 2, 3- to 10 Nm.



- To continue, press  button -item 4-.

Display on -VAS 6395/1- :

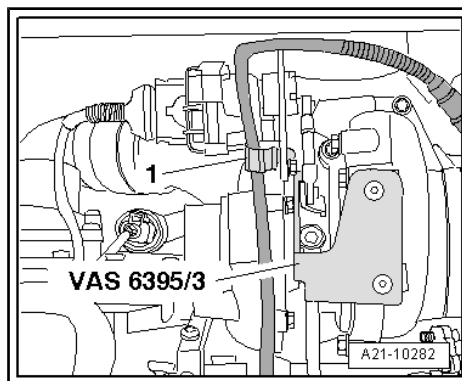
- 1 - > 1. X.XXX V
- 2 - 2. [OK]



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- Remove stop plate -VAS 6395/3- .
- Secure electrical wiring with retaining clip -1-.



- To continue, press  button -item 4-.
- Turbocharger 1 control unit -J724- moves to end positions.



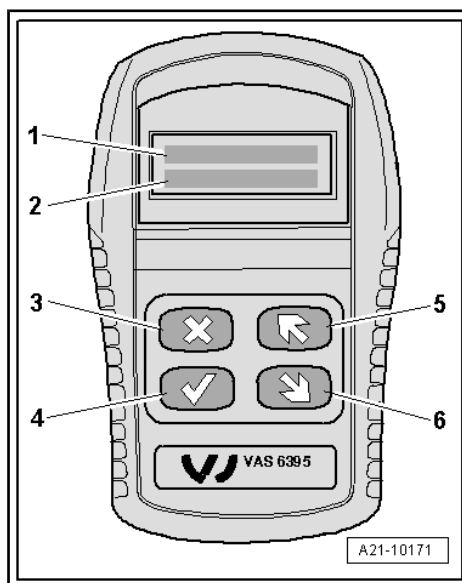
**Note**

*If the display indicates „FAULT“, the new turbocharger 1 control unit -J724- must be renewed ⇒ [page 303](#) .*

Display on -VAS 6395/1- :

- 1 -
  - 2 - [OK]
- Adjustment is completed.
  - Unplug electrical connectors for tester -VAS 6395/1- .

Assemble in reverse order.



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## 1.4 Removing and installing intermediate flange on vehicles with 2.7 ltr. engine

### Removing

- Remove starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) ; vehicles with particulate filter ⇒ [page 350](#) .
- Remove turbocharger ⇒ [page 312](#) .
- Remove bolts -3- (3x), -4- (3x), -5- (2x) and -1, 2 and 6- and take off intermediate flange.

### Installing

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



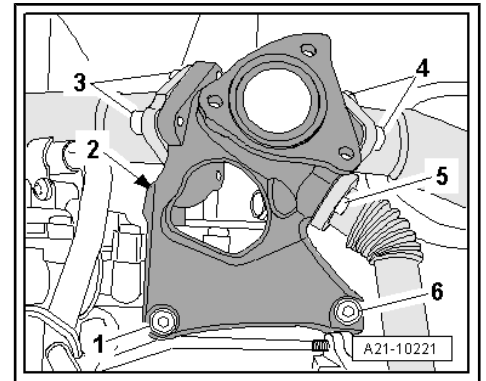
#### Note

*Renew seals and gaskets.*

- Install turbocharger ⇒ [page 312](#) .
- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .

### Tightening torques

Component	Nm
EGR connecting pipe to intermediate flange	g 1)
Intermediate pipe to intermediate flange	30 + 90° 1)2)3)
Intermediate flange to cylinder head	25
<ul style="list-style-type: none"> <li>• 1) Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• 2) Renew bolts.</li> <li>• 3) 90° = one quarter turn.</li> </ul>	



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### 1.5 Turbocharger for vehicles with 3.0 ltr. engine - exploded view

1 - 30 Nm + 90°

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

2 - Gasket

- Renew

3 - Intermediate flange

- Removing and installing ⇒ [page 326](#)

4 - Seal

- Renew

5 - Gasket

- Renew

6 - 9 Nm

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

7 - Connecting pipe to change-over flap for exhaust gas recirculation cooler

8 - 9 Nm

9 - O-ring

- Renew

10 - Gasket

- Renew

11 - Exhaust gas temperature sender 1 -G235-

- Removing and installing ⇒ [page 371](#)
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

12 - 30 Nm + 90°

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

13 - Gasket

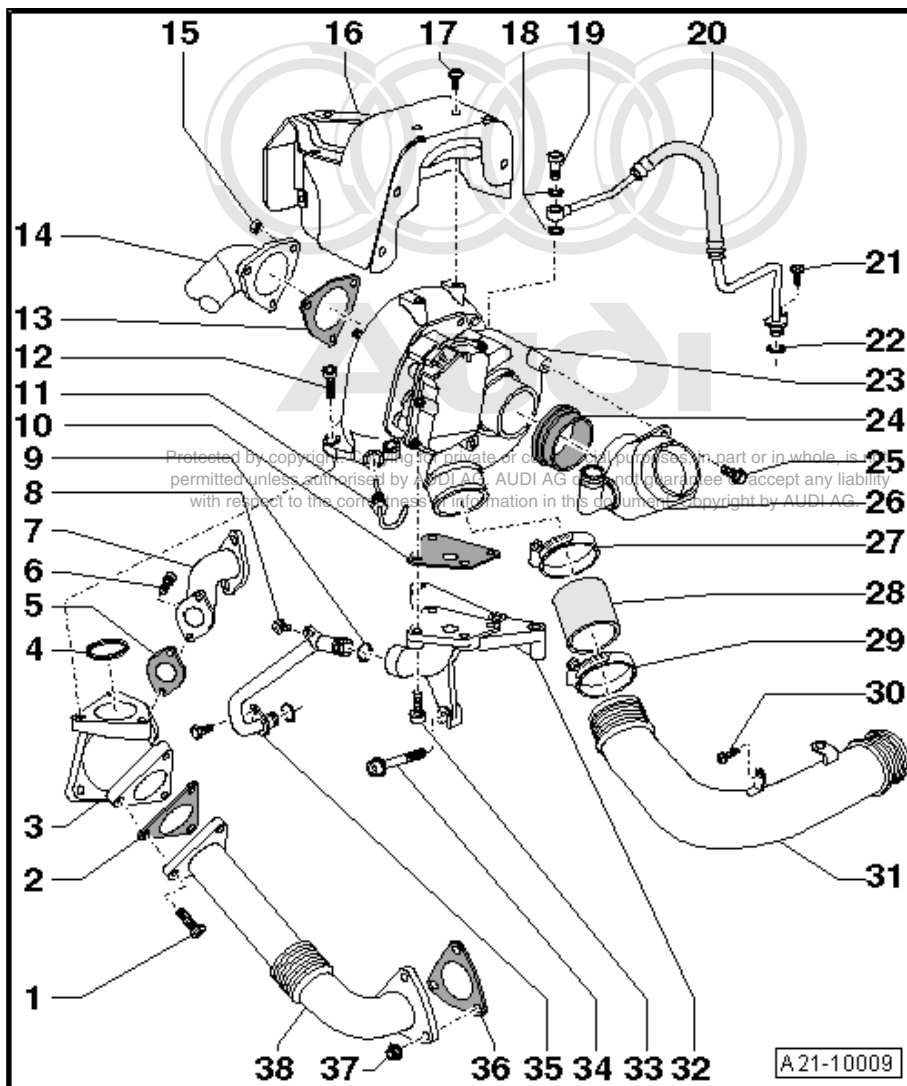
- Renew

14 - Starter catalytic converter

- Removing and installing: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .

15 - 23 Nm

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue



**16 - Heat shield for turbocharger**

**17 - 9 Nm**

**18 - Seals**

- Renew

**19 - Banjo bolt, 15 Nm**

**20 - Oil supply line**

- From cylinder block

**21 - 9 Nm**

**22 - O-ring**

- Renew

**23 - Turbocharger**

- With turbocharger 1 control unit -J724-
- Removing and installing turbocharger ⇒ [page 312](#)
- Removing and installing turbocharger 1 control unit -J724- ⇒ [page 317](#)

**24 - Seal**

- Renew if damaged

**25 - 9 Nm**

**26 - Connecting piece for air intake hose**

- From air mass meter -G70- to turbocharger
- Must be free of oil and grease when installing

**27 - Retaining clip, 5.5 Nm**

- Reinforced

**28 - Air hose**

- From turbocharger to air pipe (right-side)
  - Must be free of oil and grease when installing
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**29 - Retaining clip, 5.5 Nm**

- Reinforced

**30 - 9 Nm**

**31 - Air pipe (right-side)**

**32 - Bracket for turbocharger**

**33 - 20 Nm**

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

**34 - 25 Nm**

**35 - Oil return line**

- To cylinder block

**36 - Gasket**

- Renew

**37 - 30 Nm + 90°**

- Type of connection differs depending on version ⇒ [page 312](#)

**38 - Intermediate pipe**

- Removing and installing: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#)



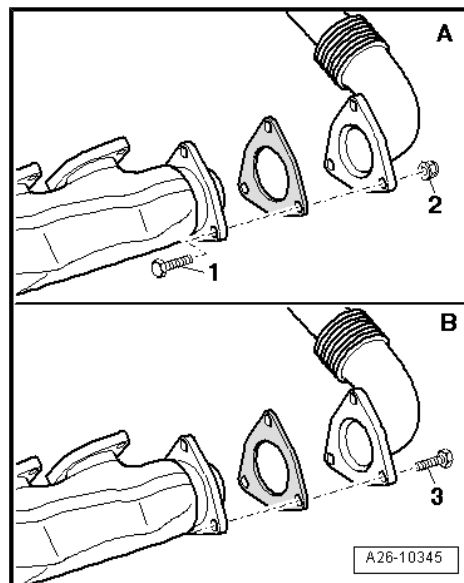
### Securing intermediate pipe to exhaust manifold

A - Exhaust manifold (sheet metal version)

- Fitted with bolts -1- and nuts -2-.
- Renew bolts and nuts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

B - Exhaust manifold (cast version)

- Fitted with bolts -3-.
- Renew bolts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .



## 1.6 Removing and installing turbocharger on vehicles with 3.0 ltr. engine

### Removing

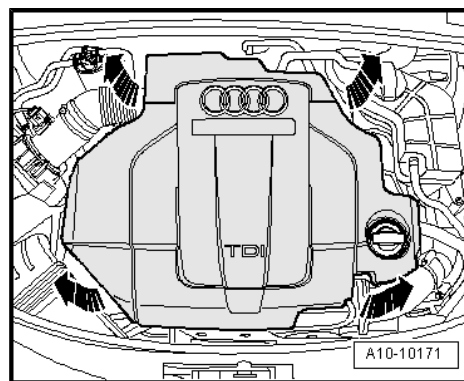


#### Caution

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

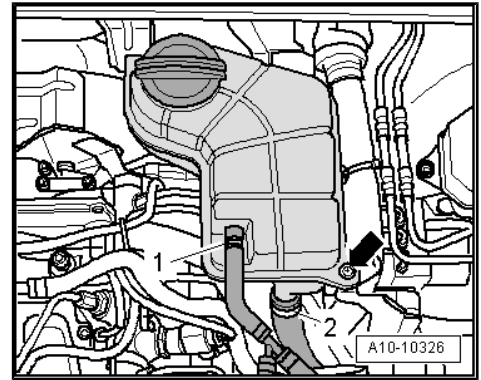
- ◆ *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- ◆ *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- ◆ *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

- Drain off coolant ⇒ [page 253](#) .
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

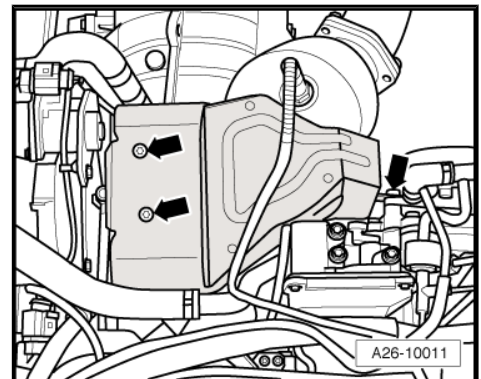


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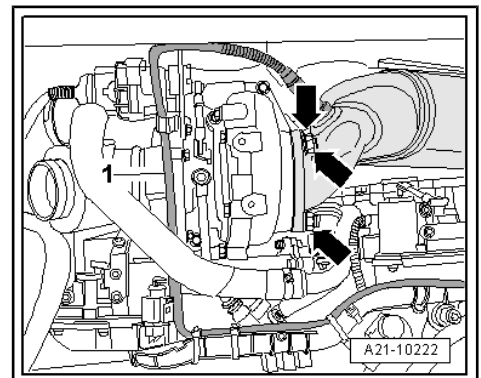
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.



- Remove heat shield for turbocharger -arrows-.

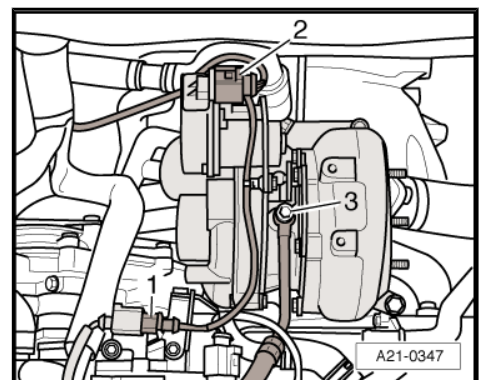


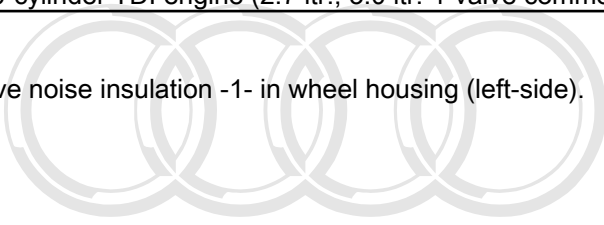
- Move electrical wiring -1- to Lambda probe clear.
- Unscrew nuts -arrows- securing starter catalytic converter to turbocharger and push starter catalytic converter to the side.



- Unplug electrical connectors -1- and -2-.
- Remove banjo bolt -3- and disconnect oil supply line from turbocharger.

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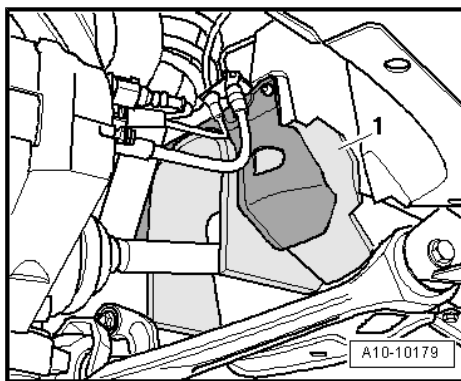




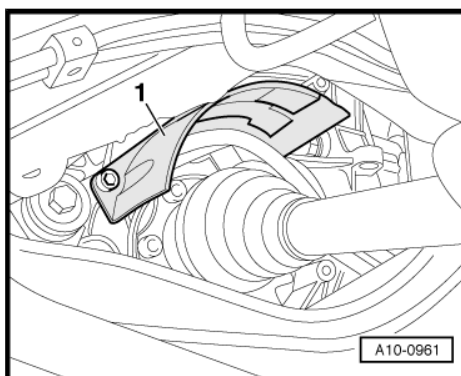
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- Remove noise insulation -1- in wheel housing (left-side).



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

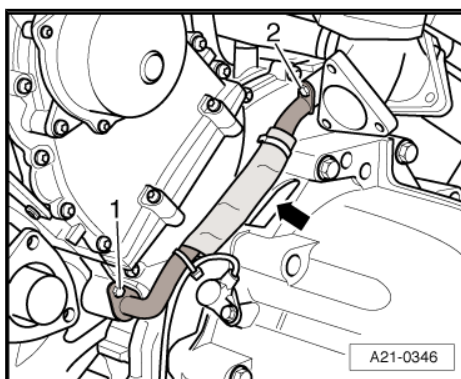


- Cover opening -arrow- in gearbox to prevent small parts from dropping in.
- Remove bolt -2- and detach oil return line from turbocharger.

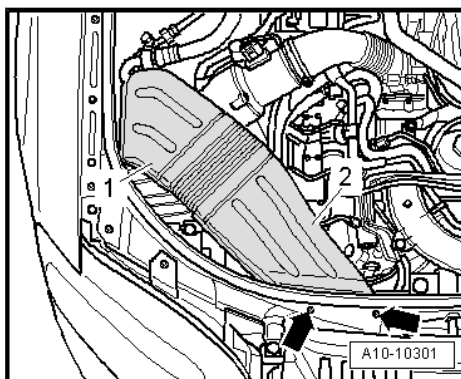


**Note**

- ◆ *Shown in illustration with intermediate pipe removed.*
- ◆ *Disregard -item 1-.*

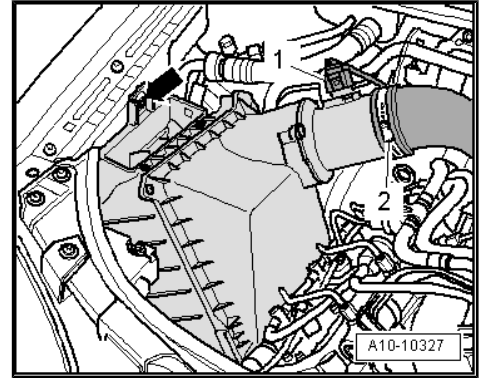


- Remove bolts -arrows-.
- Remove air ducts -1- and -2-.





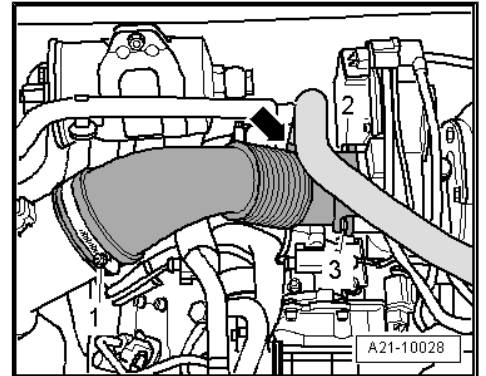
- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake pipe -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



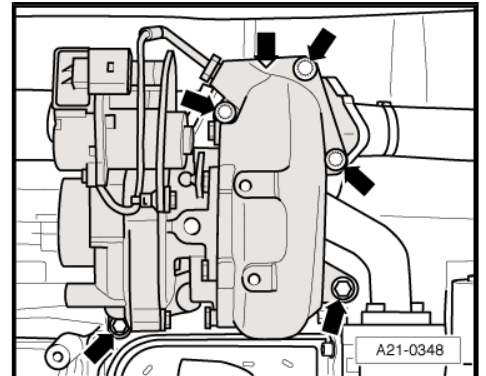
- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Disconnect air pipe from turbocharger.

 **Note**

*Disregard -item 1-.*



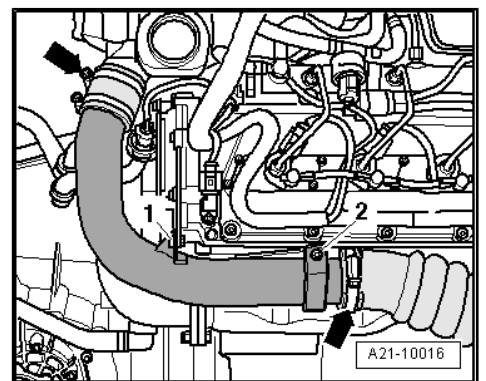
- Remove bolts -arrows-.



- Unscrew bolts -1- and -2- and disconnect air pipe from hoses -arrow-.



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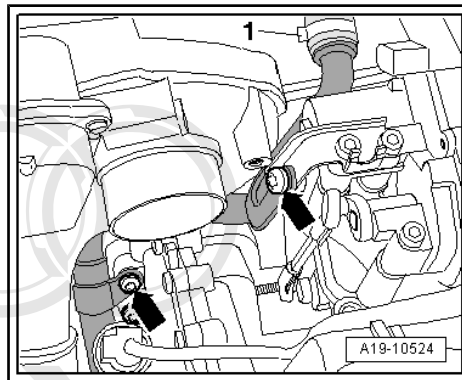
- Remove bolts -arrows-.



### Note

Place a cloth underneath to catch escaping coolant.

- Detach coolant hose -1-.
- Push turbocharger slightly towards the rear and pivot rear coolant pipe towards the right.
- Detach turbocharger.



### Installing

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



### Note

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- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- ◆ *Fit all heat insulation sleeves in the original position when installing.*
- ◆ *After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.*
- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .
- Install coolant pipe (rear) ⇒ [page 276](#) .
- Fill cooling system ⇒ [page 255](#) .

## Tightening torques

Component	Nm	
Turbocharger to:	Intermediate flange	30 + 90° 1)2)3)
	Engine	25
Oil return line to intermediate flange:	9	
Oil supply line to turbocharger	15	
Coolant pipe (rear) to cylinder head	9	
Air pipe to cylinder head	9	
Drive shaft heat shield to gearbox	23	
<ul style="list-style-type: none"> <li>• 1) Renew bolts.</li> <li>• 2) Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• 3) 90° = one quarter turn.</li> </ul>		

## 1.7 Removing and installing turbocharger 1 control unit -J724- - vehicles with 3.0 ltr. engine

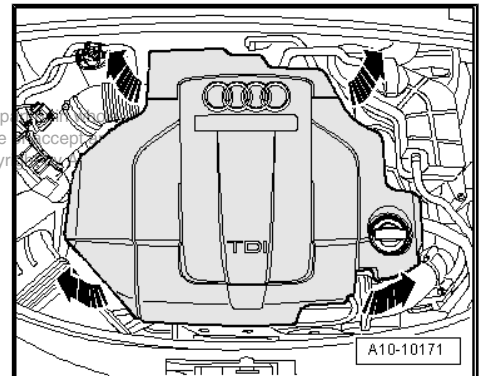
### Special tools and workshop equipment required

- ◆ Tester -VAS 6395/1-
- ◆ Connection lead -VAS 6395/4-2-
- ◆ Open-end spanner, 10 mm (90 mm long) -VAS 6395/4-3-

### Removing

Proceed as follows:

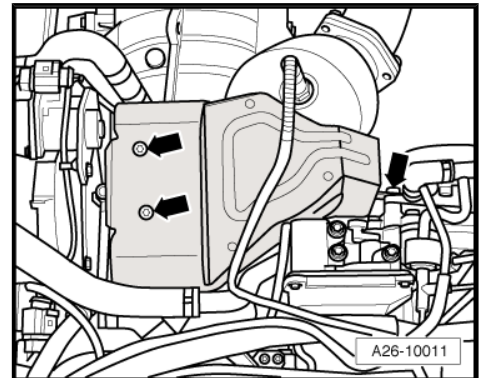
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



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

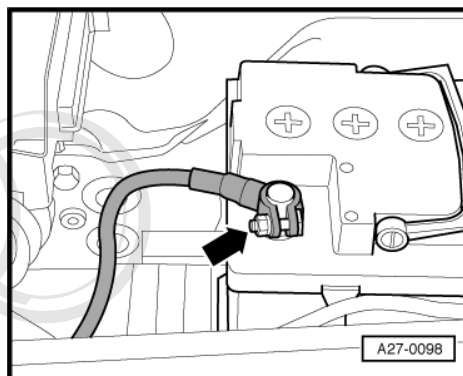
### Note

The bottom bolt -right arrow- does not have to be completely removed.





- Connect tester -VAS 6395/1- with connecting wire -VAS 6395/2- to positive battery terminal -arrow- and negative battery terminal.



### Checking software version of tester -VAS 6395/1- :



#### Caution

**Risk of damage to turbocharger 1 control unit -J724-**

- ◆ **Before continuing, check whether the correct software version is loaded in the tester -VAS 6395/1- . To do so, proceed as follows:**

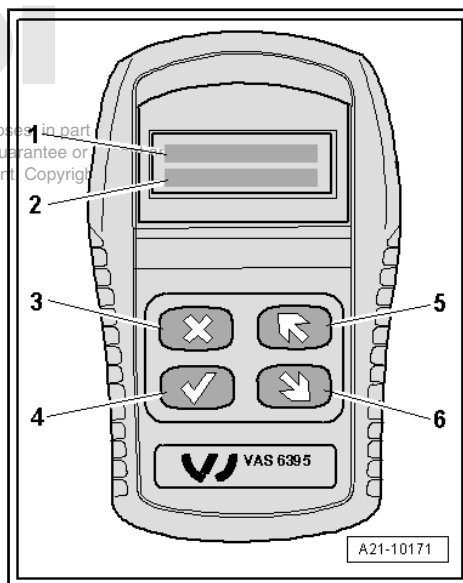
Display on -VAS 6395/1- (2 seconds after connecting to power supply) if correct software version is loaded:

- 1 - >TEST
- 2 - LEARN



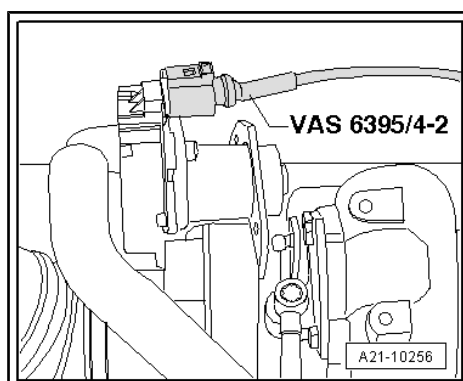
#### Note

- ◆ *If the following appears on the display, an incorrect software version has been loaded:*
- ◆ 1. START
- ◆ 2. NEXT [>]
- ◆ *If this is the case, download the correct software version from the „Audi ServiceNet“ under „Workshop Equipment“.*




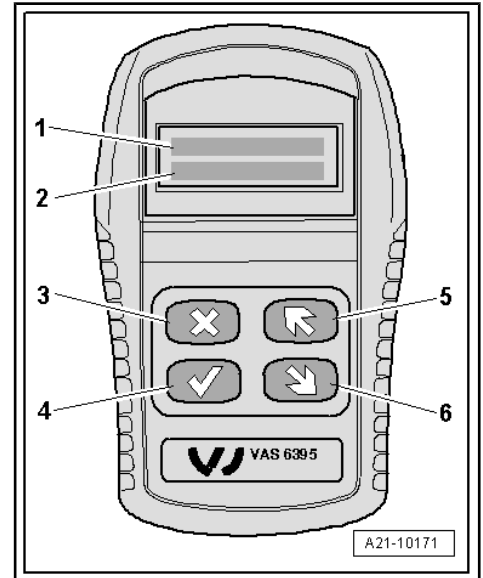
### Continuation of procedure:

- Unplug electrical connector for turbocharger 1 control unit -J724- .
- Connect connection lead -VAS 6395/4-2- to turbocharger 1 control unit -J724- and to tester -VAS 6395/1- .



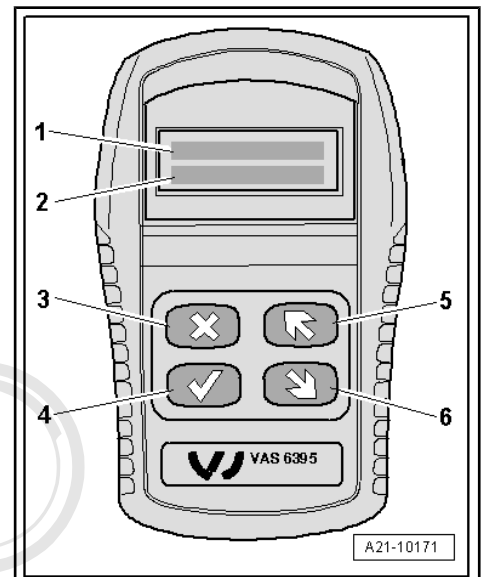
Display on -VAS 6395/1- :

- 1 - >TEST
  - 2 - LEARN
- To continue, press  button -item 4-.



Display on -VAS 6395/1- :

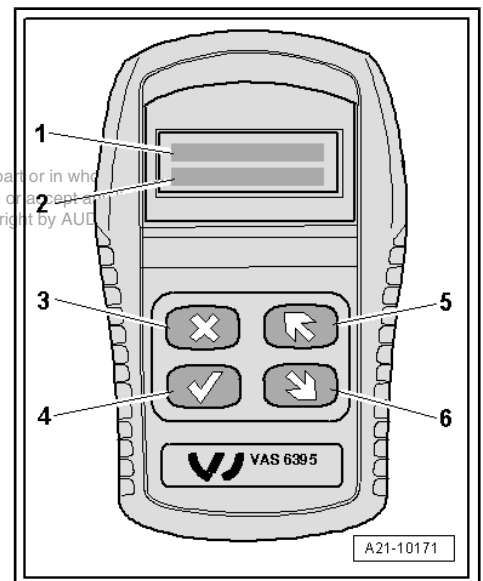
- 1 - CHECK
  - 2 - S: XX % I: XX %
- The tester -VAS 6395/1- runs through the adjustment range of the turbocharger 1 control unit -J724- and checks the feedback of the positions.



Display on -VAS 6395/1- if turbocharger 1 control unit -J724- is OK:

- 1 - ACTUATOR OK
- The test is completed.

- Unplug electrical connectors for tester -VAS 6395/1-  
 Assemble in reverse order.





**Display on -VAS 6395/1- if turbocharger 1 control unit -J724- is not OK:**

1 - PROBLEM

- Renew turbocharger 1 control unit -J724- .

- To do so, proceed as follows:

- To continue, press button -item 4-.

Display on -VAS 6395/1- :

1 - >TEST

2 - LEARN

- Press button -item 6-.



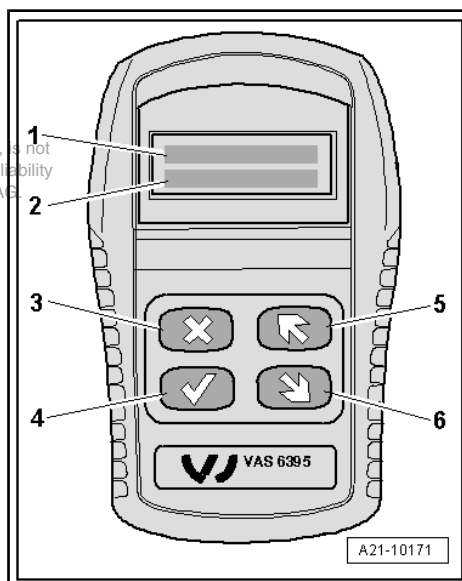
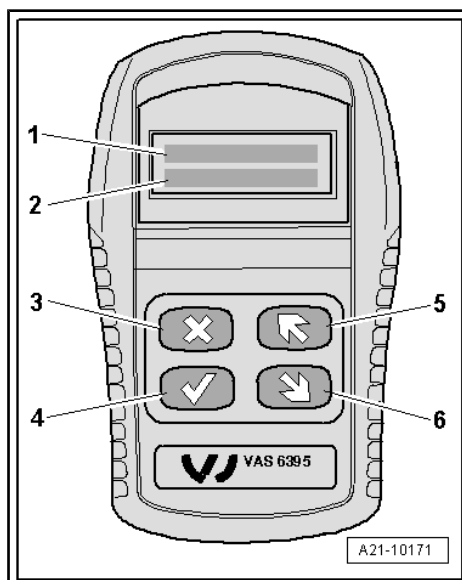
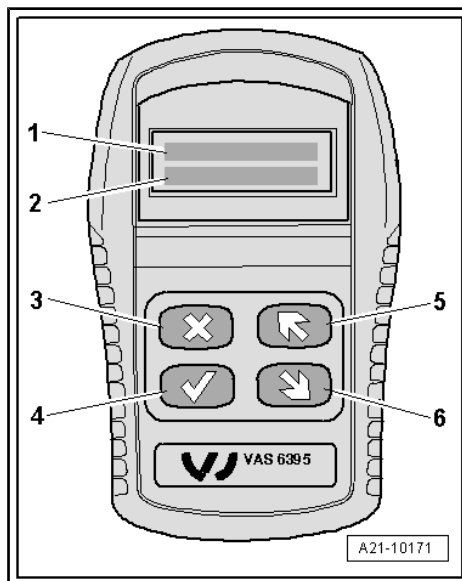
Display on -VAS 6395/1- :

1 - TEST

2 - >LEARN



- To continue, press button -item 4-.

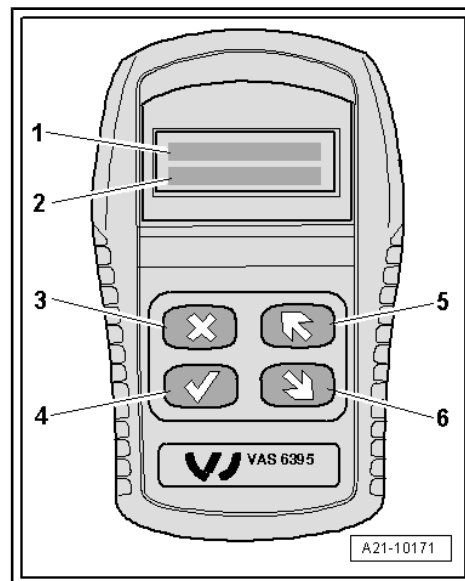
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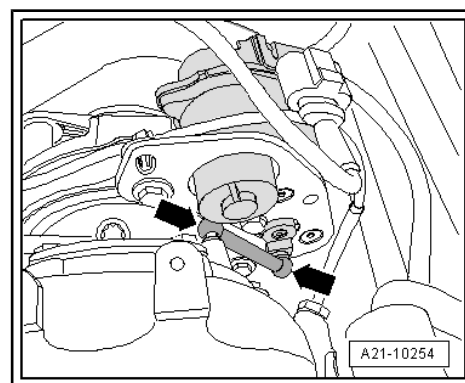
Display on -VAS 6395/1- :

1 - STEP 1

- By pressing buttons  -item 5- and  -item 6-, adjust turbo-charger 1 control unit -J724- so that coupling rod can be accessed easily for removal.



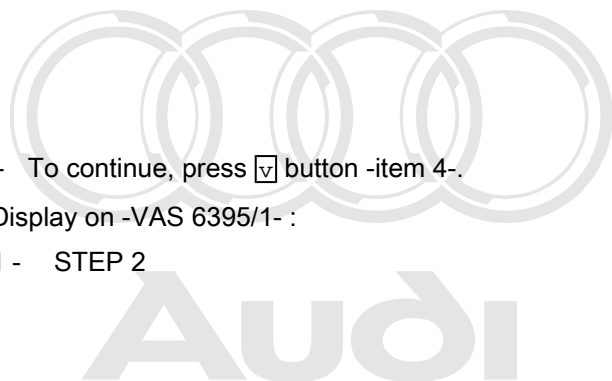
- Unclip coupling rod -arrows- and dispose of it.



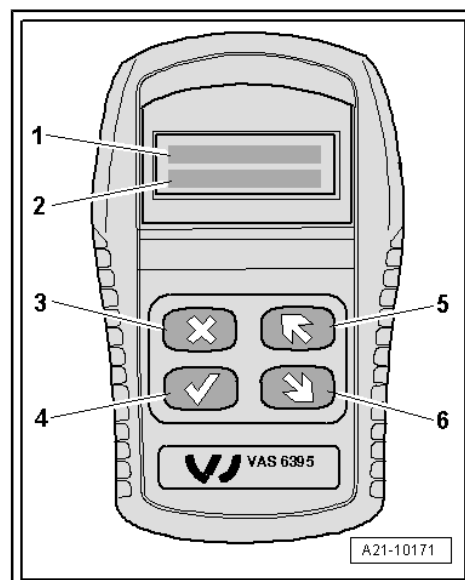
- To continue, press  button -item 4-.

Display on -VAS 6395/1- :

1 - STEP 2



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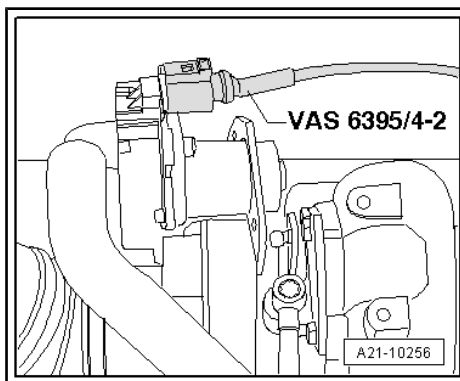


- Disconnect connection lead -VAS 6395/4-2- from turbocharger 1 control unit -J724- .

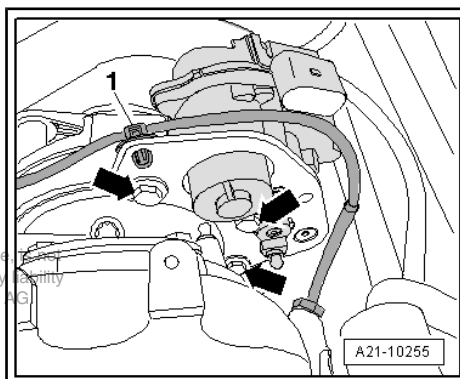


**Caution**

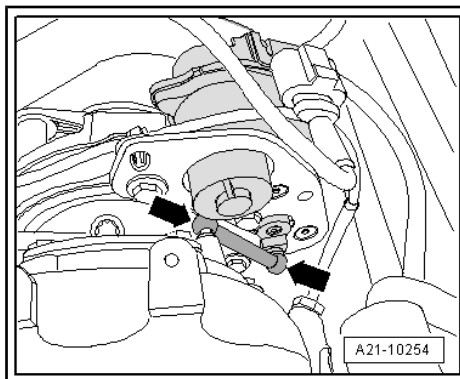
*Power supply for tester -VAS 6395/1- must remain connected.*



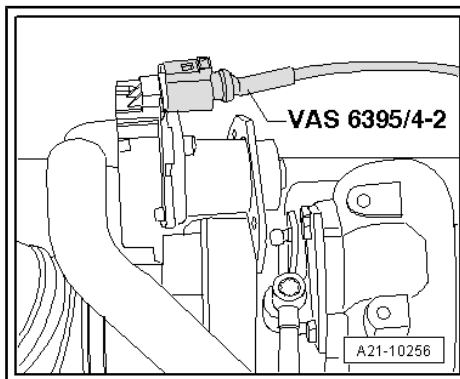
- Unclip retaining clip -1- for electrical wire.
- Remove bolts -arrows-; use open-end spanner, 10 mm (90 mm long) -VAS 6395/4-3- for bolts at centre and bottom.
- Remove old turbocharger 1 control unit -J724- and dispose of it.
- Install new turbocharger 1 control unit -J724- in reverse order of removal, tighten bolts -arrows- only hand-tight.
- Turbocharger 1 control unit -J724- must rest on retaining plate so there is no play; it must still be possible to move control unit by hand.




- Clip on new coupling rod -arrows-.



- Connect connection lead -VAS 6395/4-2- to turbocharger 1 control unit -J724- .

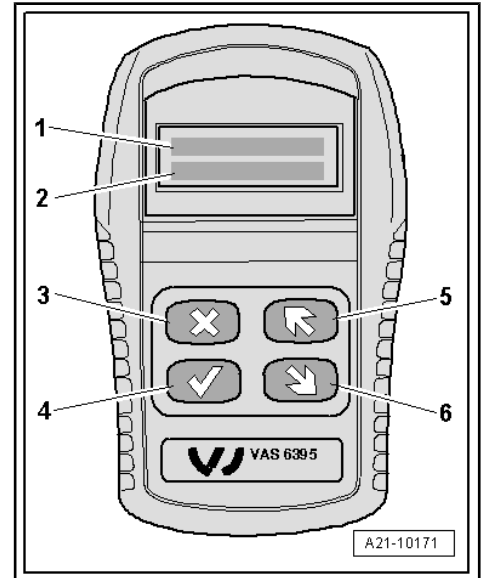




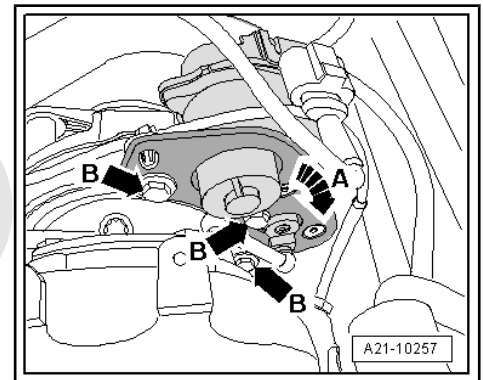
– To continue, press  button -item 4-.


Display on -VAS 6395/1- :

1- STEP 3



– Press turbocharger 1 control unit -J724- downwards and towards rear using moderate pressure -arrow A-, at the same time tighten bolts -arrows B- to 10 Nm using open-end spanner, 10 mm (90 mm long) -VAS 6395/4-3- for centre and bottom bolts.





– To continue, press  button -item 4-.

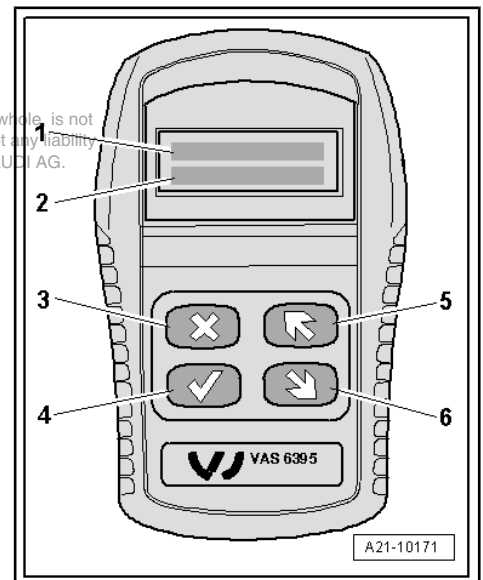
Display on -VAS 6395/1- :

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- 2 - LEARNING with respect to the correctness of information in this document. Copyright by AUDI AG.



#### Caution

- ◆ **Now check correct installation of turbocharger 1 control unit -J724- ; from the next step of the programme onwards (confirmed by the  button -item 4-) the turbocharger 1 control unit -J724- learns the limit positions of the adjustment travel once only. If the limit positions are not stored correctly due to an incorrect installation position, the learning procedure of turbocharger 1 control unit -J724- cannot be repeated and the control unit must be renewed.**
- ◆ **If you are not certain that the installation position is correct, you can terminate the procedure by pressing the  button -item 3- and the start the procedure again.**





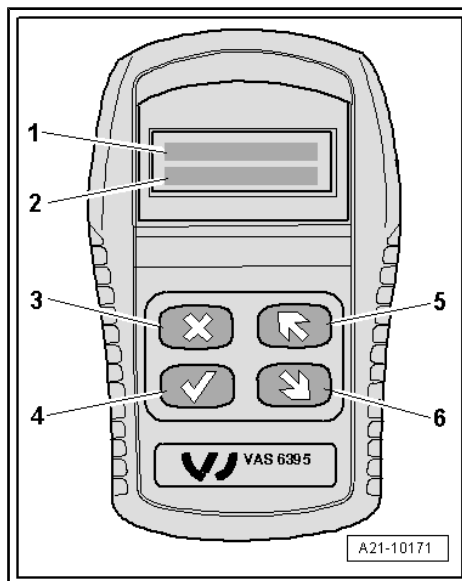
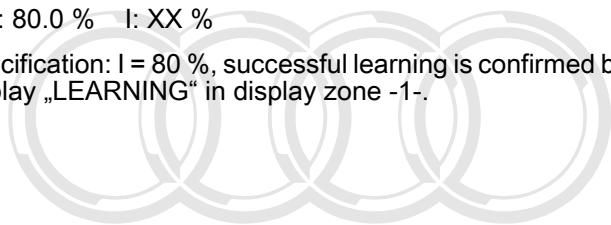
- To confirm that the new turbocharger 1 control unit -J724- has been correctly installed, press button -item 4-.

Display on -VAS 6395/1- :

1 - TEST 1

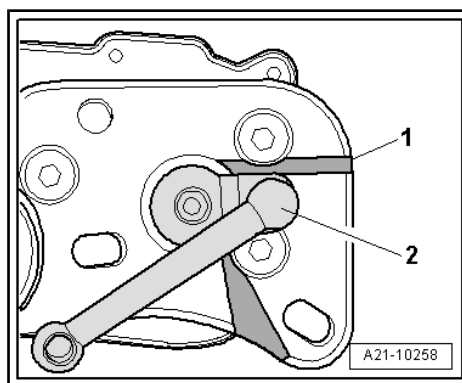
2 - S: 80.0 % I: XX %

- Specification: I = 80 %, successful learning is confirmed by the display „LEARNING“ in display zone -1-.



- At the same time, check position of adjustment lever at turbocharger 1 control unit -J724- :

- The edge of adjustment lever -2- must be within marking -1-.



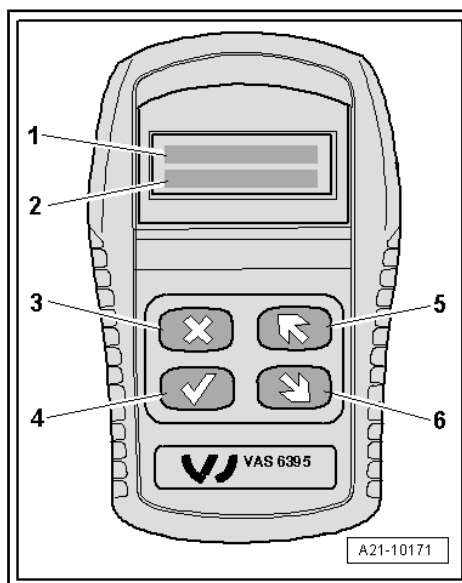
- To continue, press button -item 4-.

Display on -VAS 6395/1- :

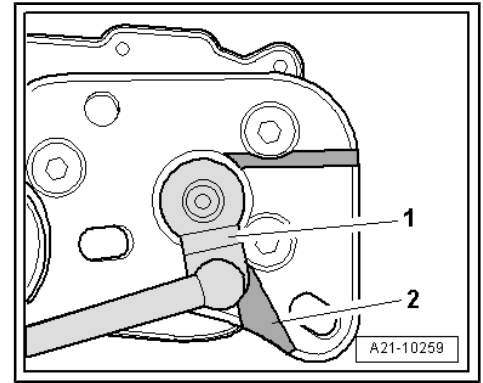
1 - TEST 2


2 - S: 16.0 % I: XX %

- Specification: I = 16 %, successful learning is confirmed by the display „LEARNING“ in display zone -1-.



- At the same time, check position of adjustment lever at turbo-charger 1 control unit -J724- :
- The edge of adjustment lever -1- must be within marking -2-.



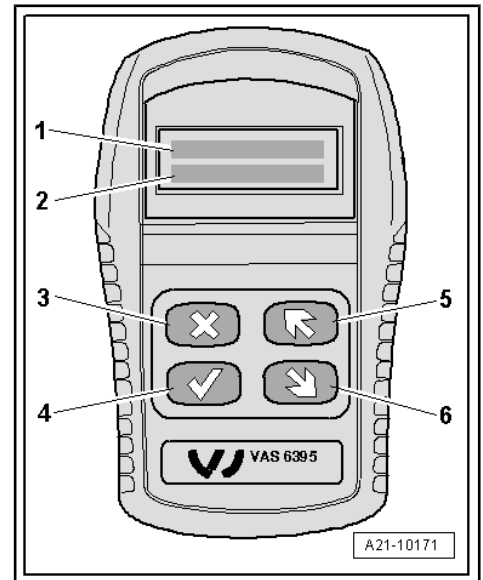
- To continue, press  button -item 4-.


Display on -VAS 6395/1- :

1 - TEST 3

2 - S: 55.0 % I: XX %


- Check of centre position is now performed.



- To continue, press  button -item 4-.

Display on -VAS 6395/1- :

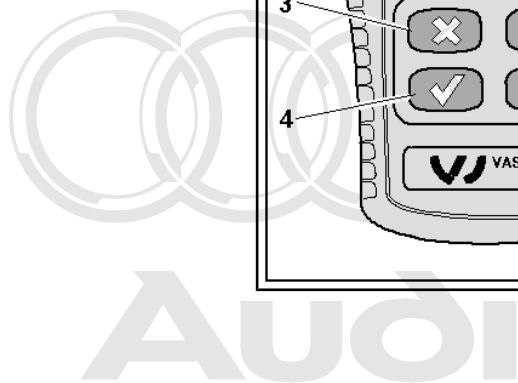
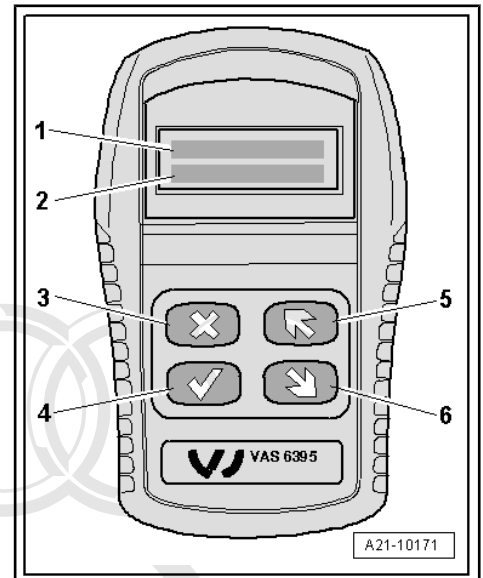
1 - OK

- To confirm, press  button -item 4-.

- Adjustment is completed.

- Unplug electrical connectors for tester -VAS 6395/1- .

Assemble in reverse order.

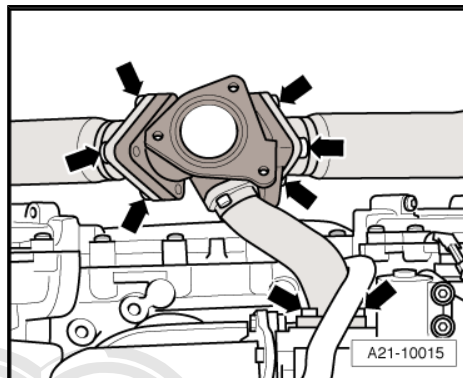




## 1.8 Removing and installing intermediate flange on vehicles with 3.0 ltr. engine

### Removing

- Remove starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) ; vehicles with particulate filter ⇒ [page 350](#) .
- Remove turbocharger ⇒ [page 312](#) .
- Unscrew bolts -arrows- and detach intermediate flange with connecting pipe for exhaust gas recirculation.



### Installing

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



#### Note

*Renew seals and gaskets.*

- Install turbocharger ⇒ [page 312](#) .
- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .

### Tightening torques

Component	Nm	
EGR connecting pipe to:	Intermediate flange	9 1)
	Change-over flap for exhaust gas recirculation cooler	25
Intermediate pipe to intermediate flange	30 + 90° 1)2)3)	
<ul style="list-style-type: none"> <li>• 1) Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• 2) Renew bolts.</li> <li>• 3) 90° = one quarter turn.</li> </ul>		

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## 1.9 Charge air cooler - exploded view



Illustration shows left-side charge air cooler.

1 - Front air duct

2 - Hose clip, 5.5 Nm

- Reinforced

3 - Air hose

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

4 - 5 Nm

5 - Charge pressure sender - G31-

- Removing and installing  
⇒ [page 329](#)

6 - O-ring

- Renew

7 - Air hose

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

8 - Hose clip, 5.5 Nm

- Reinforced

9 - Charge air cooler

- Removing and installing  
⇒ [page 328](#)

10 - Retainer

- For charge air cooler
- 2x

11 - 22 Nm

12 - Bracket

13 - Rubber grommet

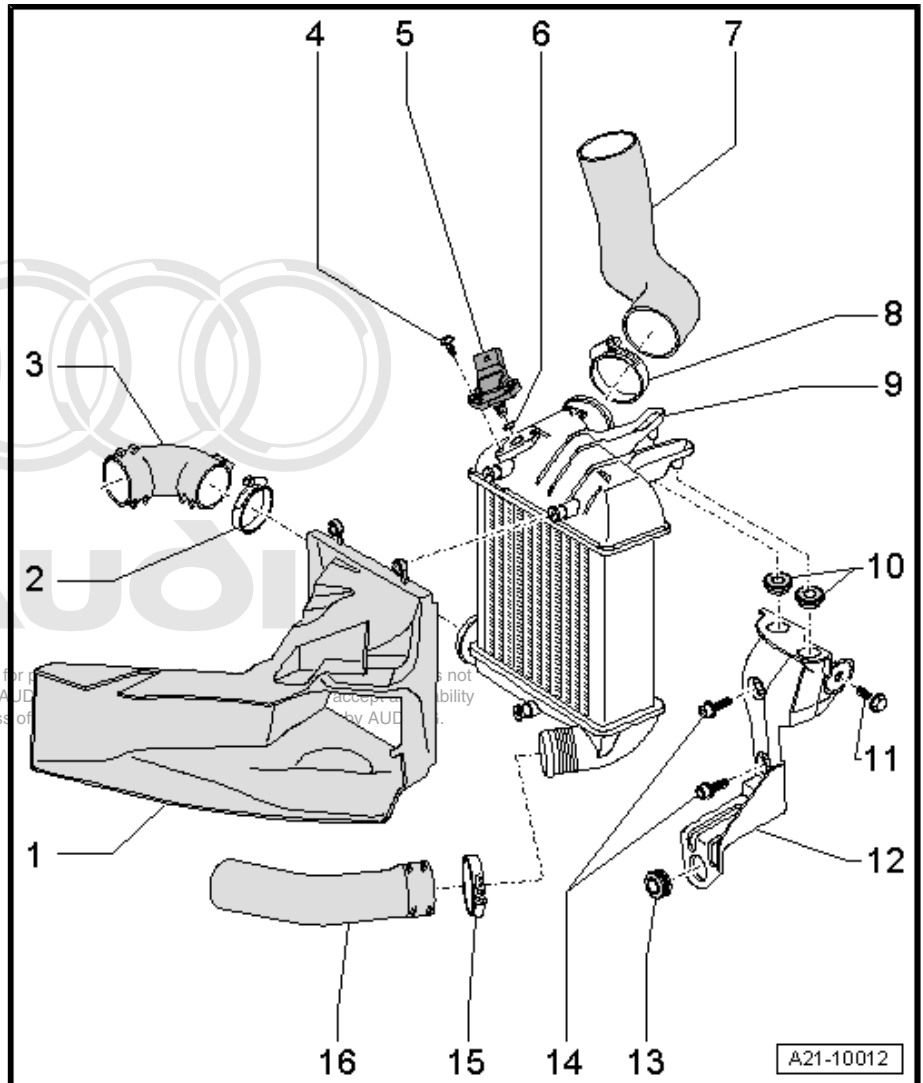
14 - 22 Nm

15 - Hose clip, 5.5 Nm

- Reinforced

16 - Air hose

- To charge air cooler (right-side)
- Must be free of oil and grease when installing





## 1.10 Removing and installing charge air cooler

### Removing



#### Note

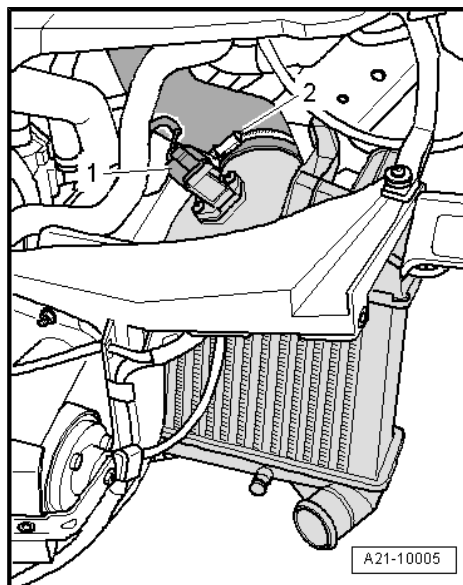
The following description shows the removal and installation of the left-side charge air cooler. The procedure for the right-side charge air cooler is the same.

- Move lock carrier to service position ⇒ [page 95](#) .
- Unplug electrical connector -1- going to charge pressure sender -G31- .
- Open hose clip -2- and disconnect air intake hose.
- Detach charge air cooler at the bottom.
- Take off charge air cooler.



#### Note

Charge air cooler is shown with headlight removed for illustration purposes.



### Installing

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



#### Note

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
  - ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- Install lock carrier with attachments ⇒ Rep. gr. 50 .
  - Install bumper cover (front) ⇒ Rep. gr. 63 .

### Tightening torque

Component	Nm
Hose clips (13 mm wide)	5.5

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## 1.11 Removing and installing charge pressure sender -G31-

### Removing

- Remove bumper cover (front) ⇒ Rep. gr. 63 .
- Remove left headlight ⇒ Rep. gr. 94 .
- Unplug electrical connector -arrow- at charge pressure sender -G31- .
- Remove bolts and pull charge pressure sender -G31- out of charge air cooler.

### Installing

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



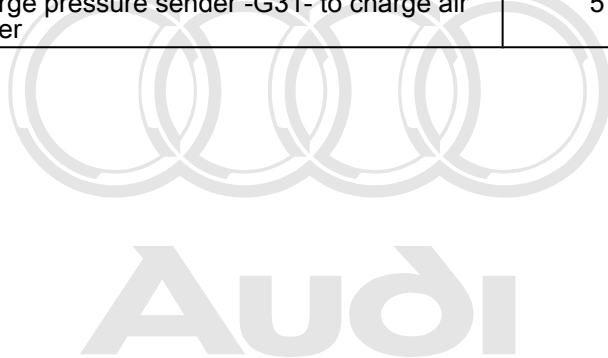
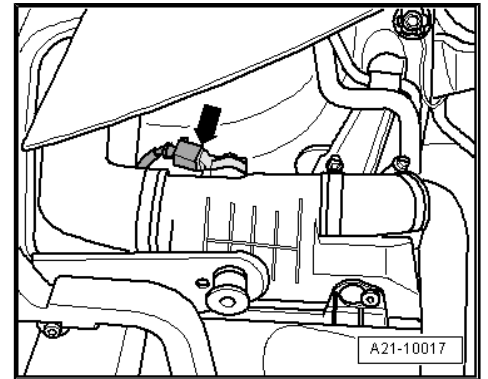
#### Note

*Renew O-ring.*

- Install headlight (left-side) ⇒ Rep. gr. 94 .
- Install bumper cover (front) ⇒ Rep. gr. 63 .

### Tightening torque

Component	Nm
Charge pressure sender -G31- to charge air cooler	5



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## 26 – Exhaust system

### 1 Exhaust system on vehicles without particulate filter



#### 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 clamps and align silencers and exhaust pipes so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.

#### 1.1 Exhaust system - exploded view

1 - 23 Nm

2 - Mounting

- Renew if damaged
- Check preload  
⇒ „1.6 Stress-free alignment of exhaust system“, page 340

3 - Y-pipe

- Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- Cutting point  
⇒ page 333
- Align exhaust system so it is free of stress  
⇒ page 340

4 - 25 Nm

- Renew

5 - Gasket

- Renew

6 - Starter catalytic converter

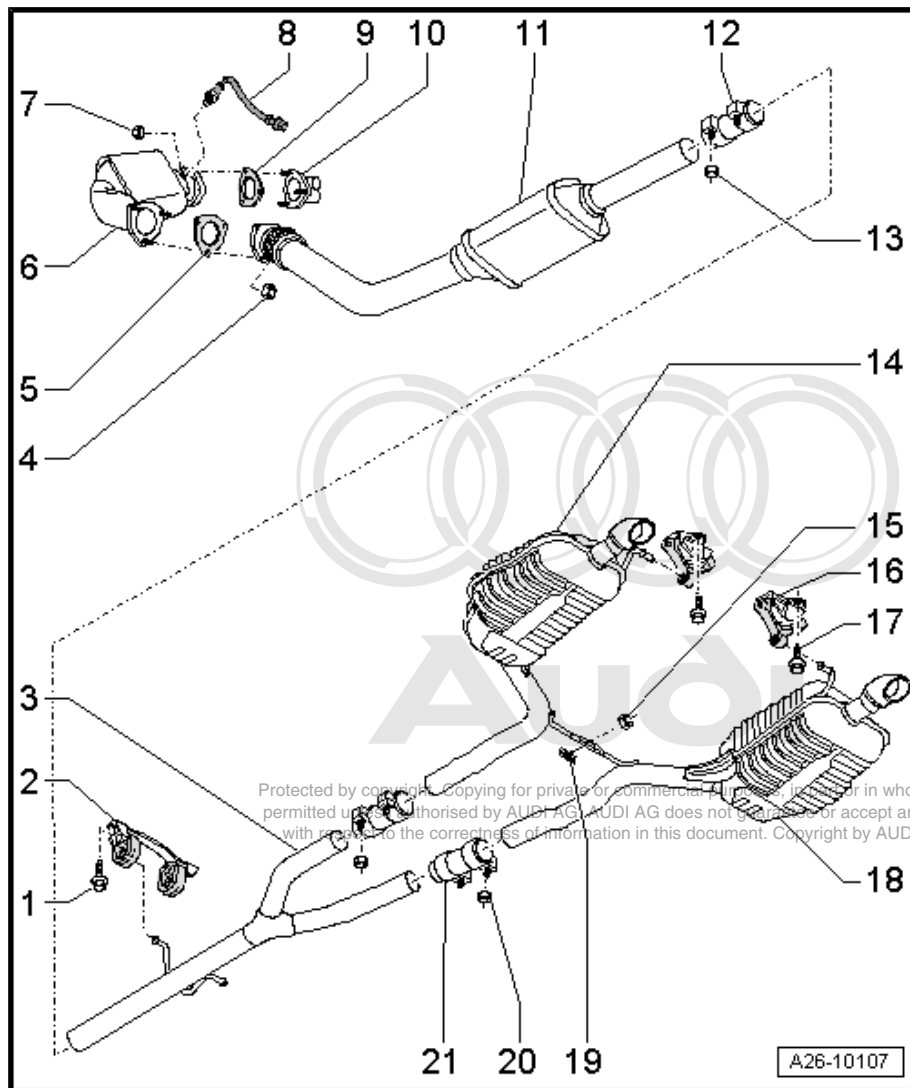
- Protect against knocks and impact
- Removing and installing  
⇒ page 334
- Align exhaust system so it is free of stress  
⇒ page 340

7 - 27 Nm

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

8 - Lambda probe -G39-

- The threads on the new Lambda probes are coated with a special assembly paste.
- If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste



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- The assembly paste/high-temperature paste must not get into the slots on the probe body.
- Removing and installing ⇒ Rep. gr. 23

#### 9 - Gasket

- Renew

#### 10 - Turbocharger

#### 11 - Front exhaust pipe with catalytic converter

- With flexible joint
- Protect against knocks and impact
- Removing and installing ⇒ [page 338](#)
- Do not bend flexible joint more than 10° – otherwise it can be damaged
- Components of exhaust pipe mountings: Vehicles with manual gearbox ⇒ [page 332](#) , vehicles with automatic gearbox ⇒ [page 333](#)
- Align exhaust system so it is free of stress ⇒ [page 340](#)

#### 12 - Clamp (front)

- Installation position ⇒ [page 332](#)
- Before tightening, align exhaust system so it is free of stress ⇒ [page 340](#)
- Tighten bolt connections evenly

#### 13 - M8: 23 Nm; M10: 40 Nm

#### 14 - Rear silencer with tailpipe

- For left side of vehicle**
- Combined with Y-pipe in one unit as original equipment
- Y-pipe, rear silencer and tailpipe can be renewed separately as required
- Cutting point: Y-pipe / rear silencer ⇒ [page 333](#)
- Cutting point: rear silencer / tailpipe ⇒ [page 334](#)
- Align exhaust system so it is free of stress ⇒ [page 340](#)

#### 15 - 25 Nm

- Renew

#### 16 - Mounting

- Renew if damaged
- Check preload ⇒ [„1.6 Stress-free alignment of exhaust system“, page 340](#)

#### 17 - 23 Nm

#### 18 - Rear silencer with tailpipe

- For right side of vehicle
- Y-pipe, rear silencer and tailpipe can be renewed separately as required
- Cutting point: Y-pipe / rear silencer ⇒ [page 333](#)
- Cutting point: rear silencer / tailpipe ⇒ [page 334](#)
- Align exhaust system so it is free of stress ⇒ [page 340](#)

#### 19 - Retainer

#### 20 - M8: 23 Nm; M10: 40 Nm

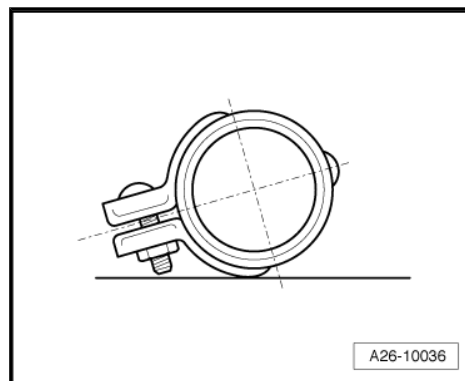
#### 21 - Clamp (rear)

- For separate replacement of Y-pipe and rear silencers
- Before tightening, align exhaust system so it is free of stress ⇒ [page 340](#)
- Installation position ⇒ [page 332](#)
- Tighten bolt connections evenly



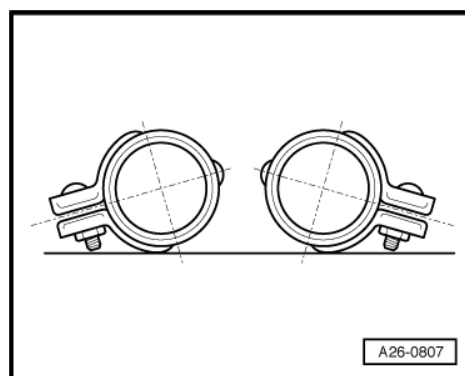
### Installation position of front clamp

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



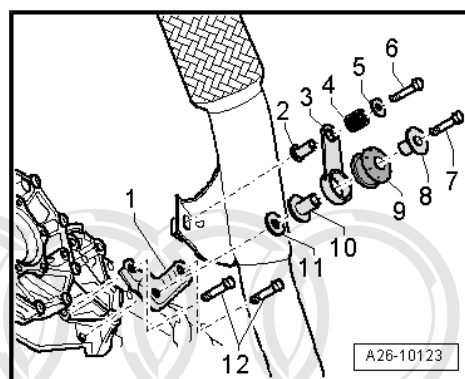
### Installation position of rear clamps

- Install clamps so that the bolt ends do not protrude beyond bottom of clamp.
- Bolt connections face outwards.



### Components of front exhaust pipe mountings - vehicles with manual gearbox

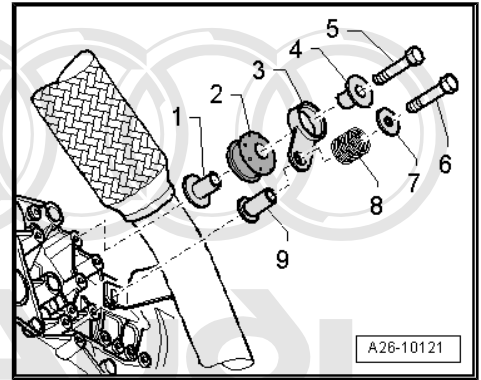
- 1 - Bracket
- 2 - Spacer sleeve
- 3 - Bracket
- 4 - Compression spring
- 5 - Washer
- 6 - Bolt, 23 Nm
- 7 - Bolt, 23 Nm
- 8 - Spacer sleeve
- 9 - Buffer
- 10 - Spacer sleeve
- 11 - Washer
- 12 - Bolt, 23 Nm



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### Components of front exhaust pipe mountings - vehicles with automatic gearbox

- 1 - Spacer sleeve
- 2 - Buffer
- 3 - Bracket
- 4 - Spacer sleeve
- 5 - Bolt, 23 Nm
- 6 - Bolt, 23 Nm
- 7 - Washer
- 8 - Compression spring
- 9 - Spacer sleeve



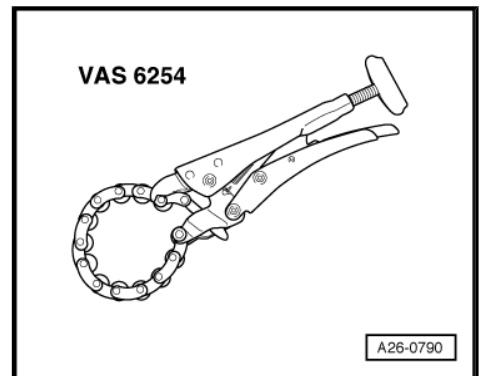
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## 1.2 Separating Y-pipe and rear silencers

- ◆ The connecting pipe can be cut through at the point marked in order to renew the Y-pipe or rear silencer(s) separately.
- ◆ The cutting point is marked by an indentation on the circumference of the exhaust pipe.

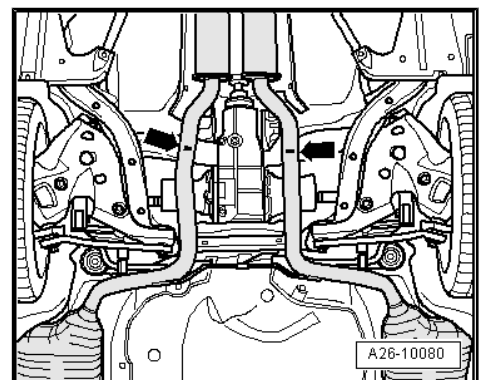
### Special tools and workshop equipment required

- ◆ Chain pipe cutter -VAS 6254-



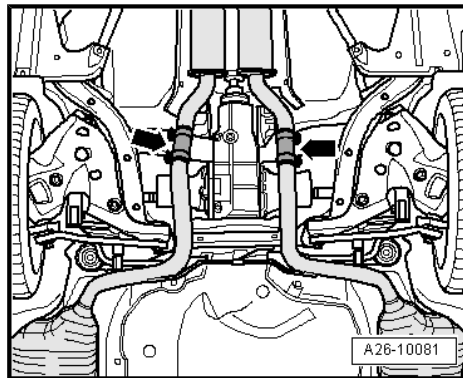
### Procedure

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

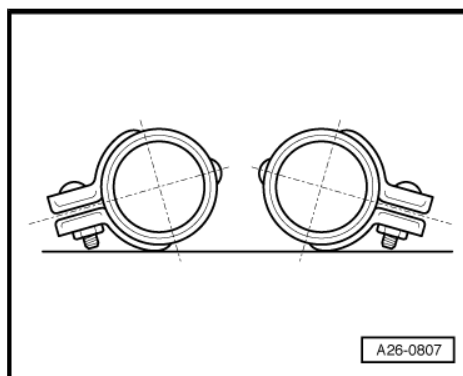




- When reassembling, position the clamps -arrows- centrally over the cutting points.



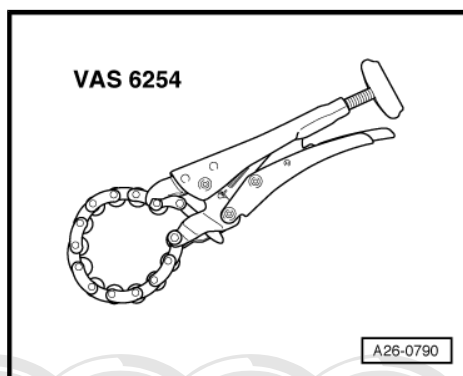
- Fit clamps so that ends of bolts do not protrude beyond bottom of clamp.
- Bolt connections face outwards.
- Align exhaust system so it is free of stress => [page 340](#) .



### 1.3 Renewing tailpipe

#### Special tools and workshop equipment required

- ◆ Chain pipe cutter -VAS 6254-

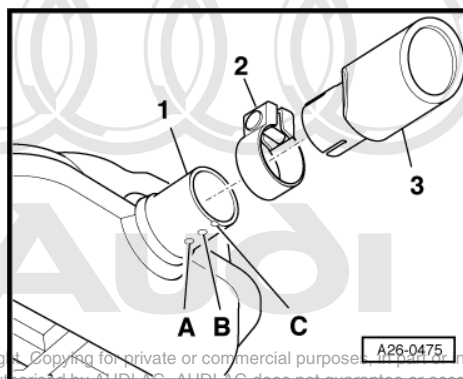


#### Procedure

- Cut through old tailpipe -1- at a right angle at cutting point -C- using chain pipe cutter -VAS 6254- .
- Push on new tailpipe -3- as far as marking -A-. Slot on tailpipe should align with marking -B-.
- Fit clip -2-.

#### Tightening torque

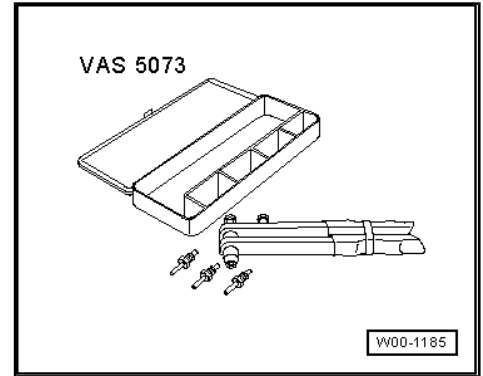
Component	Nm
Clip	25



### 1.4 Removing and installing starter catalytic converter

#### Special tools and workshop equipment required

- ◆ Pop rivet nut pliers -VAS 5073-



- ◆ Electric drill
- ◆ Drill bit, Ø 6 mm
- ◆ 2x Pop rivet A6x10 -N 908 123-
- ◆ Safety goggles

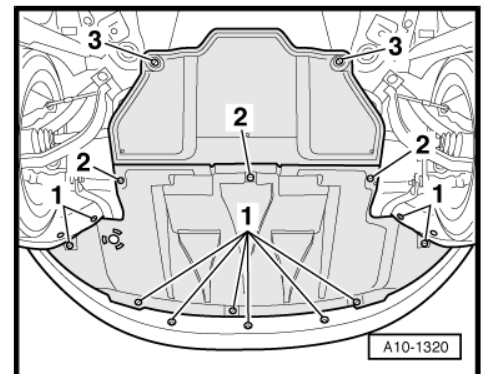
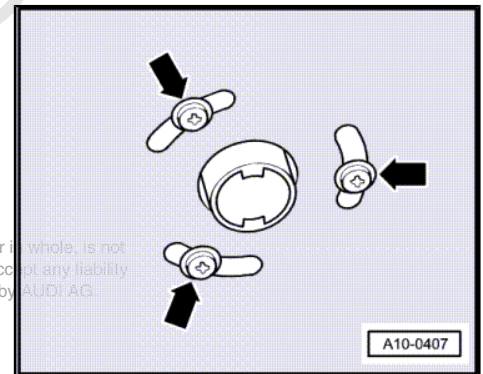
### Removing



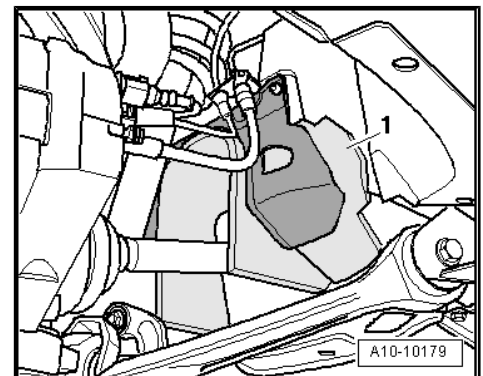
#### Note

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

- Remove front left wheel.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.

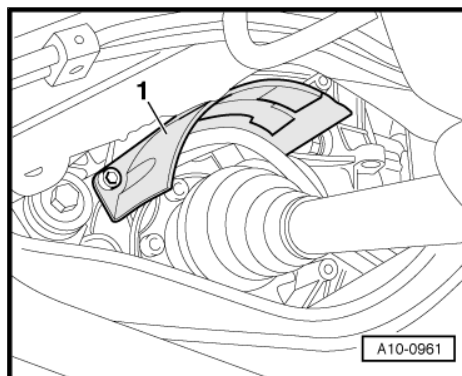


- Remove noise insulation -1- in wheel housing (left-side).

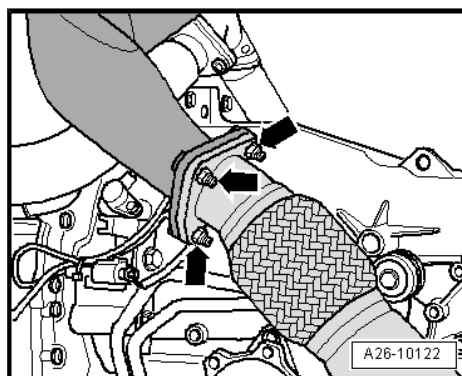




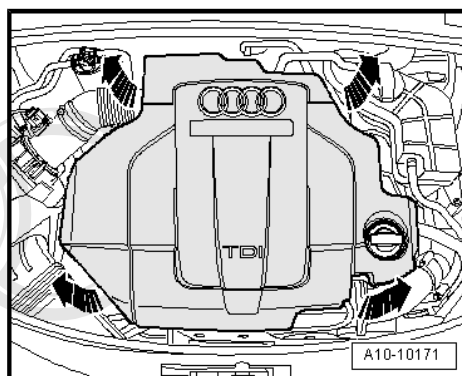
- Unbolt heat shield -1- for drive shaft (left-side).



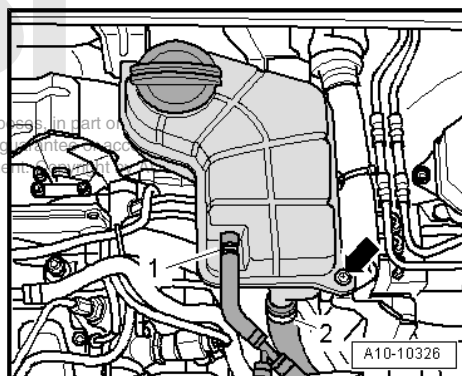
- Unscrew nuts -arrows-.



- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

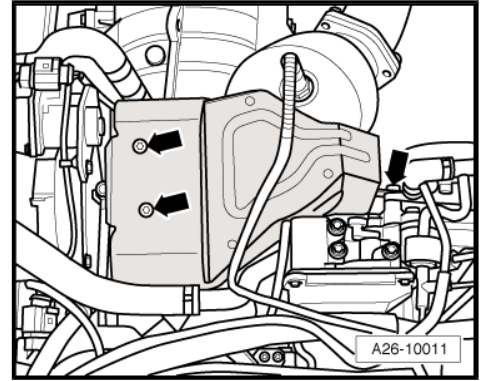


- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.

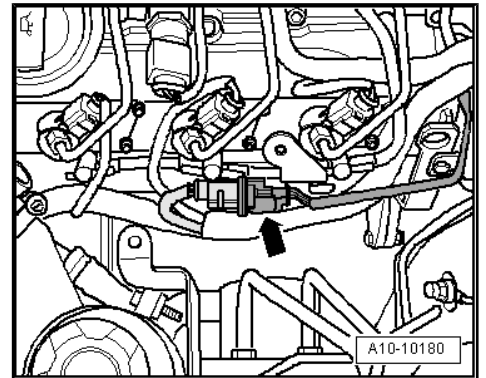


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- Remove heat shield for turbocharger -arrows-.

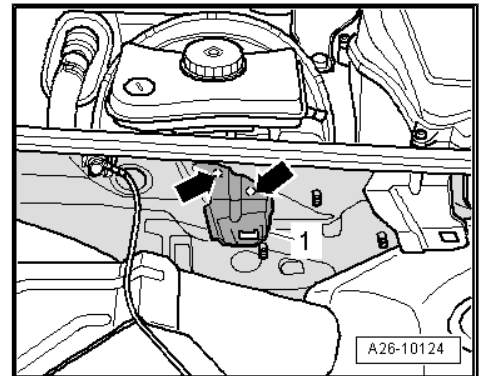


- Unplug electrical connector -arrow- for Lambda probe -G39- and move wiring clear.



- Move earth wire clear at plenum chamber partition panel.
- Move clear noise insulation at plenum chamber partition panel.

	<b>WARNING</b>
<i>Wear safety goggles.</i>	



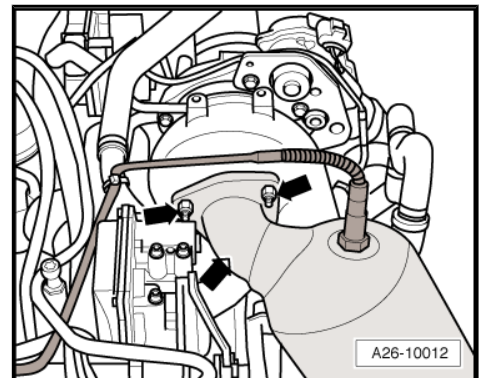
- Drill out spot welds -arrows- at bracket -1- for coolant expansion tank using a 6 mm Ø drill bit.
- Detach bracket for coolant expansion tank.
- Unscrew nuts -arrows-.
- Remove starter catalytic converter from engine compartment.

### Installing

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

#### Note

- ◆ *Renew gaskets and self-locking nuts.*
- ◆ *Fit all cable ties in the original positions when installing.*



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- **Align exhaust system so it is free of stress** ⇒ [page 340](#)

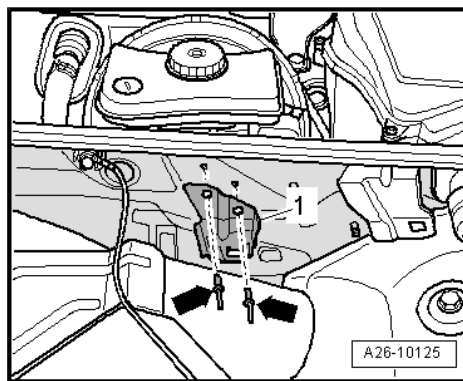


Secure bracket for coolant expansion tank to plenum chamber partition panel using two pop rivets (A6x10) -N 908 123- and pop rivet nut pliers -VAS 5073- .

**Tightening torques**

Component	Nm
Starter catalytic converter to turbocharger	27 <sup>1)2)</sup>
Heat shield to turbocharger	9
Front exhaust pipe to starter catalytic converter	25 <sup>1)</sup>
Drive shaft heat shield to gearbox	23

- <sup>1)</sup> Renew nuts.
- <sup>2)</sup> Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue



## 1.5 Removing and installing front exhaust pipe with catalytic converter

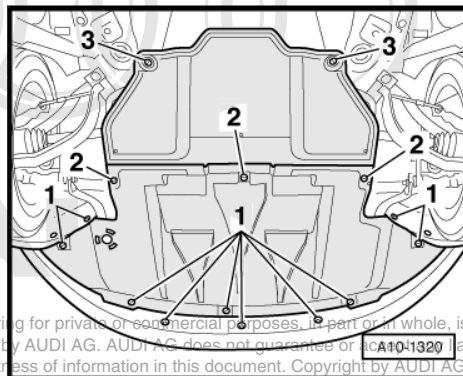
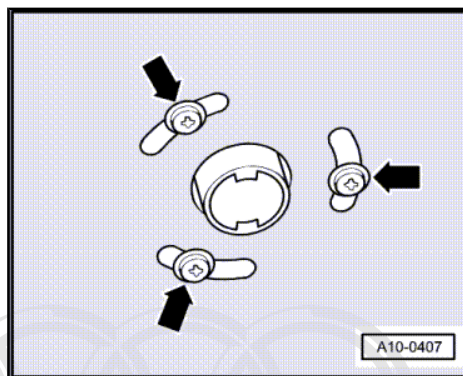
**Removing**



**Note**

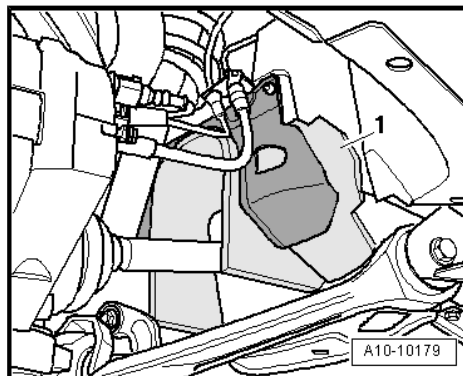
*All cable ties which are released or cut open when removing must be fitted in the same position when installing.*

- Remove front left wheel.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



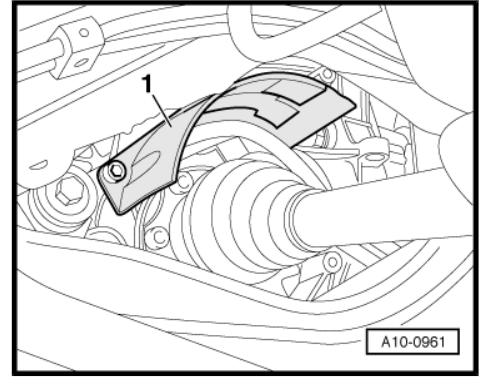
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- Remove noise insulation -1- in wheel housing (left-side).





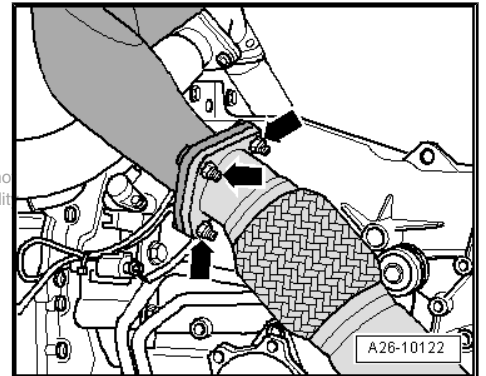
- Unbolt heat shield -1- for drive shaft (left-side).



- Unscrew nuts -arrows-.



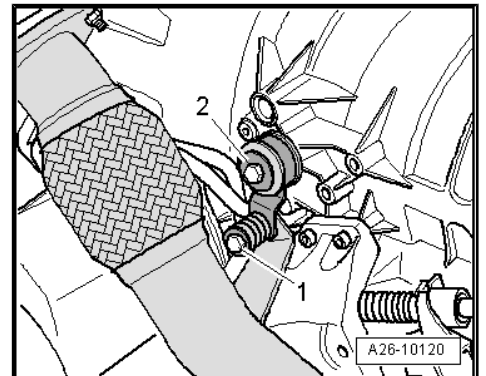
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- Remove bolt -1- on bracket for front exhaust pipe.

 **Note**

- ◆ *Disregard -item 2-.*
- ◆ *Illustration shows vehicle with automatic gearbox.*



**Note**

To avoid any damage, the flexible joint in the front exhaust pipe must not be bent more than 10°.

- Disconnect exhaust system at clamp -arrow-.
- Detach front exhaust pipe with catalytic converter.

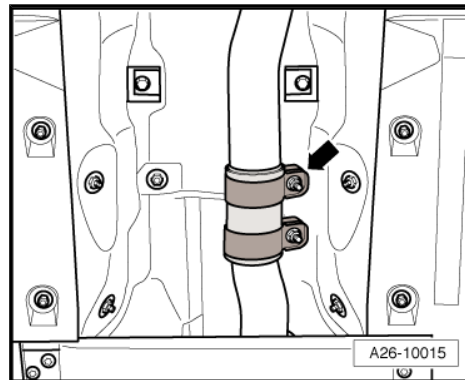
**Installing**

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

- Align exhaust system so it is free of stress ⇒ [page 340](#) .

**Tightening torques**

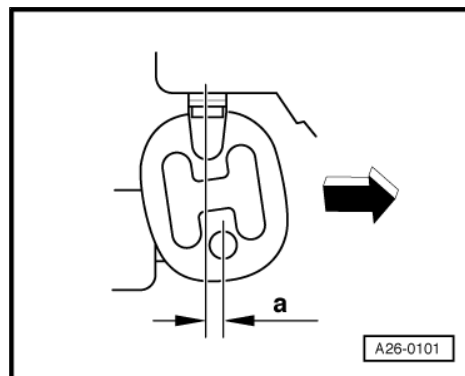
Component	Nm
Front exhaust pipe to starter catalytic converter	25 <sup>1)</sup>
Front exhaust pipe to bracket	23
Drive shaft heat shield to gearbox	23
• <sup>1)</sup> Renew nuts.	

**1.6 Stress-free alignment of exhaust system**

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

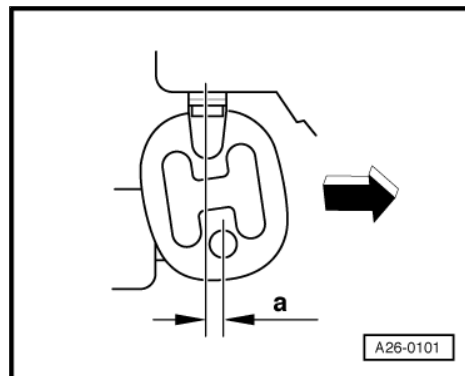
**Vehicles without clamps between Y-pipe and rear silencer**

- Loosen bolt connections of front clamp ⇒ [Item 12 \(page 331\)](#) .
- Push exhaust system towards front of vehicle -arrow-, so that mountings (right-side) for rear silencers are preloaded by -a- = 5 ... 9 mm.
- Tighten bolt connections on front clamp ⇒ [Item 12 \(page 331\)](#) evenly.
- Align tailpipes ⇒ [page 341](#) .

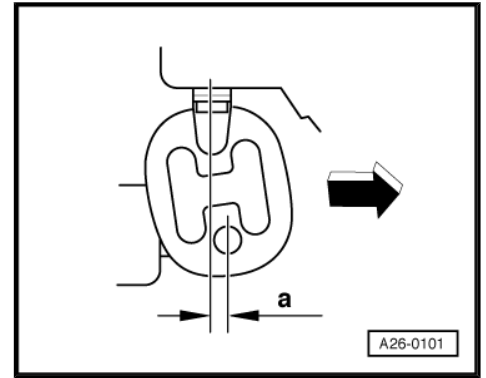
**Vehicles with clamps between Y-pipe and rear silencer****Note**

On a vehicle with clamps fitted between Y-pipe and rear silencer, it is also necessary to align the Y-pipe.

- Loosen bolts on clamps ⇒ [Item 12 \(page 331\)](#) and ⇒ [Item 21 \(page 331\)](#) .
- Push front section of exhaust system towards front of vehicle -arrow-, so that mountings for Y-pipe are preloaded by -a- = 5 ... 9 mm.
- Tighten bolt connections on front clamp ⇒ [Item 12 \(page 331\)](#) evenly.



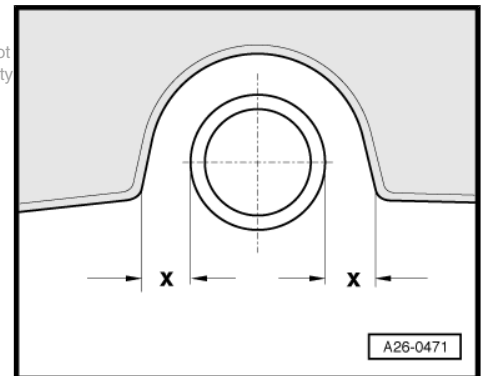
- Push rear section of exhaust system towards front of vehicle -arrow-, so that mountings (rear) for rear silencers are preloaded by -a- = 5 ... 9 mm.
- Align rear silencers so they are horizontal.
- Tighten bolt connections on rear clamps ⇒ [Item 21 \(page 331\)](#) evenly.
- Align tailpipes ⇒ [page 341](#) .



## 1.7 Aligning tailpipes

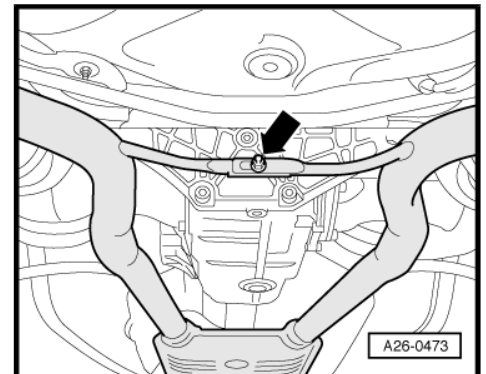
- Check clearance between tailpipes and bumper on both sides.
- Dimension -x- (left-side) = dimension -x- (right-side)

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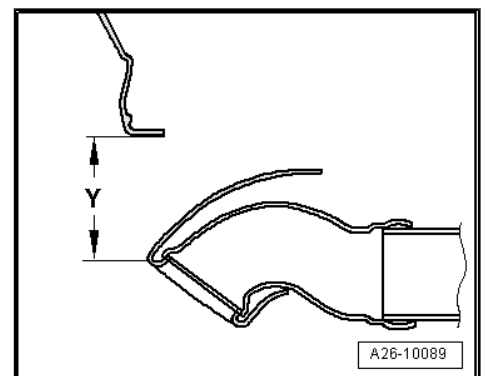


If necessary, correct dimension -x- as follows:

- Slacken bolt connection -arrow- on brace between exhaust pipes.
- Adjust the distance between the rear silencers.
- Fit new nut and tighten bolt connection to 25 Nm.



- Check clearance -y- between tailpipes and bumper:
- Dimension -y- = 37 ... 43 mm.
- If necessary, check whether the exhaust system is aligned free of stress ⇒ [page 340](#) .





## 2 Exhaust system on vehicles with particulate filter



### Note

- ◆ Renew gaskets and self-locking nuts.
- ◆ After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamps and align silencers and exhaust pipes so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.

### 2.1 Exhaust system - exploded view

#### Front-wheel drive vehicles

#### 1 - Y-pipe

- Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- Cutting point  
⇒ [page 349](#)
- Stress-free alignment of exhaust system with cutting point  
⇒ [page 359](#)

#### 2 - 23 Nm

#### 3 - Mounting

- Renew if damaged
- Check preload  
⇒ „2.8 Stress-free alignment of exhaust system“, [page 359](#)

#### 4 - 23 Nm

- Renew

#### 5 - 25 Nm

- Renew

#### 6 - Gasket

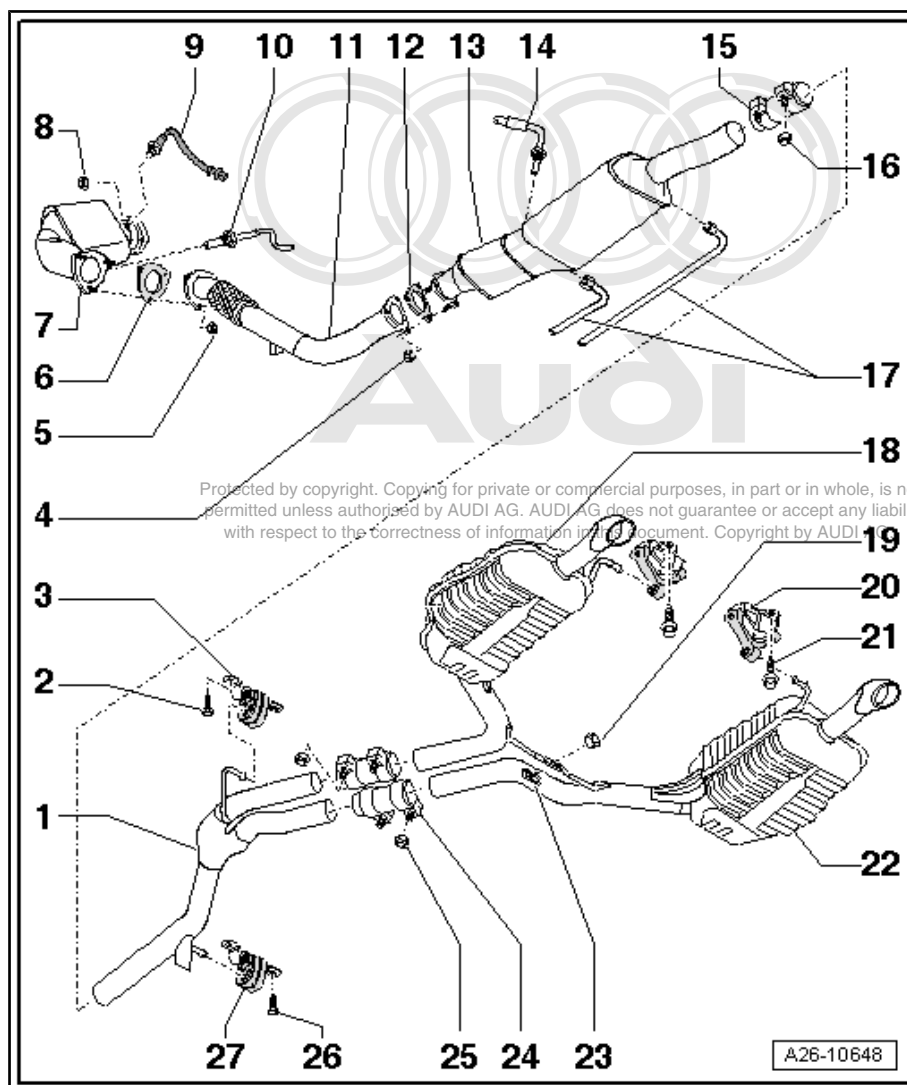
- Renew

#### 7 - Starter catalytic converter

- Protect against knocks and impact
- Removing and installing  
⇒ [page 350](#)
- Stress-free alignment of exhaust system with cutting point  
⇒ [page 359](#)

#### 8 - 27 Nm

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue



### 9 - Lambda probe -G39-

- The threads on the new Lambda probes are coated with a special assembly paste.
- If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste
- The assembly paste/high-temperature paste must not get into the slots on the probe body.
- Removing and installing ⇒ Rep. gr. 23

### 10 - Exhaust gas temperature sender 2 for cylinder bank 1 -G448-

- Removing and installing ⇒ [page 372](#)
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- Installation position: align temperature sender connection centrally between propshaft and body

### 11 - Front exhaust pipe

- With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
  - Protect against knocks and impact
  - Removing and installing ⇒ [page 355](#)
  - Mounting components:
- ◆ Vehicles with manual gearbox ⇒ [page 347](#)
  - ◆ Vehicles with multitronic gearbox ⇒ [page 347](#)
  - Stress-free alignment of exhaust system with cutting point ⇒ [page 359](#)

### 12 - Gasket

- Renew

### 13 - Diesel particulate filter with catalytic converter

- Removing and installing ⇒ [page 358](#)
- After renewing particulate filter, perform adaption in „Guided Functions“ ⇒ Vehicle diagnostic tester

### 14 - Temperature sender before particulate filter -G506-

- Removing and installing ⇒ [page 374](#)
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

### 15 - Clamp (front)

- Installation position ⇒ [page 332](#)
- Before tightening, align exhaust system so it is free of stress ⇒ [page 340](#)
- Tighten bolt connections evenly

### 16 - M8: 23 Nm; M10: 40 Nm

### 17 - Pressure pipes

- Installation sequence:
  - Fit front pressure pipe in particulate filter, clip into side bracket and tighten to 25 Nm
  - Fit rear pressure pipe in particulate filter, align parallel with front pressure pipe and tighten to 25 Nm

### 18 - Rear silencer with tailpipe

- For left side of vehicle
- Y-pipe, rear silencer and tailpipe can be renewed separately as required
- Cutting point: Y-pipe / rear silencer ⇒ [page 348](#)
- Cutting point: rear silencer / tailpipe ⇒ [page 349](#)
- Stress-free alignment of exhaust system with cutting point ⇒ [page 359](#)

### 19 - 25 Nm

- Renew

### 20 - Mounting

- Renew if damaged
- Check preload ⇒ [„2.8 Stress-free alignment of exhaust system“, page 359](#)



## 21 - 23 Nm

### 22 - Rear silencer with tailpipe

- For right side of vehicle
- Y-pipe, rear silencer and tailpipe can be renewed separately as required
- Cutting point: Y-pipe / rear silencer ⇒ [page 348](#)
- Cutting point: rear silencer / tailpipe ⇒ [page 349](#)
- Align exhaust system so it is free of stress ⇒ [page 359](#)

### 23 - Retainer

### 24 - Clamp (rear)

- For separate replacement of Y-pipe and rear silencers
- Before tightening, align exhaust system so it is free of stress ⇒ [page 359](#)
- Installation position ⇒ [page 347](#)
- Tighten bolt connections evenly

### 25 - M8: 23 Nm; M10: 40 Nm

### 26 - 23 Nm

### 27 - Mounting

- Renew if damaged
- Check preload ⇒ „1.6 Stress-free alignment of exhaust system“, [page 340](#)

## Four-wheel drive vehicles

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**1 - 23 Nm**

- Renew

**2 - 23 Nm**

**3 - Mounting**

- Renew if damaged
- Check preload  
⇒ „2.8 Stress-free alignment of exhaust system“, page 359

**4 - Y-pipe**

- Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- Cutting point  
⇒ page 349
- Stress-free alignment of exhaust system with cutting point  
⇒ page 359

**5 - 25 Nm**

- Renew

**6 - Gasket**

- Renew

**7 - Starter catalytic converter**

- Protect against knocks and impact
- Removing and installing  
⇒ page 350
- Stress-free alignment of exhaust system with cutting point  
⇒ page 359

**8 - 27 Nm**

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

**9 - Lambda probe -G39-**

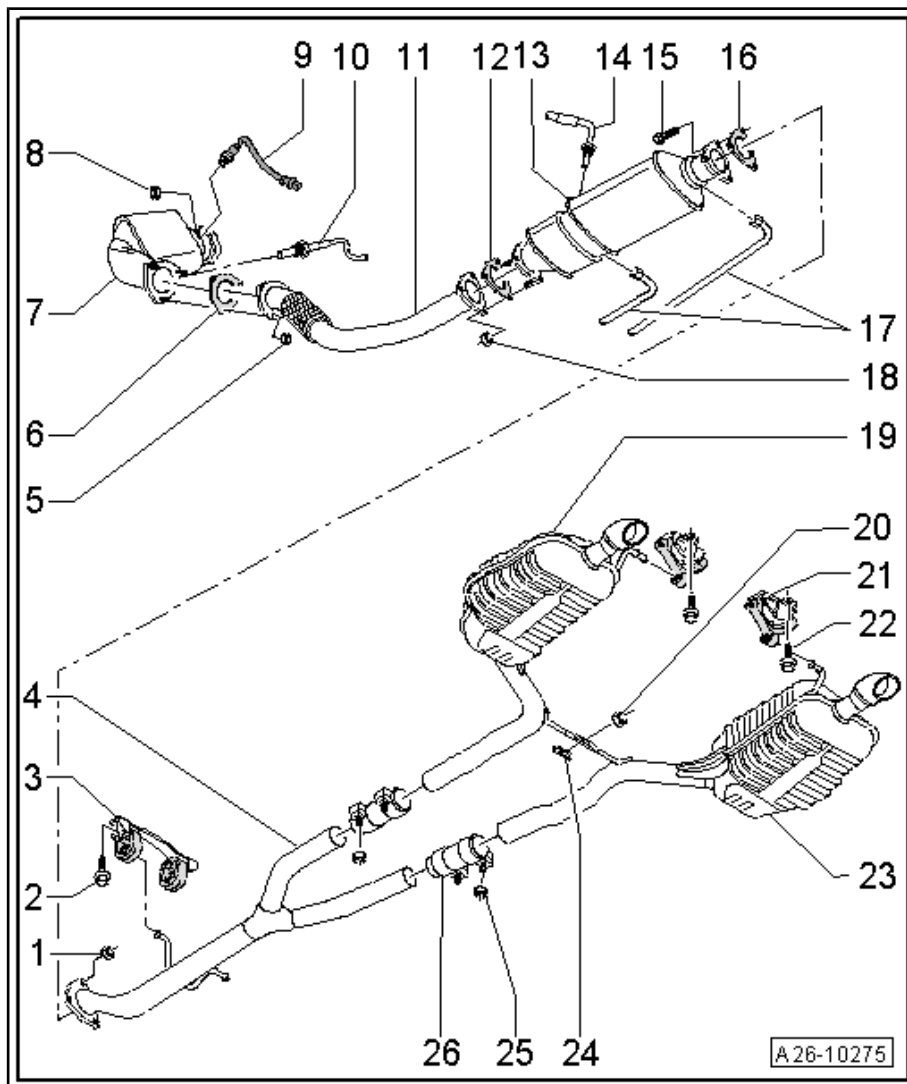
- The threads on the new Lambda probes are coated with a special assembly paste.
- If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste
- The assembly paste/high-temperature paste must not get into the slots on the probe body.
- Removing and installing ⇒ Rep. gr. 23

**10 - Exhaust gas temperature sender 2 for cylinder bank 1 -G448-**

- Removing and installing ⇒ page 372
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- Installation position: align temperature sender connection centrally between propshaft and body

**11 - Front exhaust pipe**

- With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- Protect against knocks and impact
- Removing and installing ⇒ page 355
- Components of exhaust pipe mountings: Vehicles with manual gearbox ⇒ page 347 , vehicles with automatic gearbox ⇒ page 348



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- Stress-free alignment of exhaust system with cutting point ⇒ [page 359](#)

## 12 - Gasket

- Renew

## 13 - Temperature sender before particulate filter -G506-

- Removing and installing ⇒ [page 374](#)
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

## 14 - Diesel particulate filter with catalytic converter

- Removing and installing ⇒ [page 357](#)
- After renewing particulate filter, perform adaption in „Guided Functions“ ⇒ Vehicle diagnostic tester

## 15 - Bolt

## 16 - Gasket

- Renew

## 17 - Pressure pipes

- Installation sequence:
  - Fit front pressure pipe in particulate filter, clip into side bracket and tighten to 25 Nm
  - Fit rear pressure pipe in particulate filter, align parallel with front pressure pipe and tighten to 25 Nm

## 18 - 23 Nm

- Renew

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## 19 - Rear silencer with tailpipe

- For left side of vehicle
- Y-pipe, rear silencer and tailpipe can be renewed separately as required
- Cutting point: Y-pipe / rear silencer ⇒ [page 349](#)
- Cutting point: rear silencer / tailpipe ⇒ [page 349](#)
- Stress-free alignment of exhaust system with cutting point ⇒ [page 359](#)

## 20 - 25 Nm

- Renew

## 21 - Mounting

- Renew if damaged
- Check preload ⇒ „2.8 Stress-free alignment of exhaust system“, [page 359](#)

## 22 - 23 Nm

## 23 - Rear silencer with tailpipe

- For right side of vehicle
- Y-pipe, rear silencer and tailpipe can be renewed separately as required
- Cutting point: Y-pipe / rear silencer ⇒ [page 349](#)
- Cutting point: rear silencer / tailpipe ⇒ [page 349](#)
- Align exhaust system so it is free of stress ⇒ [page 359](#)

## 24 - Retainer

## 25 - M8: 23 Nm; M10: 40 Nm

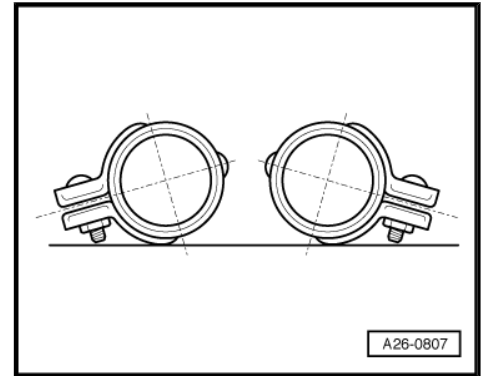
## 26 - Clamp (rear)

- For separate replacement of Y-pipe and rear silencers
- Before tightening, align exhaust system so it is free of stress ⇒ [page 359](#)
- Installation position ⇒ [page 347](#)
- Tighten bolt connections evenly



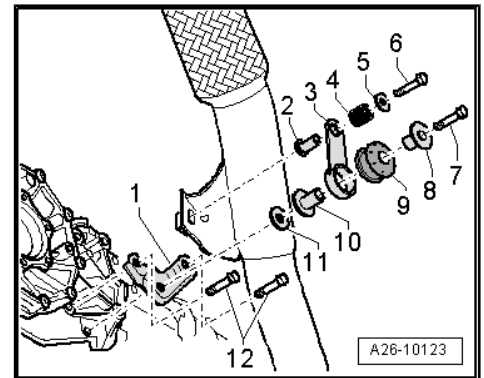
### Installation position of rear clamps

- Install clamps so that the bolt ends do not protrude beyond bottom of clamp.
- Bolt connections face outwards.



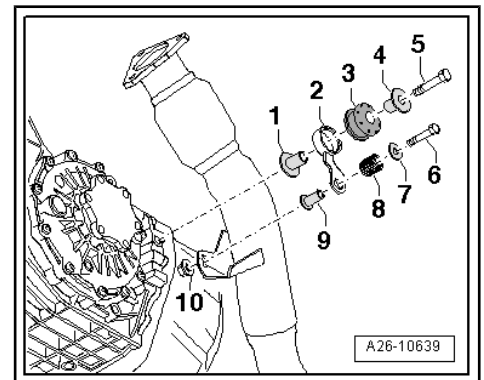
### Components of front exhaust pipe mountings - vehicles with manual gearbox

- 1 - Bracket
- 2 - Spacer sleeve
- 3 - Bracket
- 4 - Compression spring
- 5 - Washer
- 6 - Bolt, 23 Nm
- 7 - Bolt, 23 Nm
- 8 - Spacer sleeve
- 9 - Buffer
- 10 - Spacer sleeve
- 11 - Washer
- 12 - Bolt, 23 Nm



### Components of mountings for front exhaust pipe - vehicles with multitronic gearbox

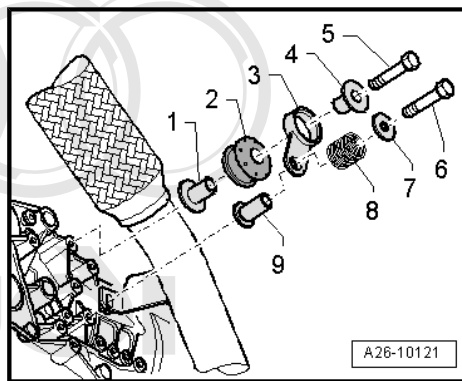
- 1 - Spacer sleeve
- 2 - Bracket
- 3 - Buffer
- 4 - Spacer sleeve
- 5 - Bolt, 23 Nm
- 6 - Bolt
- 7 - Washer
- 8 - Compression spring
- 9 - Spacer sleeve
- 10 - Nut, 23 Nm





### Components of front exhaust pipe mountings - vehicles with automatic gearbox

- 1 - Spacer sleeve
- 2 - Buffer
- 3 - Bracket
- 4 - Spacer sleeve
- 5 - Bolt, 23 Nm
- 6 - Bolt, 23 Nm
- 7 - Washer
- 8 - Compression spring
- 9 - Spacer sleeve



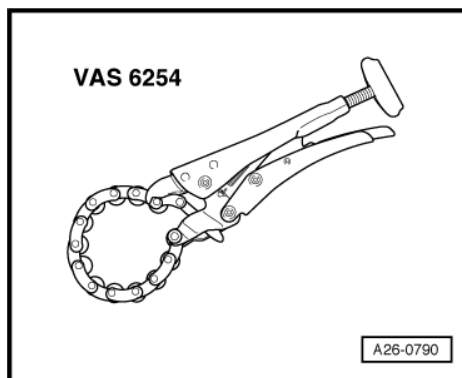
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## 2.2 Separating Y-pipe and rear silencers

- ◆ The connecting pipe can be cut through at the point marked in order to renew the Y-pipe or rear silencer(s) separately.
- ◆ The cutting point is marked by an indentation on the circumference of the exhaust pipe.

### Special tools and workshop equipment required

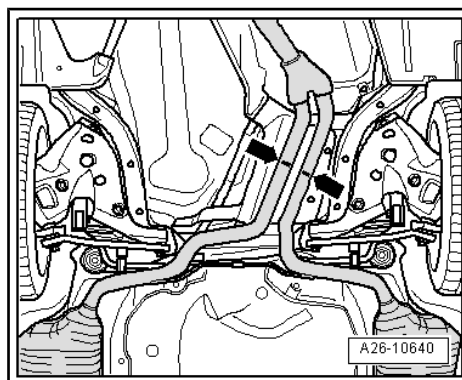
- ◆ Chain pipe cutter -VAS 6254-



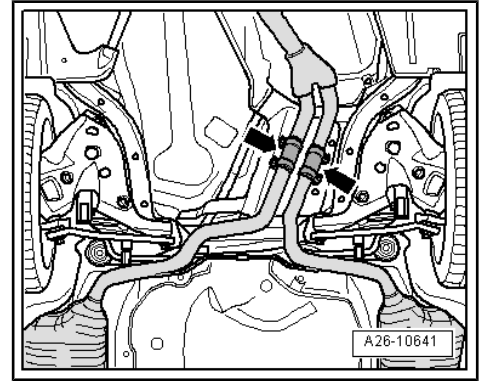
### Procedure

#### Vehicles with front-wheel drive:

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

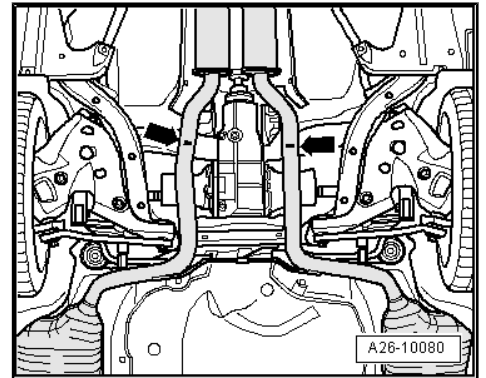


- Position clamps -arrows- centrally over cutting points.

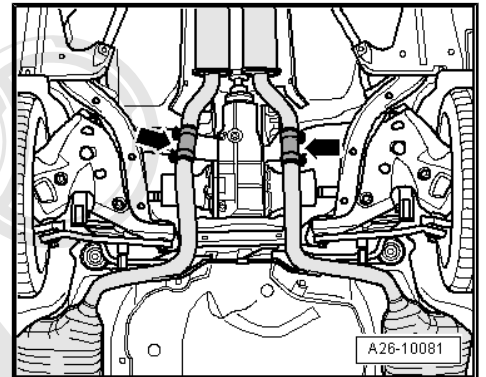


**Vehicles with four-wheel drive:**

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



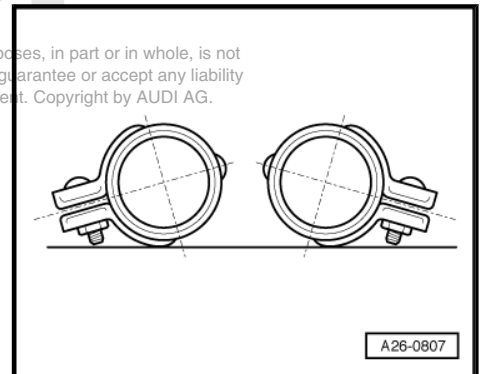
- Position clamps -arrows- centrally over cutting points.



**All vehicles (continued):**

- Fit clamps so that ends of bolts do not protrude beyond bottom of clamp.
- Bolt connections face outwards.
- Align exhaust system so it is free of stress ⇒ [page 359](#) .

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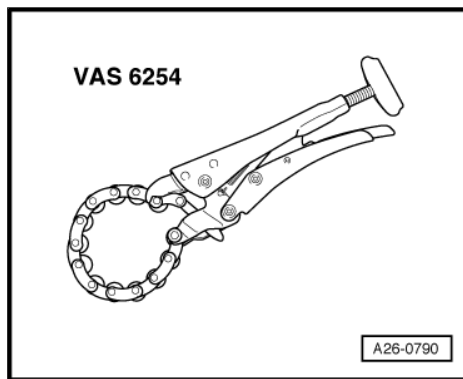


## 2.3 Renewing tailpipe

Special tools and workshop equipment required

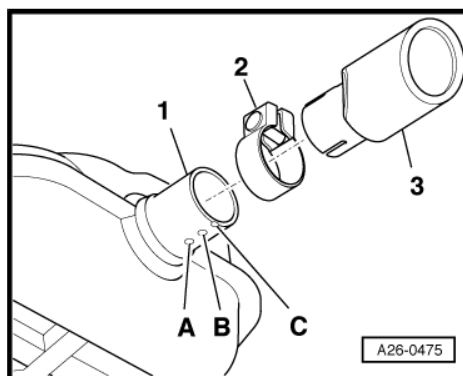


- ◆ Chain pipe cutter -VAS 6254-



**Procedure**

- Cut through old tailpipe -1- at a right angle at cutting point -C- using chain pipe cutter -VAS 6254- .
- Push on new tailpipe -3- as far as marking -A-. Slot on tailpipe should align with marking -B-.
- Fit clip -2-.



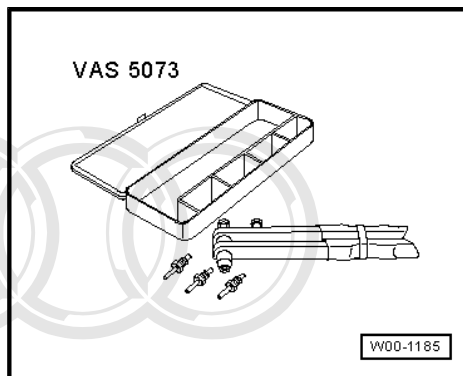
**Tightening torque**

Component	Nm
Clip	25

**2.4 Removing and installing starter catalytic converter**

**Special tools and workshop equipment required**

- ◆ Pop rivet nut pliers -VAS 5073-



- ◆ Electric drill
- ◆ Drill bit, Ø 6 mm
- ◆ 2x Pop rivet A6x10 -N 908 123-
- ◆ Safety goggles

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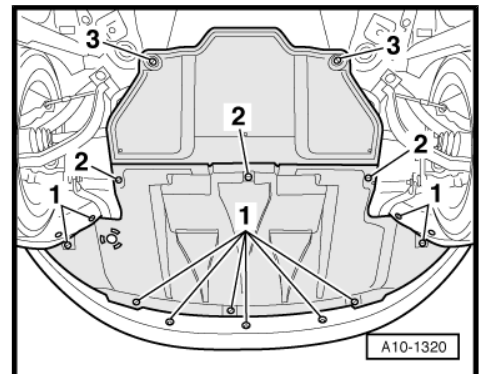
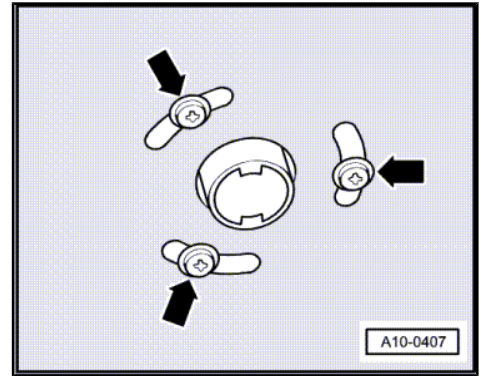
## Removing

### Note

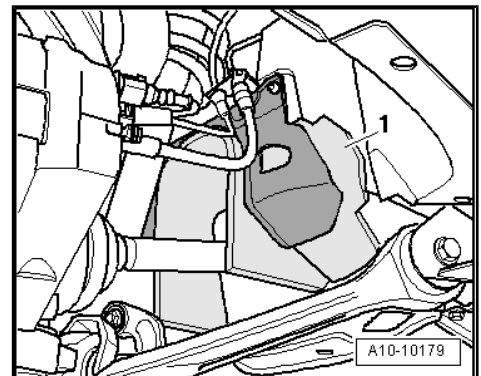
*All cable ties which are released or cut open when removing must be fitted in the same position when installing.*

- Remove front left wheel.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.

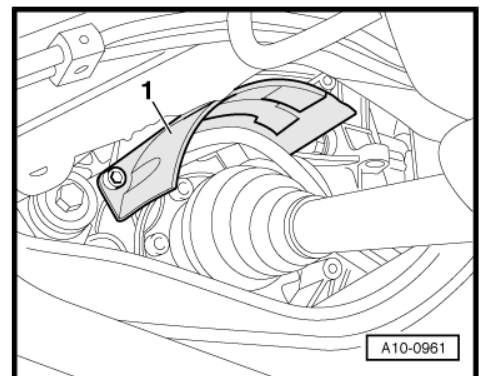
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- Remove noise insulation -1- in wheel housing (left-side).



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





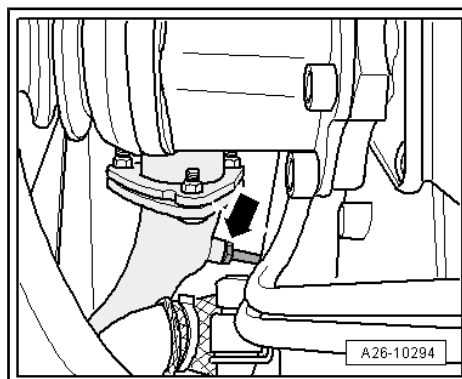
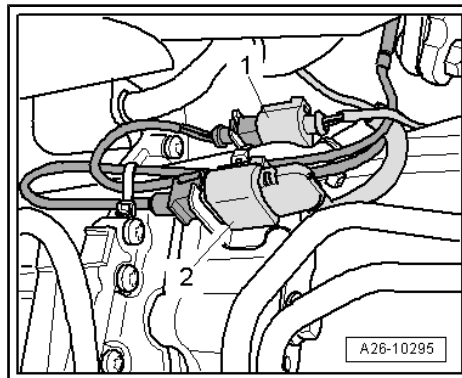
- Detach electrical connector -1- for exhaust gas temperature sender 2 for bank 1 -G448- at front left of gearbox from bracket, unplug connector and move electrical wiring clear.



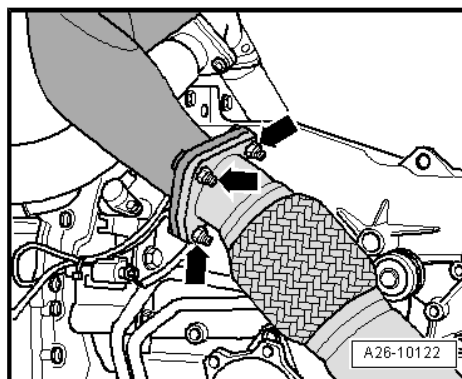
**Note**

*Disregard -item 2-.*

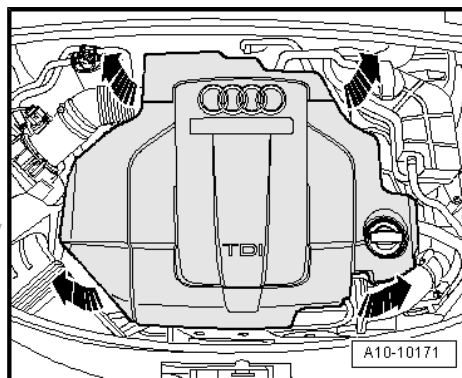
- Unscrew exhaust gas temperature sender 2 for bank 1 -G448- -arrow-.



- Unscrew nuts -arrows-.

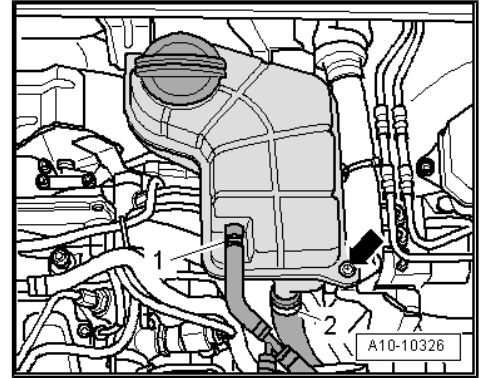


- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

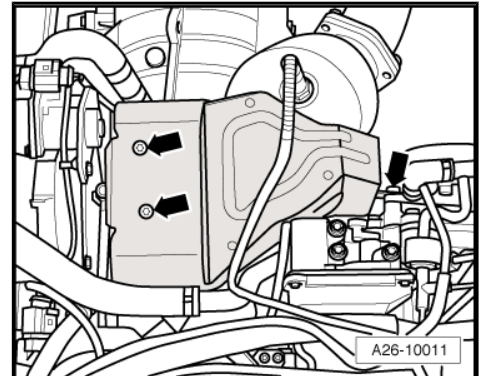
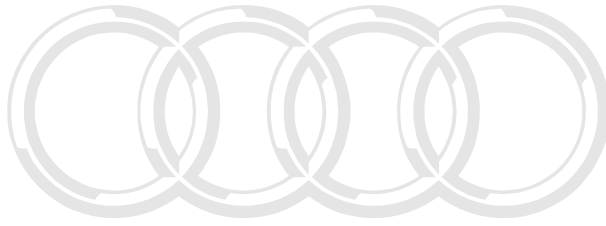


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- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.

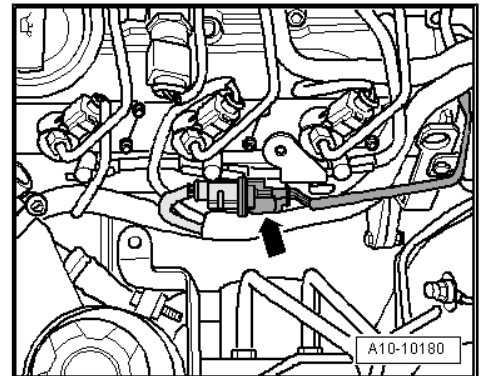


- Remove heat shield for turbocharger -arrows-.

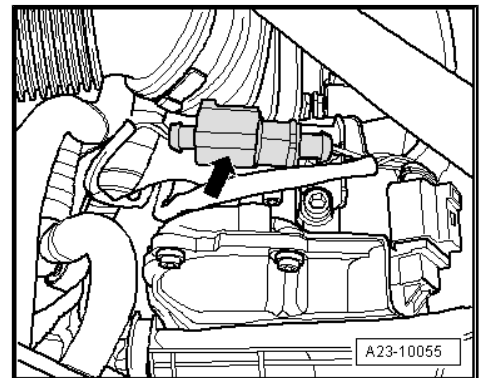


- Unplug electrical connector -arrow- for Lambda probe -G39- and move wiring clear.

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- If fitted: unplug electrical connector -arrow- for exhaust gas temperature sender 1 -G235- and move wiring clear.



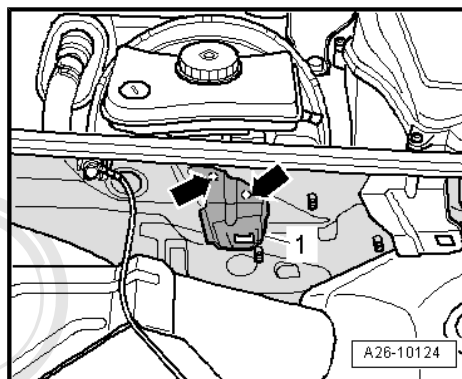


- Move earth wire clear at plenum chamber partition panel.
- Move clear noise insulation at plenum chamber partition panel.



**WARNING**

*Wear safety goggles.*



- Drill out spot welds -arrows- at bracket -1- for coolant expansion tank using a 6 mm Ø drill bit.
- Detach bracket for coolant expansion tank.
- Unscrew nuts -arrows-.
- Remove starter catalytic converter from engine compartment.

### Installing

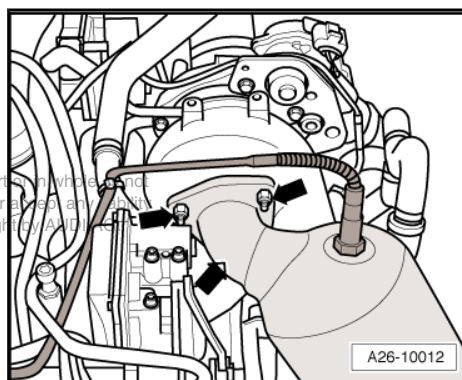
Installation is carried out in the reverse order; note the following:

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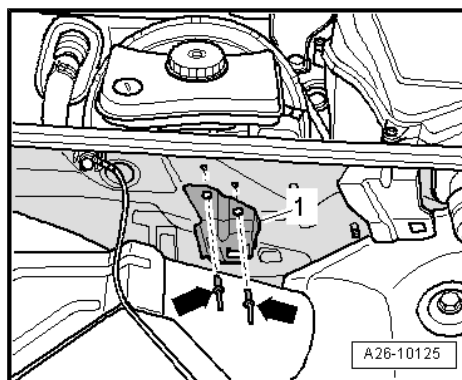
**Note**

- ◆ *Renew gaskets and self-locking nuts.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Align exhaust system so it is free of stress ⇒ [page 359](#) .
- Install temperature sender before particulate filter -G506- ⇒ [page 374](#) .
- Secure bracket for coolant expansion tank to plenum chamber partition panel using two pop rivets (A6x10) -N 908 123- and pop rivet nut pliers -VAS 5073- .



### Tightening torques

Component	Nm
Starter catalytic converter to turbocharger	27 <sup>1)2)</sup>
Heat shield to turbocharger	9
Front exhaust pipe to starter catalytic converter	25 <sup>1)</sup>
Drive shaft heat shield to gearbox	23
• <sup>1)</sup> Renew nuts.	





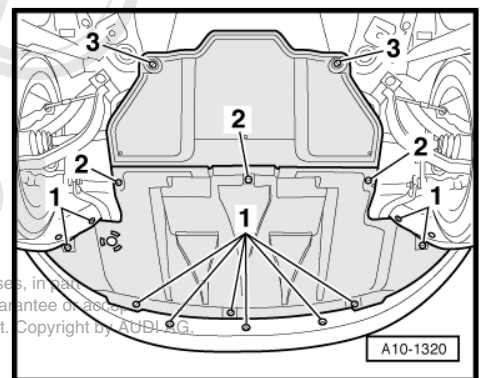
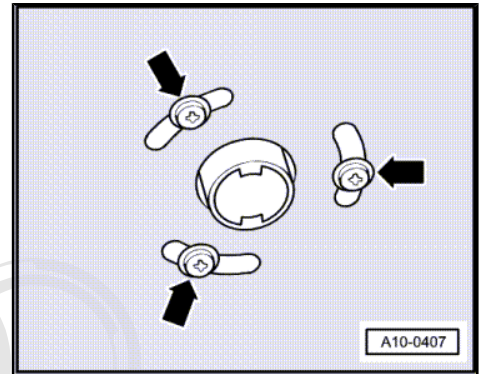
## 2.5 Removing and installing front exhaust pipe

### Removing

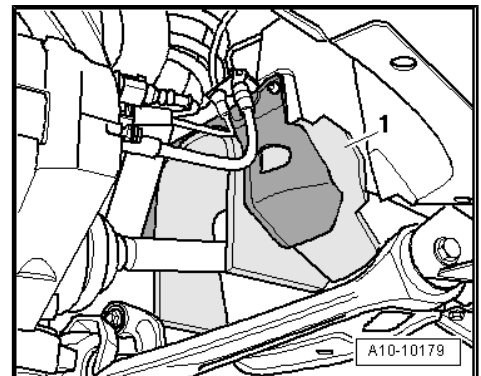
 **Note**

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

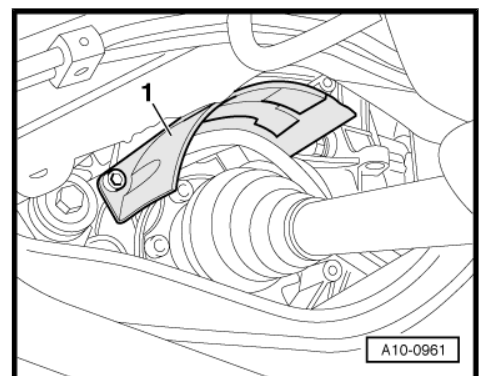
- Remove front left wheel.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



- Remove noise insulation -1- in wheel housing (left-side).



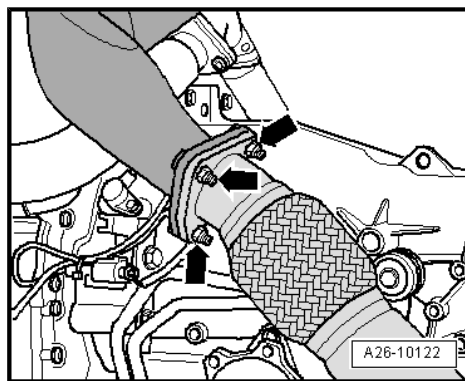
- Unbolt heat shield -1- for drive shaft (left-side).



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- Unscrew nuts -arrows-.



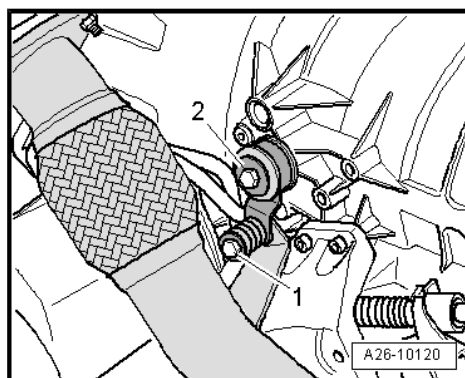
**Vehicles with manual gearbox or automatic gearbox:**

- Remove bolt -1- on bracket for front exhaust pipe.



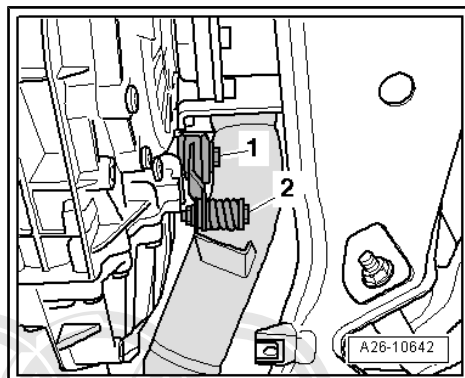
**Note**

- ◆ Disregard -item 2-.
- ◆ Illustration shows vehicle with automatic gearbox.



**Vehicles with multitronic gearbox:**

- Unscrew bolts -1- and -2- and remove bracket for front exhaust pipe.



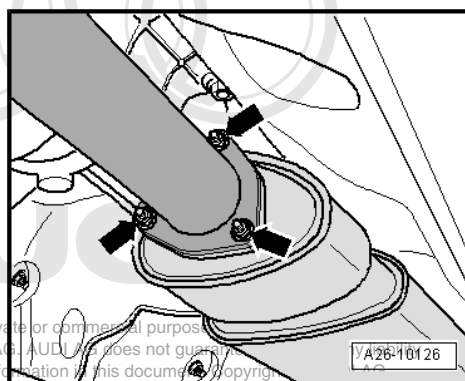
**All vehicles (continued):**



**Note**

*To avoid any damage, the flexible joint in the front exhaust pipe must not be bent more than 10°.*

- Unscrew nuts -arrows-.



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- Tie up particulate filter to heat shield or propshaft -arrow- and separate exhaust system at the flange.
- Remove front exhaust pipe.

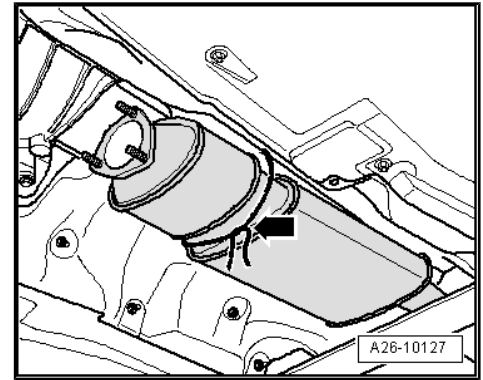
### Installing

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

- Align exhaust system so it is free of stress ⇒ [page 359](#) .

### Tightening torques

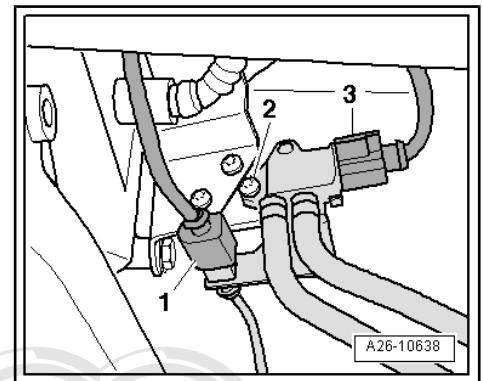
Component	Nm
Front exhaust pipe to starter catalytic converter	25 <sup>1)</sup>
Front exhaust pipe to bracket	23
Front exhaust pipe to particulate filter	23 <sup>1)</sup>
Drive shaft heat shield to gearbox	23
• <sup>1)</sup> Renew nuts.	



## 2.6 Removing and installing particulate filter with catalytic converter - vehicles with front-wheel drive

### Removing

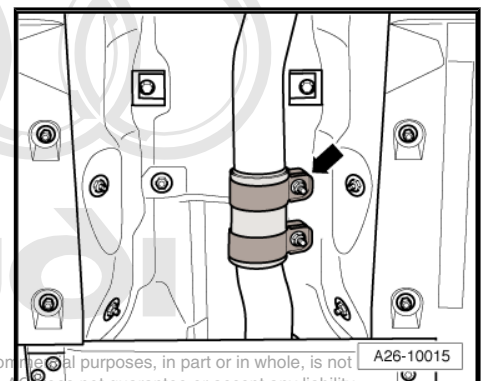
- Detach electrical connector -1- from bracket and unplug.
- Unplug electrical connector -3-.
- Remove bolt -2- and detach exhaust gas pressure sensor 1 - G450- from bracket.



### Note

*To avoid any damage, the flexible joint in the front exhaust pipe must not be bent more than 10°.*

- Disconnect exhaust system at clamp -arrow-.



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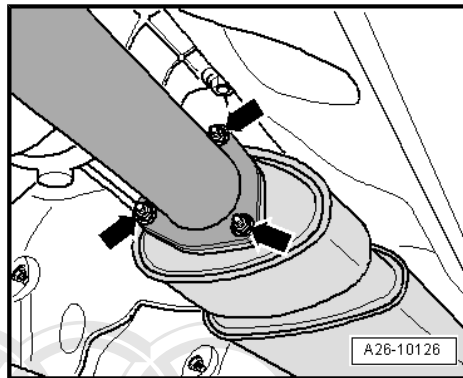


- Remove nuts -arrows- securing particulate filter to front exhaust pipe.
- Detach particulate filter.

**Installing**

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

- Install exhaust gas pressure sensor 1 -G450- ⇒ [page 374](#) .
- Align exhaust system so it is free of stress ⇒ [page 359](#) .
- After renewing particulate filter, perform adaption in „Guided Functions“ ⇒ Vehicle diagnostic tester



**Tightening torques**

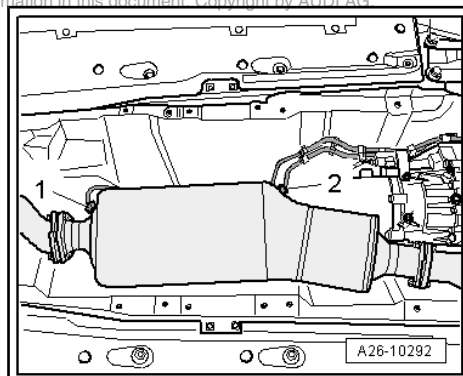
Component	Nm
Pressure pipes to particulate filter	45
Particulate filter to front exhaust pipe	23 <sup>1)</sup>
• <sup>1)</sup> Renew nuts.	

**2.7 Removing and installing particulate filter with catalytic converter - vehicles with four-wheel drive**

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**Removing**

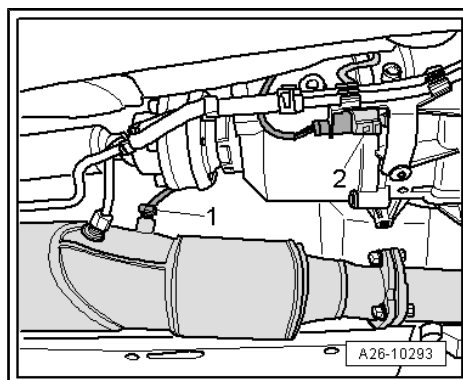
- Unscrew pressure pipes -1- and -2- from particulate filter.
- Detach pressure pipes from particulate filter.



- Unscrew temperature sender before particulate filter -G506- -item 1-.

**i Note**

*Disregard -item 2-.*

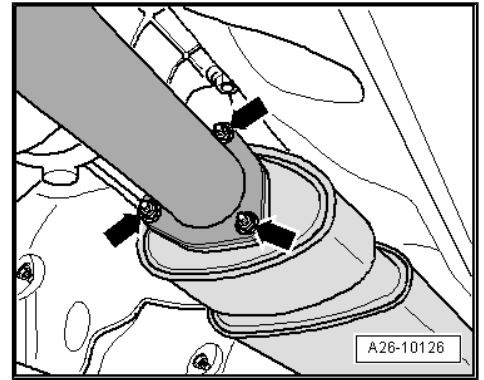


- Remove nuts -arrows- on flanges on both ends of particulate filter.
- Detach particulate filter.

### Installing

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

- Install exhaust gas temperature sender 2 for bank 1 -G448- ⇒ [page 372](#) .
- Align exhaust system so it is free of stress ⇒ [page 359](#) .
- After renewing particulate filter, perform adaption in „Guided Functions“ ⇒ Vehicle diagnostic tester



### Tightening torques

Component	Nm
Pressure pipes to particulate filter	45
Particulate filter to front exhaust pipe	23 <sup>1)</sup>
Particulate filter to Y-pipe	23
• <sup>1)</sup> Renew nuts.	

## 2.8 Stress-free alignment of exhaust system

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

### Vehicles with front-wheel drive without clamps between Y-pipe and rear silencer

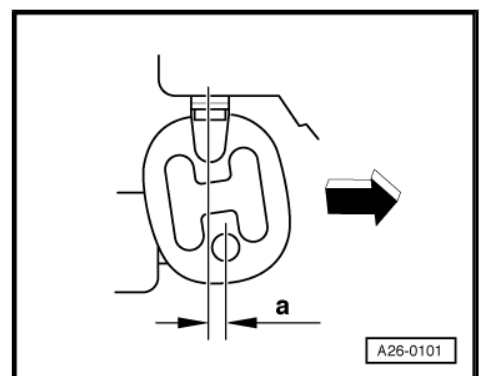
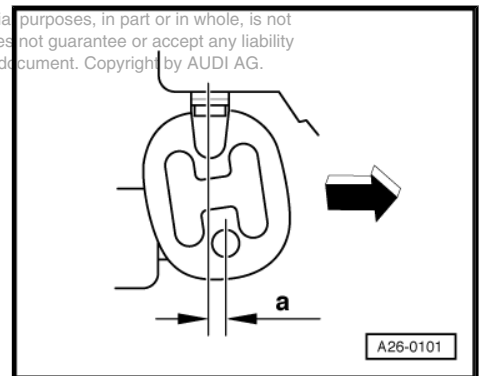
- Loosen bolts on front clamp ⇒ [Item 15 \(page 343\)](#) .
- Push exhaust system towards front of vehicle -arrow- so that mountings for Y-pipe are preloaded by -a- = 5 ... 9 mm.
- Tighten bolt connections on front clamp evenly.
- Align tailpipes ⇒ [page 341](#) .

### Vehicles with front-wheel drive with clamps between Y-pipe and rear silencer

#### Note

*On vehicles with clamps fitted between Y-pipe and rear silencer, it is also necessary to align the centre silencer.*

- Loosen bolts on clamps ⇒ [Item 15 \(page 343\)](#) and ⇒ [Item 24 \(page 344\)](#) .
- Push front section of exhaust system towards front of vehicle -arrow-, so that mountings for Y-pipe are preloaded by -a- = 5 ... 9 mm.
- Tighten bolt connections on front clamp evenly.





- Push rear section of exhaust system towards front of vehicle -arrow-, so that rear rubber mountings for rear silencer are preloaded by dimension -a- = 7 ... 11 mm.
- Align rear silencers so they are horizontal.
- Tighten bolt connections on rear clamps evenly.
- Align tailpipes ⇒ [page 341](#) .

**Vehicles with four-wheel drive without clamps between Y-pipe and rear silencer**



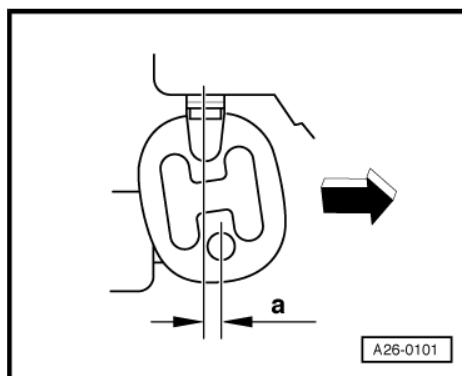
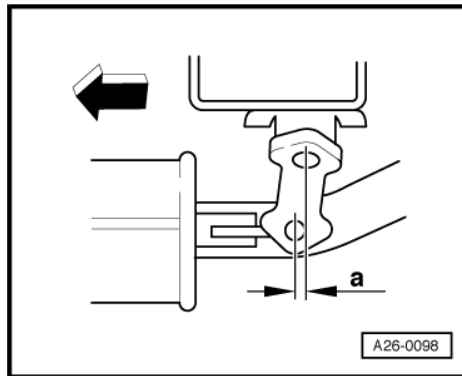
**Note**

*There is no provision for aligning the exhaust system.*

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**Vehicles with four-wheel drive with clamps between Y-pipe and rear silencer**

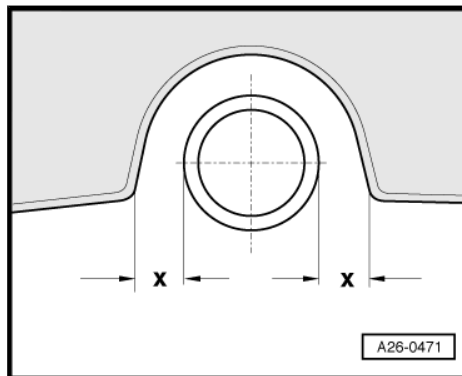
- Loosen bolts at rear clamps ⇒ [Item 26 \(page 346\)](#) .
- Push rear section of exhaust system towards front of vehicle -arrow-, so that mountings (rear) for rear silencers are preloaded by -a- = 5 ... 9 mm.
- Align rear silencers so they are horizontal.
- Tighten bolt connections on rear clamps evenly.
- Align tailpipes ⇒ [page 360](#) .



## 2.9 Aligning tailpipes

### Procedure

- Check clearance between tailpipes and bumper on both sides.
- Dimension -x- (left-side) = dimension -x- (right-side)



If necessary, correct dimension -x- as follows:

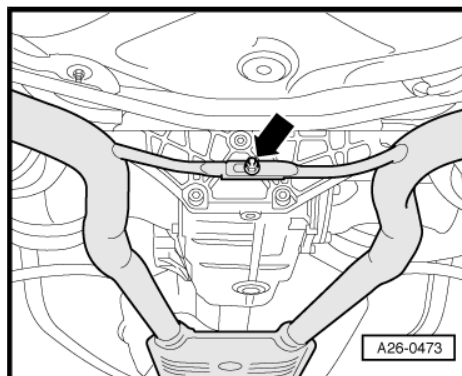
- Slacken bolt connection -arrow- on brace between exhaust pipes.



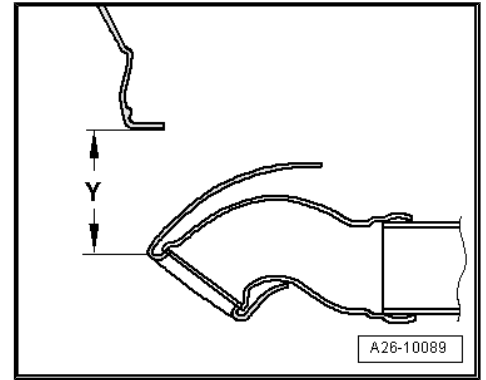
**Note**

*Illustration shows vehicle with four-wheel drive.*

- Adjust the distance between the rear silencers.
- Fit new nut and tighten bolt connection to 25 Nm.



- Check clearance -y- between tailpipes and bumper:
- Dimension -y- = 37 ... 43 mm.
- If necessary, check whether the exhaust system is aligned free of stress ⇒ [page 359](#) .



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## 3 Exhaust manifolds and intermediate pipes

### 3.1 Exhaust manifold - exploded view



#### Note

Illustration shows exhaust manifold of cylinder bank 2 (left-side) with intermediate pipe.

#### 1 - 25 Nm

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

#### 2 - Exhaust manifold

- Removing and installing: left-side ⇒ [page 363](#) , right-side ⇒ [page 365](#)

#### 3 - Gasket

- Renew

#### 4 - Gasket

- Renew

#### 5 - 30 Nm + 90°

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

#### 6 - Intermediate pipe

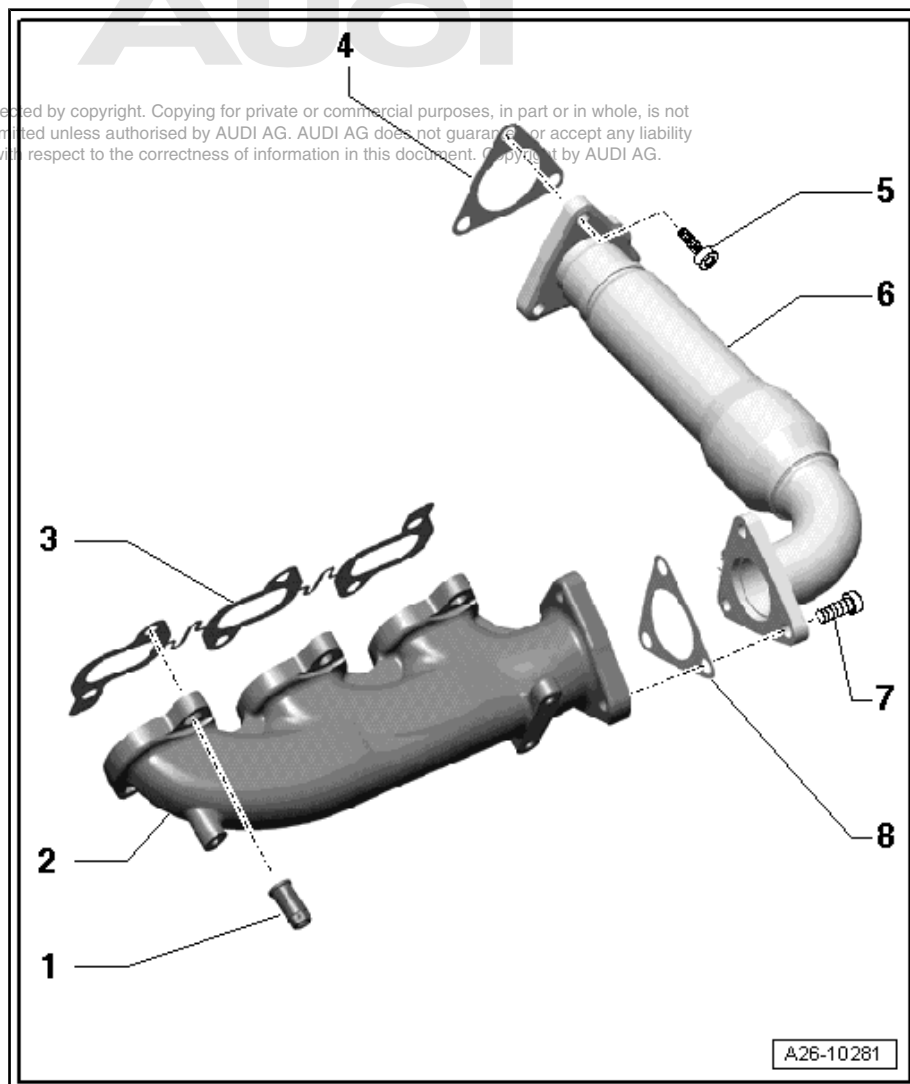
- Removing and installing: left-side ⇒ [page 368](#) , right-side ⇒ [page 370](#)

#### 7 - 30 Nm + 90°

- Type of connection differs depending on version ⇒ [page 363](#)

#### 8 - Gasket

- Renew





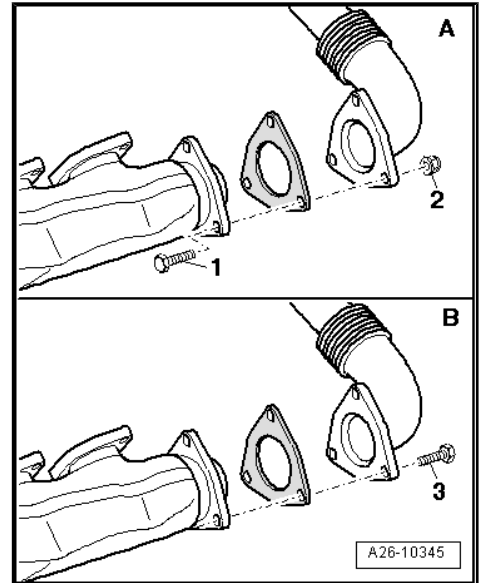
### Securing intermediate pipe to exhaust manifold

A - Exhaust manifold (sheet metal version)

- Fitted with bolts -1- and nuts -2-.
- Renew bolts and nuts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

B - Exhaust manifold (cast version)

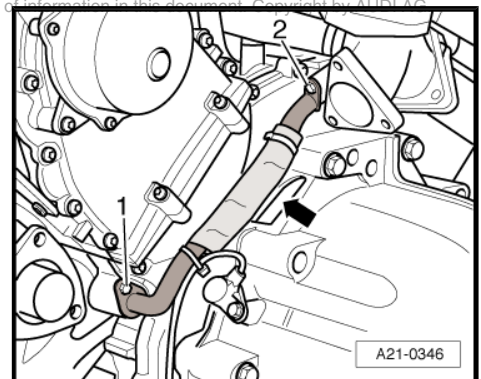
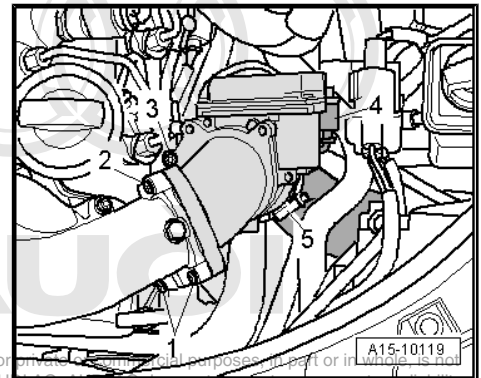
- Fitted with bolts -3-.
- Renew bolts.
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .



## 3.2 Removing and installing exhaust manifold (left-side)

### Removing

- Remove starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) ; vehicles with particulate filter ⇒ [page 350](#) .
- Unplug electrical connector -4-.
- Detach air hose -5-.
- Remove bolts -1 ... 3- and detach throttle valve module -J338- from intake connecting pipe.
- Cover opening -arrow- in gearbox to prevent small parts from dropping in.
- Unscrew bolts -1- and -2- and detach oil return line.

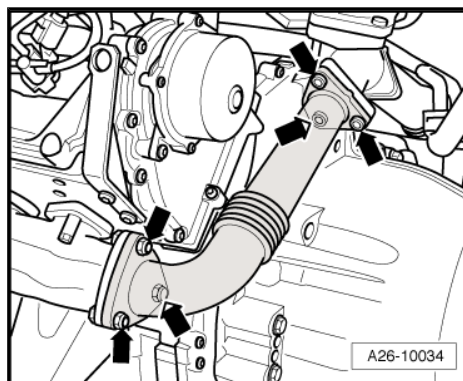


### Note

*Shown in illustration with engine removed and intermediate pipe detached.*



- Unscrew nuts and bolts -arrows- and detach intermediate pipe.



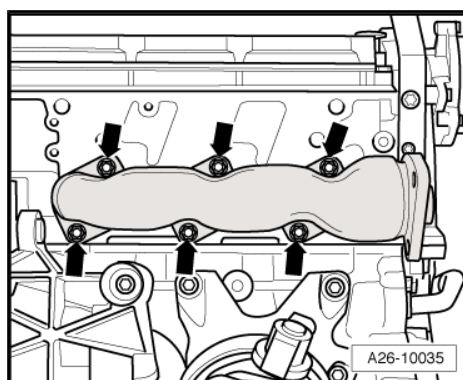
- Unbolt exhaust manifold -arrows-.

### Installing

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

#### Note

- ◆ Renew gaskets, O-rings and self-locking nuts.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .
- ◆ To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.



- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .
- Align exhaust system so it is free of stress: vehicles without particulate filter ⇒ [page 340](#) , vehicles with particulate filter ⇒ [page 359](#) .

### Tightening torques

Component	Nm	
Exhaust manifold to cylinder head	25 <sup>1)2)</sup>	
Intermediate pipe to:	Exhaust manifold	30 + 90° <sup>1)2)3)</sup>
	Intermediate flange	30 + 90° <sup>1)2)3)</sup>
Oil return line to:	Cylinder block	9
	Intermediate flange	9
Hose clips (13 mm wide)	5.5	
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Renew nuts/bolts.</li> <li>• <sup>2)</sup> Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• <sup>3)</sup> 90° = one quarter turn.</li> </ul>		



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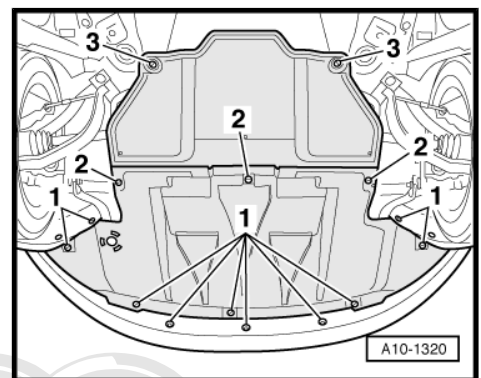
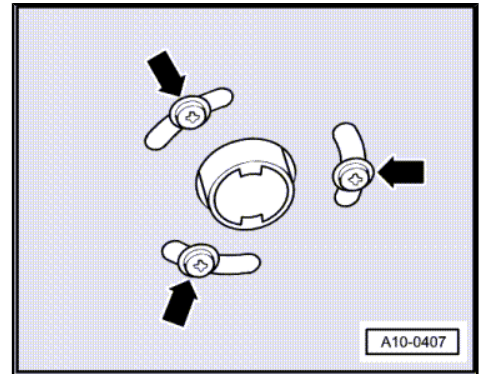
### 3.3 Removing and installing exhaust manifold (right-side)

#### Removing

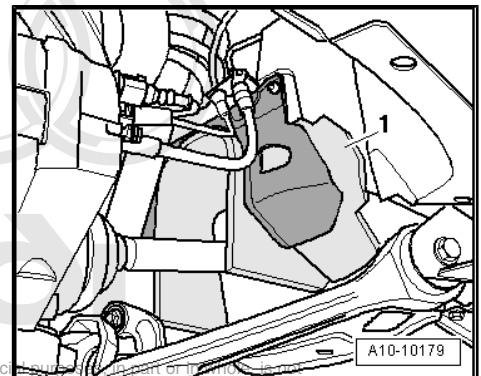
 **Note**

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

- Remove front right wheel.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



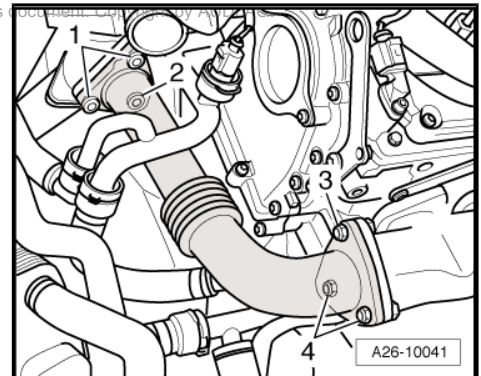
- Remove noise insulation -1- in wheel housing (right-side).
- Unbolt drive shaft (right-side) from gearbox flange.



- Unscrew bolts and nuts -2- and -4- (accessible from below) securing intermediate pipe.

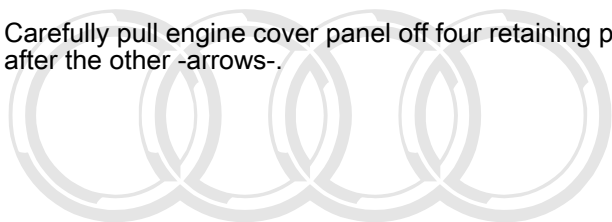
 **Note**

*Shown in illustration with engine removed.*

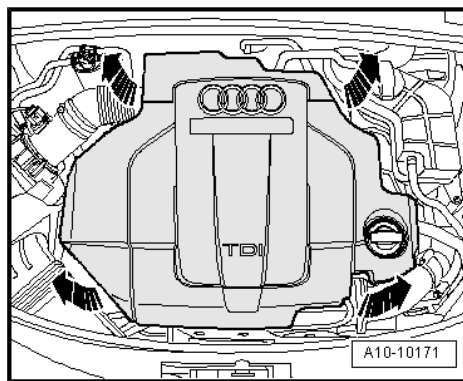




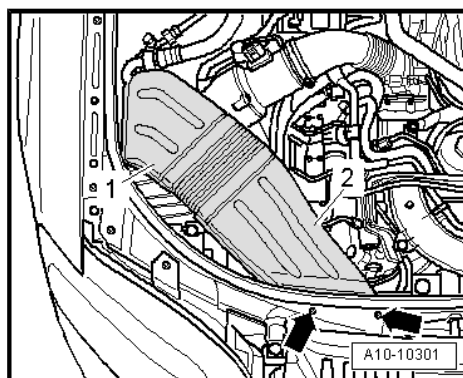
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



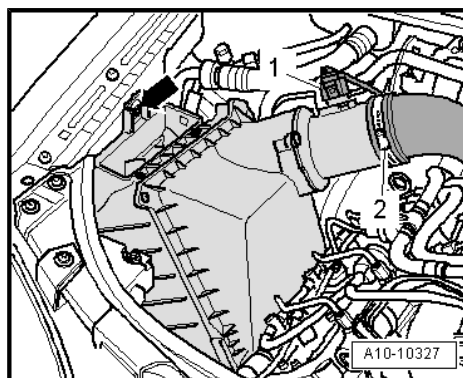
# Audi



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



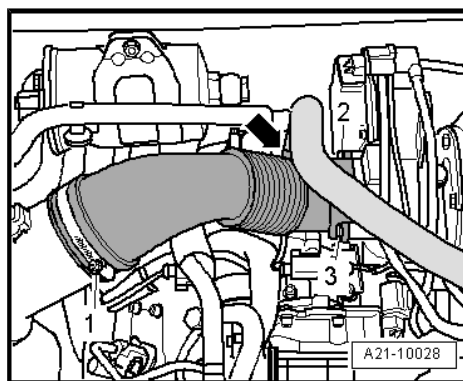
- Unplug electrical connector -1- at air mass meter -G70- .
- Detach air intake pipe -2- at air mass meter.
- Detach clip -arrow- and remove air cleaner housing together with air mass meter.



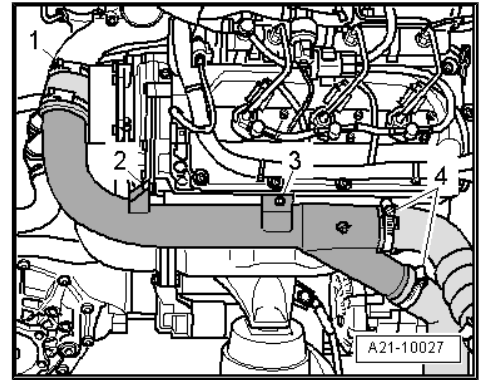
- Pull crankcase breather hose off air pipe -arrow-.
- Remove bolts -2- and -3-.
- Disconnect air pipe from turbocharger.

 **Note**

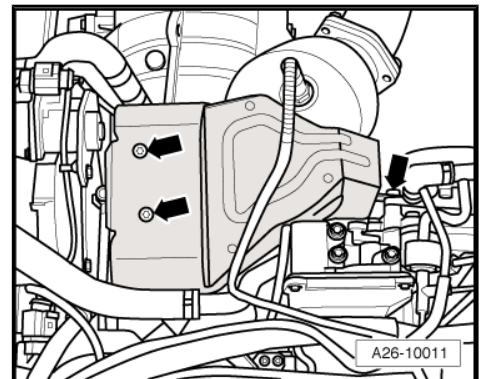
Disregard -item 1-.



- Unscrew bolts -2- and -3- and disconnect air pipe from hoses -1- and -4-.



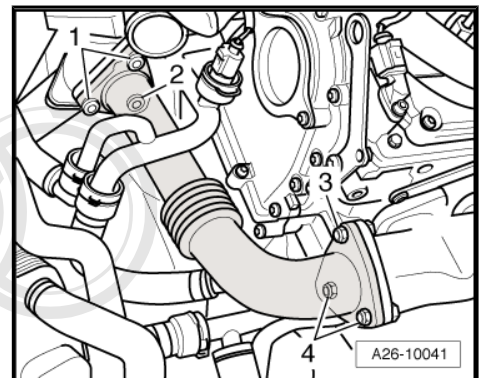
- Remove heat shield for turbocharger -arrows-.



- Unscrew bolts and nuts -1- and -3- (accessible from above).

 **Note**

*Shown in illustration with engine removed.*



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- Unbolt exhaust manifold -arrows- and take out together with intermediate pipe.

### Installing

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



#### Note

- ◆ Renew gaskets and self-locking nuts.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .
- ◆ To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
- ◆ Fit all cable ties in the original positions when installing.

- Install drive shaft (right-side) ⇒ Rep. gr. 40 .

### Tightening torques

Component	Nm	
Exhaust manifold to cylinder head	25 <sup>1)2)</sup>	
Intermediate pipe to:	Exhaust manifold	30 + 90° <sup>1)2)3)</sup>
	Intermediate flange	30 + 90° <sup>1)2)3)</sup>
Heat shield to turbocharger	9	
Air pipe to:	Bracket	9
	Engine lifting eye	9
Hose clips (13 mm wide)	5.5	
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Renew nuts/bolts.</li> <li>• <sup>2)</sup> Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• <sup>3)</sup> 90° = one quarter turn.</li> </ul>		

## 3.4 Removing and installing intermediate pipe (left-side)

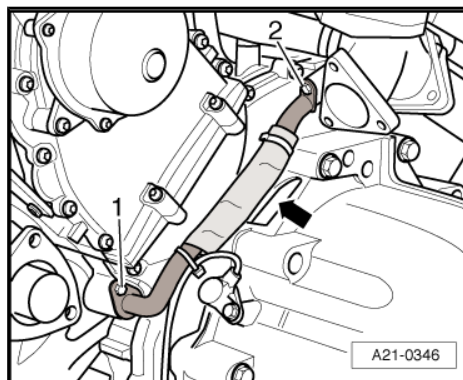
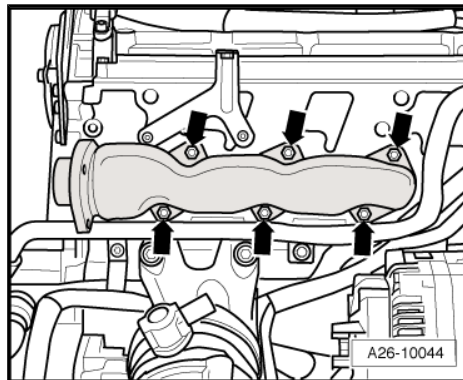
### Removing

- Remove starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#).
- Cover opening -arrow- in gearbox to prevent small parts from dropping in.
- Unscrew bolts -1- and -2- and detach oil return line.

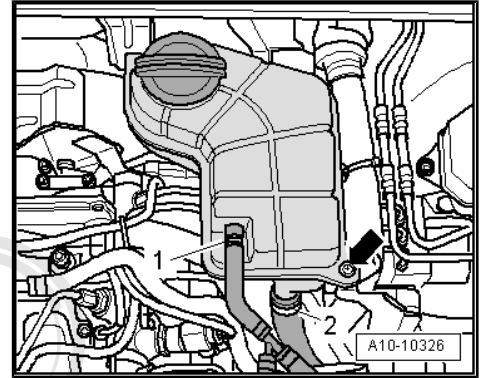


#### Note

Shown in illustration with engine removed and intermediate pipe detached.



- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.



- Unbolt intermediate pipe -arrows-.

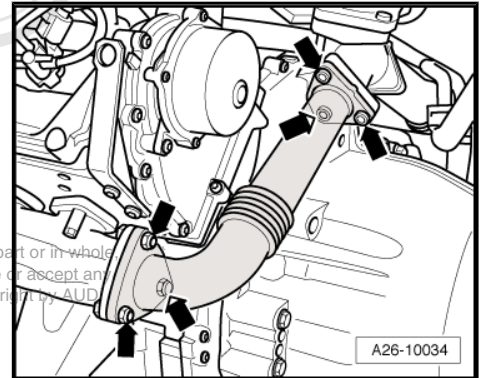
### Installing

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



**Renew gaskets, O-rings and self-locking nuts.**

- Install starter catalytic converter: vehicles without particulate filter ⇒ [page 334](#) , vehicles with particulate filter ⇒ [page 350](#) .



### Tightening torques

Component		Nm
Intermediate pipe to:	Exhaust manifold	30 + 90° 1)2)3)
	Intermediate flange	30 + 90° 1)2)3)
Oil return pipe to:	Cylinder block	9
	Intermediate flange	9

- 1) Renew nuts/bolts.
- 2) Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- 3) 90° = one quarter turn.



### 3.5 Removing and installing intermediate pipe (right-side)

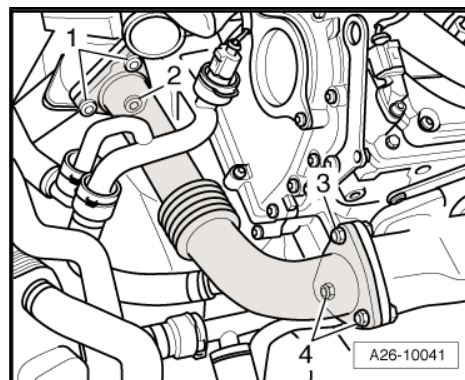
#### Removing

- Drain off coolant ⇒ [page 253](#) .
- Remove coolant pipe (rear) ⇒ [page 276](#) .
- Unscrew bolts -1- and -2- and nuts -3- and -4- and take off intermediate pipe.



#### Note

Shown in illustration with engine removed.



#### Installing

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



#### Note

Renew seals and gaskets.

- Install coolant pipe (rear) ⇒ [page 276](#) .
- Fill cooling system ⇒ [page 255](#) .

#### Tightening torques

Component	Nm
Intermediate pipe to:	
Exhaust manifold	30 + 90° 1)2)3)
Intermediate flange	30 + 90° 1)2)3)
<ul style="list-style-type: none"> <li>• 1) Renew nuts/bolts.</li> <li>• 2) Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue</li> <li>• 3) 90° = one quarter turn.</li> </ul>	

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### 3.6 Checking exhaust system for leaks

- Start engine and run at idling speed.
- Plug tailpipes (e. g. with rags or stopper) and leave plugged until the check is complete.
- Listen for leaks at joints between cylinder head/exhaust manifold, exhaust manifold/intermediate pipe, intermediate pipe/intermediate flange, intermediate flange/turbocharger, etc.
- Repair any leaks that are found.



## 4 Exhaust gas temperature control

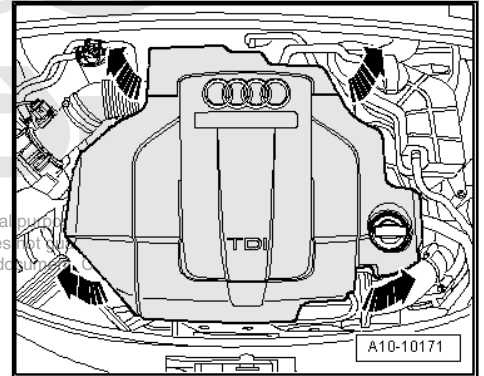
### 4.1 Removing and installing exhaust gas temperature sender 1 -G235- - vehicles with 3.0 ltr. engine

#### Removing

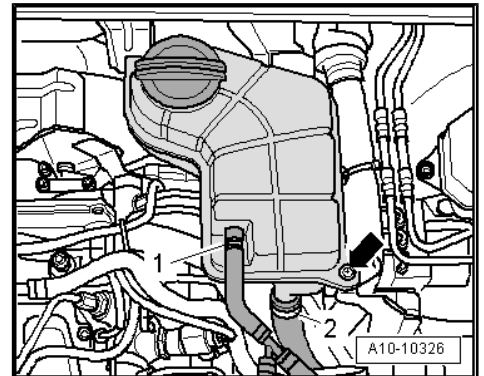


*All cable ties which are released or cut open when removing must be fitted in the same position when installing.*

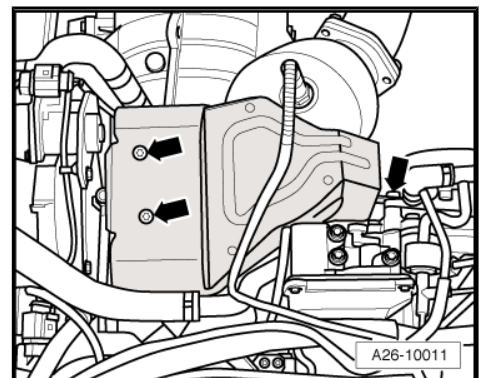
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



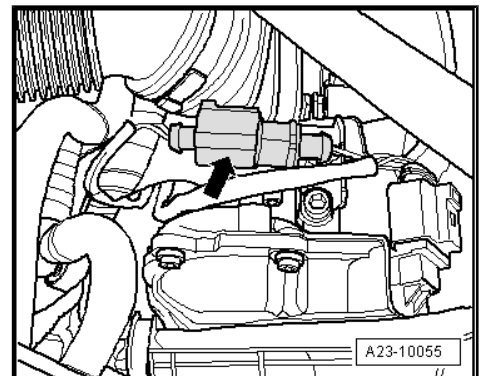
- Unbolt coolant expansion tank -arrow-.
- Detach electrical connector at coolant shortage indicator switch -F66- on coolant expansion tank (bottom).
- Lay aside coolant expansion tank with coolant hoses -1- and -2- connected.



- Remove heat shield for turbocharger -arrows-.



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





- Unscrew exhaust gas temperature sender 1 -G235- -arrow-



**Note**

*Shown from rear with engine removed for illustration purposes.*

**Installing**

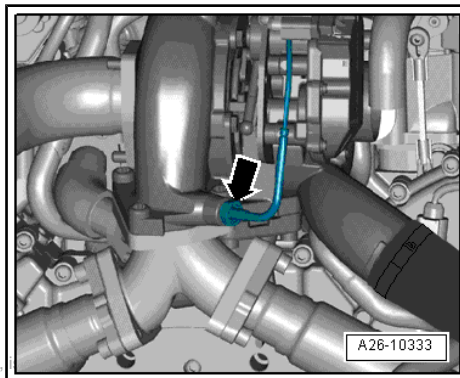
Installation is carried out in the reverse order; note the following:



**Note**

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*Fit all cable ties in the original positions when installing.*



**Tightening torque**

Component	Nm
Exhaust gas temperature sender 1 -G235- to turbocharger	45 <sup>1)</sup>
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Grease thread with high-temperature paste; refer to =&gt; Electronic parts catalogue for high-temperature paste</li> </ul>	

## 4.2 Removing and installing exhaust gas temperature sender 2 for bank 1 -G448-

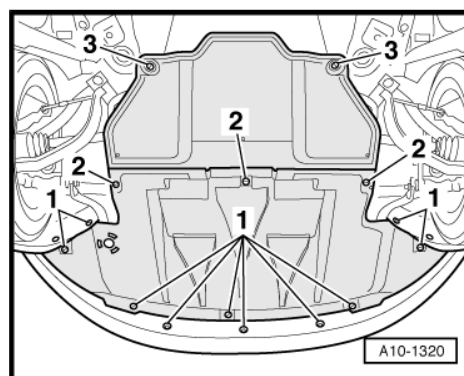
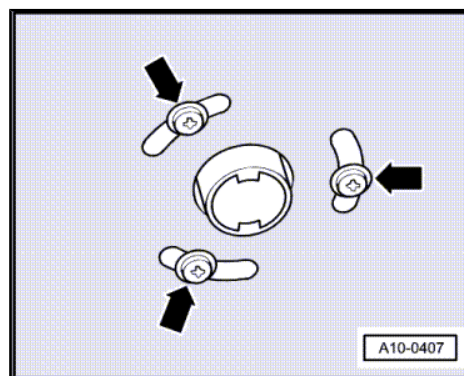
**Removing**



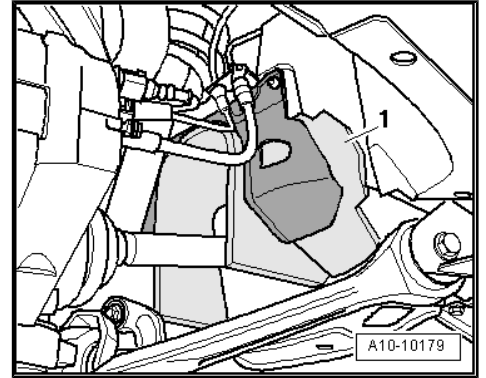
**Note**

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

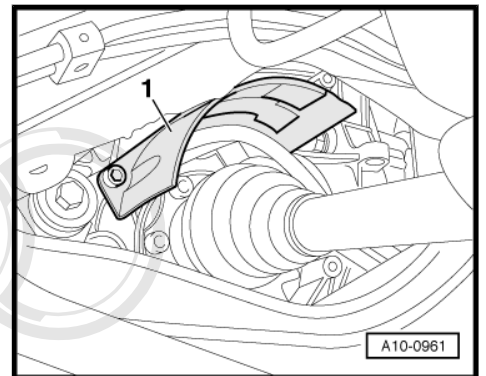
- Remove front left wheel.
- Vehicles with auxiliary heater: remove bolts -arrows- securing exhaust pipe for auxiliary/additional heater to noise insulation.
- Open quick-release fasteners -1 ... 3- and take off front and rear noise insulation.



- Remove noise insulation -1- in wheel housing (left-side).



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

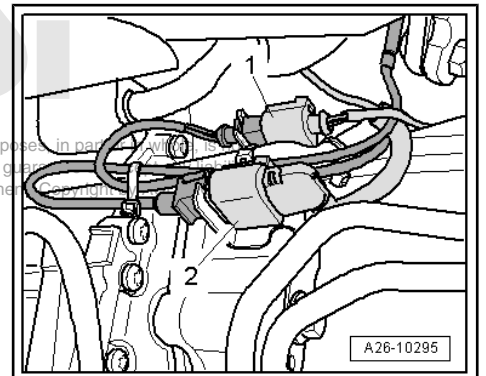


- Unplug electrical connector -1- for exhaust gas temperature sender 2 for bank 1 -G448- at front of gearbox (left-side) and move wiring clear.



*Disregard -item 2-.*

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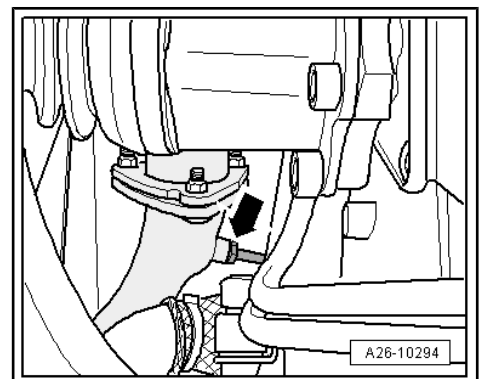
- Unscrew exhaust gas temperature sender 2 for bank 1 -G448- -arrow-.

### Installing

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



*Fit all cable ties in the original positions when installing.*



### Tightening torque

Component	Nm
Exhaust gas temperature sender 2, bank 1 - G448- to starter catalytic converter	45 <sup>1)</sup>
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Grease thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste</li> </ul>	



### 4.3 Removing and installing temperature sender before particulate filter -G506-

#### Removing

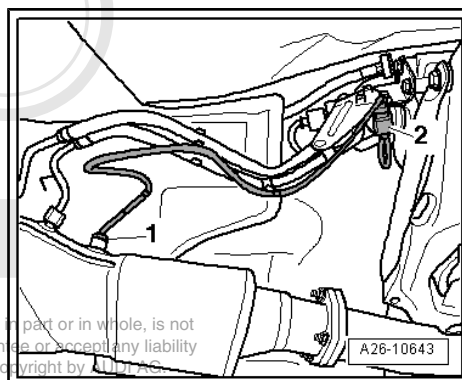


**Note**

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

#### Vehicles with front-wheel drive:

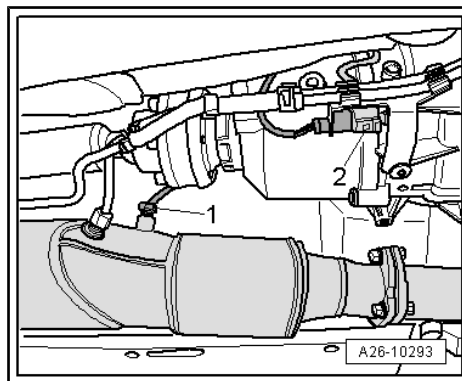
- Unplug electrical connector -2- and detach connector from bracket.
- Move wiring clear.
- Unscrew temperature sender before particulate filter -G506- item 1-.



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#### Vehicles with four-wheel drive:

- Unplug electrical connector -2- and detach connector from bracket.
- Move wiring clear.
- Unscrew temperature sender before particulate filter -G506- item 1-.



#### Installing

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



**Note**

Fit all cable ties in the original positions when installing.

- Note correct installation position of exhaust gas temperature sender 2, bank 1 -G448- :
- Align temperature sender connection centrally between prop-shaft and body.

#### Tightening torque

Component	Nm
Temperature sender before particulate filter - G506- to particulate filter	45 <sup>1)</sup>
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Grease thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste</li> </ul>	

## 5 Exhaust gas recirculation system

### 5.1 Exhaust gas recirculation system - exploded view

1 - Connecting pipe for exhaust gas recirculation

2 - Gasket

Renew

3 - 25 Nm

4 - Vacuum hose

5 - Bracket for exhaust gas recirculation cooler

With connection for coolant hose

6 - O-ring

Renew

7 - 9 Nm

8 - Coolant hose

9 - 9 Nm

10 - Exhaust gas recirculation cooler

Removing and installing  
⇒ [page 376](#)

11 - Coolant hose

12 - Coolant hose

13 - Gasket

Renew

14 - Vacuum hose

From exhaust gas recirculation cooler change-over valve -N345-

15 - Vacuum unit for exhaust gas recirculation changeover function

16 - 4 Nm

17 - Gasket

Renew

18 - 25 Nm

19 - **Connecting pipe for exhaust gas recirculation**

20 - **Change-over flap for exhaust gas recirculation cooler**

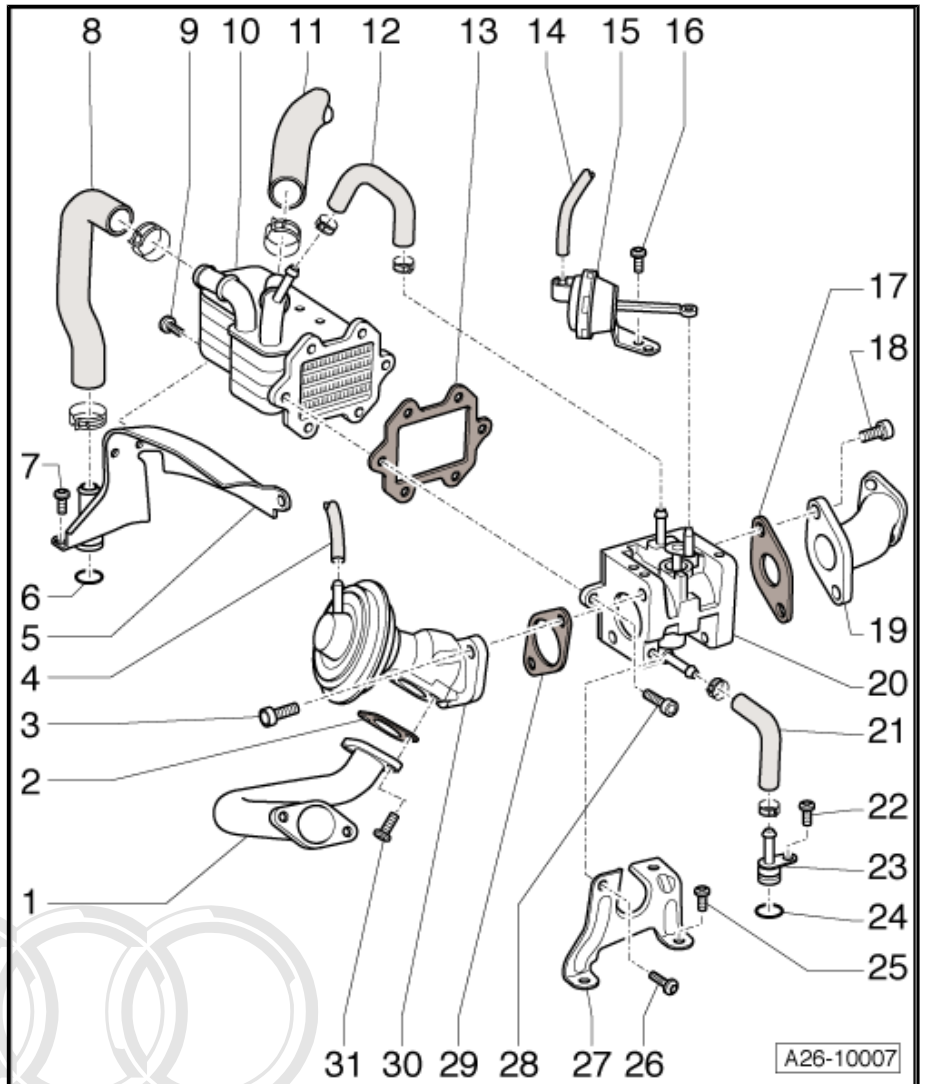
21 - Coolant hose

22 - 9 Nm

23 - Connection for coolant hose

24 - O-ring

Renew



- 25 - 9 Nm
- 26 - 9 Nm
- 27 - Bracket for change-over flap for exhaust gas recirculation cooler
- 28 - 9 Nm
- 29 - Gasket
  - Renew
- 30 - Mechanical exhaust gas recirculation valve
  - Removing and installing ⇒ [page 376](#)
- 31 - 9 Nm

## 5.2 Removing and installing mechanical exhaust gas recirculation valve

### Removing

- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Detach vacuum hose at mechanical exhaust gas recirculation valve.
- Remove bolts -arrows- and take off mechanical exhaust gas recirculation valve with connecting pipe.

### Installing

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

#### Note

*Renew seals and gaskets.*

- Install intake manifold (top section) ⇒ Rep. gr. 23 .

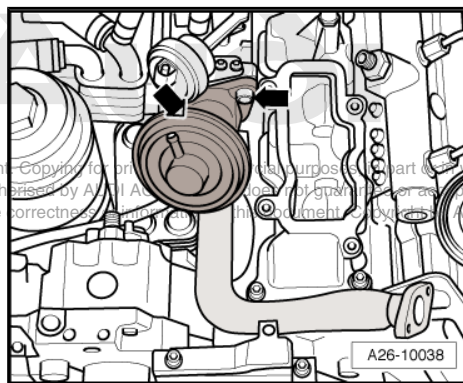
### Tightening torques

Component	Nm
Mechanical exhaust gas recirculation valve to connecting flange	25
Connecting pipe to mechanical exhaust gas recirculation valve	9

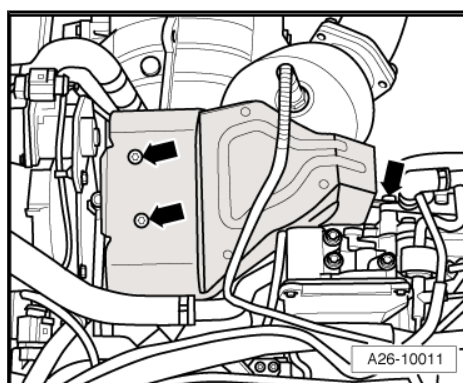
## 5.3 Removing and installing exhaust gas recirculation cooler

### Removing

- Drain off coolant ⇒ [page 253](#) .
- Remove intake manifold (top section) ⇒ Rep. gr. 23 .
- Remove bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Remove heat shield for turbocharger -arrows-.



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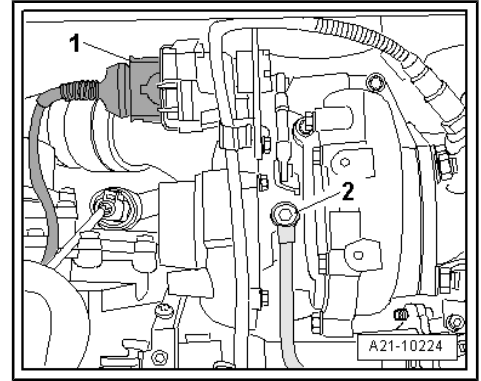


**Vehicles with 2.7 ltr. engine:**

- Remove banjo bolt -2- and disconnect oil supply line from turbocharger.



*Disregard items marked -1- and -2-.*

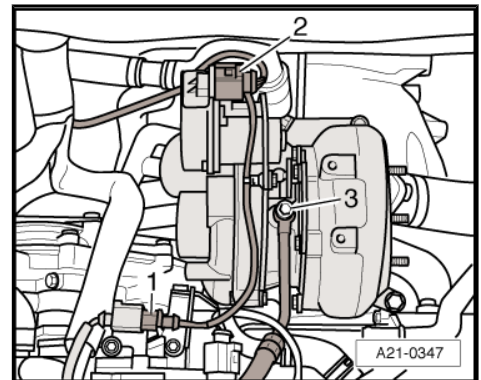


**Vehicles with 3.0 ltr. engine:**

- Remove banjo bolt -3- and disconnect oil supply line from turbocharger.

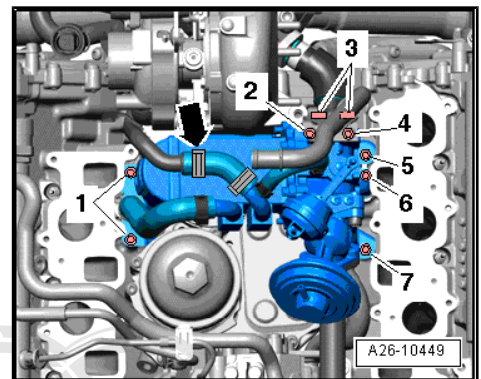


*Disregard items marked -1- and -2-.*



**All vehicles (continued):**

- Detach hose -arrow-.
- Remove bolts -1 ... 7-.



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- Remove bolt -2- and push coolant pipe (rear) slightly to the side.

**Note**

Ignore items marked -1- and -arrows-.

- Lift off cooler for exhaust gas recirculation (left-side) from cylinder block.

**Installing**

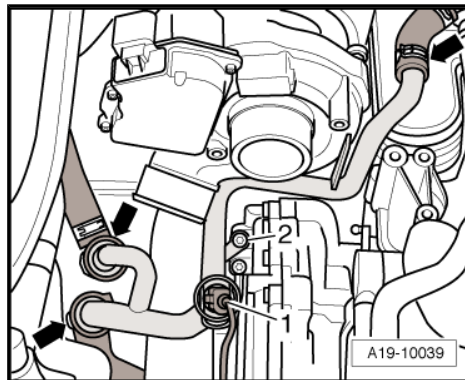
Installation is carried out in the reverse order; note the following:

**Note**

- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Install mechanical exhaust gas recirculation valve  
⇒ [page 376](#) .
- Install bottom section of intake manifold (left and right) ⇒ Rep. gr. 23 .
- Install intake manifold (top section) ⇒ Rep. gr. 23 .
- Fill cooling system ⇒ [page 255](#) .

**Tightening torques**

Component	Nm
Exhaust gas recirculation cooler to cylinder block	9
Connecting pipe to exhaust gas recirculation cooler	25
Coolant pipe (rear) to cylinder head	9
Crankcase breather pipe to change-over flap for exhaust gas recirculation cooler	9
Heat shield to:	
Turbocharger	9
Cylinder head	9



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