

Audi A4 1995 ➤

4-cylinder Diesel Direct Injection Engine (TDI), Mechanics

Engine ID	1Z	AFF	AFN	AHH	AHU	AVG			
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Edition 04.1998



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List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

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4-cylinder Diesel Direct Injection Engine (TDI), Mechanics

Repair Group

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



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

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Contents

00 - Technical data	1
1 Technical data	1
1.1 Technical data	1
1.2 Engine number	1
1.3 Engine data	1
10 - Removing and installing engine	3
1 Removing and installing engine	3
1.1 Removing and installing engine	3
1.2 Removing	4
1.3 Attaching engine to engine stand	19
1.4 Installing	19
1.5 Tightening torques	21
13 - Crankshaft group	24
1 Dismantling and assembling engine	24
1.1 Dismantling and assembling engine	24
1.2 Lock carrier: move into service position	24
1.3 Ribbed belt drive for vane pump, alternator, coolant pump and viscous fan	29
1.4 Removing and installing viscous fan	35
1.5 Ribbed belt drive for air conditioner	36
1.6 Routing of ribbed belt	39
1.7 Removing and installing ribbed belt	40
1.8 Removing and installing bearing for viscous fan	43
1.9 Removing and installing bracket for alternator, vane pump and viscous fan	44
1.10 Toothed belt drive	47
1.11 Removing and installing toothed belt, engine codes 1Z, AFF, AFN, AHU	55
1.12 Removing and installing toothed belt, engine code AHH	61
1.13 Checking semi automatic toothed belt tensioner	67
1.14 Rotating crankshaft to TDC with engine removed	68
2 Removing and installing sealing flanges and flywheel/drive plate	70
2.1 Removing and installing sealing flanges and flywheel/drive plate	70
2.2 Renewing crankshaft oil seal on pulley end	76
2.3 Removing and installing dual mass flywheel/drive plate	79
3 Removing and installing crankshaft	82
3.1 Removing and installing crankshaft	82
3.2 Removing and installing needle bearing in crankshaft	87
3.3 Crankshaft dimensions	88
4 Dismantling and assembling pistons and conrods	89
4.1 Dismantling and assembling pistons and conrods	89
4.2 Checking piston projection at TDC	97
4.3 Piston and cylinder dimensions	99
15 - Cylinder head, Valve gear	100
1 Removing and installing cylinder head	100
1.1 Removing and installing cylinder head	100
1.2 Removing and installing cylinder head cover	105
1.3 Removing and installing intake pipe, engine codes 1Z, AFF, AHU	107
1.4 Removing and installing intake pipe, engine codes AFN, AHH	108
1.5 Removing cylinder head	109
1.6 Installing cylinder head	117
1.7 Check compression	120
2 Servicing valve gear	122



2.1	Servicing valve gear	122
2.2	Checking camshaft axial clearance	129
2.3	Removing and installing camshaft	130
2.4	Checking hydraulic bucket tappets	134
2.5	Renewing valve stem seals	136
2.6	Reworking valve seats	138
2.7	Checking valve guides	140
17	- Lubrication	141
1	Removing and installing parts of the lubrication system	141
1.1	Removing and installing parts of the lubrication system	141
1.2	Part I	142
1.3	Part II	147
1.4	Removing and installing oil pan	151
1.5	Removing and installing oil pump	158
1.6	Checking oil pressure and oil pressure switch	158
1.7	Engine oil	161
1.8	check oil level	161
19	- Cooling system	162
1	Removing and installing parts of the cooling system	162
1.1	Removing and installing parts of the cooling system	162
1.2	Parts of cooling system	163
1.3	Draining and filling cooling system	165
1.4	Removing and installing coolant pump and coolant thermostat	170
1.5	Removing and installing coolant pump	172
1.6	Removing and installing, checking coolant thermostat	173
1.7	Removing and installing coolant pipe	173
1.8	Removing and installing radiator	176
1.9	Checking cooling system for leaks	179
21	- Charging	182
1	Charge air system with turbocharger	182
1.1	Charge air system with turbocharger	182
1.2	Diagram of connections for boost pressure control - engine codes 1Z, AFF, AHU	182
1.3	Diagram for boost pressure control - engine codes AFN, AHH	184
1.4	Checking turbocharger and boost pressure control system	187
1.5	Testing boost pressure - engine codes 1Z, AFF, AHU	188
1.6	Testing boost pressure - engine code AFN, AHH	192
1.7	Checking linkage and pressure unit for boost pressure regulating valve - engine codes 1Z, AFF, AHU	194
1.8	Checking linkage and vacuum unit for boost pressure control - engine codes AFN, AHH	195
1.9	Checking solenoid valve for boost pressure limitation -N75	197
1.10	Check intake manifold pressure sensor	202
1.11	Rules for cleanliness	203
1.12	Turbocharger- engine codes 1Z, AFF, AHU	204
1.13	Removing and installing pressure unit for boost pressure regulating valve - engine codes 1Z, AFF, AHU	208
1.14	Removing and installing turbocharger, engine codes 1Z, AFF, AHU	209
1.15	Turbocharger-engine codes AFN, AHH	212
1.16	Removing and installing turbocharger - engine codes AFN, AHH	217
1.17	Removing and installing parts of charge air cooling system > 06.97	221
1.18	Removing and installing parts of charge air cooling system 07.97 ä	224
1.19	Removing and installing charge air cooler (intercooler)	225
26	- Exhaust system	227
1	Removing and installing parts of exhaust system	227
1.1	Removing and installing parts of exhaust system	227

1.2	Vehicles with front-wheel drive	227
1.3	Vehicles with four-wheel drive	233
1.4	Separating front and rear silencers	238
1.5	Removing and installing exhaust manifold	240
1.6	Removing and installing exhaust pipe	240
1.7	Removing and installing catalytic converter	242
1.8	Stress free alignment of exhaust system	243
1.9	Checking exhaust system for leaks	246
2	Exhaust gas recirculation system	246
2.1	Exhaust gas recirculation system	246
2.2	Removing and installing parts of exhaust gas recirculation	247
2.3	Diagram of vacuum hose connections	249
2.4	Checking mechanical EGR valve	251
2.5	Testing exhaust gas recirculation > 06.97	251
2.6	Test exhaust gas recirculation 07.97 ä	254
2.7	Checking EGR valve -N18	256

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4-cylinder Diesel Direct Injection Engine (TDI), Mechanics - Edition 04.1998



Audi

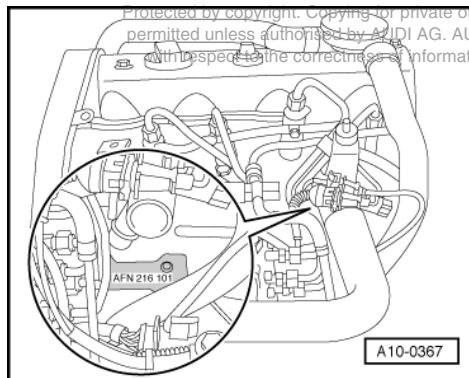
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00 - Technical data

1 - Technical data

1.1 - Technical data

1.2 - Engine number



-> The engine number ("Engine code" and "Serial number") can be found on the left of the cylinder block.

Additionally there is a sticker on the toothed-belt guard showing the engine code and serial number.

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

1.3 - Engine data

Code letters		AFF	1Z	AHH
Production		12.95 ä	01.95 ä	08.97 ä
Capacity	ltrs.	1.9	1.9	1.9
Output	kW at rpm	55/4000	66/4000	66/4000
Torque	Nm at rpm	150 1500 ... 3200	202 1900	202 1900
Bore	ø mm	79.5	79.5	79.5
Stroke	mm	95.5	95.5	95.5
Compression		19.5	19.5	19.5
CN	at least	45	45	45
Firing order		1-3-4-2	1-3-4-2	1-3-4-2
Catalytic converter		x	x	x
Exhaust gas recirculation system		x	x	x
Charging		x	x	x
Charge air cooler		x	x	x



Code letters	AFF	1Z	AHH
Valve timing			
At 1 mm valve lift and 0 mm valve clearance			
Inlet opens after TDC	16°	16°	16°
Inlet closes after BDC	25°	25°	25°
Exhaust opens before BDC	28°	28°	28°
Exhaust closes before TDC	19°	19°	19°

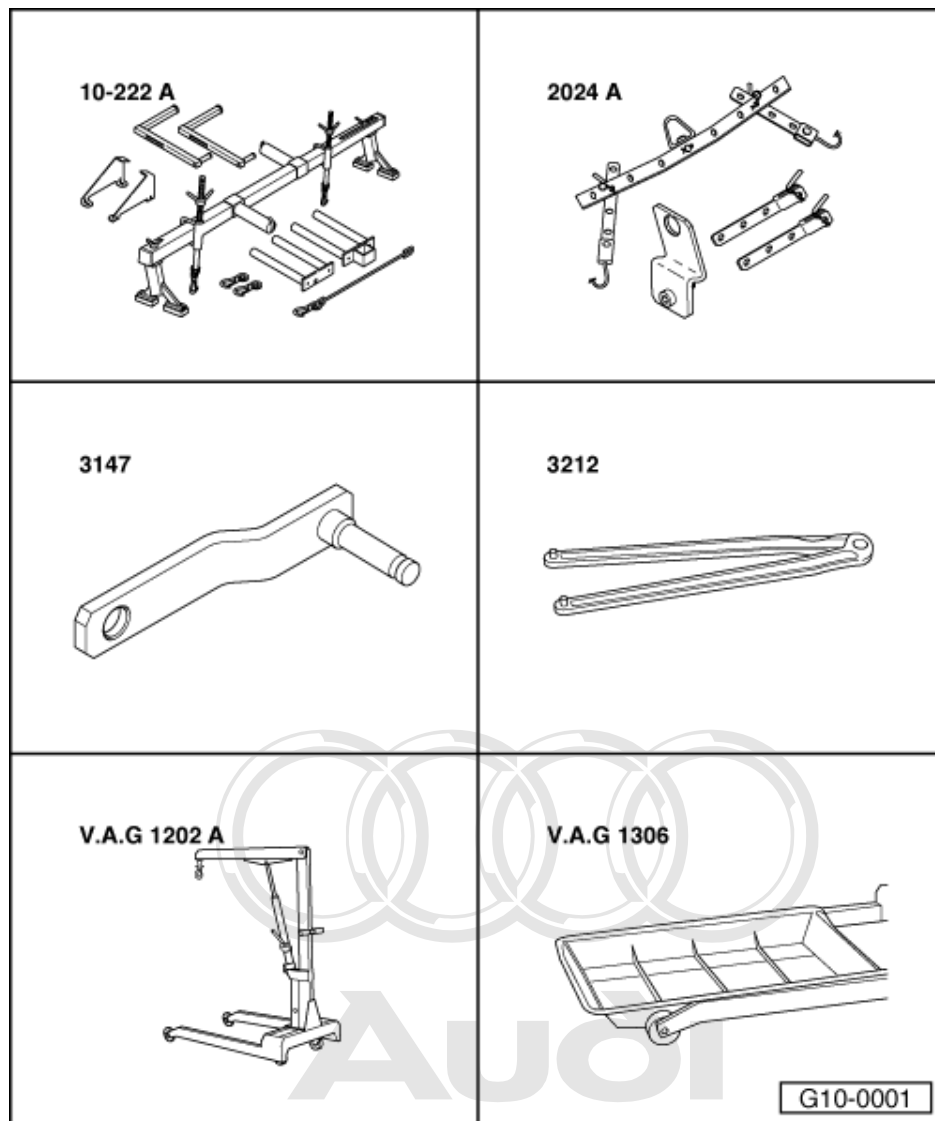
Code letters	AHU	AFN	AVG
Production	08.96 ä	12.95 ä	08.99 ä
Capacity ltrs.	1.9	1.9	1.9
Output kW at rpm	66/4000	81/4000	81/4000
Torque Nm at rpm	202 1900	225 1700 ... 3000	225 1700 ... 3000
Bore ø mm	79.5	79.5	79.5
Stroke mm	95.5	95.5	95.5
Compression ratio	19.5	19.5	19.5
ON at least	45	45	45
Firing order	1-3-4-2	1-3-4-2	1-3-4-2
Catalytic converter	x	x	x
Exhaust gas recirculation system	x	x	x
Charging	x	x	x
Charge air cooler	x	x	x

Code letters	AHU	AFN	AVG
Valve timing			
At 1 mm valve lift and 0 mm valve clearance			
Inlet opens after TDC	16°	16°	16°
Inlet closes after BDC	25°	25°	25°
Exhaust opens before BDC	28°	28°	28°
Exhaust closes before TDC	19°	19°	19°

10 - Removing and installing engine

1 - Removing and installing engine

1.1 - Removing and installing engine

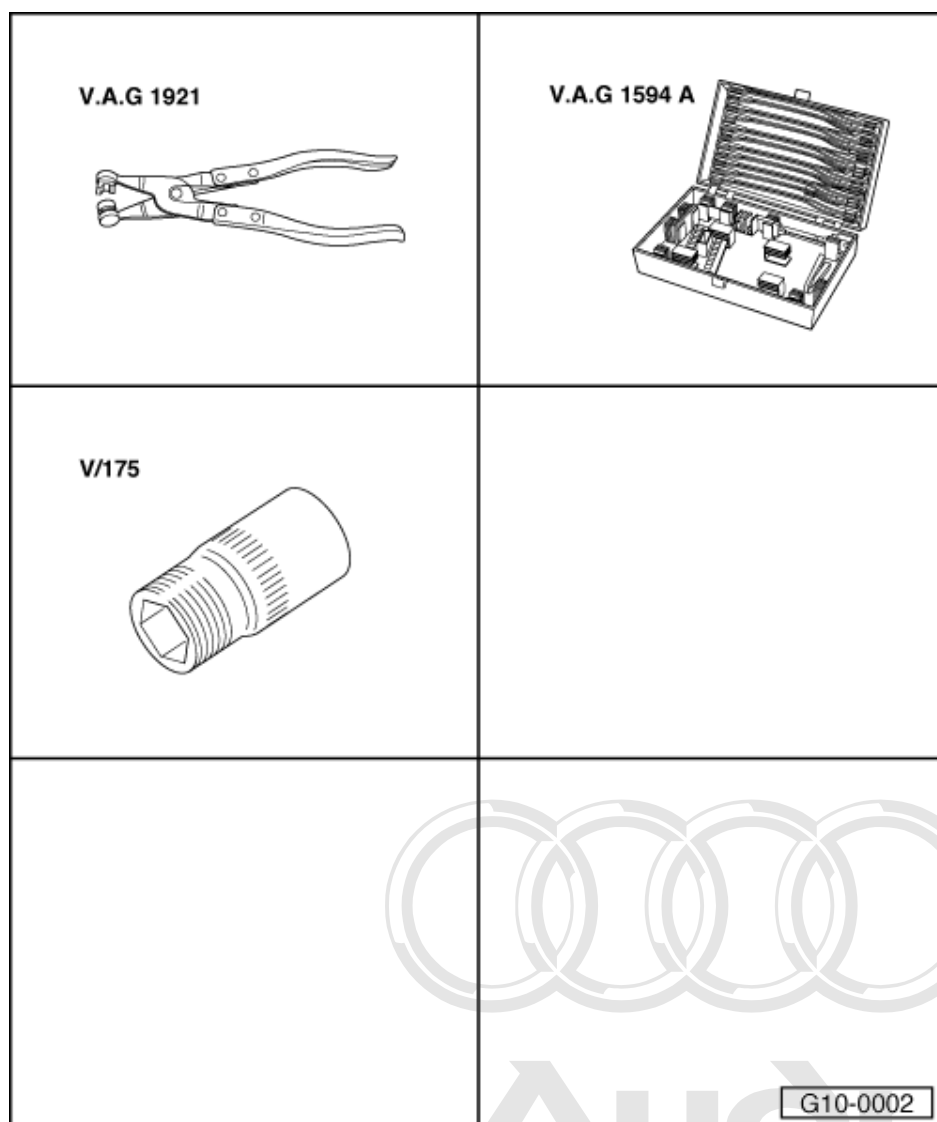


Special tools, testers and auxiliary items required

- ♦ Special tool 10-222A
with 10-222A/1
- ♦ Special tool 2024 A
with 2024 A/1 and 2024 A/2
- ♦ Special tool 3147
- ♦ Special tool 3212
- ♦ V.A.G 1202 A



- ♦ V.A.G 1306



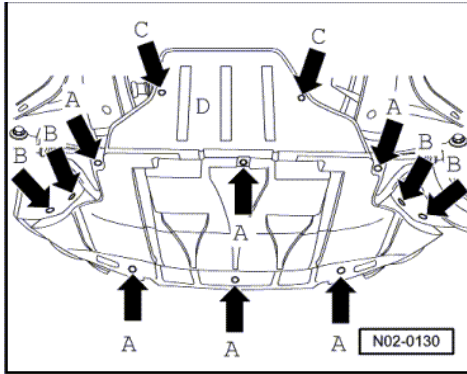
- ♦ V.A.G 1921
- ♦ VAS 1978/8
- ♦ Special tool Matra V/175

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1.2 - Removing

Notes:

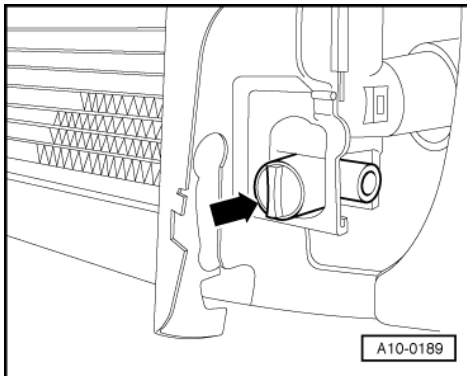
- ♦ The engine is removed from the front without the gearbox.
- ♦ Renew all cut and defective cable ties. Refit cable ties in the same position when installing the engine.
- ♦ Catch drained off coolant in a clean container for re use or disposal.
- Observe or obtain radio code on vehicles with coded radio.
- Run windscreen wipers to vertical position.



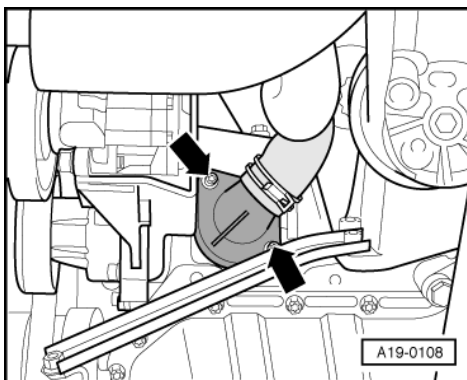
- Disconnect earthing strap at battery with ignition switched off.
- Open the cover of the coolant expansion tank
- Remove front bumper:

=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper Front bumper
Removing and installing front bumper

- -> Remove noise insulation -arrows-.
- Place drip tray V.A.G 1306 below engine.



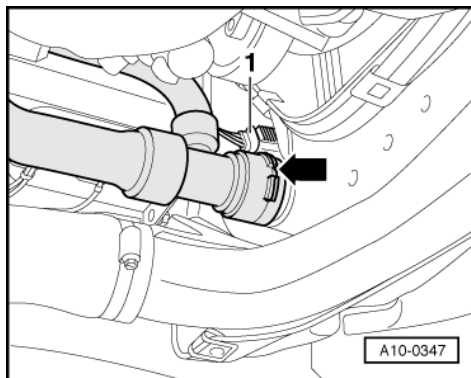
- -> Turn drain screw -arrow- on radiator anti clockwise. If necessary, fit drain hose on connection.



- -> To drain remaining coolant, remove screws -arrows-, detach connection, O-ring and thermostat.



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- -> Pull off bottom coolant hose retaining clip -arrow- and remove coolant hose from radiator.

Vehicles with uprated cooling system:

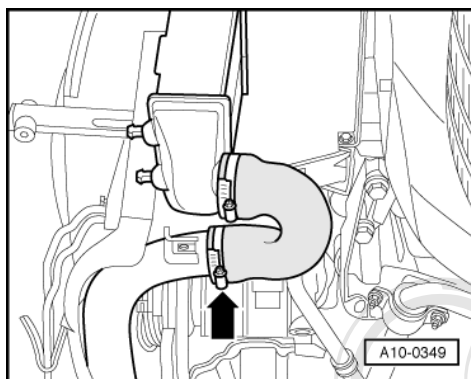
- Unplug connector -1- from radiator fan thermoswitch -F18/-F54 on radiator (bottom left) and move electrical wires clear.

Vehicles with automatic gearbox:

- Place drip tray V.A.G 1306 underneath.
- Detach ATF pipes at lock carrier

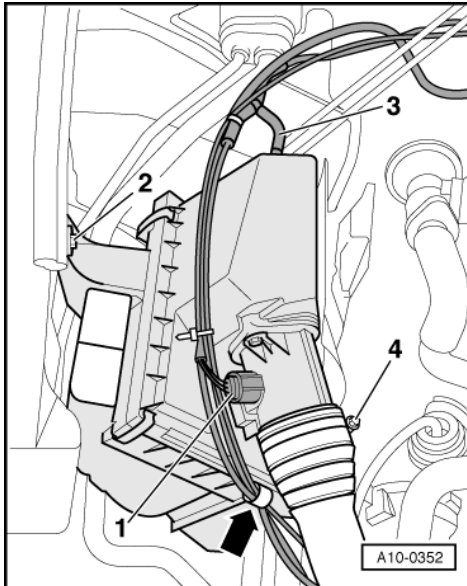
=> Automatic gearbox 01V; Repair group 37; Dismantling and assembling gearbox; Removing and installing ATF pipes Dismantling and assembling gearbox Removing and installing ATF pipes

All models:

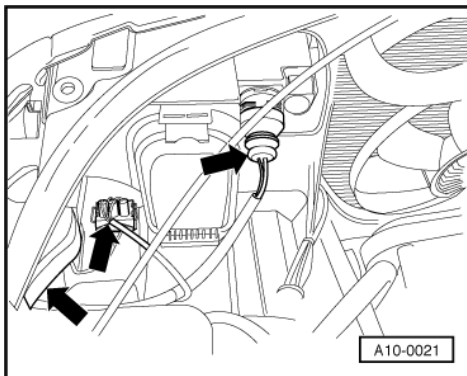


- -> Disconnect air intake hose -arrow- to charge air cooler at bottom left of lock carrier.
- Disconnect air intake hose to turbocharger at bottom right of lock carrier.

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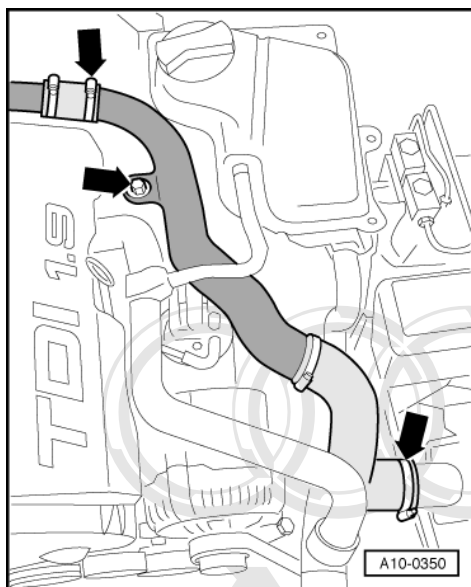


- Unbolt and remove air duct pipe leading to air cleaner on lock carrier.
- -> Disconnect hose -3- from air cleaner housing.
- Unplug connector -1- at air mass meter.
- Detach wiring harness from air cleaner housing -arrow-.
- Remove air intake hose -4-.
- Unscrew bolt -2-.
- Detach air cleaner housing.



- -> Unplug connectors for headlights and headlight range control -arrows-.
- Turn bulb holders for turn signals anti clockwise and remove from turn signal housing -left arrow-.
- Pull off retaining clip for upper coolant hose and detach coolant hose from radiator.

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- -> Remove screw and detach air charge hose together with left air duct pipe -arrows-.

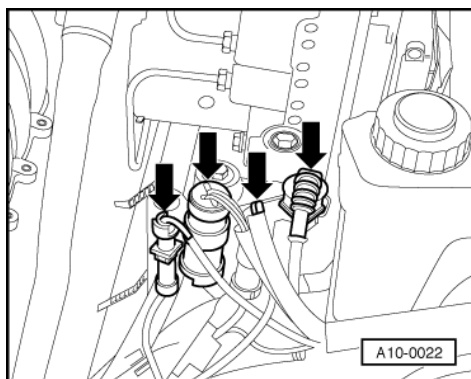
Note:

On vehicles 07.97, pipe has been discontinued. Only remove hose to charge air cooler.

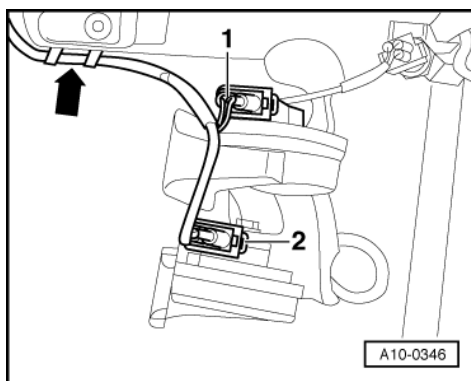
- Detach bonnet lock cable from lock carrier.

=> General body repairs; Repair group 55; Bonnet; Removing and installing bonnet lock cable Bonnet Removing and installing bonnet lock cable

- Detach cover from power steering fluid reservoir.



- -> Unplug connectors located in front of ABS unit -arrows- and move electrical wiring clear.
- Unplug connector for anti theft alarm on lock carrier (top left) and move electrical wiring clear.



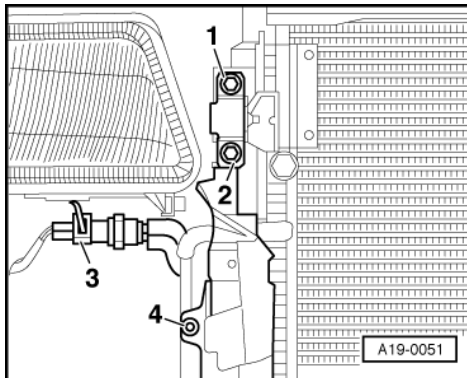
- -> Unplug connectors from both horns -1- and -2-, disengage electrical wiring from bracket -arrow- and move wiring clear.

Vehicles with air conditioner:

Important:
The air conditioner refrigerant circuit must not be opened.

Note:

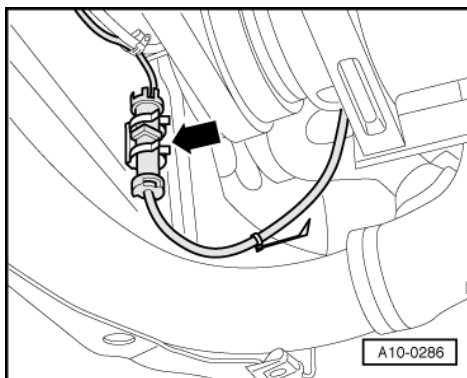
To prevent damage to the condenser and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.



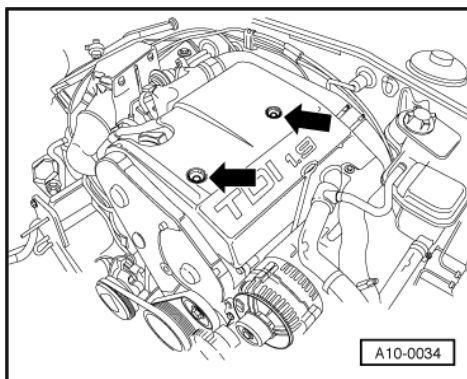
- -> Detach air cowls from radiator -4- (left and right).
- Remove securing bolts -1- and -2- for condenser.
- Pull connector -3- off low-pressure switch for air conditioner -F73.
- Pull condenser up out of its bracket, pivot towards the side and secure to right-hand front wheel with wire.

Note:

Protect wing panel from damage.



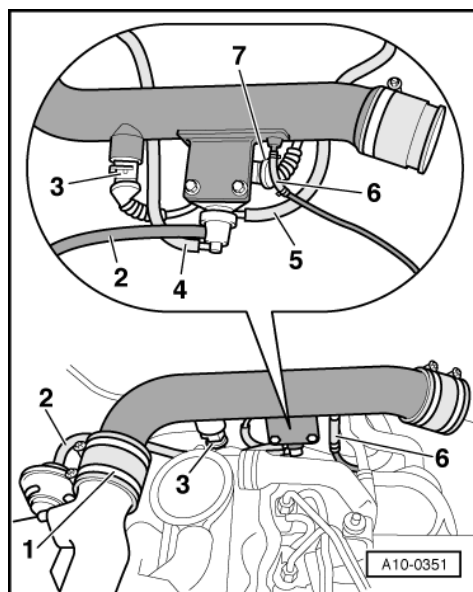
- -> Unclip green connector -arrow- for air conditioner magnetic clutch on lock carrier (bottom right). Unplug connector and move electrical wiring clear.
- Unbolt lock carrier and place in a secure position.



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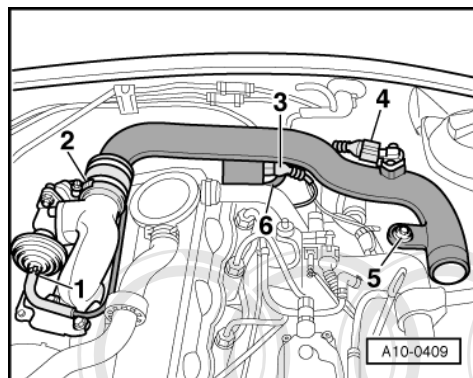
- -> Remove engine cover panel -arrows-.



Vehicles ä 06.97:

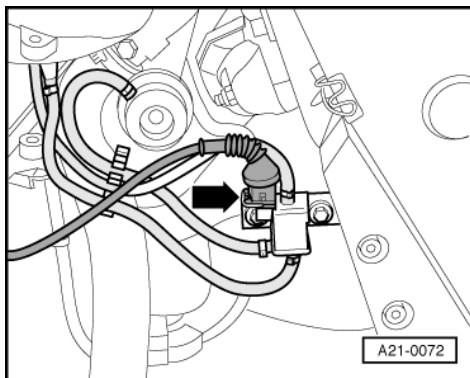
- -> Remove rear air duct:
 - Unfasten hose clip -1-.
 - Detach hose -2-.
 - Disconnect connector -3-.
 - Detach hoses -4-, -5- and -6-.
 - Disconnect connector -7-.

Vehicles 07.97 ä:



- -> Remove rear air duct:
 - Detach hose -1-.
 - Unfasten hose clip -2-.
 - Disconnect connectors -3- and -4-.
 - Remove bolt -5-.
 - Detach hose -6-.

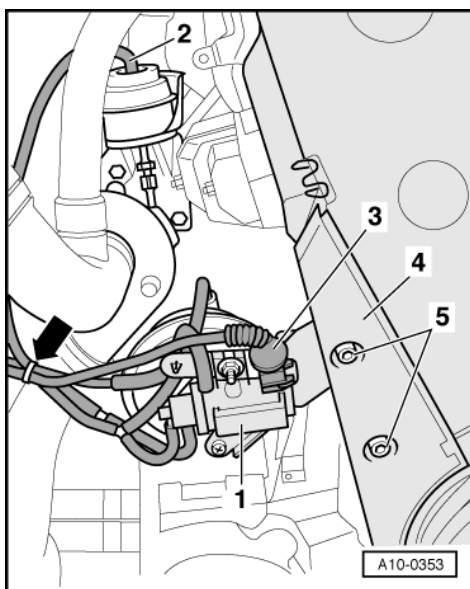
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Vehicles with engine codes 1Z, AFF, AHU:

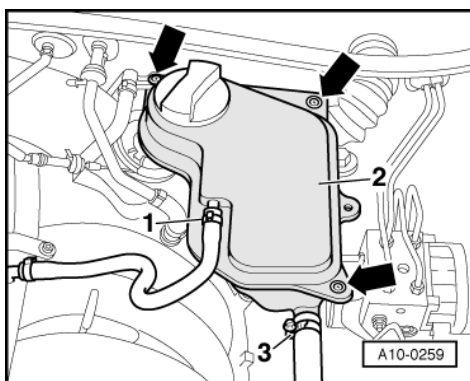
- Pull connector -arrow- off solenoid valve for boost pressure control.

Vehicles with engine codes AFN, AHH:



- -> Pull off vacuum hose -2-.
- Disconnect connector -3-, separate cable ties -arrow- and lay electrical wiring onto engine.
- Remove bolts -5- and detach cover -4-.
- Place solenoid valve for boost pressure control-1- to one side with hoses connected.

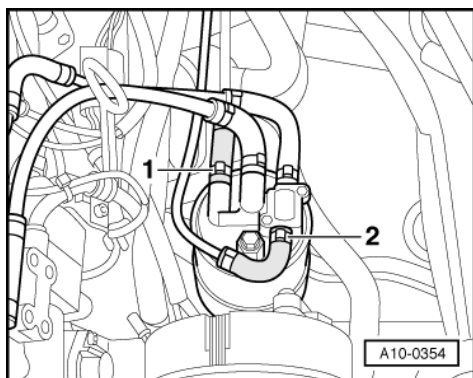
All models:



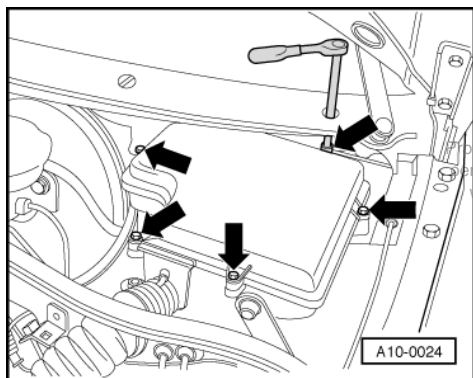
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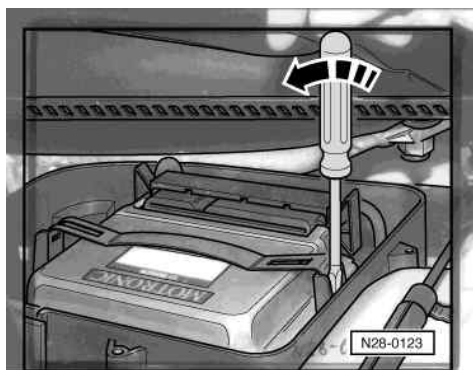
- -> Detach coolant hoses -1- and -3-.
- Unbolt coolant expansion tank -2- (-arrows-).
- Disconnect wiring to coolant shortage indicator switch -F66 at bottom of coolant expansion tank.



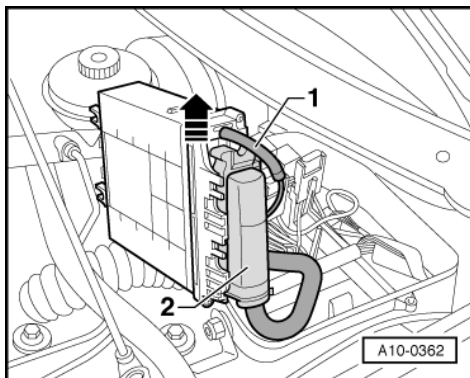
- -> Disconnect fuel supply line -1- and fuel return line -2- from filter cover and move to one side.



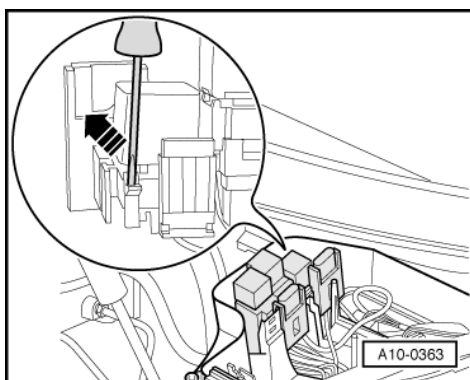
- -> Remove cover for electronics box (plenum chamber) -arrows-.



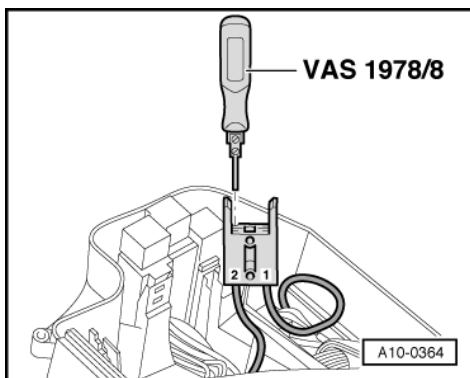
- -> Carefully lever off the retainer bar with a screwdriver -arrow-.



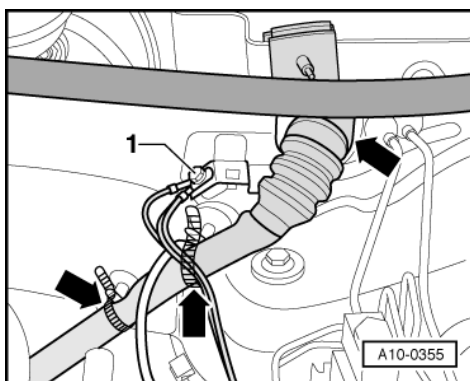
- -> Detach connector latches -arrow- and disconnect connector -2- of control unit.
- Where fitted, disconnect hose -1- from control unit.



- -> Release latches -arrow- and pull off auxiliary relay carrier in electronics box upwards.



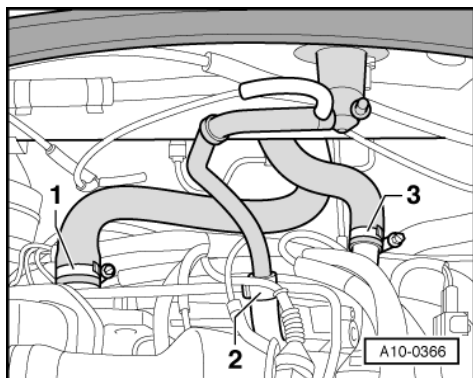
- -> Release both fuse holders on auxiliary relay carrier and pull off upwards.
- With VAS 1978/8, release plug-in contact in plug-in board 2.



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- -> Disconnect earth connection -1- on plenum chamber.
- Disengage wiring harness -arrows- and move clear to one side.



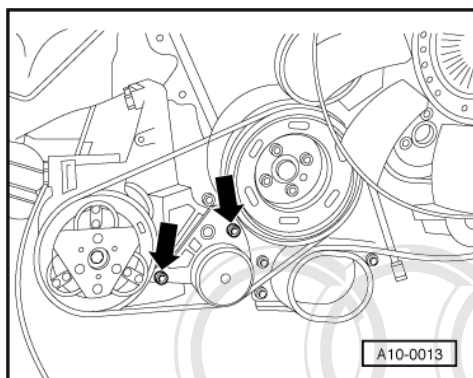
- -> Pull off coolant hoses -1- and -3- to heating-system heat exchanger on engine.
- Pull off vacuum hose -2- for brake servo
- Unplug connector from speedometer sender -G22- on left of gearbox and move electrical wire clear.

Vehicles with manual gearbox

- Unplug connector for reversing light switch on gearbox and move electrical wiring clear.

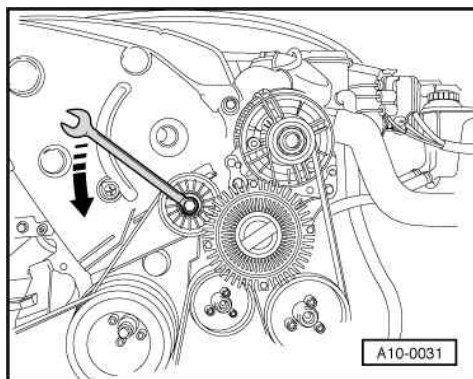
Vehicles with air conditioner:

Note:



Before removing the ribbed belt, mark the direction of rotation with chalk or a felt pen. If the belt rotates in the wrong direction when it is refitted, this can cause breakage. Ensure that the belt is properly seated on the pulleys when installing.

- -> Loosen bolts securing ribbed belt tensioner for A/C compressor -arrows-. Slacken belt and remove.
- Detach A/C compressor from bracket and secure to body with wire.

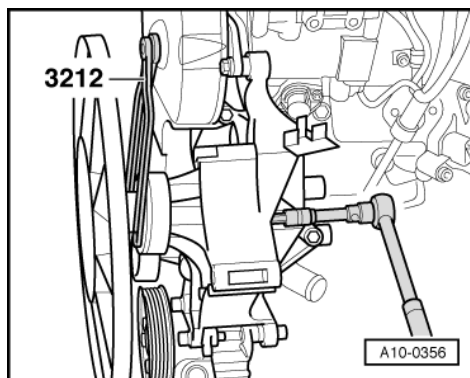


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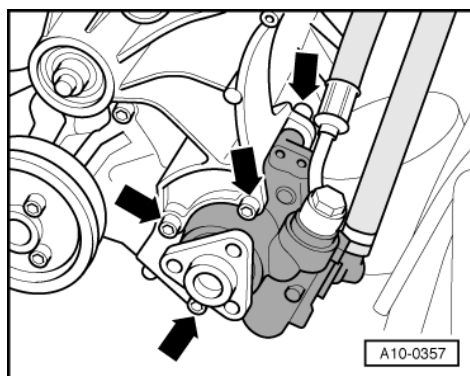
Important:
The air conditioner refrigerant circuit must not be opened.

All models:

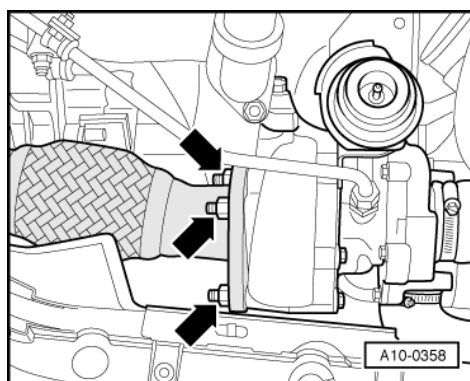
- -> To slacken ribbed belt, turn tensioning element in direction of arrow.
- Remove ribbed belt from alternator pulley.



- -> Counter hold pulley for viscous fan with 2-hole pin wrench 3212 and unscrew from bracket with 8 mm Allen key.
- Remove ribbed V-belt.
- Detach pulley from power steering vane pump. Use a drift to counter hold.



- -> Unbolt power steering vane pump -arrow-, move clear to one side and tie in place. Do not open hydraulic connections.
- Unbolt cable clamp for positive cable to starter from engine (right side), below exhaust manifold.



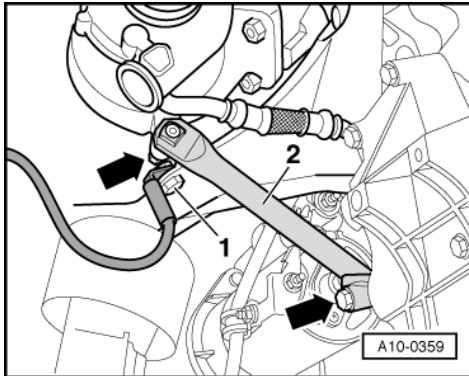
- -> Unscrew turbocharger/catalytic converter bolts -arrows-.
- Release front clamps for exhaust system.
- Push clamp towards the rear and separate exhaust pipe.

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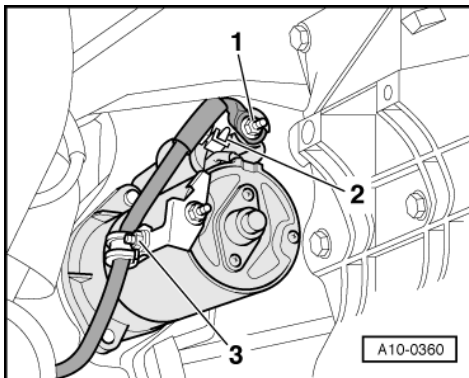
- Pull front exhaust pipe with catalytic converter off turbocharger.

Note:

The isolating element in exhaust system must not be bent more than 10° to avoid damage.

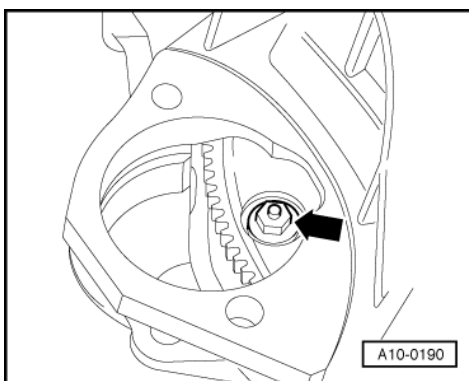


- -> Unbolt earth wire from engine support (right side) -1-.
- If fitted, remove bracket -2- for turbocharger -arrows-.



- -> Detach electrical wires -1- and -32- from starter, remove insulator from positive connection on starter.
- Unbolt cable clamp -3-.
- Unbolt starter from gearbox and remove.

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**Vehicles with automatic gearbox:**

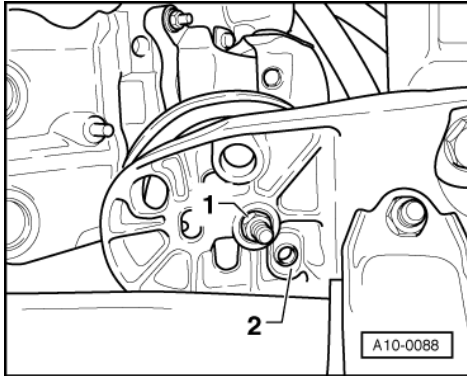
- -> Use 15 mm wrench socket Matra V/175 to screw out 3 nuts of torque converter in opening in removed starter (give crankshaft 1/3 of a turn in each case).

Note:

When loosening torque converter bolts, counterhold crankshaft by applying spanner to central bolt on vibration damper.

All models:

- Loosen nuts a few turns on left and right engine mountings (top).

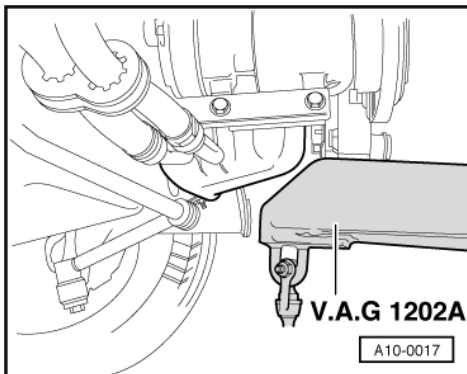


- -> Mark positions of mountings -1- and locating sleeves -2- on left and right engine mountings (bottom).

Note:

Different mounting holes are provided for the different engine versions.

- Remove bottom nuts -1- on left and right engine mountings.



- -> Lift engine and gearbox slightly on bracket for torque reaction support using workshop crane V.A.G 1202 A.

Important:
 Ensure that components are supported safely - accident risk.

Note:

Ensure that wiring and other connections are not damaged at top of bulkhead.

- Unscrew engine/gearbox securing bolts accessible from below.

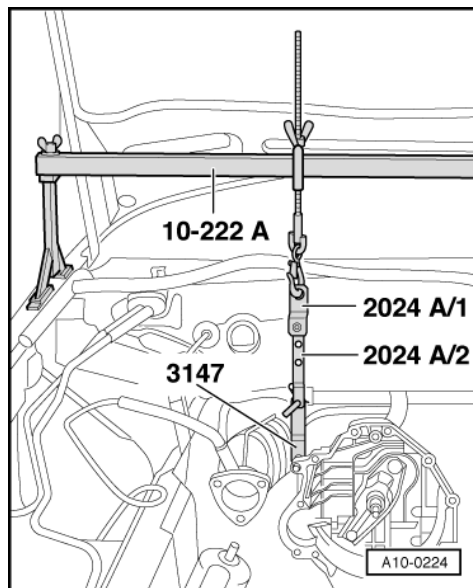
Vehicles with automatic gearbox:

- Unbolt bracket for ATF pipes from left of engine.



All models:

- Lower engine back down again.
- Refit nuts loosely to engine mounting studs.
- Remove nuts on top engine mountings.

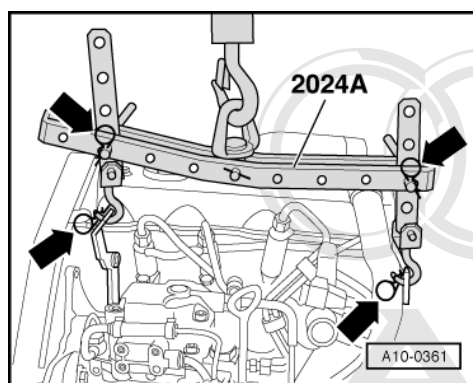


- -> Set up support bar 10-222 A on wing panel flanges. Spindle is at front.
- Engage gearbox support 3147 in bolthole in bell housing on gearbox.
- Connect gearbox support 3147 to support bar 10-222 A using extension 2024 A/1 and bar 2024 A/2 (secure bolt with nut and washer).

Note:

Shown in illustration with engine removed.

- Unscrew upper engine/gearbox securing bolts. Leave one bolt in place (hand tight).



- -> Attach lifting device 2024 A to engine and to workshop crane V.A.G 1202 A.

Note:

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To balance the centre of gravity of the engine, position the hook attachments as shown in the illustration.

Important:

The hooks and locating pins of the lifting tackle must be secured with locking pins -arrows in illustration.

- Remove the last securing bolt.

Note:

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

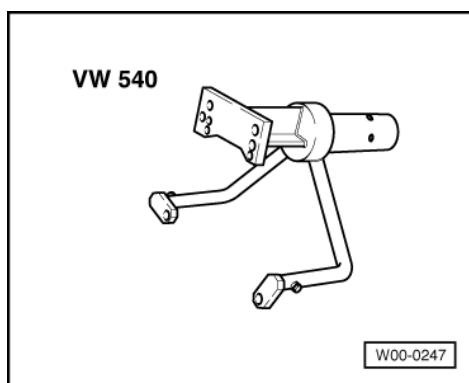
- Lift engine over studs of engine mounts.
- Tighten spindle of support bar 10-222 A.
- Guide engine out of engine compartment from the front.

Vehicles with automatic gearbox:

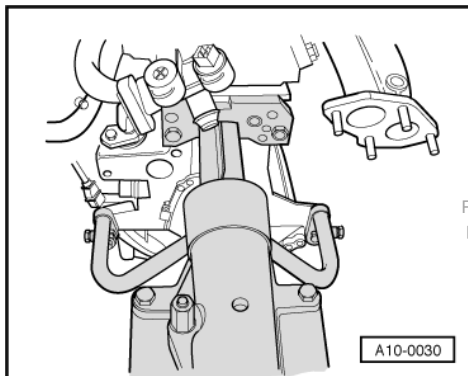
- Secure torque converter in gearbox to prevent it falling out.

1.3 - Attaching engine to engine stand

Special tools, testers and auxiliary equipment required



- ♦ Special tool VW 540



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-> When working on the engine, it should be secured to the engine stand using the engine bracket VW 540.

1.4 - Installing

Installation is carried out in the reverse order, when doing this note the following:

Note:

When performing repairs, replace seals, gaskets, self-locking nuts and stretch bolts which have a specified tightening angle.

- Check whether both the dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- Fit intermediate plate onto dowel sleeves.

Vehicles with manual gearbox

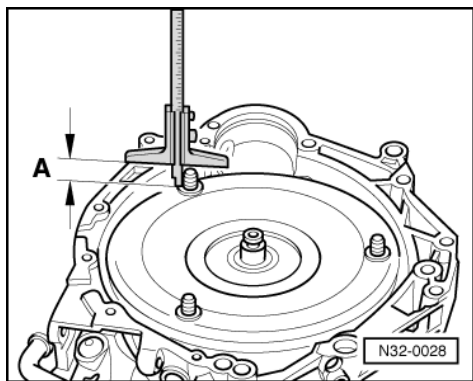
- Check clutch release bearing for wear, renew if necessary.
- Lightly grease splines on gearbox input shaft with G 000 100. Do not grease guide sleeve for release bearing.
- If necessary, check that clutch plate is properly centred.
- A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox. Install needle bearing, if necessary => Page 87 .

Vehicles with automatic gearbox:

- In vehicles with automatic gearbox, no needle bearing must be fitted in the crankshaft. Remove needle bearing if necessary => Page 87 .
- To secure torque converter on drive plate, only use correct bolts as specified in parts catalogue (same as original equipment).

=> Parts List

- Use special tool Matra V/175 to fasten nuts of torque converter.

Checking position of torque converter


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-> If the torque converter has been fitted correctly, the distance -A- between the gearbox housing flange and the contact surfaces at the base of the studs on the torque converter should be about 23 mm.

If the torque converter is not fully inserted, this distance is about 13 mm mm.

Important:

If the torque converter is not installed correctly, the torque converter drive plate or the ATF pump will be seriously damaged when the gearbox is joined to the engine.

- Check ATF level:

=> Automatic gearbox 01N; Repair group 37; Checking and changing ATF; Checking ATF level and topping up ATF Checking and changing ATF Checking ATF level and topping up ATF

All models:

- Installing engine mounts free of stress. Ensure that engine mounts are free of stress by shaking engine to align it before tightening engine mounts.
- Install ribbed belt =>Page 41 .
- Install lock carrier =>Page 24 .

- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.
- Top up cooling system => Page 167 .

Notes:

- ♦ Drained off coolant may only be used again if the original cylinder head and cylinder block are re installed.
- ♦ Coolant must not be used again if it is dirty.
- Stress-free alignment of exhaust system => Page 243 .
- Electrical connections and routing:

=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations

- Connect hoses and lines for exhaust gas recirculation => Diagram of connections, Page 249 .
- Connect hoses and lines for boost pressure control => Diagram of connections, Page 183 onwards.
- After connecting battery, enter anti theft code for radio.

=> Radio operating instructions

Important:
If a charger is used for boost starting there is a risk of damaging the vehicle control units.

- Close windows fully using electric window switches.
- Then actuate all electric window switches again for at least one second in the "close" direction to activate the automatic open/close function.
- Set clock to correct time.
- Check oil level before starting engine.
- To interrogate fault memory:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis; Interrogating and erasing fault memory Self diagnosis Interrogating and erasing fault memory

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=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Self-diagnosis; Interrogating and erasing fault memory Self-diagnosis Interrogating and erasing fault memory

Note:

Faults will have been recorded in the fault memory because the connectors have been unplugged. Therefore interrogate and erase fault memory after installing engine.

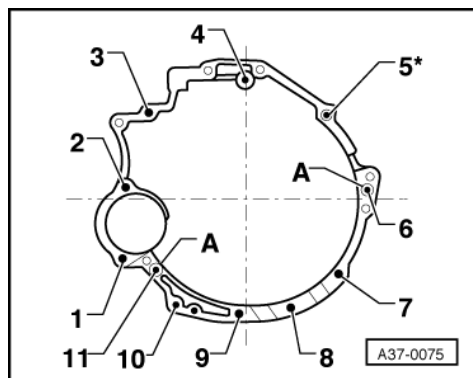
- Adjust headlights.

=> Electrical system; Repair group 94; Removing/ installing and servicing headlights; Adjusting headlights
Removing/ installing and servicing headlights Adjusting headlights

1.5 - Tightening torques

Notes:

- ♦ The tightening torques listed on this page apply only to lightly greased, oiled, phosphated, or black finished nuts and bolts.
- ♦ Additional lubricant such as engine or gearbox oil may be used, but do not use graphite lubricant.
- ♦ Do not use degreased parts.
- ♦ Tightening torque tolerance $\pm 15\%$.

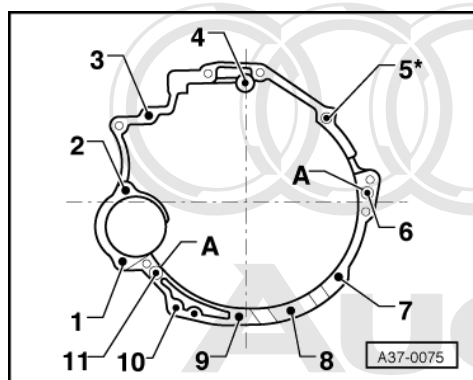


-> Engine/gearbox mountings (manual gearbox)

Item	Bolt	Nm
1, 3, 4	M12 x 67	65
2, 6	M12 x 90	65
5, 11	M12 x 110	65
7, 8 1), 9, 10	M10 x 45	45

1) Up to approx. 07.96: M8 bolt; tightening torque: 25 Nm

A: Centring sleeves



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-> Engine/gearbox mountings (automatic gearbox)

Item	Bolt	Nm
1, 8, 9, 10	M10 x 45	45
2, 3, 4, 11	M12 x 67	65
5	M12 x 110	65
6	M12 x 90	65
7	M10 x 60	45

A: Centring sleeves

Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65
Except for the following:		

Component	Nm
Engine mounting to subframe	25
Engine support to engine mount	25
Stop for torque reaction support to bracket for torque reaction support	25
Drive plate to torque converter M10 x1	85
A/C compressor to bracket	25
Power steering pump to bracket	25
Pulley to PAS vane pump	25
Viscous fan to bearing	45
Bracket for turbocharger to turbocharger	20
to cylinder block	20
Catalytic converter to turbocharger	25

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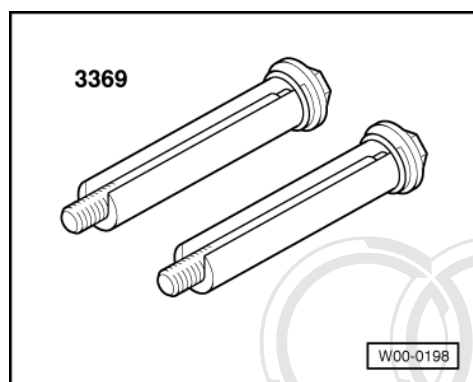
13 - Crankshaft group

1 - Dismantling and assembling engine

1.1 - Dismantling and assembling engine

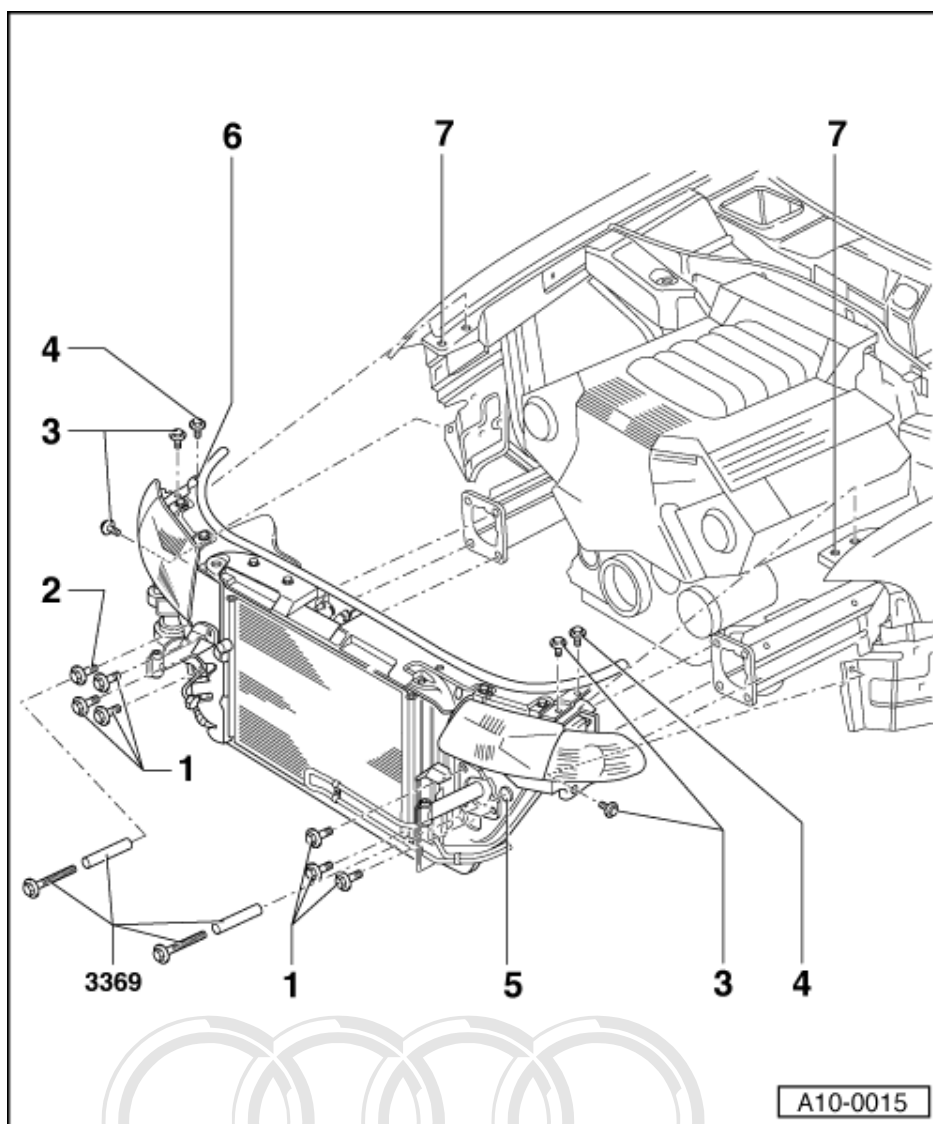
1.2 - Lock carrier: move into service position

Special tools, testers and auxiliary equipment required



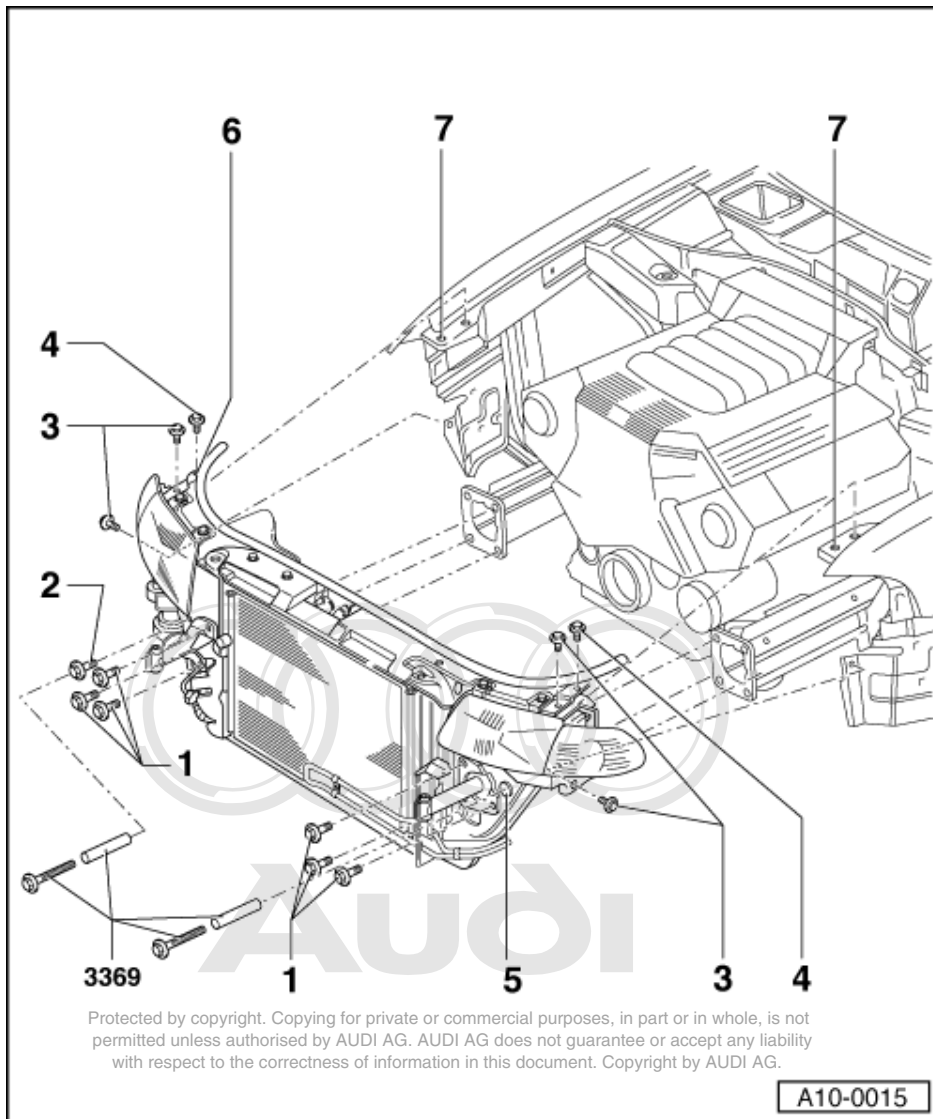
- ♦ Special tool 3369

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- 1 45 Nm
- 2 45 Nm
- 3 10 Nm
- 4 10 Nm
- 5 Bore
- ♦ For special tool 3369
- 6 Hole in lock carrier
- 7 Bore in wing panel

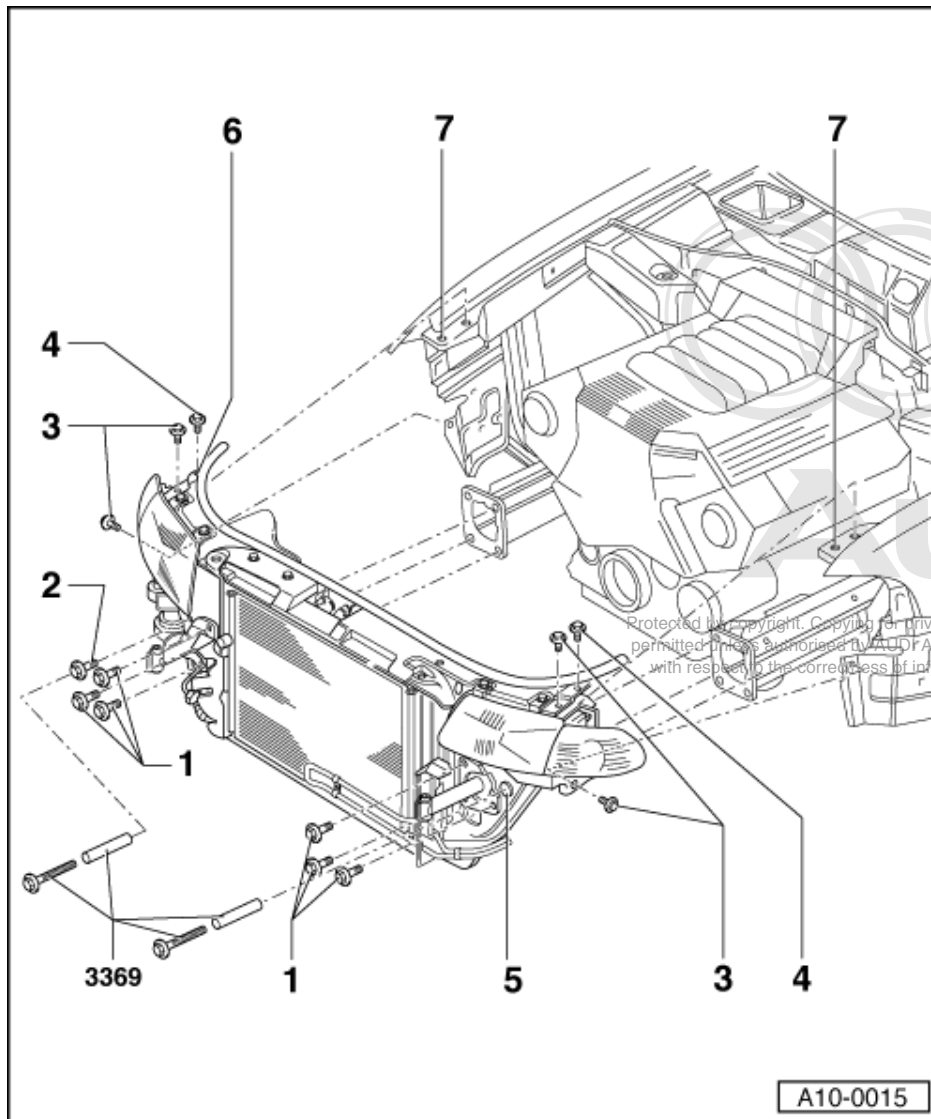
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- Remove front bumper:

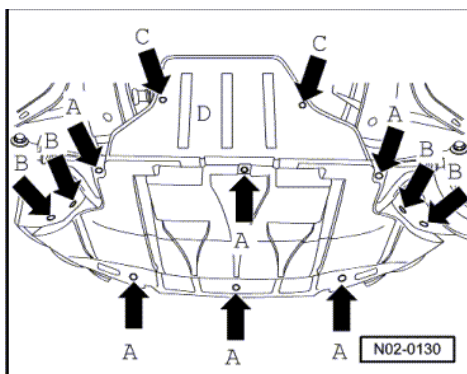
=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper Front bumper
Removing and installing front bumper

- Remove front noise insulation => Fig. 1
- Detach bottom air intake hose to charge air cooler => Fig. 2
- Unbolt air duct between lock carrier and air cleaner (air duct is bolted to lock carrier).
- Remove retaining clips (if fitted) for wiring loom on left at radiator shroud.
- Remove bolt -2- on the right and screw in special tool 3369.



- Screw special tool 3369 into hole -5- (left).
- Remove bolts -1- and -3-.
- Remove bolts -4- and pull the whole lock carrier out as far as it will go.
- Secure the lock carrier with suitable M6 bolts in hole -6- (lock carrier) and hole -7- (wing panel).
- When lock carrier has been installed, check that the wiring next to the radiator is correctly routed.
- Install front bumper.

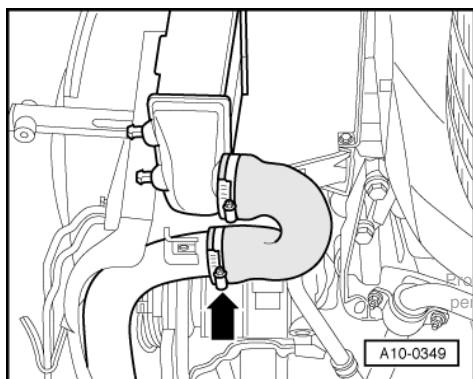
=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper Front bumper
Removing and installing front bumper





-> Fig.1 Remove front noise insulation

- Release quick-release fasteners -A- and -B- and take off front noise insulation.

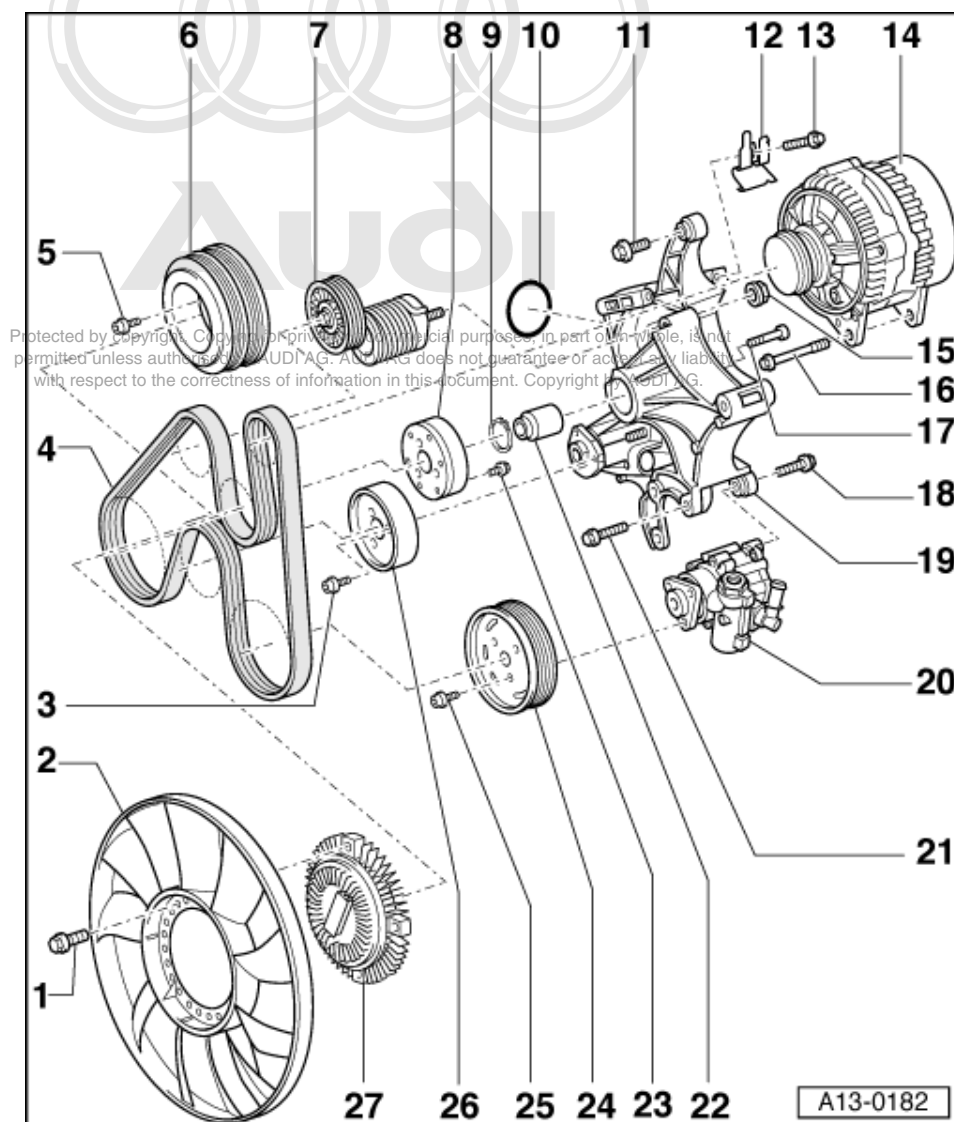


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-> Fig.2 Remove air intake hose

- Disconnect right air intake hose to turbocharger at bottom of lock carrier.

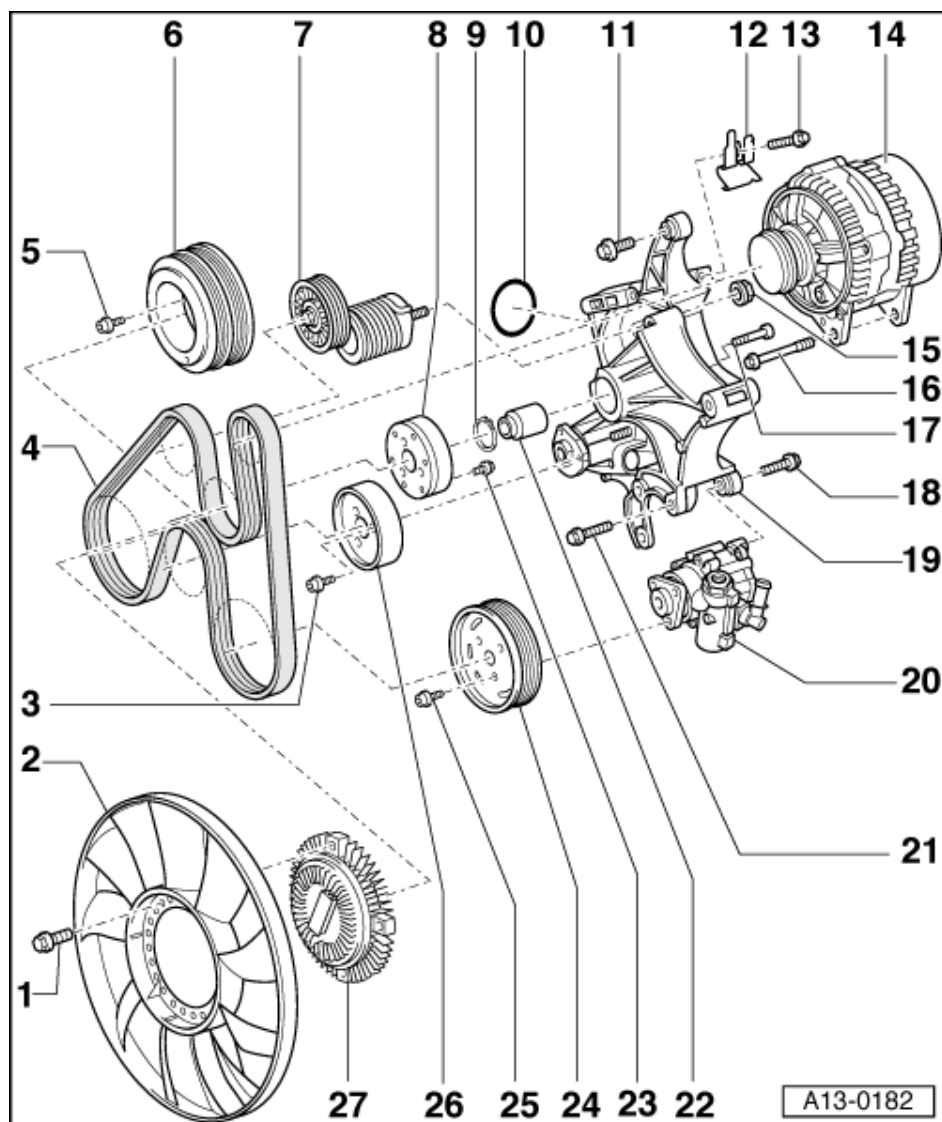
1.3 - Ribbed belt drive for vane pump, alternator, coolant pump and viscous fan



Note:

Mark the direction of rotation with chalk or felt pen before removing the ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage. Ensure that the belt is properly seated on the pulleys when installing.

- 1 10 Nm
- 2 Fan wheel
 - ♦ For viscous fan
 - ♦ Removing and installing
=> Page 35



3 25 Nm

4 Ribbed V-belt

- ♦ Removing and installing
=> Page 40
- ♦ Check for wear

5 Bolt

- ♦ Bolt with strength rating 8.8: tighten to 25 Nm.
- ♦ Bolt with strength rating 10.9: tighten to 35 Nm.

=> Parts List

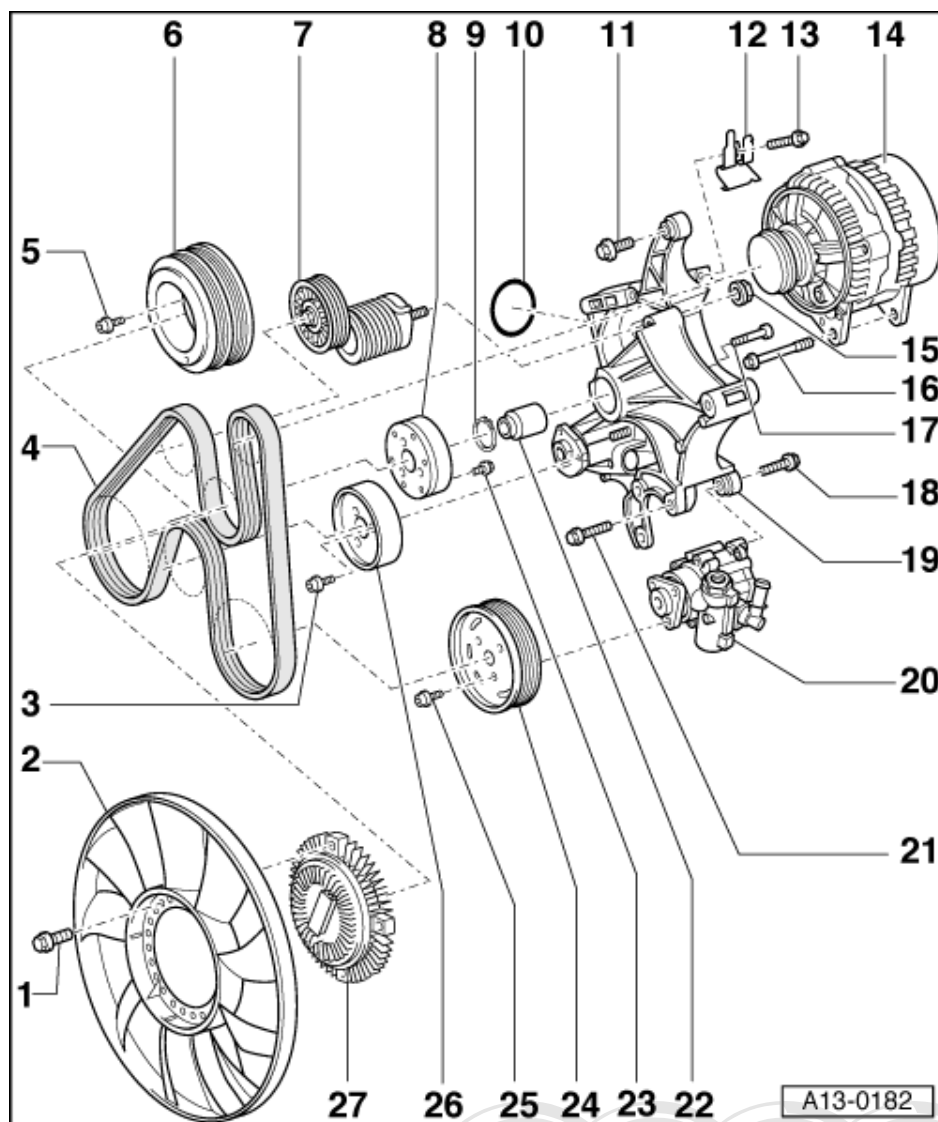
6 Vibration damper

- ♦ With pulley for ribbed V-belt
- ♦ Can only be installed in one position. Holes are offset

7 Tensioning element for ribbed V-belt

- ♦ Turn with open end spanner to slacken ribbed belt => Page 41 (lock carrier in service position)

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- ♦ Removing:
 - Remove ribbed belt
=> Page 40
 - Remove viscous fan
=> Page 35
 - Remove rear tensioner.
- ♦ Installing: only possible in one position

8 Pulley

- ♦ For viscous fan
- ♦ Removing and installing
=> Page 35

9 Circlip

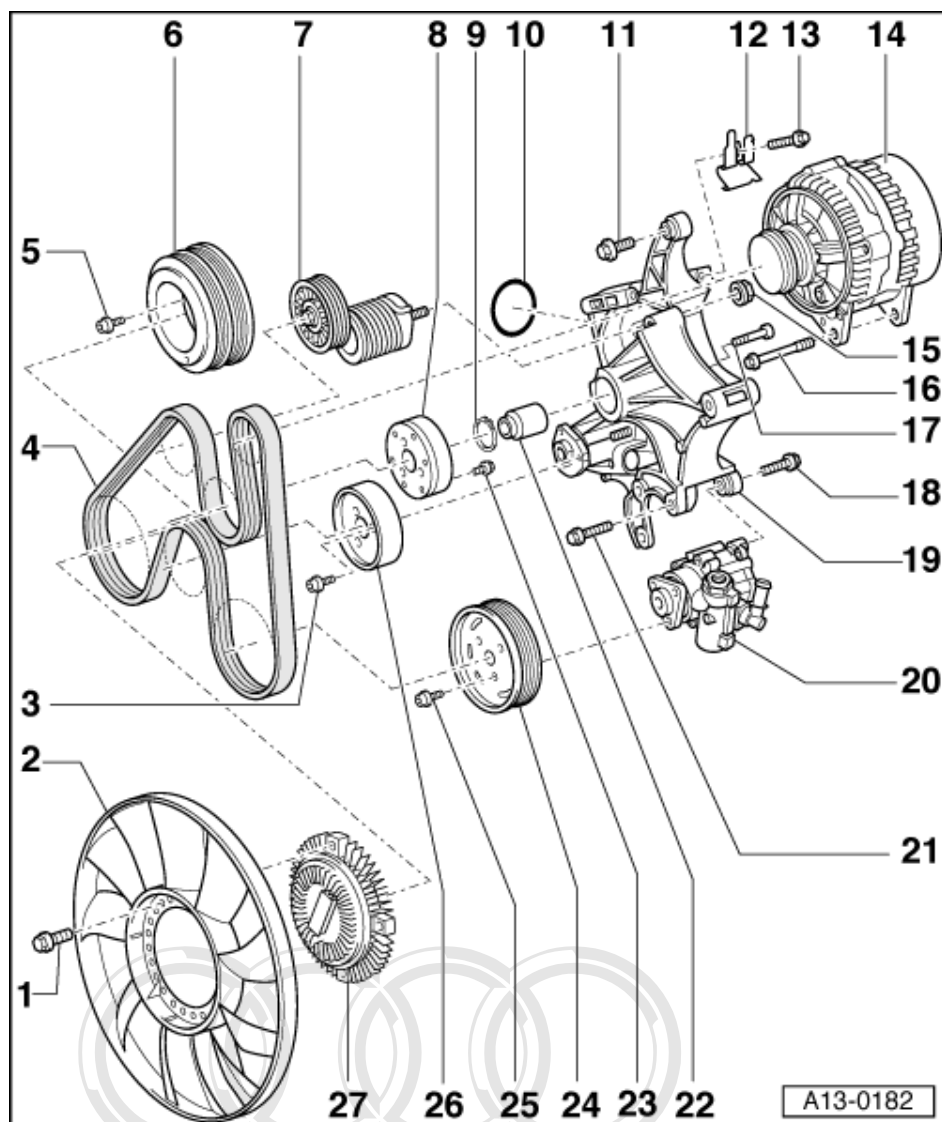
- ♦ For viscous fan bearing
- ♦ Removing and installing => Page 43

10 O-ring

- ♦ Replace

11 25 Nm

- ♦ Tightening sequence =>Fig. 1



12 Bracket

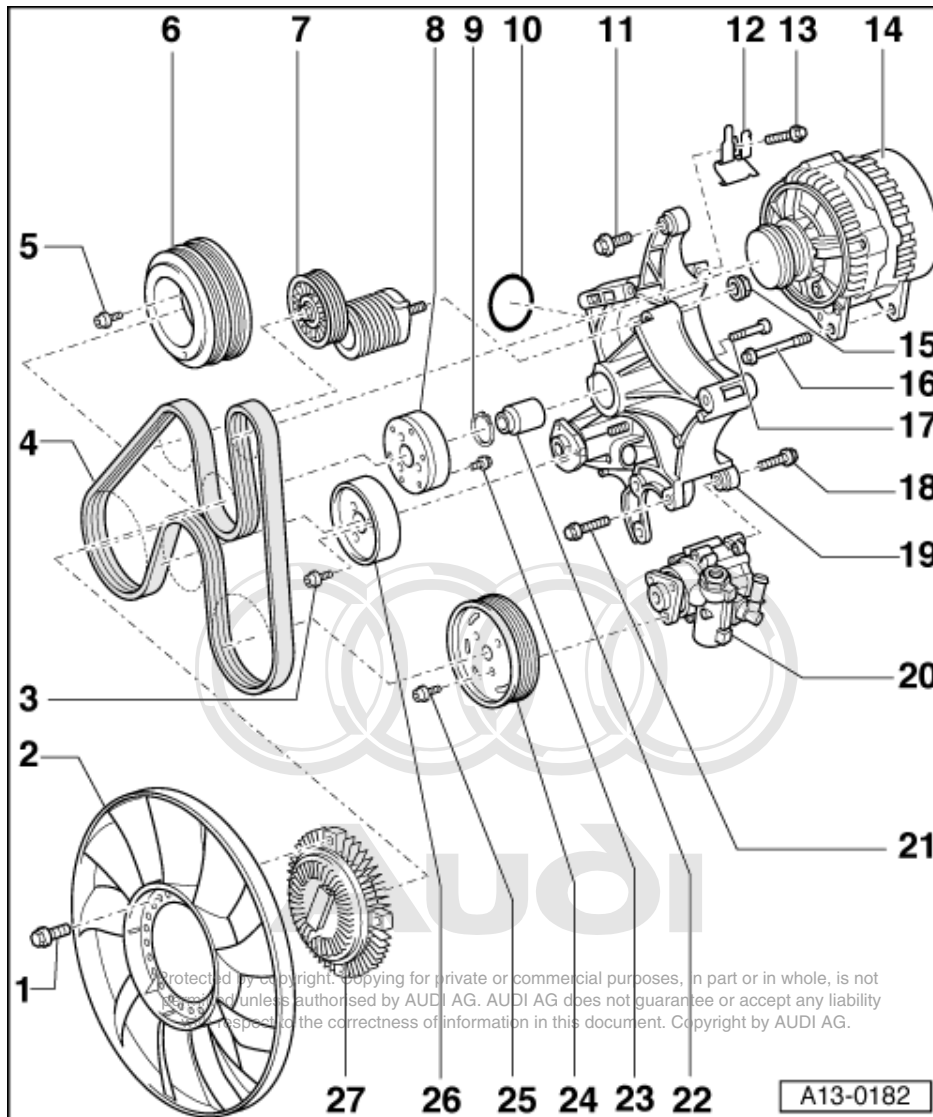
- ♦ for engine cover

13 25 Nm

- ♦ Tightening sequence => Fig. 1

14 Alternator

- ♦ Removing:
 - Detach battery earth strap.
 - Slacken ribbed belt and take belt off alternator => Page 40 (lock carrier in service position).
 - Remove viscous fan => Page 35
 - Disconnect electrical wiring from alternator.
 - Disconnect connector, move electrical wiring clear.
 - Remove bottom bolts from bracket.
 - Remove alternator
 - ♦ To facilitate the positioning of alternator on bracket, knock back bush for retaining bolt slightly



15 45 Nm

16 25 Nm

17 45 Nm

18 25 Nm

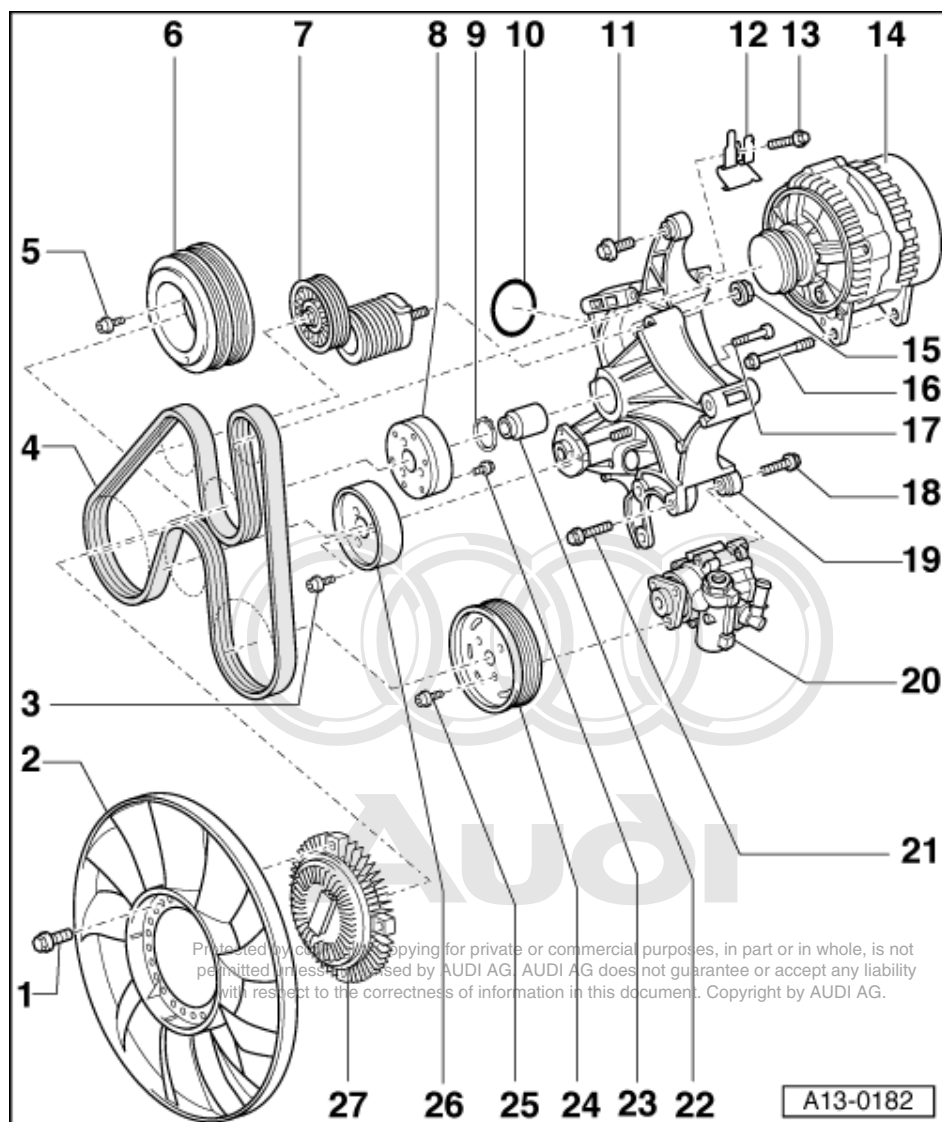
19 Bracket

- ♦ For alternator, vane pump and viscous fan
- ♦ Removing and installing
=> Page 44
- ♦ with coolant pump and thermostat

20 Vane pump

- ♦ For power steering
- ♦ Removing and installing:

=> Running gear FWD and 4WD; Repair group 48; Power steering/oil circuit 4-cyl. engine; Removing and installing vane pump Power steering/oil circuit 4-cyl. engine Removing and installing vane pump



21 25 Nm

22 Mounting

- ♦ For viscous fan
- ♦ Removing and installing
=> Page 43

23 10 Nm

24 Pulley

- ♦ For vane pump

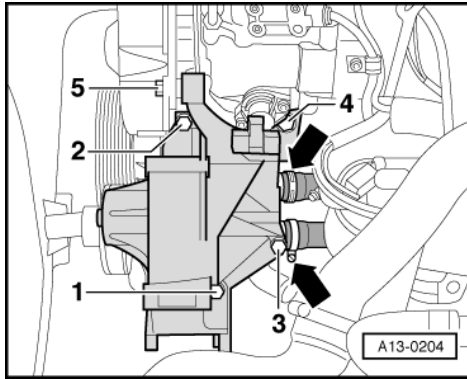
25 25 Nm

26 Pulley

- ♦ For coolant pump

27 Viscous coupling

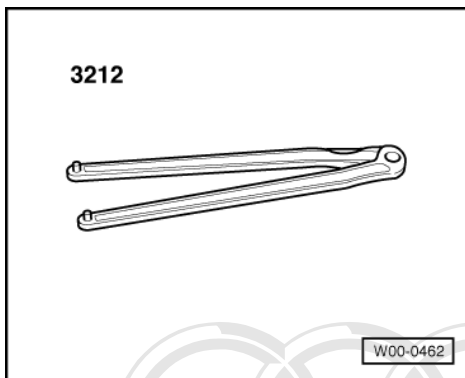
- ♦ Removing and installing
=> Page 35



-> Fig.1 Tightening sequence of bracket for alternator, vane pump and viscous fan

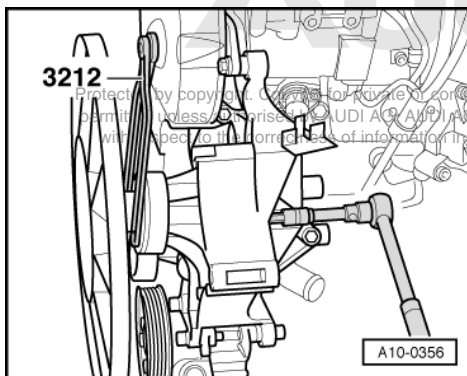
- Tighten bolts in number sequence -1 ... 5- 25 Nm.

1.4 - Removing and installing viscous fan



Special tools, testers and auxiliary equipment required

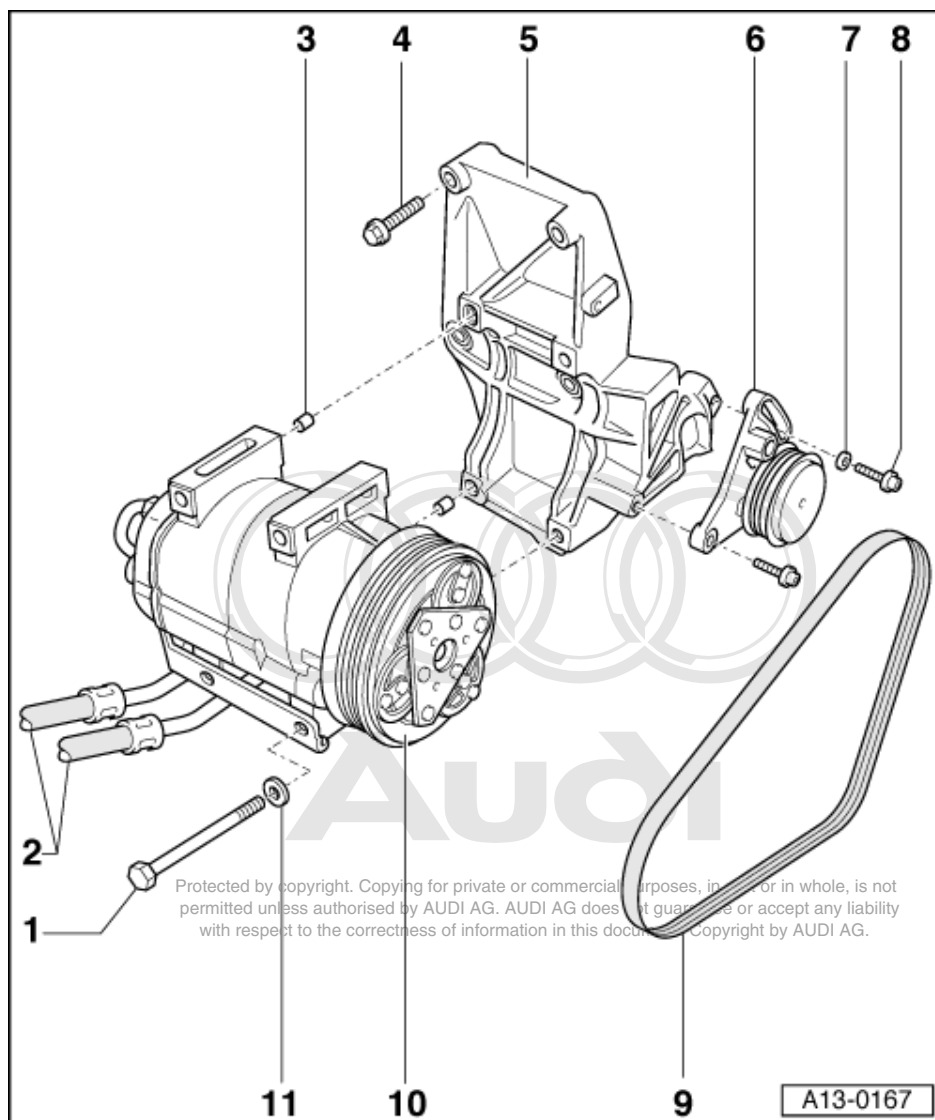
- ◆ Special tool 3212
- Lock carrier must be in service position => Page 24 .
- Ribbed belt must be slackened => Page 41 .



- -> Counter hold pulley for viscous fan with 2-hole pin wrench 3212 and unscrew from bracket with 8 mm Allen key.
- Remove viscous fan.
- When installing viscous fan, tighten to 45 Nm.



1.5 - Ribbed belt drive for air conditioner



Important:
The air conditioner refrigerant circuit must not be opened.

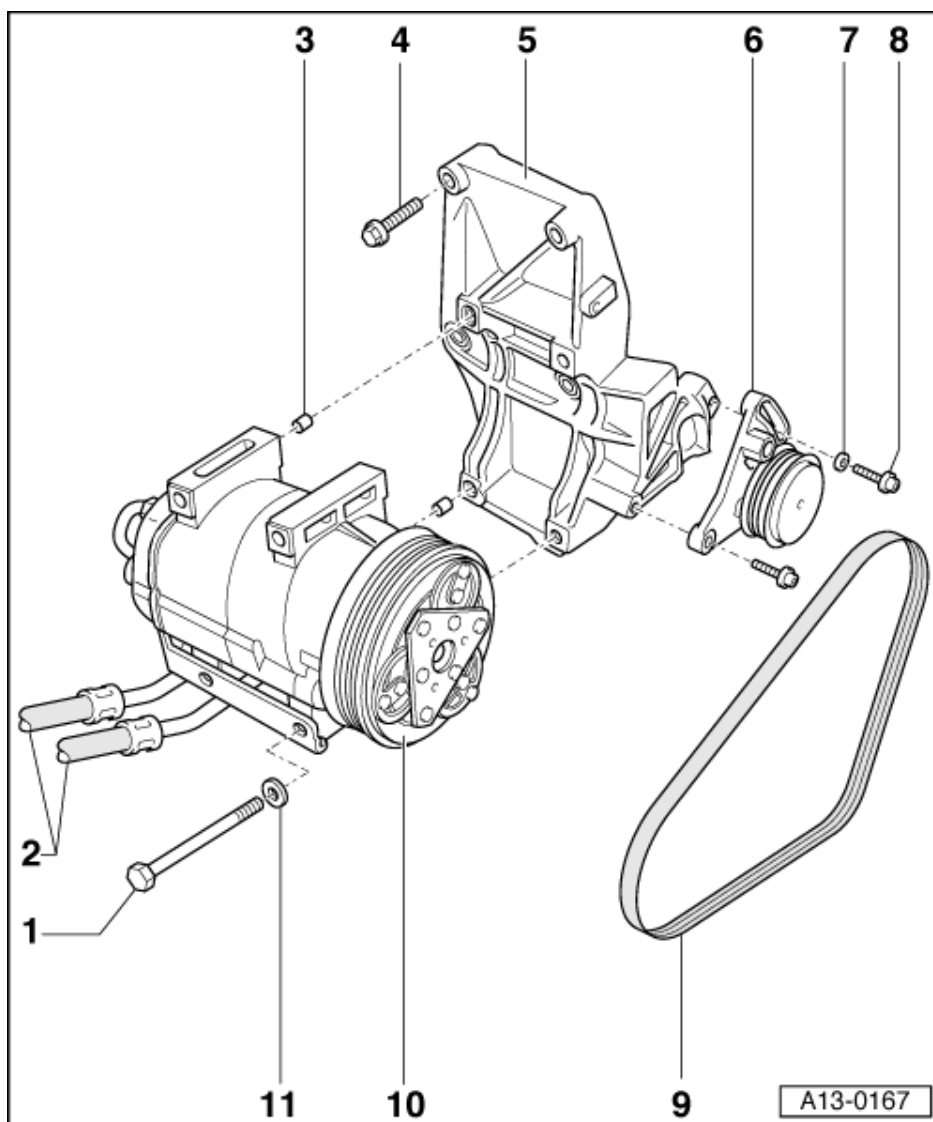
Note:

Mark the direction of rotation with chalk or felt pen before removing the ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage. Ensure that the belt is properly seated on the pulleys when installing.

1 25 Nm

- ♦ Use only correct bolt (same as original equipment); strength rating 10.9.

=> Parts List



2 Refrigerant pipes

- ◆ Do not unscrew or disconnect pipes.

3 Dowel sleeve

- ◆ Check sleeve is correctly seated in bracket.

4 Bolt

- ◆ Bolt with strength rating 8.8: tighten to 25 Nm.
- ◆ Bolt with strength rating 10.9: tighten to 30 Nm.

=> Parts List

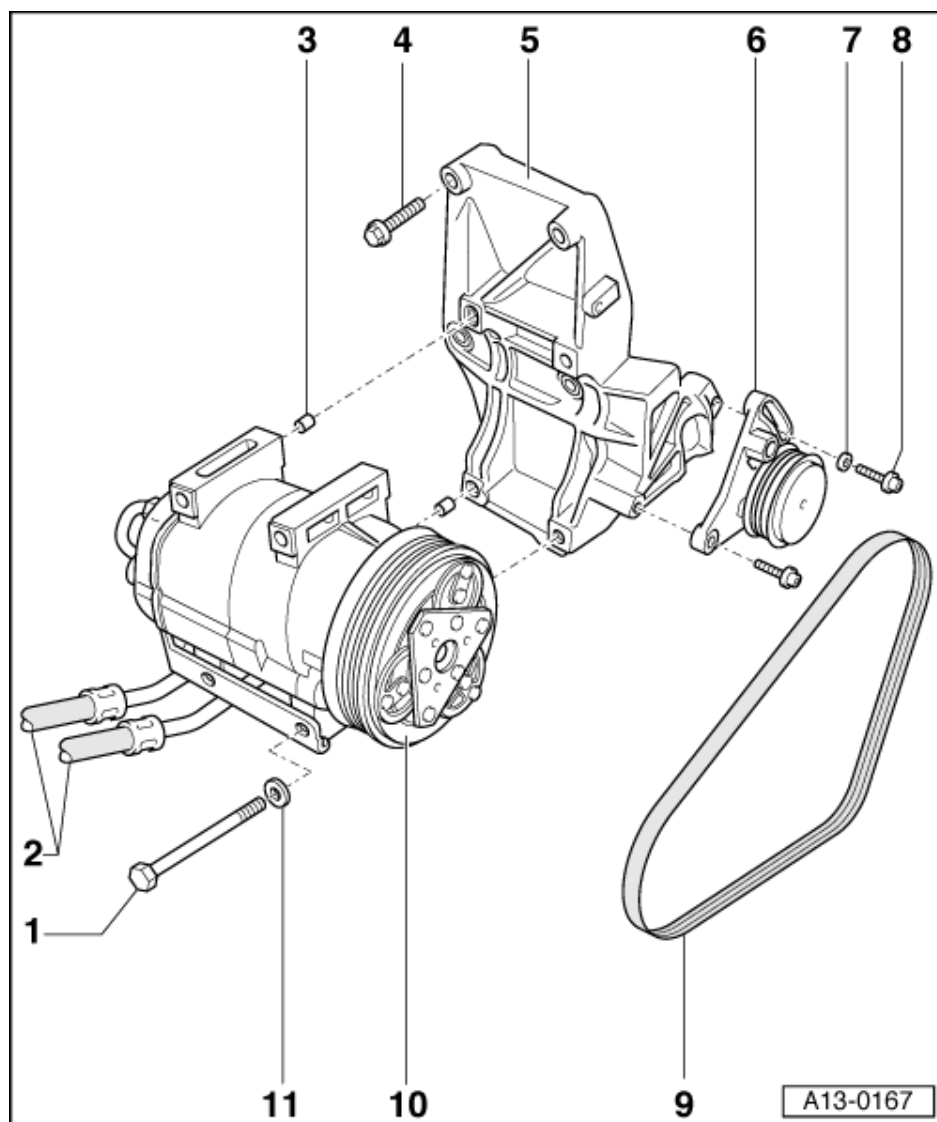
5 Bracket

- ◆ For A/C compressor

6 Tensioner

- ◆ For ribbed belt
- ◆ Removing and installing ribbed belt => Page 41

7 Washer



8 20 Nm

9 Ribbed V-belt

- ♦ Removing and installing
=> Page 40
- ♦ Check for wear

10 Air conditioner compressor

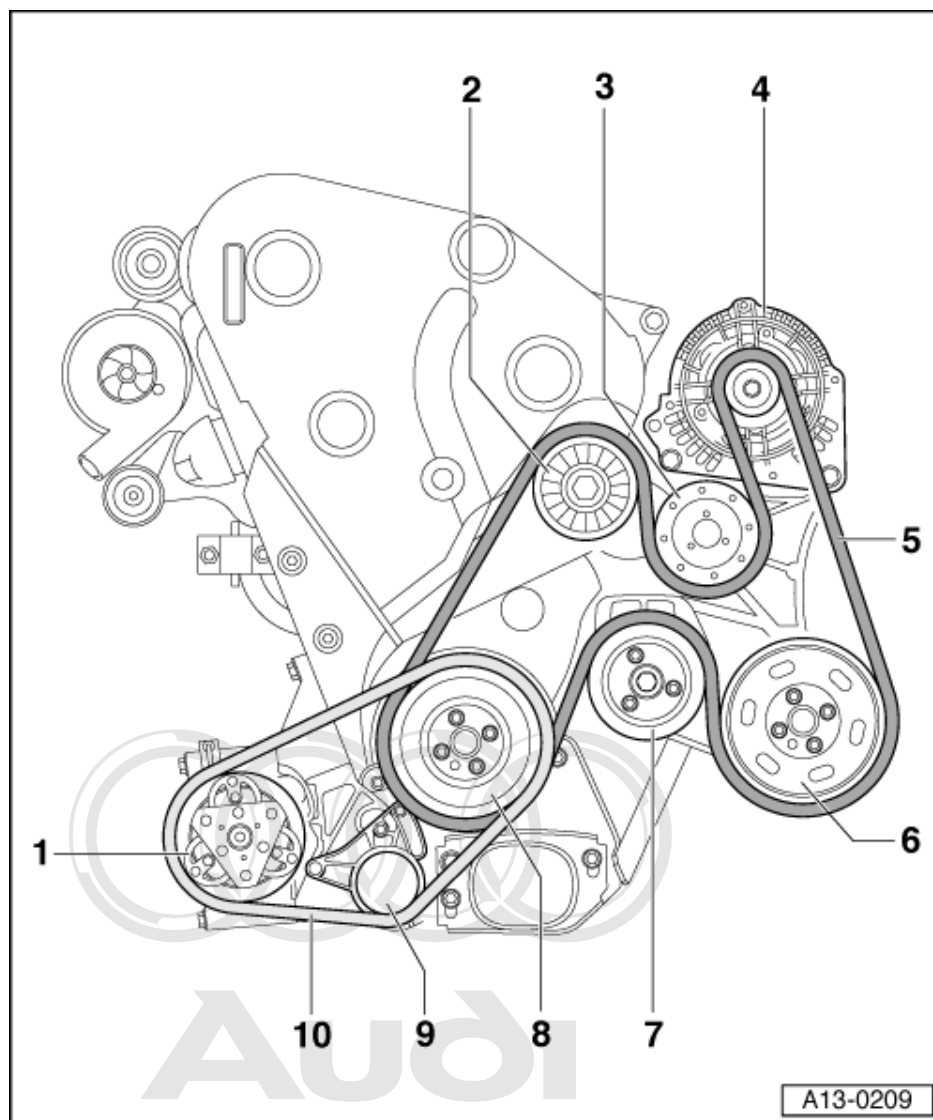
- ♦ After removing compressor from mountings, secure to chassis side member with wire or similar. Do not leave compressor suspended on refrigerant hoses.
- ♦ Do not unscrew or disconnect refrigerant hoses or pipes.

11 Washer

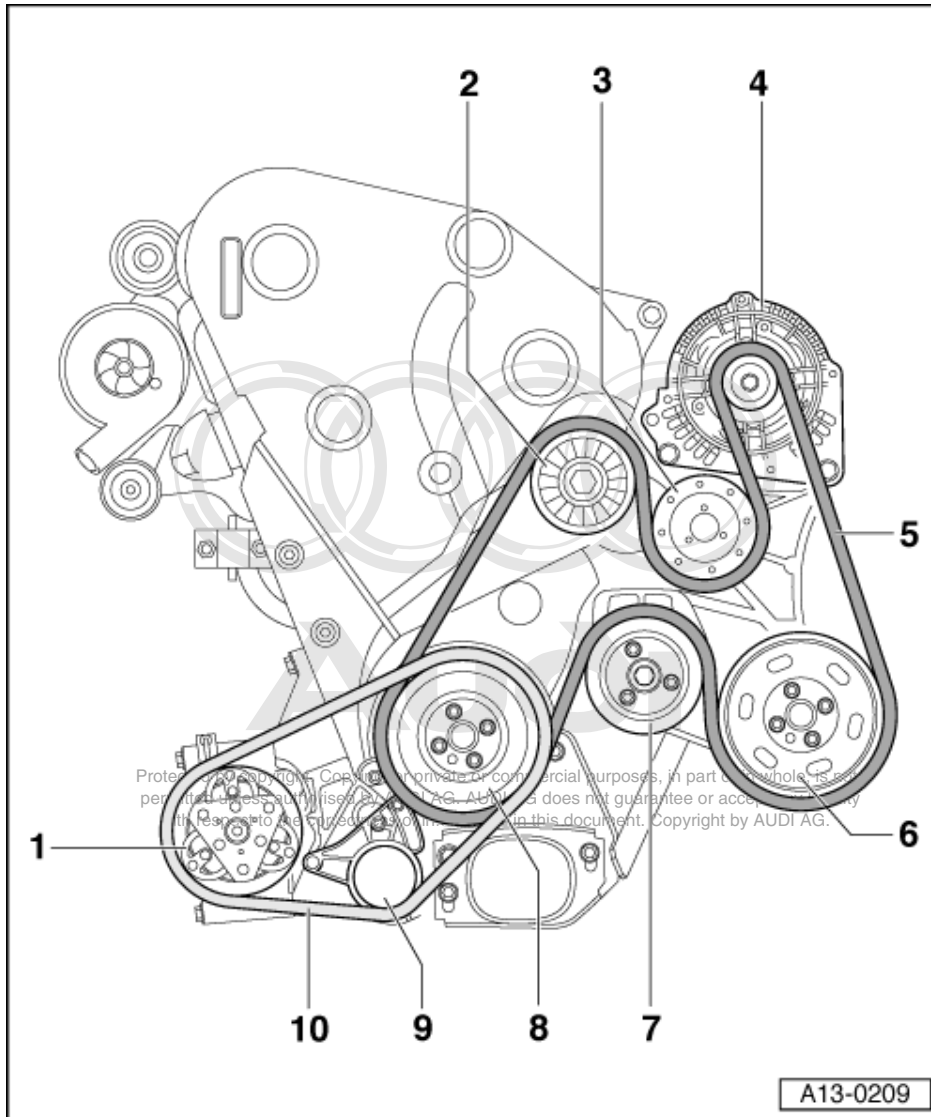


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1.6 - Routing of ribbed belt



- 1 **Air conditioner compressor**
2 **Tensioning element for ribbed V-belt**
3 **Pulley**
♦ For viscous fan
4 **Alternator**
5 **Ribbed V-belt**
♦ For alternator, vane pump, coolant pump and viscous fan
♦ Removing and installing
=> Page 40
6 **Vane pump**

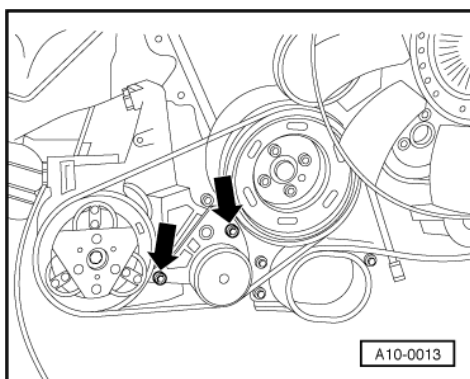


- 7 Coolant pump
- 8 Vibration damper
- 9 Tensioning element for ribbed V-belt
 - ♦ For A/C compressor
- 10 Ribbed V-belt
 - ♦ For A/C compressor
 - ♦ Removing and installing
 - => Page 40

1.7 - Removing and installing ribbed belt

- Lock carrier must be in service position => Page 24 .

Removing



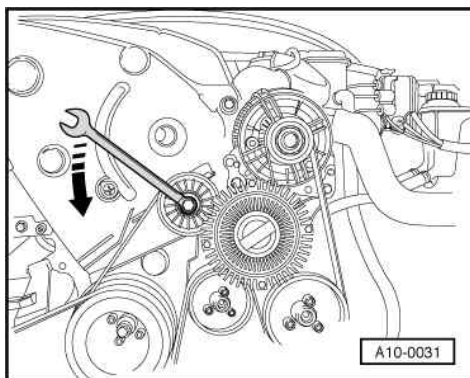
Note:

Mark direction of rotation of belt with chalk or felt pen before removing ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage.

Vehicles with air conditioner:

- -> Loosen bolts securing ribbed belt tensioner for A/C compressor -arrows-, slacken belt and remove.

All models:

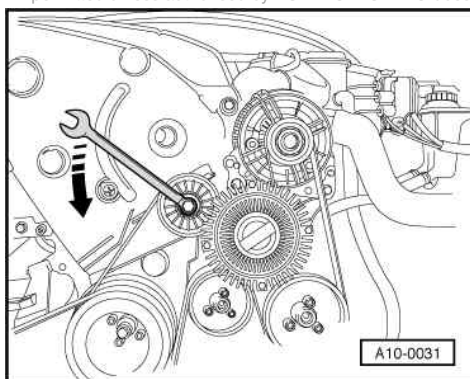


- -> To slacken ribbed belt, turn tensioning element in direction of arrow.
- Remove ribbed belt and release tensioning element.

Installing

- Fit ribbed belt over crankshaft pulley, coolant pump pulley, viscous fan pulley, vane pump pulley and tensioning element.

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- -> Turn ribbed belt tensioning element in direction of arrow.



- Fit ribbed belt over alternator pulley last. Release tensioning element.

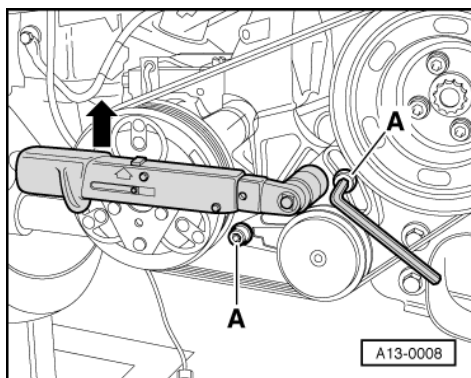
Note:

Ensure that ribbed belt is properly seated on the pulleys when installing.

- Check that ribbed belt is properly seated.
 - Ribbed belt routing => Page 39

Vehicles with air conditioner:

- Fit ribbed belt for A/C compressor.
 - Ribbed belt routing => Page 39



- -> Apply torque wrench as shown to hexagon on tensioner and tension with a torque of 25 Nm.
- At the same time, tighten bolts -A- to 20 Nm.

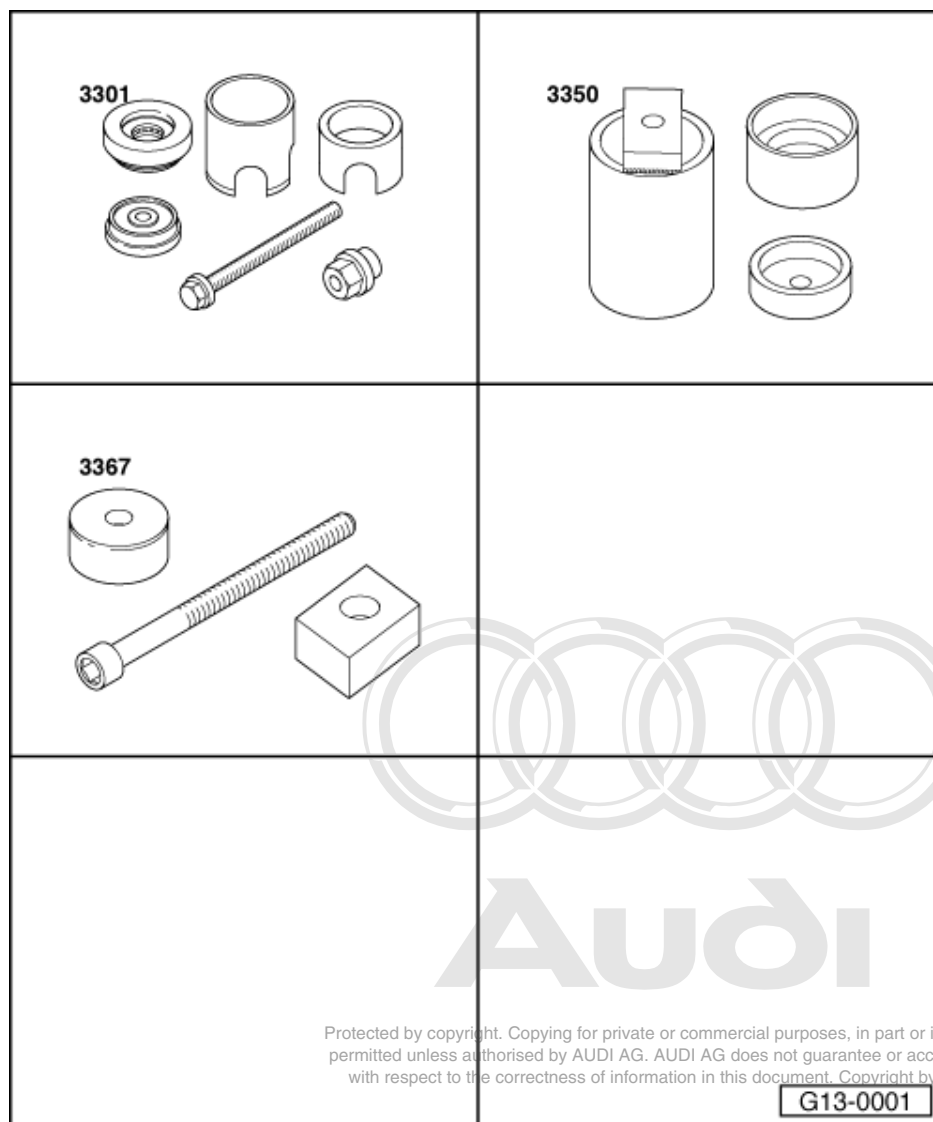
All models:

- Start engine and check belt running.



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1.8 - Removing and installing bearing for viscous fan



Special tools, testers and auxiliary items required

- ◆ Special tool 3301
- ◆ Special tool 3350
- ◆ Special tool 3367
- Lock carrier must be in service position => Page 24 .

Removing

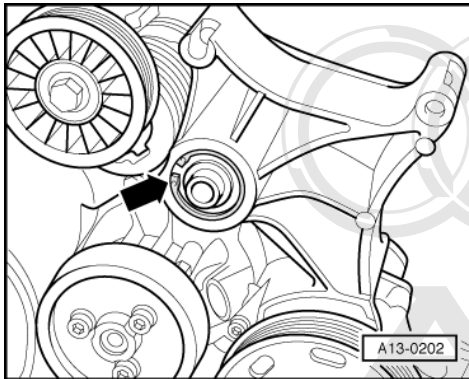
- Observe or obtain radio code on vehicles with coded radio.
- Disconnect earthing strap at battery with ignition switched off.
- Removing toothed belt => Page 41

Note:

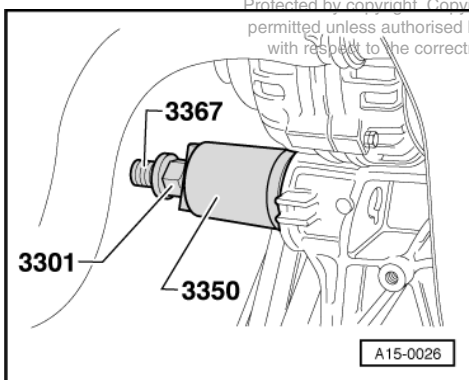
Ribbed belt for air conditioner does not have to be removed.

- Remove viscous fan (with belt pulley) => Page 35 .

- Remove alternator => Page 32 .



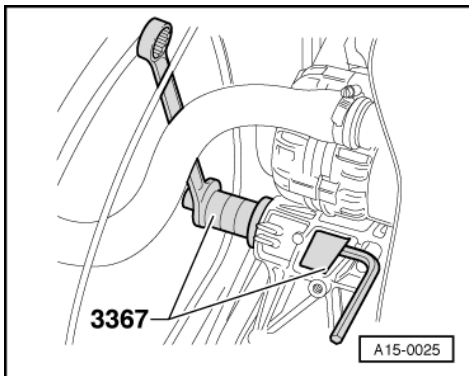
- -> Remove the bush circlip -arrow-.



- -> Pull bearing out of bracket using nut from assembly tool 3301, bolt from press tool for viscous fan 3367 and tube 3350.

Installing

Installation is carried out in the reverse order, when doing this note the following:



- -> Press in bearing with press tool for viscous fan 3367 and nut from assembly tool 3301.
- Fit circlip in bracket for viscous fan using angle circlip pliers.
- Install viscous fan=> Page 35 .
- Install ribbed belt =>Page 41 .

1.9 - Removing and installing bracket for alternator, vane pump and viscous fan

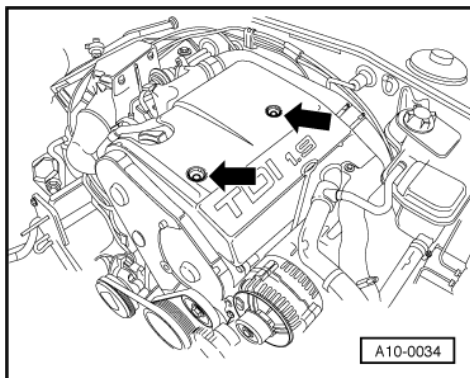
- Lock carrier must be in service position => Page 24 .

Removing

- Observe or obtain radio code on vehicles with coded radio.
- Disconnect earthing strap at battery with ignition switched off.
- Removing toothed belt => Page 41

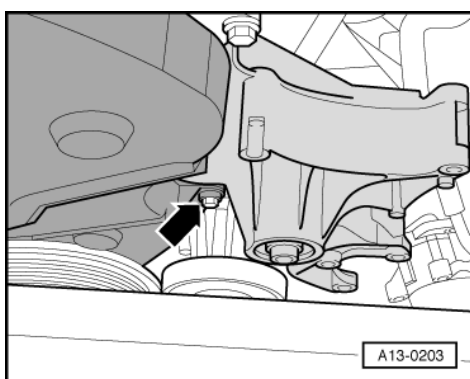
Note:

Ribbed belt for air conditioner does not have to be removed.

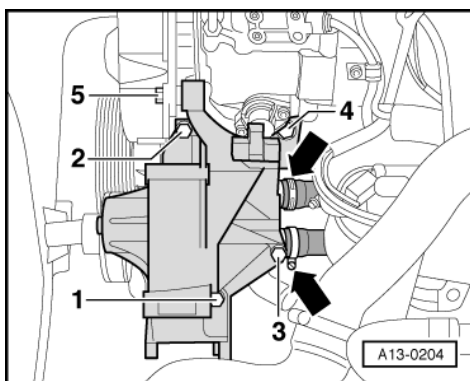


- Drain coolant => Page 165 .
- -> Remove engine cover panel -arrows-.
- Remove viscous fan (with belt pulley) => Page 35 .
- Remove alternator => Page 32 .
- Install ribbed belt tensioner => Page 30 .
- Unbolt pulley from vane pump for power steering.

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- Unbolt vane pump from bracket for alternator, vane pump and viscous fan, lift clear to one side and tie in place. Do not open hydraulic connections.
- -> Remove bolt -arrows- for toothed belt guard from below.





- -> Unscrew bolts -1 ... 5-.
- Pull off the 2 hoses -arrows- at rear from bracket.
- Remove bracket.

Installing

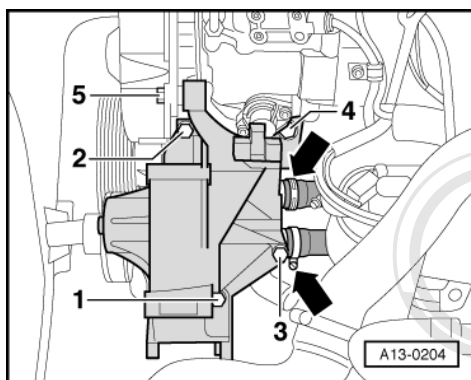
Installation is carried out in the reverse order, when doing this note the following:

- Clean and smooth down sealing surface for O- ring as required.

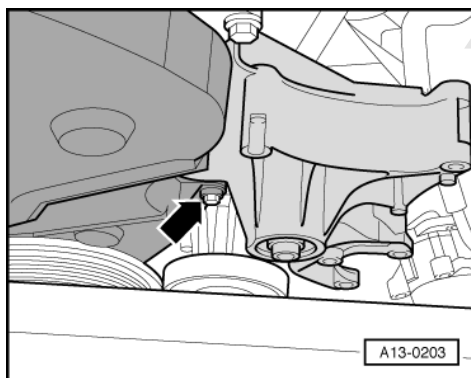
Note:

Renew O-ring.

- Ensure that guide sleeve is inserted at rear of bracket.
- Drive bush for upper securing bolt back slightly to facilitate tension free positioning of bracket on injection pump bracket.



- -> Tighten bolts in number sequence -1 ... 5-.
- Install coolant hoses -arrows-.



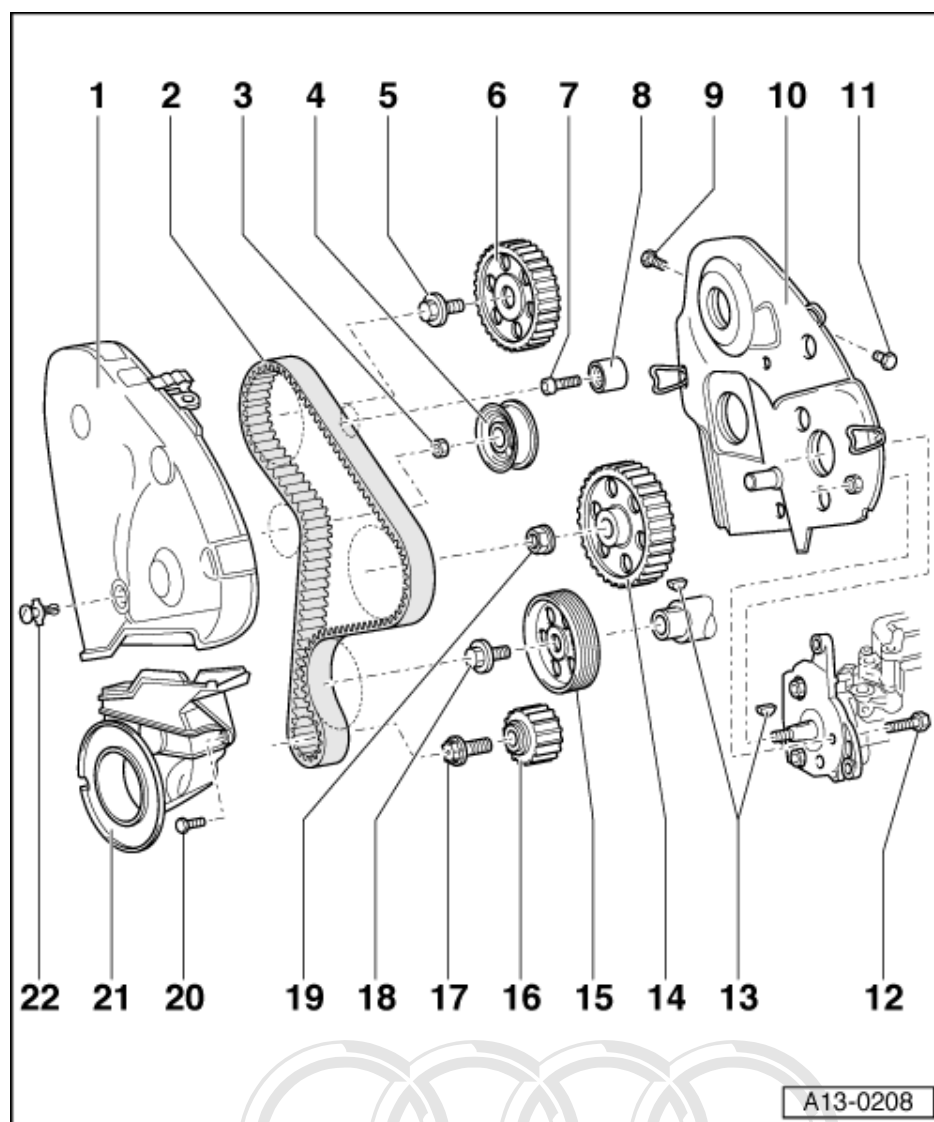
- -> Tighten bolt for toothed belt guard.
- Install viscous fan=> Page 35 .
- Install ribbed belt =>Page 41 .

Tightening torques

Component	Nm
Bracket for alternator, vane pump and viscous fan to cylinder block	25
to injection pump bracket	25
Alternator to bracket for alternator, vane pump and viscous fan	25
Tensioner for ribbed belt to bracket for alternator, vane pump and viscous fan	45
Bottom section of toothed belt guard to bracket	10

Component	Nm
Belt pulley to vane pump	25
Vane pump to bracket for alternator, vane pump and viscous fan	25

1.10 - Toothed belt drive



Note:

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

1 Toothed belt guard - top

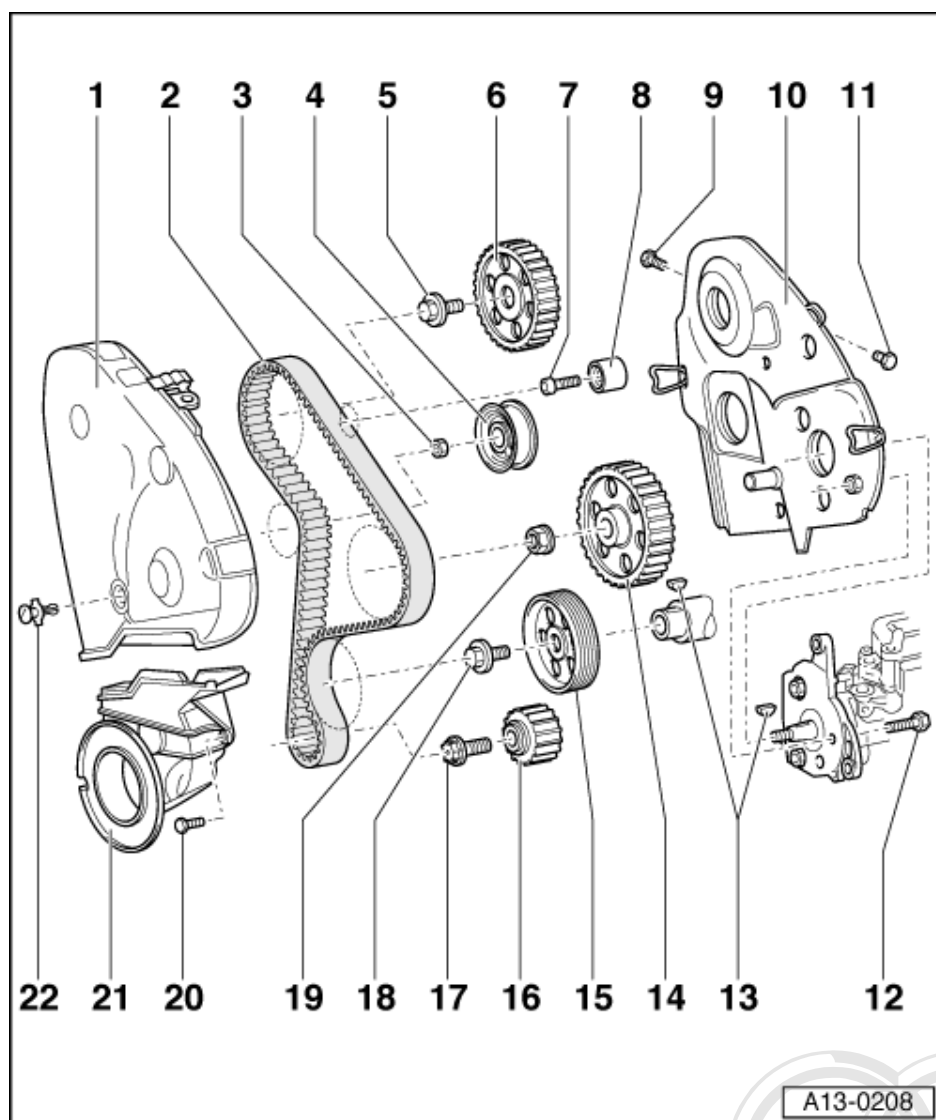
- ♦ Remove, to remove tensioner for ribbed belt -Item **30**
- ♦ When installing, engage carefully in bottom toothed belt guard.

2 Toothed belt

- ♦ Mark direction of rotation with chalk or felt pen before removing
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- ♦ Check for wear



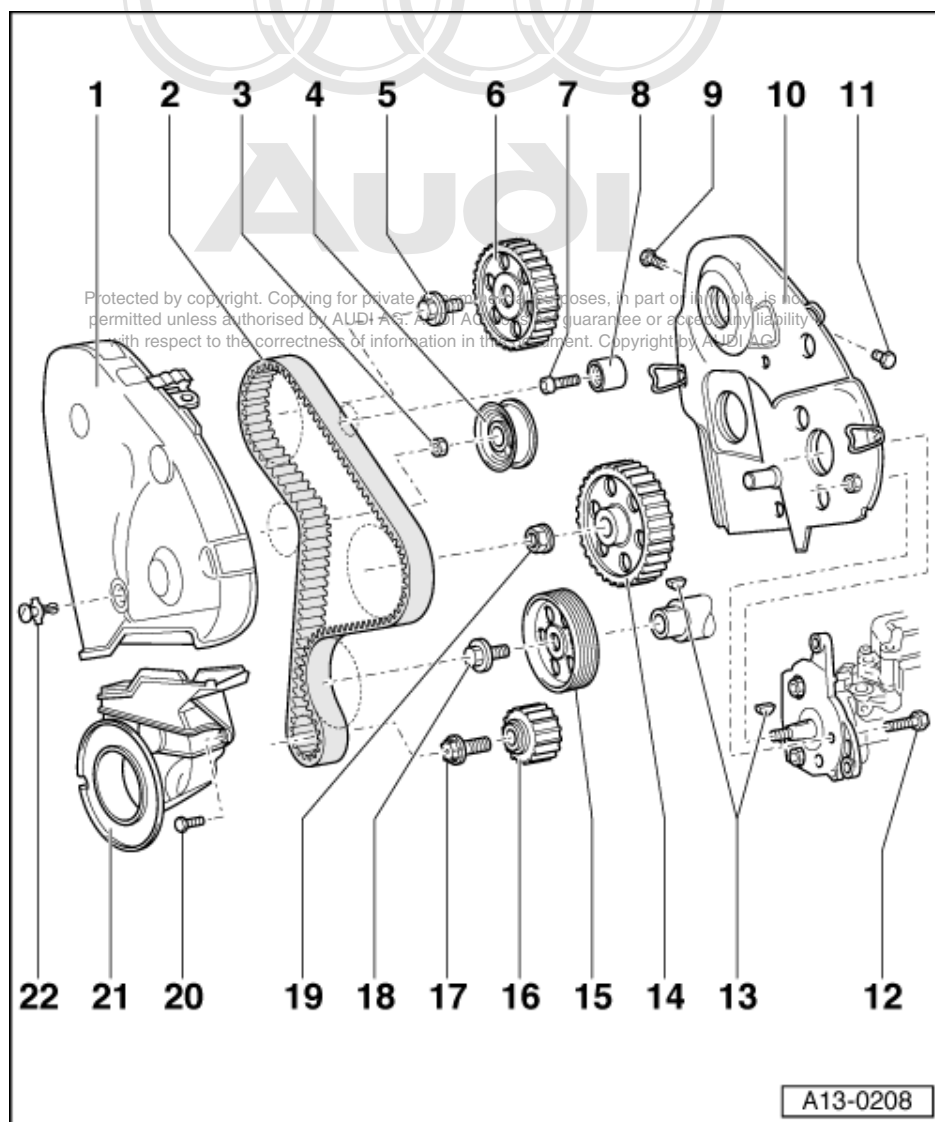
- ♦ Removing with engine codes 1Z, AFF, AFN, AHU => Page 55
- ♦ Installing (adjust valve timings) with engine codes 1Z, AFF, AFN, AHU => Page 58
- ♦ Removing with engine code AHH => Page 61
- ♦ Installing (adjust valve timing) with engine code AHH => Page 65

3 20 Nm

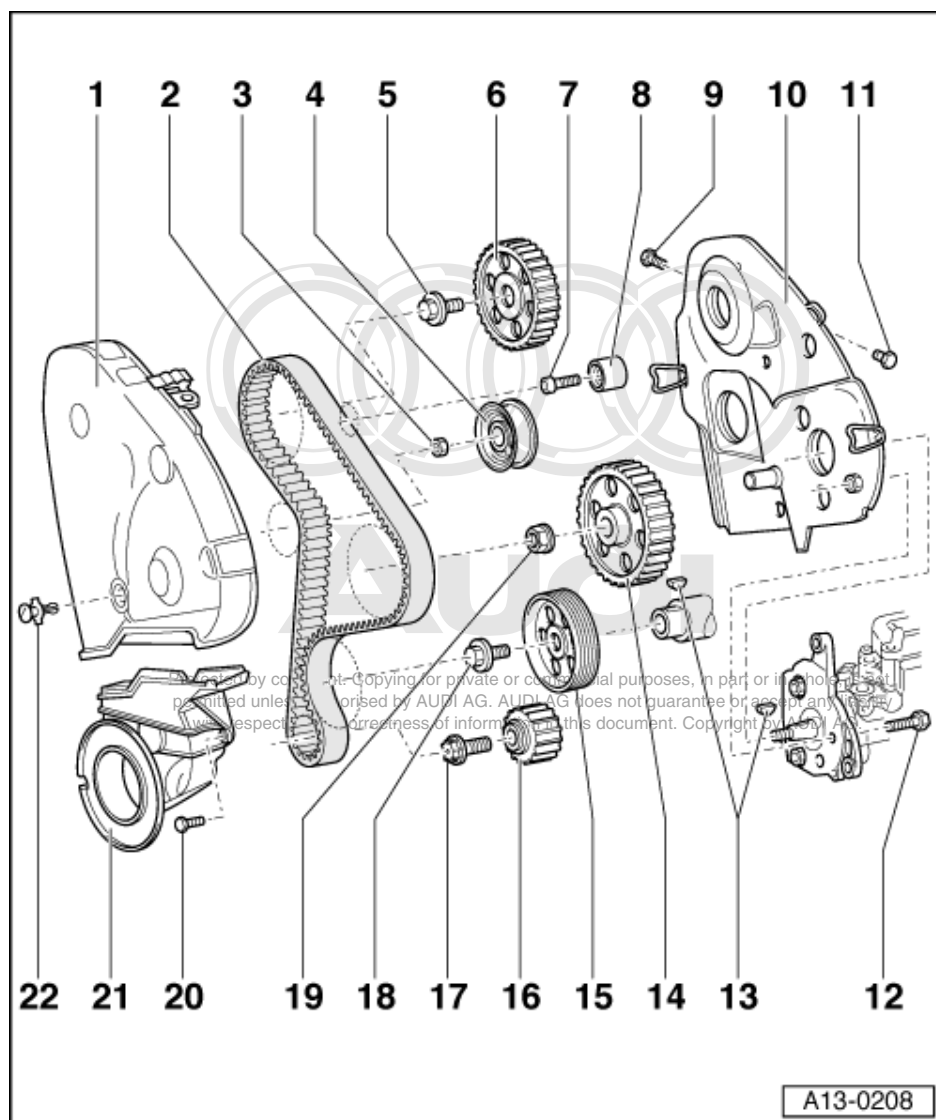
4 Tensioner

- ♦ Checking semi automatic toothed belt tensioner => Page 67
- ♦ Installation position => Fig. 1 .

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- 5 45 Nm
 - ♦ Counter hold with 3036 to loosen and tighten
- 6 **Camshaft sprocket**
 - ♦ Release from camshaft taper by tapping with hammer and drift through hole of toothed belt guard
- 7 25 Nm
- 8 Idler wheel
- 9 10 Nm
- 10 **Toothed belt guard - rear**
- 11 10 Nm
- 12 25 Nm



13 Woodruff key

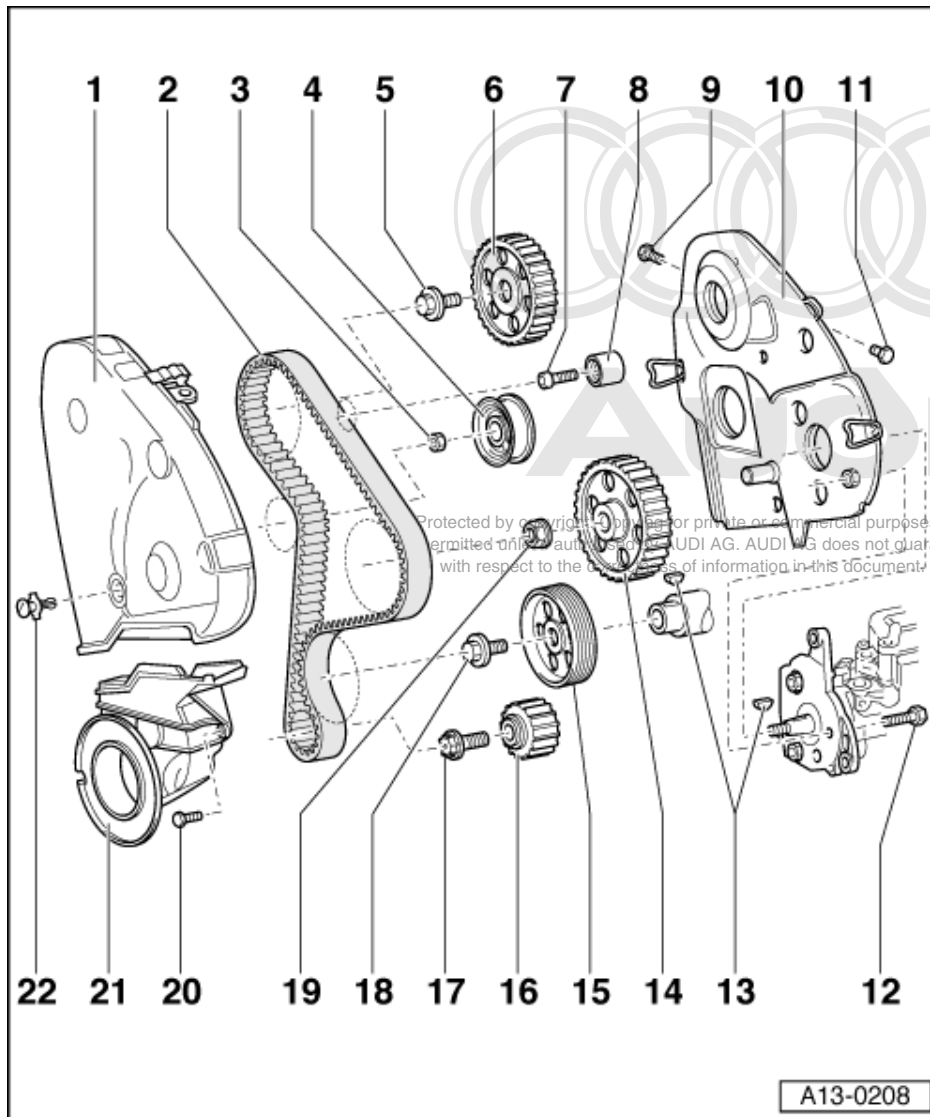
- ◆ Ensure tight fit
- ◆ On two piece injection pump sprocket/injection pump shaft without Woodruff key

14 Injection pump sprocket

- ◆ Removing and installing one piece injection pump sprocket
=> Fig. 3
- ◆ Note Woodruff key on one piece injection pump sprocket
- ◆ Central nut must not be opened on two part injection pump sprocket => Fig. 4

15 Intermediate shaft sprocket

- ◆ Installation position => Fig. 2 .
- ◆ Note Woodruff key

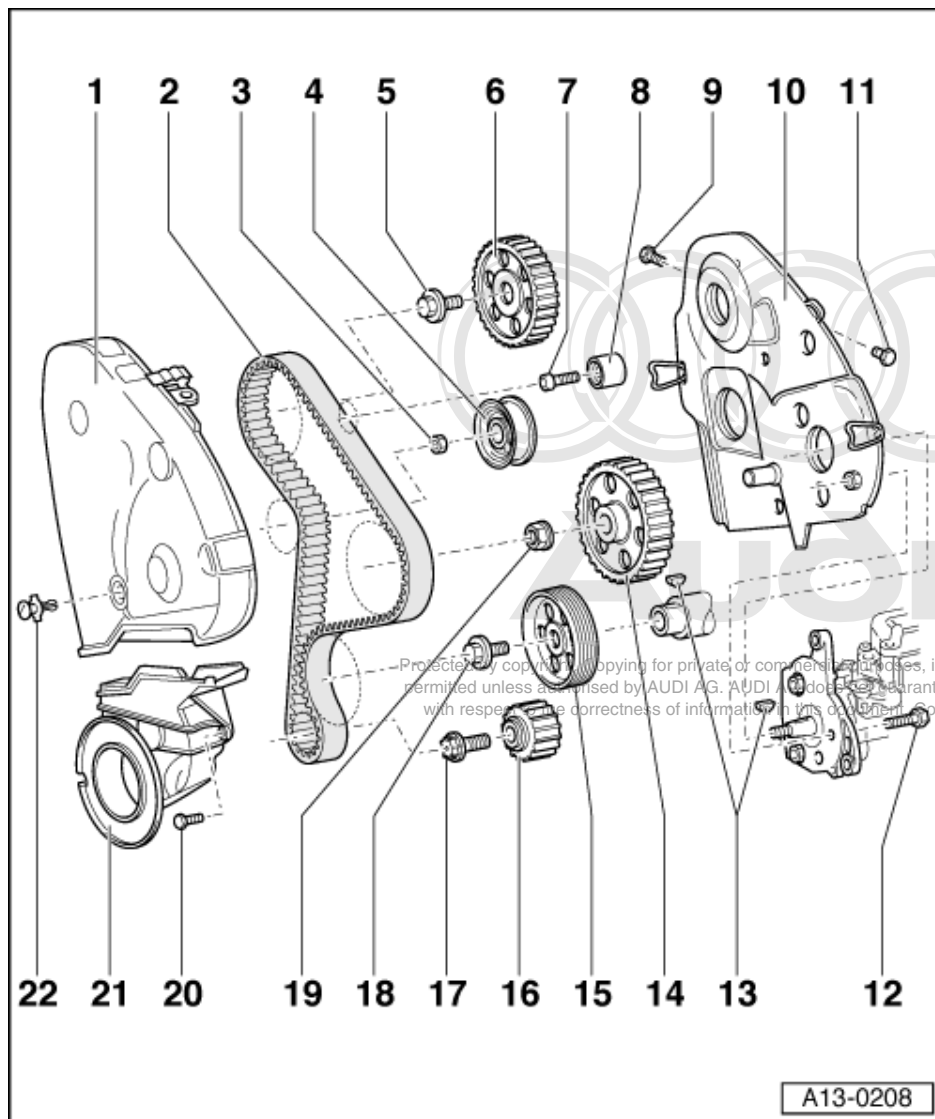


16 Crankshaft sprocket

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

17 90 Nm + 1/4 turn (90°) further

- ◆ Replace
- ◆ Do not use oil
- ◆ Use special tool 3099 or 3415 to loosen and tighten
- ◆ Bolting on counter tool 3099 => Page 77
- ◆ Remove bracket for torque reaction support -Item 144 before bolting on counter tool.



18 45 Nm

- ♦ Counter hold with 3036 to loosen and tighten

19 45 Nm

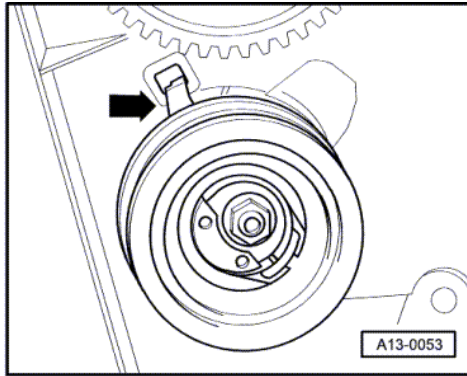
- ♦ Must not be opened on two piece injection pump sprocket => Fig. 4

20 10 Nm

21 Toothed belt guard - bottom

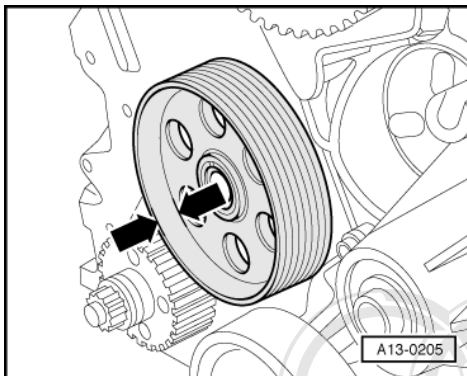
- ♦ To remove, unbolt vibration damper

22 Expanding clip



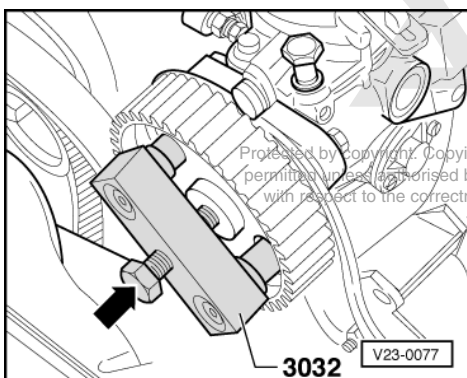
-> Fig.1 Installation position of semi-automatic tensioner

Retaining lug -arrow- must engage in slot on rear toothed belt guard.



-> Fig.2 Installation position of intermediate shaft sprocket

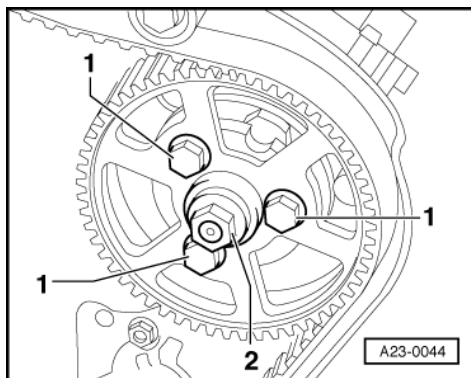
- ◆ Wide web -arrows- of intermediate shaft sprocket points towards front.
- ◆ The inscription on wheel points towards rear.



-> Fig.3 Remove one piece injection pump sprocket

- Toothed belt removed => Page 55
- Remove nut for injection pump sprocket.
- Loosen arms of puller and place puller 3032 in position.
- Align arms with holes in injection pump sprocket and tighten.
- Use the puller to tension the injection pump sprocket.

- Release the injection pump sprocket from the taper of the injection pump by gently tapping on the puller stem-arrow- (whilst doing so, hold the sprocket firmly to prevent it from falling out).



-> Fig.4 Removing and installing two piece injection pump sprocket

Note:

Do not loosen central nut -2- of injection pump sprocket. Otherwise the injection pump basic setting is maladjusted and can no longer be corrected using workshop tools.

- Replace injection pump sprocket securing bolts -1-.

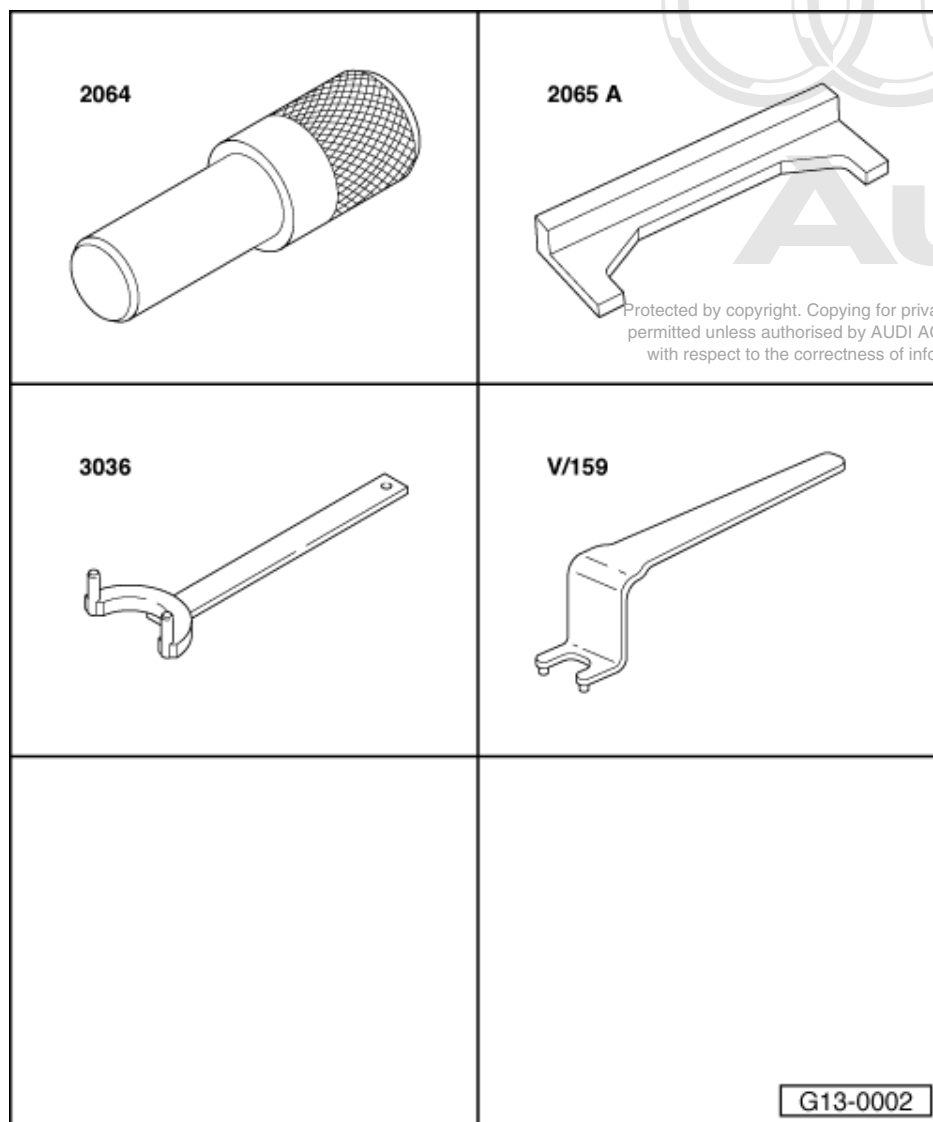
Note:

The securing bolts are stretch bolts and cannot be re-used. Once tightened to correct torque (20 Nm + 90°), they must be replaced after loosening.



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1.11 - Removing and installing toothed belt, engine codes 1Z, AFF, AFN, AHU

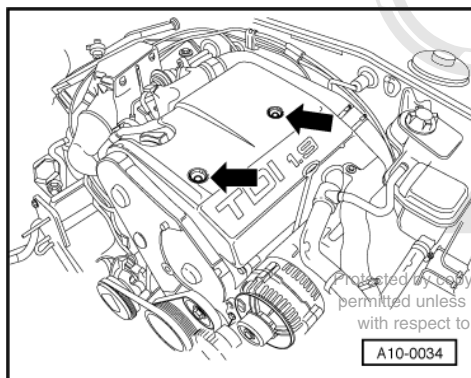


Special tools, testers and auxiliary items required

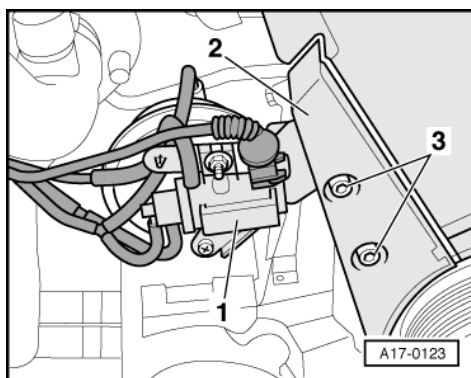
- ◆ Special tool 2064
- ◆ Special tool 2065 A
- ◆ Special tool 3036
- ◆ Special tool Matra V/159
- Engine in vehicle
- Lock carrier must be in service position => Page 24 .



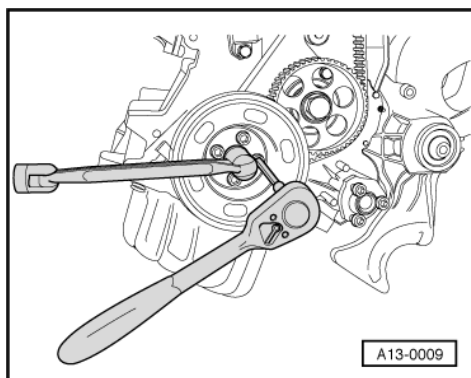
Removing



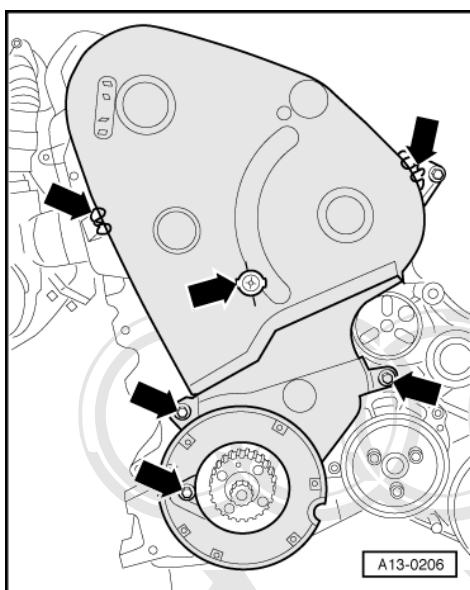
- -> Remove engine cover panel -arrows-.
- Removing toothed belt => Page **41**
- Remove viscous fan (with belt pulley) => Page **35** .
- Install ribbed belt tensioner => Page **30** .



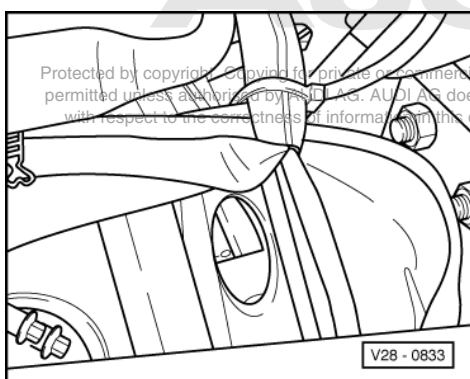
- -> Remove bolts -3- and detach cover -2-.
- Place solenoid valve for boost pressure control -1- to one side with hoses connected.



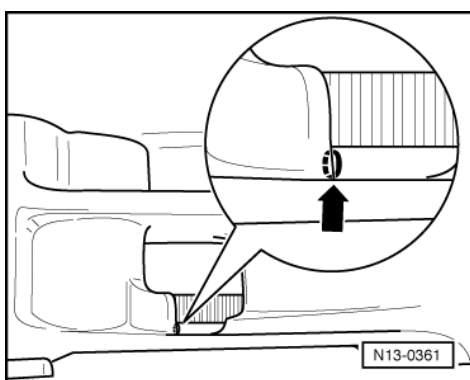
- -> Unbolt vibration damper.



- -> Remove upper and bottom section of toothed belt guard -arrows-.



- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with manual gearbox).

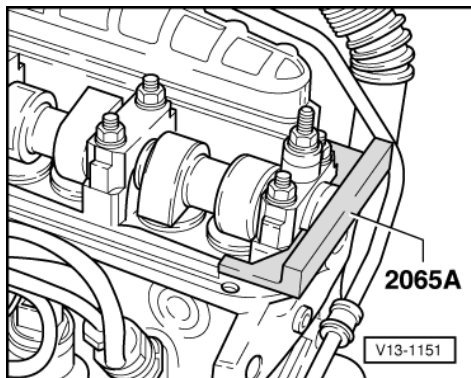


- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with automatic gearbox).

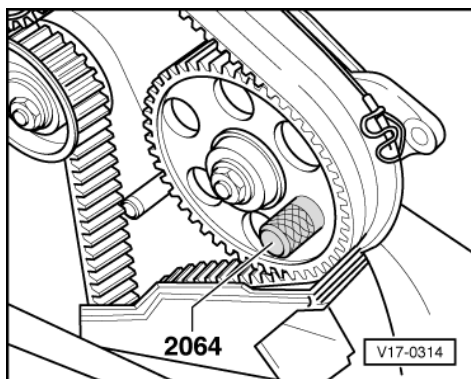
Note:

With engine removed turn crankshaft to TDC No. 1 cylinder=> Page 68 .

- Remove cylinder head cover => Page 105 .



- -> Lock camshaft with setting bar 2065 A.
- Align setting bar as follows:
Turn arrested camshaft so that one end of setting bar contacts cylinder head. Measure the gap at other end of setting bar using a feeler gauge. Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until setting bar contacts feeler gauge. Insert a 2nd feeler gauge of same thickness at other end, between setting bar and the cylinder head.



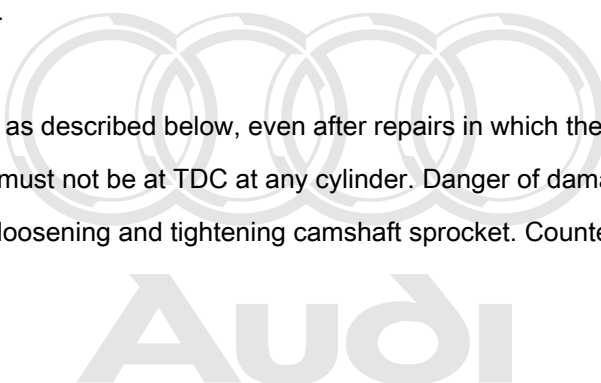
- -> Lock injection pump sprocket with setting pin 2064.
- Mark direction of rotation of belt with chalk or felt pen.
- Release tensioner.
- Remove idler wheel.
- Take off toothed belt.

Installing (adjust valve timing)

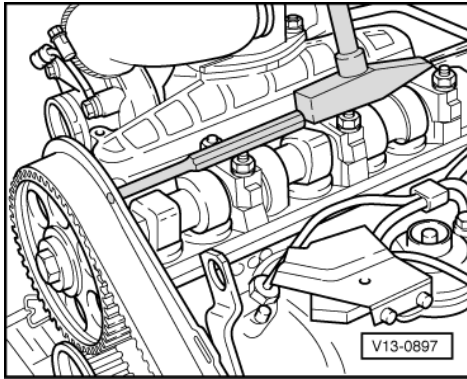
- Camshaft locked with setting bar.
- Injection pump locked with setting pin 2064.

Notes:

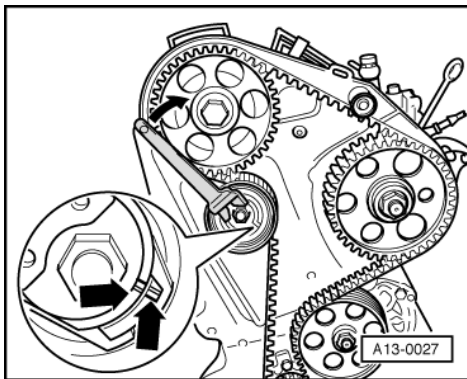
- ♦ The position of the toothed belt must be set as described below, even after repairs in which the belt is only taken off the camshaft sprocket.
- ♦ When turning the camshaft, the crankshaft must not be at TDC at any cylinder. Danger of damage valves/ piston crown.
- ♦ Never use setting bar to counterhold when loosening and tightening camshaft sprocket. Counterhold with 3036.



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- -> Loosen securing bolt of camshaft sprocket by 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through hole of rear toothed belt guard).
- Check again whether TDC mark on flywheel and reference mark are aligned.
- Place toothed belt on crankshaft sprocket, intermediate shaft, injection pump sprocket and tensioner (note direction of rotation).
- Install camshaft sprocket together with toothed belt and position with securing bolt (camshaft sprocket can still be turned).
- Install the idler wheel.



- -> Turn tensioner eccentric clockwise using nut driver (e.g. Matra V/159) until notch and lobe -arrows- are aligned.

Note:

If eccentric has been turned too far clockwise during tensioning, tensioner must then be fully released. Then turn eccentric clockwise again to tension.

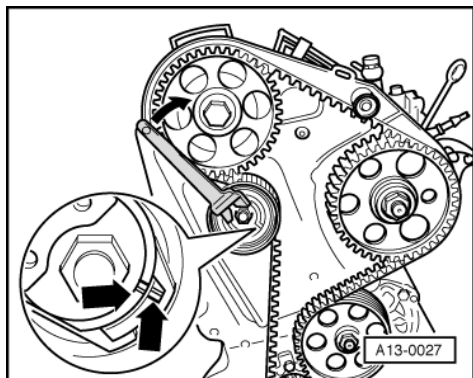
- Tighten lock nut on tensioner to 20 Nm.
- Check again whether TDC mark on flywheel and reference mark are aligned.
- Tighten securing bolt for camshaft sprocket to 45 Nm.

Note:

Never use setting bar to counterhold when loosening and tightening camshaft sprocket. Counterhold with 3036.

- Remove setting bar.
- Remove pin 2064.
- Turn crankshaft a further two rotations in direction of engine rotation and reset to TDC No. 1 cylinder.

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- -> Check tension of toothed belt.
- Markings -arrows- must be aligned.
- If necessary retighten toothed belt.
- Check if injection pump sprocket can be locked with pin 2064.
- Check position of camshaft with setting bar.

Note:

If it is not possible to insert setting bar or pin, repeat adjustment.

- Remove setting bar.
- Remove pin 2064.
- Install viscous fan=> Page 35 .
- Install ribbed belt =>Page 41 .
- Dynamically check commencement of injection

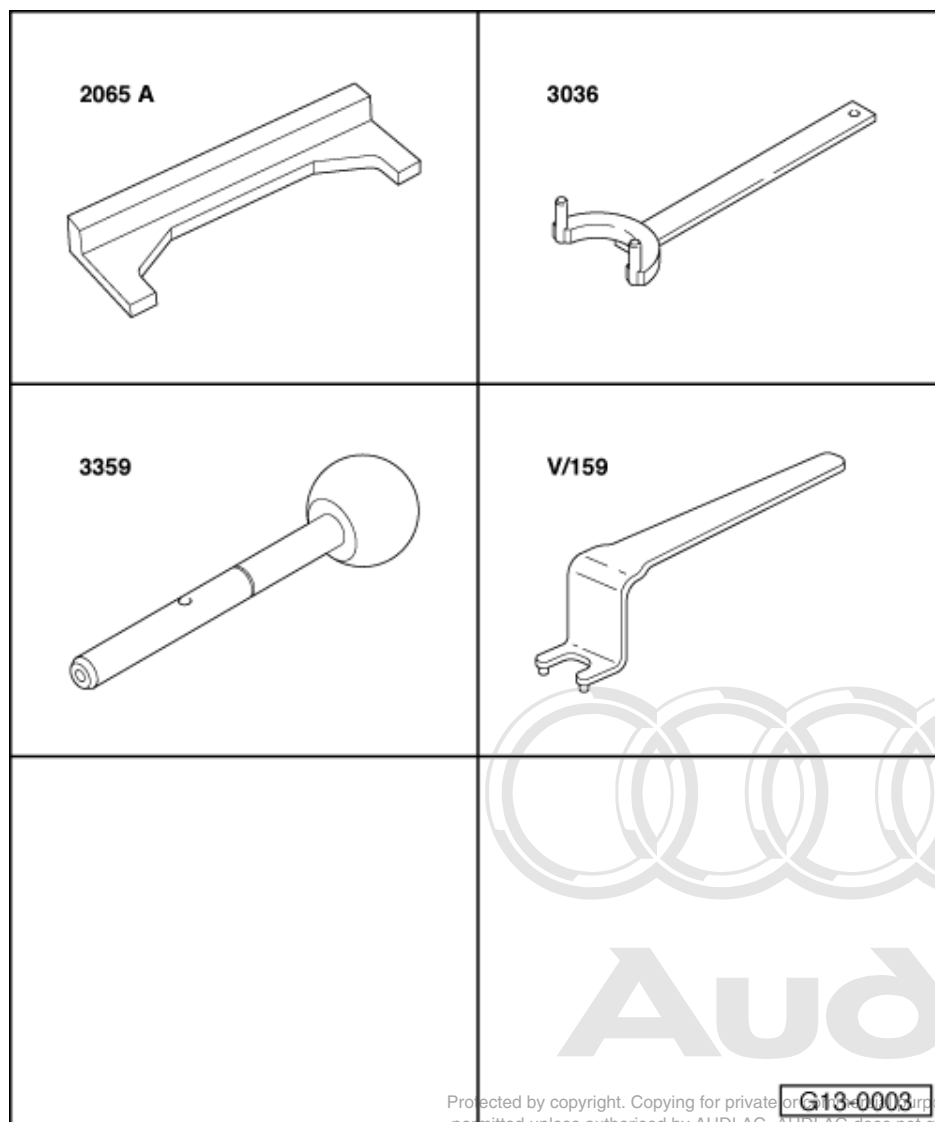
=> Diesel direct injection and glow plug system (4-cyl.) 06.97; Repair group 23; Servicing diesel direct injection system; Dynamically checking and adjusting commencement of injection Servicing diesel direct injection system Dynamically checking and adjusting commencement of injection

=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 23; Servicing diesel direct injection system; Dynamically checking and adjusting commencement of injection Servicing diesel direct injection system Dynamically checking and adjusting commencement of injection

Tightening torques

Component	Nm
Toothed belt sprocket to camshaft	45
Idler wheel to bracket	25
Semi automatic tensioner to cylinder block	20
Bottom section of toothed belt guard to cylinder block	10
Vibration damper	8.8
to crankshaft	10.9
Tensioner for ribbed belt on bracket to bracket for alternator, vane pump and viscous fan	45

1.12 - Removing and installing toothed belt, engine code AHH

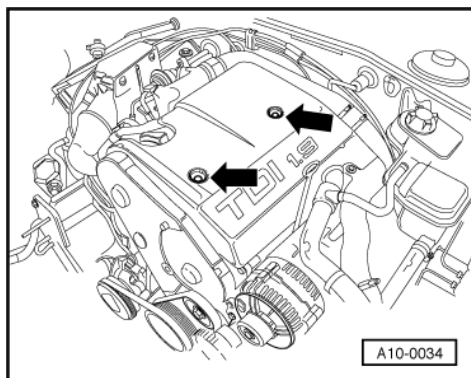


Special tools, testers and auxiliary items required

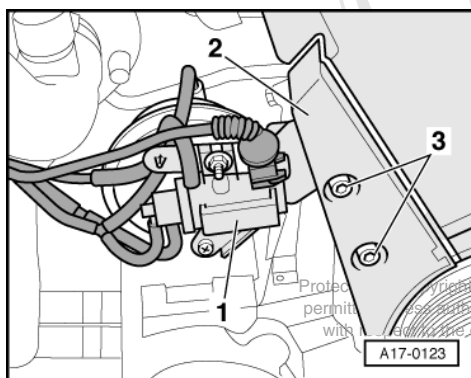
- ◆ Special tool 2065 A
- ◆ Special tool 3036
- ◆ Special tool 3359
- ◆ Special tool Matra V/159
- Engine in vehicle
- Lock carrier must be in service position => Page 24 .



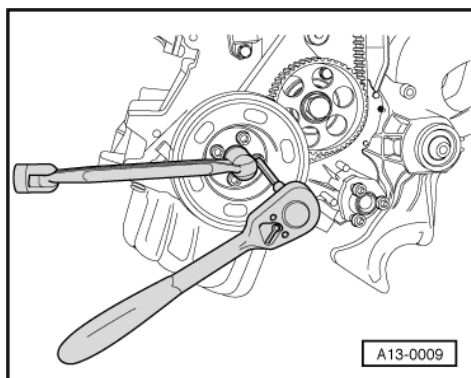
Removing



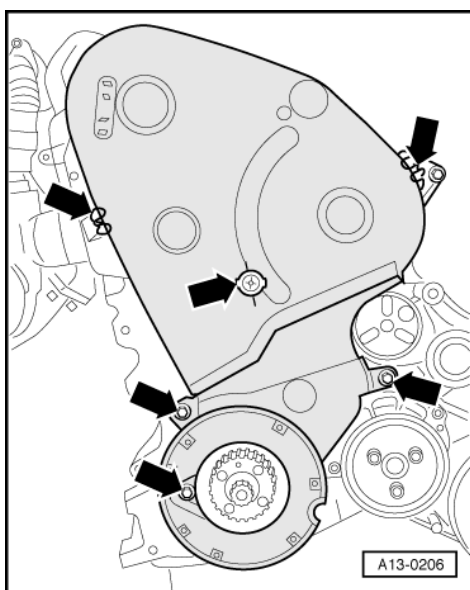
- -> Remove engine cover panel -arrows-.
- Removing toothed belt => Page **41**
- Remove viscous fan (with belt pulley) => Page **35**.
- Install ribbed belt tensioner => Page **30**.



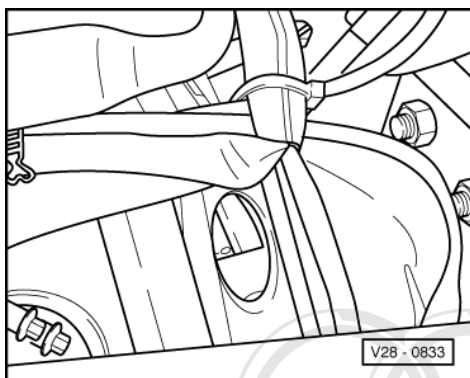
- -> Remove bolts -3- and detach cover -2-.
- Place solenoid valve for boost pressure control-1- to one side with hoses connected.



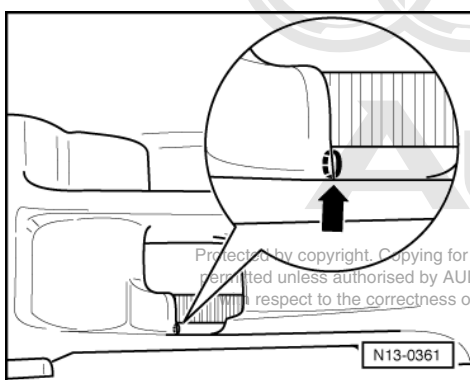
- -> Unbolt vibration damper.



- -> Remove upper and bottom section of toothed belt guard -arrows-.



- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with manual gearbox).

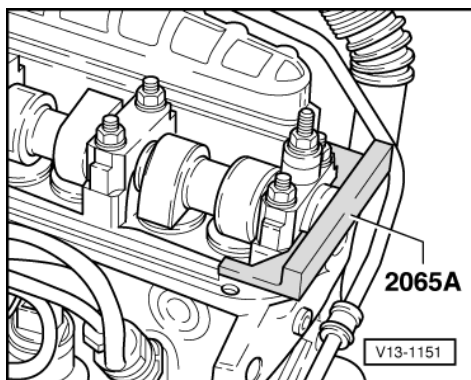


- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with automatic gearbox).

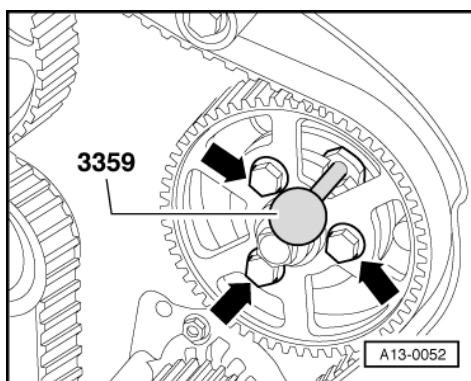
Note:

With engine removed turn crankshaft to TDC No. 1 cylinder=> Page 68 .

- Remove cylinder head cover => Page 105 .

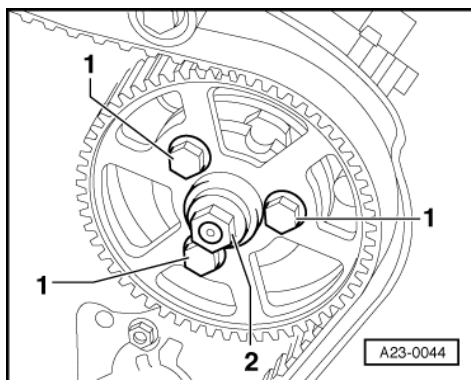


- -> Lock camshaft with setting bar 2065 A.
- Align setting bar as follows:
Turn arrested camshaft so that one end of setting bar contacts cylinder head. Measure the gap at other end of setting bar using a feeler gauge. Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until setting bar contacts feeler gauge. Insert a 2nd feeler gauge of same thickness at other end, between setting bar and the cylinder head.



- -> Lock injection pump sprocket with setting pin 3359.
- Remove securing bolts -arrows- of injection pump sprocket.

Note:



-> Do not loosen central nut -2- of injection pump sprocket. Otherwise the injection pump basic setting is mal-adjusted and can no longer be corrected using workshop tools.

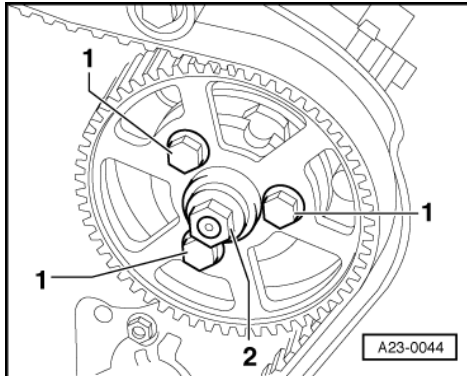
- Mark direction of rotation of belt with chalk or felt pen.
- Remove tensioner.
- Remove idler wheel.
- Take off toothed belt.

Installing (adjust valve timing)

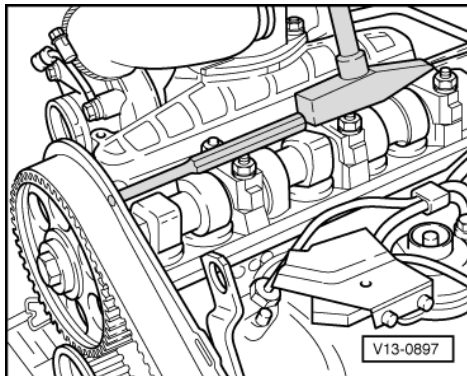
- Camshaft locked with setting bar.
- Injection pump locked with setting pin 3359.

Notes:

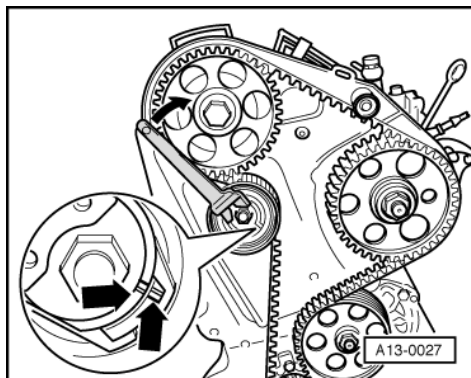
- ♦ The position of the toothed belt must be set as described below, even after repairs in which the belt is only taken off the camshaft sprocket.
- ♦ When turning the camshaft, the crankshaft must not be at TDC at any cylinder. Danger of damage valves/piston crown.
- ♦ Never use setting bar to counterhold when loosening and tightening camshaft sprocket. Counterhold with 3036.



- ♦ -> Replace securing bolts -1- of injection pump sprocket.



- -> Loosen securing bolt of camshaft sprocket by 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through hole of rear toothed belt guard).
- Centre the injection pump sprocket in the slots.
- Check again whether TDC mark on flywheel and reference mark are aligned.
- Place toothed belt on crankshaft sprocket, intermediate shaft, injection pump sprocket and tensioner (note direction of rotation).
- Install camshaft sprocket together with toothed belt and position with securing bolt (camshaft sprocket can still be turned).
- Install the idler wheel.



- -> Turn tensioner eccentric clockwise using nut driver (e.g. Matra V/159) until notch and lobe -arrows- are aligned.

Note:

If eccentric has been turned too far clockwise during tensioning, tensioner must then be fully released. Then turn eccentric clockwise again to tension.

- Tighten lock nut on tensioner to 20 Nm.
- Check again whether TDC mark on flywheel and reference mark are aligned.
- Tighten securing bolt for camshaft sprocket to 45 Nm.

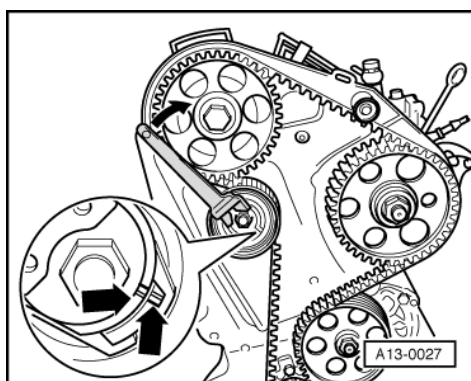
Note:

Never use setting bar to counterhold when loosening and tightening camshaft sprocket. Counterhold with 3036.

- Tighten new securing bolts for injection pump sprocket initially to 20 Nm.

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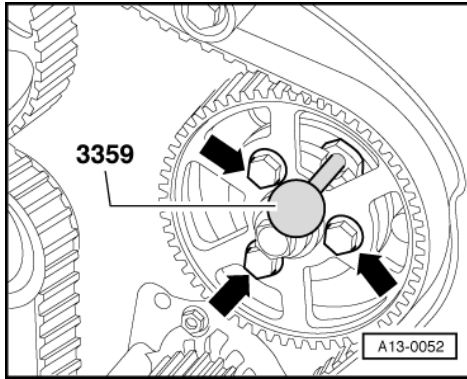
- ♦ After injection start dynamic test, bolts must be tightened by a 1/4 (90°) turn.
- ♦ The securing bolts are stretch bolts and cannot be re-used. Once tightened to correct torque (20 Nm + 90°), they must be replaced after loosening.
- Remove setting bar 2065 A from camshaft and setting pin 3359 from injection pump sprocket.
- Turn crankshaft a further two rotations in direction of engine rotation and reset to TDC No. 1 cylinder.



- -> Check tension of toothed belt.
- Markings -arrows- must be aligned.
- If necessary retighten toothed belt.
- Check if injection pump sprocket can be locked with pin 3359.
- Check position of camshaft with setting bar 2065 A.

Notes:

- ♦ If it is not possible to insert setting bar, repeat adjustment.



♦ If setting pin 3359 cannot be inserted:

- -> Loosen securing bolts -arrows- of injection pump sprocket.
- Rotate injection pump sprocket hub until setting pin fits.
- Retighten securing bolts for injection pump sprocket to 20 Nm.
- Install viscous fan=> Page 35 .
- Install ribbed belt =>Page 41 .
- Dynamically check commencement of injection

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 23; Servicing diesel direct injection system; Dynamically checking and adjusting commencement of injection Servicing diesel direct injection system Dynamically checking and adjusting commencement of injection

Tightening torques

Component	Nm
Toothed belt sprocket to camshaft	45
Idler wheel to bracket	25
Semi automatic tensioner to cylinder block	20
Bottom section of toothed belt guard to cylinder block	10
Vibration damper to crankshaft	8.8 10.9
Tensioner for ribbed belt to bracket for alternator, vane pump and viscous fan	25 35
Injection pump toothed belt sprocket to injection pump hub	45 20 + 90°1)2)

1) Stretch bolts - renew

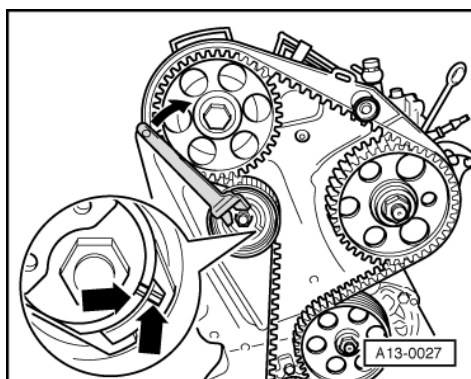
2) 90° corresponds to a quarter turn

1.13 - Checking semi automatic toothed belt tensioner

Test conditions

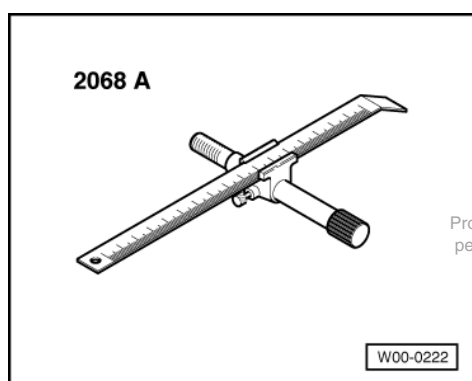
- Toothed belt in position and tensioned.

Test sequence



- -> Tension toothed belt with firm thumb pressure.
Notch and lobe -arrow- must move.
- Release thumb pressure on toothed belt. Tensioner must return to initial position.
- Markings -arrows- must be aligned.

1.14 - Rotating crankshaft to TDC with engine removed

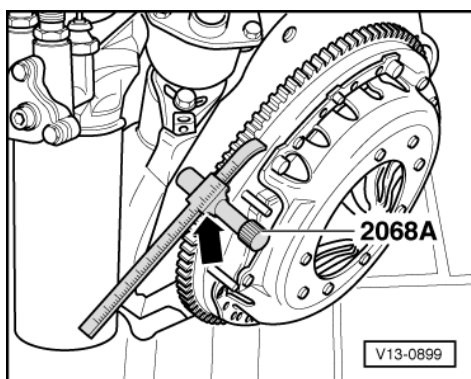


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Special tools, testers and auxiliary equipment required

- ♦ Special tool 2068 A
- Oil filter removed.

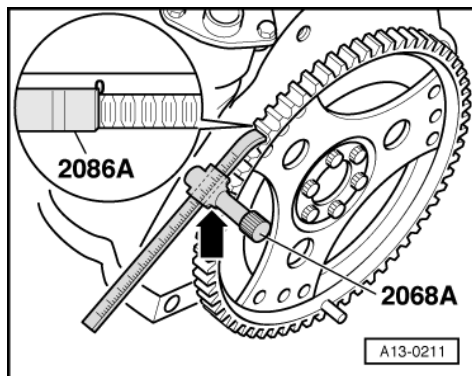
Vehicles with manual gearbox



- -> Screw in setting device for TDC point 2068 as shown in illustration.
- Set setting device to 107 mm (left notch on vernier scale -arrow- is reference point).

- Rotate crankshaft until flywheel TDC marking "0" is aligned with edge of setting device.

Vehicles with automatic gearbox:



- -> Screw in setting device for TDC point 2068 as shown in illustration.
- Set setting device to 99 mm (left notch on vernier scale -arrow- is reference point).
- Rotate crankshaft until drive plate TDC marking "0" is aligned with edge of setting device.

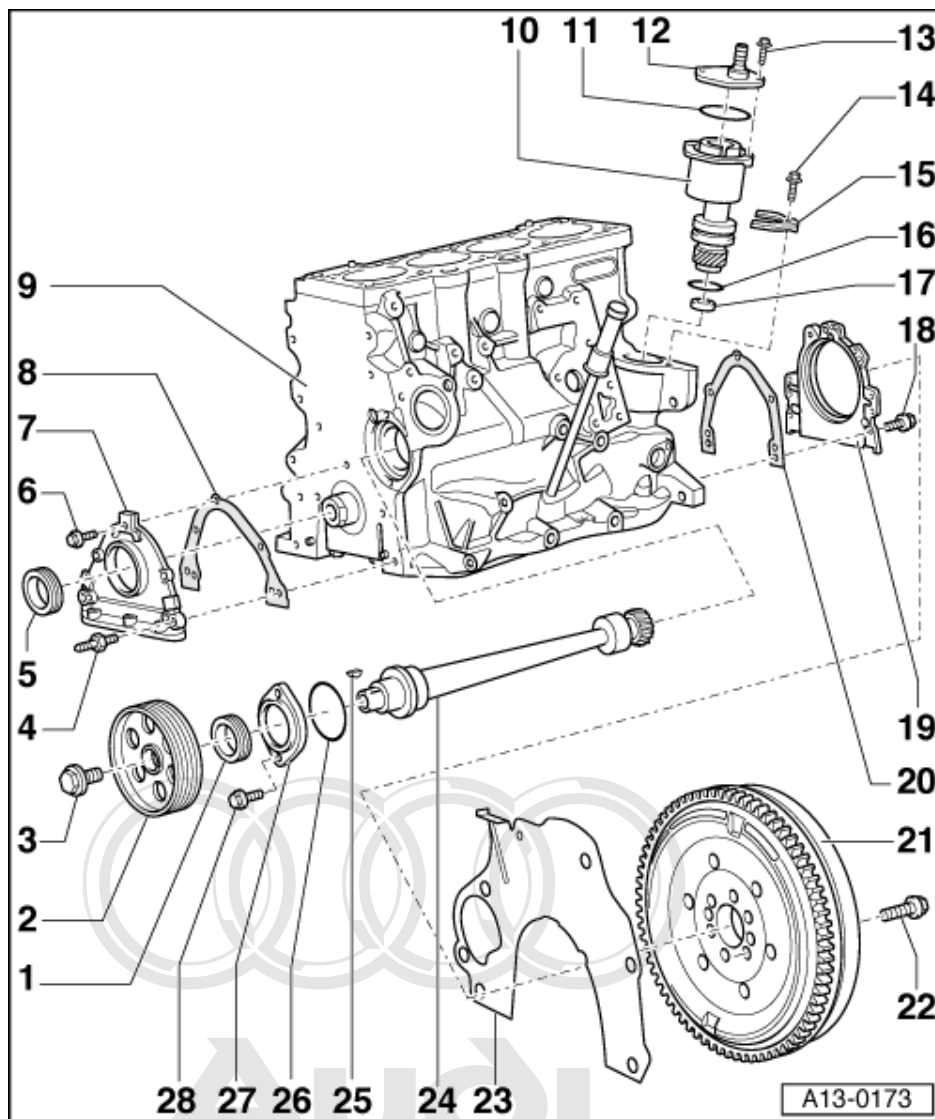
Note:

TDC marking "0" is stamped on drive plate side facing cylinder block.

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2 - Removing and installing sealing flanges and flywheel/drive plate

2.1 - Removing and installing sealing flanges and flywheel/drive plate



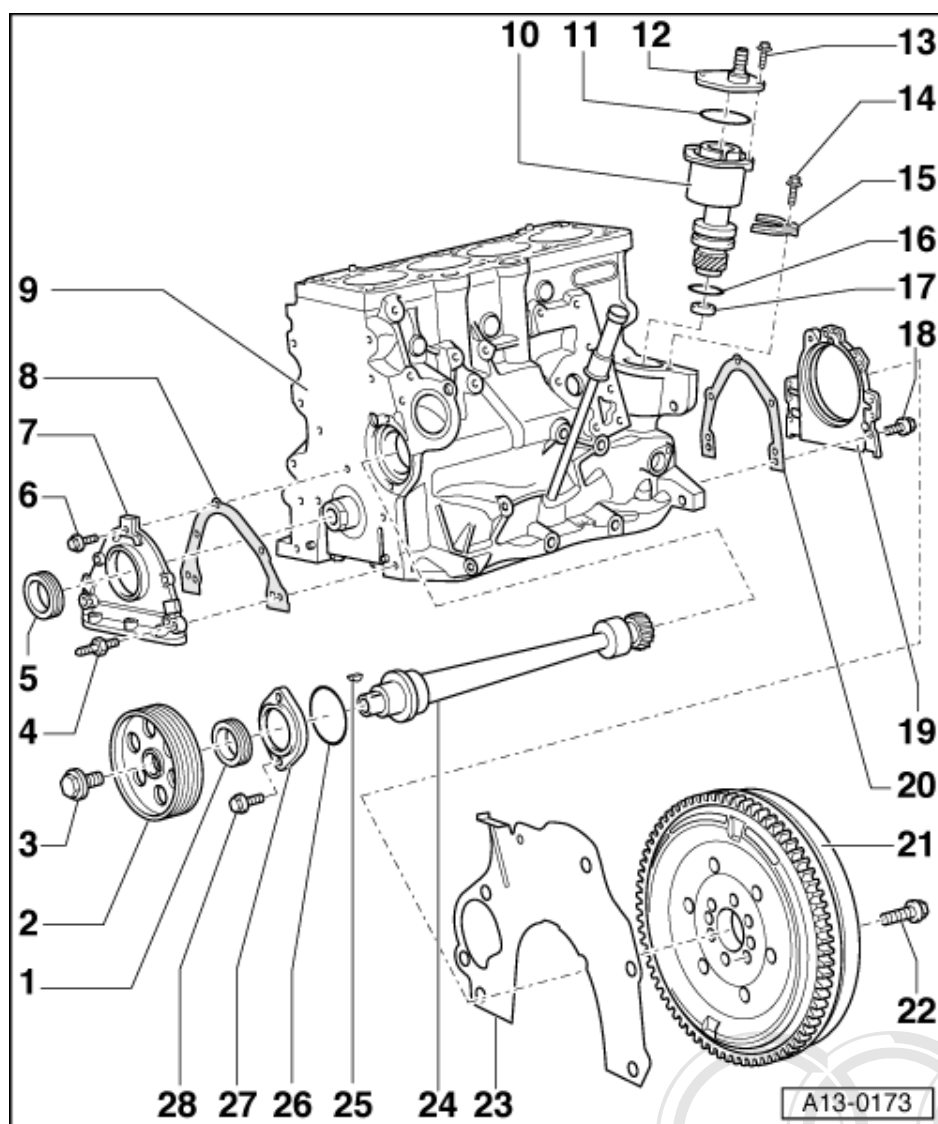
Note:

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For repairs to the clutch: of information in this document. Copyright by AUDI AG.

1 Sealing ring

- ◆ To remove, remove sealing flange -Item **27** -
- ◆ Install with 10-203
- ◆ Lightly oil sealing lip of oil seal



2 Intermediate shaft sprocket

- ♦ Installation position => Fig. 1 .
- ♦ Note Woodruff key -Item 25 -

3 45 Nm

- ♦ Counter hold with 3036 to loosen and tighten

4 25 Nm

5 Sealing ring

- ♦ Replacing => Page 77 .
- ♦ Lightly oil sealing lip of oil seal

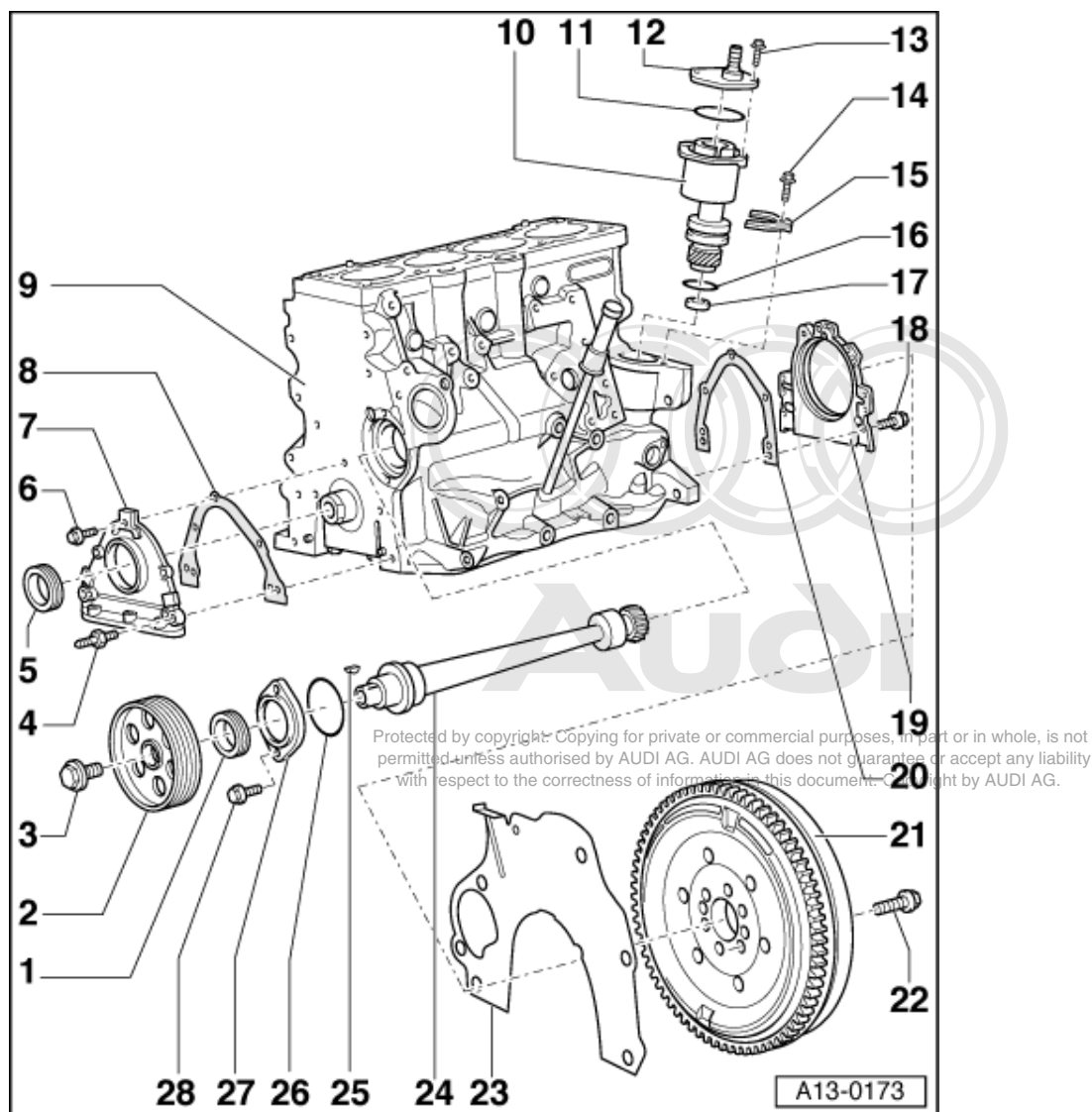
6 10 Nm

7 Sealing flange - front

- ♦ Before fitting sump, apply a small amount of sealant "AMV 174 004 01" to sealing points between sealing flange and cylinder block

=> Parts List

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8 Gasket

- ♦ Replace

9 cylinder block

- ♦ Removing and installing crankshaft=> Page 82 .
- ♦ Dismantling and assembling pistons and conrods => Page 89 .

10 Exhauster

- ♦ For brake servo

11 O-ring

- ♦ Replace

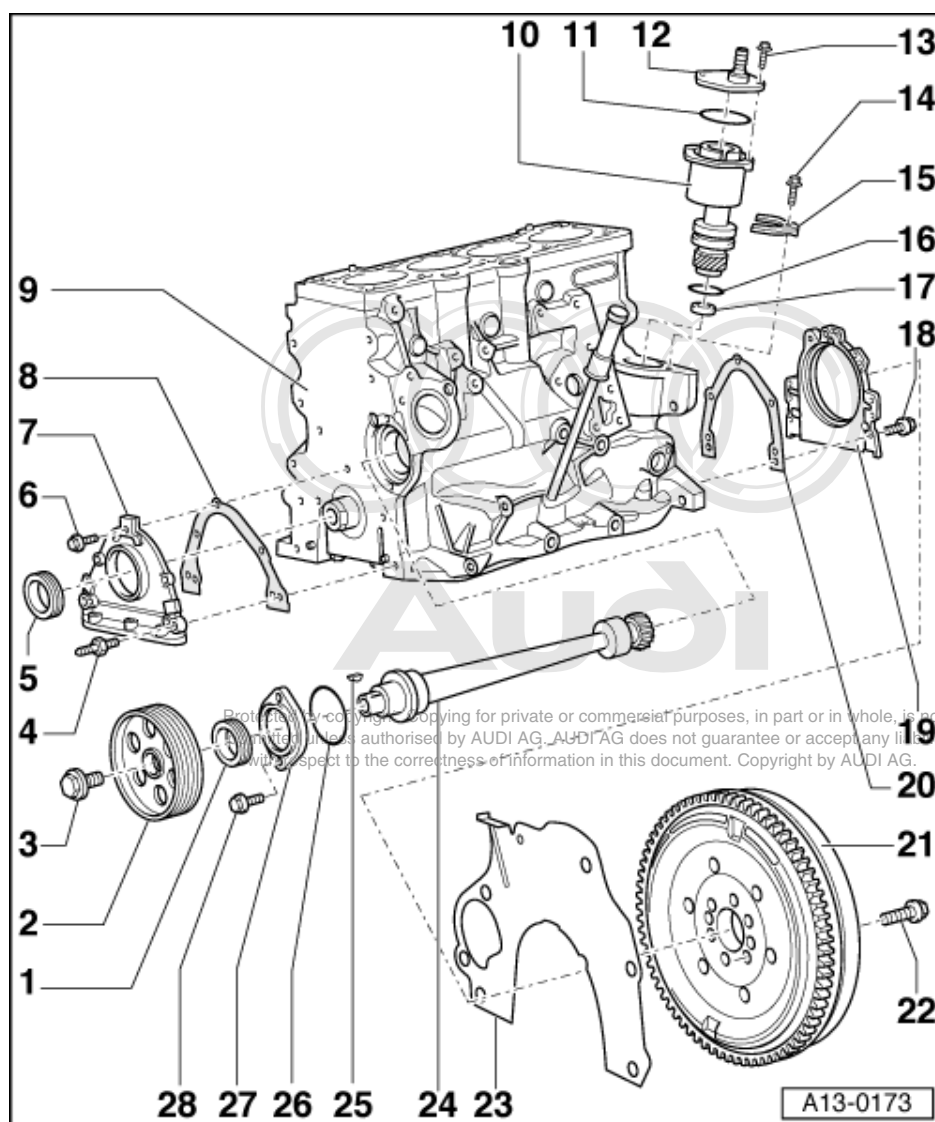
12 Cap

13 10 Nm

14 20 Nm

15 Bracket

- ♦ For exhauster



16 O-ring

- ◆ Replace

17 Sealing ring

- ◆ Replace

18 10 Nm

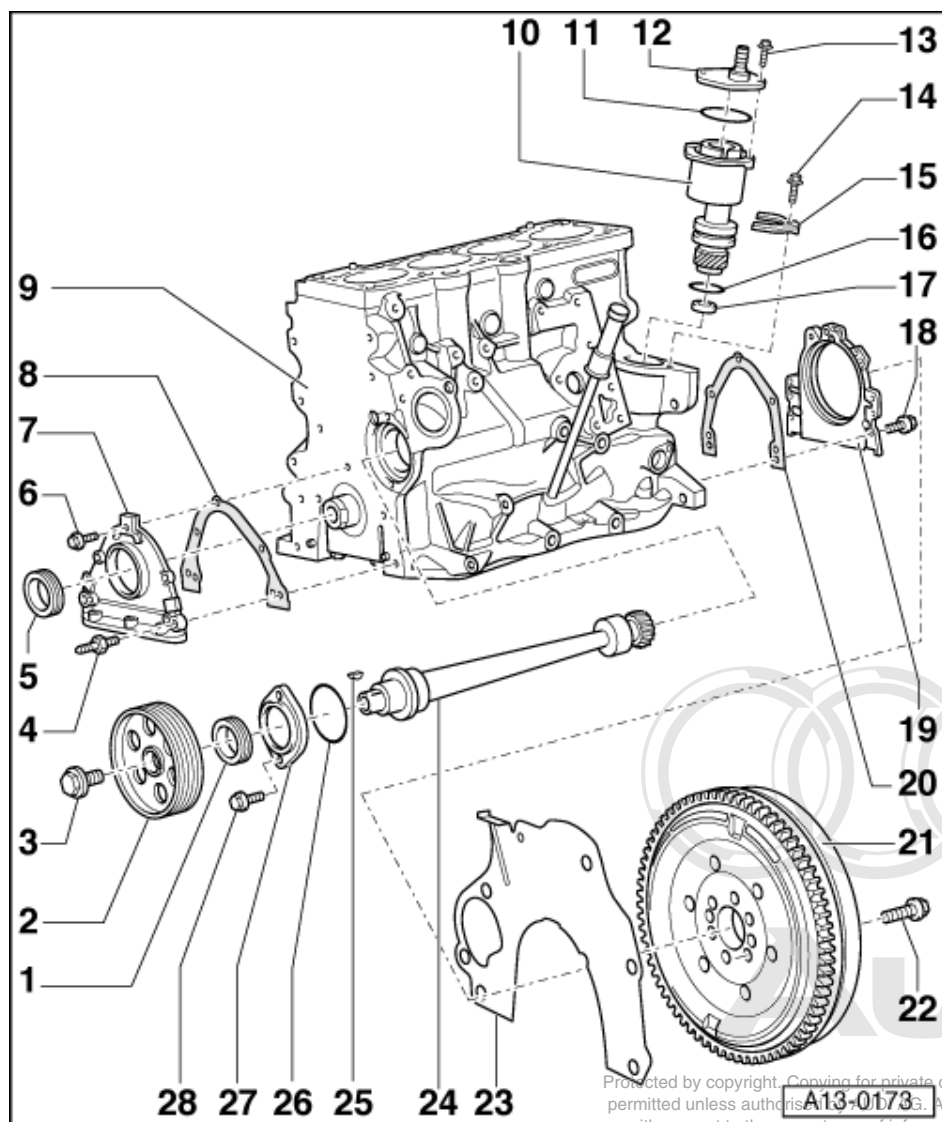
19 Rear sealing flange

- ◆ With oil seal
- ◆ Replace only as complete unit
- ◆ Lightly oil sealing lip of oil seal
- ◆ Before fitting sump, apply a small amount of sealant "AMV 174 004 01" to sealing points between sealing flange and cylinder block

=> Parts List

20 Gasket

- ◆ Only install if sealing flange has no sealing lip on cylinder block side



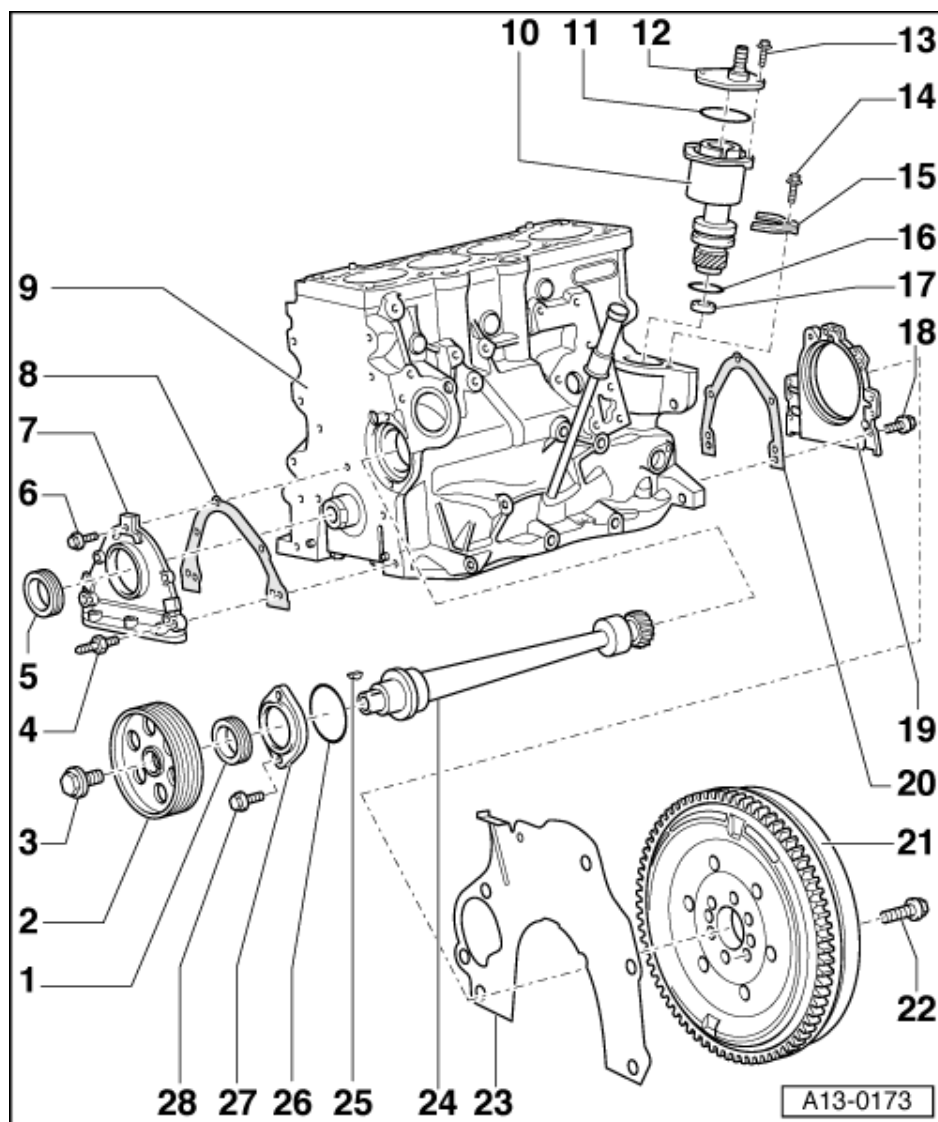
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21 Dual-mass flywheel/drive plate

- ♦ Removing and installing dual mass flywheel=> Page 79
- ♦ Removing and installing drive plate=> Page 80

22 Securing bolt for dual-mass flywheel or drive plate

- ♦ Replace
- ♦ Tightening torque for dual-mass flywheel: 60 Nm + 1/2 turn (180°) further
- ♦ Tightening torque for drive plate (vehicles with automatic gearbox): 60 Nm + 1/4 turn (90°) further



23 Intermediate plate

- ♦ Must be located on dowel sleeves
- ♦ Do not damage/bend when assembling.

24 Intermediate shaft

- ♦ Axial clearance max. 0.25 mm

25 Woodruff key

- ♦ Ensure tight fit

26 O-ring

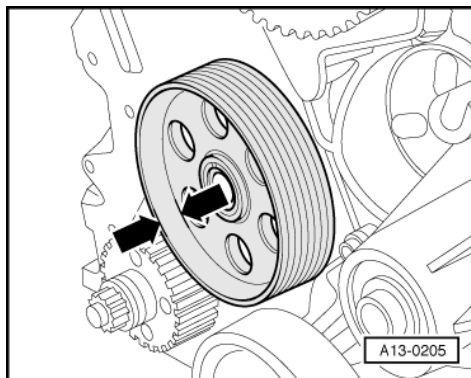
- ♦ Replace

27 Sealing flange for intermediate shaft

28 25 Nm



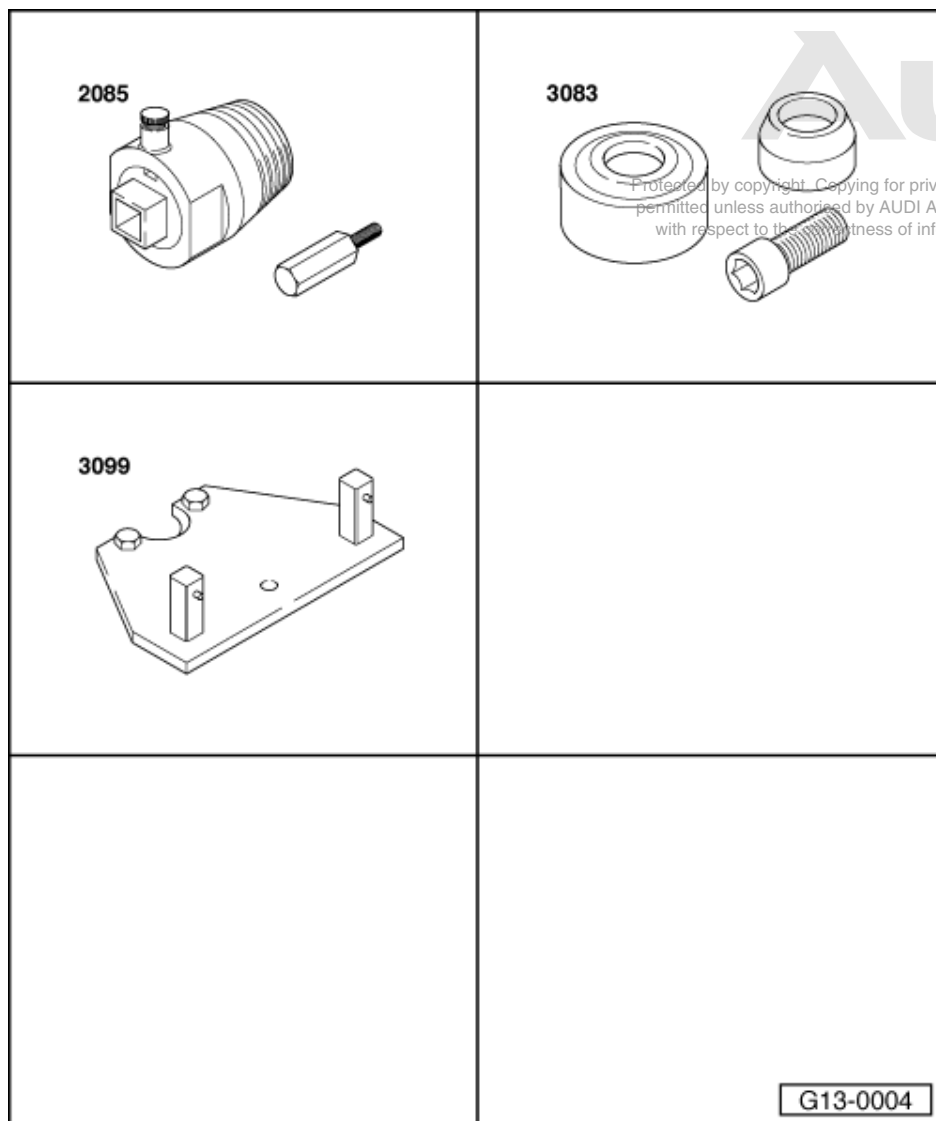
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-> Fig.1 Installation position of intermediate shaft sprocket

- ♦ Wide web -arrows- of intermediate shaft sprocket points towards front.
- ♦ The inscription on wheel points towards rear.

2.2 - Renewing crankshaft oil seal on pulley end

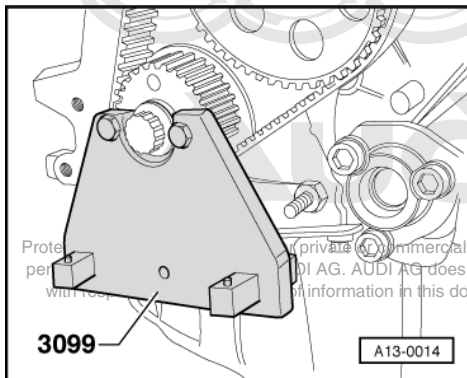


Special tools, testers and auxiliary items required

- ◆ Special tool 2085
- ◆ Special tool 3083
- ◆ Special tool 3099
- Engine in vehicle
- Lock carrier must be in service position => Page 24 .

Removing

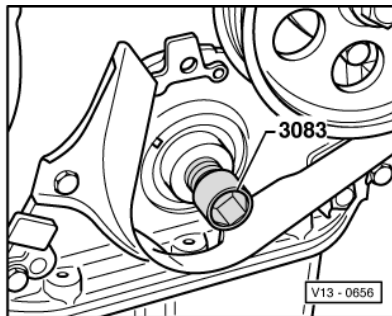
- Removing toothed belt => Page 41
- Removing toothed belt with engine codes 1Z, AFF, AFN, AHU => Page 61 .
- Remove bracket for torque reaction support -Item 144 .



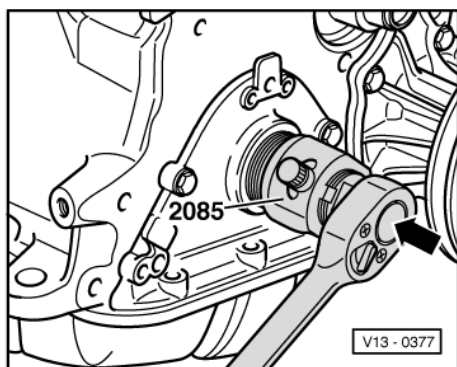
- -> Remove toothed belt sprocket from crankshaft. To do this, counter hold sprocket with 3099.

Note:

It is also possible to use special tool 3415.

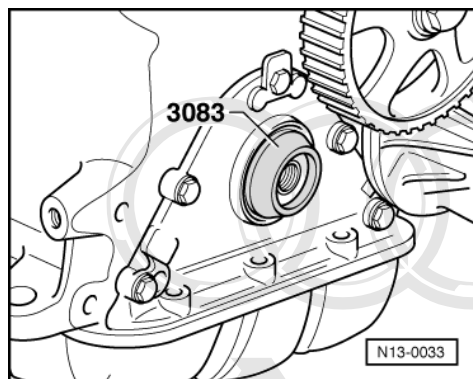


- -> Install cheese-head bolt from 3083 5...6 turns into crankshaft before positioning oil seal extractor.
- Adjust inner part of oil seal extractor 2085 two turns (approx 3 mm) from the outer part and lock in position with the knurled screw.



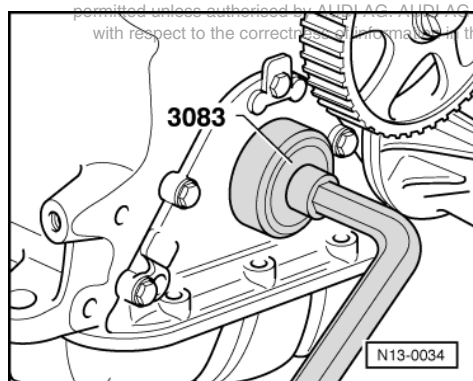
- -> Lubricate threaded head of oil seal extractor, place it in position and exerting firm pressure, screw it into oil seal as far as possible.
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice. Remove oil seal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

Installing



- Lightly oil sealing lip of oil seal.
- -> Place guide sleeve from 3083 onto crankshaft journal.
- Slide oil seal over guide sleeve.

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- -> Press oil seal in onto stop using press sleeve and bolt from 3083.
- Replace bolt for crankshaft sprocket.
- Install crankshaft sprocket and lock in position with retainer 3099.

Notes:

- ♦ Contact surface between sprocket and crankshaft must be free of oil.

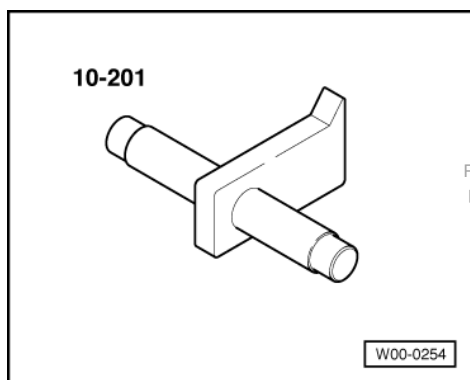
- ♦ Do not oil bolt for sprocket.
- Installing toothed belt (adjust valve timing) with engine codes 1Z, AFF, AFN, AHU => Page 65 .
- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.
- Install ribbed belt =>Page 41 .

Tightening torque

Component	Nm
Toothed belt sprocket to crankshaft	90 + 90°1)2)

- 1) Replace bolt
- 2) 90° corresponds to a quarter turn

2.3 - Removing and installing dual mass flywheel/drive plate

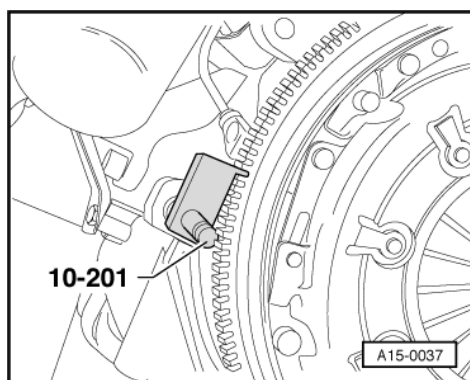


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Dual-mass flywheel

Special tools, testers and auxiliary equipment required

- ♦ Special tool 10-201



- -> Reverse position of counterhold tool 10-201 for loosening/tightening bolts.
- Mark position of flywheel relative to engine.
- Replace bolts.

Tightening torque

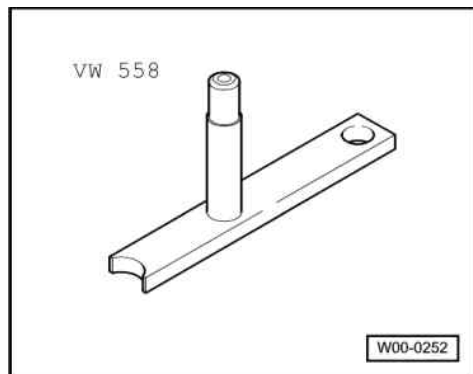
Component	Nm
Dual mass flywheel to crankshaft	60 + 180°1)



1) 180° corresponds to a half turn

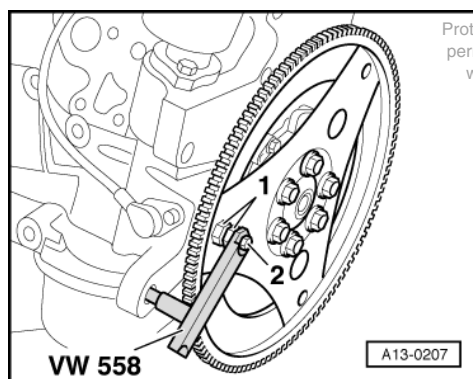
Drive plate

Special tools, testers and auxiliary equipment required



- ♦ Special tool VW 558
- ♦ Hexagon bolt M8 x 45 and two M10 hexagon nuts
- ♦ Depth gauge

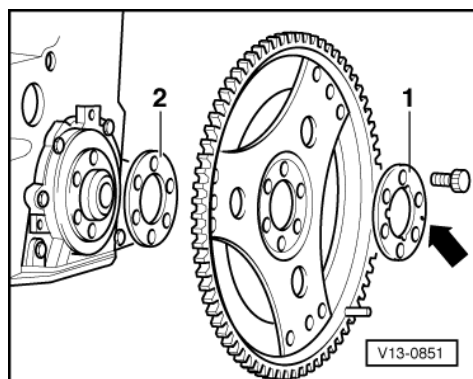
Removing



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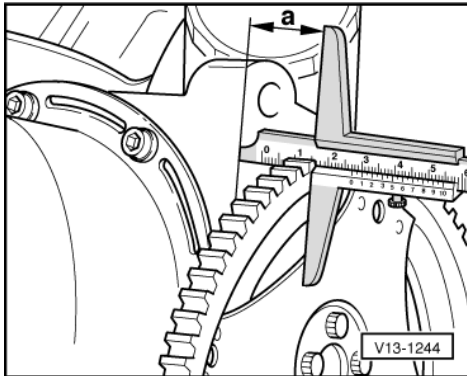
- -> Secure counter hold tool VW 558 to the drive plate with a hexagon bolt M8 x 45. Place two M10 hexagon nuts between counter hold tool and drive plate.
- Mark position of drive plate relative to engine.
- Loosen securing bolts on drive plate.

Installing



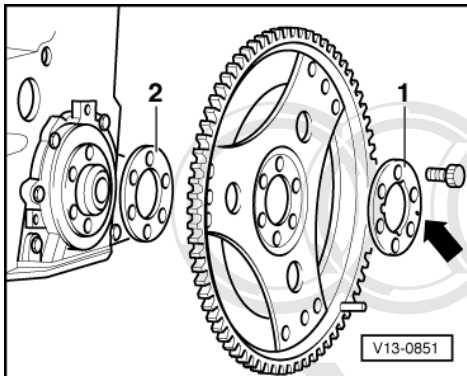
- -> Place drive plate with shim -2- and washer -1- in position. Lug -arrow- must face towards torque converter.

- Insert at least 3 of the old securing bolts and tighten to 30 Nm.



- -> Measure distance -a- at three points and calculate average value.
- Specified value: 26 ... 28 mm

If nominal value is exceeded:



- -> Remove drive plate again and fit without shim -2-. Retighten bolts to 30 Nm.
- Measure distance again.

If the specified value is obtained:

- Fit new bolts and tighten.
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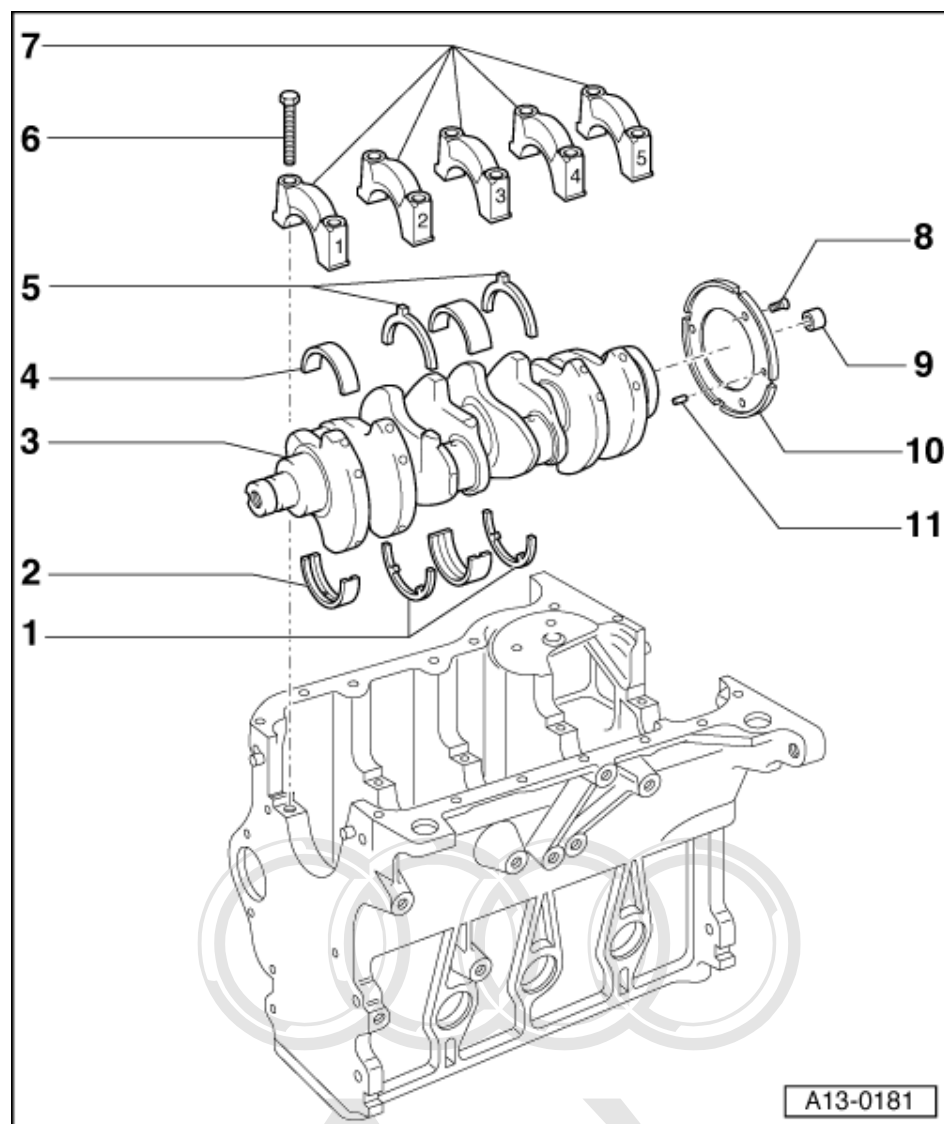
Tightening torque

Component	Nm
Drive plate to crankshaft	60 + 90°1)

- 1) 90° corresponds to a quarter turn

3 - Removing and installing crankshaft

3.1 - Removing and installing crankshaft



Note:

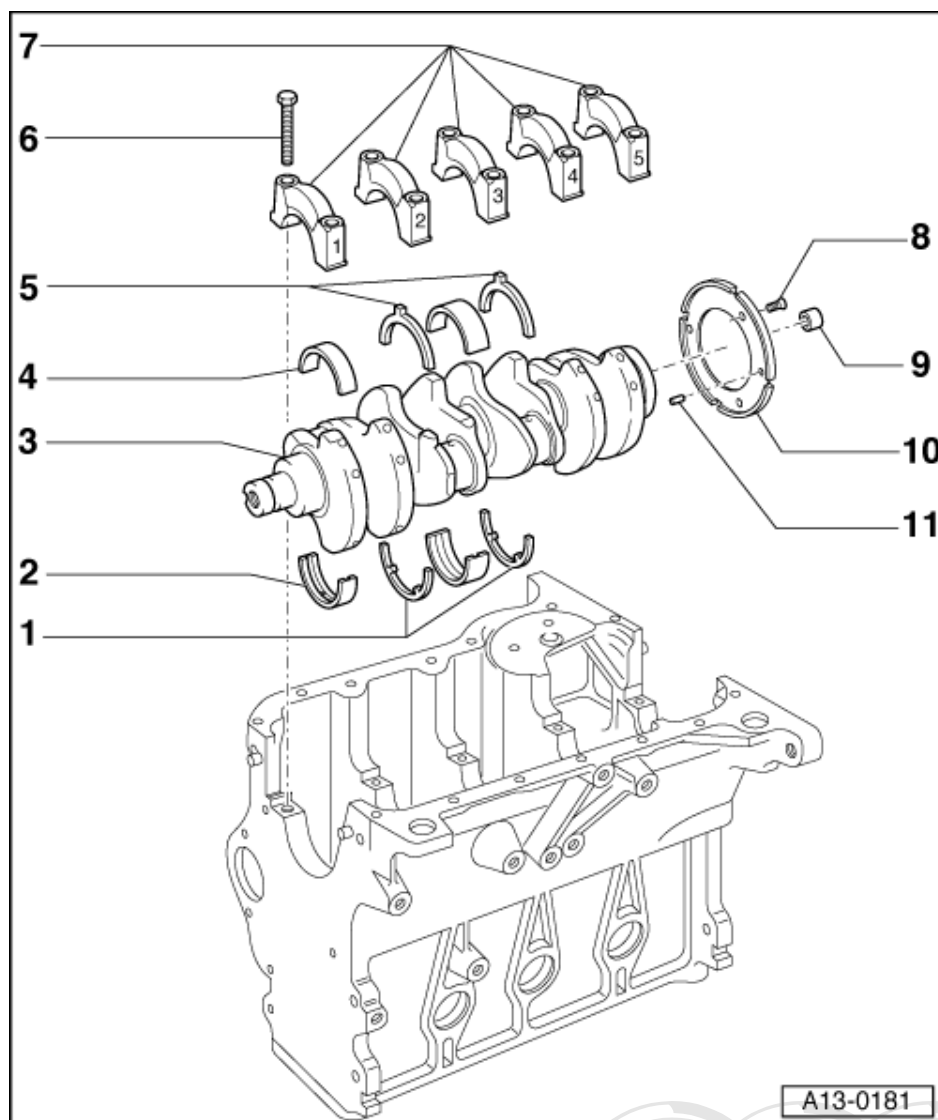
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When working on the engine, it should be secured to the engine stand using the engine bracket VW 540.
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1 Thrust washers

- ◆ For bearing 3
- ◆ Different versions for cylinder block and bearing cap
- ◆ Note fixing arrangement

2 Bearing shell

- ◆ For cylinder block with oil groove
- ◆ Do not interchange used bearing shells (mark).



3 Crankshaft

- ♦ Axial clearance new: 0.07...0.17 mm
Wear limit: 0.37 mm
- ♦ Check radial clearance with Plastigage
New: 0.03...0.08 mm
Wear limit: 0.17 mm
- ♦ Do not rotate the crankshaft when checking the radial clearance.
- ♦ Crankshaft dimensions
=> Page 88

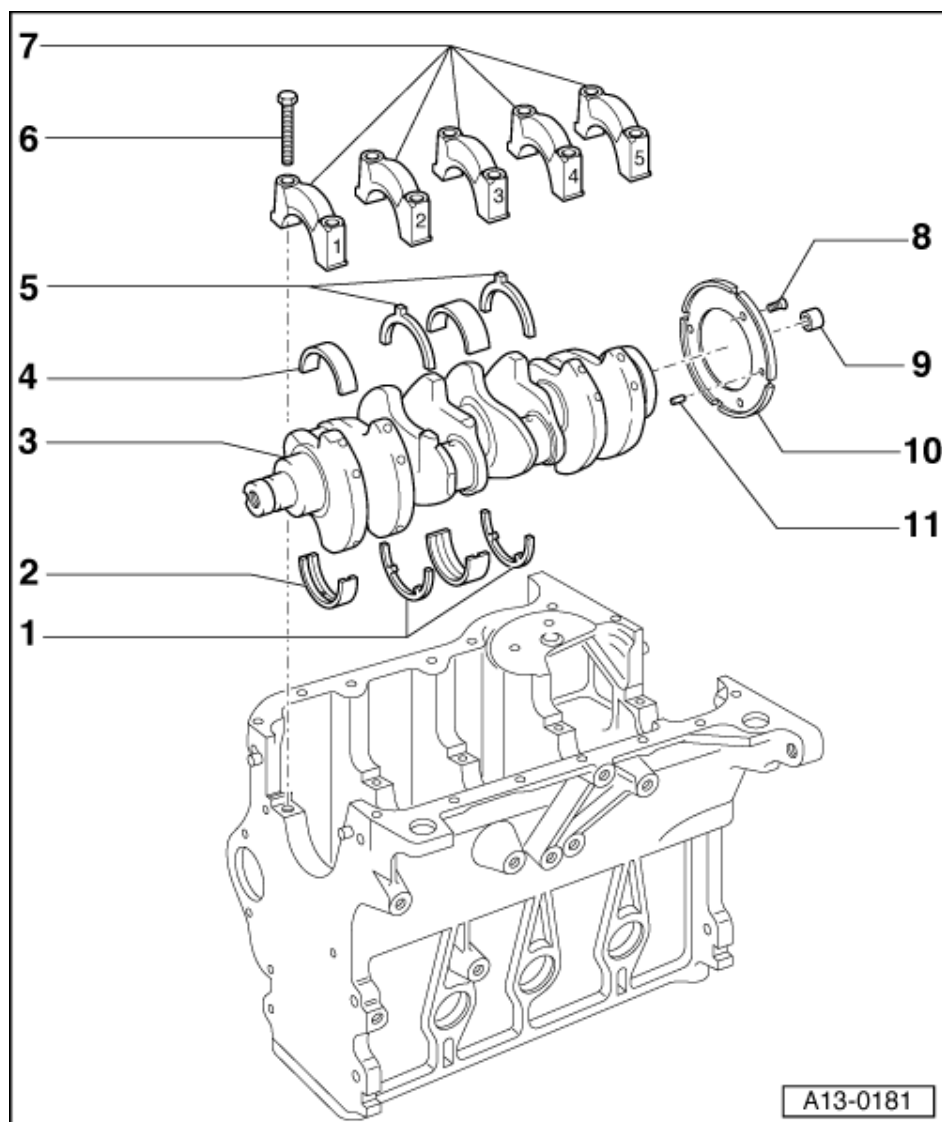
4 Bearing shell

- ♦ For bearing cap without oil groove
- ♦ Do not interchange used bearing shells (mark).

5 Thrust washers

- ♦ For bearing 3 bearing cap
- ♦ different versions for cylinder block and bearing cap
- ♦ Note fixing arrangement

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6 65 Nm + 1/4 turn (90°) further

- ◆ Replace
- ◆ When measuring radial clearance of crankshaft, tighten to 65 Nm but do not turn further.

7 Bearing cap

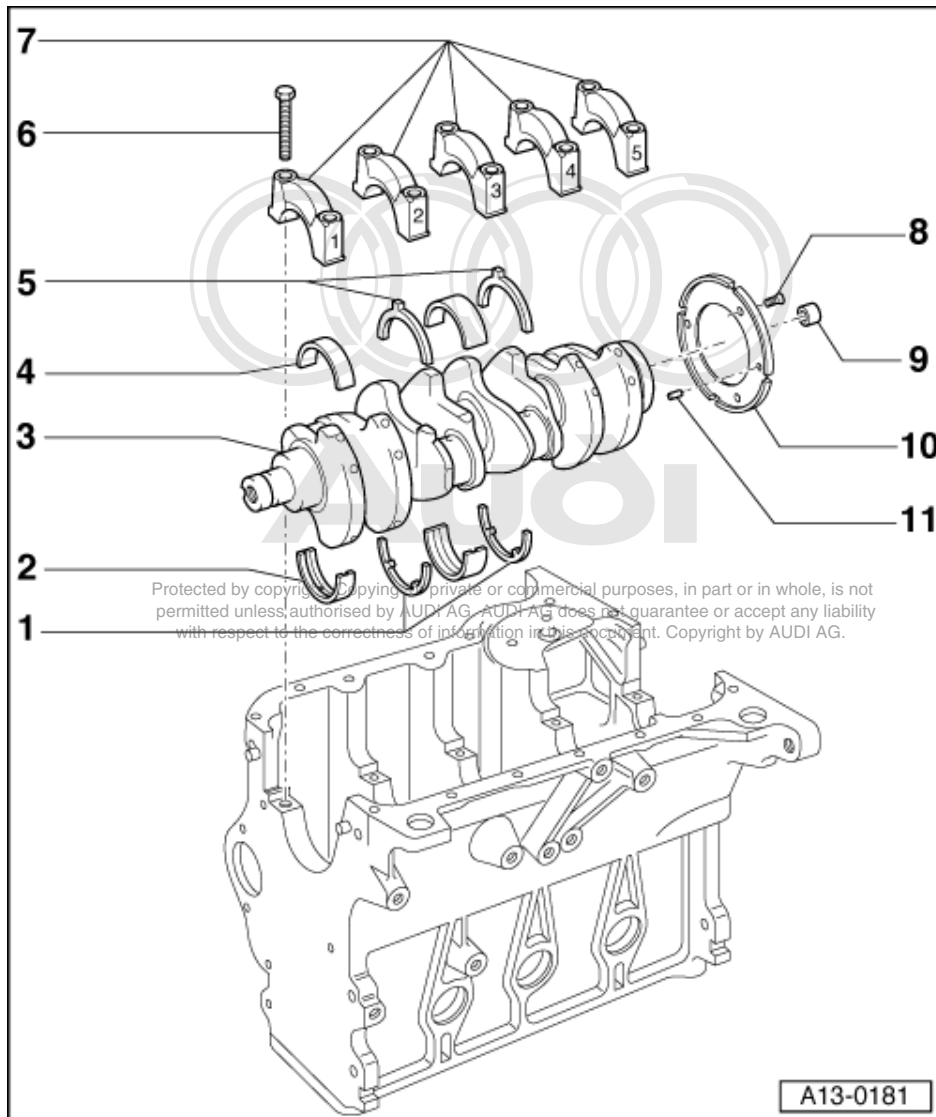
- ◆ Bearing cap 1: Pulley end
- ◆ Bearing cap 3 with recesses for thrust washers
- ◆ Bearing shell retaining lugs (cylinder block/bearing cap) must be on the same side.

8 10 Nm + 1/4 turn (90°) further

- ◆ Replace
- ◆ Always renew sender wheel if securing bolts have been unscrewed
=> Fig. 1



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9 Needle bearing

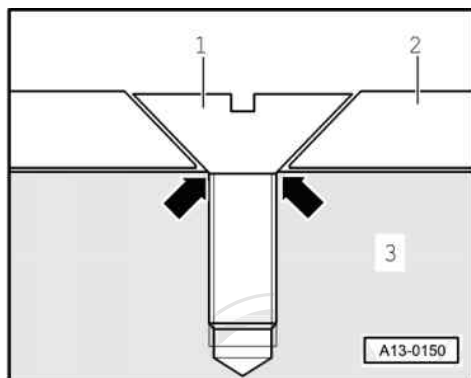
- ♦ Pulling out and driving in
=> Page 87

10 Sender wheel

- ♦ For sender for engine speed sender -G28
- ♦ Can only be installed in one position. Holes are off set
- ♦ Always renew sender wheel if securing bolts have been unscrewed.
- ♦ Removing and installing => Fig. 1

11 Fitted pin

- ♦ Check projection from crankshaft => Fig. 2



➔ Fig.1 Removing and installing sender wheel

- Always renew sender wheel -2- if securing bolts -1- have been unscrewed.

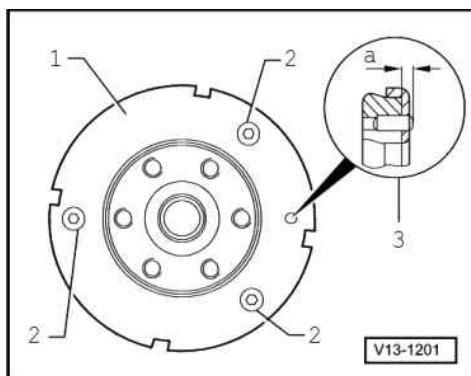
Notes:

- ♦ If the securing bolts are tightened a second time, the seats for the countersunk bolt heads in the sender wheel will be distorted to such an extent that the bolt heads will come into direct contact with the crankshaft -3- (-arrows-) and the sender wheel will only fit loosely under the bolts.
- ♦ The mounting holes are asymmetrically spaced, so it is only possible to install the sender wheel in one position.

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Tightening torque

Component	Nm
Sender wheel to crankshaft	10 + 90° 1)2)



- 1) Renew bolts
- 2) 90° corresponds to a quarter turn

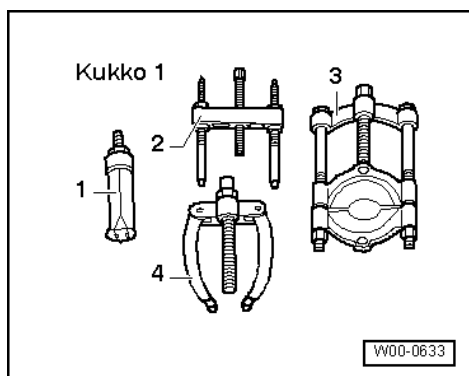
➔ Fig.2 Checking projection of fitted pin from crankshaft

Projection fitted pin -3- from crankshaft

- ♦ $a = 2.5 \dots 3.0 \text{ mm}$

3.2 - Removing and installing needle bearing in crankshaft

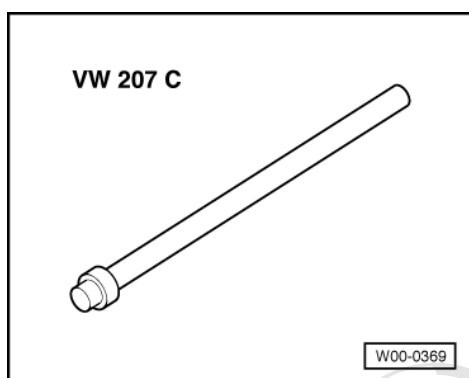
Notes:



- ♦ A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox. Install needle bearing if necessary.
- ♦ The needle bearing must not be fitted in the crankshaft on vehicles with automatic gearbox. Remove needle bearing if necessary.

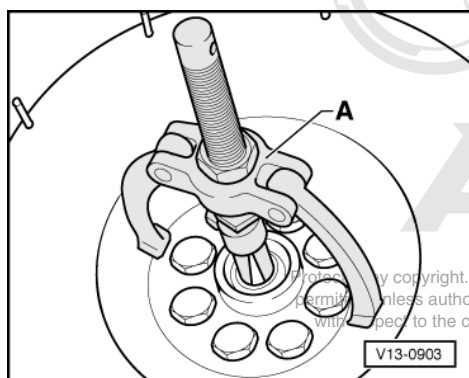
Special tools, testers and auxiliary equipment required

- ♦ Special tool Kukko 21/2 (Pos. 4) and Kukko 22/1 (Pos. 1)



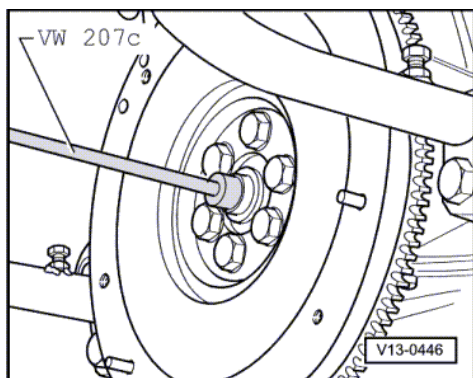
- ♦ Special tool VW 207 C

Removing

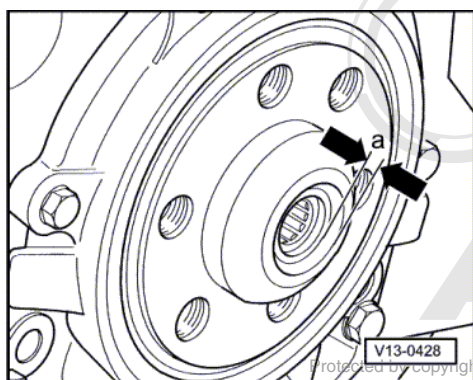


- -> Pull out using puller -A-, e.g. Kukko 21/2 and Kukko 22/1.

Installing



- -> Drive in using drift 207 C.
- Lettering on needle bearing must be visible when installed.



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-> Installation depth for needle bearing

- ♦ Distance a = 1.5 mm

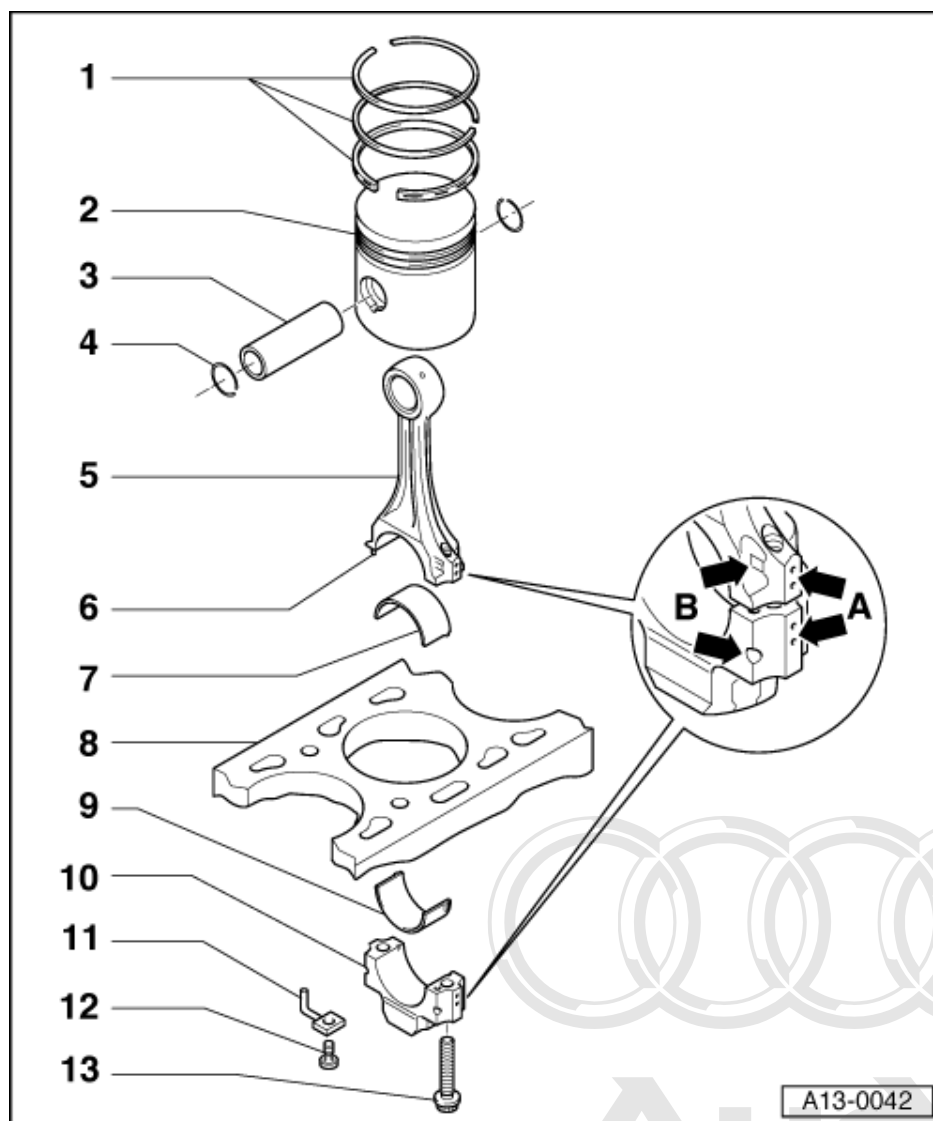
3.3 - Crankshaft dimensions

(in mm)

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

4 - Dismantling and assembling pistons and conrods

4.1 - Dismantling and assembling pistons and conrods



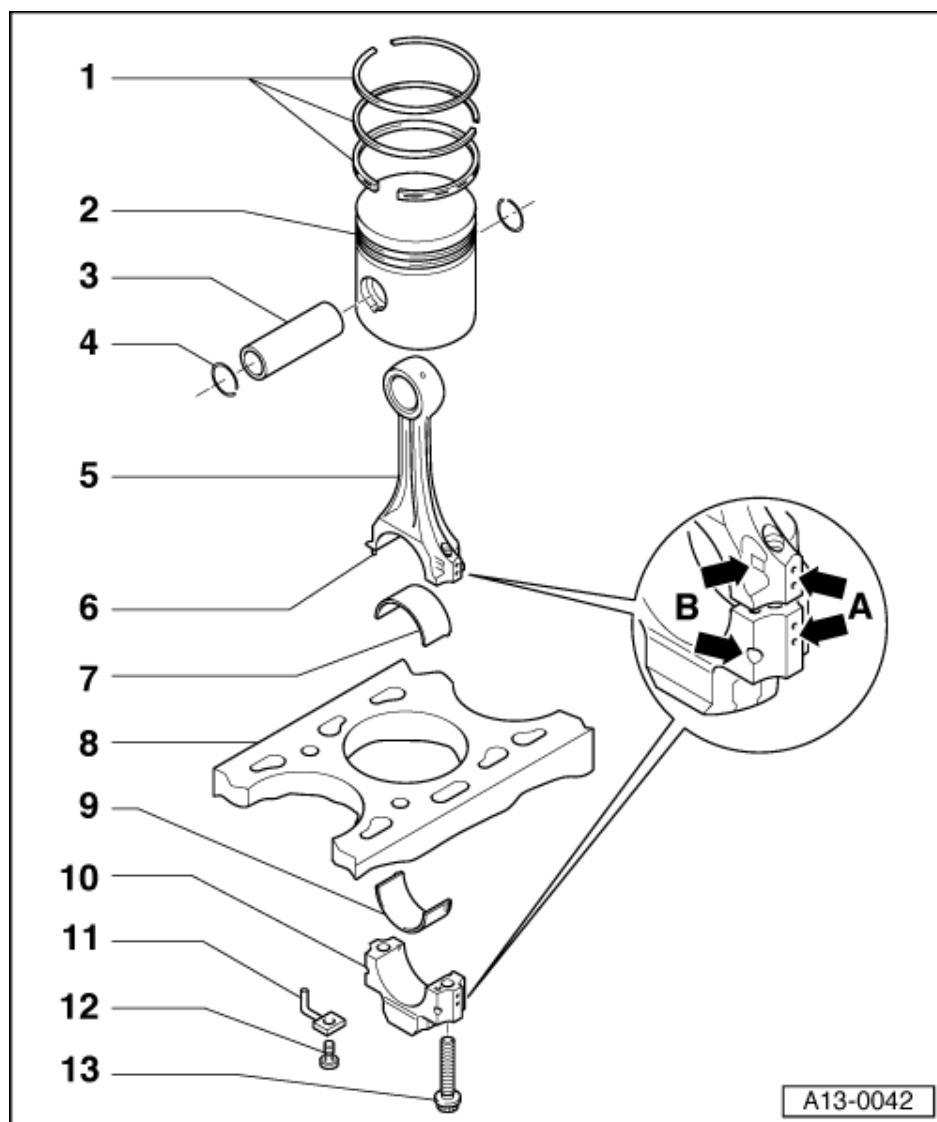
Note:

Following conrod versions are alternately installed:

- ♦ Conrod with fitted pin -Item 6 -. Conrod bolts without centring sleeves are used here.
- ♦ Conrod without fitted pin. Conrod bolts with centring sleeves are used here.

1 Piston rings

- ♦ Offset gaps by 120°
- ♦ Remove and install with piston ring pliers.
- ♦ "TOP" must face piston crown.
- ♦ Checking ring gap => Fig. 1
- ♦ Checking ring to groove clearance=> Fig. 2



2 Piston

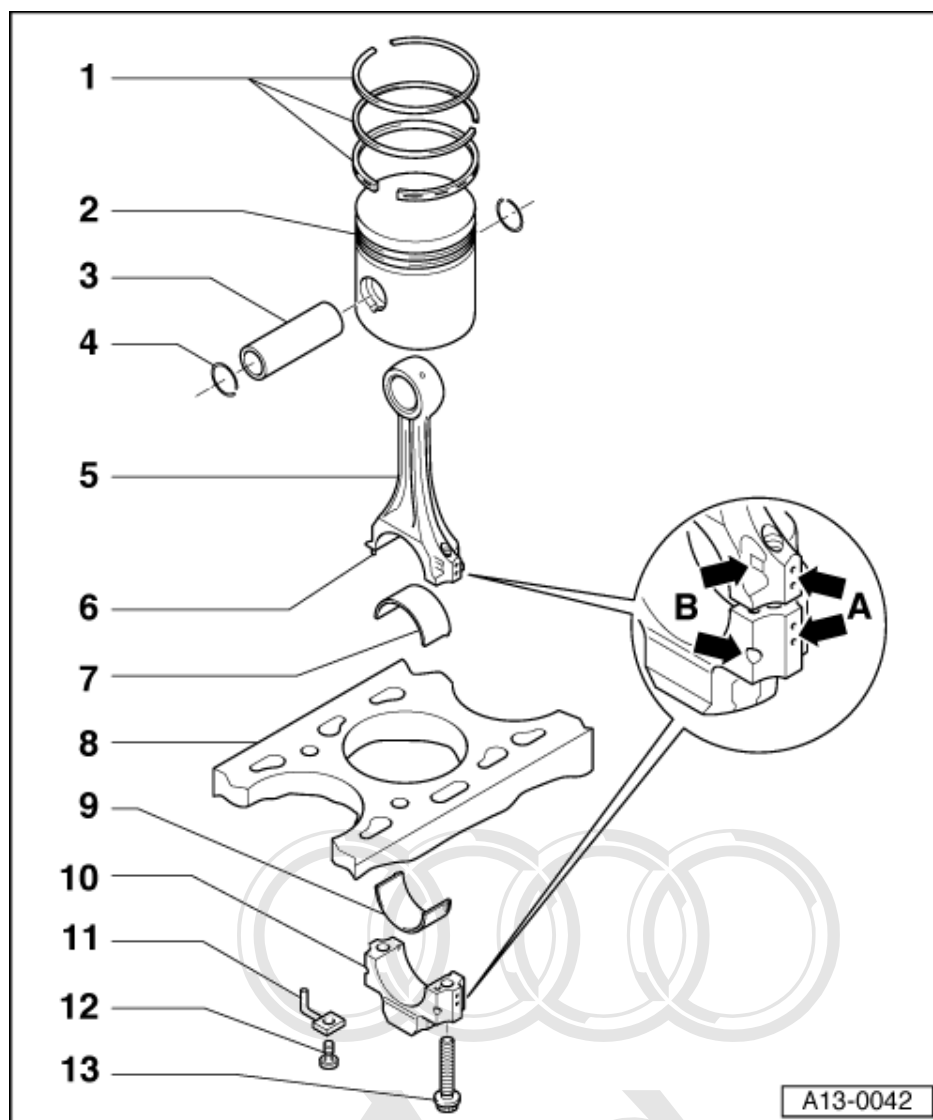
- ◆ With combustion chamber
- ◆ Mark installation position and cylinder number.
- ◆ Checking => Fig. 3
- ◆ Installation position and arrangement of piston/cylinder => Fig. 5
- ◆ If cracking is visible on piston skirt, replace piston
- ◆ Arrow on piston crown points to pulley end.
- ◆ Install using piston ring clamp.
- ◆ Checking piston projection at TDC =>Page 97
- ◆ Piston and cylinder dimensions
=>Page 99 .

3 Piston pin

- ◆ If difficult to remove, heat piston to approx. 60 °C.
- ◆ Remove and install with VW 222a

4 Circlip

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5 Conrod

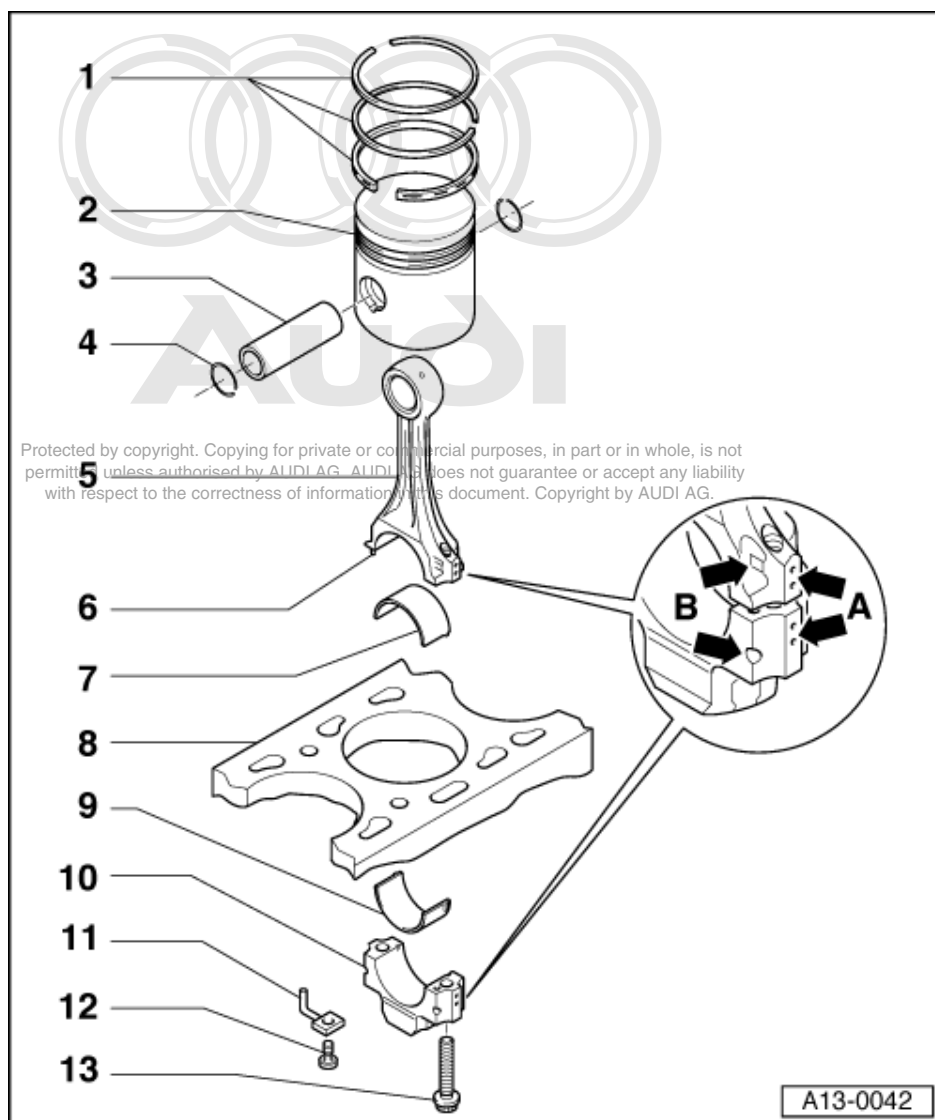
- ♦ See note
=>Page 89 .
- ♦ Only renew as a set.
- ♦ Mark cylinder number A.
- ♦ Installation position:
Markings -B- face towards pulley side

6 Fitted pin

- ♦ Must fit securely in conrod, not in conrod bearing cap

7 Bearing shell

- ♦ Note installation position
- ♦ Do not interchange used bearing shells (mark).
- ♦ Ensure retaining lugs fit tightly in recesses.
- ♦ Axial clearance:
Wear limit: 0.37 mm
- ♦ Check radial clearance with Plastigage:
Wear limit: 0.08 mm
Do not rotate crankshaft when checking radial clearance

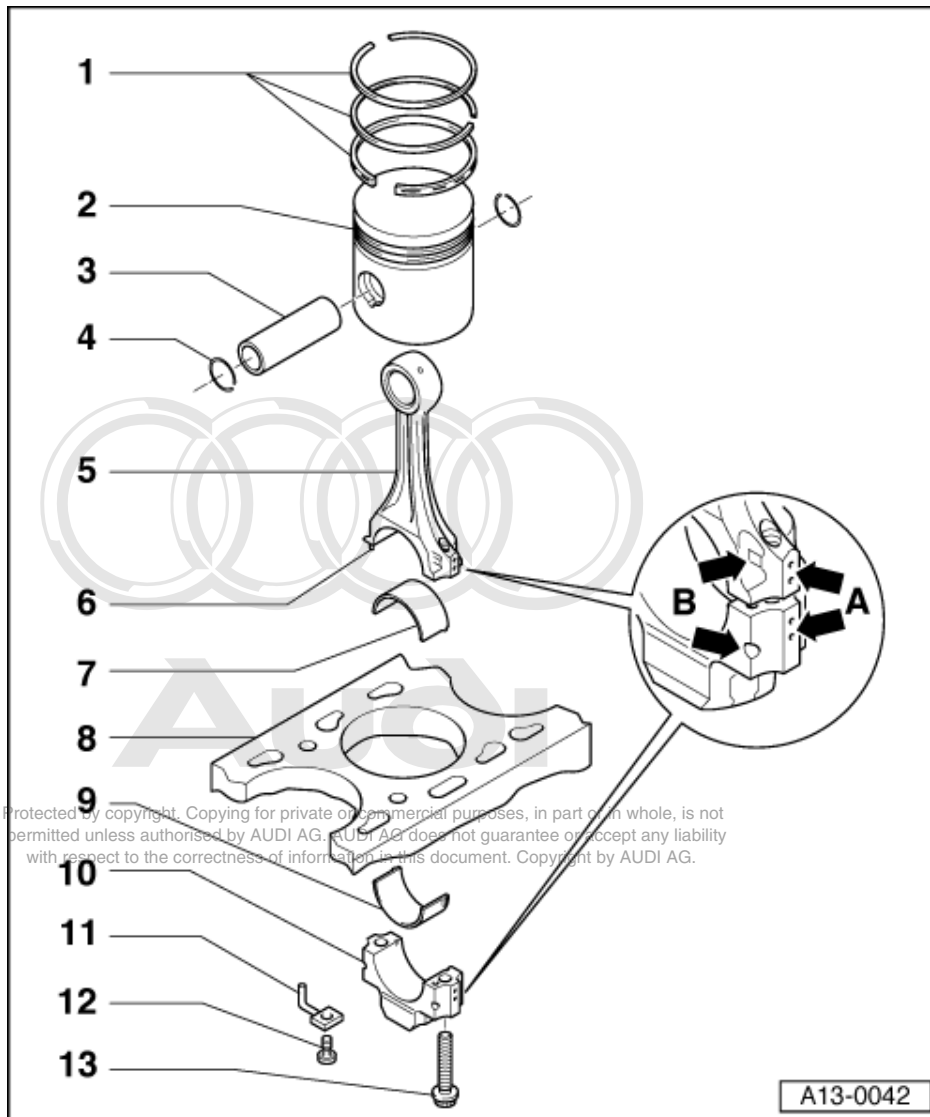


8 cylinder block

- ◆ Checking cylinder bore
=>Fig. 4
- ◆ Piston and cylinder dimensions
=>Page 99.

9 Bearing shell

- ◆ Note installation position
- ◆ Do not interchange used bearing shells (mark).
- ◆ Ensure retaining lugs fit tightly in recesses.
- ◆ Axial clearance
Wear limit: 0.37 mm
- ◆ Check radial clearance with Plastigage:
Wear limit: 0.08 mm
Do not rotate crankshaft when checking radial clearance



10 Conrod bearing cap

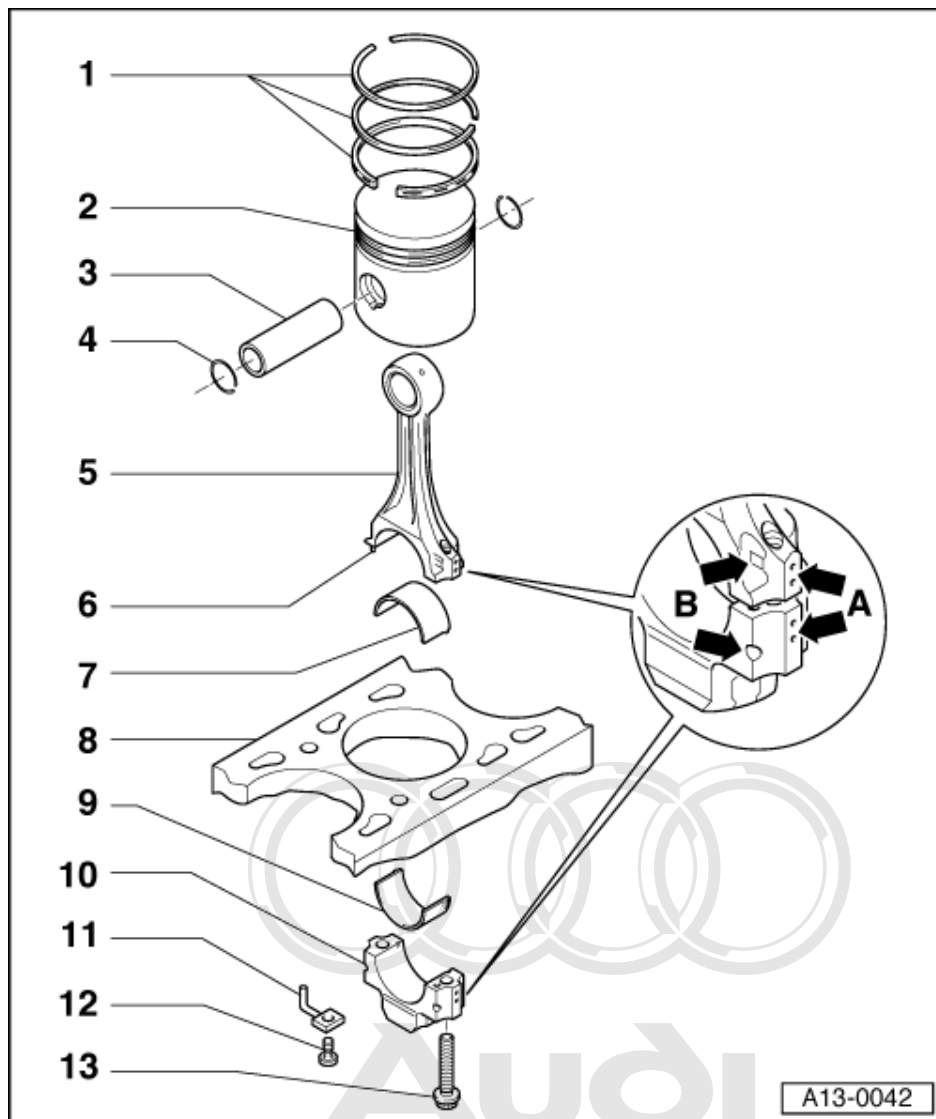
- ♦ Mark cylinder number -A-
- ♦ Installation position:
Markings -B- face towards pulley side

11 Oil spray jet

- ♦ For piston cooling
- ♦ Illustration shows: Version 07.96 ä (gradual introduction)
- ♦ Version ä 06.96
=> Fig. 6

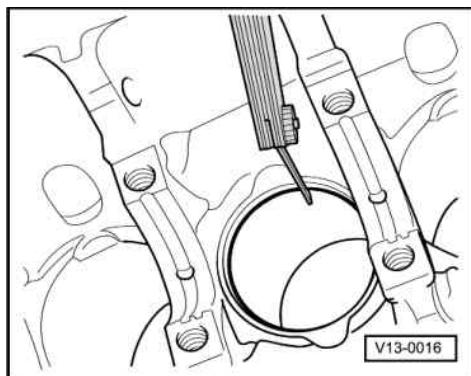
12 Pressure relief valve, 27 Nm

- ♦ Opens at:
1.3 ... 1.6 bar
- ♦ Insert without locking fluid
- ♦ Illustration shows: Version 07.96 ä (gradual introduction)
- ♦ Version ä 06.96
=> Fig. 6



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

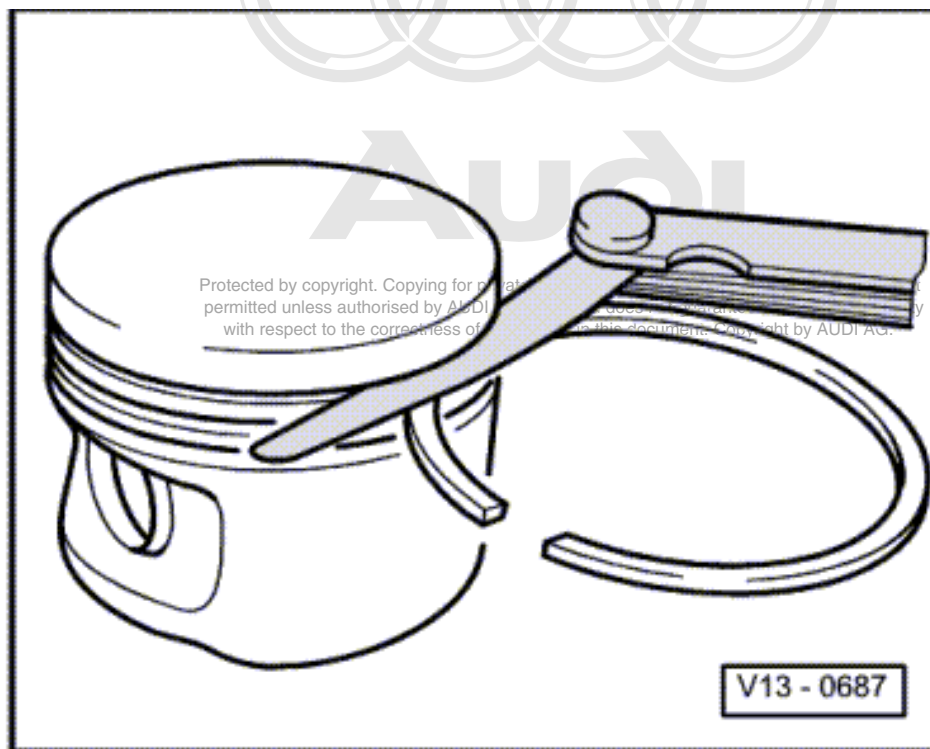
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- ◆ =>Page 89
- ◆ Replace
- ◆ Oil threads and contact surface
- ◆ Use original bolt to measure radial clearance



-> Fig.1 Checking piston ring gap

- Push ring squarely from above down into the lower cylinder aperture approx. 15 mm from the cylinder edge.

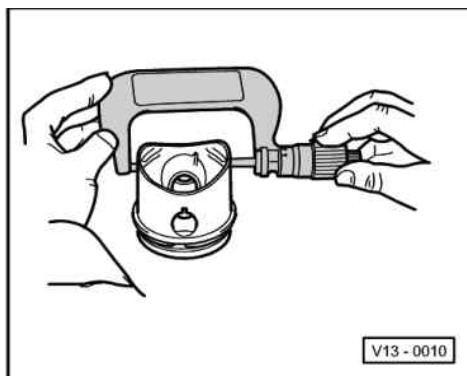
Piston ring Dimensions in mm	new	Wear limit
1st compression ring	0.20...0.40	1.0
2nd compression ring	0.20...0.40	1.0
Oil scraper ring	0.25...0.50	1.0



-> Fig.2 Checking ring to groove clearance

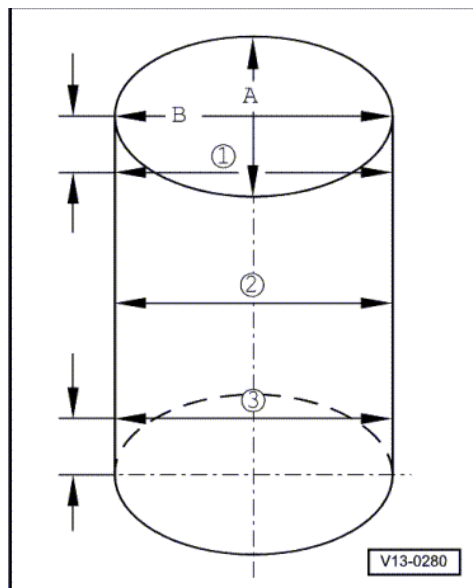
- Clean groove before checking clearance.

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



-> Fig.3 Checking piston

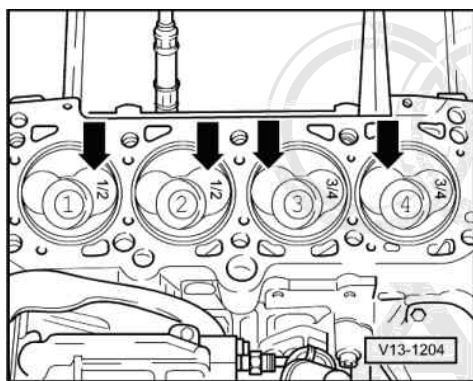
- Measure pistons approx. 10 mm from the lower edge of skirt, at 90° to the piston pin axis.
 - Permissible deviation from nominal dimension: no more than 0,04 mm.
 - Table of pistons-Ø =>Page 99



-> Fig.4 Checking cylinder bores.

Special tools, testers and auxiliary equipment required

- ♦ Use internal dial gauge 50...100 mm.
- Take measurements at 3 positions in both lateral direction -A- and longitudinal direction -B-.
 - Permissible deviation from nominal dimension: no more than 0,10 mm.



-> Fig.5 Piston installation position and arrangement of piston/cylinder

- Mark installation position and assignment on inside of piston (not on piston crown) using electronic pen or felt pen.

Pistons in cylinders 1 and 2:

Large valve relief for inlet valve to flywheel side -arrows-

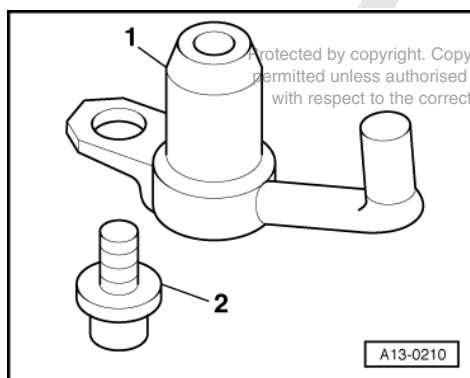
Pistons in cylinders 3 and 4:

Large valve relief for inlet valve to pulley side -arrows-

Note:

On new pistons cylinder numbers are stamped in colour on piston crown.

- ♦ Pistons for cylinders 1 and 2:
are marked 1/2
- ♦ Pistons for cylinders 3 and 4:
are marked 3/4

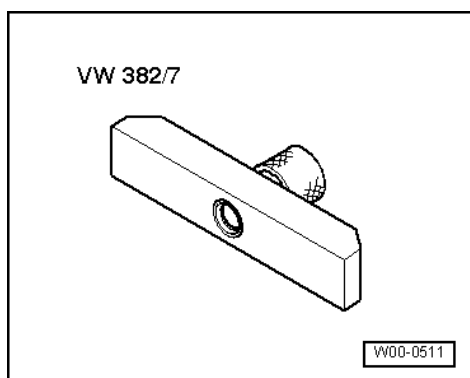


-> Fig.6 Oil spray jet and pressure relief valve

Version ä 06.96

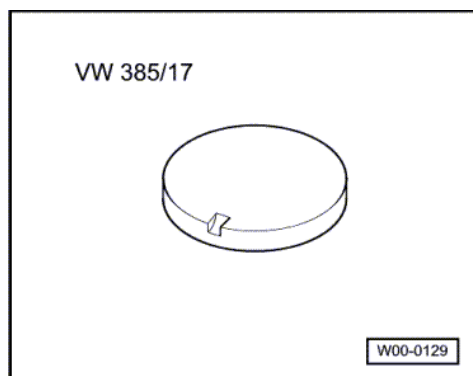
- 1 - Oil spray jet with pressure relief valve
Opening pressure 1.3 ... 1.6 bar
- 2 - Bolt - 7 Nm
- Insert with AMV 188 100 02

4.2 - Checking piston projection at TDC

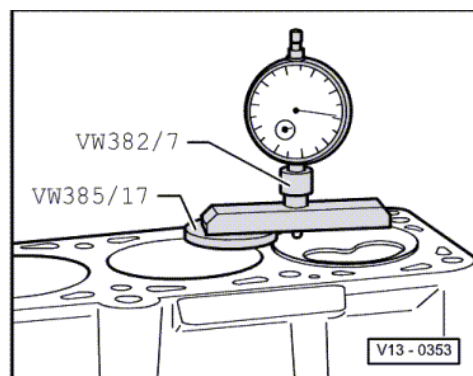


Special tools, testers and auxiliary equipment required

- ♦ Special tool VW 382/7



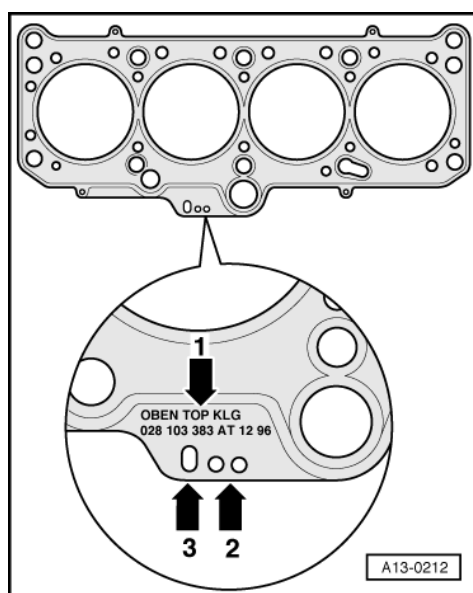
- ♦ Special tool VW 385/17



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-> 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:

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



-> Cylinder head gasket identification

- ◆ Part no. = arrow 1
- ◆ Holes = arrow 2
- ◆ Production control code = arrow 3 (can be disregarded!)

Note:

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

4.3 - Piston and cylinder dimensions

Honing dimension		Piston-ø	Cylinder bore-ø
Basic dimension	mm	79.47	79.51
1st undersize	mm	79.72	79.76
2nd undersize	mm	79.97	80.01

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15 - Cylinder head, Valve gear

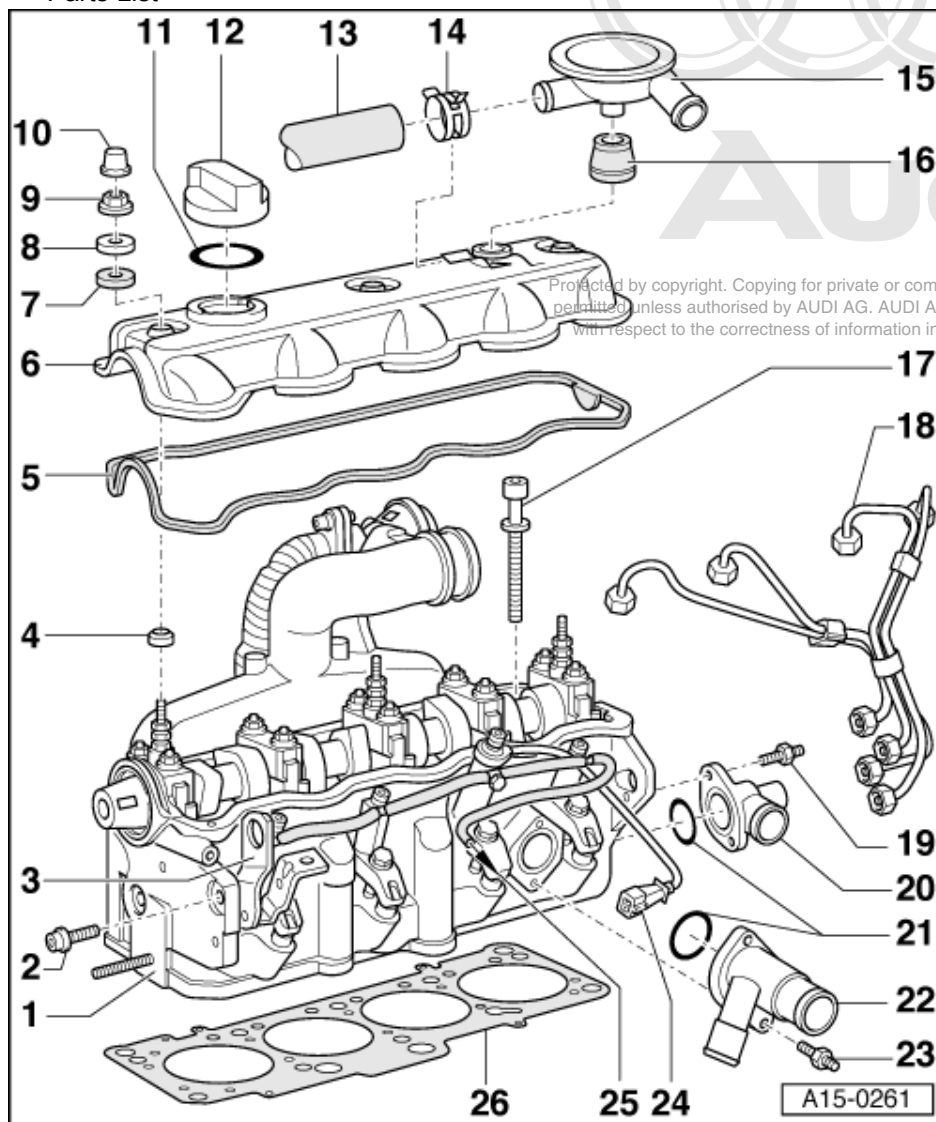
1 - Removing and installing cylinder head

1.1 - Removing and installing cylinder head

Notes:

- ♦ Cylinder heads with cracks between valve seats can still be used without a reduction of service life, if cracks are slight, max. 0.5 mm wide.
- ♦ When fitting a new cylinder head or cylinder head gasket, drain off all the old coolant and re-fill with new coolant.
- ♦ The cylinder head on a diesel engine must not be reworked.
- ♦ When installing an exchange cylinder head with fitted camshaft, the contact surfaces between tappets and cams must be oiled after installing the head.
- ♦ The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.
- ♦ Note current specifications when using sealant:

=> Parts List



1 cylinder head

- ♦ Removing => Page 109
- ♦ Check for distortion => Fig. 1
- ♦ Installing =>Page 117
- ♦ After replacing, fill with fresh coolant

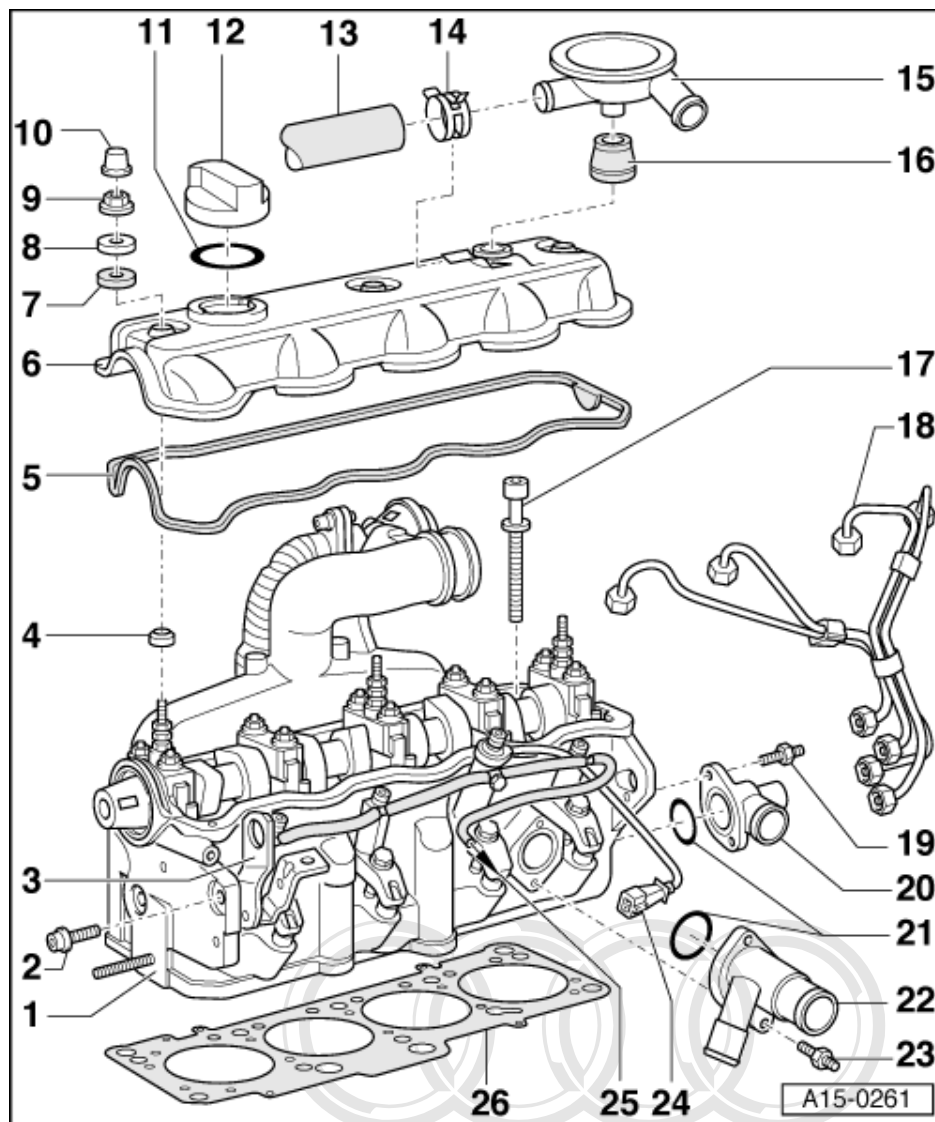
2 25 Nm

3 Lifting eye

4 Sealing cone, bottom

5 Cylinder head cover gasket

- ♦ Renew if damaged or leaking
- ♦ Before fitting gasket apply D454 300 A2 at sealing points => Fig. 3 and Fig. 4
- ♦ Insert lugs in holes on cylinder head



6 Cylinder head cover

- ♦ Removing and installing
=> Page 105

7 Sealing washer, top

- ♦ Replace, if damaged

8 Plate washer

9 10 Nm

10 Trim cap

11 Gasket

- ♦ Renew if damaged or leaking

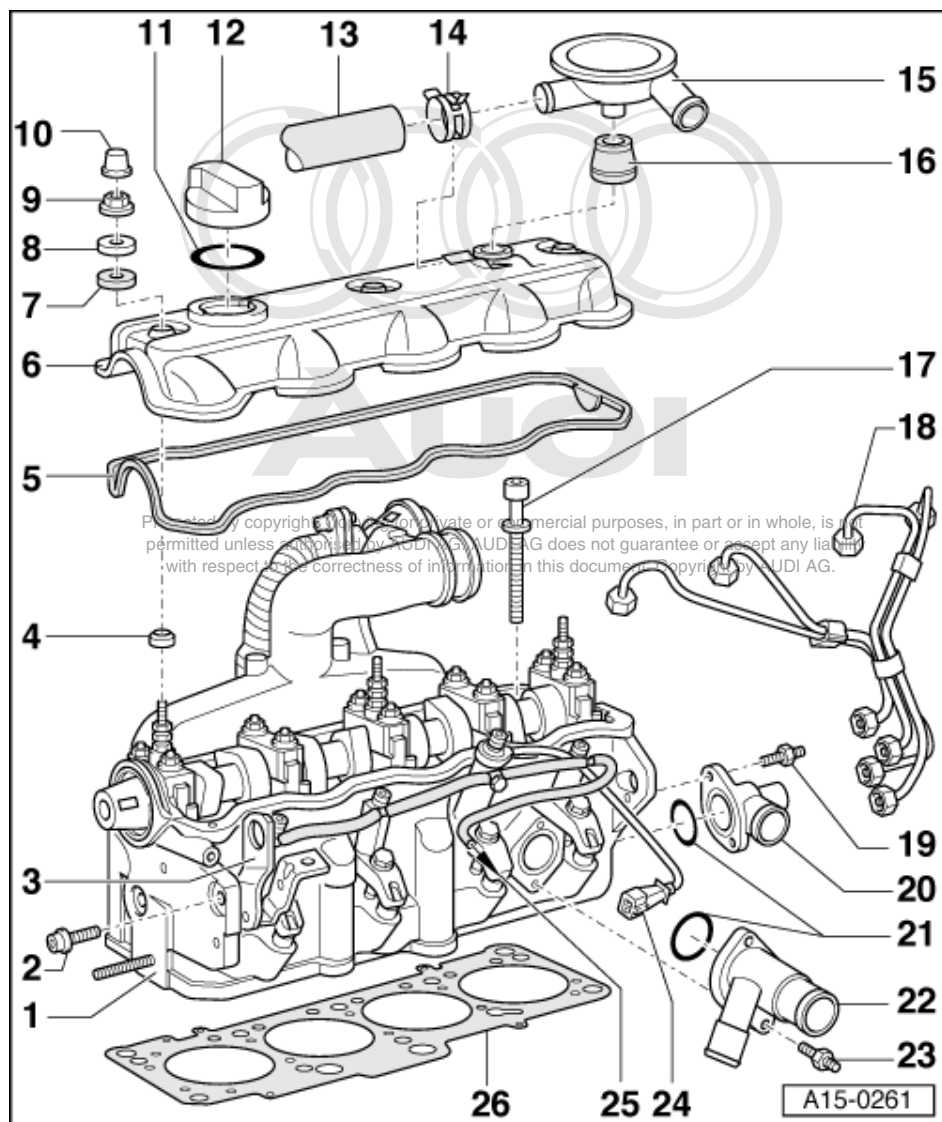
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12 Cap

13 Breather hose

14 Hose clamp

- ♦ Connect with hose to retainer tab of cylinder head cover



15 Pressure regulating valve

- ♦ For crankcase breather

16 Gasket

- ♦ Replace, if damaged

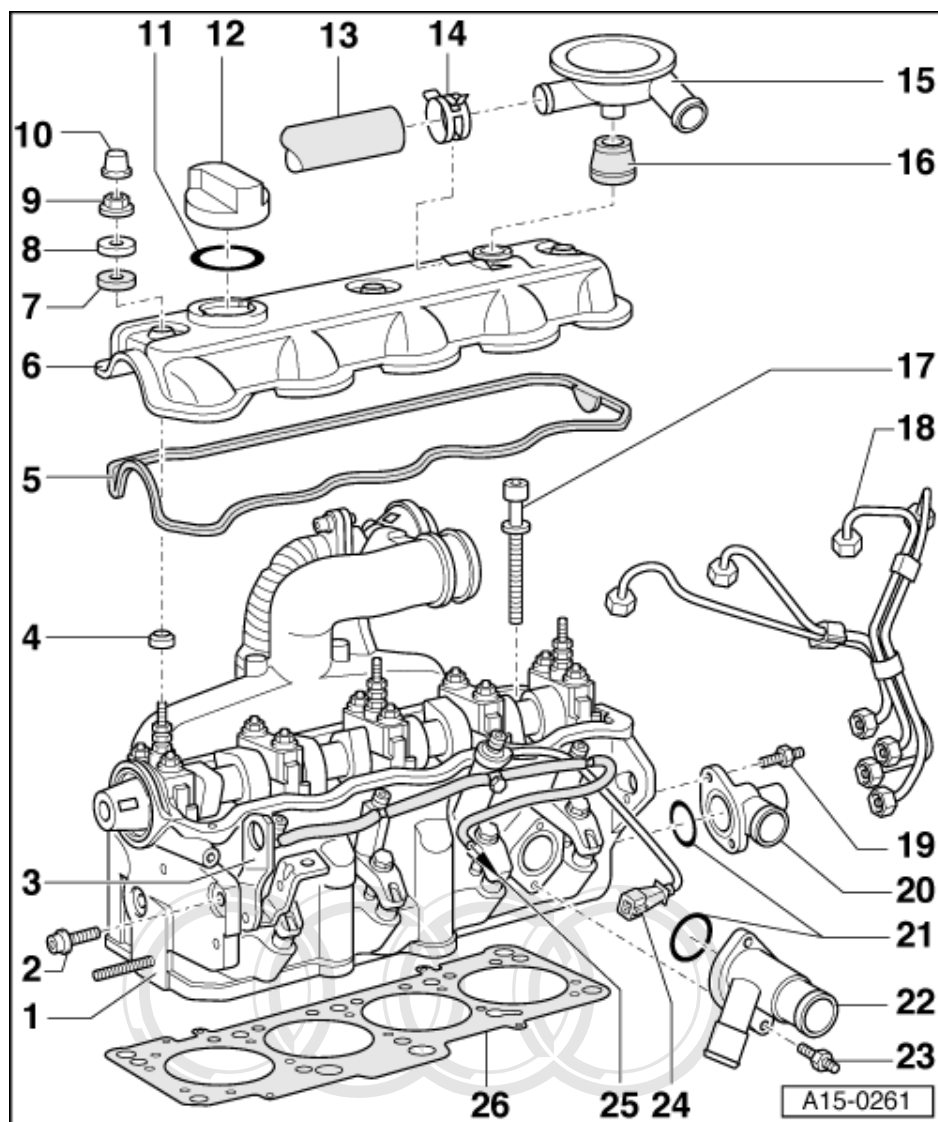
17 Cylinder head bolt

- ♦ Replace
- ♦ Note sequence when loosening => Page 117
- ♦ Note sequence when tightening => Page 119

18 Injector pipes

- ♦ Tighten to 25 Nm
- ♦ Remove with 3035
- ♦ Always remove pipework complete
- ♦ Do not alter shape

19 10 Nm



20 Coolant flange

- ♦ With coolant temperature sender

21 O-ring

- ♦ Replace

22 Coolant flange

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23 10 Nm

24 Connector

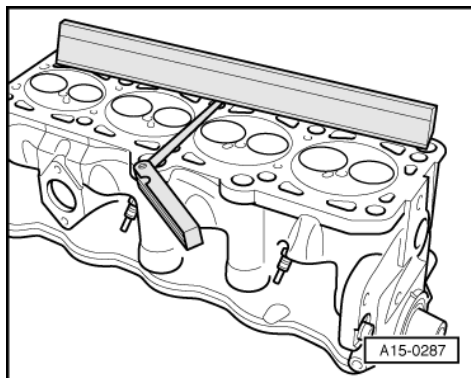
- ♦ For needle lift sender -G80

25 Return pipe

- ♦ To injection pump

26 Cylinder head gasket

- ♦ Renew => Removing cylinder head, Page 109 .
- ♦ Observe marking =>Fig. 2
- ♦ After replacing, fill with fresh coolant

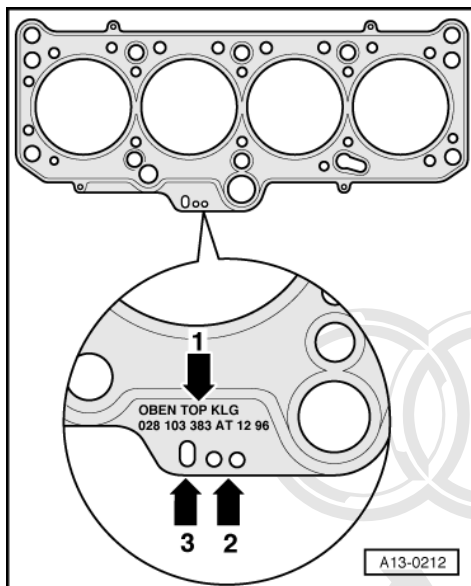


→ Fig.1 Check cylinder head for distortion.

- Use knife edge, straightedge and feeler gauge to measure at several points.
 - Max. permissible distortion: 0.1 mm

Note:

The cylinder head on a diesel engine must not be reworked.



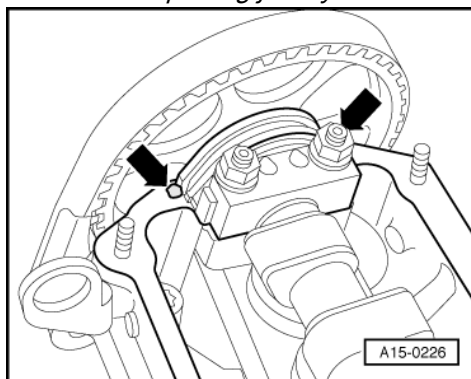
→ Fig.2 Cylinder head gasket identification

- ♦ Part no. = arrow 1
- ♦ Holes = arrow 2
- ♦ Production control code = arrow 3 (can be disregarded!)

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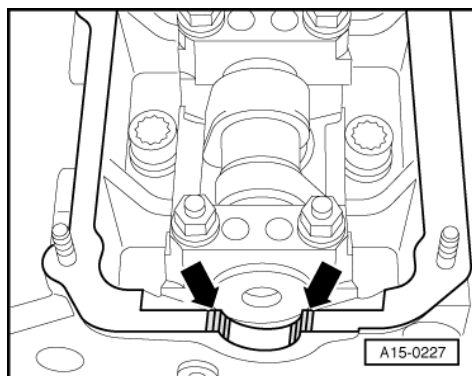
Note:

Cylinder head gaskets of different thickness are fitted depending on the amount of piston projection => Page 97. When replacing just cylinder head gasket, new gasket should be same size as old one.



-> Fig.3 Seal connections between bearing cap and cylinder head

- Carefully apply a small amount of sealant "D 454 A2" to both sides of sealing surfaces between bearing cap and cylinder head -arrows- using a small screwdriver.

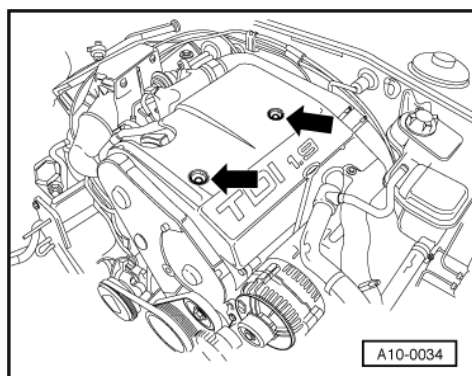


-> Fig.4 Seal connections

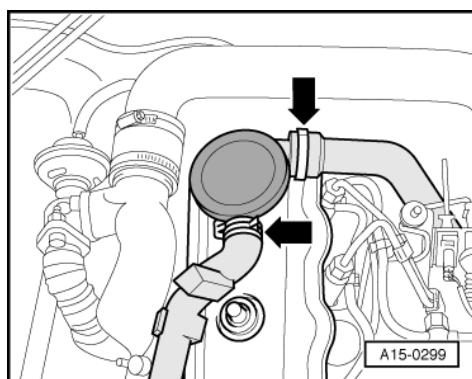
- Carefully apply a small amount of sealant "D 454 300 A2" to both sides of sealing surfaces -arrows- using a small screwdriver.

1.2 - Removing and installing cylinder head cover

Removing

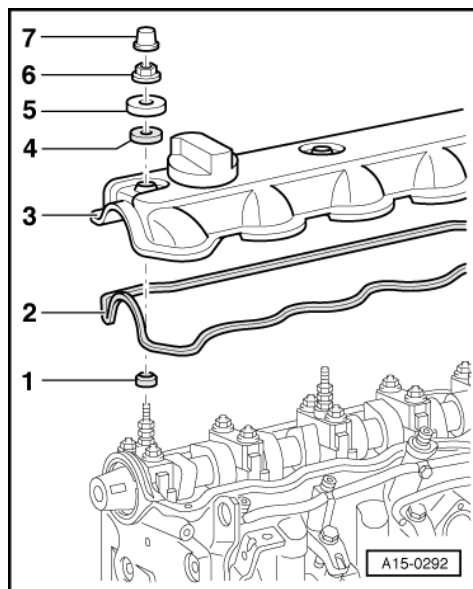


- -> Remove engine cover panel -arrows-.



- -> Loosen hose clips -arrows- and disconnect crankshaft breather hoses on pressure control valve.

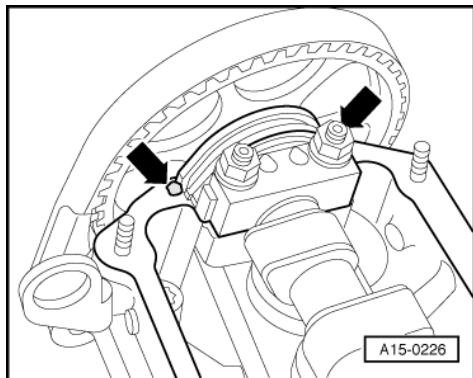
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- -> Pull off covers -7-.
- Loosen nuts -6- on cylinder head cover.
- Remove plate washer -5- and top sealing washer -4-.
- Remove cylinder head cover -3-.
- Detach gasket -2- and bottom sealing cone -1-.

Installing

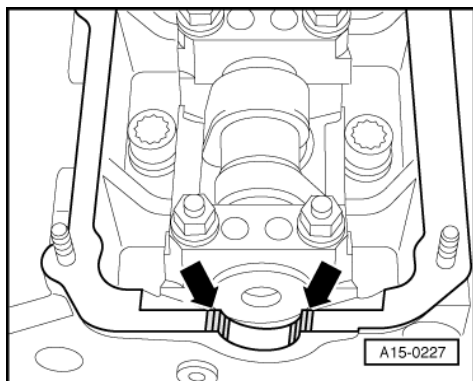
Installation is carried out in the reverse order, when doing this note the following:



Note:

Replace cylinder head cover gasket, top sealing washer and sealing cone if damaged.

- -> Carefully apply a small amount of sealant "D 454 A2" to both sides of sealing surfaces between bearing cap and cylinder head -arrows- using a small screwdriver.



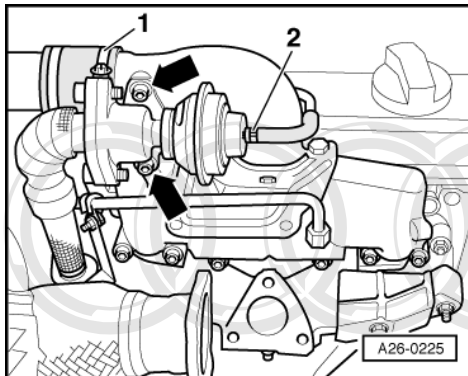
- -> Carefully apply a small amount of sealant "D 454 300 A2" to both sides of sealing surfaces -arrows- using a small screwdriver.
- Fit cylinder head cover with parts.

Tightening torque

Component	Nm
Cylinder head cover to cylinder head	10

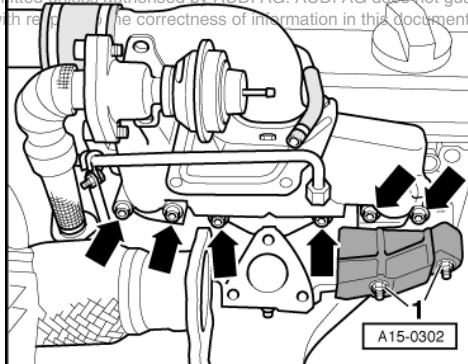
1.3 - Removing and installing intake pipe, engine codes 1Z, AFF, AHU

Removing



- Remove turbocharger=> Page 209 .
- -> Loosen hose clamp -1-.
- Pull off hose -2-.
- Remove bolts -arrows-.

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- -> Remove nuts -1- and detach heat shield.
- Remove bolts -arrows-.
- Take off intake pipe.

Installing

Install in reverse order.

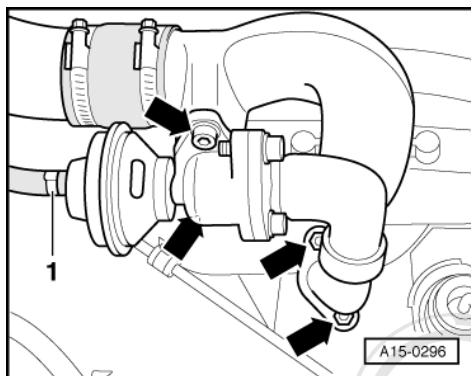
Tightening torques

Component	Nm
Intake pipe to cylinder head	25
Heat shield to exhaust manifold	25

Component	Nm
Mechanical exhaust gas recirculation valve to intake pipe	25

1.4 - Removing and installing intake pipe, engine codes AFN, AHH

Removing

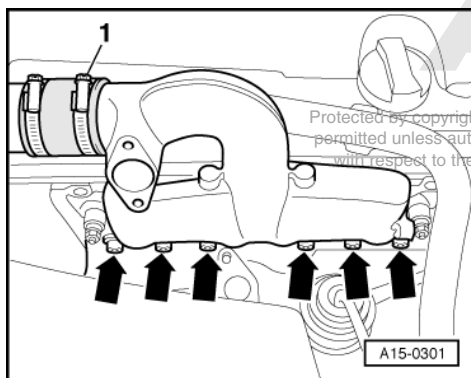


- -> Remove pipe for exhaust gas recirculation and mechanical exhaust gas recirculation valve -arrows-.

Note:

Hose -1- can remain connected.

- Place pipe and valve clear to one side.



- -> Loosen hose clamp -1-.
- Unscrew oil supply pipe bracket from exhaust manifold and clamp and move bracket clear to one side.
- Remove bolts -arrows-.
- Take off intake pipe.

Installing

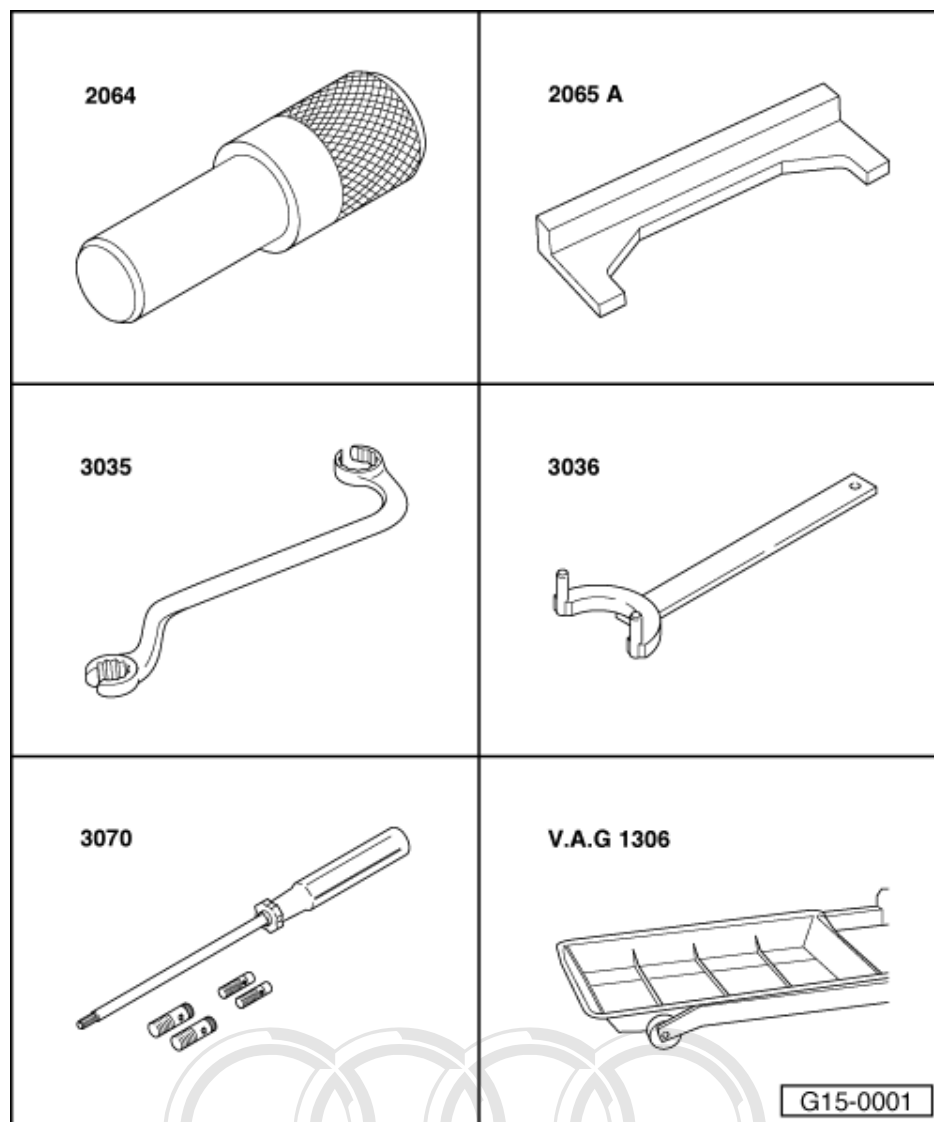
Install in reverse order.

Tightening torques

Component	Nm
Intake pipe to cylinder head	25
Exhaust gas recirculation pipe to exhaust manifold	25

Component	Nm
Mechanical exhaust gas recirculation valve to intake pipe	25
Oil supply pipe bracket to exhaust manifold	25

1.5 - Removing cylinder head



Special tools, testers and auxiliary items required

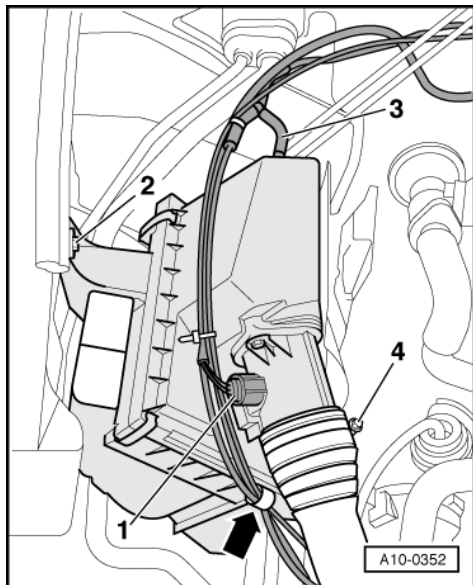
- ◆ Special tool 2064
- ◆ Special tool 2065 A
- ◆ Special tool 3035
- ◆ Special tool 3036
- ◆ Special tool 3070
- ◆ V.A.G 1306

- Engine in vehicle
- Lock carrier must be in service position => Page 24

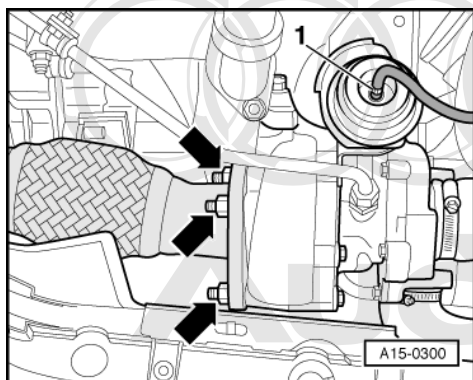
Note:

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

- Observe or obtain radio code on vehicles with coded radio.
- Disconnect earthing strap at battery with ignition switched off.



- -> Disconnect hose -3- from air cleaner housing.
- Unplug connector -1- at air mass meter.
- Remove wiring harness from air cleaner housing -arrow-.
- Remove air intake hose -4-.
- Unscrew bolt -2-.
- Take off air cleaner housing.



- -> Disconnect hose 1- at pressure unit/vacuum unit for boost pressure control.
- Unscrew turbocharger/catalytic converter securing bolts -arrows-.

Note:

Shown in illustration with engine code AFN/AHH.

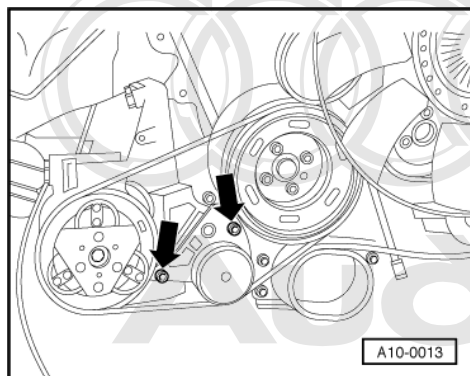
- Release front clamps for exhaust system.
- Push clamping sleeve towards the rear.
- Pull front exhaust pipe with catalytic converter off turbocharger.

Note:

The isolating element in exhaust system must not be bent more than 10° to avoid damage.

Vehicles with air conditioner:

Note:



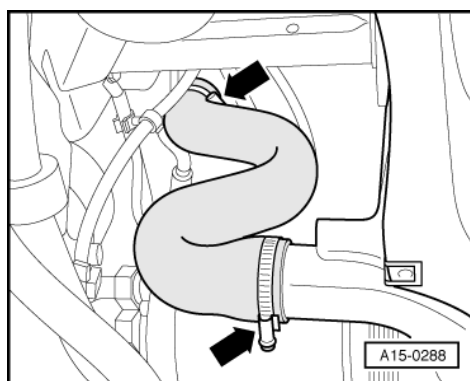
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Mark direction of rotation of belt with chalk or felt pen before removing ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage.

- -> Loosen bolts securing ribbed belt tensioner for A/C compressor -arrows-. Slacken belt and remove.
- Detach A/C compressor from bracket and secure to body with wire.

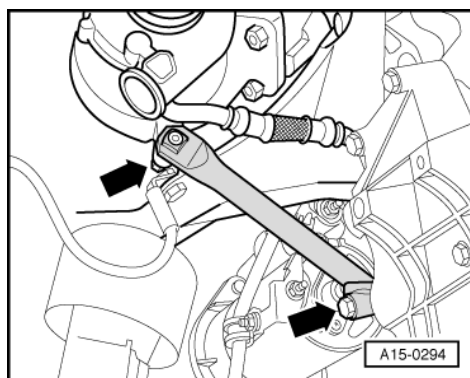
Important:

The air conditioner refrigerant circuit must not be opened.

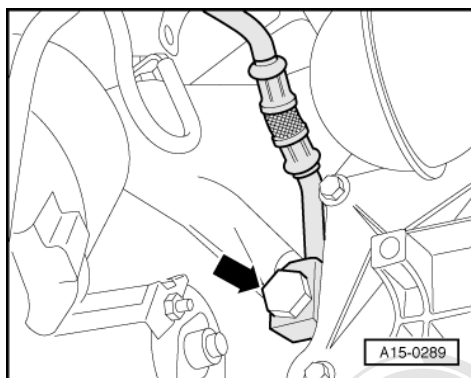


All models:

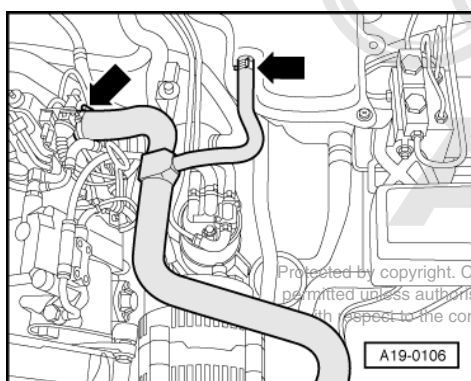
- -> Remove right air intake hose -arrows-.



- -> If fitted, remove bracket for turbocharger -arrows-.



- -> Remove oil return pipe from cylinder block -arrows-.
- Drain coolant => Page 165 .

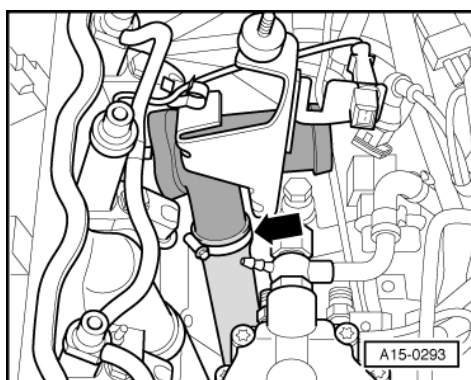


- -> Remove left coolant hose from cylinder head and expansion tank -arrows- and move clear to one side.
- Remove injector pipes.

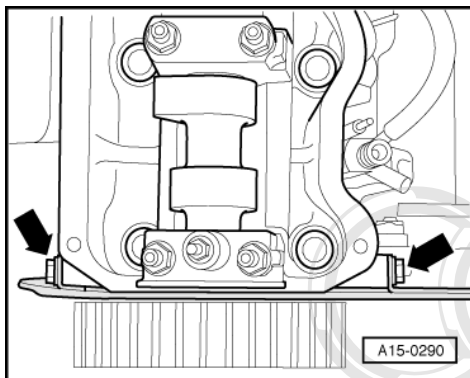
Note:

Always complete remove pipe set. Use wrench 3035 for injector pipes.

- Pull connectors off glow plugs.

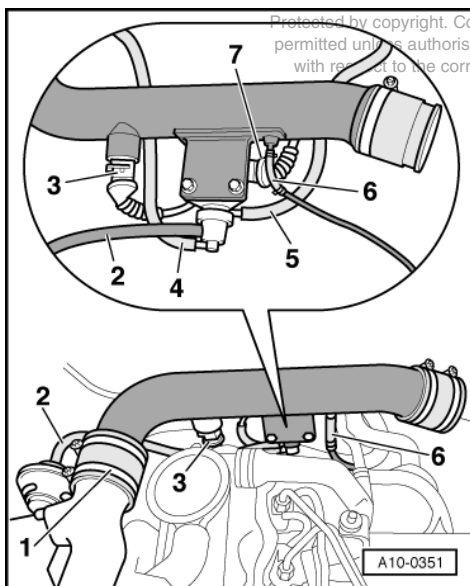


- -> Remove coolant hose -arrow- at bottom left of cylinder head.



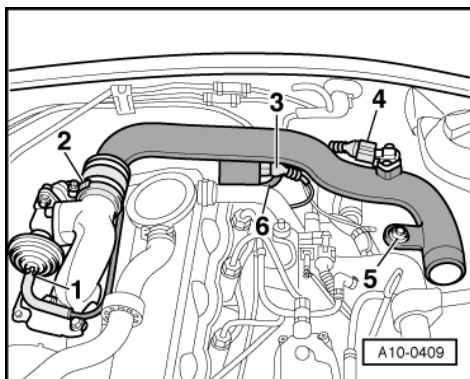
- Remove toothed belt => Page 41
- Remove viscous fan (with belt pulley) => Page 35 .
- Install ribbed belt tensioner => Page 30 .
- Remove upper toothed belt guard => Page 47 .
- -> Unscrew 2 bolts -arrow- for rear toothed belt guard on both sides of cylinder head.

Vehicles ä 06.97:



- -> Remove rear air duct pipe:
 - Unfasten hose clip -1-.
 - Detach hose -2-.
 - Disconnect connector -3-.
 - Detach hoses -4-, -5- and -6-.
 - Disconnect connector -7-.

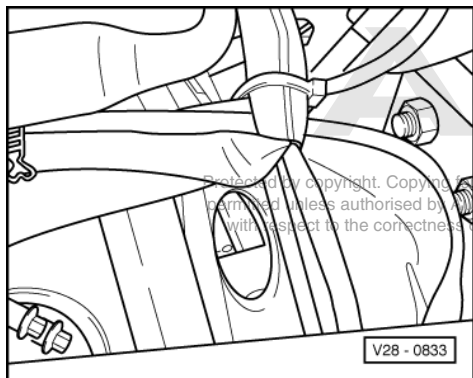
Vehicles 07.97 ä:



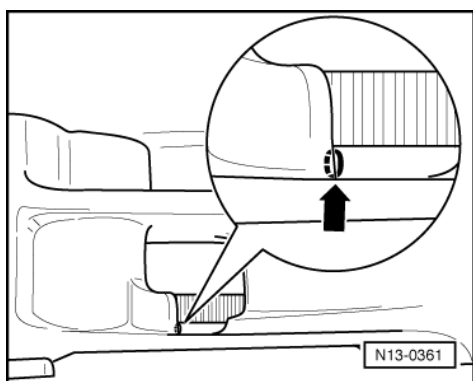


- -> Remove rear air duct pipe:
 - Detach hose -1-.
 - Unfasten hose clip -2-.
 - Disconnect connectors -3- and -4-.
 - Remove bolt -5-.
 - Detach hose -6-.

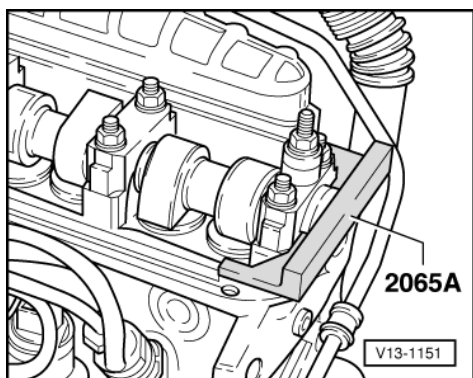
All models:



- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with manual gearbox).

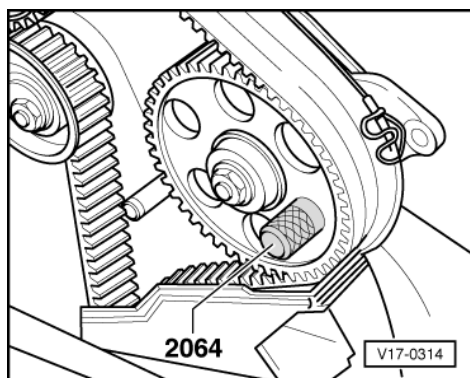


- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with automatic gearbox).
- Remove cylinder head cover => Page 105 .



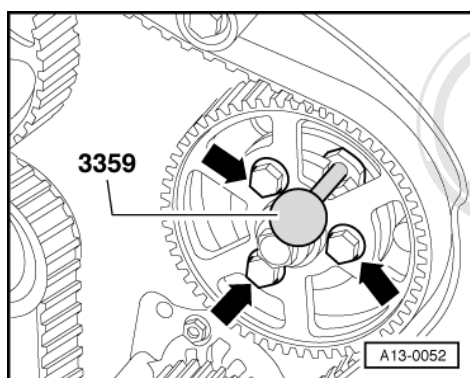
- -> Lock camshaft with setting bar 2065 A.
- Align setting bar as follows:
Turn arrested camshaft so that one end of setting bar contacts cylinder head. Measure the gap at other end of setting bar using a feeler gauge. Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until setting bar contacts feeler gauge. Insert a 2nd feeler gauge of same thickness at other end, between setting bar and the cylinder head.

Vehicles with engine codes 1Z, AFF, AFN, AHU:



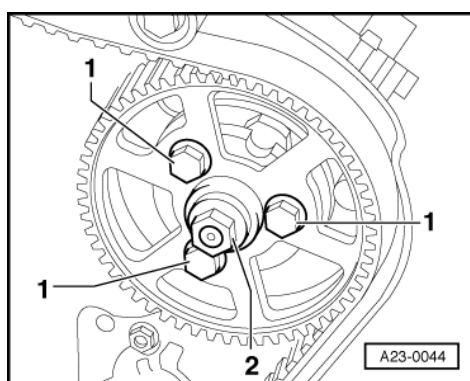
- -> Lock injection pump sprocket with setting pin 2064.

Vehicles with engine code AHH:



- -> Lock injection pump sprocket with setting pin 3359.
 - Remove securing bolts -arrows- of injection pump sprocket.
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Note:



-> Do not loosen central nut -2- of injection pump sprocket. Otherwise the injection pump basic setting is mal-adjusted and can no longer be corrected using workshop tools.

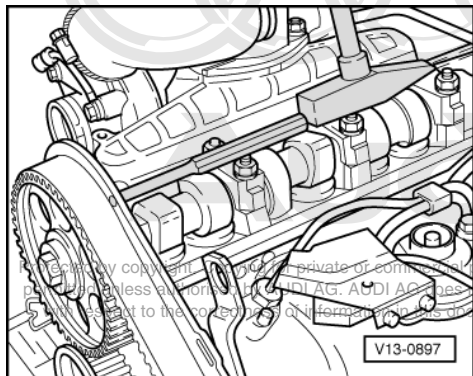
All models:

- Mark direction of rotation of belt with chalk or felt pen.
- Remove tensioner.
- Remove idler wheel.
- Take toothed belt off camshaft sprocket.



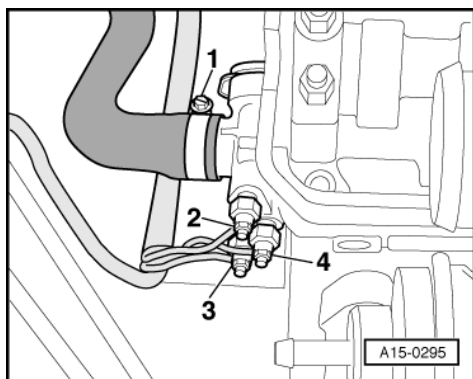
- Remove toothed belt tensioner.

Note:

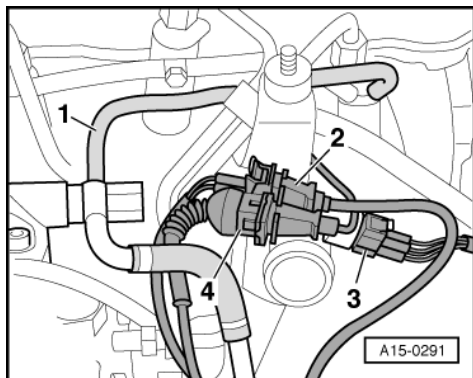


Never use setting bar to counterhold when loosening and tightening camshaft sprocket. Counterhold with 3036.

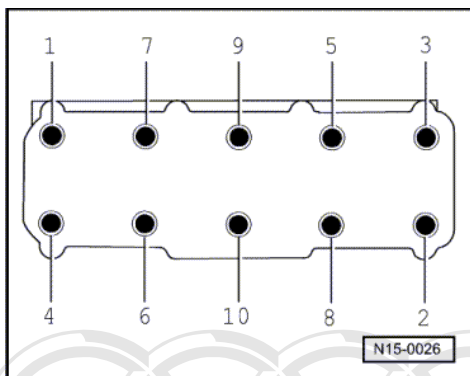
- -> Loosen securing bolt of camshaft sprocket by 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through hole of rear toothed belt guard).
- Remove camshaft toothed belt sprocket.



- Remove oil supply pipe for turbocharger.
- -> Remove coolant hose -1- at rear of cylinder head.
- Remove electrical wiring -2 ... 4- on heating elements of additional heater.



- -> Remove injector/injection pump return hose -1-.
- Unplug connectors -2 ... 4-.



- -> Maintain sequence when loosening and tightening cylinder head bolts.
- Slightly lift cylinder head with 2nd mechanic and swivel to rear.

1.6 - Installing cylinder head

Notes:

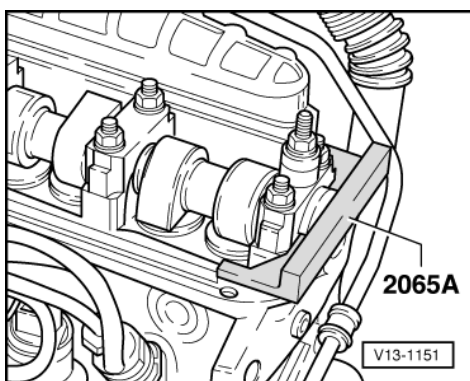
- ◆ Replace the cylinder head bolts.
- ◆ When performing repairs, replace seals, gaskets, self-locking nuts and stretch bolts which have a specified tightening angle.
- ◆ **Secure all hose connections with the correct hose clips (same as original equipment):**

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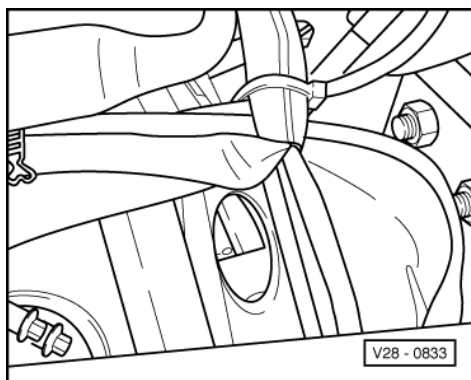
=> Parts List

- ◆ If repairing, carefully remove any remains of gasket material from the cylinder head and cylinder block. Make sure that no long scores or scratches are made on the surfaces.
- ◆ Carefully remove any remaining emery and abrasive material.
- ◆ Remove new cylinder head gasket from packaging, just before installation.
- ◆ Handle gasket extremely carefully. Damaging the silicone layer or the indented area will lead to leaks.
- ◆ No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder head.
- ◆ 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.

Installation is carried out in the reverse order, when doing this note the following:



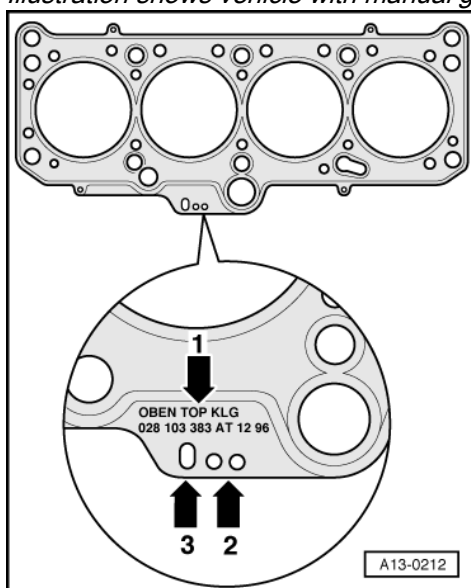
- -> Before positioning cylinder head, set crankshaft and camshaft to TDC of No. 1 cylinder. It must be possible to insert setting bar 2065 A into camshaft...



- -> ... and TDC marking must be on reference edge.

Note:

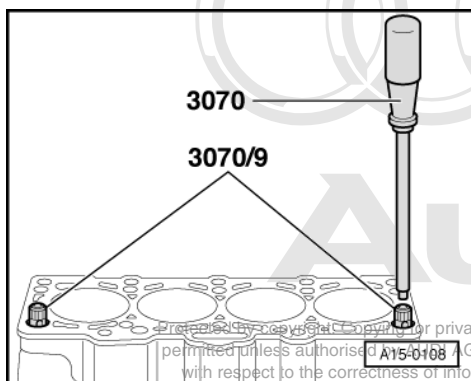
Illustration shows vehicle with manual gearbox.



- -> Note identification markings on cylinder head gasket.
- Part no. = arrow 1
- Holes = arrow 2
- Production control code = arrow 3 (can be disregarded!)

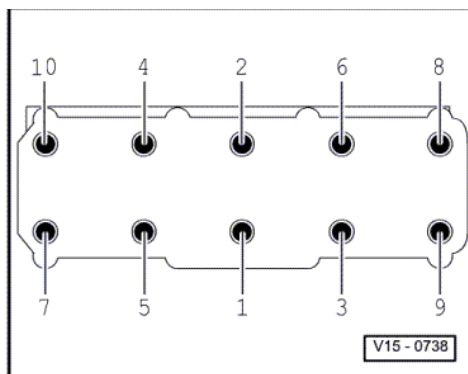
Notes:

- ♦ If the cylinder head gasket or the cylinder head has been replaced, select a new gasket according to the number of holes on the old gasket.
- ♦ If parts of the crankshaft drive have been replaced, the new cylinder head gasket must be selected by measuring the piston projection at TDC => Page 97 .



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- -> To centralise, screw guide pins 3070/9 from 3070 into outer holes in cylinder block.
- Place cylinder head gasket in position.
 - Note centring sleeve in cylinder block.
 - Check installation position of cylinder head gasket: mark "top" or the part No. must face cylinder head.
- Place cylinder head on.
- Fit 8 cylinder head bolts and tighten by hand.
- Unscrew guide pins with removal tool from 3070 through bolt holes in cylinder head and install remaining cylinder head bolts.



- -> Tighten cylinder head bolts in four stages in sequence shown as follows:
- Tighten using torque wrench:
 - 1. Stage 1: 40 Nm
 - 2. Stage 1: 60 Nm
- Tighten with rigid wrench:
 - 3. Stage 1: 90° (1/4 turn) further
 - 4. Stage 1: 90° (1/4 turn) further

Note:

It is not necessary to retighten cylinder head bolts after repairs have been performed.

- Installing toothed belt (adjust valve timing) with engine codes 1Z, AFF, AFN, AHU => Page 65.

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Note:

Observe all instructions on removing and installing the toothed belt =>Page 55 onwards.

- Install cylinder head cover => Page 106.
- Install ribbed belt =>Page 41.
- Stress-free alignment of exhaust system => Page 243.
- Replace coolant => Page 167.
- After connecting battery, enter anti theft code for radio.

=> Radio operating instructions

- Close windows fully using electric window switches.
- Then actuate all electric window switches again for at least one second in the "close" direction to activate the automatic open/close function.
- Set clock to correct time.

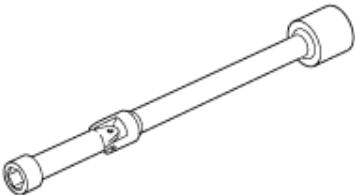
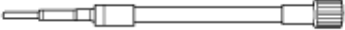
Tightening torques

Component	Nm
Catalytic converter to turbocharger	25
Bracket for turbocharger to turbocharger	20
to cylinder block	20
Oil return line to cylinder block	30
Injector pipes to injectors/injection pump	25



Component	Nm
Viscous fan to bearing	45
Idler wheel to bracket	25
Tensioner for ribbed belt to bracket for alternator, vane pump and viscous fan	45
Toothed belt sprocket to camshaft	45
Oil supply pipe to turbocharger	30

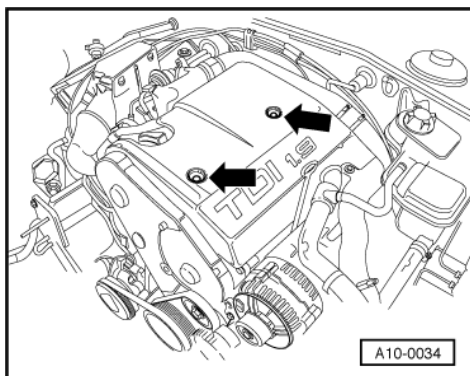
1.7 - Check compression

3220 	V.A.G 1763 
V.A.G 1381/12 	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
	G15-0002

Special tools, testers and auxiliary items required

- ♦ Special tool 3220
- ♦ V.A.G 1763
- ♦ V.A.G 1381/12

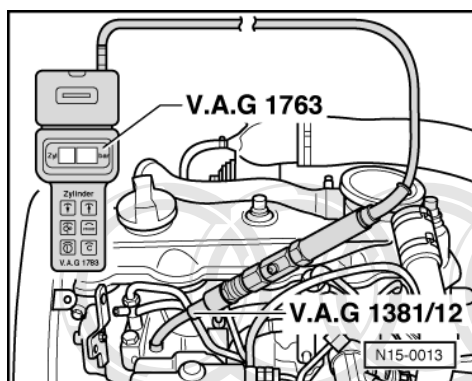
Test requirements:



- Engine oil temperature at least 30 °C
- Battery voltage at least 12 V

Test sequence

- -> Remove engine cover panel -arrows-.
- Unplug fuel cut-off valve connector on injection pump.
- Unplug connector to quantity adjuster on injection pump.
- Remove all glow plugs using jointed spanner 3220.



- -> Screw in adapter V.A.G 1381/12 place of glow plugs.
- Check compressions with compression tester V.A.G 1381/V.A.G 1763.

Note:

Using the compression tester

- => Operating instructions
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- Operate starter until tester shows no further pressure increase.

Compression values:

New bar excess pres- sure	Wear limit bar excess pres- sure	Permissible dif- ference between cylinders bar excess pres- sure
25 ... 31	19	max. 5

- Install glow plugs with jointed spanner 3220 (15 Nm)
- Interrogating and erasing fault memory:



=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis; Interrogating and erasing fault memory Self diagnosis Interrogating and erasing fault memory

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Self-diagnosis; Interrogating and erasing fault memory Self-diagnosis Interrogating and erasing fault memory

Note:

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

Tightening torque

Component	Nm
Glow plugs to cylinder head	15

2 - Servicing valve gear

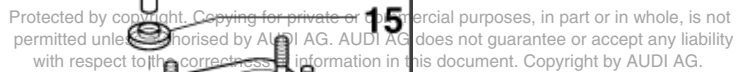
2.1 - Servicing valve gear

Notes:

- ♦ Cylinder heads with cracks between valve seats can still be used without a reduction of service life, if cracks are slight, max. 0.5 mm wide.
- ♦ After installing the camshaft, wait for about 30 minutes before starting the engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.
- ♦ Renew all gaskets and seals.
- ♦ Note current specifications when using sealant.

=> Parts List

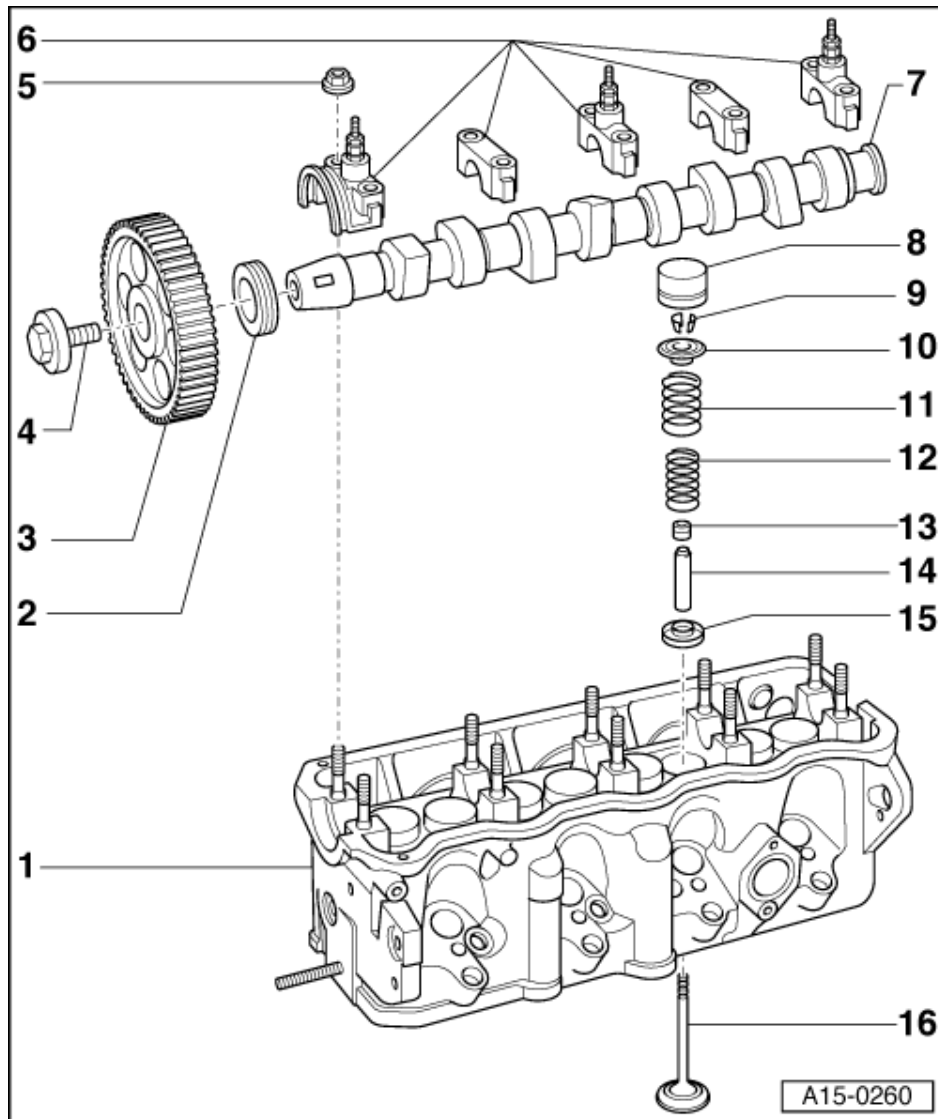
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- ◆ See note
=> Page 122
- ◆ Checking valve guides, grinding in valve seats
=> Page 140
- ◆ Rework valve seats
=> Page 138

- ◆ Remove, to remove and install bearing cap and remove toothed belt sprocket
- ◆ Removing and installing toothed belt=> Page 58

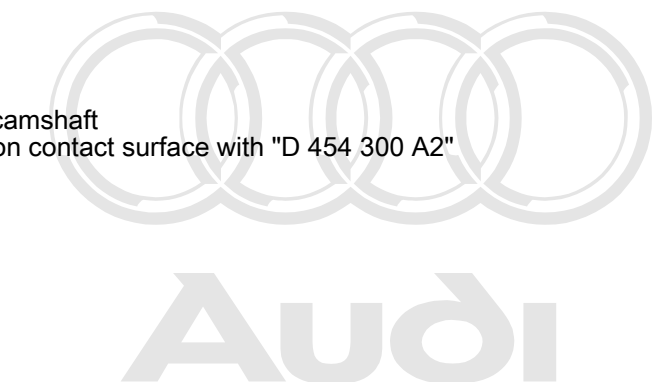
- ◆ Remove toothed belt before removing and installing => Page 58
- ◆ Release from camshaft taper by tapping with a hammer, using a drift through hole of toothed belt guard

**4** 45 Nm

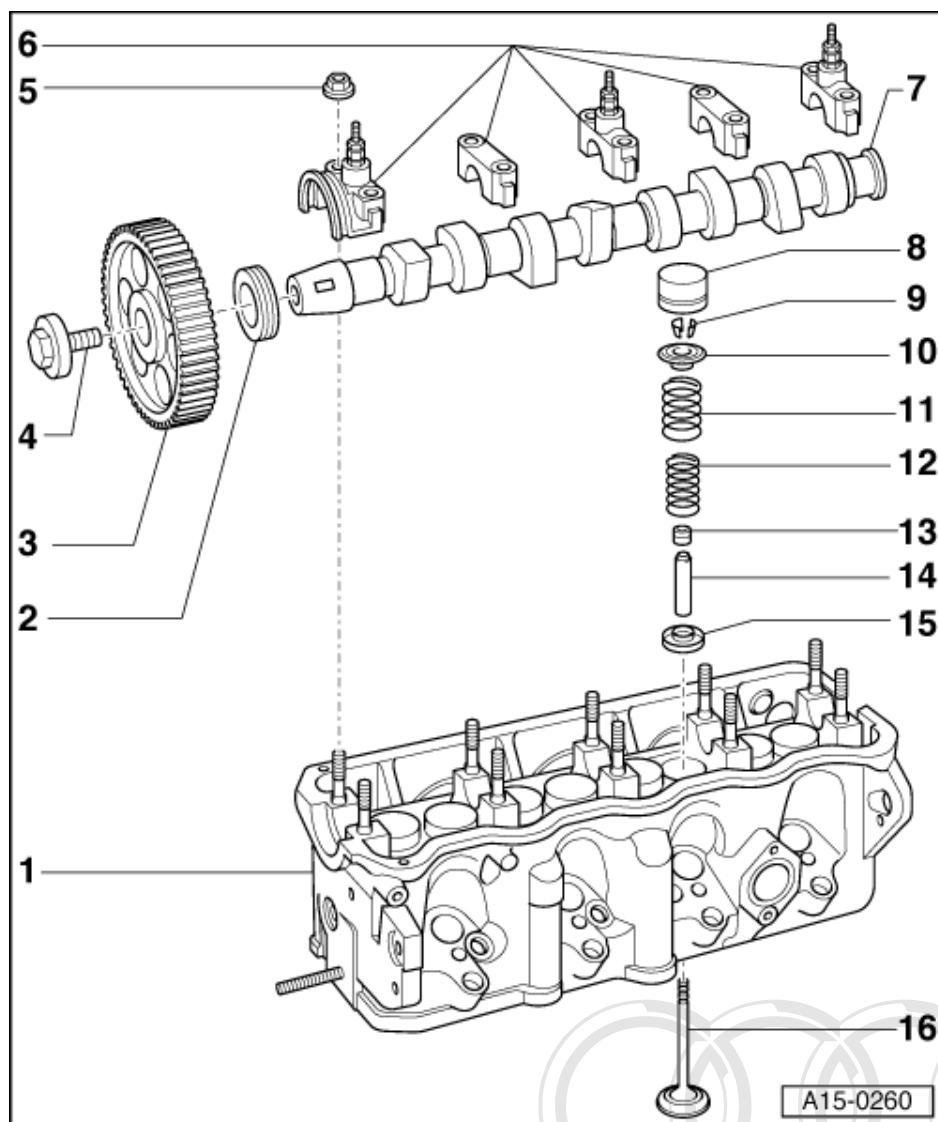
- ♦ Counter hold with 3036 to loosen and tighten

5 20 Nm**6** Bearing cap

- ♦ Installation position => Fig. 1
- ♦ Installation sequence
=> Page 130, Removing and installing camshaft
- ♦ Before installing thin coat bearing cap 1 on contact surface with "D 454 300 A2"
- ♦ Sealing points
=> Fig. 105



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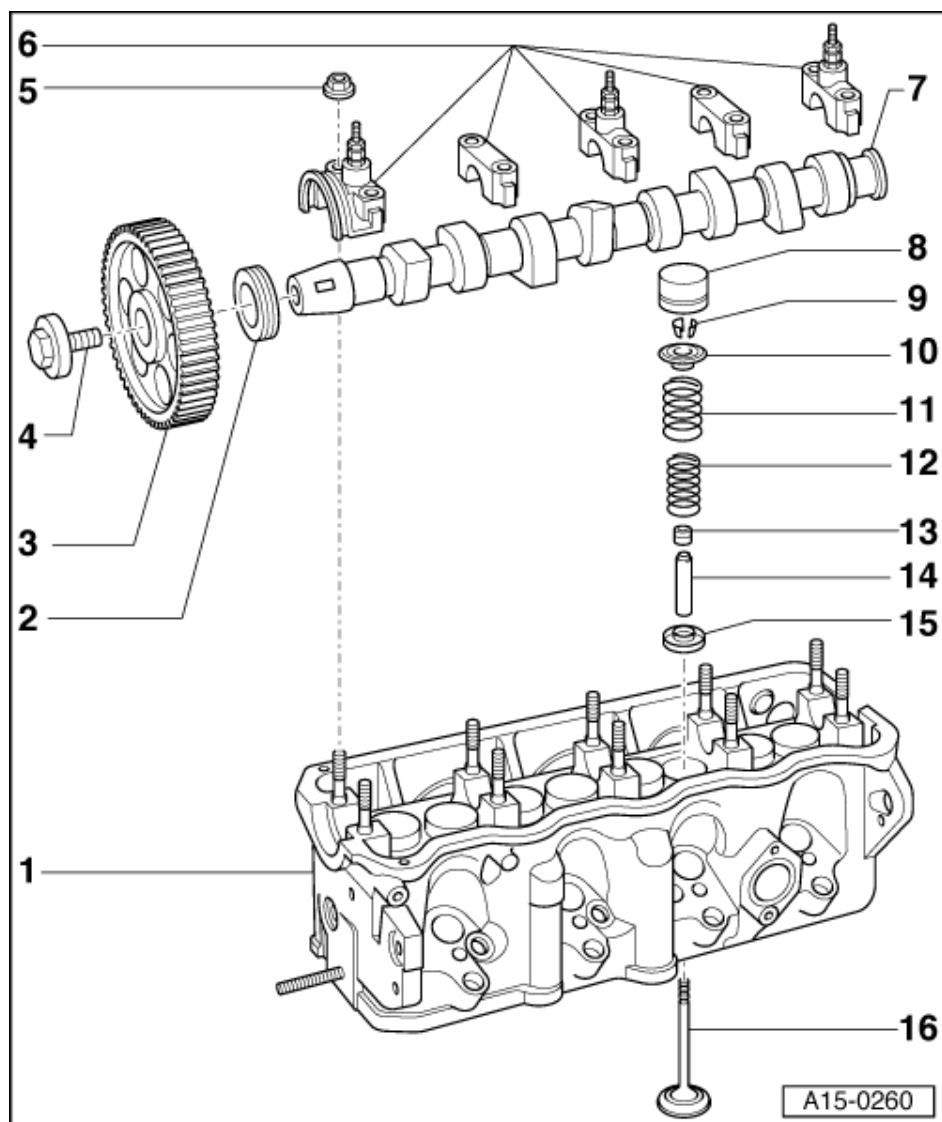
7 Camshaft

- ◆ Check axial clearance
=> Page 129
- ◆ Removing and installing
=> Page 130
- ◆ Checking radial clearance with Plastigage
Wear limit: 0.11 mm
- ◆ Run-out: no more than 0.01 mm
- ◆ Valve timings => from Page 1

8 Hydraulic bucket tappet

- ◆ Checking => Page 134
- ◆ Removing and installing
=> Page 136
- ◆ Do not interchange
- ◆ Store with cam contact surface downwards
- ◆ Before installing check camshaft axial clearance
=> Page 129
- ◆ Oil contact surface

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**9 Valve cotters****10 Upper valve spring retainer****11 Valve spring, outer**

- ♦ Removing and installing:
Cylinder head
removed: with 2037
installed: => Page 136

12 Valve spring, inner

- ♦ Removing and installing:
Cylinder head
removed: with 2037
installed: => Page 136

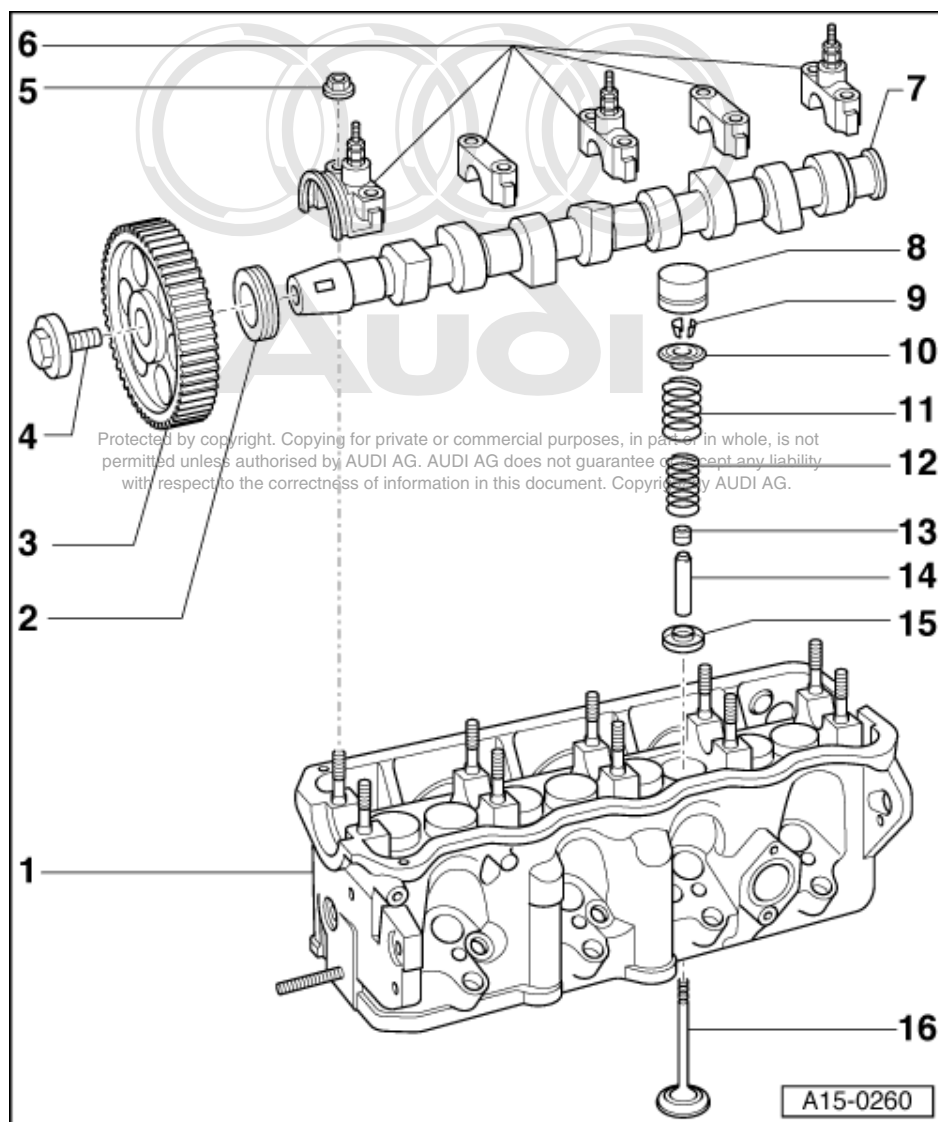
13 Valve stem seal

- ♦ Replacing => Page 136

14 Valve guide

- ♦ Checking => Page 140
- ♦ Replace cylinder head if wear limit exceeded

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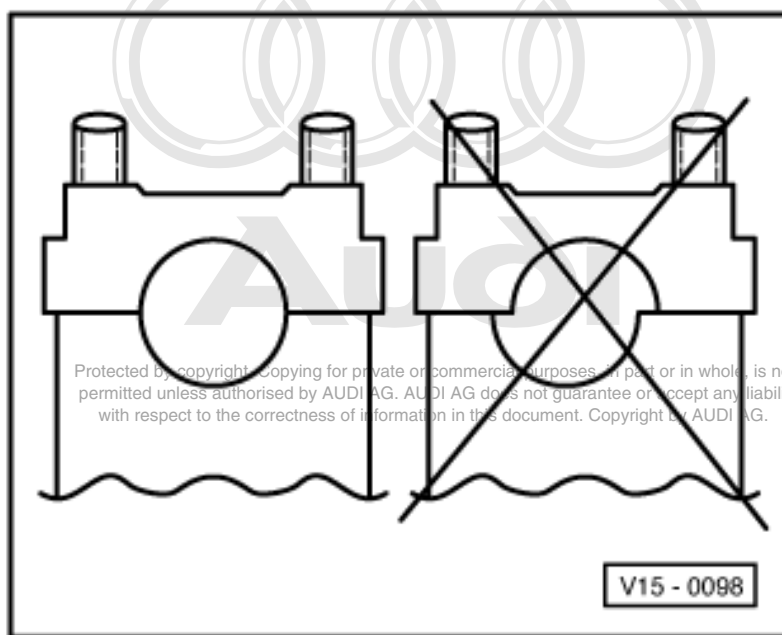


15 Lower valve spring retainer

- ♦ Remove and install with puller 3047 A

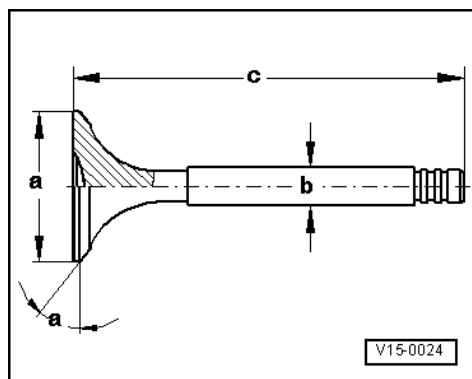
16 Valve

- ♦ Do not rework only grinding in is permitted
- ♦ Valve dimensions => Fig. 2



-> Fig.1 Installation position of camshaft bearing cap

Note offset. Before installing camshaft fit bearing caps and determine installation position.



-> Fig.2 Valve dimensions

Note:

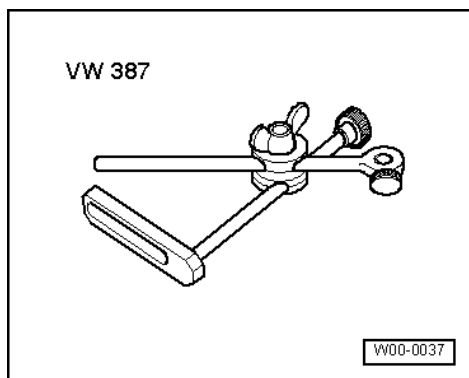
Valves must not be reworked. Only grinding in is permitted.

Dim.	Inlet valve	Exhaust valve
$\varnothing a$ mm	35.95	31.45
$\varnothing a$ mm	6.963	6.943
c mm	96.85	96.85

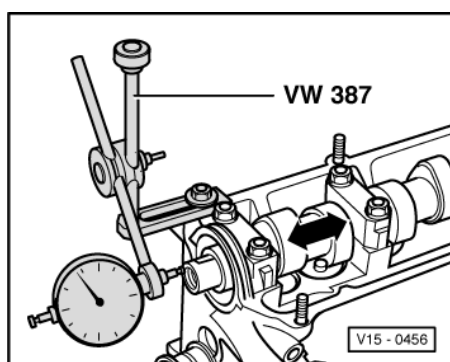
Dim.	Inlet valve	Exhaust valve
$\alpha <^\circ$	45	45

2.2 - Checking camshaft axial clearance

Special tools, testers and auxiliary equipment required



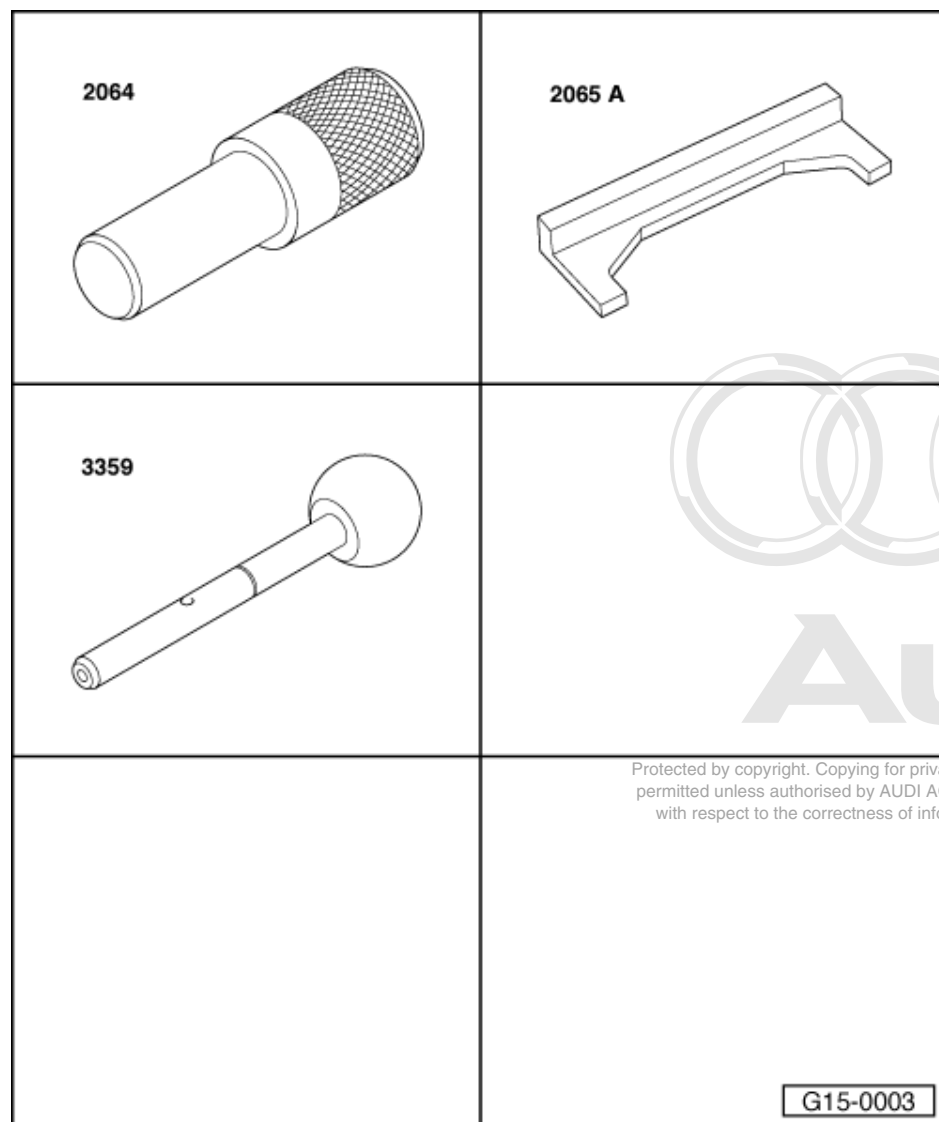
- ♦ Special tool VW 387
- ♦ Dial gauge



- -> Measure with tappets removed and with first and last bearing caps fitted.
- Wear limit: no more than 0.15 mm

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2.3 - Removing and installing camshaft

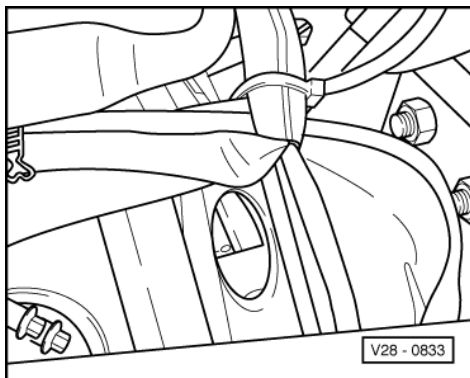


Special tools, testers and auxiliary items required

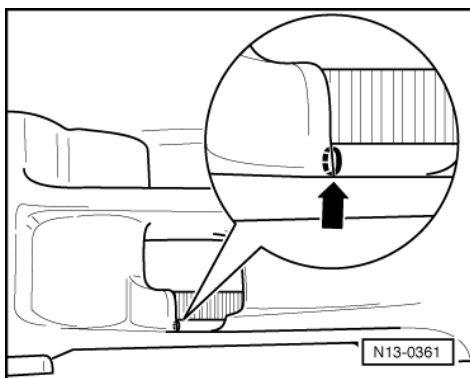
- ♦ Special tool 2064
- ♦ Special tool 2065 A
- ♦ Special tool 3359
- Cylinder head installed
- Lock carrier must be in service position => Page 24 .

Removing

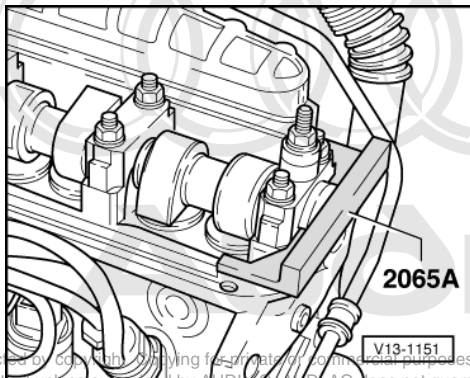
- Remove toothed belt => Page 41
- Remove viscous fan (with belt pulley) => Fig., Page 35 .
- Install ribbed belt tensioner => Page 30 .
- Remove upper toothed belt guard => Page 47 .
- Remove cylinder head cover => Page 105 .



- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with manual gearbox).



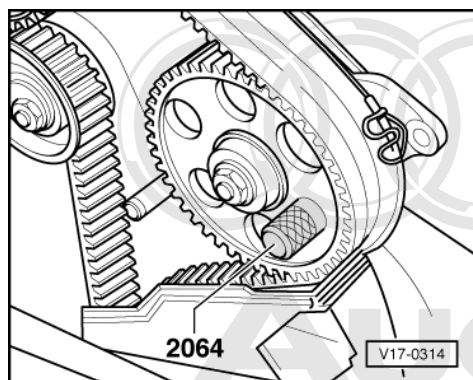
- -> Turn crankshaft to TDC No. 1 cylinder -arrow- (vehicles with automatic gearbox).



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- **> Lock camshaft with setting bar 2065A**
Align setting bar as follows:
Turn arrested camshaft so that one end of setting bar contacts cylinder head. Measure the gap at other end of setting bar using a feeler gauge. Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until setting bar contacts feeler gauge. Insert a 2nd feeler gauge of same thickness at other end, between setting bar and the cylinder head.

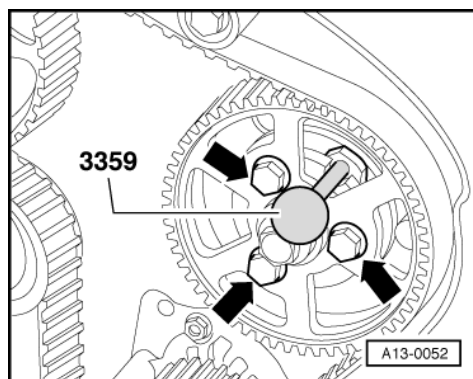
Vehicles with engine codes 1Z, AFF, AFN, AHU:



- -> Lock injection pump sprocket with setting pin 2064.

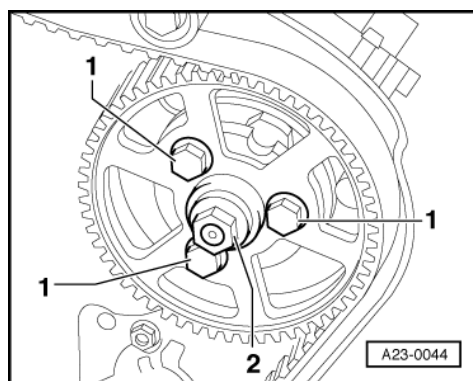
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Vehicles with engine code AHH:



- -> Lock injection pump sprocket with setting pin 3359.
- Remove securing bolts -arrows- of injection pump sprocket.

Note:

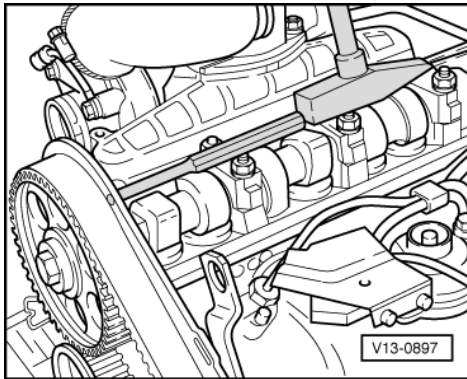


-> Do not loosen central nut -2- of injection pump sprocket. Otherwise the injection pump basic setting is mal-adjusted and can no longer be corrected using workshop tools.

All models:

- Mark direction of rotation of belt with chalk or felt pen.
- Remove tensioner.
- Remove idler wheel.
- Take toothed belt off camshaft sprocket.

Note:



Never use setting bar to counterhold when loosening and tightening camshaft sprocket. Counterhold with 3036.

- -> Loosen securing bolt of camshaft sprocket by 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through hole of rear toothed belt guard).
- Remove camshaft toothed belt sprocket.
- Only remove bearing caps 1, 3 and 5. Loosen bearing caps 2 and 4 alternately and diagonally.

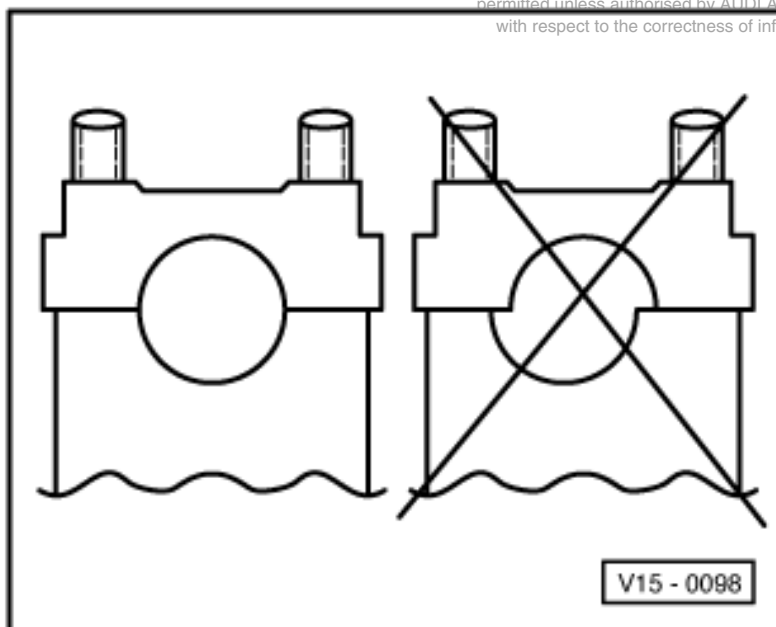
Installing

Installation is carried out in the reverse order, when doing this note the following:

Notes:

- ◆ Renew camshaft oil seal.
- ◆ When installing the camshaft, No. 1 cylinder cams must point upwards.

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- ◆ -> Before installing bearing caps, note bore offset and determine installation position.



- Oil camshaft running surfaces.
- Tighten bearing caps 2 and 4 alternately and diagonally to 20 Nm.
- Install bearing caps 5, 1 and 3 and also tighten to 20 Nm.
- Installing toothed belt (adjust valve timing) with engine codes 1Z, AFF, AFN, AHU => Page 65 .

Notes:

- ♦ Observe all instructions on removing and installing the toothed belt =>Page 55 onwards.
 - ♦ After installing the camshaft, wait for about 30 minutes before starting the engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
 - ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.
-
- Install cylinder head cover => Page 106 .
 - Dynamically check commencement of injection

=> Diesel direct injection and glow plug system (4 cyl.) ä 06.97; Repair group 23; Servicing diesel direct injection system; Dynamically checking and adjusting commencement of injection Servicing diesel direct injection system Dynamically checking and adjusting commencement of injection

=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 23; Servicing diesel direct injection system; Dynamically checking and adjusting commencement of injection Servicing diesel direct injection system Dynamically checking and adjusting commencement of injection

Tightening torque

Component	Nm
Bearing cap to cylinder head	20

2.4 - Checking hydraulic bucket tappets

Special tools, testers and auxiliary equipment required

- ♦ Feeler gauge
 - ♦ Wood or plastic wedge
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Notes:

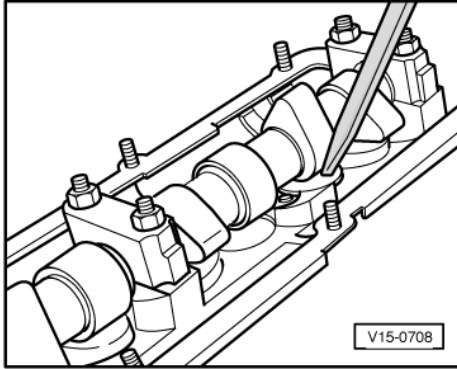
- ♦ Hydraulic tappets cannot be adjusted or repaired.
 - ♦ Irregular valve noise during starting is normal.
-
- Start engine and leave it running until coolant temperature has reached approx. 80 °C.
 - Increase engine speed to about 2500 rpm for 2 minutes (perform road test if necessary).

Note:

If the irregular valve noises stop but recur repeatedly during short journeys, a new oil retention valve must be fitted. Oil retention valve location: In the oil filter bracket => Page 147 .

If the hydraulic tappets are still noisy, locate defective tappets as follows:

- Remove cylinder head cover => Page 105 .
- Rotate crankshaft until the cams of the tappets to be checked are pointing upwards:
 - Vehicles with manual gearbox push vehicle forwards with 4th gear engaged and ignition switched off.
 - Vehicles with automatic gearbox: remove noise insulation and turn crankshaft clockwise by applying spanner to central bolt on crankshaft sprocket.
- Determine play between cam and tappet.



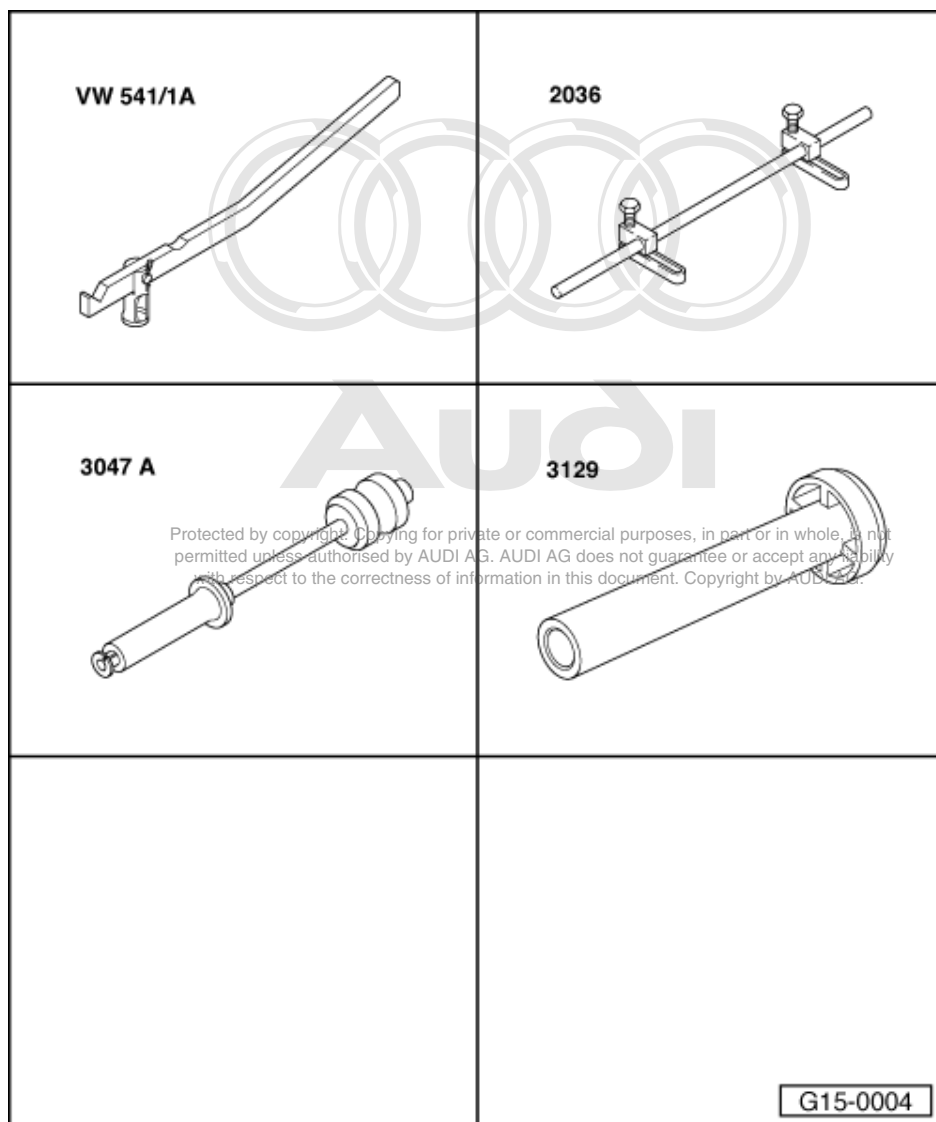
- -> Press down tappet with a wooden or plastic wedge. If an 0.20 mm feeler gauge can be inserted between camshaft and tappet, renew tappet.
- Replacing bucket tappet => Removing camshaft, Page 130 .

Notes:

- ◆ After installing the camshaft, wait for about 30 minutes before starting the engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ◆ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

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2.5 - Renewing valve stem seals



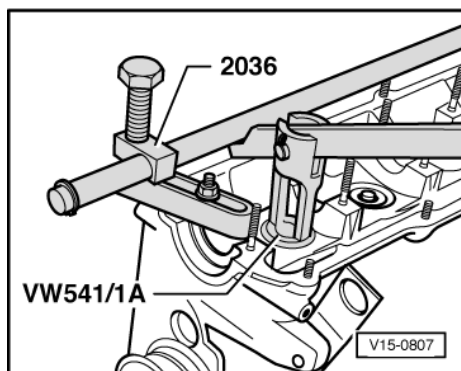
Special tools, testers and auxiliary items required

- ♦ Special tool VW 541/1A
- ♦ Special tool 2036
- ♦ Special tool 3047 A
- ♦ Special tool 3129

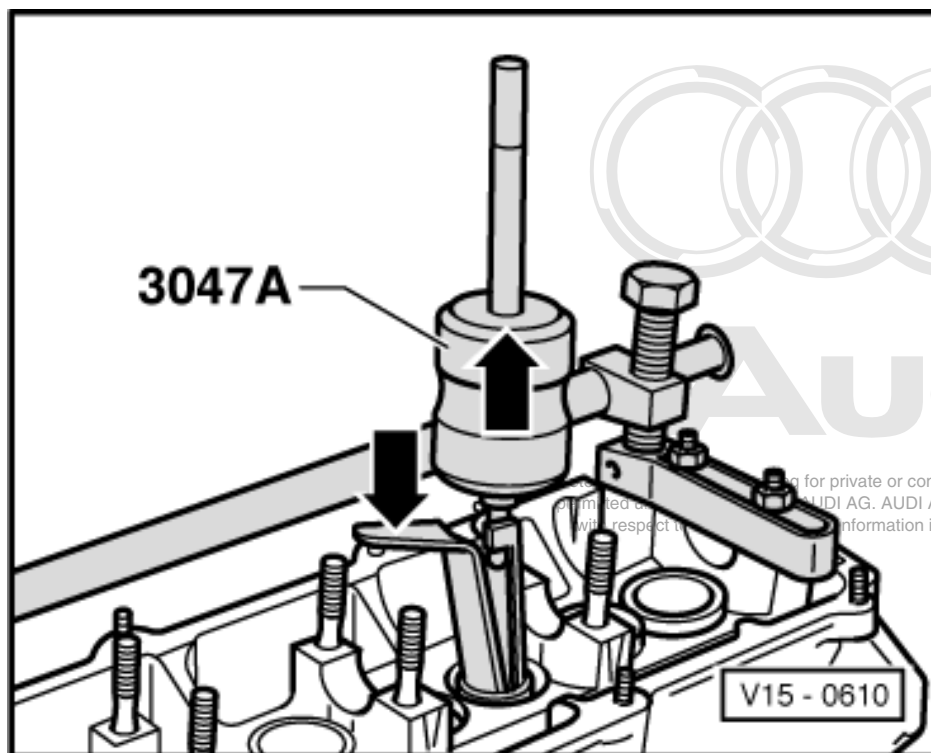
- Cylinder head in situ

Removing

- Removing camshaft => Page 130 .



- Remove the bucket tappets and put them down with the contact surface downwards. When doing this ensure that the tappets are not interchanged.
- Move piston of respective cylinder to top dead centre (TDC).
- -> Position fitting tool 2036 with shaft parallel to sealing edge of cylinder head cover. Tighten bolts to secure fitting tool.
- Adjust shaft of fitting tool so that it is level with the studs for the bearing caps.



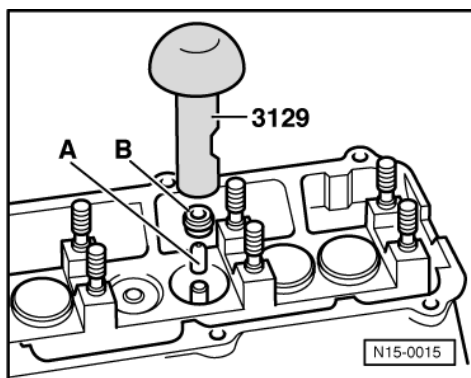
- Remove valve springs with assembly lever VW 541/1A.

Note:

Valves rest on piston crowns whilst doing this.

- -> Use 3047 A to remove valve stem seals.

Installing



- -> To prevent damage to the new valve stem seals -B- , place plastic sleeve -A- on valve stem.
- Lightly oil sealing lip of valve stem seal.
- Place valve stem seal in tool 3129 and push carefully onto valve guide.
- Remove plastic sleeve again.
- Install camshaft =>Page 133 .

Notes:

- ♦ After installing the camshaft, wait for about 30 minutes before starting the engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

2.6 - Reworking valve seats

Note:

If a good seating pattern cannot be obtained by grinding the valve seats (lapping), they must be refaced (re-worked):

Special tools, testers and auxiliary equipment required

- ♦ Depth gauge
- ♦ Valve seat machining tool

Notes:

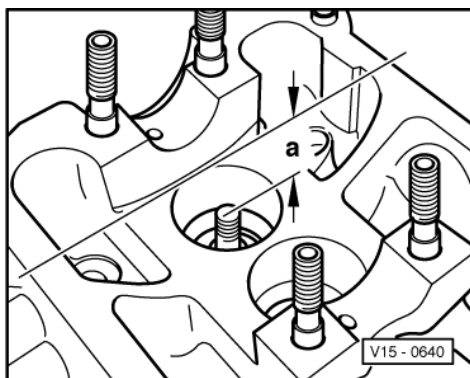
- ♦ When repairing engines with leaking valves, it is not sufficient to reface the valve seats and renew the valves. The valve guides must also be checked for wear. This is particularly important on high mileage engines => Page 140 .
- ♦ Only rework the valve seats as far as is necessary to ensure a good seating pattern.
- ♦ Before starting to rework the valve seats, calculate the maximum permissible reworking dimension.
- ♦ If the maximum permissible reworking dimension is 0 mm or less than 0 mm, repeat the measurement with a new valve. If the measured result is again 0 mm or less than 0 mm, renew the cylinder head.

Calculating maximum permissible reworking dimension

- Insert valve and press firmly against valve seat.

Note:

If the valve is to be renewed as part of a repair, use a new valve for the calculation.



- -> Measure distance a between valve stem end and top edge of cylinder head.
- Calculate max. permissible reworking dimension from measured distance a and minimum dimension.

Minimum dimensions:

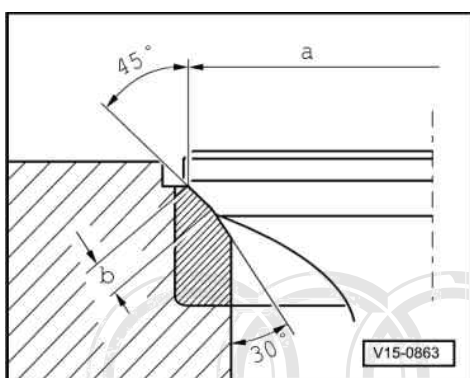
Inlet valve 35.8 mm

Exhaust valve 36.1 mm

Measured distance minus minimum dimension
= max. permissible reworking dimension.

Example:

- Measured distance	36.5 mm
Minimum dimension	35.8 mm
= max. permissible reworking dim.	0.7 mm

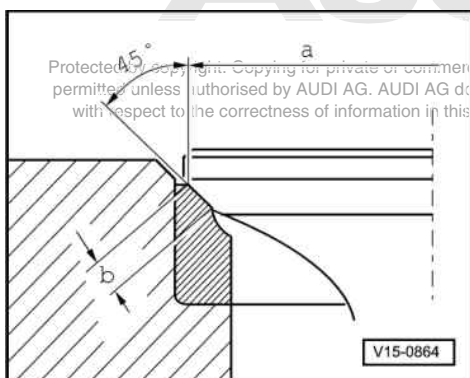


-> Rework inlet valve seat

a	= $\varnothing 35.7$ mm
b	= 1.6 mm
45°	= Valve seat angle

Note:

The valve seat angle rear cut of 30° -is absolutely necessary due to flow conditions in intake duct.



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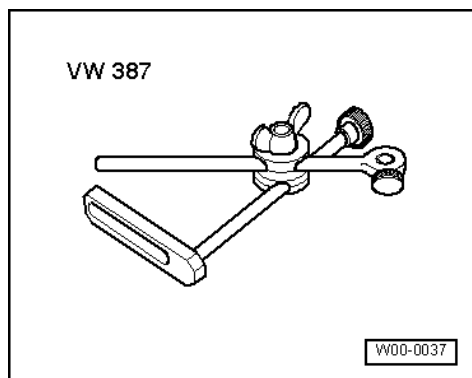


-> Rework exhaust valve seat

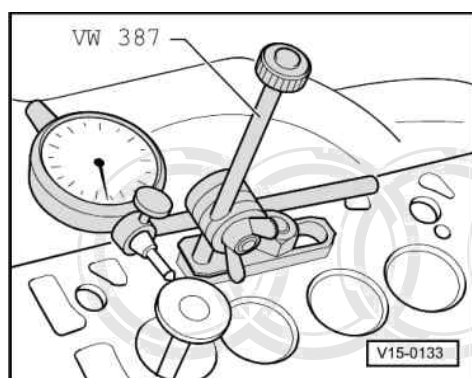
a	= $\varnothing 31.4$ mm
b	= 2.7 mm
45°	= Valve seat angle

2.7 - Checking valve guides

Special tools, testers and auxiliary equipment required



- ♦ Special tool VW 387
- ♦ Dial gauge



- -> Set valve in guide. Valve stem end must be flush with guide. Due to the slight difference in stem diameters, ensure that only an inlet valve is used in the inlet guide and an exhaust valve in the exhaust guide.

Wear limit

Lateral play: no more than 1.3 mm

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Notes:

- ♦ If the wear limit is exceeded, repeat the measurement with new valves. If the wear limit is again exceeded, renew the cylinder head.
- ♦ If the valve is to be renewed as part of a repair, use a new valve for the calculation.

17 - Lubrication

1 - Removing and installing parts of the lubrication system

1.1 - Removing and installing parts of the lubrication system

Notes:

- ♦ 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 oil cooler 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!
- ♦ Note current specifications when using sealant:

=> Parts List

Viscosity grades and oil specifications:

=> Maintenance manual; Engine oil: fill up

Oil system capacity:

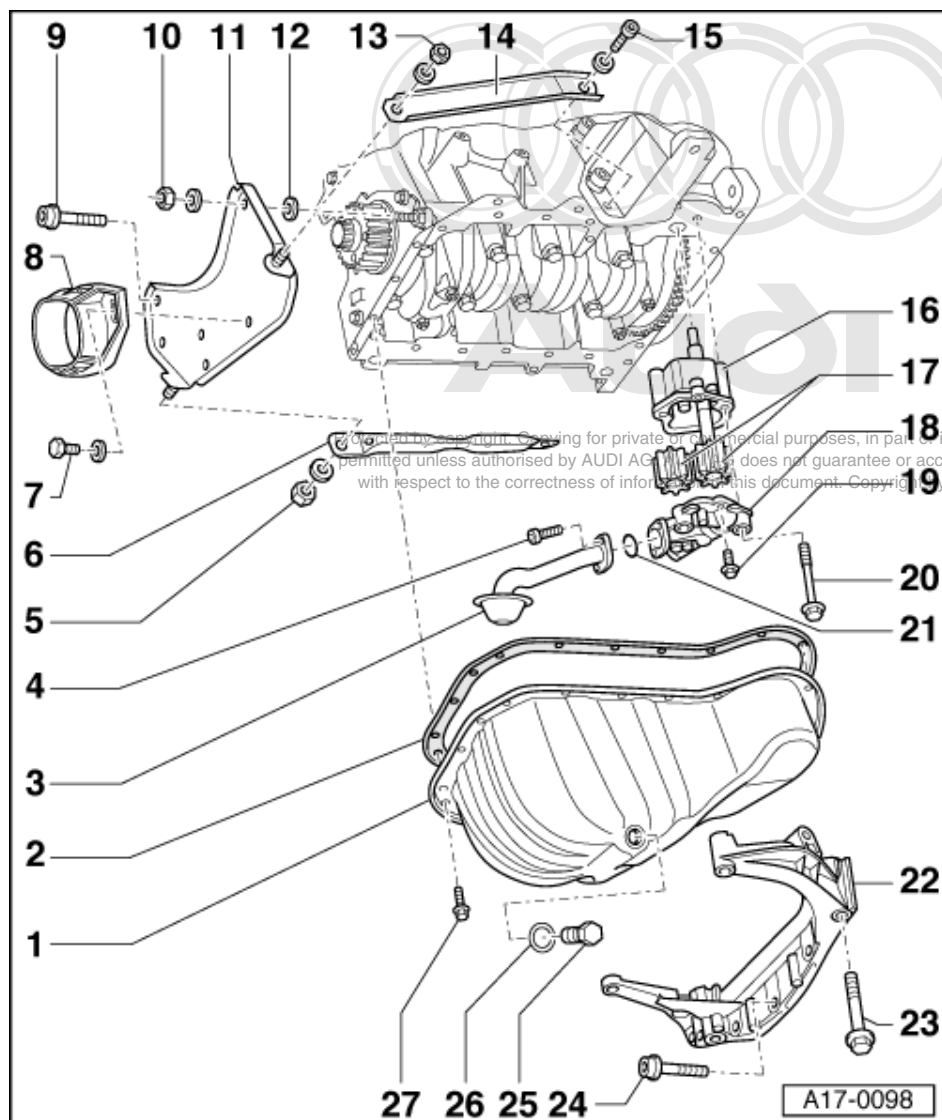
=> "Exhaust emission test" binder



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1.2 - Part I



1 Sump

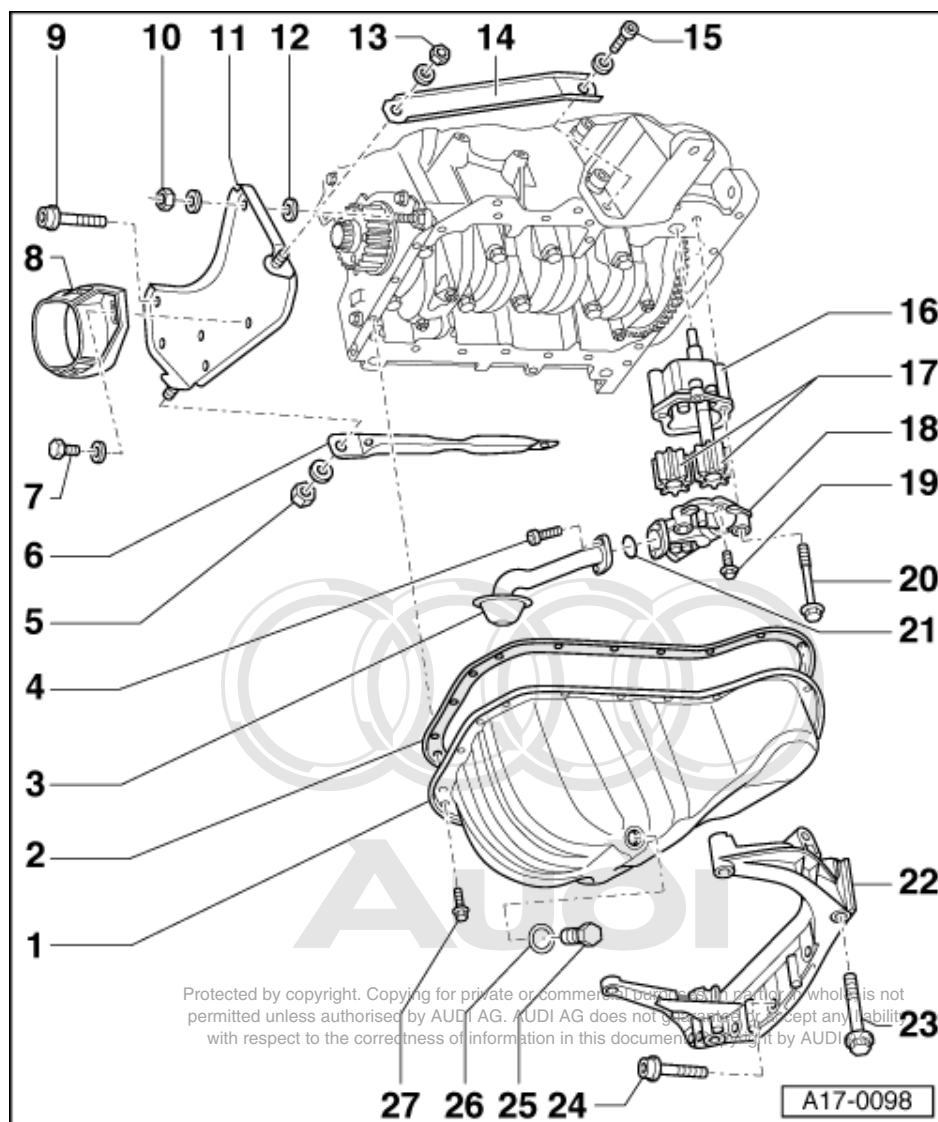
- ♦ Removing and installing => Page 151
- ♦ Clean sealing surface before installing
- ♦ Before fitting sump, apply a small amount of sealant "AMV 174 004 01" to front and rear sealing points between sealing flanges and cylinder block

=> Parts List

2 Gasket

- ♦ Replace
- ♦ Install dry
- ♦ Apply a small amount of sealant "AMV 174 004 01" only to sealing points between sealing flange and cylinder block (front and rear)

=> Parts List



3 Suction pipe

- ♦ Clean strainer if soiled

4 10 Nm

5 25 Nm

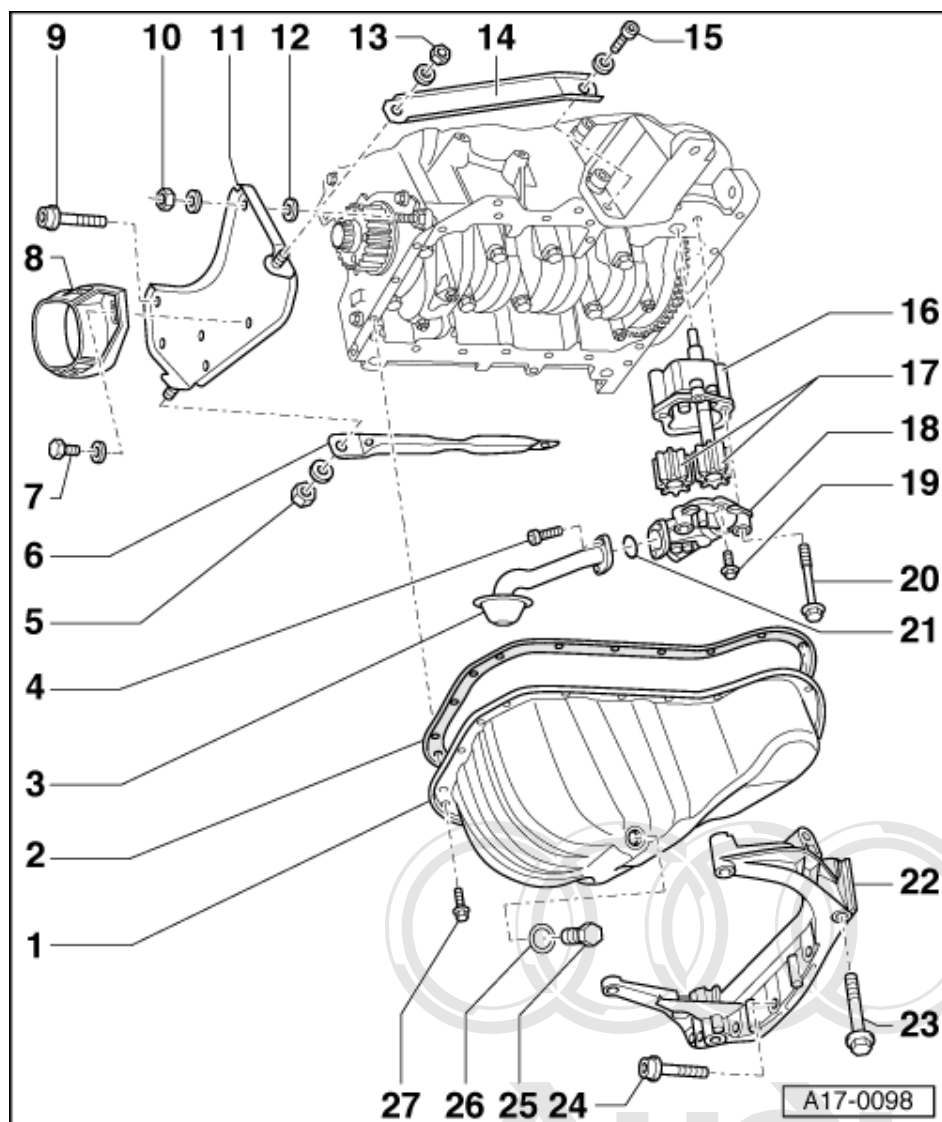
6 Longitudinal strut, right

7 25 Nm

8 Stop plate

- ♦ For torque reaction support
- ♦ Adjusting:
 - Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.

9 25 Nm



10 25 Nm

11 Bracket

- ♦ For torque reaction support

12 Spacer

13 25 Nm

14 Longitudinal strut, left

15 20 Nm

16 Oil pump housing

17 Gears

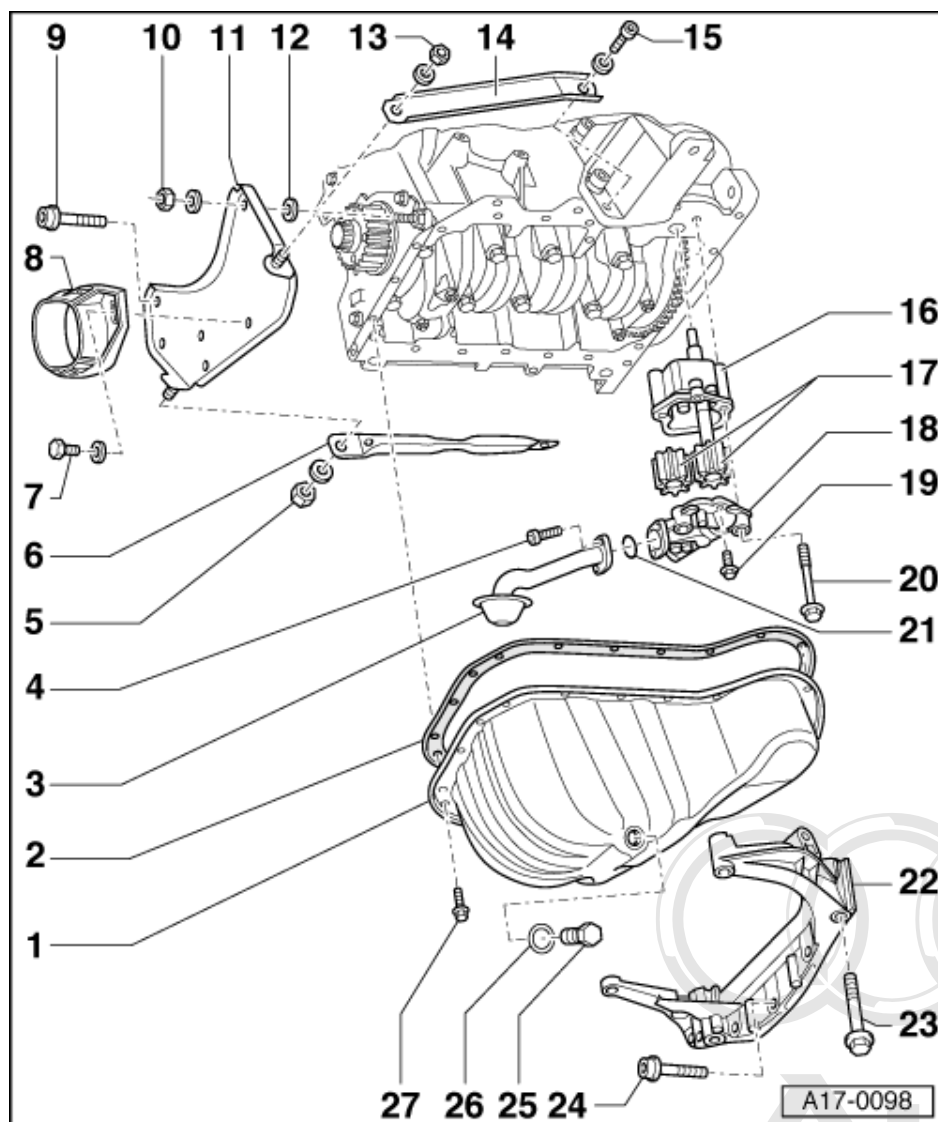
- ♦ Checking backlash
=> Fig. 1

- ♦ Checking ring gap => Fig. 2

18 Oil pump cover with pressure relief valve

- ♦ Opening pressure: 5.7 ... 6.7 bar

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19 10 Nm

20 25 Nm

21 O-ring

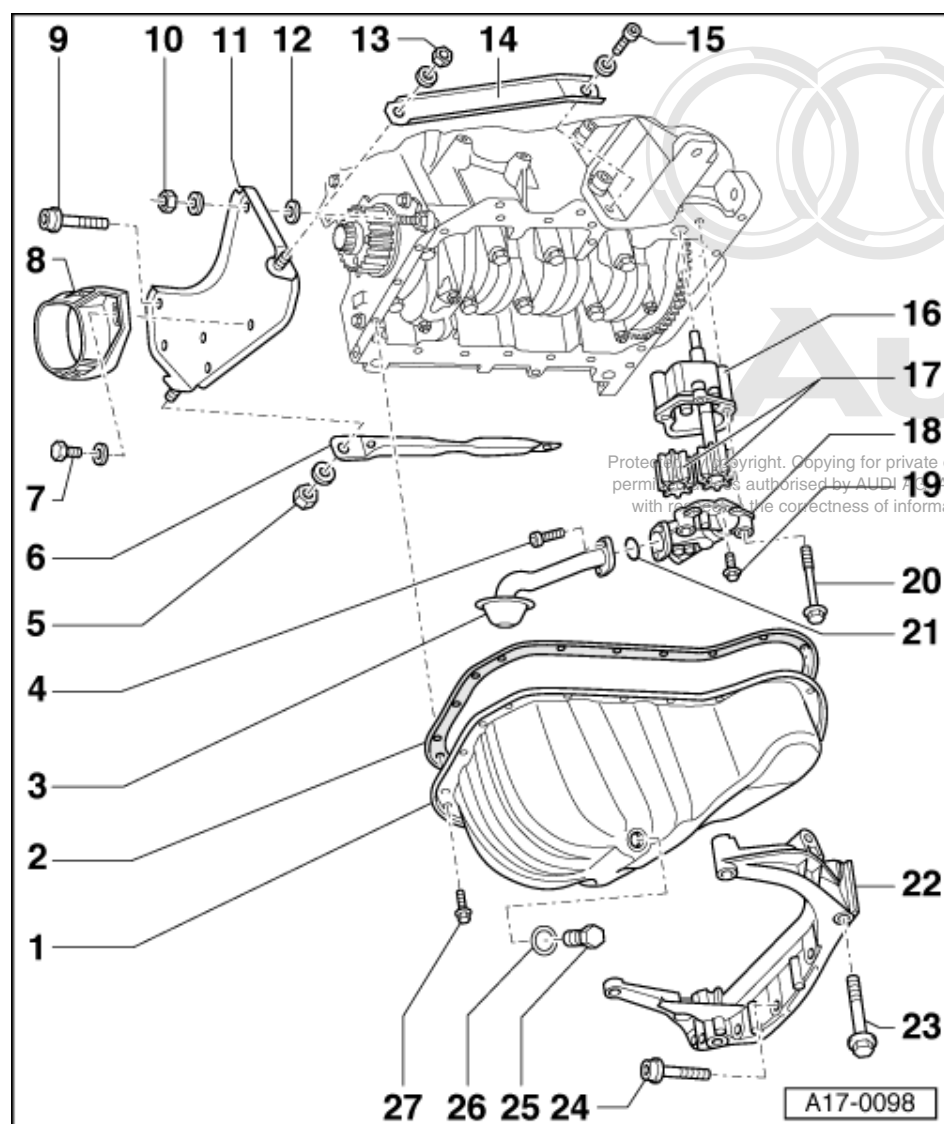
- ◆ Replace

22 Engine/gearbox support

- ◆ Remove for removal of sump => Page 151
- ◆ When installing with engine removed from vehicle, ensure that engine/gearbox support is positioned flush with intermediate plate at flywheel end (i.e. engine/gearbox support should protrude 0.8 mm from cylinder block).

23 45 Nm

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24 25 Nm (bolt M8)

45 Nm (bolt M10)

25 Oil drain plug - 30 Nm

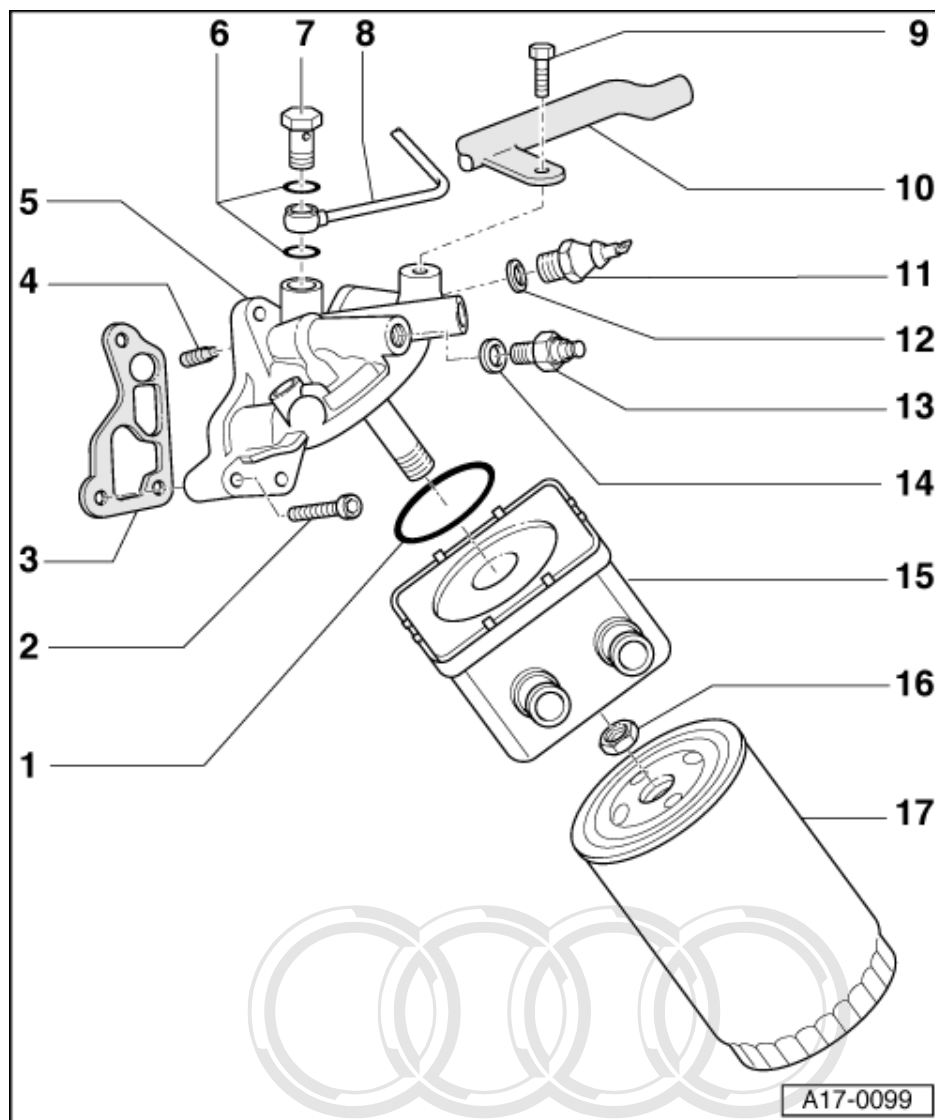
26 Gasket

- ◆ Replace

27 18 Nm

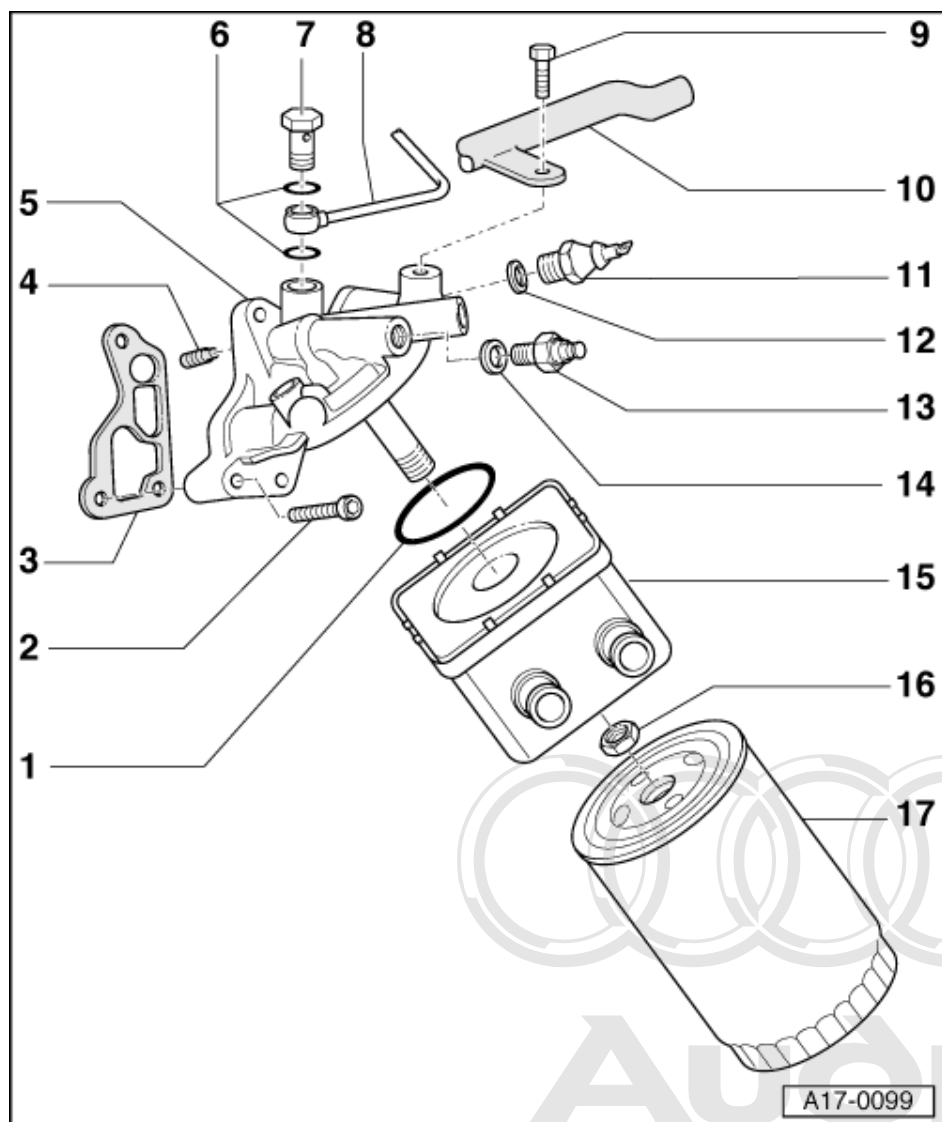
- ◆ Tighten in stages and in diagonal sequence

1.3 - Part II



- 1 O-ring
 - ♦ Replace
 - ♦ Engage in projections on oil cooler
- 2 25 Nm
- 3 Gasket
 - ♦ Replace
- 4 Oil retention valve
 - ♦ Tighten to 8 Nm
- 5 Oil filter bracket
- 6 Seals
 - ♦ Replace
- 7 Banjo bolt - 25 Nm
- 8 Oil supply pipe
 - ♦ To turbocharger

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9 20 Nm

10 Coolant pipe

11 0.9 bar oil pressure switch -F1
- 25 Nm

- ♦ Grey
- ♦ Checking => Page **158**

12 Sealing ring

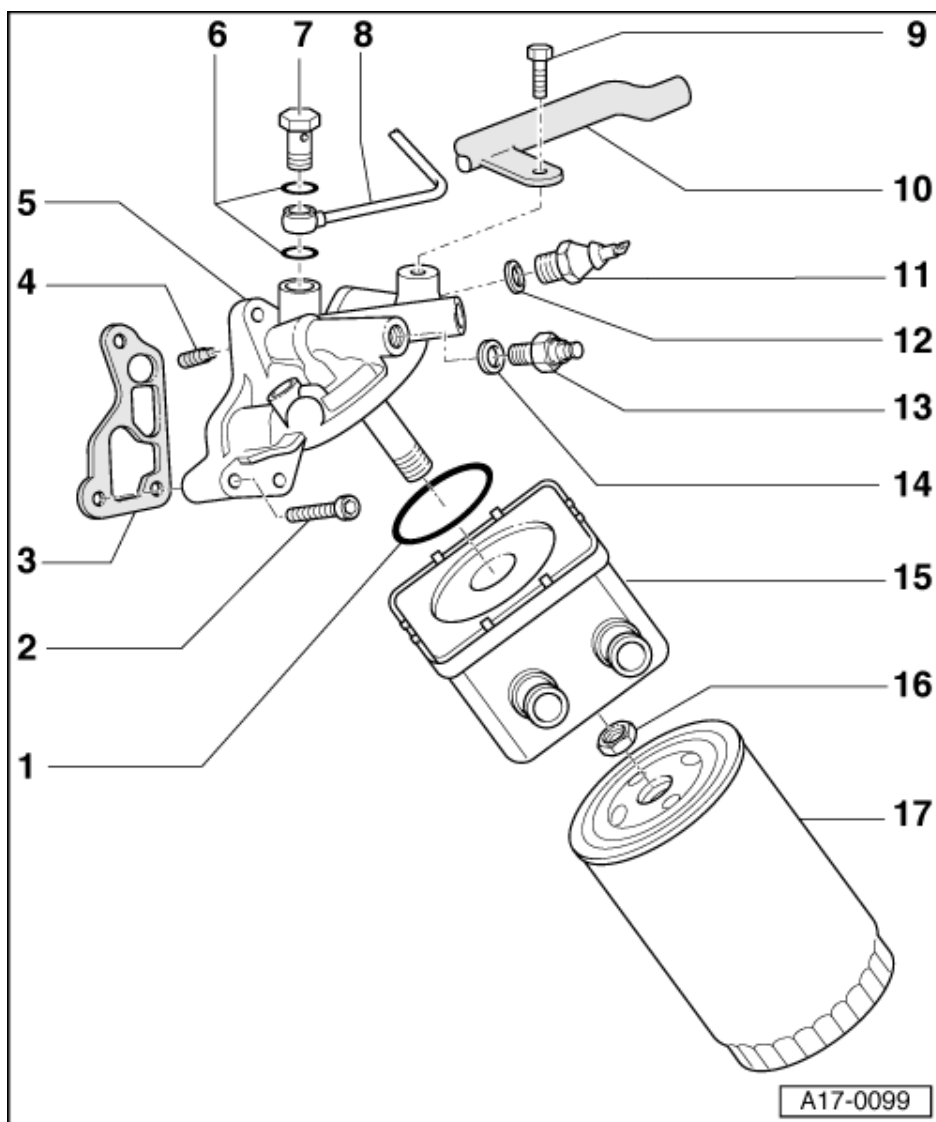
- ♦ If seal is leaking, cut open and renew.

13 Oil temperature sender -G8 - 10 Nm

14 Sealing ring

- ♦ If seal is leaking, cut open and renew.

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15 Oil cooler

- ◆ Illustration shows: Version for engine code AFN
- ◆ See note
=> Page 141

16 25 Nm

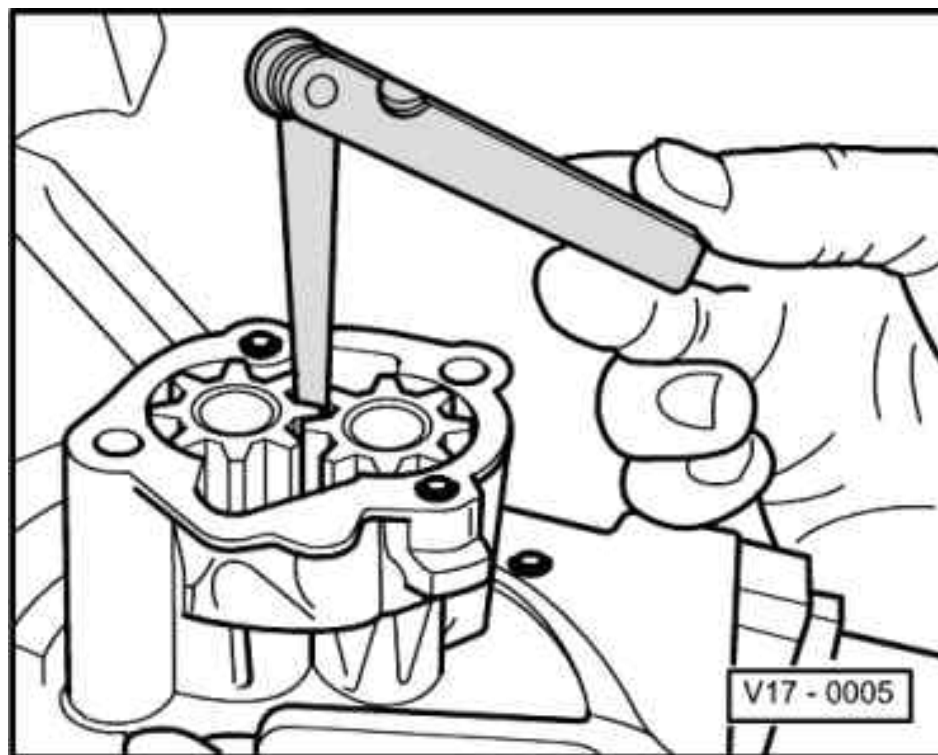
17 Oil filter

- ◆ Observe change intervals

=> Maintenance manual

- ◆ Loosen with securing strap
- ◆ Observe installation instructions on oil filter

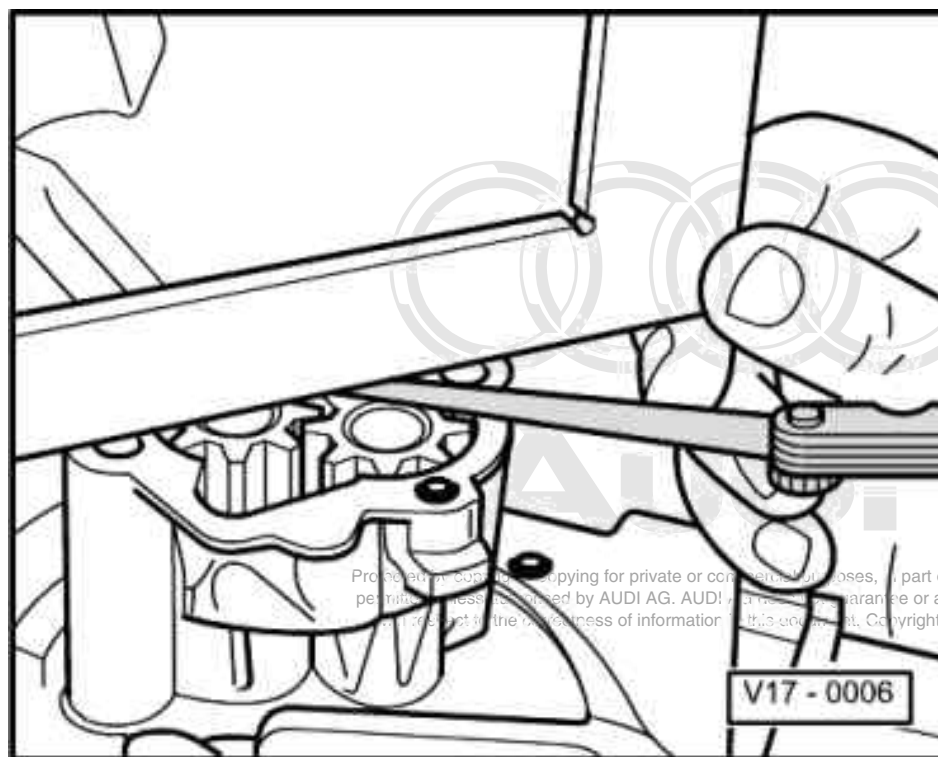
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-> Fig.1 Checking oil pump backlash

New: 0.05 mm

Wear limit: 0.20 mm



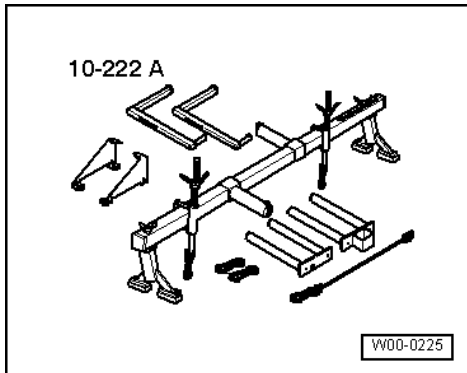
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-> Fig.2 Checking oil pump axial clearance

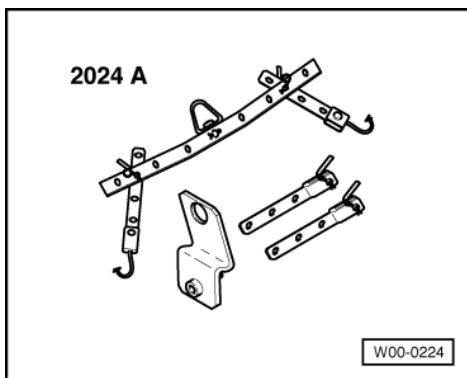
Wear limit: 0.15 mm

1.4 - Removing and installing oil pan

Special tools, testers and auxiliary equipment required

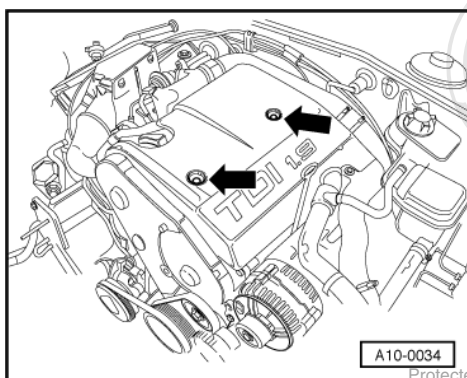


- ◆ Special tool 10-222A with 10-222A/1

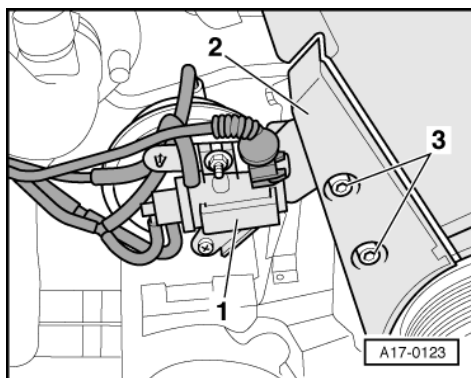


- ◆ Special tool 2024 A
- ◆ Sealant AMV 174.004 01

Removing



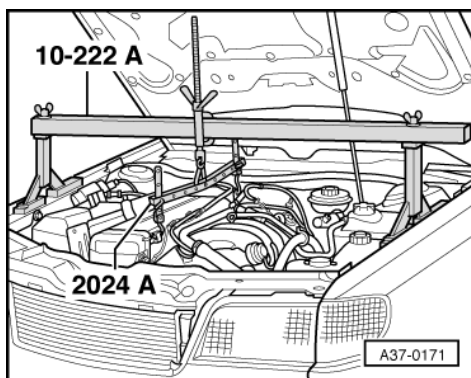
- -> Remove engine cover panel (arrows)
- Unbolt and remove air duct pipe leading to air cleaner on lock carrier.



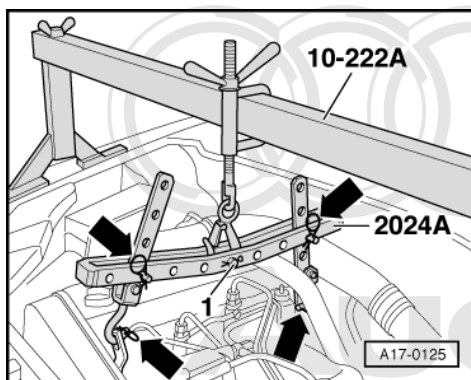
- -> Remove bolts -3- and detach cover -2-.
- Place solenoid valve for boost pressure control -1- to one side with hoses connected.

Note:

Shown in illustration with engine code AFN/AHH.



- -> Set up support bar 10-222 A on wing panel flanges.

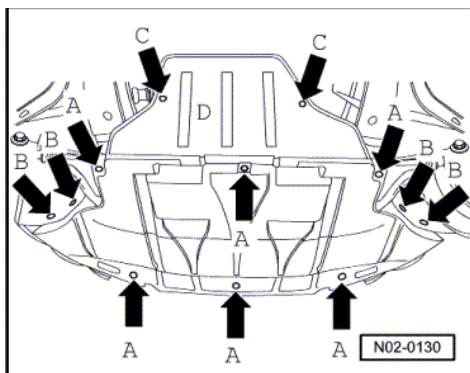


- -> Remove lifting eye from lifting tackle 2024 A.
- Replace pin -1- in centre hole on lifting tackle and secure with locking pin.
- Engage pin on lifting tackle 2024 A on spindle of support bar 10-222 A.
- Engage lifting tackle 2024 A in front and rear lifting eyes on engine.

Important:

The hooks and locating pins of the lifting tackle must be secured with locking pins -arrows in illustration-.

- Pre-tighten engine as far as possible with spindle of support bar without lifting.

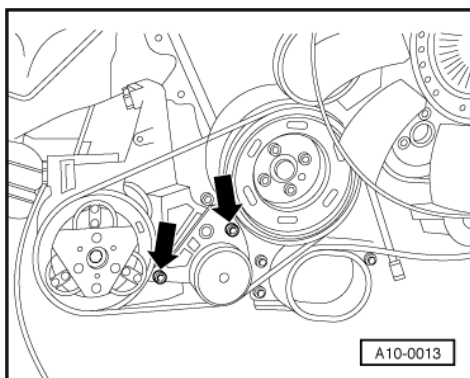


- -> Remove noise insulation -arrows-.
- Drain engine oil.

Vehicles with air conditioner:

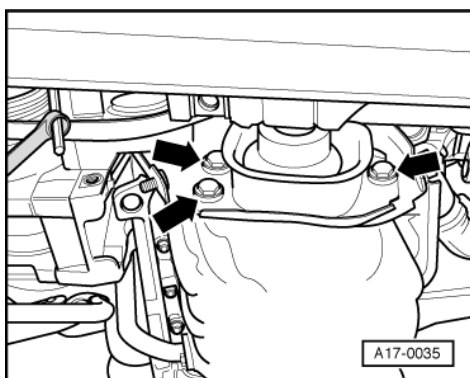
Note:

Mark direction of rotation of belt with chalk or felt pen before removing ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage.

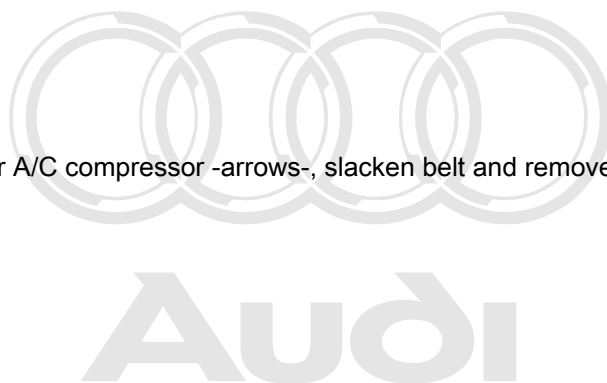


- -> Loosen bolts securing ribbed belt tensioner for A/C compressor -arrows-, slacken belt and remove.
- Remove tensioner.

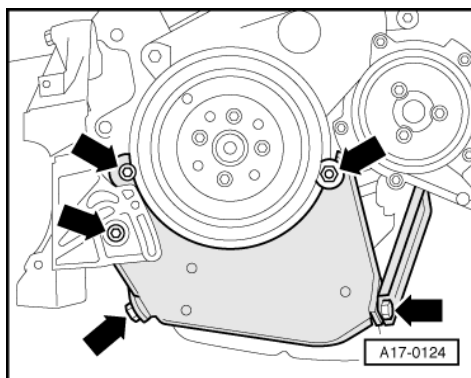
All models:



- -> Unbolt stop for torque reaction support -arrows-.



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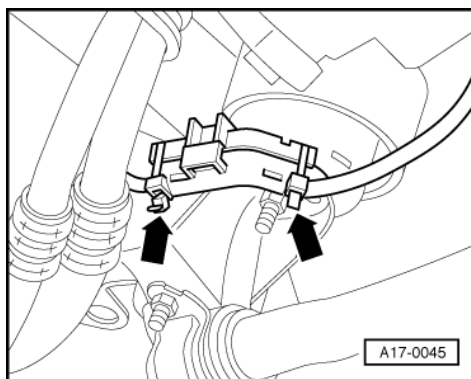


- -> Remove left and right longitudinal strut and remove bracket for torque reaction support from engine - arrows-.

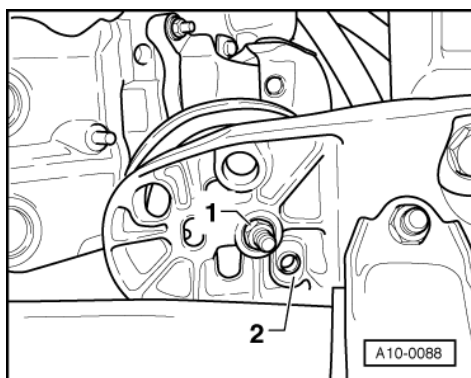
Note:

Shown in illustration with engine removed.

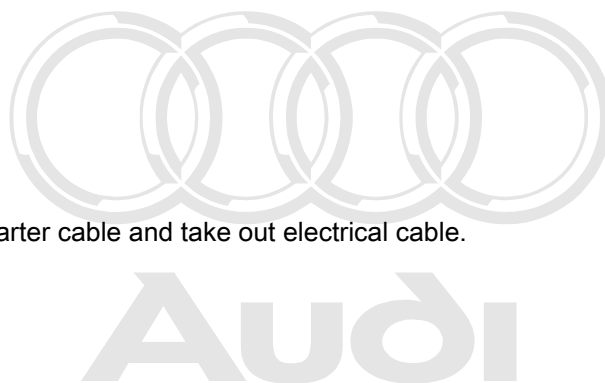
All models:



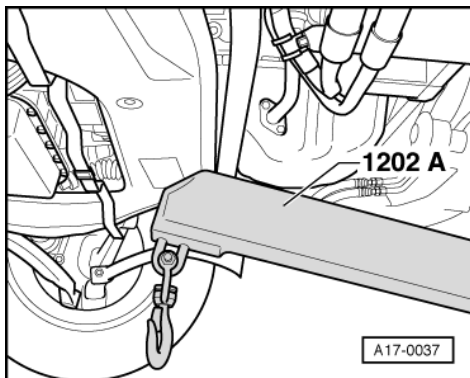
- -> Cut through cable ties -arrows-. Open retainer for starter cable and take out electrical cable.



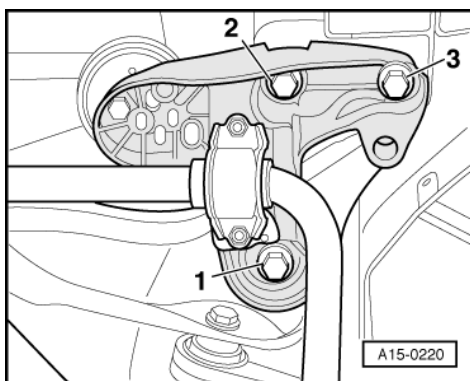
- -> Unbolt both nuts -1- on engine mountings (bottom).



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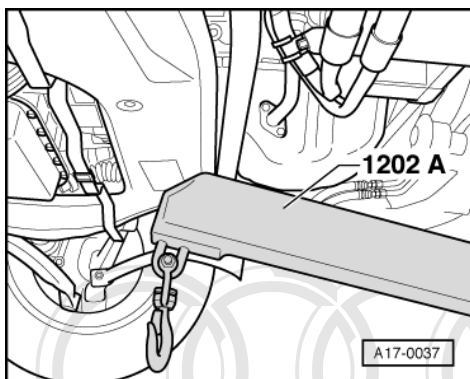
- -> Support subframe with workshop crane V.A.G 1202 A.



- -> Remove front subframe bolts -2- and -3- (left and right), then unscrew bolts -1-.

Note:

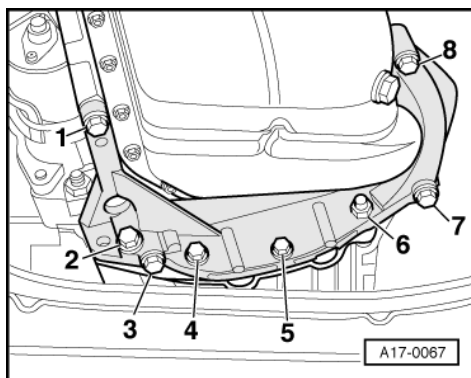
The subframe should be detached and lowered at the front only, otherwise it will be necessary to check wheel alignment.



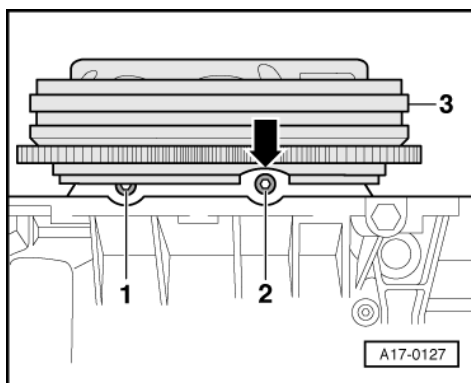
- -> Lower subframe slowly using workshop crane 1202 A.
- Take out workshop crane 1202 A; pivot anti-roll bar downwards.



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- -> Unscrew bolts -1 ... 8- for engine/gearbox support.
- Guide engine/gearbox support rearwards and detach it.
- Unbolt sump.



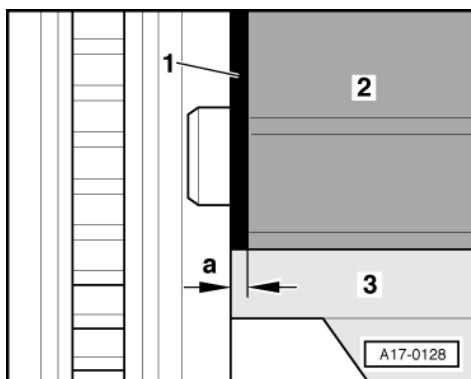
Note:

-> On vehicles with manual gearbox the two rear sump bolts -1- and -2- are accessible via the recess-arrow-on flywheel -3- (turn flywheel as required).

- Take off sump: if necessary loosen it by striking lightly with a rubber hammer.

Installing

Installation is carried out in the reverse order, when doing this note the following:



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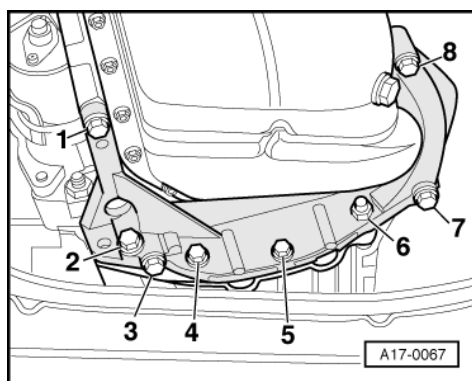
Notes:

- ◆ Renew seals and gaskets.
- ◆ -> When installing engine/gearbox support -3- with engine removed, ensure that engine/gearbox support is positioned flush with intermediate plate -1- at flywheel end (i.e. engine/gearbox support should protrude by "a" = 0.8 mm from cylinder block -2-).
- Clean sealing surfaces before installing sump.
- Apply a small amount of sealant "AMV 174 004 01" to sealing surface of sealing points sealing flange/cylinder block on sump (front and rear).
- Tighten bolts securing sump to cylinder block in two stages in diagonal sequence (final torque 18 Nm).
- Installing subframe

=> Running Gear, FWD and 4WD; Repair group 40; Removing and installing subframe Removing and installing subframe

- Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 25 Nm.
- Install ribbed belt =>Page 41 .
- Fill up with engine oil and check oil level.

Tightening torques



-> Fastening engine/gearbox support

Item	Bolt	Nm
1	M10 x 28	45
2, 4, 5 1)	M10 x 45	45
3, 7	M10 x 95	45
6	M10 x 50	45
8	M10 x 65	45

1) Up to approx. 07.96: M8 bolt; tightening torque: 25 Nm

Component	Nm
Sump to cylinder block 1)	18
Engine mounting to subframe	25
Bracket for torque reaction support to engine	25
Longitudinal strut to bracket for torque reaction support	25
Longitudinal strut to engine support	20
Stop for torque reaction support to bracket for torque reaction support	25



Component	Nm
Oil drain connector	30

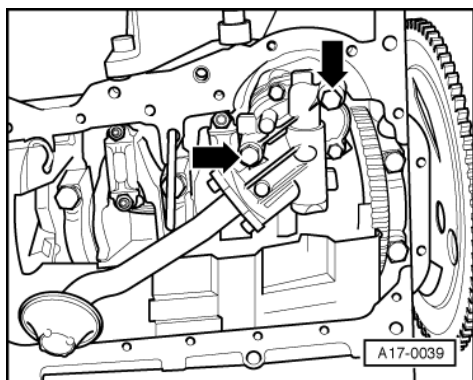
- 1) Special bolts, only use genuine bolts.

=> Parts List

1.5 - Removing and installing oil pump

Removing

- Removing sump => Page **151**



- -> Loosen bolts -arrow-.
- Press subframe downwards and remove oil pump.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Installing sump => Page **156**

Tightening torque

Component	Nm
Oil pump to cylinder block	25

1.6 - Checking oil pressure and oil pressure switch

Function of dynamic oil pressure warning system

Testing warning lamp

The oil pressure warning lamp lights up when the ignition is switched on ("Terminal 15 on") with the engine not running (this does not apply to vehicles with auto check system).

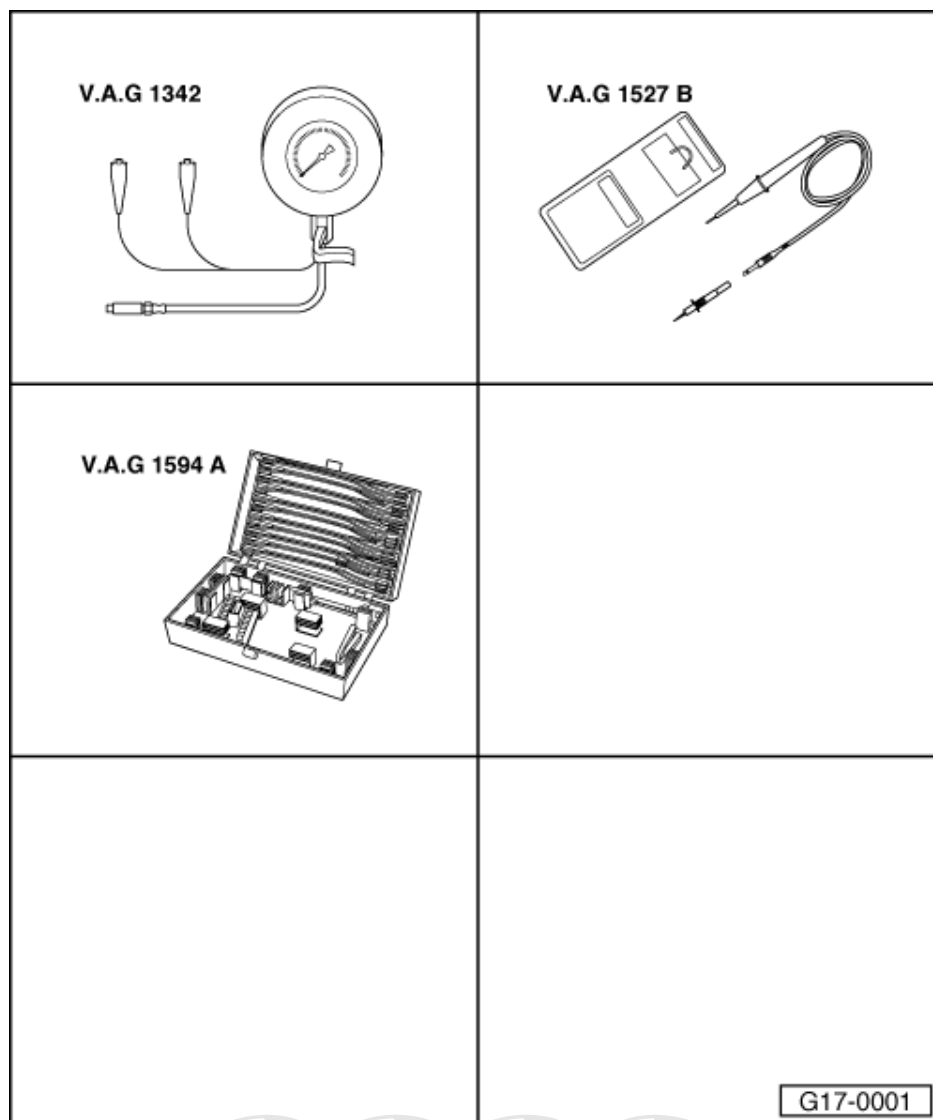
Conditions for activation of warning

- Engine not running; oil pressure switch closed.
- Coolant temperature below 60 °C, engine speed above 300 rpm and oil pressure switch open.
- Coolant temperature above 60 °C, engine speed above 1500 rpm and oil pressure switch open.
- When engine speed is above 5000 rpm an active oil pressure warning is not cancelled, irrespective of the condition of the oil pressure switch.
- If the oil pressure switch is open for longer than 0.5 seconds at engine speeds above 1500 rpm, this condition is stored in the memory.



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If this condition occurs three times during one journey, the warning will also become active or remain active at engine speeds below 1300 rpm.



Special tools, testers and auxiliary items required

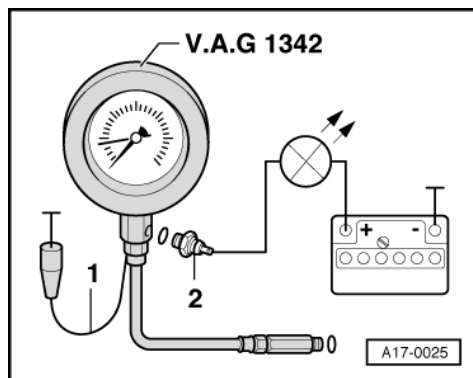
- ♦ V.A.G 1342
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A

Test requirements:

- Oil level OK.
- Oil pressure warning lamp K3 must come on when ignition is switched on.
- In vehicles with auto check system the "OK" display must appear (call up symbol).
- Engine oil temperature approx. 80 °C.

Testing oil pressure switch

- Disconnect wire from oil pressure switch.



- -> Unscrew oil pressure switch and screw in oil pressure tester V.A.G 1342.
- Screw oil pressure switch -2- into V.A.G 1342.
- Connect brown wire 1 of tester to earth (-).
- Connect voltage tester V.A.G 1527 to oil pressure switch and positive side of battery (+) using test leads from V.A.G 1594.
- Test lamp should not light up.
- If the test lamp lights up, fit a new oil pressure switch.
- Start the engine.

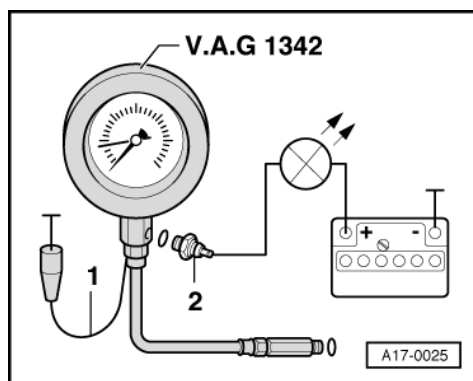
Note:

The switching point of the oil pressure switch can be reached when the engine is cranked on the starter motor, so watch the tester and the test lamp while starting the engine.

- at 0.75 ... 1.05 bar.
- If the test lamp does not light up, fit a new oil pressure switch.

Check oil pressure

- Disconnect wire from oil pressure switch.



- -> Unscrew oil pressure switch and screw in oil pressure tester V.A.G 1342.
- Screw oil pressure switch -2- into V.A.G 1342.
- Start engine (engine oil temperature approx. 80 °C).
- Oil pressure at 2000 rpm: at least 2.0 bar
- Oil pressure at higher engine speeds: max. 7.0 bar

If the specified values are not obtained:

- Pressure relief valve or oil pump defective, replace oil pump => Page 158 .



1.7 - Engine oil

The engine is filled with a high quality multigrade oil at the factory which can be used all year round, except in extremely cold climates.

Viscosity grades and oil specifications

Viscosity grades and oil specifications:

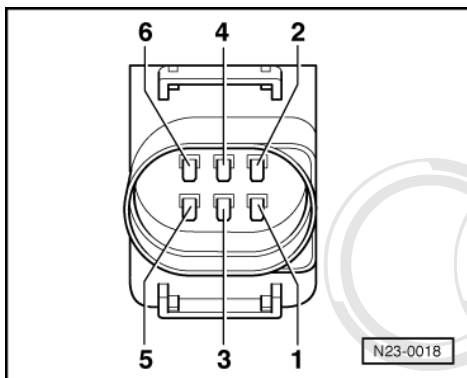
=> Maintenance manual; Engine oil: fill up

The engine is filled with a high quality multigrade oil at the factory, which can be used all year round, except in extremely cold climates.

1.8 - check oil level

Test requirements:

- Engine oil temperature at least 60 °C.
- Vehicle must be level (horizontal)
- Wait a few minutes after switching off the engine to allow the oil to flow back into the sump.
- Pull out the dipstick, wipe with a clean cloth and insert again to stop.
- Pull out the dipstick again and read off the oil level.



-> Markings on oil dipstick:

- a - Oil must not be topped up.
- b - Oil may be topped up. The oil level may rise as far as area -a- after topping up.
- c - Oil must be topped up. The oil level is sufficient if somewhere in area -b- (grooved area) after topping up.

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Note:

The oil level must not be above marking -a- on the dipstick.



19 - Cooling system

1 - Removing and installing parts of the cooling system

1.1 - Removing and installing parts of the cooling system

Important:

Hot steam can escape when opening cap on expansion tank: Cover cap with a cloth and open carefully.

Notes:

- ♦ When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- ♦ Secure all hose connections with the correct hose clips (same as original equipment):

=> Parts List

- ♦ V.A.G 1921 pliers are recommended when installing spring type clips.
- ♦ Renew all gaskets and seals.
- ♦ The arrow markings on the coolant pipes and on the ends of the hoses must be aligned with each other.
- ♦ Removing and installing viscous fan => Page 35 .

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1.2 - Parts of cooling system

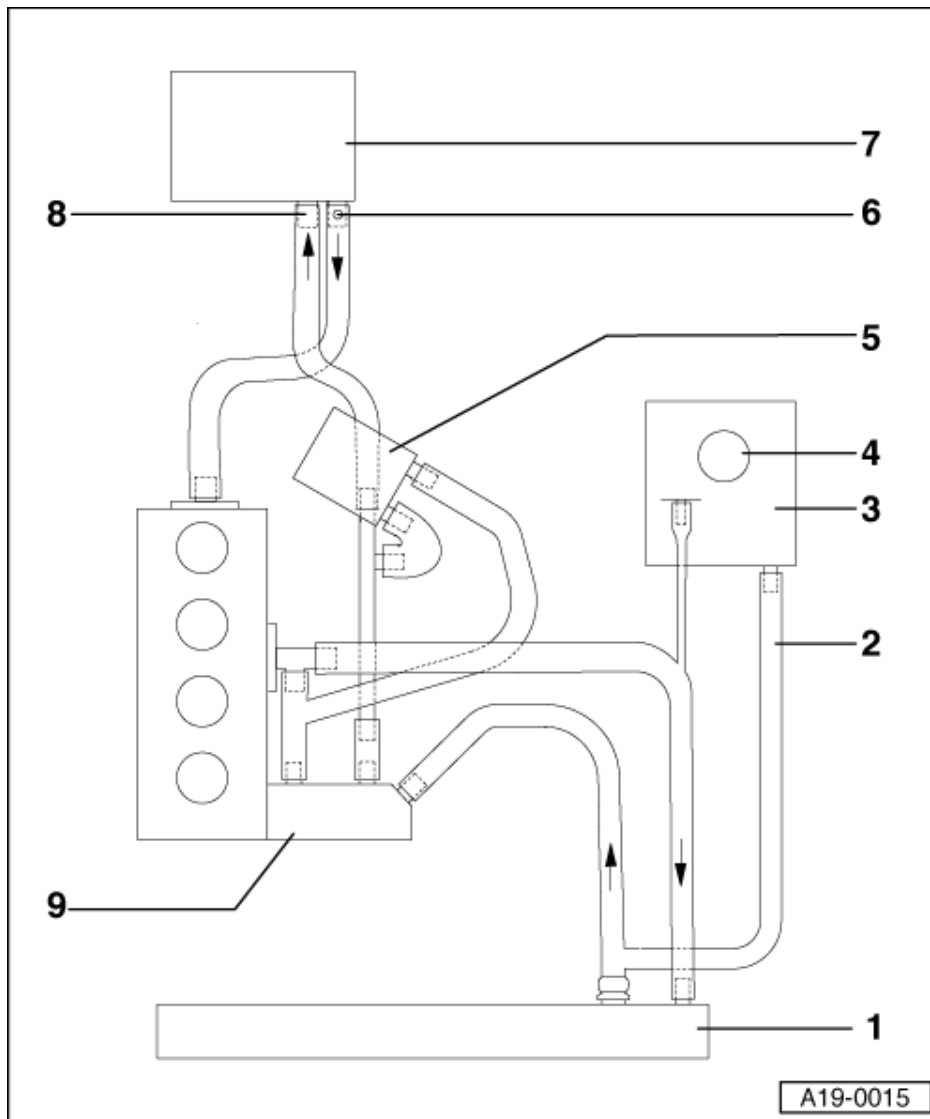
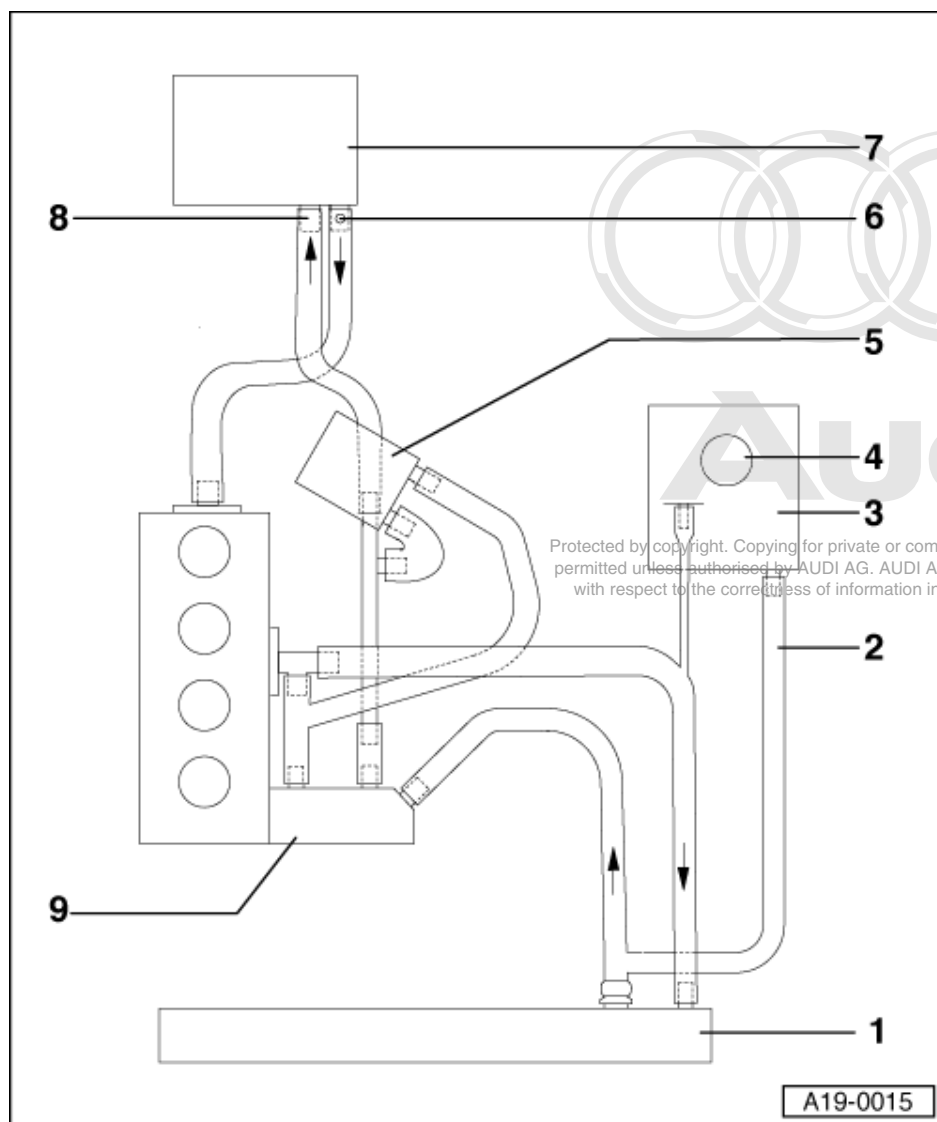


Diagram of coolant hose connections

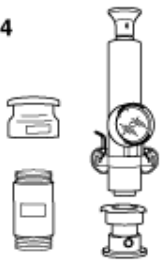
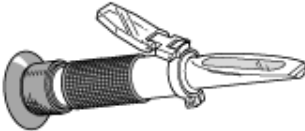
- 1 Radiator
 - ♦ Removing and installing
=> Page 176
 - ♦ After replacing, fill with fresh coolant
- 2 Return pipe
 - ♦ To expansion tank
- 3 Expansion tank
- 4 Cap
 - ♦ With pressure relief valve
 - ♦ Checking pressure relief valve
=> Page 181
- 5 Oil cooler
 - ♦ Removing and installing => Item 149

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- 6 Bleeder hole**
 - ◆ In return pipe of heating system heat exchanger
- 7 Heating system heat exchanger**
 - ◆ After replacing, fill with fresh coolant
- 8 Supply pipe**
 - ◆ To heating system heat exchanger
- 9 Coolant pump/coolant thermostat**
 - ◆ Removing and installing coolant pump => Page 172
 - ◆ Check for ease of movement
 - ◆ Removing and installing coolant pump => Page 173
 - ◆ Checking => Page 173

1.3 - Draining and filling cooling system

V.A.G 1274 	V.A.G 1274/8 
V.A.G 1274/10 	V.A.G 1306 
V.A.G 1921 	T10007  G19-0001

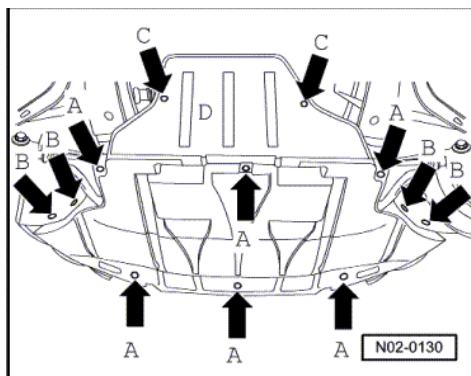
Special tools, testers and auxiliary items required

- ◆ V.A.G 1274/1 (for vehicles with small filler cap)
- ◆ V.A.G 1274/8 (for vehicles with large filler cap)
- ◆ V.A.G 1274/10
- ◆ V.A.G 1306
- ◆ V.A.G 1921
- ◆ Special tool T10007 (for coolant additive G 012 A8 D)

Draining

Note:

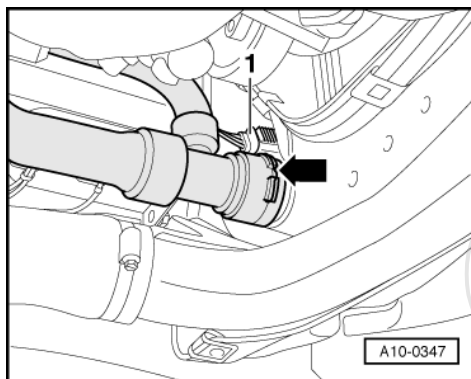
Catch drained off coolant in a clean container for re use or disposal.



Important:

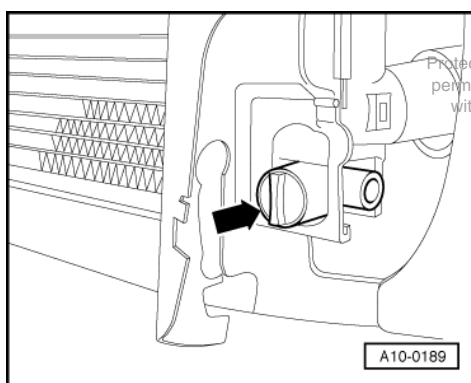
Hot steam can escape when opening cap on expansion tank: Cover cap with a cloth and open carefully.

- Open the cover of the coolant expansion tank
- -> Release quick release fasteners -A- and -B- and take off front noise insulation.



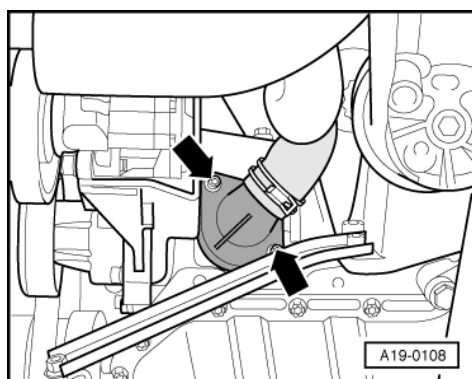
- Place drip tray V.A.G 1306 below engine.
- -> Pull off bottom coolant hose retaining clip -arrow- and remove coolant hose from radiator.

Note:



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-> When bumper is removed from vehicle, coolant can also be drained from radiator via drain screw -arrow-.



- -> Remove bolts -arrows-, detach connection, O-ring and thermostat and drain remaining coolant.

Filling

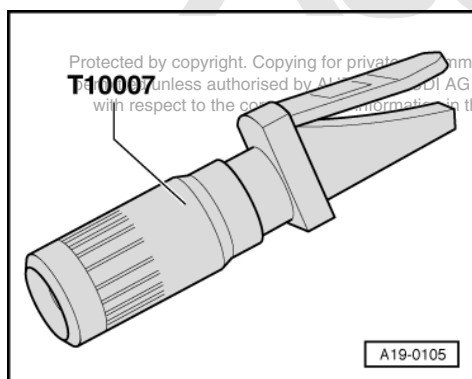
Notes:

- ♦ The cooling system is filled all year round with a mixture of water and antifreeze/corrosion protection agent.
- ♦ Coolant additive G 011 A8 C (green) is used in vehicles up to 06.96.
- ♦ Only coolant additive G 012 A8 D (red) is used in vehicles from 07.96 onwards.

Important:

The two different coolant additives G 011 A8 C and G 012 A8 D must not be mixed together. Otherwise, this can result in serious damage to the engine.

- ♦ If the fluid in the expansion tank is brown, this means G 012 A8 D has been mixed with another type of coolant. In this case, flush out the cooling system and fill with fresh coolant. To flush the system, fill it with clean water and run the engine for about 2 minutes. This should remove as much of the old coolant as possible.
- ♦ G 011 A8 C and G 012 A8 D (and coolant additives marked "meeting specification TL VW 774 C" or "meeting specification TL VW 774 D") prevent frost and corrosion damage, stop scaling and at the same time raise the boiling point of the coolant. For these reasons the cooling system must be filled all year round with the correct anti freeze and anti corrosion additive.
- ♦ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ♦ Protection against frost must be assured to about -25 °C (in arctic climatic countries to about -35 °C).
- ♦ The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti freeze ratio must be at least 40 %.
- ♦ If greater frost protection is required in very cold climates, the amount of G 012 A8 D can be increased, but only up to 60 % (this gives frost protection to about -40 °C), as otherwise frost protection is reduced again and cooling effectiveness is also reduced.
- ♦ If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, do not reuse old coolant.



- ♦ -> Use special tool T10007 to check frost protection of coolant additive G012 A8 D in cooling system.

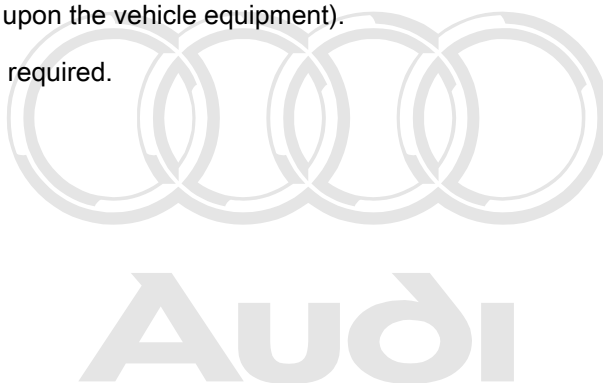
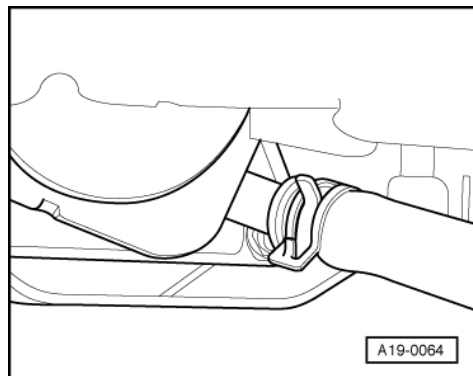


Recommended mixture ratios:

Frost protection to	Anti freeze concentration	G 012A8 D 1)	Water 1)
-25 °C	40 %	2.4 l	3.6 l
-35 °C	50 %	3.0 l	3.0 l

1) Coolant quantity: 6.0 litres (may vary depending upon the vehicle equipment).

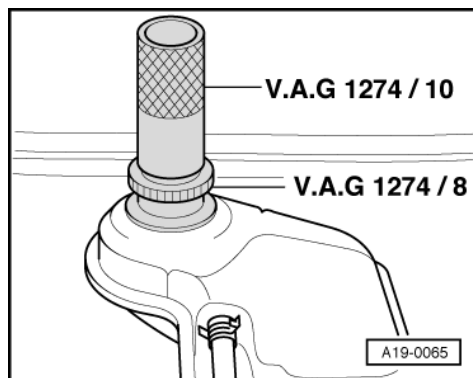
- Clean and smooth down sealing surface for O-ring as required.
- Install thermostat, new O-ring and connection.
- Install lower coolant hose and secure.



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Vehicles with small filler cap:

- -> Screw adapter V.A.G 1274/1 onto coolant expansion tank.
- Fit special tool V.A.G 1274/10 onto adapter.



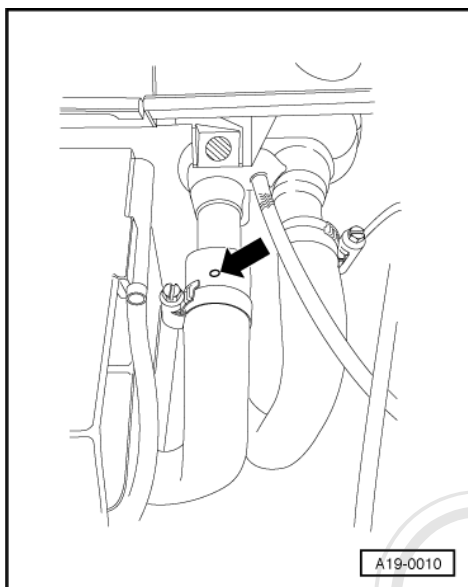
Vehicles with large filler cap:

- -> Screw adapter V.A.G 1274/8 onto coolant expansion tank.
- Fit special tool V.A.G 1274/10 onto adapter.

All models:

Note:

To fill expansion tank without special tools, detach expansion tank and raise it about 100 mm.



- Push back bellows on connection of heater heat exchanger in plenum chamber.
- -> Release coolant hose going to heat exchanger and pull back the hose until the bleeder hole in the hose -arrow- is no longer covered by the connection.
- Top up coolant until it flows out at the bleeder hole in coolant hose.
- Push coolant hose on connection and secure.
- Fit expansion tank cap.
- Start engine and maintain an engine speed of about 2000 rpm for approx. 3 minutes.
- Then allow engine to run at idling speed until the lower hose on radiator becomes hot.
- Check coolant level and top up if necessary. If the engine is warm, coolant level must be at max. mark; if cold, between min. and max. marks.

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Important:

Hot steam can escape when opening cap on expansion tank: Cover cap with a cloth and open carefully.

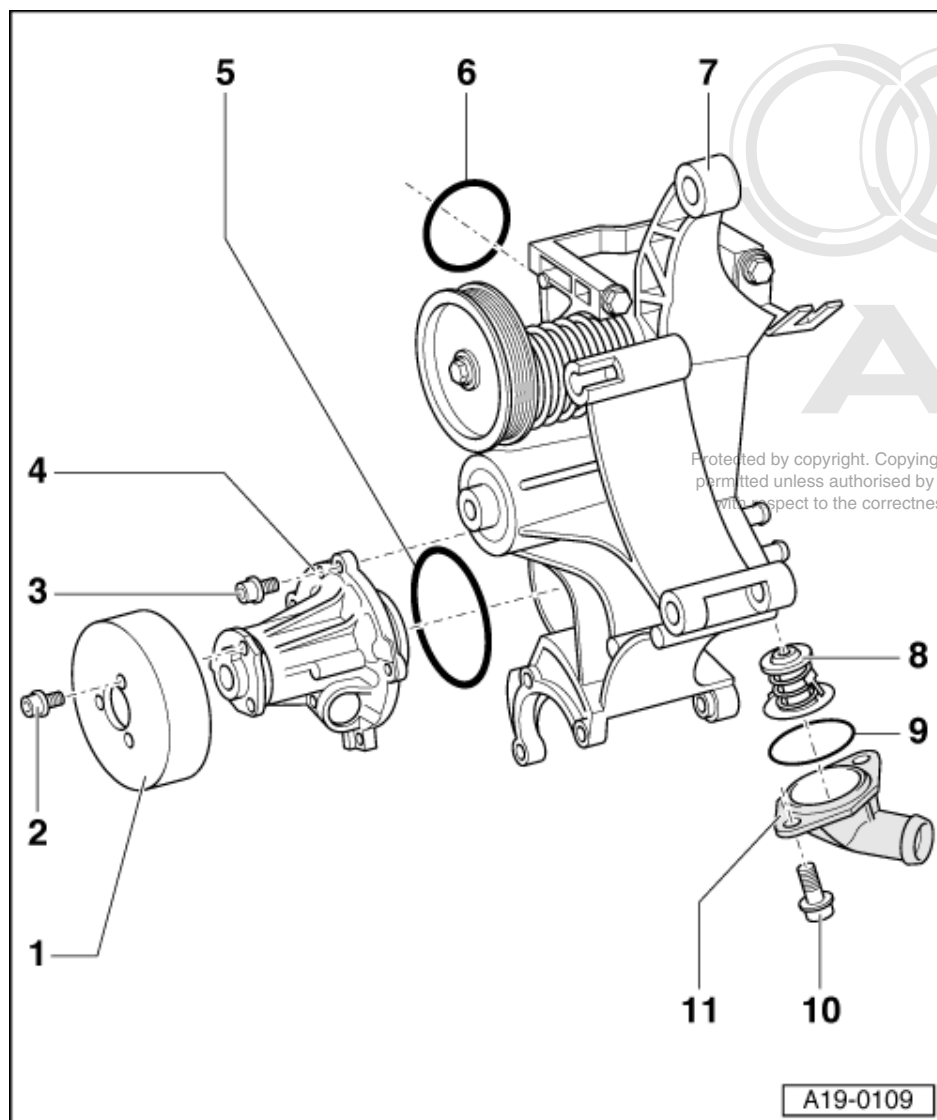
- Stop engine.

Tightening torque

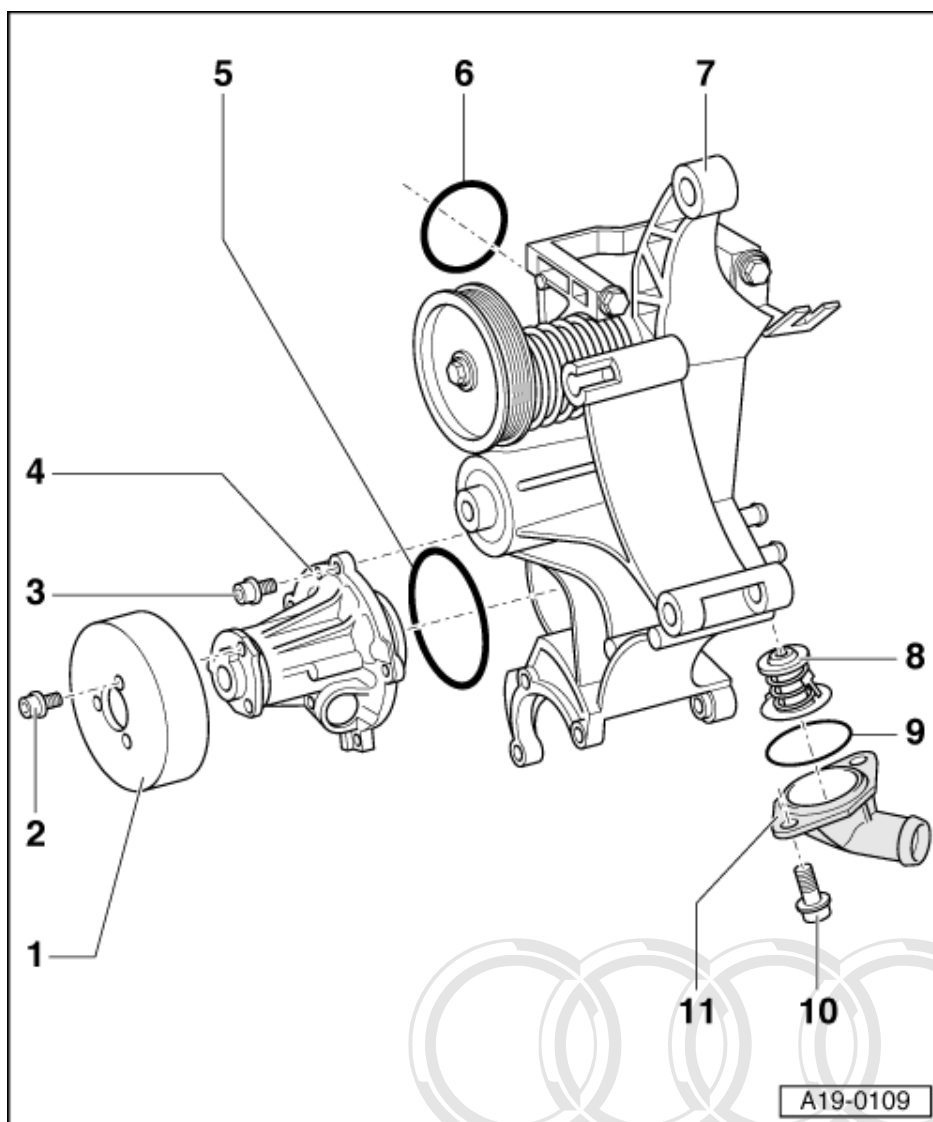
Component	Nm
Connection to bracket for alternator, vane pump and viscous fan	10



1.4 - Removing and installing coolant pump and coolant thermostat



- 1 Pulley
- 2 25 Nm
- 3 10 Nm
- 4 Coolant pump
 - ♦ Removing and installing
 - => Page 172
 - ♦ Check for ease of movement
- 5 O-ring
 - ♦ Replace
- 6 O-ring
 - ♦ Replace



7 Bracket

- ♦ For alternator, vane pump and viscous fan
- ♦ Removing and installing
=> Page 44

8 Thermostat

- ♦ Removing and installing
=> Page 173
- ♦ Checking => Page 173

9 O-ring

- ♦ Replace

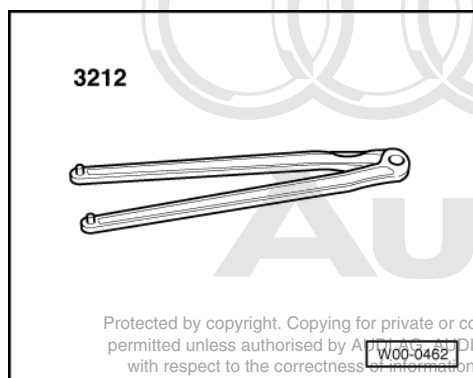
10 10 Nm

11 Pipe union

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1.5 - Removing and installing coolant pump

Special tools, testers and auxiliary equipment required

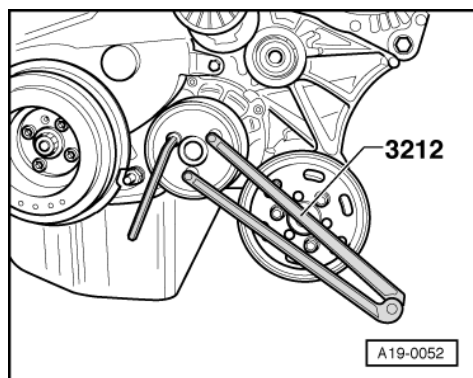


- ♦ Special tool 3212

- Lock carrier must be in service position => Page 24 .

Removing

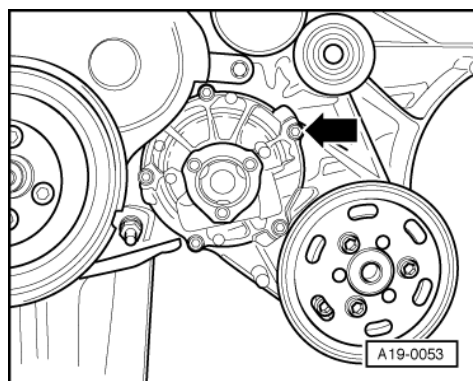
- Remove toothed belt => Page 41 .
- Remove viscous fan (with belt pulley) => Page 35 .



Note:

Ribbed belt for air conditioner does not have to be removed.

- Drain coolant => Page 165 .
- -> Counterhold coolant pump pulley with 2-hole pin wrench 3212 and unscrew bracket using 8 mm Allen key.



- -> Remove coolant pump from bracket for alternator, vane pump and viscous fan -arrow-.
- Remove coolant pump.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Clean sealing surfaces on both sections of housing.

Note:

Renew O-ring.

- Install viscous fan=> Page 35 .
- Install ribbed belt =>Page 41 .
- Top up cooling system => Page 167 .

Tightening torques

Component	Nm
Coolant pump to bracket for alternator, vane pump and viscous fan	10
Pulley to coolant pump	25

1.6 - Removing and installing, checking coolant thermostat

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Important: Hot steam can escape when opening cap on expansion tank: Cover cap with a cloth and open carefully.

- Open the cover of the coolant expansion tank.
- Drain coolant => Page 165 .

Installing

- Clean and smooth down sealing surface for O-ring as required.
- Install thermostat, new O-ring and connection.
- Top up cooling system => Page 167 .

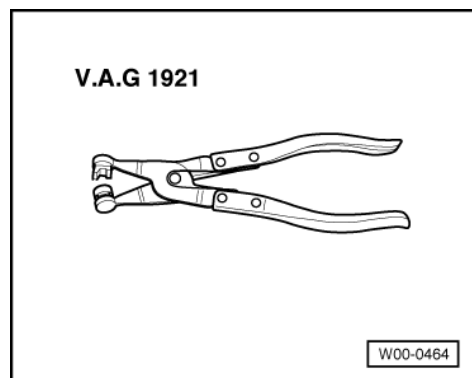
Check coolant thermostat

- Heat thermostat in water bath.

Starts to open	Fully open	Opening travel
approx. 87 °C	approx. 102 °C 1)	at least 8 mm

1) cannot be tested

1.7 - Removing and installing coolant pipe

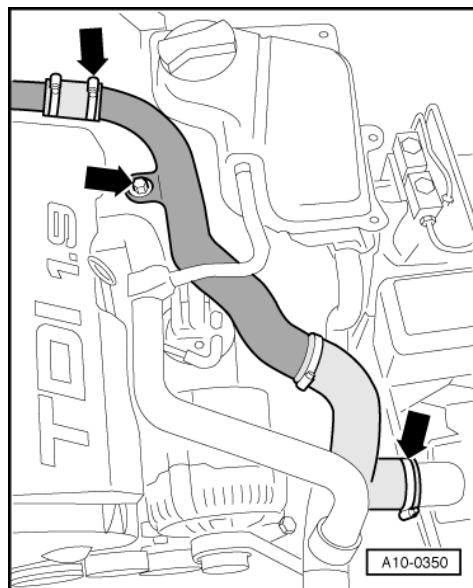




Special tools, testers and auxiliary equipment required

- ♦ V.A.G 1921

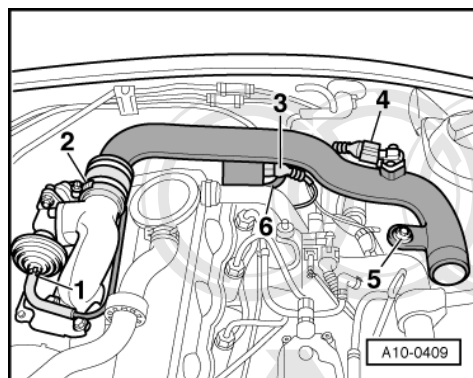
Removing



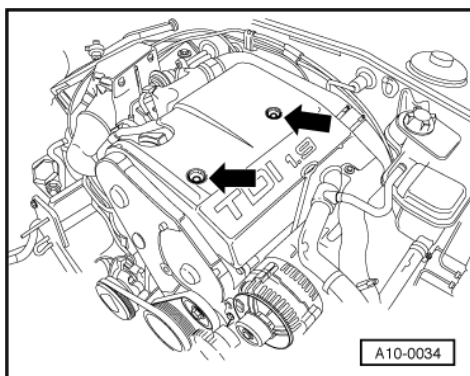
Vehicles ä 06.97:

- -> Remove screw and detach air charge hose together with left air duct pipe -arrows-.

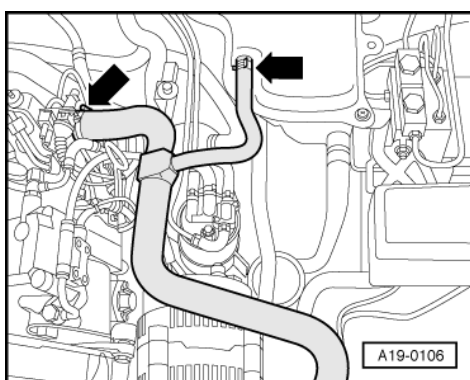
Vehicles 07.97 ä:



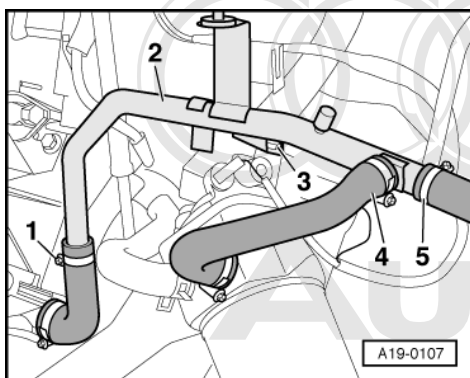
- Loosen left air intake hose on rear air duct pipe and move hose clear to one side.
- -> Remove rear air duct pipe:
 - Detach hose -1-.
 - Unfasten hose clip -2-.
 - Disconnect connectors -3- and -4-.
 - Remove bolt -5-.
 - Detach hose -6-.



- -> Remove engine cover panel -arrows-.
- Drain coolant => Page 165 .



- -> Remove left coolant hose from cylinder head and expansion tank -arrows- and move clear to one side.
- Release injection pump connector and detach from bracket.
- Move wiring harness connected to coolant pipe clear.



- -> Disconnect hose -4- (going to oil cooler) from coolant pipe -2-.
- Disconnect hose -5- (going to heat exchanger) from coolant pipe.
- Detach coolant pipe from hose -1- going to coolant pump.
- Unbolt coolant pipe from oil filter bracket -3-.

Installing

Installation is carried out in the reverse order, when doing this note the following:

- Top up cooling system => Page 167 .

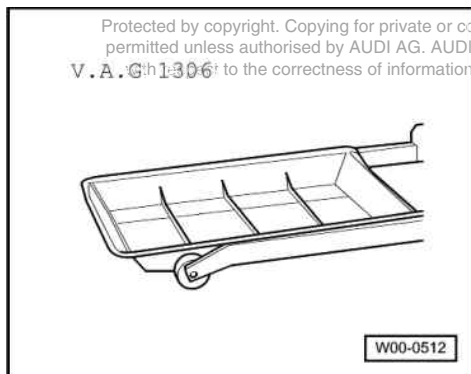


Tightening torques

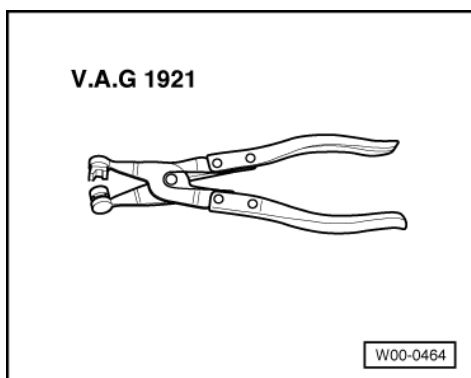
Component	Nm
Coolant pipe to oil filter bracket	20

1.8 - Removing and installing radiator

Special tools, testers and auxiliary equipment required



- ♦ V.A.G 1306

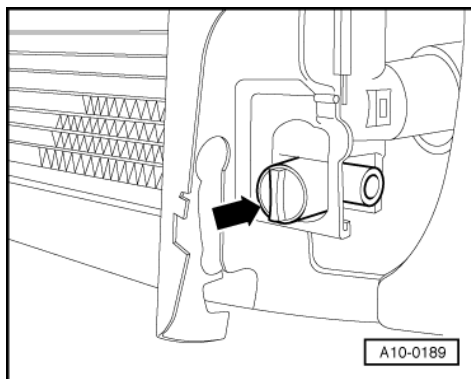


- ♦ V.A.G 1921

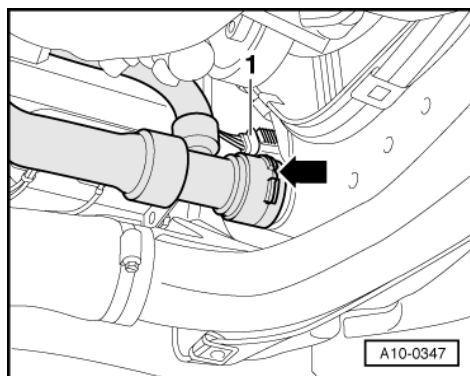
Removing

- Remove front bumper:

=> General body repairs; Repair group 63; Front bumper; Removing and installing front bumper Front bumper
Removing and installing front bumper



- Place drip tray V.A.G 1306 below engine.
- Open the cover of the coolant expansion tank
- -> Turn drain screw -arrow- on radiator anti clockwise. If necessary, fit drain hose on connection.



- -> Pull off bottom coolant hose retaining clip -arrow- and remove coolant hose from radiator.

Vehicles with uprated cooling system:

- Unplug connector -1- from radiator fan thermoswitch -F18/-F54 on radiator (bottom left) and move electrical wires clear.

Vehicles with automatic gearbox:

- Removing ATF pipes/hoses from radiator:

=> Automatic gearbox 01N; Repair group 37; Dismantling and assembling gearbox; Removing and installing ATF pipes Dismantling and assembling gearbox Removing and installing ATF pipes

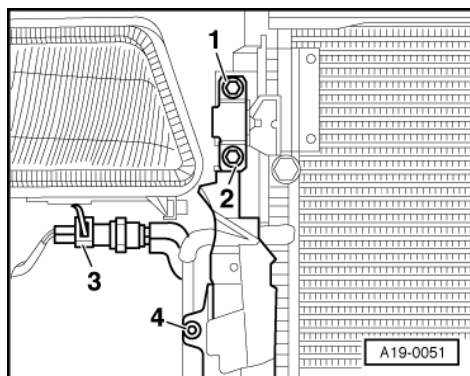
Vehicles with air conditioner:

Important:
The air conditioner refrigerant circuit must not be opened.

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Note:

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



- -> Detach air cowls from radiator -4- (left and right).
- Remove securing bolts -1- and -2- for condenser.
- Unplug connector -3- from air conditioner pressure switch -F129.
- Pull condenser up out of its bracket, pivot towards the side and secure to right-hand front wheel with wire.

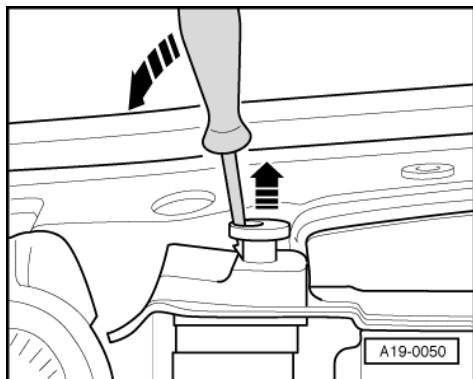


Note:

Protect wing panel from damage.

All models:

- Disconnect upper coolant hose.



- -> Release two retaining pins for radiator and pull out upwards -arrows-.
- Pivot radiator towards the front and lift out.

Installing

Installation is carried out in the reverse order, when doing this note the following:

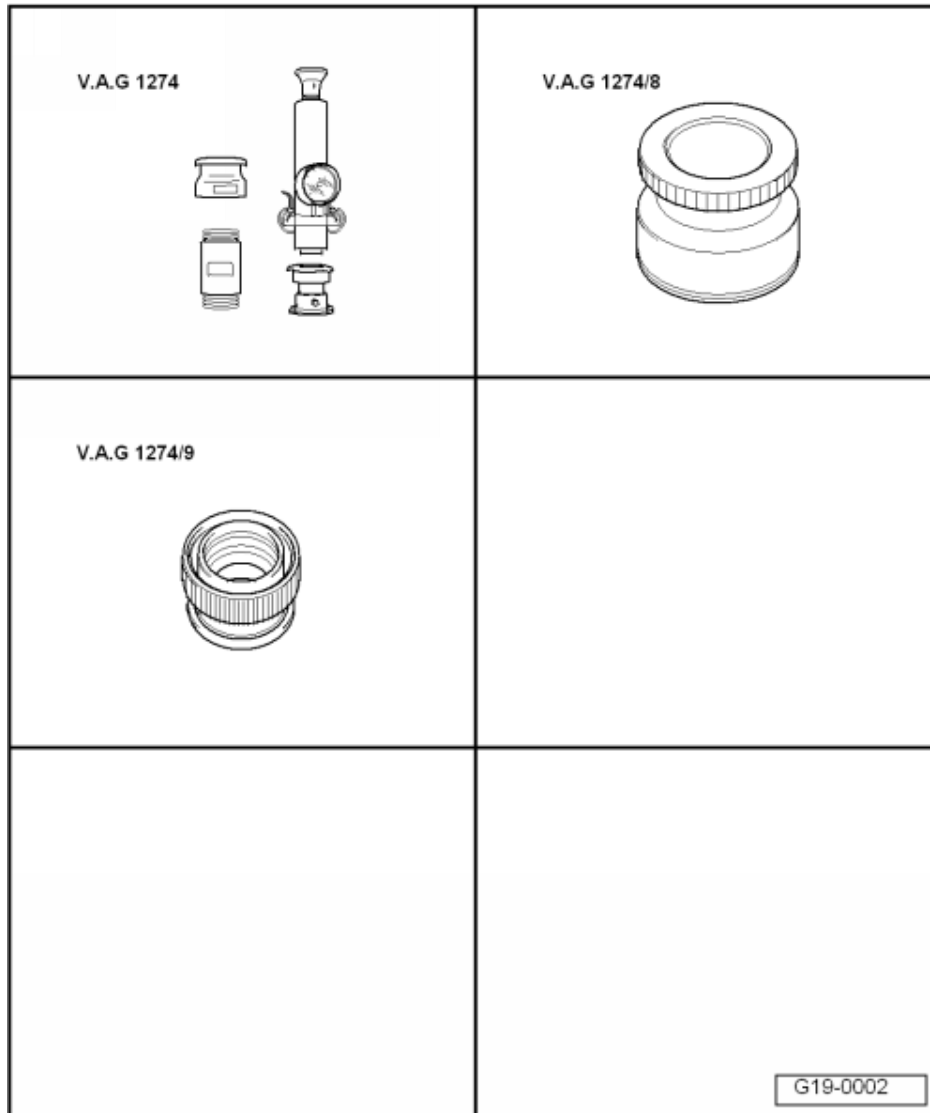
- Top up cooling system => Page 167 .

Tightening torque

Component	Nm
Condenser to radiator	10

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1.9 - Checking cooling system for leaks



Special tools, testers and auxiliary items required

- ◆ V.A.G 1274
- ◆ V.A.G 1274/1 (for vehicles with small filler cap)
- ◆ V.A.G 1274/8 (for vehicles with large filler cap)
- ◆ V.A.G 1274/9 (for vehicles with large filler cap)

Test requirements: Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not less 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.

- Engine at operating temperature.

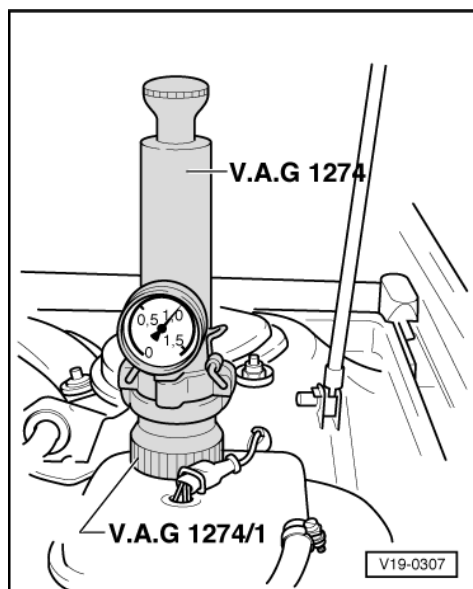
Important:

Hot steam can escape when opening cap on expansion tank: Cover cap with a cloth and open carefully.

- Open the cover of the coolant expansion tank

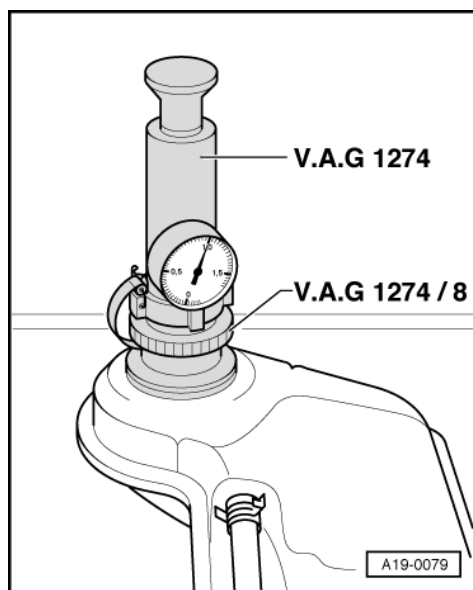


Vehicles with small filler cap:



- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/1 onto expansion tank.

Vehicles with large filler cap:



- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/8 onto expansion tank.

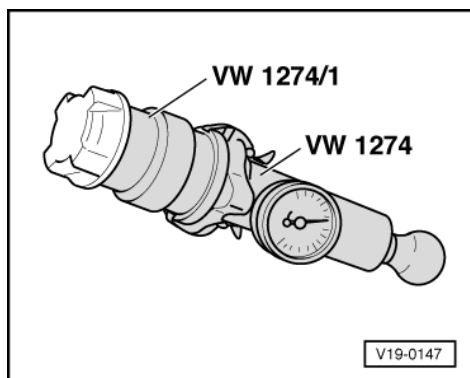
All models:

- Using hand pump on tester, build up a pressure of approx. 1.0 bar.
- If this pressure is not maintained, locate and rectify leaks.



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Testing pressure relief valve in filler cap

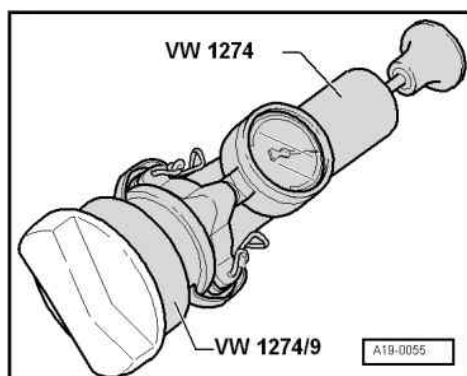


Vehicles with small filler cap:

- -> Fit tester V.A.G 1274 with adapter V.A.G 1274/1 (2 parts) onto filler cap.
- Operate hand pump.
- The pressure relief valve should open at a pressure of 1.2 ... 1.5 bar.

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Vehicles with large filler cap:



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

21 - Charging

1 - Charge air system with turbocharger

1.1 - Charge air system with turbocharger

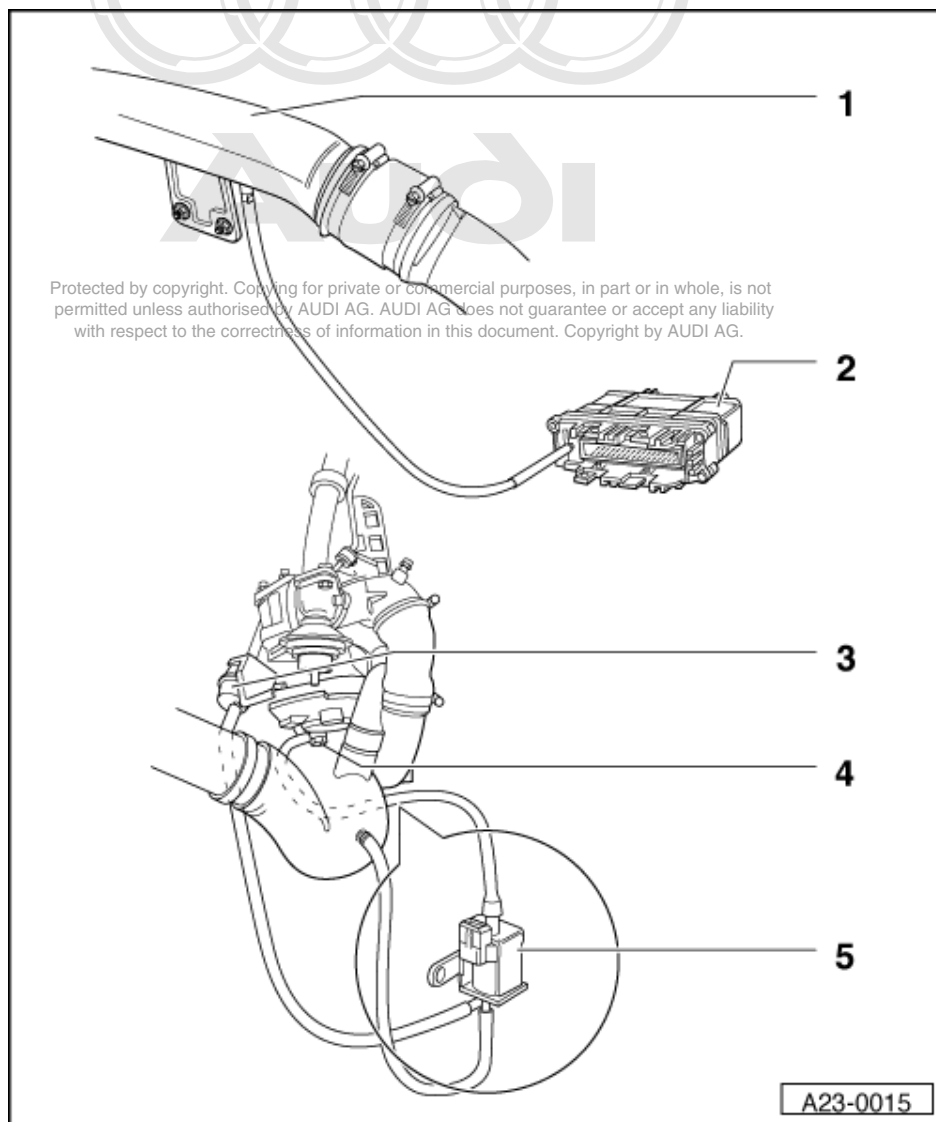
Notes:

- ♦ For cleanliness rules, see=> Page 203 .
- ♦ Secure all hose connections with the correct hose clips (same as original equipment):

=> Parts List

- ♦ Charge air system must be free of leaks.
- ♦ When performing repairs, replace seals, gaskets, self-locking nuts and stretch bolts which have a specified tightening angle.

1.2 - Diagram of connections for boost pressure control - engine codes 1Z, AFF, AHU

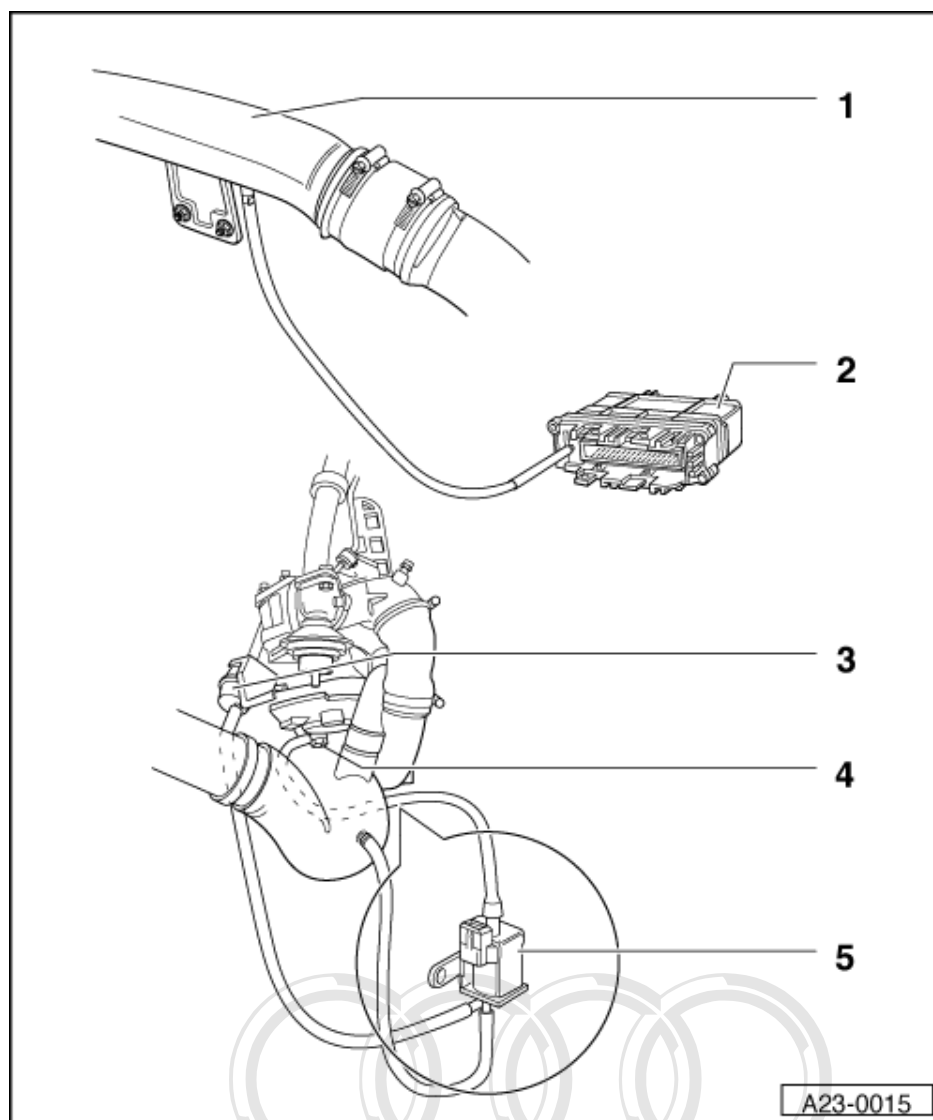


Note:

On vehicles 07.97 ▶ intake manifold pressure sender -G71 combined with intake manifold temperature sender -G72 is located on air duct pipe from charge air cooler to intake pipe. The connection hose shown in this illustration, from rear air duct pipe -1- to diesel direct injection system control unit -2- is therefore no longer required.

1 Air duct pipe, rear

- ◆ Boost air cooler/intake pipe
- ◆ ä 06.97 with pressure connection for intake manifold pressure sender -G71



2 Control unit for diesel direct injection system -J248

- ◆ ä 06.97 with intake manifold pressure sender -G71

3 Pressure unit for boost pressure control

- ◆ Checking => Page 194

4 Pressure connection on turbocharger

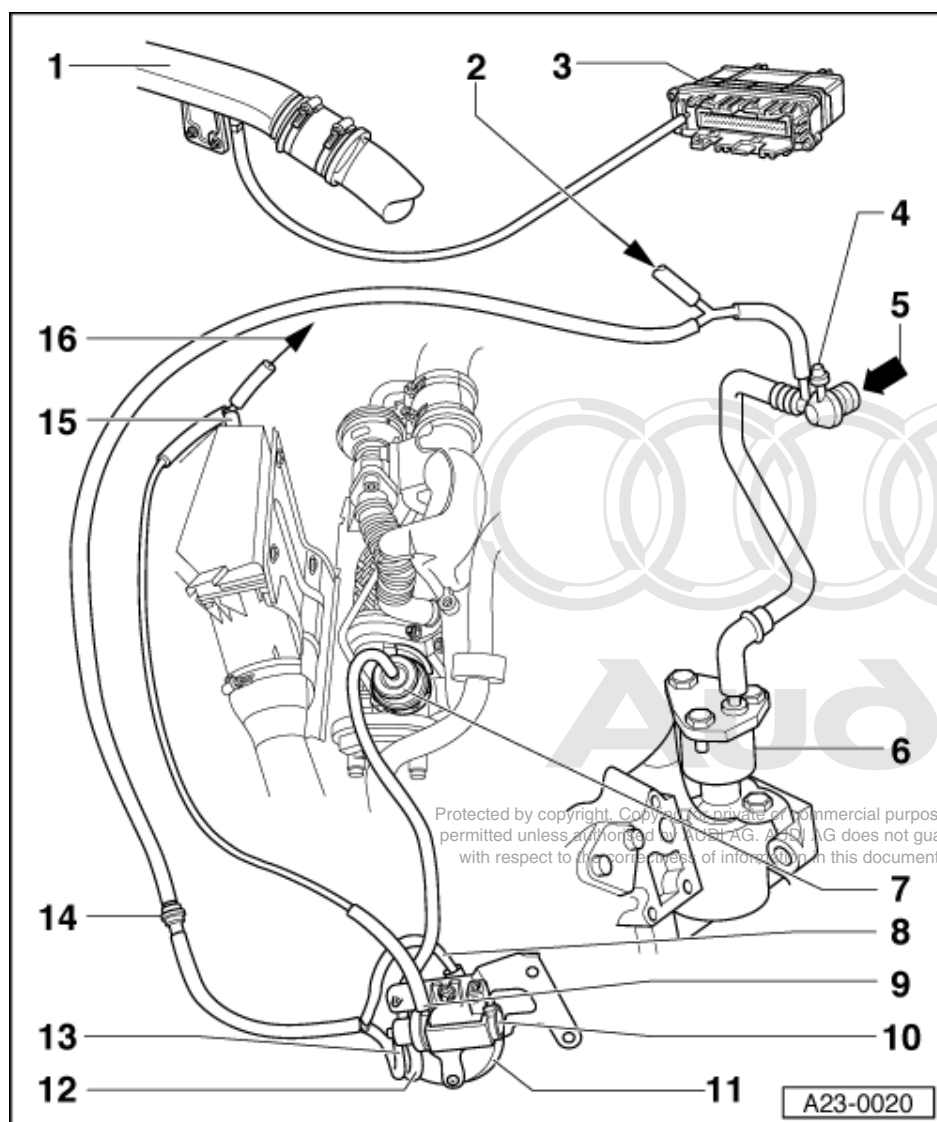
- ◆ Pressure supply for boost pressure control

5 Boost pressure control solenoid valve -N75

- ◆ Installation position: at front left of engine compartment
- ◆ Checking => Page 197

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1.3 - Diagram for boost pressure control - engine codes AFN, AHH

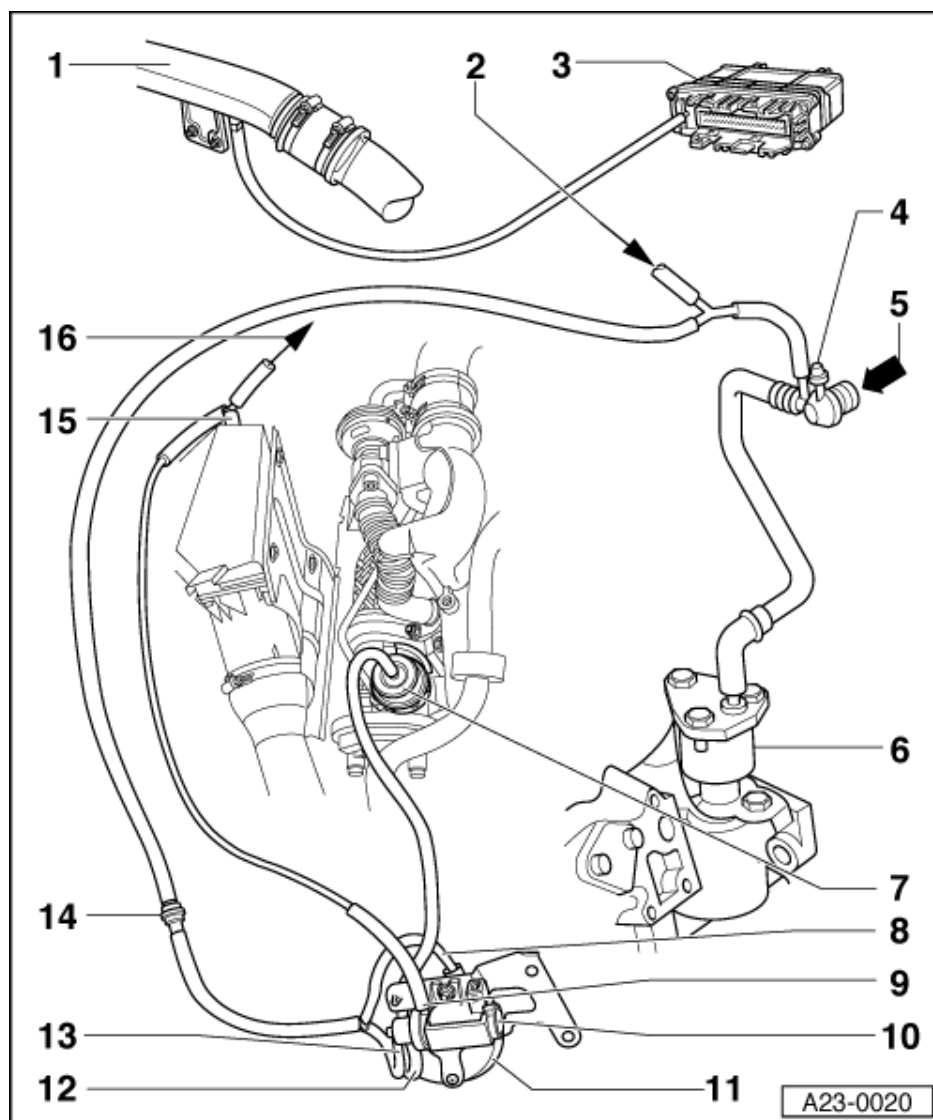


Note:

On vehicles 07.97 ▶ intake manifold pressure sender -G71 combined with intake manifold temperature sender -G72 is located on air duct pipe from charge air cooler to intake pipe. The connection hose shown in this illustration, from rear air duct pipe -1- to diesel direct injection system control unit -2- is therefore no longer required.

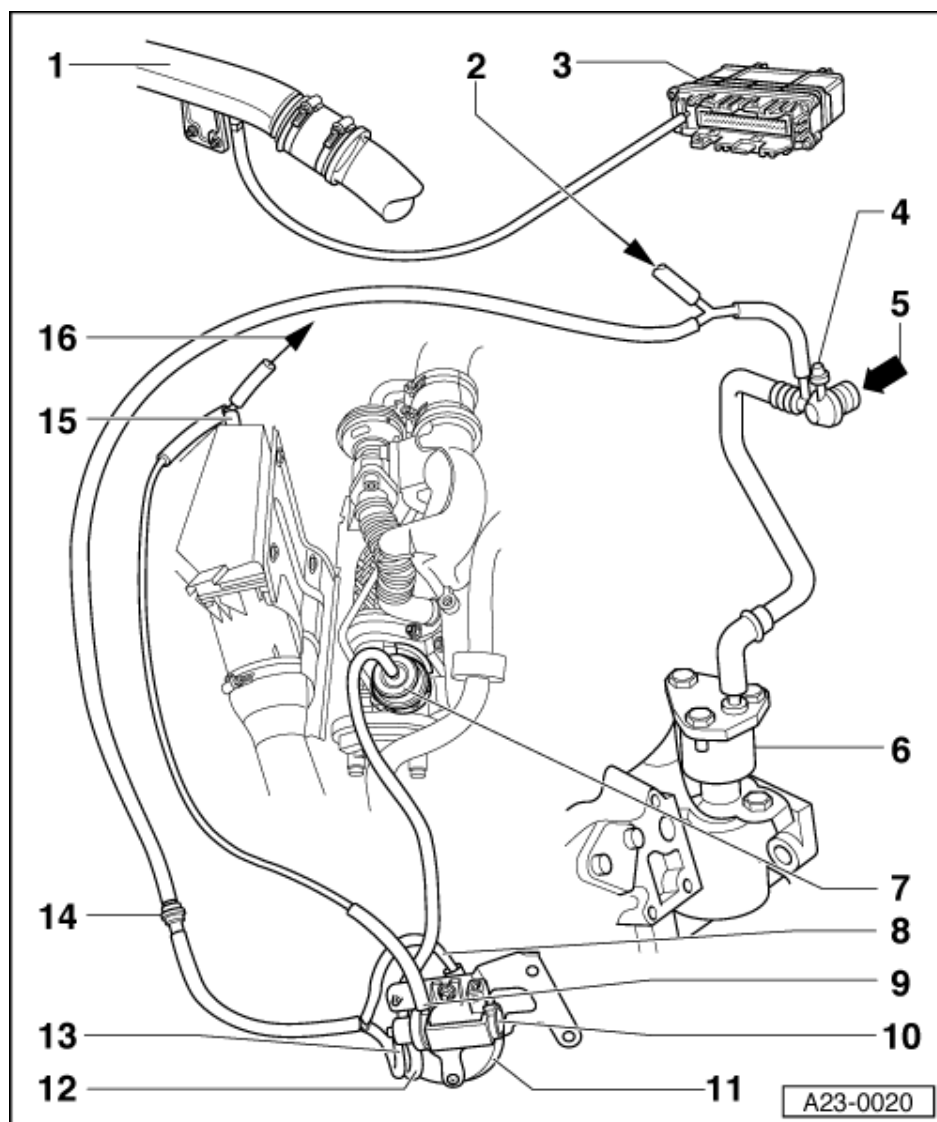
1 Air duct pipe, rear

- ◆ Boost air cooler/intake pipe
- ◆ ä 06.97 with pressure connection for intake manifold pressure sender -G71



- 2 From exhaust gas recirculation valve
- 3 Control unit for diesel direct injection system -J248
 - ♦ ä 06.97 with intake manifold pressure sender -G71
- 4 Vacuum connection
 - ♦ For air conditioner
 - ♦ With filler cap on vehicles without air conditioner
- 5 From brake servo
- 6 Exhauster
- 7 Vacuum unit for boost pressure control
- 8 Vacuum hose
 - ♦ To vacuum reservoir

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9 Vent line

- ♦ From solenoid valve for boost pressure limitation -N75 to air cleaner.

10 Boost pressure control solenoid valve -N75

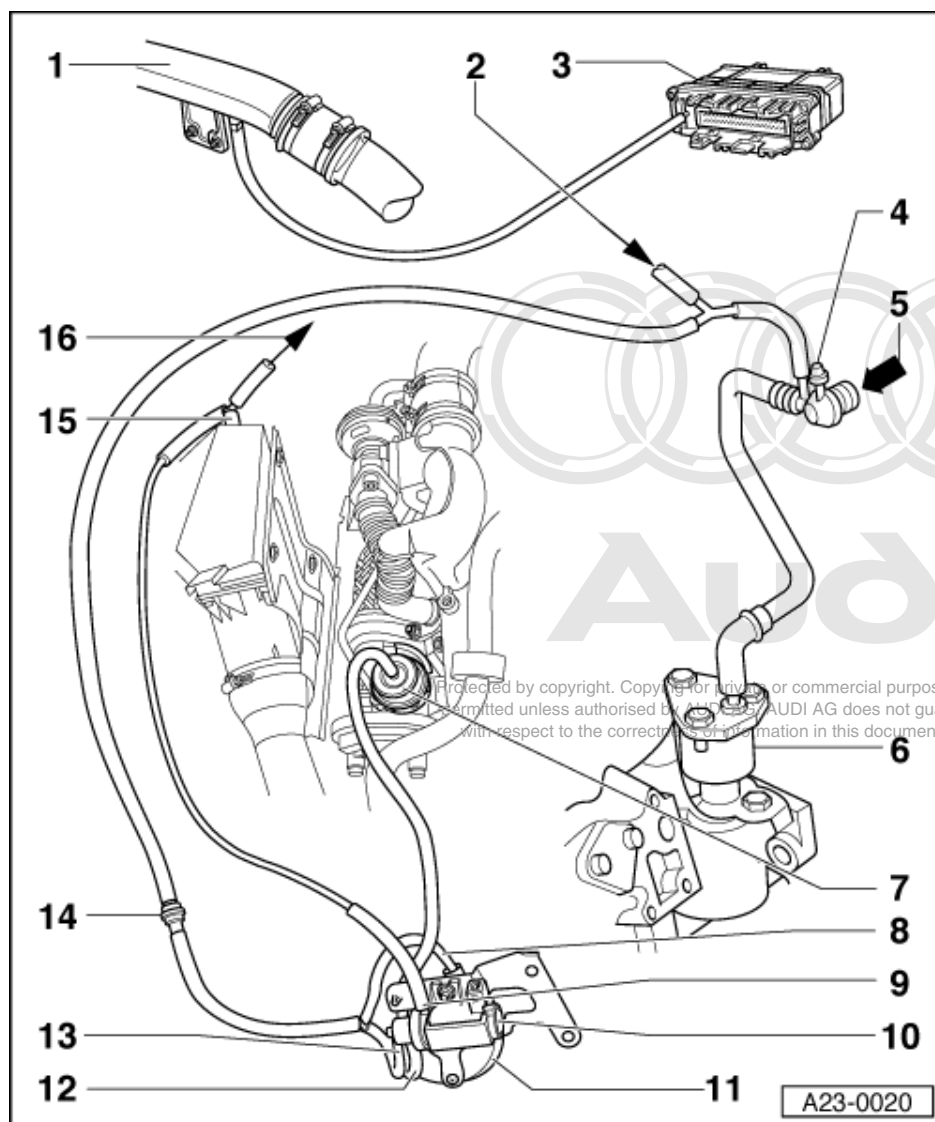
11 Vacuum reservoir

12 Vacuum hose

- ♦ From solenoid valve for boost pressure limitation -N75 to vacuum unit for boost pressure control

13 Vacuum hose

- ♦ From solenoid valve for boost pressure limitation -N75 to non-return valve

**14 Non-return valve**

- ♦ White connector to solenoid valve for boost pressure limitation -Fig. 10 - and to vacuum reservoir.

15 Vent line

- ♦ To air cleaner

16 Vent line

- ♦ To EGR valve -N18

1.4 - Checking turbocharger and boost pressure control system**Safety precautions**

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

Important:

- ♦ Always attach testers and measuring instruments to the back seat and have a second person operate them from there.
- ♦ If test equipment were operated from the front passenger seat, the person sitting there could be injured if the front passenger airbag were triggered in the event of an accident.

**Test requirements:**

- Fault memory has been interrogated

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Interrogating and erasing fault memory Self diagnosis of diesel direct-injection system Interrogating and erasing fault memory

=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Self-diagnosis; Interrogating and erasing fault memory Self-diagnosis Interrogating and erasing fault memory

- Final control diagnosis has been performed

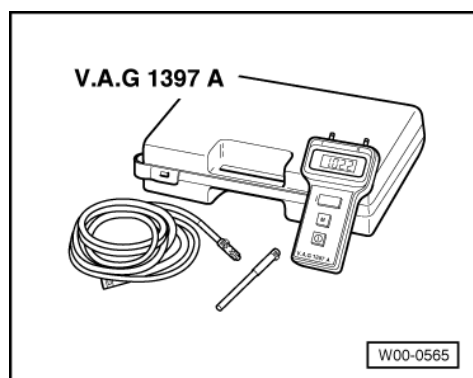
=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Final control diagnosis Self diagnosis of diesel direct-injection system Final control diagnosis

=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Final control diagnosis Final control diagnosis

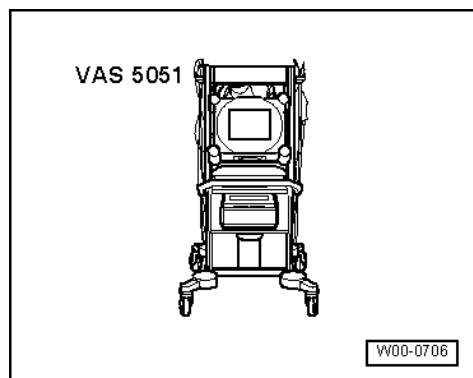
- No leaks in intake or exhaust system
- No faults in engine or injection system, e.g. compression, injectors or commencement of injection.
- Coolant temperature at least 80 °C.

1.5 - Testing boost pressure - engine codes 1Z, AFF, AHU

- ♦ To localise faults, the turbocharger (without boost pressure control) must be checked first and then the boost pressure with boost pressure control.
- ♦ A modified injection system is fitted on vehicles 07.97 ä, on which the connection hose to engine control unit is discontinued. The turbocharger tester cannot be connected to this injection system. The boost pressure can only be checked using fault reader V.A.G 1551.
- ♦ This section describes the test using both measuring devices.

**Special tools, testers and auxiliary equipment required**

- ♦ V.A.G 1397 A (only for vehicles ä 06.97)

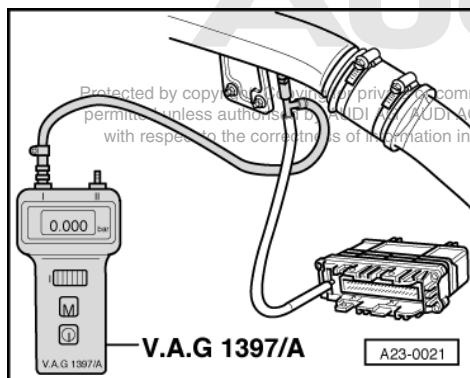


♦ VAS 5051

or

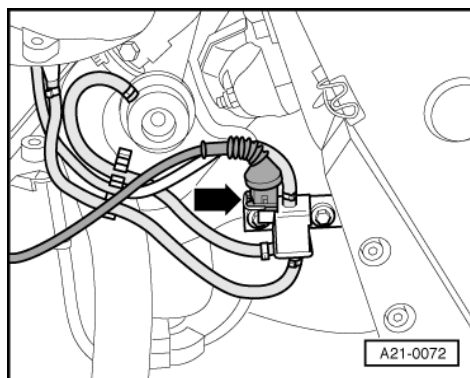
♦ V.A.G 1551 with V.A.G 1551/3 A

Test sequence

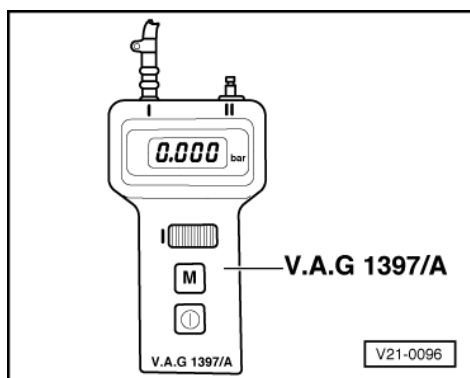


- -> On vehicles > 06.97, disconnect connecting hose between rear air duct pipe and engine control unit and connect to T-piece of turbocharger tester V.A.G 1397 A.
- Route measuring hose under rear edge of bonnet and into passenger compartment via right hand window.

Testing without boost pressure control:



- -> Pull connector -arrow- off solenoid valve for boost pressure control.



- -> Switch on turbocharger tester and set measuring range selector switch to position -I- (absolute pressure).
- Connect measuring hose to connection -I-.

Notes:

- ♦ Hose connections must be completely airtight, otherwise measurements will not be correct.

- ◆ Ensure that measuring hose is not pinched at bonnet or side window.
- ◆ Pressing memory key M on turbocharger tester will store the last measured value until memory key M is pressed again or tester is switched off.
- ◆ The decimal point in the display flashes to indicate that the value is being stored.
- ◆ If the battery voltage of the turbocharger tester drops below the minimum level, an arrow will appear at the top left of the display.
- ◆ Observe safety precautions => Page 187 .

- Read measured value block, display group 011:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Reading measured value block Self diagnosis of diesel direct-injection system Reading measured value block

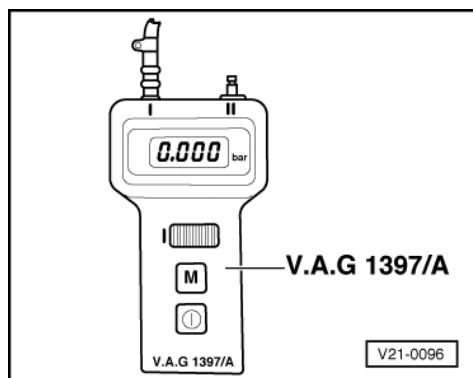
=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Reading measured value block Reading measured value block

-> Display:

Read measured value block 11
840 rpm 938 mbar 978 mbar
92 %

- Measure the boost pressure at full throttle.
- Accelerate from 2000 rpm at full throttle in third gear (or with selector lever at position 2), and watch rev counter.
- Press PRINT key on V.A.G 1551 and memory key M on V.A.G 1397 A simultaneously at approx. 3000 rpm.

Specified values:



- ◆ -> Specified value on V.A.G 1397 A:
1.550 ... 1.750 bar

Read measured value block 11
3000/min 1833 mbar 1700 mbar
42 %

-> Specified value on V.A.G 1551:
1550 ... 1750 mbar (in display zone 3)

Notes:

- ◆ On vehicles ▶ 06.97, boost pressure level is measured with turbocharger tester V.A.G 1397/A. Fault reader V.A.G 1551 is then used to check whether boost pressure is being registered by the control unit.
- ◆ On vehicles 07.97 ▶ boost pressure can only be checked using V.A.G 1551.
- If measured boost pressure is OK, repeat boost pressure measurement with boost pressure control => Page 191 .

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If the boost pressure is not obtained:

- ♦ Leak between turbocharger and intake pipe
- ♦ Fault on linkage or vacuum unit for boost pressure control. Checking => Page 194
- ♦ Turbocharger defective (turbine sticking because of foreign body)

If boost pressure is exceeded:

- ♦ Boost pressure control hoses fallen off, leaking or clogged
- ♦ Solenoid valve for boost pressure limitation blocked
- ♦ Actuator (linkage, shaft) of bypass valve stiff or stuck (bypass valve always closed)

Testing with boost pressure control:

- Attach connector at solenoid valve for boost pressure limitation -N75.
- Erase fault memory.

Note:

A fault was recorded in fault memory due to disconnecting solenoid valve for boost pressure limitation -N75 when previous test was carried out.

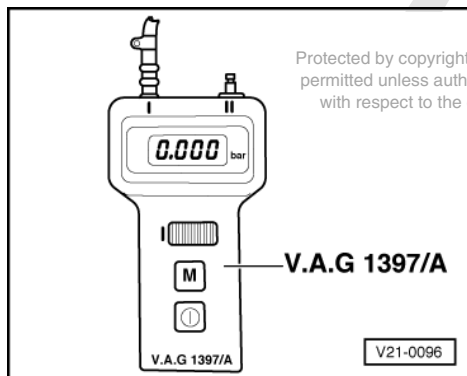
- Read measured value block, display group 011.

-> Display:

Read measured value block 11
840 rpm 938 mbar 978 mbar
92 %

- Measure the boost pressure at full throttle.
- Accelerate from 2000 rpm at full throttle in third gear (or with selector lever at position 2), and watch rev counter.
- Press PRINT key on V.A.G 1551 and memory key M on V.A.G 1397 A simultaneously at approx. 3000 rpm.

Specified values:



- ♦ -> Specified value on V.A.G 1397 A:
1.800 ... 2.050 bar

Read measured value block 11
3000/min 1990 mbar 1990 mbar
42 %

- > Specified value on V.A.G 1551:
1800 ... 2050 mbar (in display zone 3)

If the boost pressure is not obtained:

- ♦ No electrical function of solenoid valve for boost pressure limitation.
- ♦ Solenoid valve for boost pressure limitation -N75 is stuck in the open position



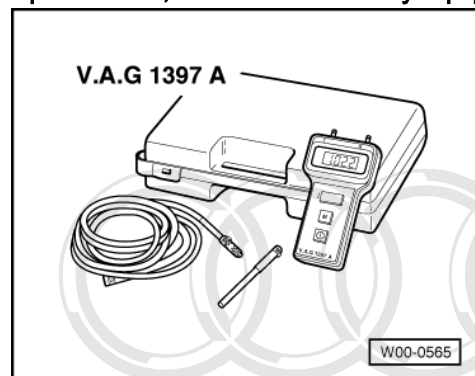
If boost pressure is exceeded:

- ♦ Solenoid valve for boost pressure limitation -N75 sometimes stuck closed.
- ♦ Boost pressure increased as a result of tuning

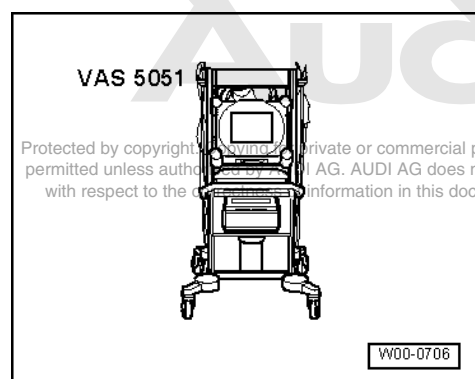
1.6 - Testing boost pressure - engine code AFN, AHH

- ♦ A modified injection system is fitted on vehicles 07.97 ä, on which the connection hose to engine control unit is discontinued. The turbocharger tester cannot be connected to this injection system. The boost pressure can only be checked using fault reader V.A.G 1551.
- ♦ This section describes the test using both measuring devices.

Special tools, testers and auxiliary equipment required



- ♦ V.A.G 1397 A (only for vehicles ä 06.97)

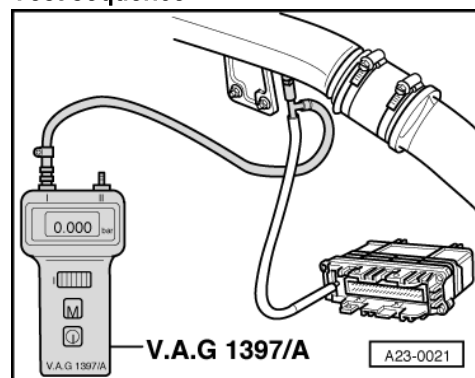


- ♦ VAS 5051

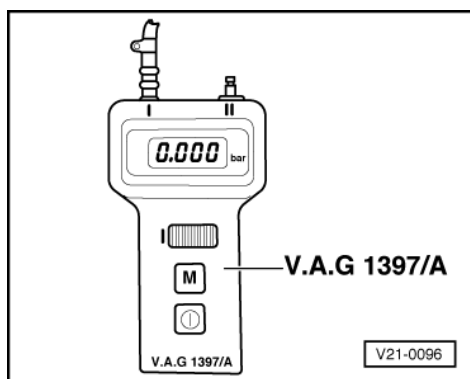
or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test sequence



- -> On vehicles ä 06.97, disconnect connecting hose between rear air duct pipe and engine control unit and connect to T-piece of turbocharger tester V.A.G 1397 A.
- Route measuring hose under rear edge of bonnet and into passenger compartment via right hand window.



- -> Switch on turbocharger tester and set measuring range selector switch to position -I- (absolute pressure).
- Connect measuring hose to connection -I-.

Notes:

- ◆ Hose connections must be completely airtight, otherwise measurements will not be correct.
- ◆ Ensure that measuring hose is not pinched at bonnet or side window.
- ◆ Pressing memory key M on turbocharger tester will store the last measured value until memory key M is pressed again or tester is switched off.
- ◆ The decimal point in the display flashes to indicate that the value is being stored.
- ◆ If the battery voltage of the turbocharger tester drops below the minimum level, an arrow will appear at the top left of the display.
- ◆ Observe safety precautions => Page 187 .

- Read measured value block, display group 011:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Reading measured value block Self diagnosis of diesel direct-injection system Reading measured value block

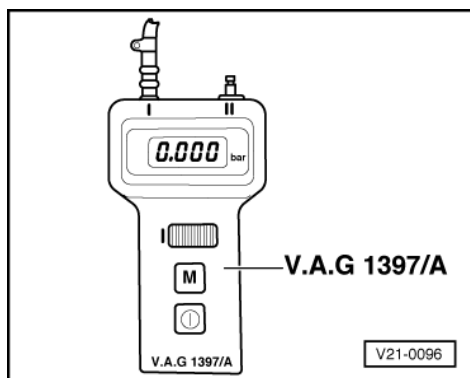
=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Reading measured value block Reading measured value block

-> Display:

Read measured value block 11
840 rpm 938 mbar 978 mbar
92 %

- Measure the boost pressure at full throttle.
- Accelerate from 2000 rpm at full throttle in third gear (or with selector lever at position 2), and watch rev counter.
- Press PRINT key on V.A.G 1551 and memory key M on V.A.G 1397 A simultaneously at approx. 3000 rpm.

Specified values:



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- ♦ -> Specified value on V.A.G 1397 A:
1.850 ... 2.200 bar

Read measured value block 11
3000/min 2190 mbar 2190 mbar
42 %

-> Specified value on V.A.G 1551:
1850... 2200 mbar (in display zone 3)

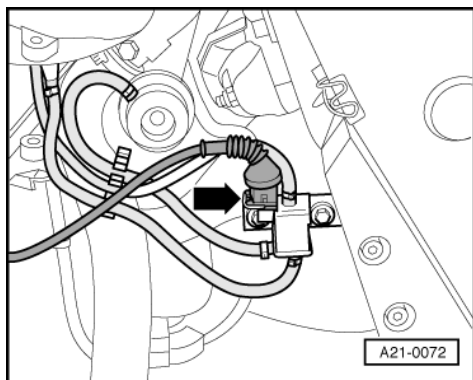
Notes:

- ♦ On vehicles ▶ 06.97, boost pressure level is measured with turbocharger tester V.A.G 1397/A. Fault reader V.A.G 1551 is then used to check whether boost pressure is being registered by the control unit.
- ♦ On vehicles 07.97 ▶ boost pressure can only be checked using V.A.G 1551.

If the boost pressure is not obtained:

- ♦ Leak between turbocharger and intake pipe
- ♦ Fault on linkage or vacuum unit for boost pressure control. Checking => Page 195
- ♦ Turbocharger defective (turbine sticking because of foreign body)

1.7 - Checking linkage and pressure unit for boost pressure regulating valve - engine codes 1Z, AFF, AHU

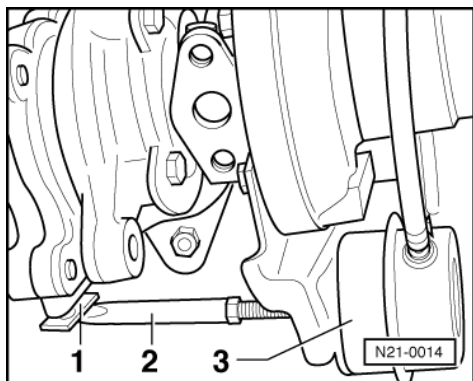


Test requirements:

- Coolant temperature at least 80 °C.

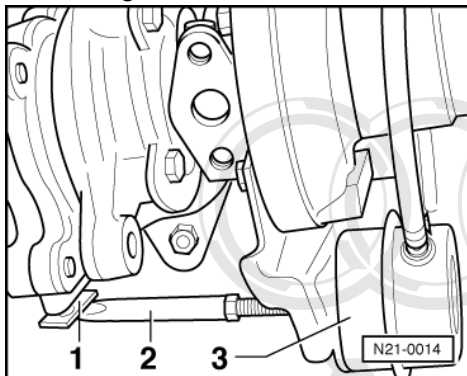
Test sequence

- -> Pull connector -arrow- off valve for boost pressure limitation.



- -> Start engine and attain maximum revs by spontaneously operating throttle.
- The actuating rod -2- for boost pressure regulating valve must move

If actuating rod does not move:



- -> Test lever for boost pressure regulating valve -1- for ease of operation. Replace turbocharger if seized by rust.

If actuating rod does not move, despite ease of movement at lever:

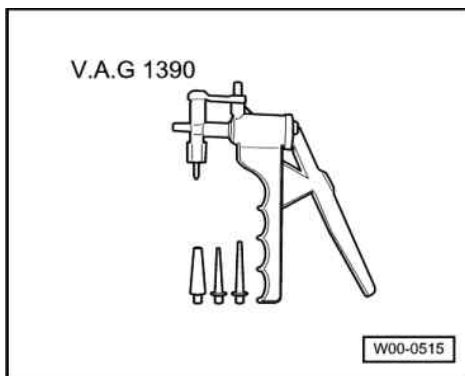
- Replace pressure unit for boost pressure regulating valve -3-.
- Erase fault memory.

Replaced by unit for boost pressure regulating valve 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.

Note:

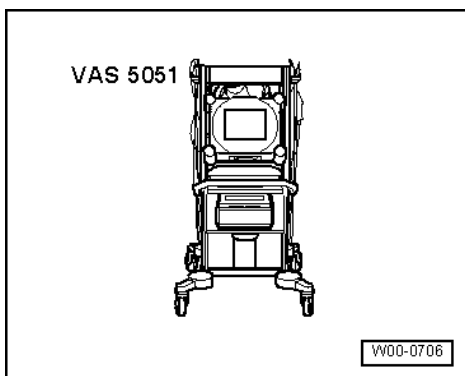
A fault was recorded in fault memory due to disconnecting solenoid valve for boost pressure limitation -N75 when previous test was carried out.

1.8 - Checking linkage and vacuum unit for boost pressure control - engine codes AFN, AHH



Special tools, testers and auxiliary equipment required

- ♦ V.A.G 1390





- ♦ VAS 5051

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test sequence

- Start final control diagnosis and activate solenoid valve for boost pressure limitation -N75:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Final control diagnosis Self diagnosis of diesel direct-injection system Final control diagnosis

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Final control diagnosis Final control diagnosis

-> Display:

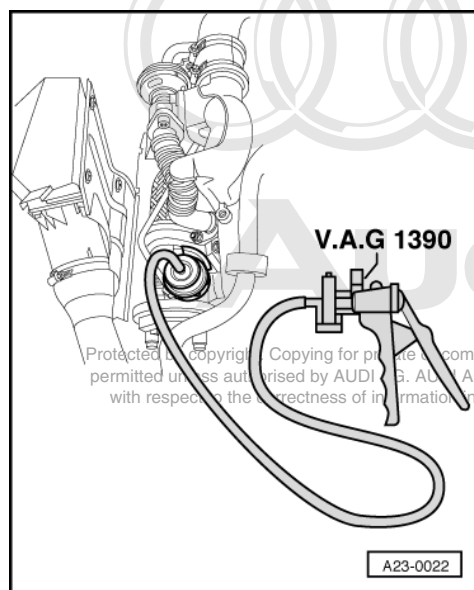
Final control diagnosis
Solenoid valve for boost pressure
limitation -N75

- ♦ Solenoid valve for boost pressure limitation -N75 should operate audibly.
- ♦ The boost pressure control linkage of the vacuum unit on the turbo charger should move to and from (at least 3 ... or 4 times while there is a vacuum in the vacuum reservoir).

If linkage does not move because solenoid valve is not working:

- Check boost pressure limitation solenoid valve -N75 => Page 197 .
- Check all vacuum hoses are fitted and not leaking => Page 184 onwards.

If linkage does not move, even though solenoid valve is working:



- -> Connect hand vacuum pump V.A.G 1390 to boost pressure regulating valve and check that linkage moves freely between both end stops.

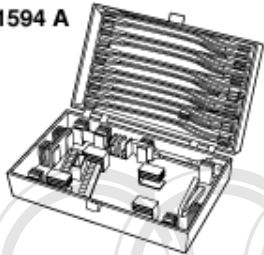
If the linkage moves, but the boost pressure specified values are not attained:

- Fit a new turbocharger.

If the linkage does not move freely, or moves in jolts: (irregular performance when driving):

- Fit a new turbocharger.

1.9 - Checking solenoid valve for boost pressure limitation -N75

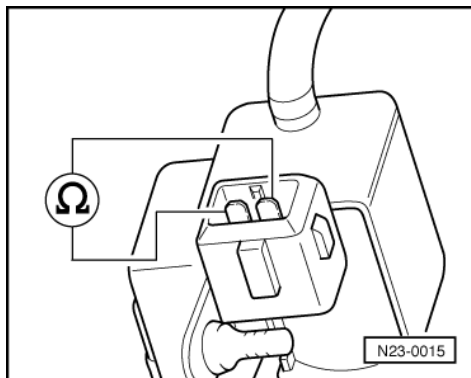
V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/18 	V.A.G 1598/22  Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
	G26-0001

Special tools, testers and auxiliary items required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/18
(Vehicles ä 06.97)
- ♦ V.A.G 1598/22
(Vehicles 07.97 ä)

Checking internal resistance

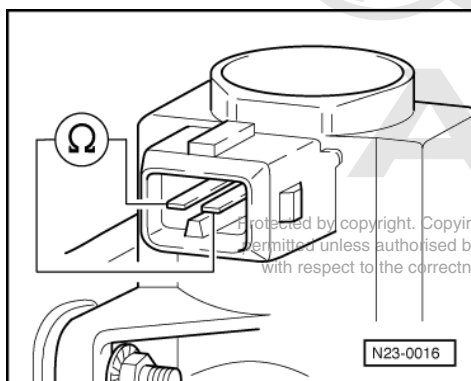
- Switch ignition off.



- Unplug connector on solenoid valve for boost pressure limitation -N75.
- Connect multimeter to valve to measure resistance.

-> Engine codes 1Z, AFF, AHU:

- Specified value: 25 ... 45 ω



-> Engine codes AFN, AHH:

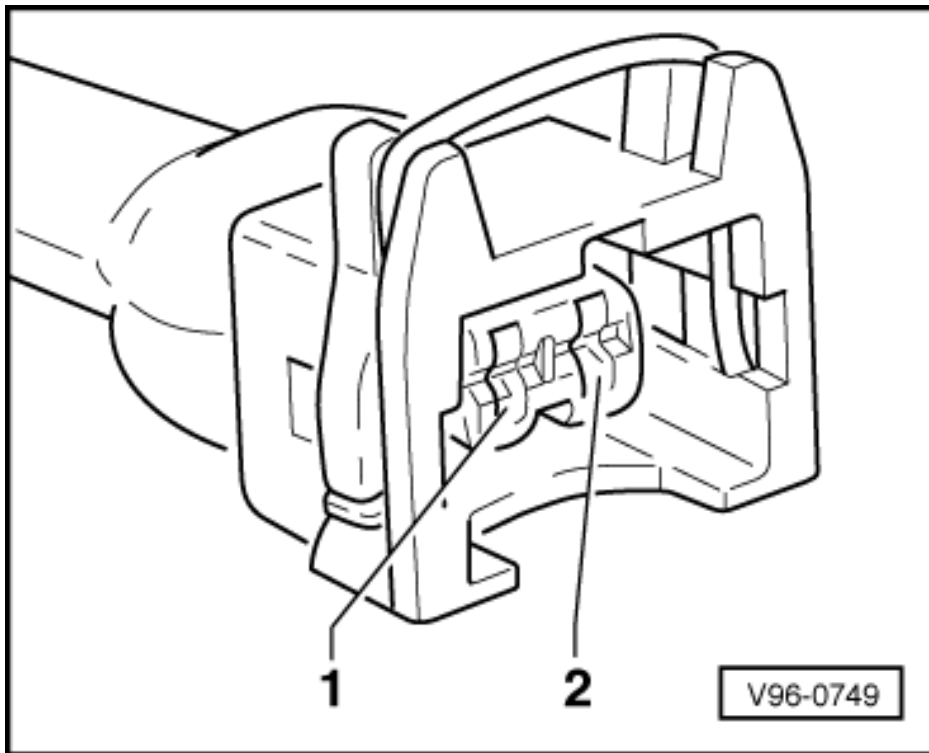
- Specified value: 14 ... 20 ω

All models:

If the specified value is not obtained:

- Replace solenoid valve for boost pressure limitation -N75.

Checking power supply



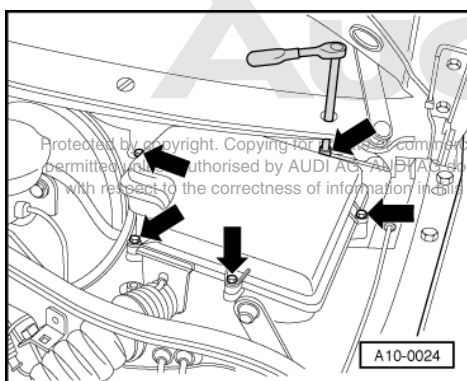
- -> Connect multimeter to contact 1 and earth to measure voltage.
- Switch the ignition on.
 - Specified value: approx. battery voltage

If the specified value is not obtained:

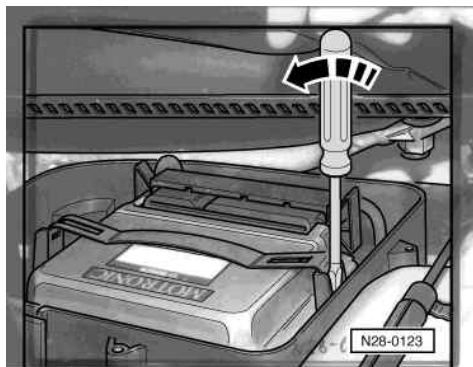
- Test wiring for open circuit and short to positive or earth.

=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations

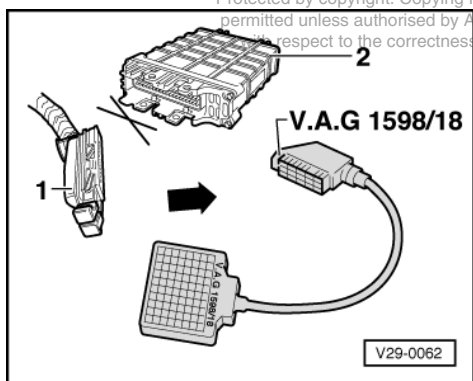
Testing control signal wiring



- -> Remove cover for electronics box (plenum chamber) -arrows-.

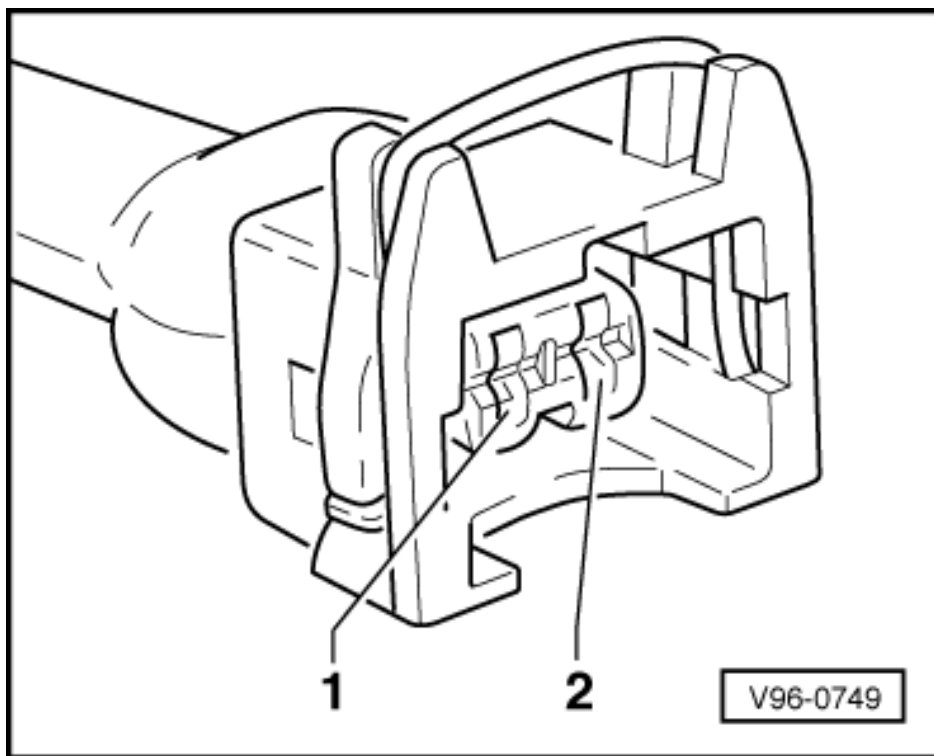


- -> Carefully lever off the retainer -arrow- using a screwdriver.
- Release catches and detach connectors from control unit.



Vehicles ä 06.97:

- -> With the ignition switched off, connect test box V.A.G 1598/18 to connector -1- (control unit -2- remains disconnected).

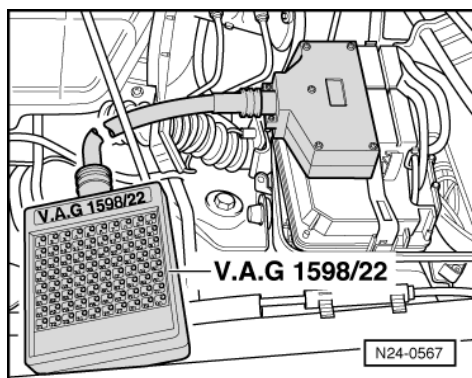


- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector for -N75 Contact	Test box V.A.G 1598/18 Socket
2	47

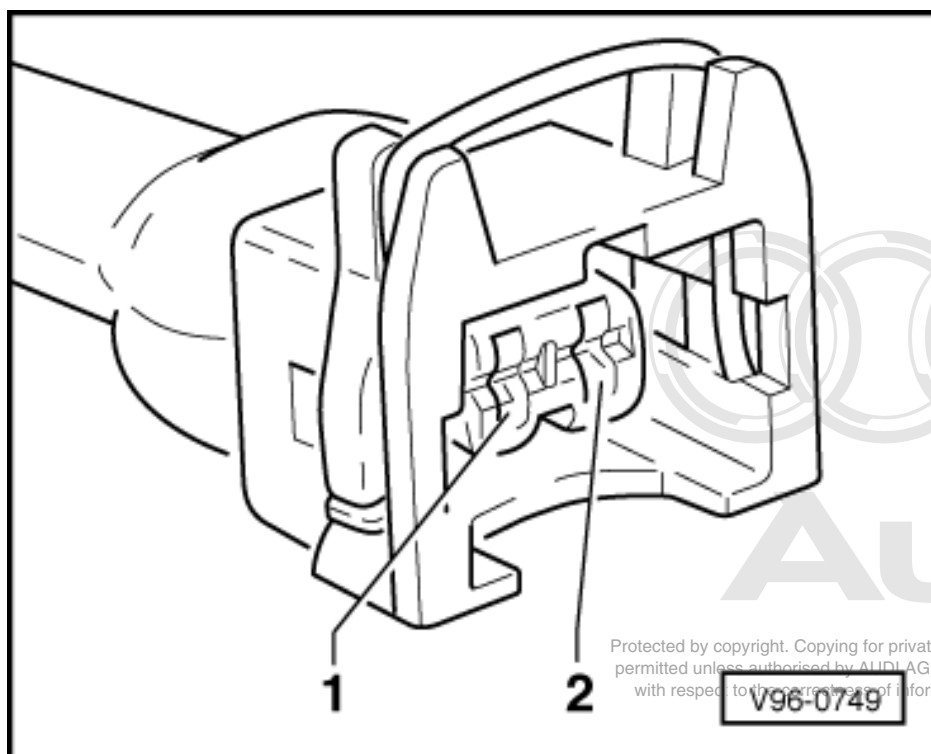
- Rectify any open/short circuit as necessary.
- If wiring connection is OK, replace engine control unit.

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 23; Replacing engine electronics control unit Replacing engine electronics control unit



Vehicles 07.97 ä:

- -> With ignition switched off, connect test box V.A.G 1598/22 to connector (control unit remains disconnected).



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- -> Check for open circuit and short to positive or earth in the following wiring connections:



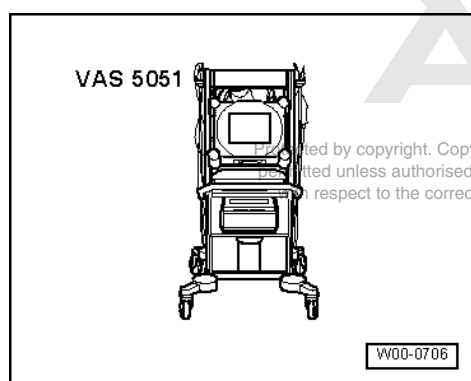
Connector for -N75 Contact	Test box V.A.G 1598/22 Socket
2	15

- Rectify any open/short circuit as necessary.
- If wiring connection is OK, replace engine control unit.

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 23; Replacing engine control unit Replacing engine control unit

1.10 - Check intake manifold pressure sensor

Special tools, testers and auxiliary equipment required



- ♦ VAS 5051

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test sequence

Vehicles ä 06.97:

The intake manifold pressure sender is located in the diesel direct injection system control unit.

- Read measured value block, display group 010.

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Reading measured value block Self diagnosis of diesel direct-injection system Reading measured value block

-> When adjacent display appears:

Read measured value block 10		
0 mg/stroke	1027 mbar	1013
mbar	0.0 %	

- Check display in zones 2 and 3.
 - Specified value: Pressures match
 - Tolerance ± 30 mbar

If the specified value is not obtained:

- Pull pressure hose off engine control unit.

If the specified values are again not attained:

- Fit a new engine control unit:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 23; Replacing engine electronics control unit Replacing engine electronics control unit

Vehicles 07.97 ä:

The intake manifold pressure sender is combined into one housing with intake manifold temperature sender. Fitting location: in rear of air duct pipe.

- Read measured value block, display group 010.

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Reading measured value block Reading measured value block

-> When adjacent display appears:

Read measured value block 10			
0 mg/stroke	1027 mbar	1013	
mbar	0.0 %		

- Check display in zones 2 and 3.
 - Specified value: Pressures match
 - Tolerance ± 30 mbar

If the specified value is not obtained:

- Replace intake manifold pressure sender.

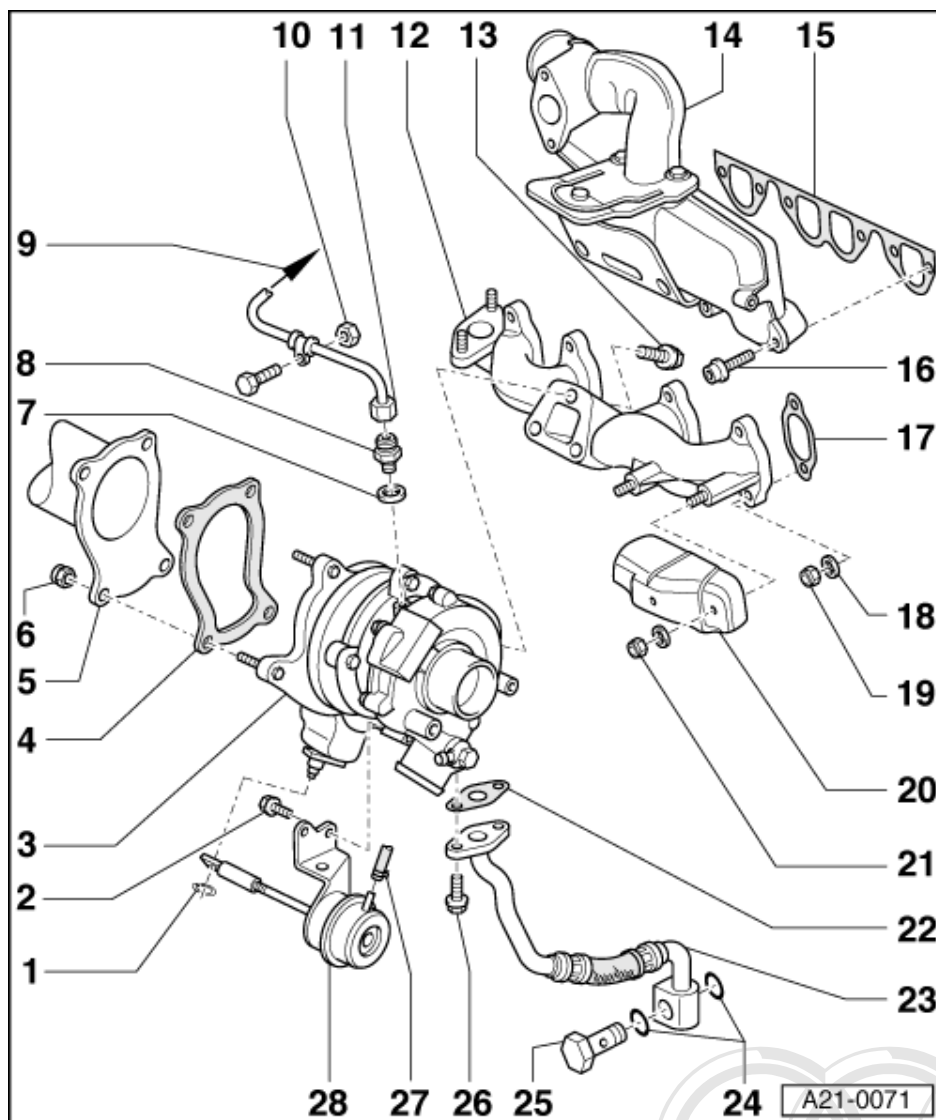
1.11 - Rules for cleanliness

When working on the exhaust gas turbocharger, pay careful attention to the following "5 rules":

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Use lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components:
 - Only remove replacement parts from packaging immediately prior to installation.
 - Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open:
 - Do not work with compressed air if this can be avoided.
 - Do not move vehicle unless absolutely necessary.



1.12 - Turbocharger- engine codes 1Z, AFF, AHU



1 Circlip

2 10 Nm

- ♦ Install with locking fluid D 000 600 A2

=> Parts List

3 Turbocharger

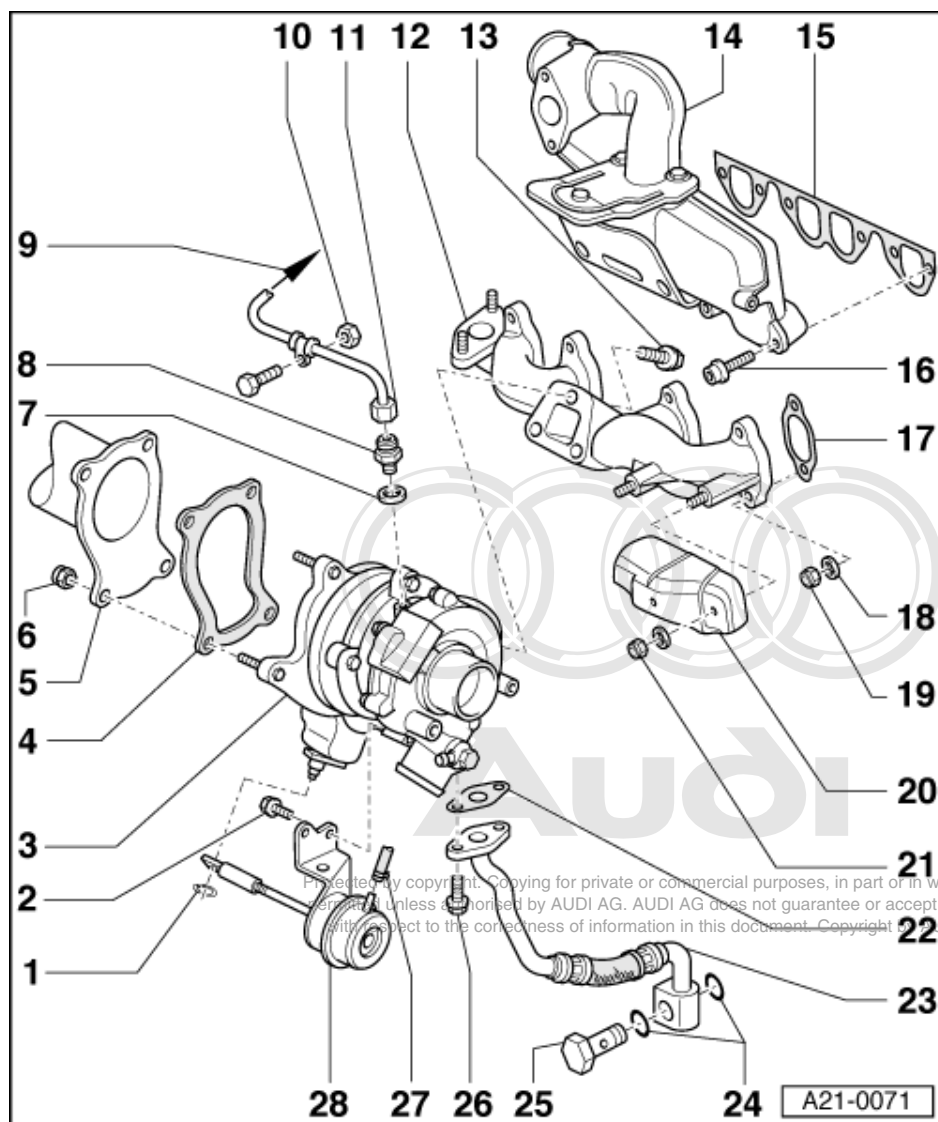
- ♦ Testing => Page 187 onwards
- ♦ Removing and installing
=> Page 209

4 Gasket

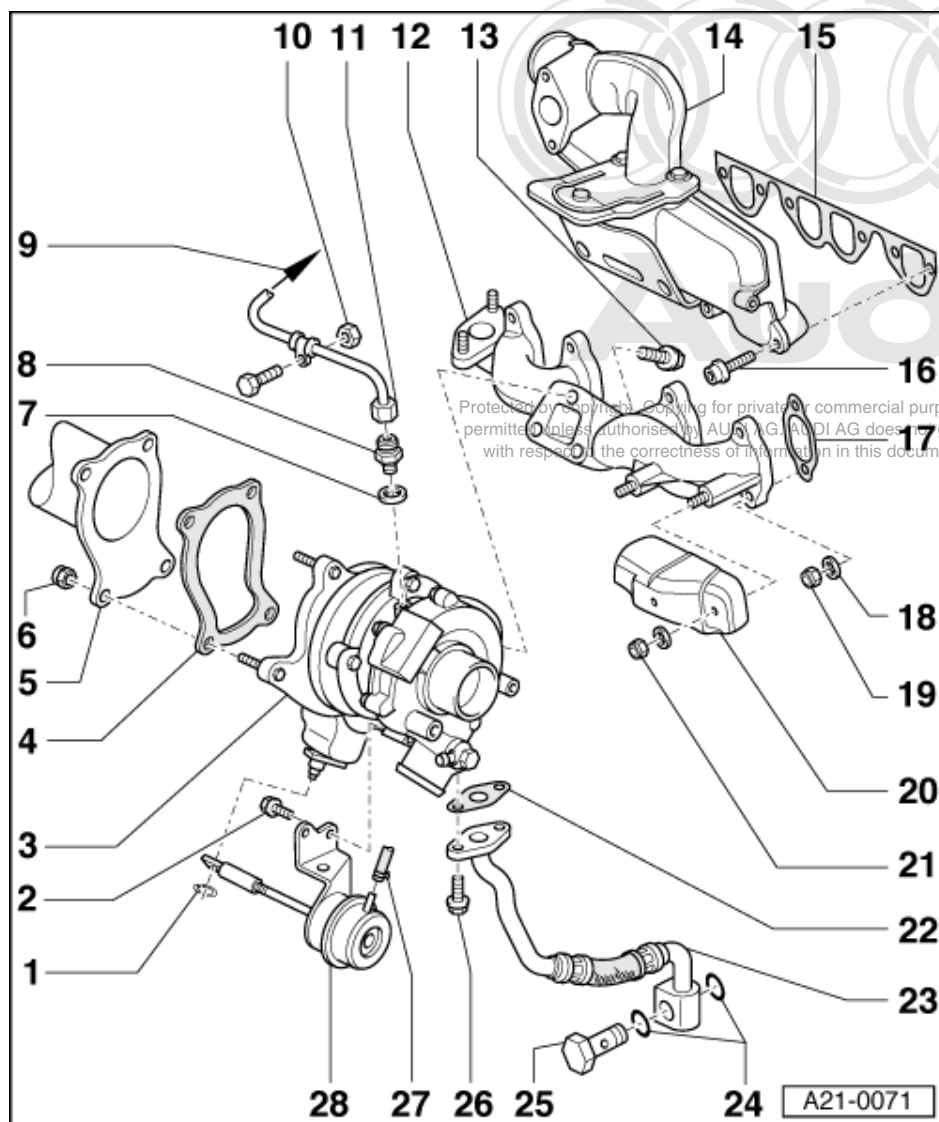
- ♦ Replace

5 Catalytic converter

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- 6 25 Nm
♦ Replace
- 7 Sealing ring
♦ Replace
- 8 Screw connection
♦ Tighten to 23 Nm on Garret version
♦ Tighten to 40 Nm on KKK version
- 9 to oil filter bracket
- 10 10 Nm
- 11 Oil supply pipe
♦ Tighten union nut to 25 Nm
- 12 Exhaust manifold



13 30 Nm

- ♦ Replace
- ♦ Coat threads and bolt head seating surface with hot bolt paste "G 052 112 A3"

=> Parts List

14 Intake pipe

- ♦ Removing and installing
- => Page 107

15 Gasket

- ♦ Replace
- ♦ Note installation position

16 25 Nm

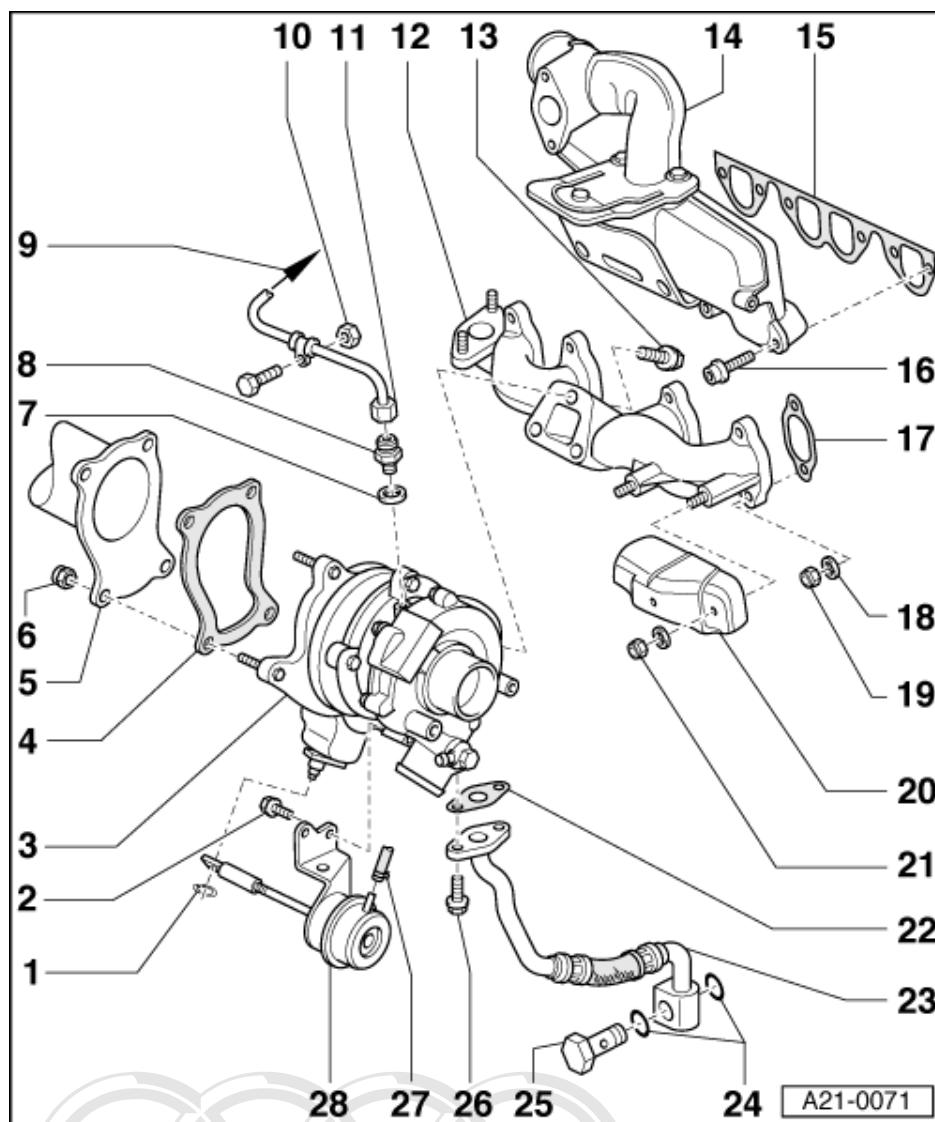
17 Gasket

- ♦ Replace
- ♦ Note installation position

18 Shim

19 25 Nm

- ♦ Replace



20 Heat shield

21 25 Nm

22 Gasket

- ◆ Replace

23 Oil return pipe

- ◆ To cylinder block

24 Sealing ring

- ◆ Replace

25 Banjo bolt - 30 Nm

26 10 Nm

27 Hose
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- ◆ From solenoid valve for boost pressure limitation -N75

28 Pressure unit

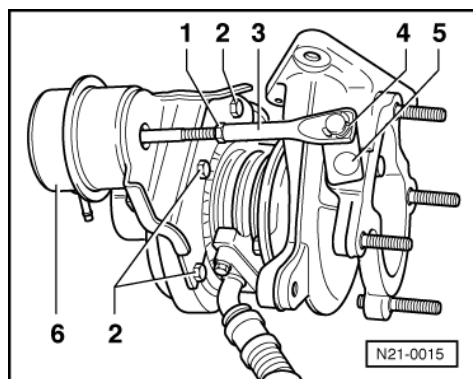
- ◆ For boost pressure control



1.13 - Removing and installing pressure unit for boost pressure regulating valve - engine codes 1Z, AFF, AHU

Removing

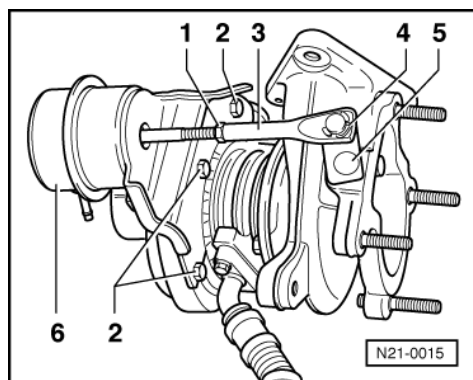
- Remove turbocharger => Page **209** .



- -> Unclip retainer -4-.
- Unscrew bolts -2-.
- Detach pressure unit -6-.

Installing

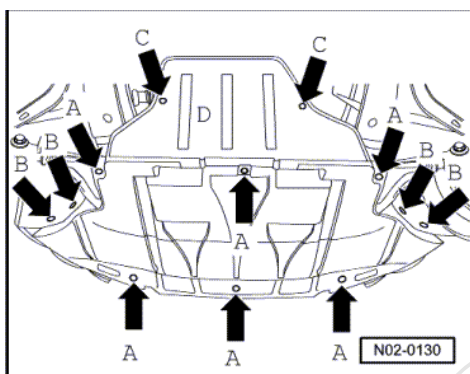
- Insert bolts -2- for pressure unit -6- on turbocharger with locking fluid "D 000 600 A2" and tighten to 10 Nm.
- Loosen lock nut -1- of actuating rod -3-.
- Swivel lever for boost pressure valve -5- to limit stop to pressure unit and hold.
- Adjust length of actuating rod -3-, so that rod eye can easily be pushed over pin of lever -5-. (lever at limit stop with no play)



- -> Screw actuating rod 8 turns inwards from this position. (rod shortens)
- Tighten lock nut -1-.
- Push actuating rod onto lever and fit retainer -4-.
- Install turbocharger =>Page **211** .

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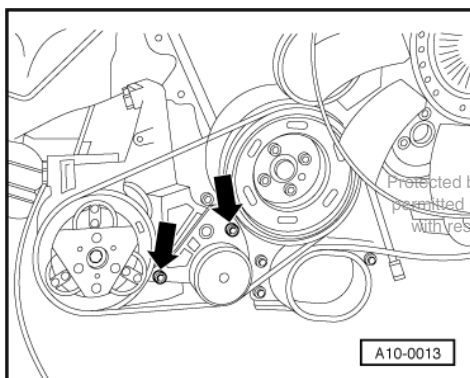
1.14 - Removing and installing turbocharger, engine codes 1Z, AFF, AHU



Removing

- -> Release quick release fasteners -A- and -B- and take off front noise insulation.

Vehicles with air conditioner:



Note:

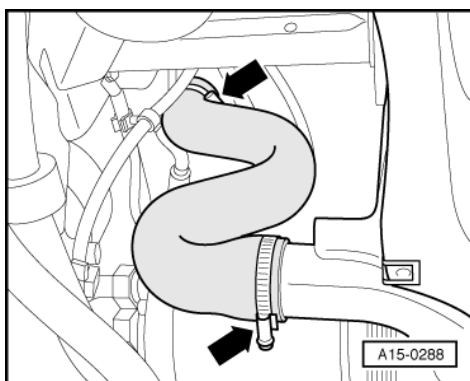
Mark direction of rotation of belt with chalk or felt pen before removing ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage.

- -> Loosen bolts securing ribbed belt tensioner for A/C compressor -arrows-. Slacken belt and remove.
- Detach A/C compressor from bracket and secure to body with wire.

Important:

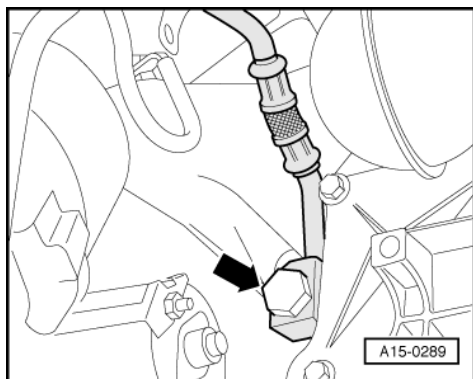
The air conditioner refrigerant circuit must not be opened.

All models:

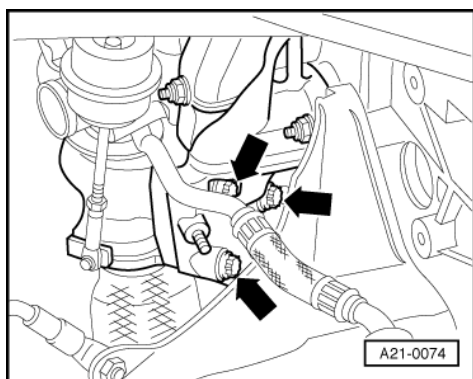




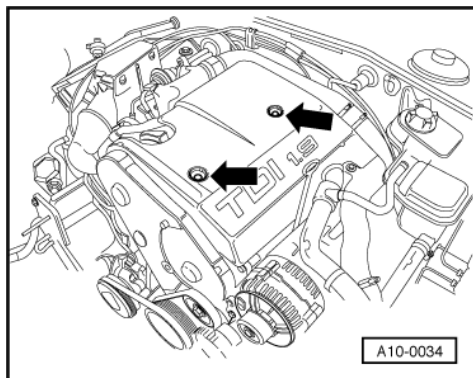
- -> Remove right air intake hose -arrows-.



- -> Remove oil return pipe from cylinder block -arrows-.



- -> Loosen bolts for turbocharger -arrows-. Leave the two front bolts loosely in place.

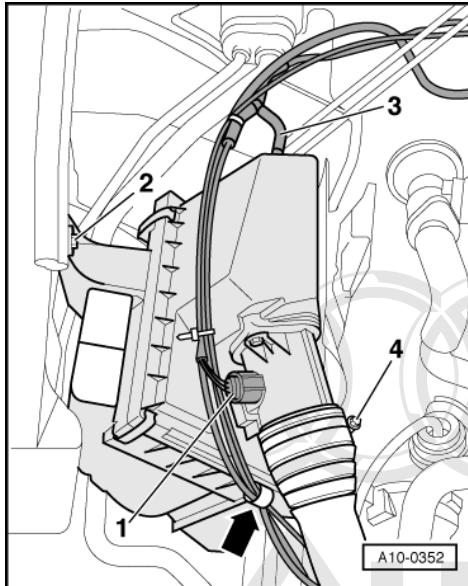


- -> Remove engine cover panel -arrows-.



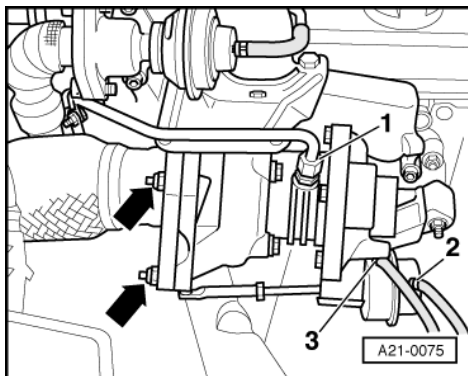
Audi

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- Remove air intake duct to air cleaner.
- -> Disconnect hose -3- from air cleaner housing.
- Unplug connector -1- at air mass meter.
- Remove wiring harness from air filter housing -arrow-
- Remove air intake hose -4-.
- Unscrew bolt -2-.
- Take off air filter housing.

- Detach air intake from front of turbocharger.



- -> Detach oil feed line -1- at turbocharger.
- Disconnect hose -2- at pressure unit for boost pressure control.
- Disconnect hose -3- from turbocharger.
- Unscrew turbocharger/catalytic converter nuts-arrows-.
- Completely remove turbocharger/exhaust manifold bolts and detach turbocharger.

Installing

Installation is carried out in the reverse order, when doing this note the following:

Notes:

- ◆ Fill turbocharger with engine oil via oil supply connection.
- ◆ Secure all hose connections with the correct hose clips (same as original equipment):



=> Parts List

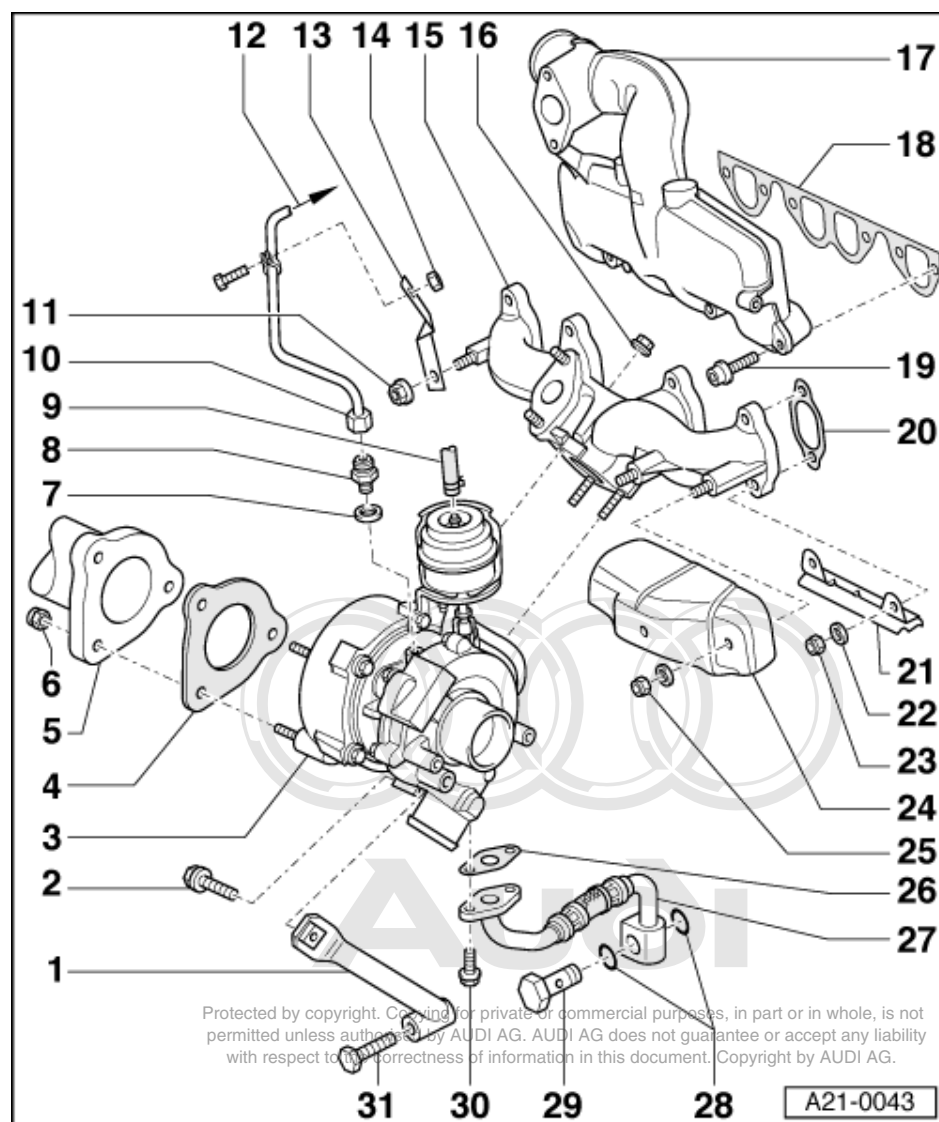
- ♦ Always replace seals, gaskets and self-locking nuts.
- ♦ Charge air system must be free of leaks.
- ♦ After installing turbocharger, run engine for approx. 1 minute at idling speed; do not rev. up immediately. This ensures the turbocharger is properly lubricated.

- Check oil level => Page 161 .

Tightening torques

Component	Nm
Turbocharger to exhaust manifold	30
Turbocharger to catalytic converter	25
Oil return line to cylinder block	30
Oil supply pipe to turbocharger	25

1.15 - Turbocharger-engine codes AFN, AHH



- 1 Bracket
2 20 Nm

3 Turbocharger

- ♦ Checking => Page 187 onwards
- ♦ Removing and installing
=> Page 217

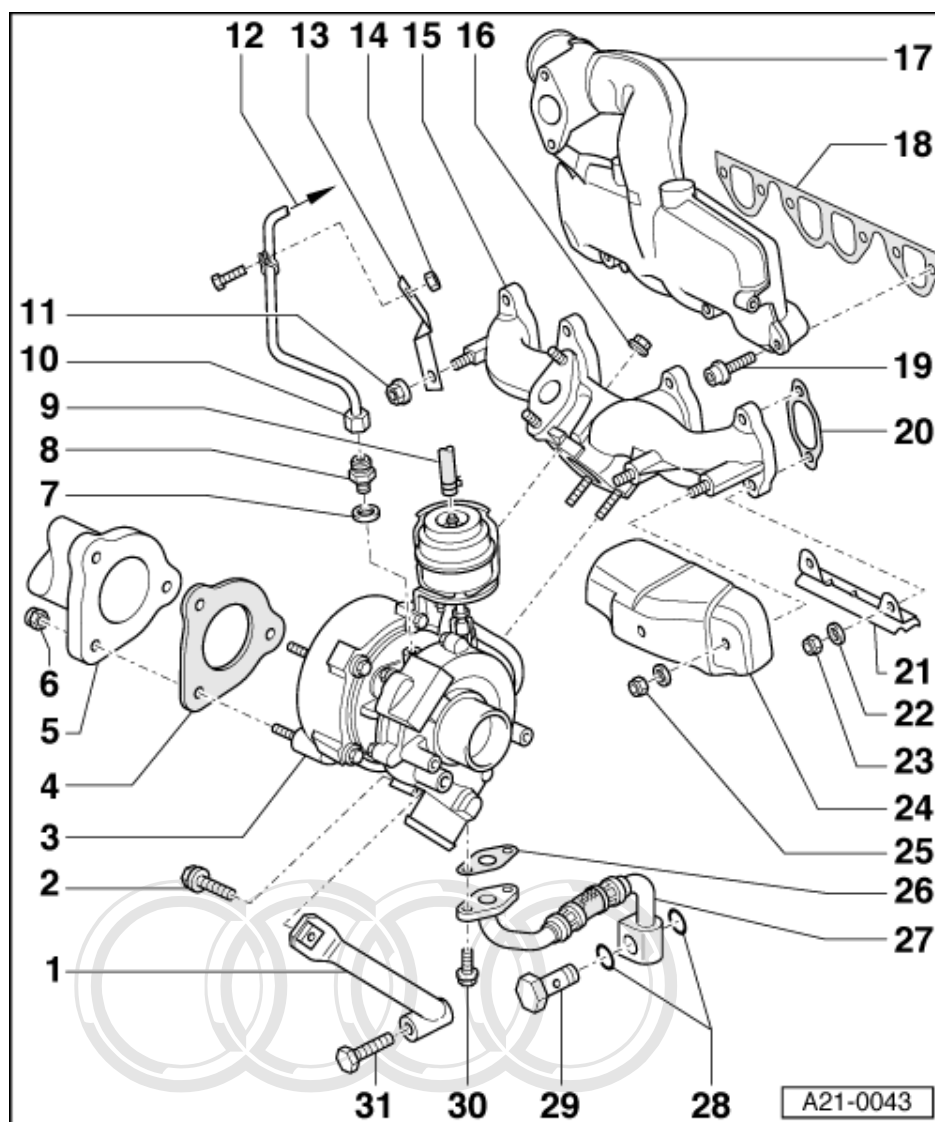
4 Gasket

- ♦ Replace

5 Catalytic converter

6 25 Nm

- ♦ Replace



7 Sealing ring

- ♦ Replace

8 Screw connection

- ♦ Tighten to 23 Nm on Garret version.
- ♦ Tighten to 40 Nm on KKK version

9 Hose

- ♦ From solenoid valve for boost pressure limitation -N75

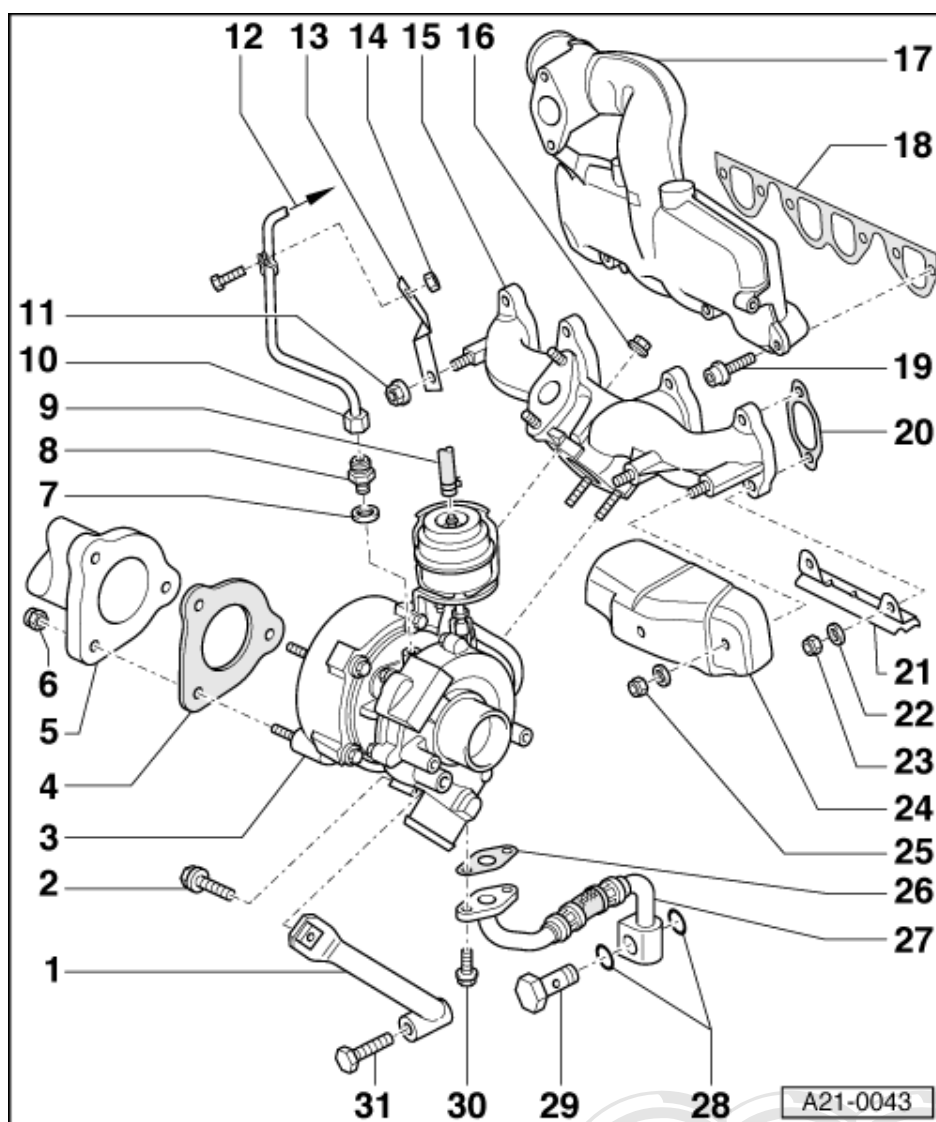
10 Oil supply pipe

- ♦ Tighten union nut to 25 Nm

11 25 Nm

12 to oil filter bracket

13 Bracket



14 10 Nm

15 Exhaust manifold

16 25 Nm

- ◆ Replace
- ◆ Coat threads and bolt head seating surface with hot bolt paste "G 052 112 A3"

=> Parts List

17 Intake pipe

- ◆ Removing and installing
=> Page 108

18 Gasket

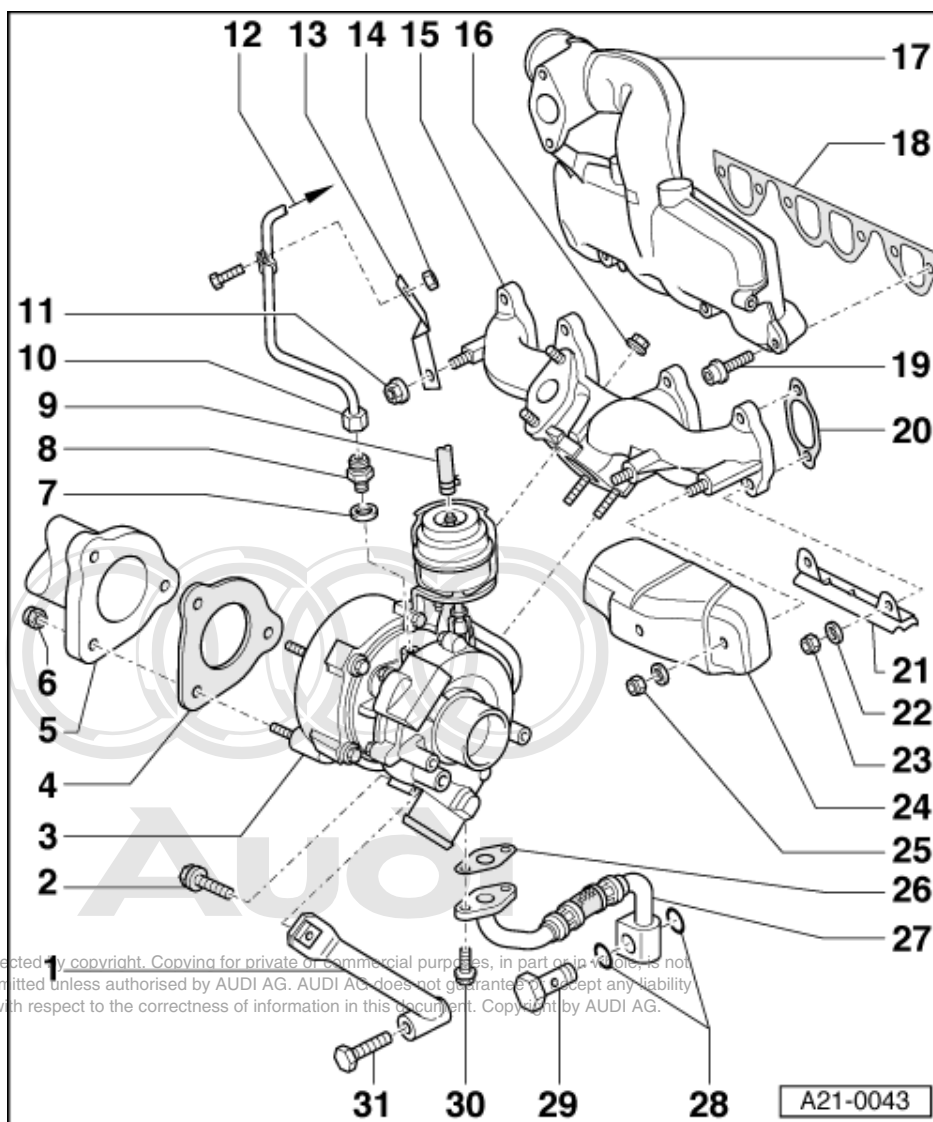
- ◆ Replace
- ◆ Note installation position

19 25 Nm

20 Gasket

- ◆ Replace
- ◆ Note installation position

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21 Bracket

- ♦ For heat shield
-Item 24 -

22 Shim

23 25 Nm

- ♦ Replace

24 Heat shield

- ♦ Attach to bracket -Item 21 -

25 25 Nm

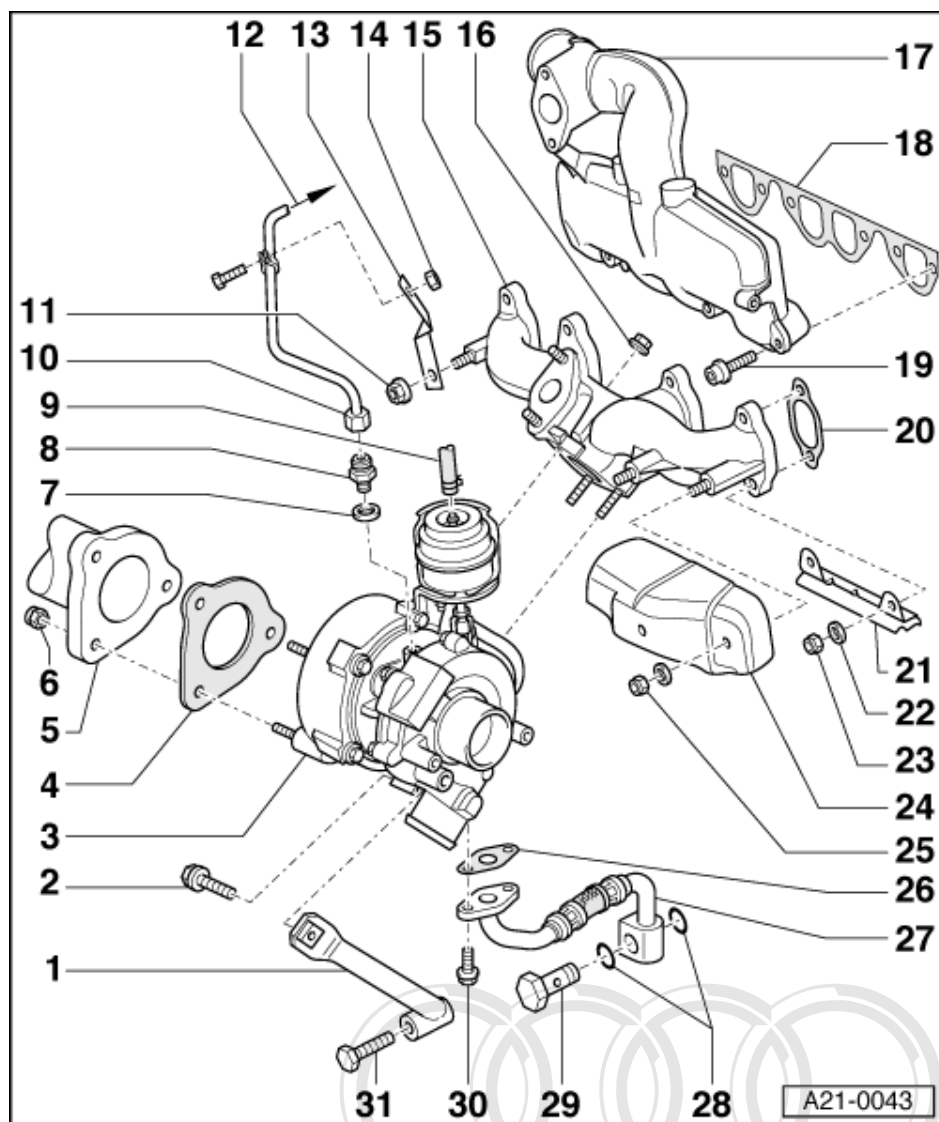
- ♦ Replace

26 Gasket

- ♦ Replace

27 Oil return pipe

- ♦ To cylinder block



28 Sealing ring

- ♦ Replace

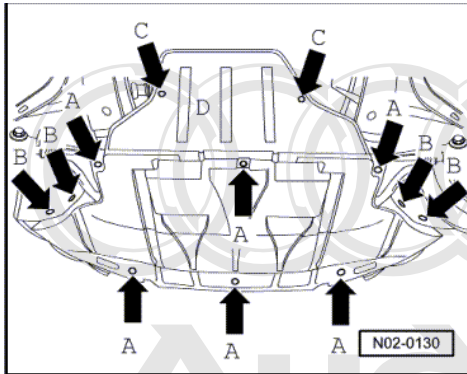
29 Banjo bolt - 30 Nm

30 10 Nm

31 20 Nm

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1.16 - Removing and installing turbocharger - engine codes AFN, AHH



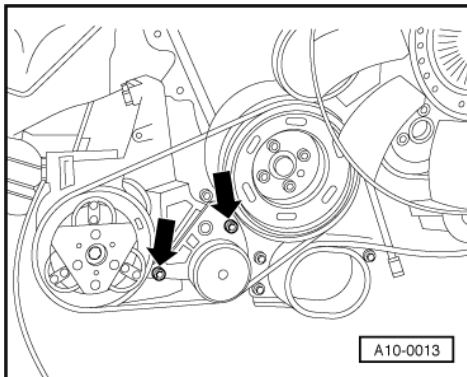
Removing

-> Release quick release fasteners -A- and -B- and take off front noise insulation.
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Vehicles with air conditioner:

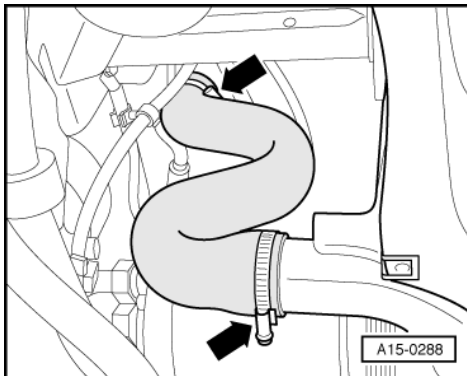
Note:

Mark direction of rotation of belt with chalk or felt pen before removing ribbed belt. If the belt rotates in the wrong direction when it is refitted, this can cause breakage.



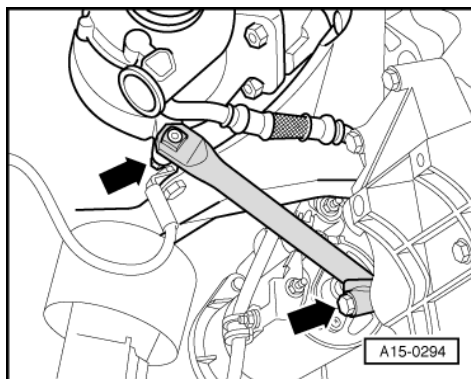
- -> Loosen bolts securing ribbed belt tensioner for A/C compressor -arrows-. Slacken belt and remove.
- Detach A/C compressor from bracket and secure to body with wire.

Important:
 The air conditioner refrigerant circuit must not be opened.

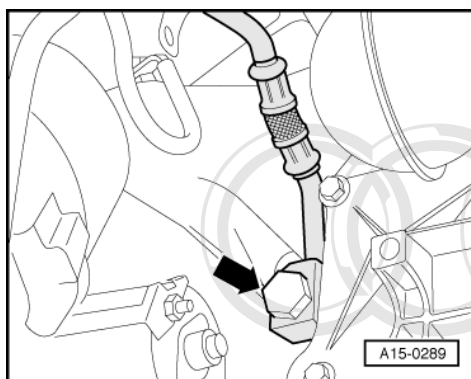




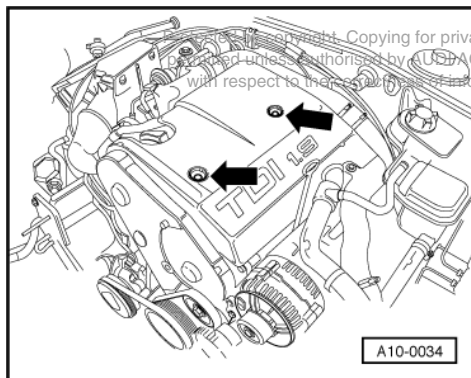
- -> Remove right air intake hose -arrows-.



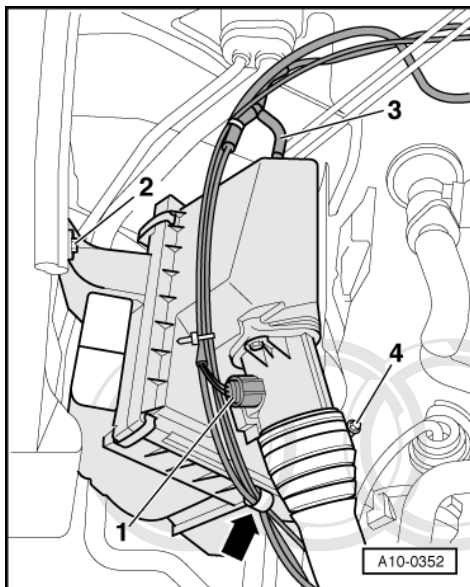
- -> Remove bracket for turbocharger -arrows-.



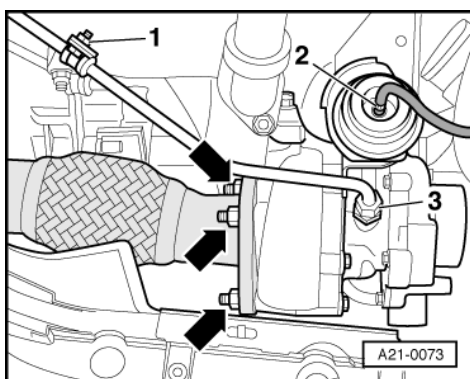
- -> Remove oil return pipe from cylinder block -arrows-.
- Unscrew nuts for turbocharger/exhaust manifold accessible from below.



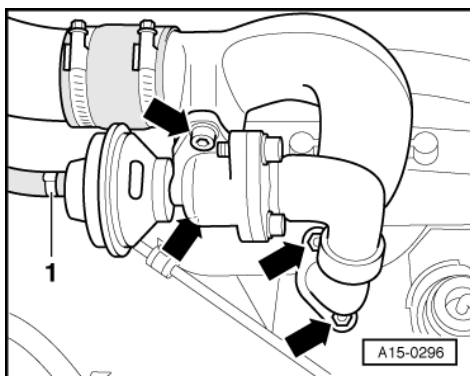
- -> Remove engine cover panel -arrows-.
- Remove air intake duct to air cleaner.



- -> Disconnect hose -3- from air cleaner housing.
- Unplug connector -1- at air mass meter.
- Remove wiring harness from air filter housing -arrow-.
- Pull off air intake hose -4-.
- Unscrew bolt -2-.
- Take off air filter housing.
- Detach air intake from front of turbocharger.



- -> Disconnect hose -2- at pressure unit for boost pressure control.
- Release bolt -1- from bracket for oil supply pipe.
- Disconnect oil supply pipe -3- from turbocharger.
- Unscrew turbocharger/catalytic converter nuts -arrows-.



- -> Pull off hose -1-.
- Remove pipe for exhaust gas recirculation and mechanical exhaust gas recirculation valve -arrows-.
- Remove upper securing nut of turbocharger.



- Remove turbocharger.

Installing

Installation is carried out in the reverse order, when doing this note the following:

Notes:

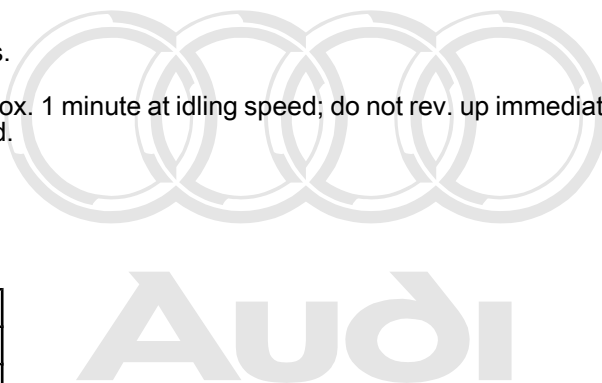
- ♦ Fill the turbocharger with engine oil via the oil supply connection.
- ♦ Secure all hose connections with the correct hose clips (same as original equipment):

=> Parts List

- ♦ Always replace seals, gaskets and self-locking nuts.
 - ♦ Charge air system must be free of leaks.
 - ♦ After installing the turbocharger, run engine for approx. 1 minute at idling speed; do not rev. up immediately. This ensures the turbocharger is properly lubricated.
- Check oil level => Page **161** .

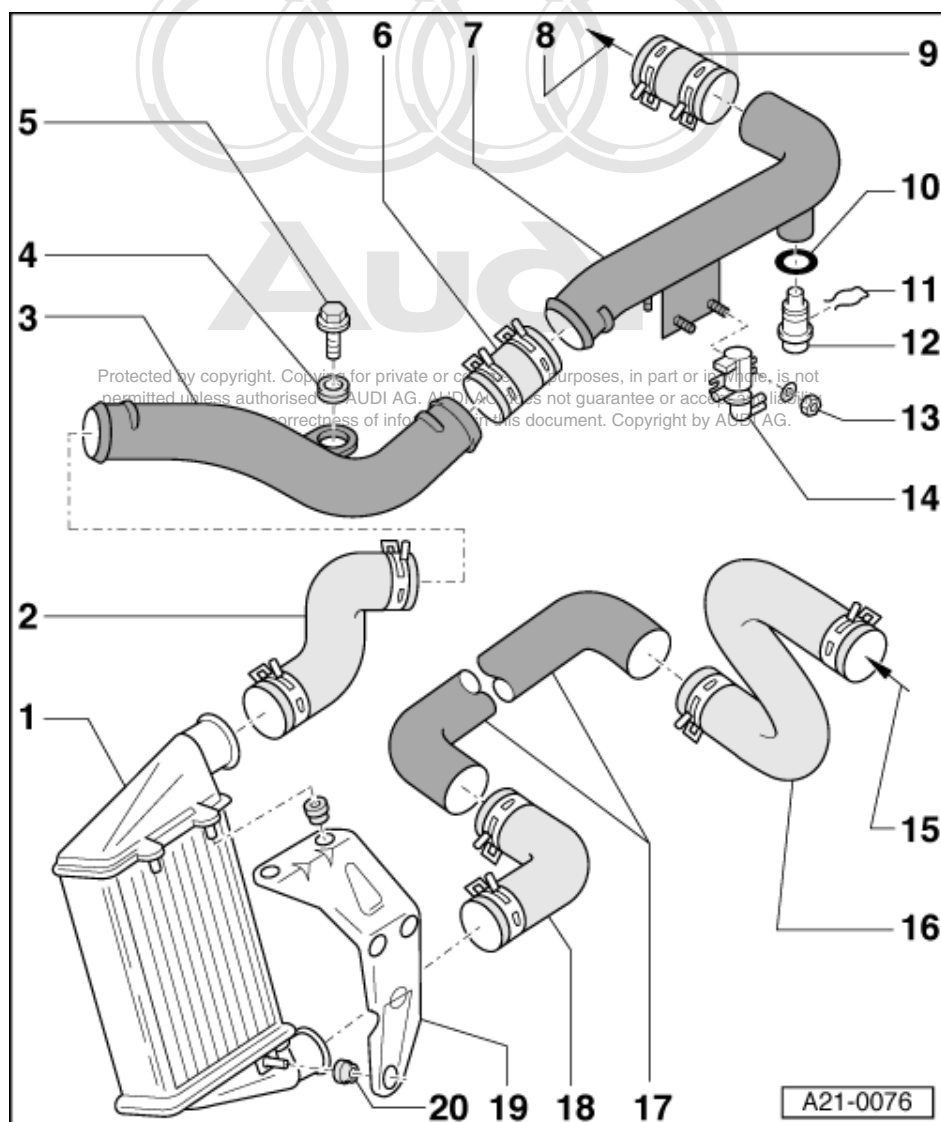
Tightening torques

Component	Nm
Turbocharger to exhaust manifold	25
Turbocharger to catalytic converter	25
Oil return line to cylinder block	30
Oil supply pipe to turbocharger	25
Exhaust gas recirculation pipe to exhaust manifold	25
Mechanical exhaust gas recirculation valve to intake pipe	25



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1.17 - Removing and installing parts of charge air cooling system > 06.97



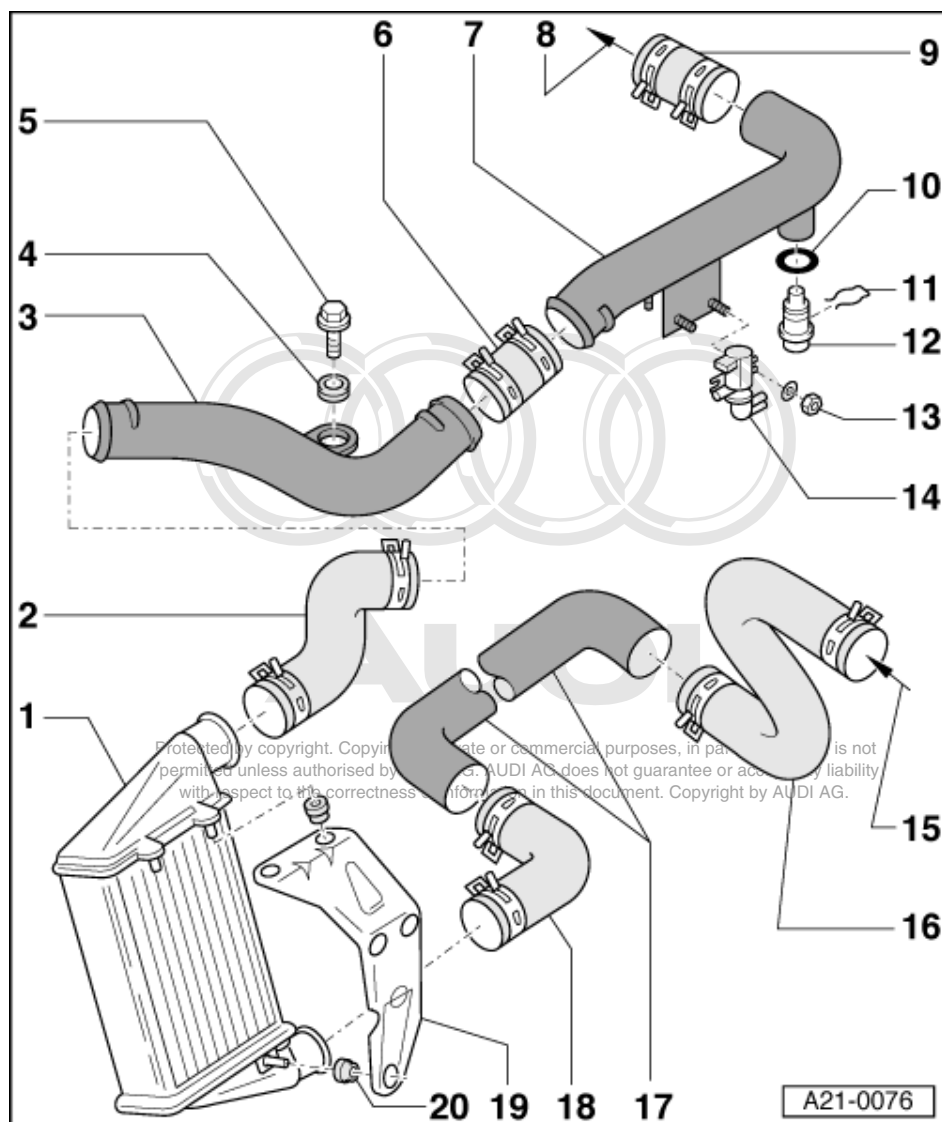
Notes:

- ◆ Secure all hose connections with the correct hose clips (same as original equipment):

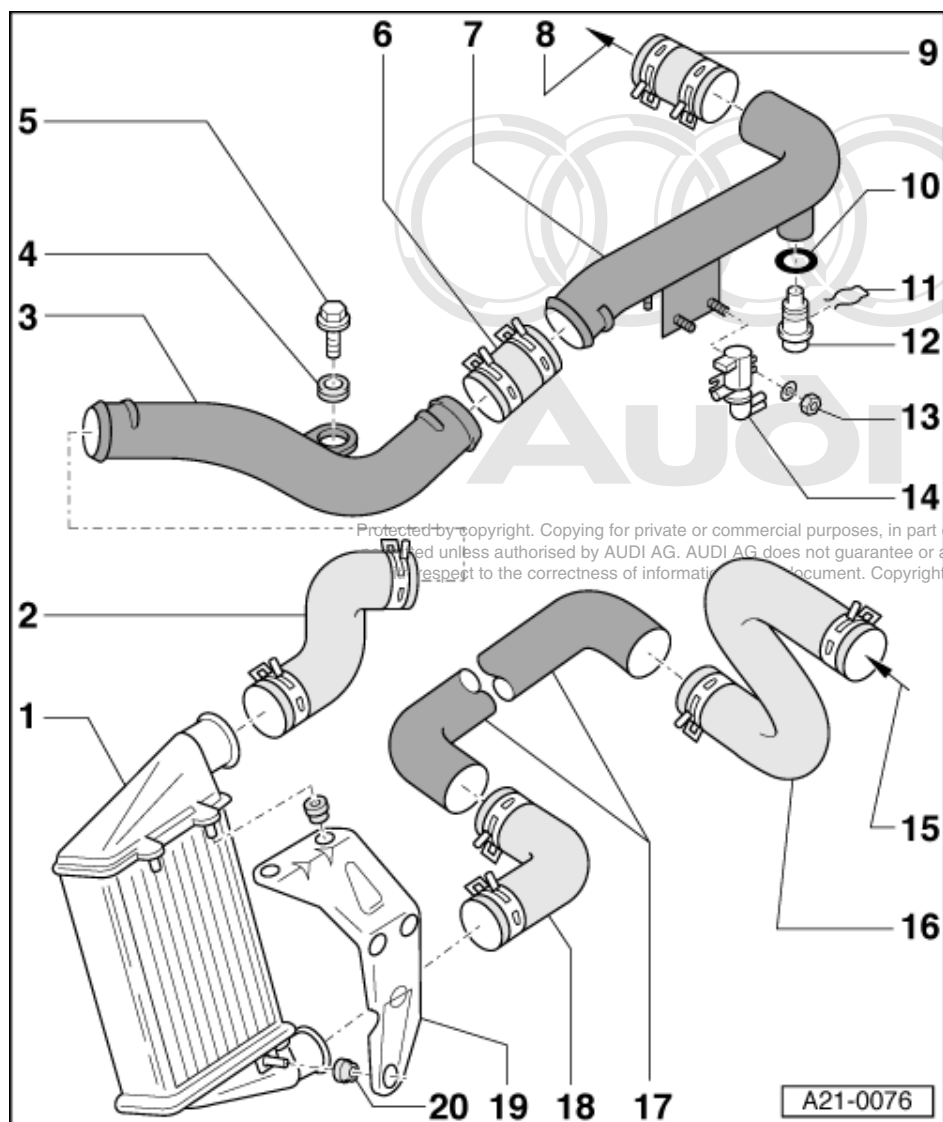
=> Parts List

- ◆ Charge air system must be free of leaks.

- 1 Charge air cooler
- 2 Air intake hose
- 3 Air duct, left
- 4 Rubber grommet
- 5 10 Nm

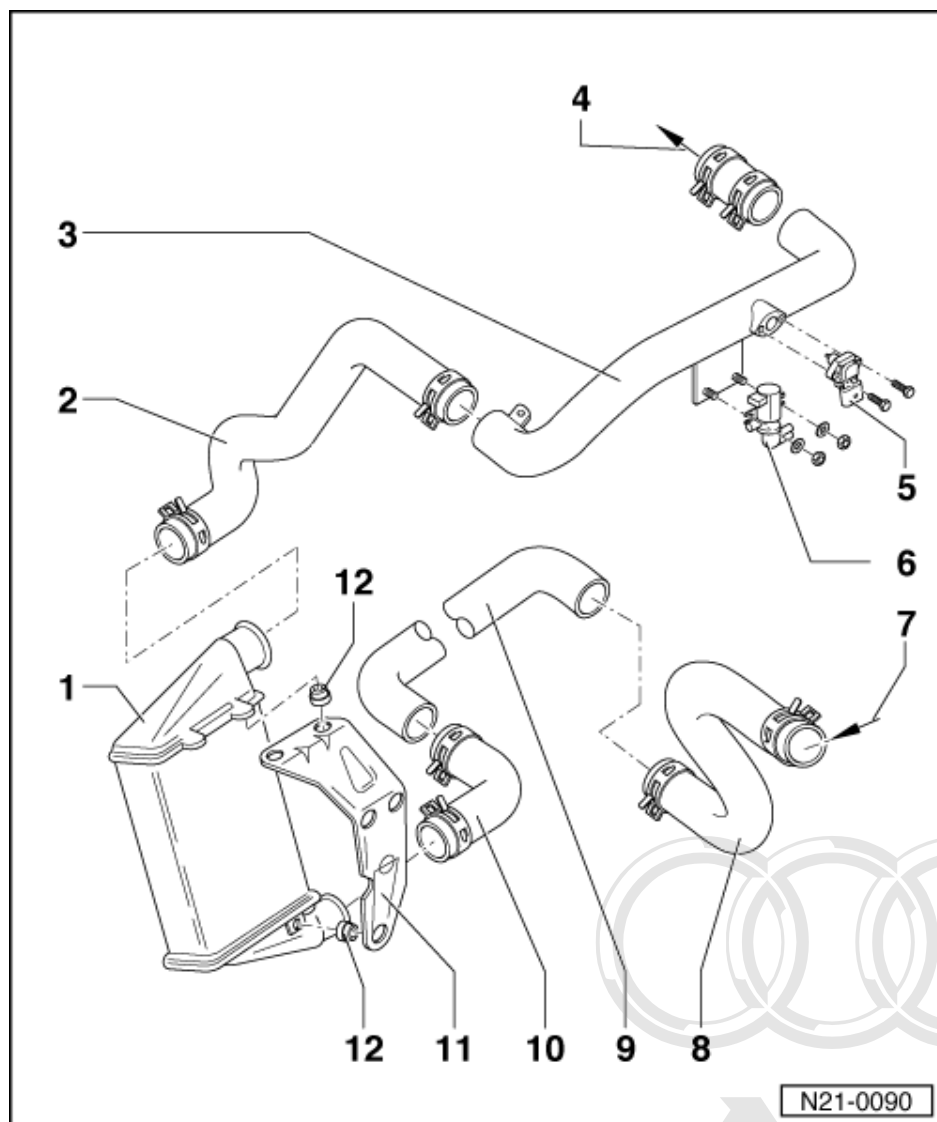


- 6 Connecting hose
- 7 Air duct, rear
- 8 to intake pipe
- 9 Connecting hose
- 10 O-ring
 - ♦ Replace, if damaged
- 11 Bracket
- 12 Intake manifold temperature sender -G72
- 13 10 Nm
- 14 EGR valve
-N18
- 15 from turbocharger



- 16 Air intake hose
- 17 Transverse pipe
 - ♦ In lock carrier, bottom
- 18 Air intake hose
- 19 Rubber grommet
- 20 Bracket

1.18 - Removing and installing parts of charge air cooling system 07.97 ä



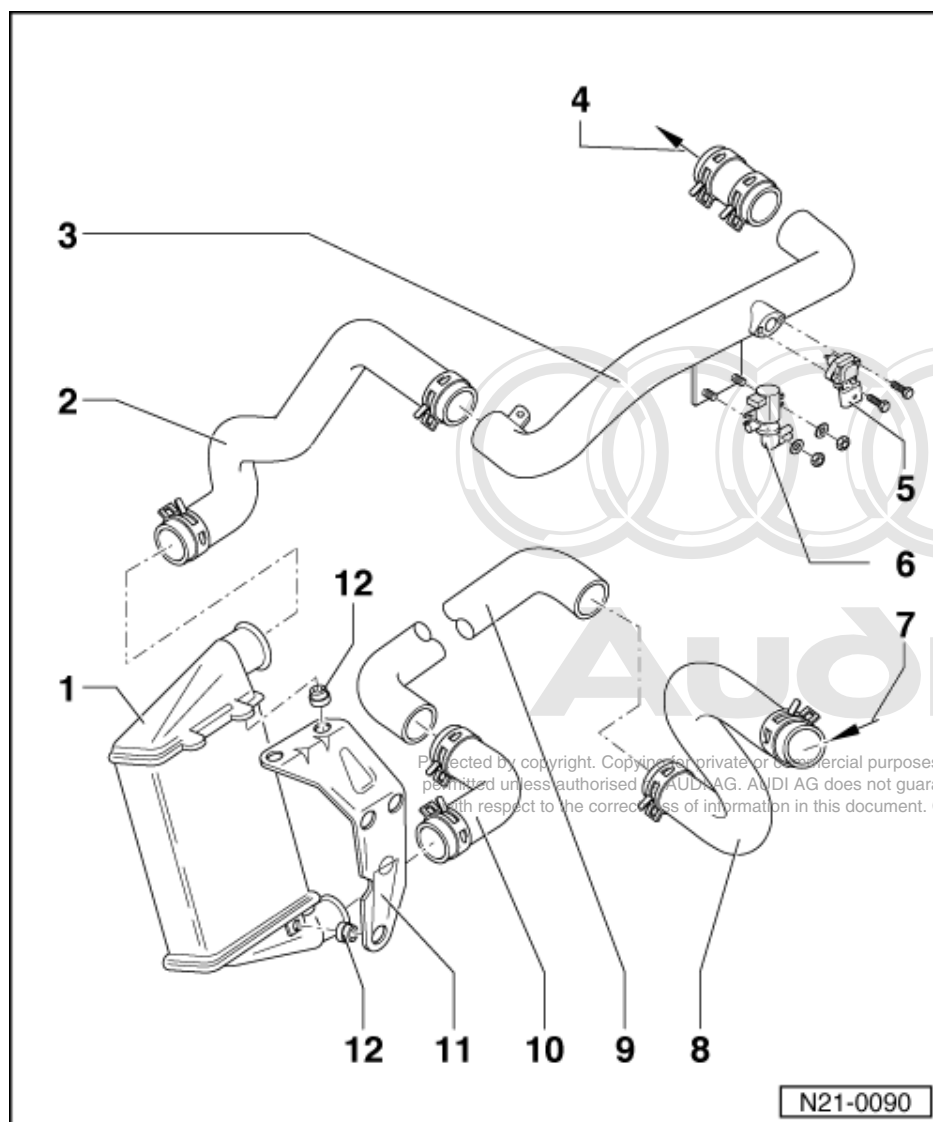
Notes:

- ♦ Secure all hose connections with the correct hose clips (same as original equipment):

=> Parts List

- ♦ Charge air system must be free of leaks.

- 1 Charge air cooler
- 2 Air intake hose
- 3 Air duct, rear
- 4 to intake pipe
- 5 Intake manifold pressure sender -G71
 - ♦ With intake manifold temperature sender -G72



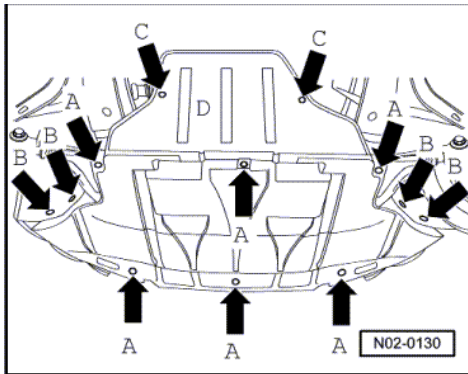
- 6 EGR valve
-N18
- 7 From turbocharger
- 8 Air intake hose
- 9 Transverse pipe
 - ♦ In lock carrier, bottom
- 10 Air intake hose
- 11 Bracket
- 12 Rubber grommet

1.19 - Removing and installing charge air cooler (intercooler)

- Lock carrier must be in service position => Page 24 .

Removing

- Disconnect air hose at top of charge air cooler.



- -> Release quick release fasteners -A- and -B- and take off front noise insulation.
- Detach air duct from charge air cooler.
- Remove air hose at bottom of charge air cooler.
- Take out charge air cooler from underneath.

Installing

Install in reverse order.



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26 - Exhaust system

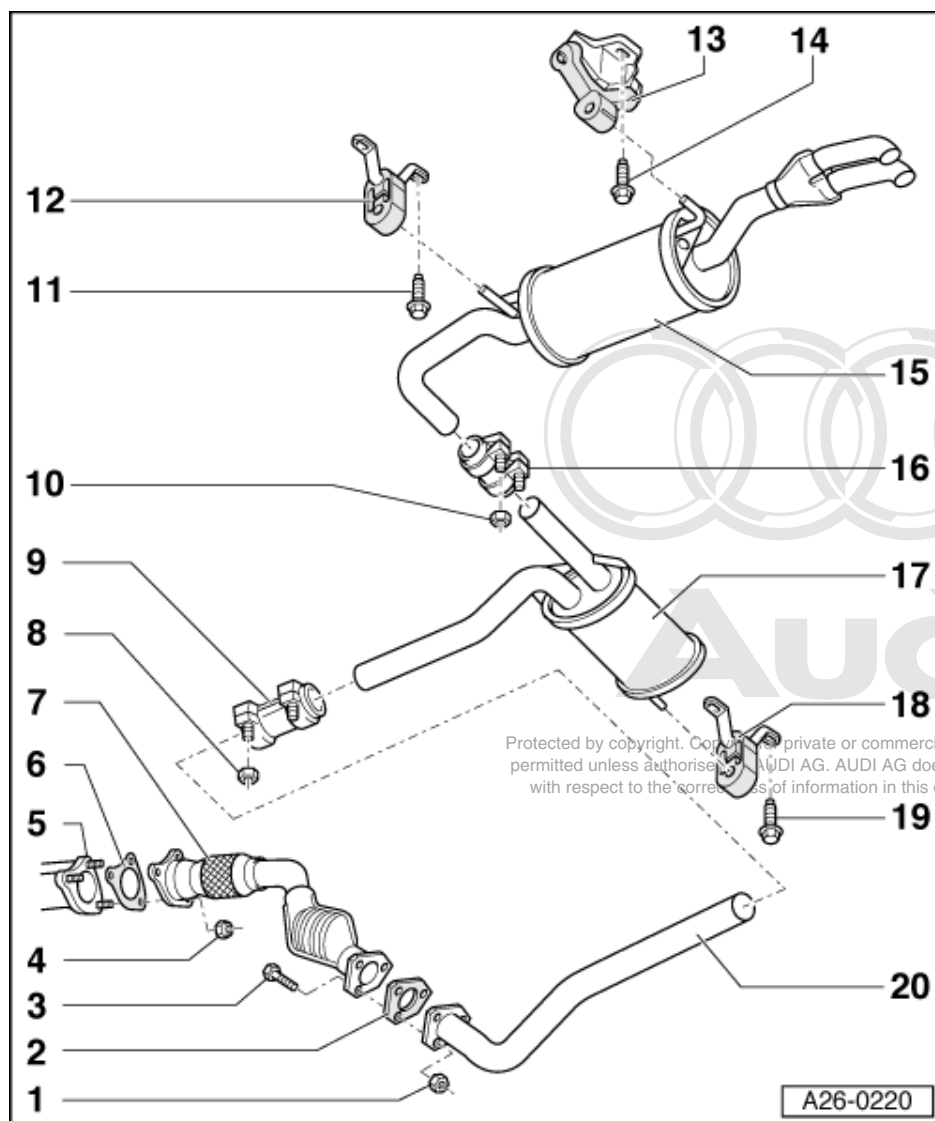
1 - Removing and installing parts of exhaust system

1.1 - Removing and installing parts of exhaust system

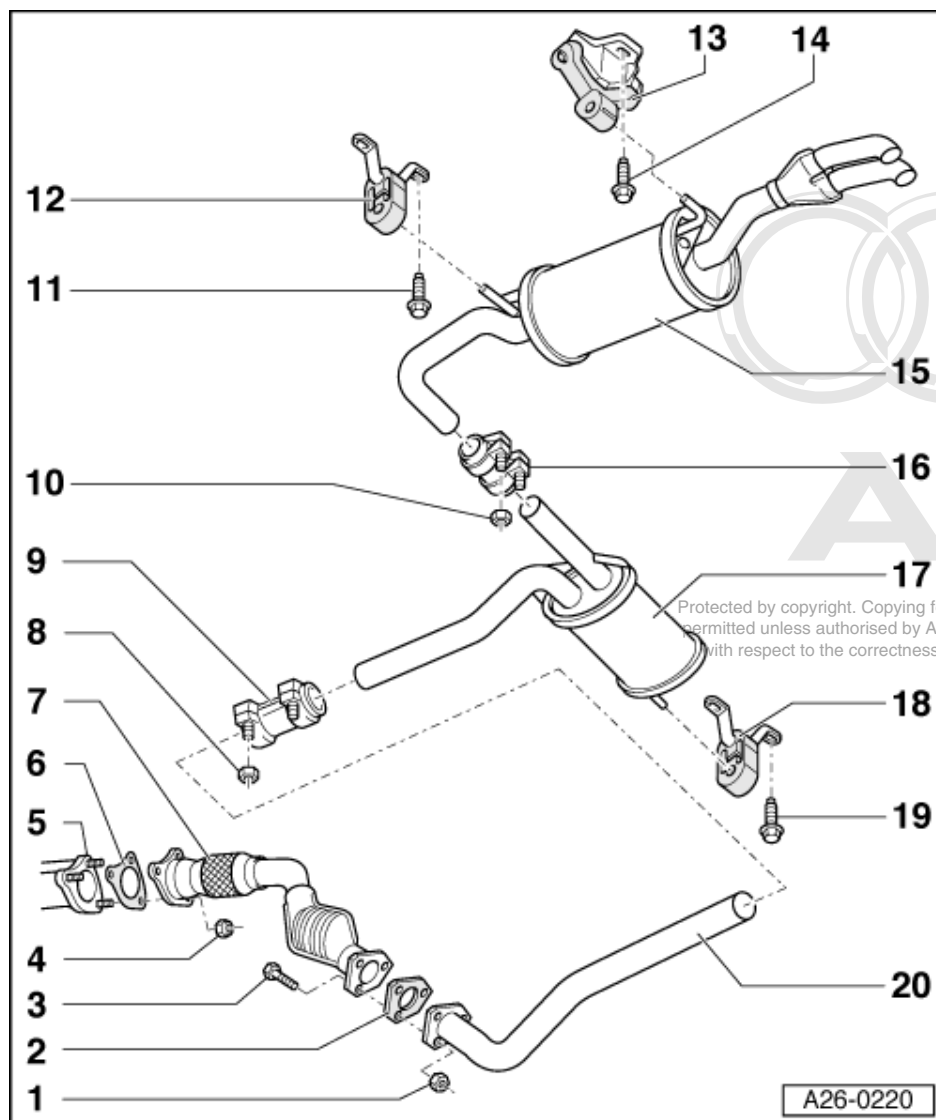
Notes:

- ♦ Always replace seals, 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 bodywork. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the bodywork at all points and the mountings are evenly loaded.
- ♦ The isolating element in exhaust system must not be bent more than 10° to avoid damage.

1.2 - Vehicles with front-wheel drive



- 1 25 Nm
 - ♦ Replace
- 2 Gasket
 - ♦ Replace
- 3 25 Nm
- 4 25 Nm
 - ♦ Replace
- 5 Turbocharger
- 6 Gasket
 - ♦ Replace

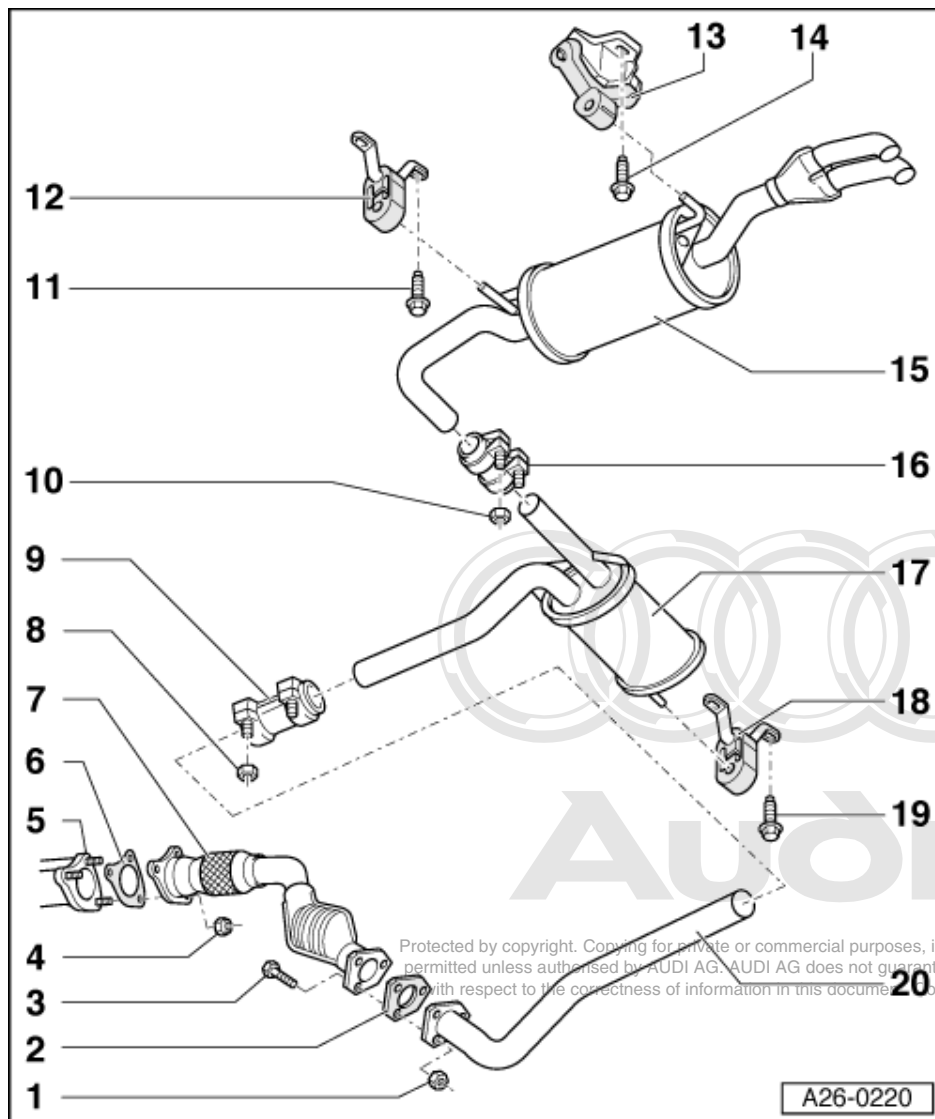


- 7 Catalytic converter
 - ♦ With flexible connection (de coupling element)
 - ♦ Do not bend flexible connection more than 10° - otherwise it can be damaged
 - ♦ Protect from damage by knocks and impact
 - ♦ Removing and installing
=>Page 242
- 8 40 Nm
- 9 Front clamp
 - ♦ Align exhaust system so it is free of stress before tightening clamp => Page 243
 - ♦ Installation position: bolted connection facing to the left
 - ♦ Position of bolts => Fig. 1

-
- This diagram illustrates the assembly of a front suspension component, likely a lower control arm or steering knuckle. The parts are numbered 1 through 20, indicating the sequence of assembly. The components include various bushings, ball joints, and structural parts. A large, faint 'Audi' watermark is visible in the background.
- 1
2
3
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- A26-0220

15 Rear silencer

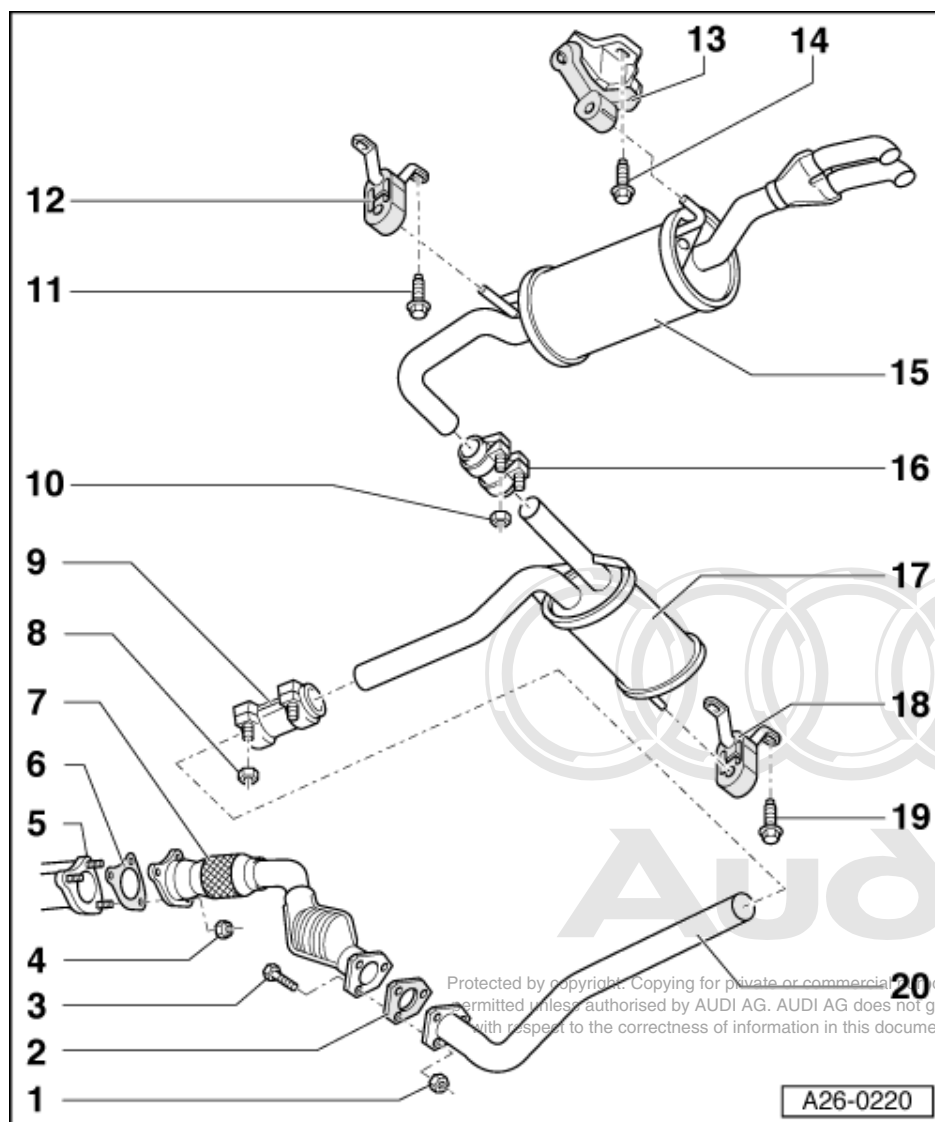
- ◆ Rear silencer and front silencer are one unit as original equipment, In cases of repair renew individually
- ◆ Cutting point => Page 239
- ◆ Align exhaust system so it is free of stress before tightening clamp => Page 243

**16 Rear clamp**

- ♦ For separate replacement of front and rear silencers
- ♦ Align exhaust system so it is free of stress before tightening clamp => Page 243
- ♦ Installation position: Bolted connection facing to the rear
- ♦ Installation position => Fig. 2
- ♦ Tighten bolted connections evenly.

17 Front silencer

- ♦ Centre and rear silencers are one unit as original equipment. In cases of repair renew individually
- ♦ Cutting point => Page 239
- ♦ Align exhaust system so it is free of stress before tightening clamp => Page 243

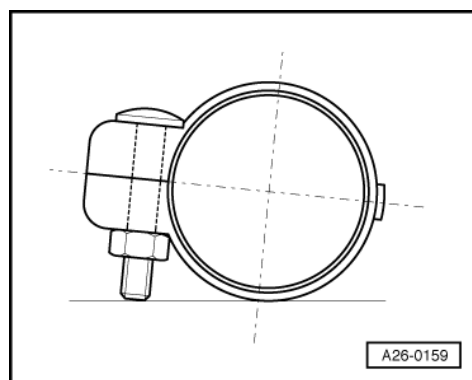


18 Mounting

19 25 Nm

20 Exhaust pipe

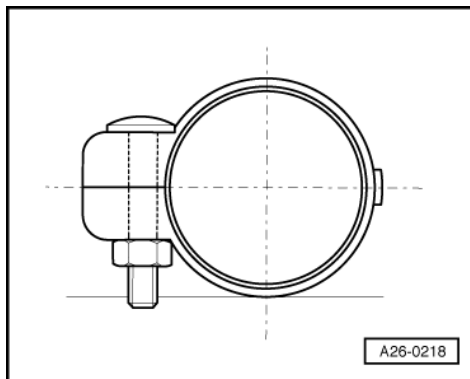
- ♦ Removing and installing
=> Page 240





-> Fig.1 Installation position of front clamp

- Install the clamps so that the ends of the bolts -arrow- are not below the bottom circumference of the clamp.



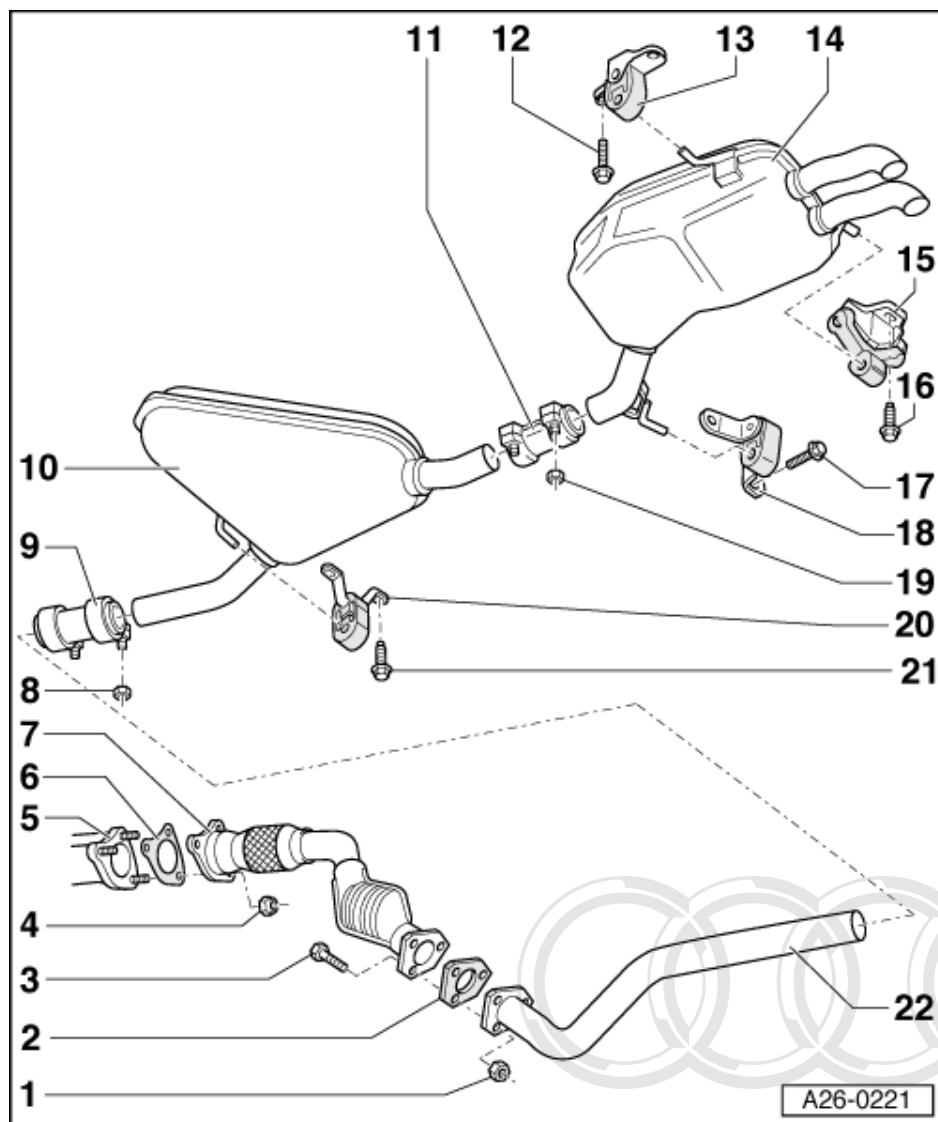
-> Fig.2 Installation position of rear clamp

- Fit clamp in horizontal position.
 - Bolted connection faces to rear



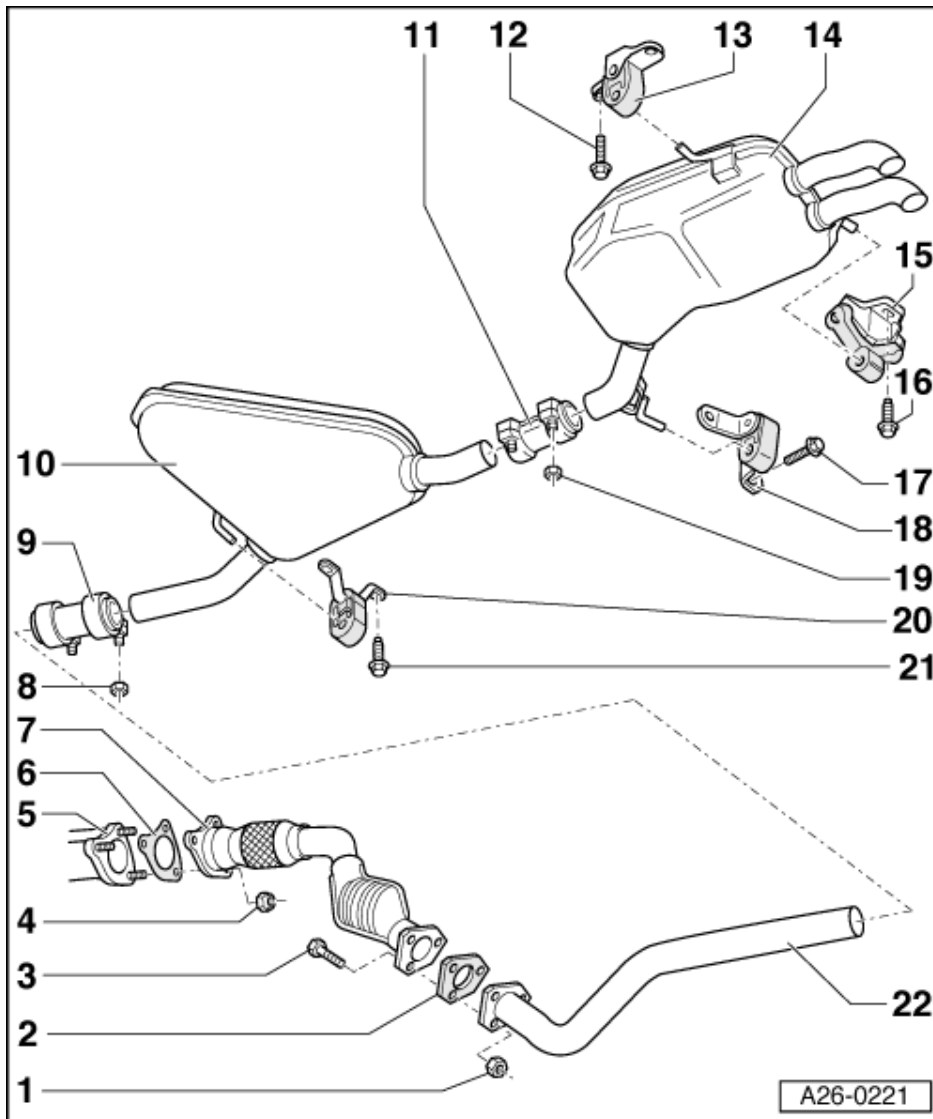
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1.3 - Vehicles with four-wheel drive



- 1 25 Nm
 - ♦ Replace
- 2 Gasket
 - ♦ Replace
- 3 25 Nm
- 4 25 Nm
 - ♦ Replace
- 5 Turbocharger
- 6 Gasket
 - ♦ Replace

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7 Catalytic converter

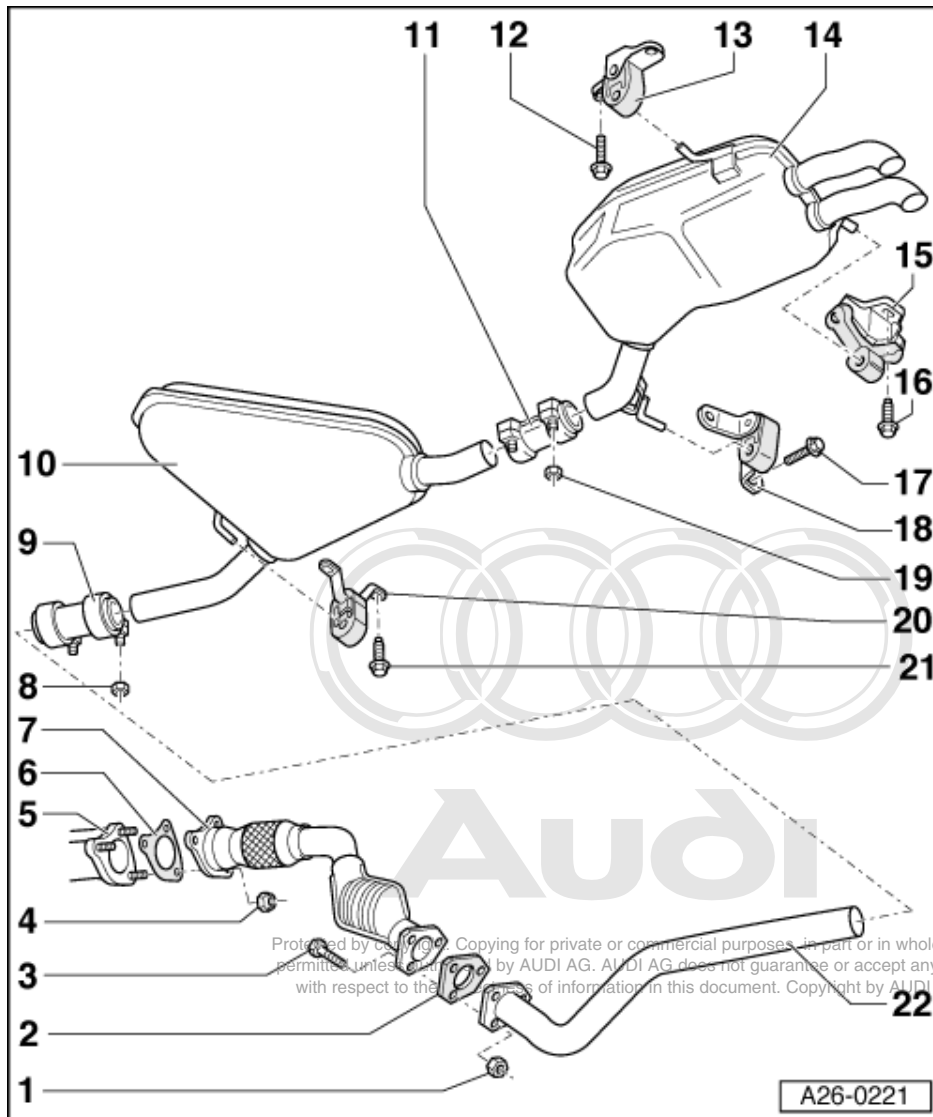
- ◆ With flexible connection (decoupling element)
- ◆ Do not bend flexible connection more than 10° - otherwise it can be damaged.
- ◆ Protect from damage by knocks and impact
- ◆ Removing and installing
=>Page 242

8 40 Nm

9 Front clamp

- ◆ Align exhaust system so it is free of stress before tightening clamp => Page 243
- ◆ Installation position: bolted connection on right
- ◆ Position of bolts => Fig. 1
- ◆ Tighten bolted connections evenly

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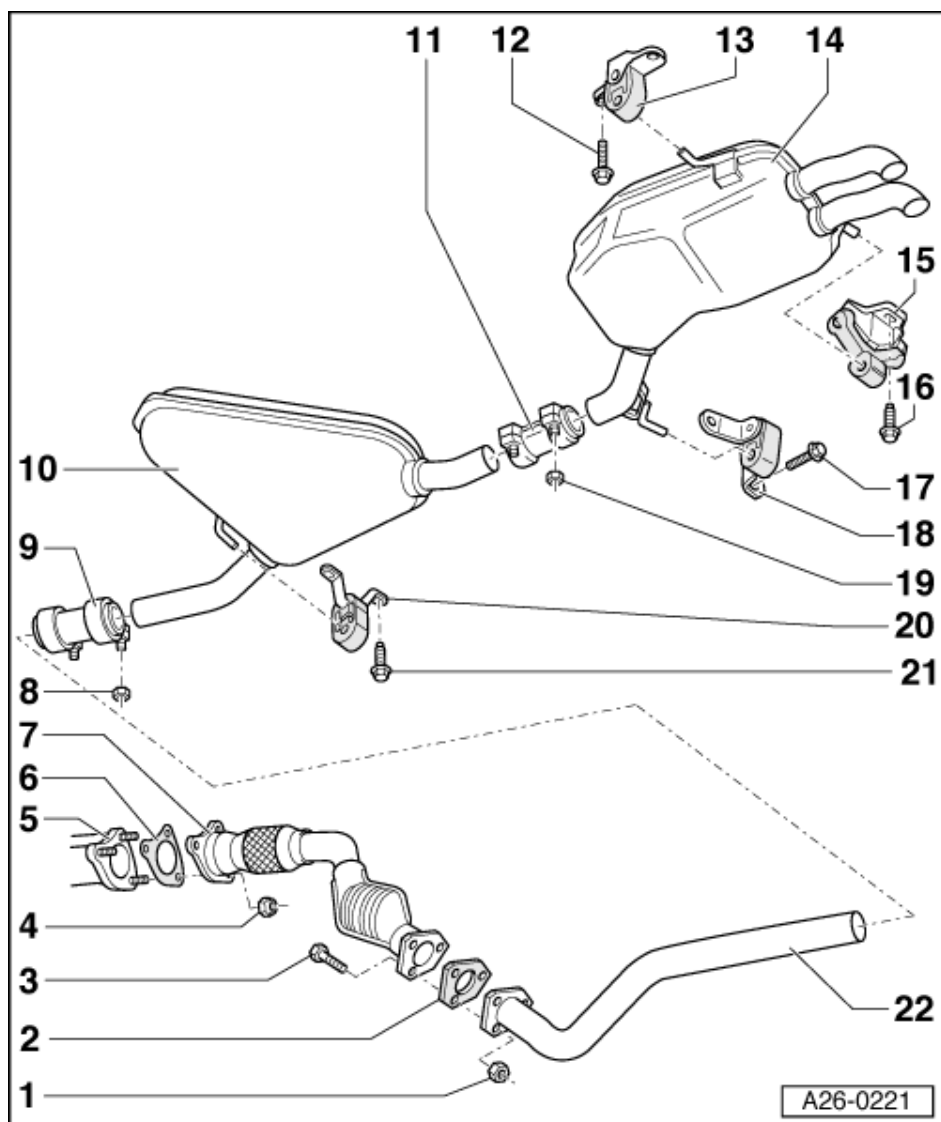


10 Front silencer

- ◆ Centre and rear silencers are one unit as original equipment. In cases of repair renew individually
- ◆ Cutting point => Page 239
- ◆ Align exhaust system so it is free of stress before tightening clamp => Page 243

11 Rear clamp

- ◆ For separate replacement of front and rear silencers
- ◆ Align exhaust system so it is free of stress before tightening clamp => Page 243
- ◆ Installation position: bolted connection facing to the left
- ◆ Position of bolts => Fig. 2
- ◆ Tighten bolted connections evenly.



12 25 Nm

13 Mounting

14 Rear silencer

- ◆ Rear silencer and front silencer are one unit as original equipment, In cases of repair renew individually
- ◆ Cutting point => Page 239
- ◆ Align exhaust system so it is free of stress before tightening clamp => Page 243

15 Mounting

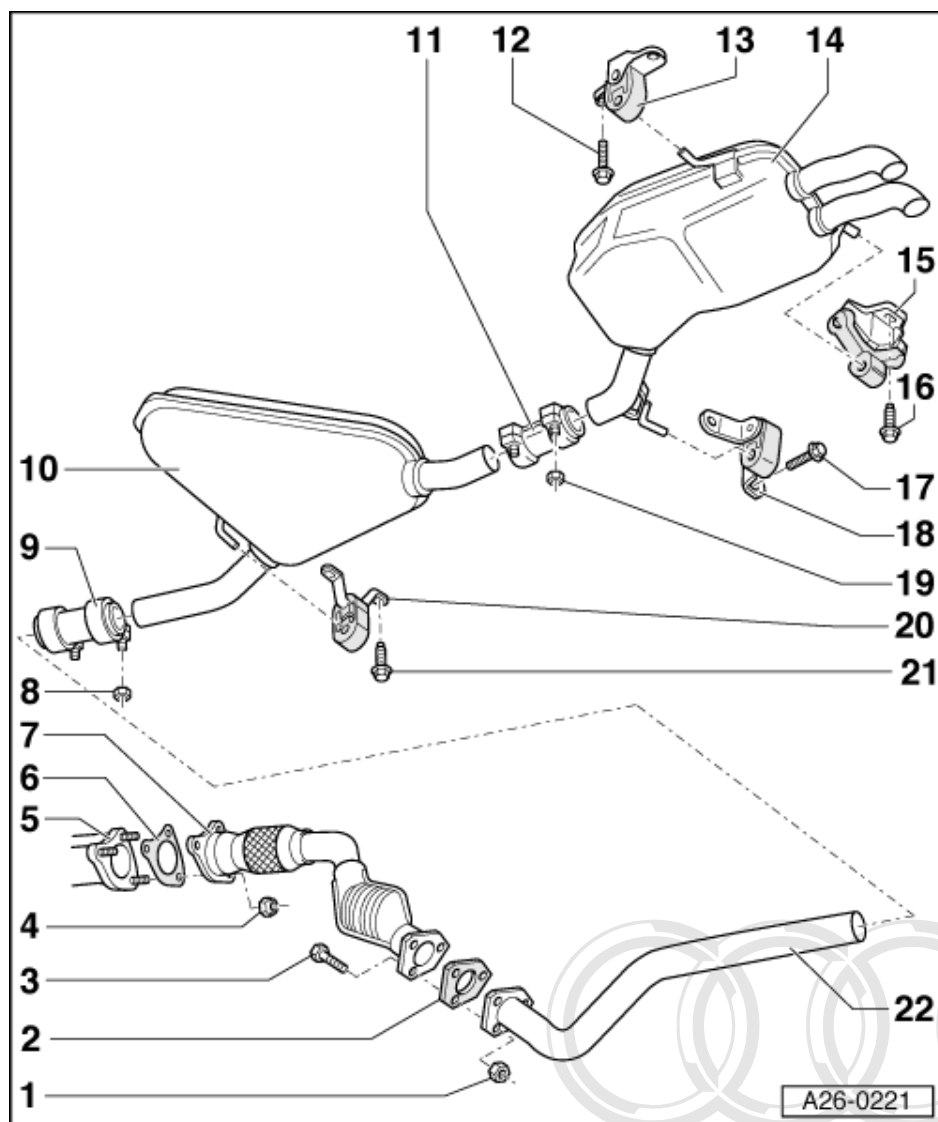
16 25 Nm

17 25 Nm

18 Mounting

19 40 Nm

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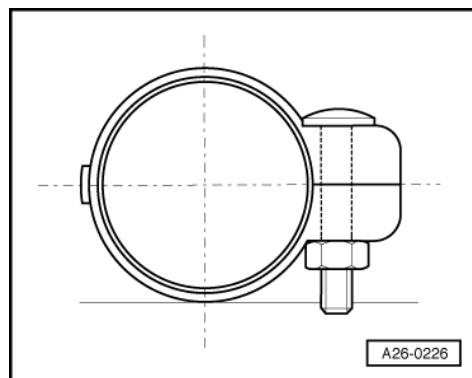


20 Mounting

21 25 Nm

22 Exhaust pipe

- ♦ Removing and installing
=> Page 240

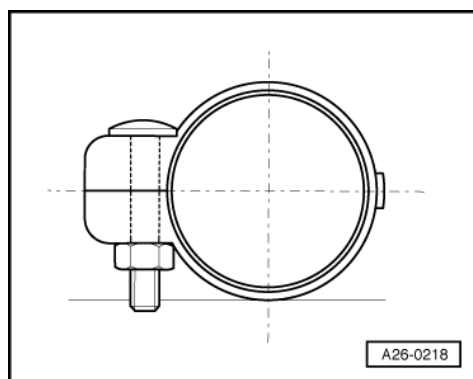


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-> Fig.1 Installation position of front clamp

- Fit clamp in horizontal position.
- Bolted connection faces right



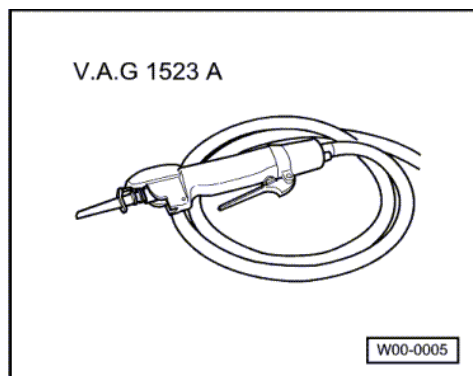
-> Fig.2 Installation position of rear clamp

- Fit clamp in horizontal position.
- Bolted connection facing to the left

1.4 - Separating front and rear silencers

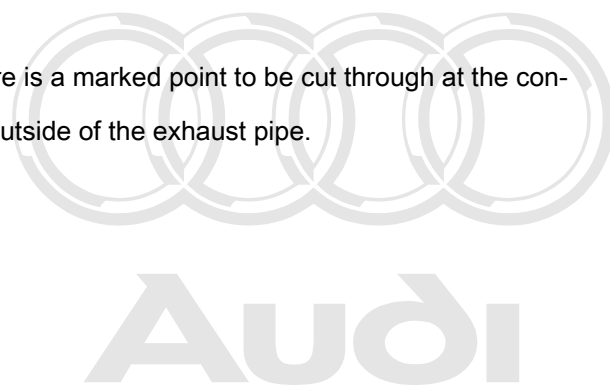
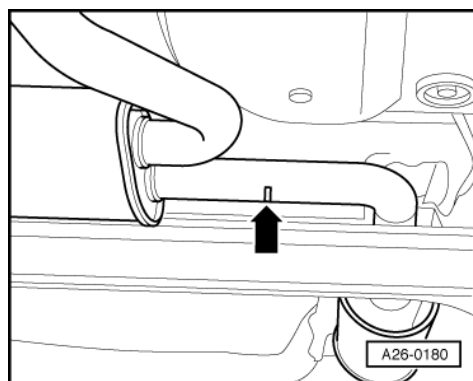
- ♦ For individual replacement of front or rear silencers there is a marked point to be cut through at the connecting pipe.
- ♦ The cutting point is marked with an indentation on the outside of the exhaust pipe.

Special tools, testers and auxiliary equipment required



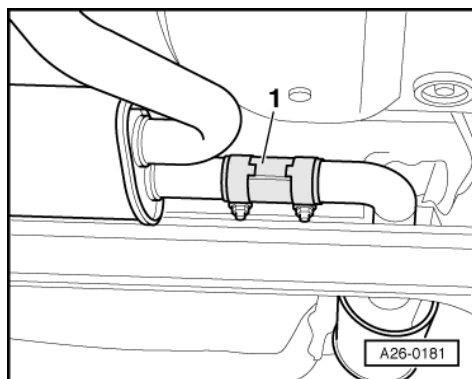
- ♦ V.A.G 1523 A

Vehicles with front wheel drive:



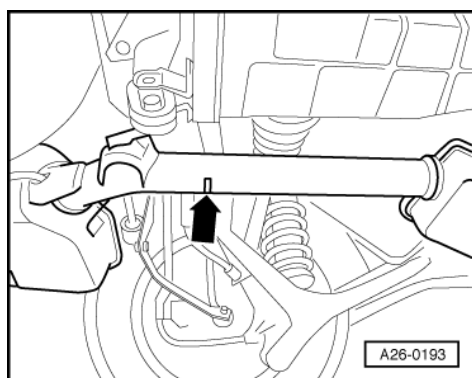
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- -> Cut through exhaust pipe at right angles with body saw (e.g. V.A.G 1523) at position marked -arrow-.
- When installing, position clamp centrally over saw cut.

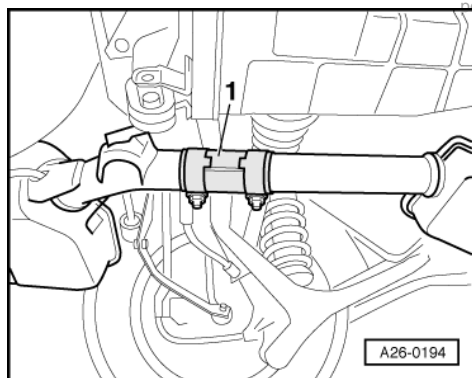


- -> Installation position of clamp -1-: horizontal, with bolted connections facing rear => Fig. 232
- Stress-free alignment of exhaust system => Page 243
- Tighten bolted connections on clamp evenly to 40 Nm.

Vehicles with four-wheel drive:



- -> Cut through exhaust pipe at right angles with body saw (e.g. V.A.G 1523) at the positions marked -arrow-.
- When installing, position clamp centrally over saw cut.

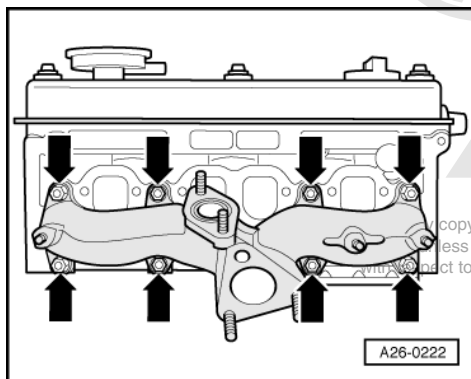


- -> Installation position of clamp -1-: horizontal, with bolted connections facing rear left wheel => Fig. 238
- Stress-free alignment of exhaust system => Page 243
- Tighten bolted connections on clamp evenly to 40 Nm.

1.5 - Removing and installing exhaust manifold

Removing

- Remove turbocharger => Page 217 .
- Remove heat shield.
- Remove intake pipe => Page 108 .
- Unbolt bracket for oil supply pipe from exhaust manifold.
- Only on vehicles with engine codes 1Z, AFF, AHU: Unbolt pipe for exhaust gas recirculation.



- -> Unscrew all nuts -arrows- on exhaust manifold.
- Remove washers and bracket for heat shield and exhaust manifold if fitted.

Installing

Installation is carried out in the reverse order, when doing this note the following:

Note:

Always replace seals, gaskets and self-locking nuts.

- Install intake pipe => Page 108 .
- Install turbocharger => Page 220 .

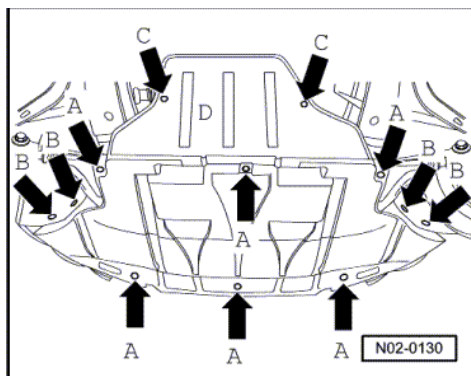
Tightening torques

Component	Nm
Exhaust manifold to cylinder head	25
Heat shield to exhaust manifold	25

1.6 - Removing and installing exhaust pipe

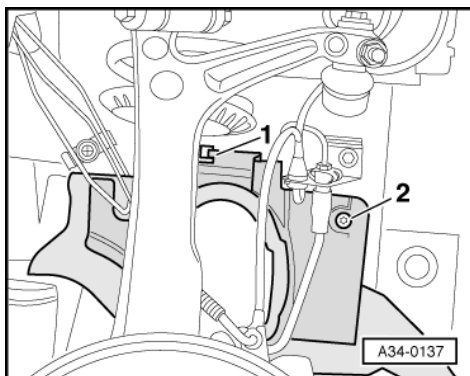
Removing

Note:

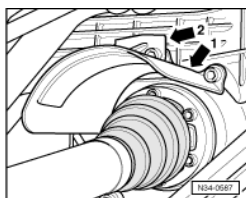


The isolating element in exhaust system must not be bent more than 10° to avoid damage.

- Remove front right wheel.
- -> Remove noise insulation (two sections) -arrows A ... C-.



- -> Loosen bolts -2- of noise insulation above front right drive shaft.
- Disengage hook -1- and detach noise insulation.



- -> Detach heat shields -arrow 1- and -arrow 2- above the right-hand drive shaft.
- Detach right drive shaft from flange shaft and rest this on suspension link.

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Note:

Take care not to damage protective coating on drive shaft.

- Unbolt exhaust pipe from catalytic converter.
- Release rear clamp for exhaust system.
- Push clamp rearwards and detach exhaust pipe.

Installing

Installation is carried out in the reverse order, when doing this note the following:

Note:

Always replace seals, gaskets and self-locking nuts.

- Stress-free alignment of exhaust system => Page 243

Tightening torques

Component	Nm
Exhaust pipe to catalytic converter	25
Clamp for exhaust pipe	40
Drive shaft to flange shaft	M8 40
	M10 77
Heat shields over drive shafts to gearbox	23

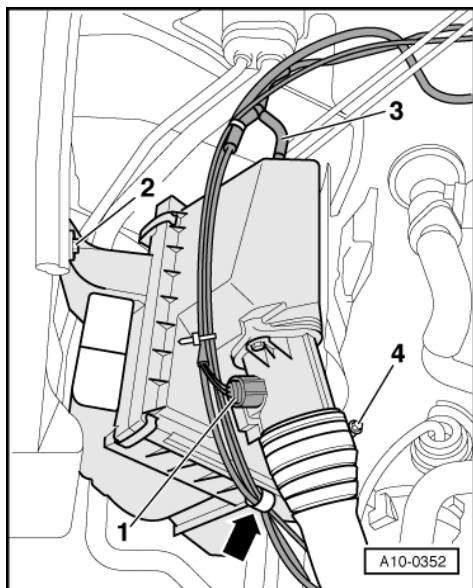
1.7 - Removing and installing catalytic converter

Removing

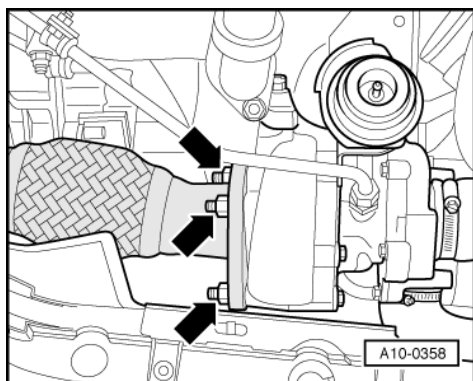
Note:

The isolating element in exhaust system must not be bent more than 10° to avoid damage.

- Remove exhaust pipe => Page 240 .
- Remove air intake duct to air cleaner.



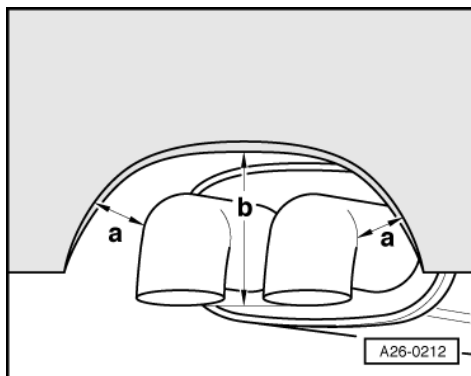
- -> Disconnect hose -3- from air cleaner housing.
- Unplug connector -1- at air mass meter.
- Remove wiring harness from air filter housing -arrow-.
- Pull off air intake hose -4-.
- Unscrew bolt -2-.
- Take off air filter housing.



- -> Unscrew turbocharger/catalytic converter bolts -arrows-.

- Tighten bolts on front clamp -Item **228** evenly to 40 Nm.

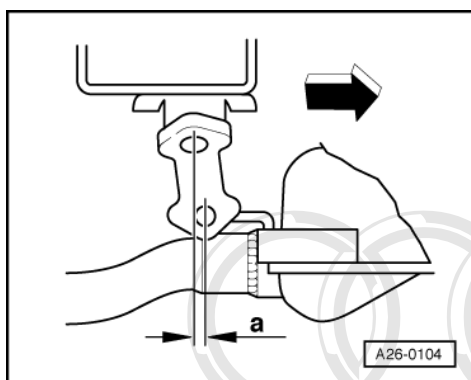
Aligning tailpipes



- -> Align tailpipes so that distance -a- is the same on both sides.
- At the same time, set distance -b- between bumper cut out and bottom of tailpipes:
 - Distance b = 97 ... 103 mm

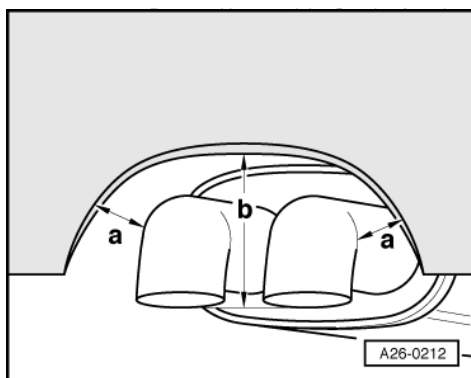
Vehicles with four-wheel drive:

- Vehicles without clamp between front and rear silencers



- Slacken bolted connections on clamp -Item **234** .
- -> Push exhaust system towards front of vehicle -arrow- so that rear right mounting on rear silencer is preloaded by a = 9 ... 11 mm.
- Tighten bolted connections on clamp evenly to 40 Nm.

Aligning tailpipes



- -> Align tailpipes so that distance -a- is the same on both sides.
- At the same time, set distance -b- between bumper cut out and bottom of tailpipes:

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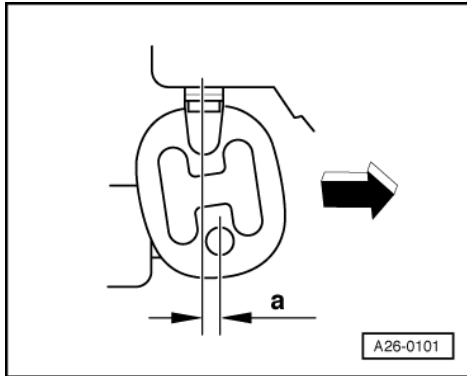
- Distance $b = 97 \dots 103 \text{ mm}$

- Vehicles with clamp between front and rear silencers

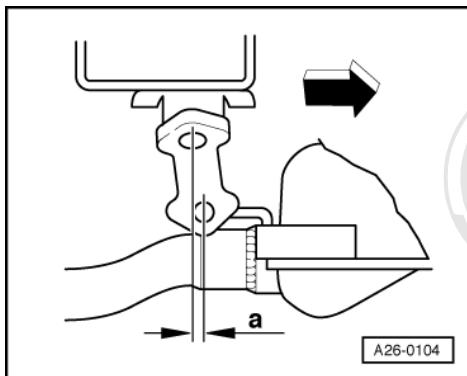
Note:

On vehicles with clamp between front and rear silencers the front silencer also has to be aligned. (This step is not required on other vehicles).

- Slacken bolted connections on clamp -Item **235**.



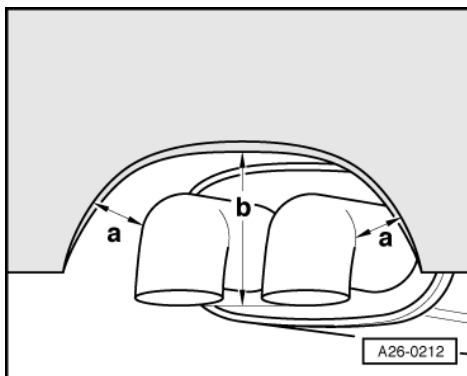
- -> Push exhaust system towards front of vehicle -arrow- so that rear left mounting on front silencer is preloaded by $a = 7 \dots 9 \text{ mm}$.
- Tighten bolts on front clamp -Item **234** evenly to 40 Nm.



- -> Push rear silencer towards front of vehicle -arrow- so that rear right mounting on rear silencer is preloaded by $a = 7 \dots 11 \text{ mm}$.
- Tighten bolts on rear clamp -Item **235** evenly to 40 Nm.

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Aligning tailpipes



- -> Align tailpipes so that distance -a- is the same on both sides.
- At the same time, set distance -b- between bumper cut out and bottom of tailpipes:



- Distance b = 97 ... 103 mm

1.9 - Checking exhaust system for leaks

- Start engine and run at idling speed.
- Plug tailpipes (with rags or stoppers, etc.) until check is completed.
- Listen for noise at the connection points (cylinder head/manifold, manifold/turbocharger, turbocharger/catalytic converter, etc.) to locate any leaks.
- Rectify any leaks that are found.

2 - Exhaust gas recirculation system

2.1 - Exhaust gas recirculation system

Notes:

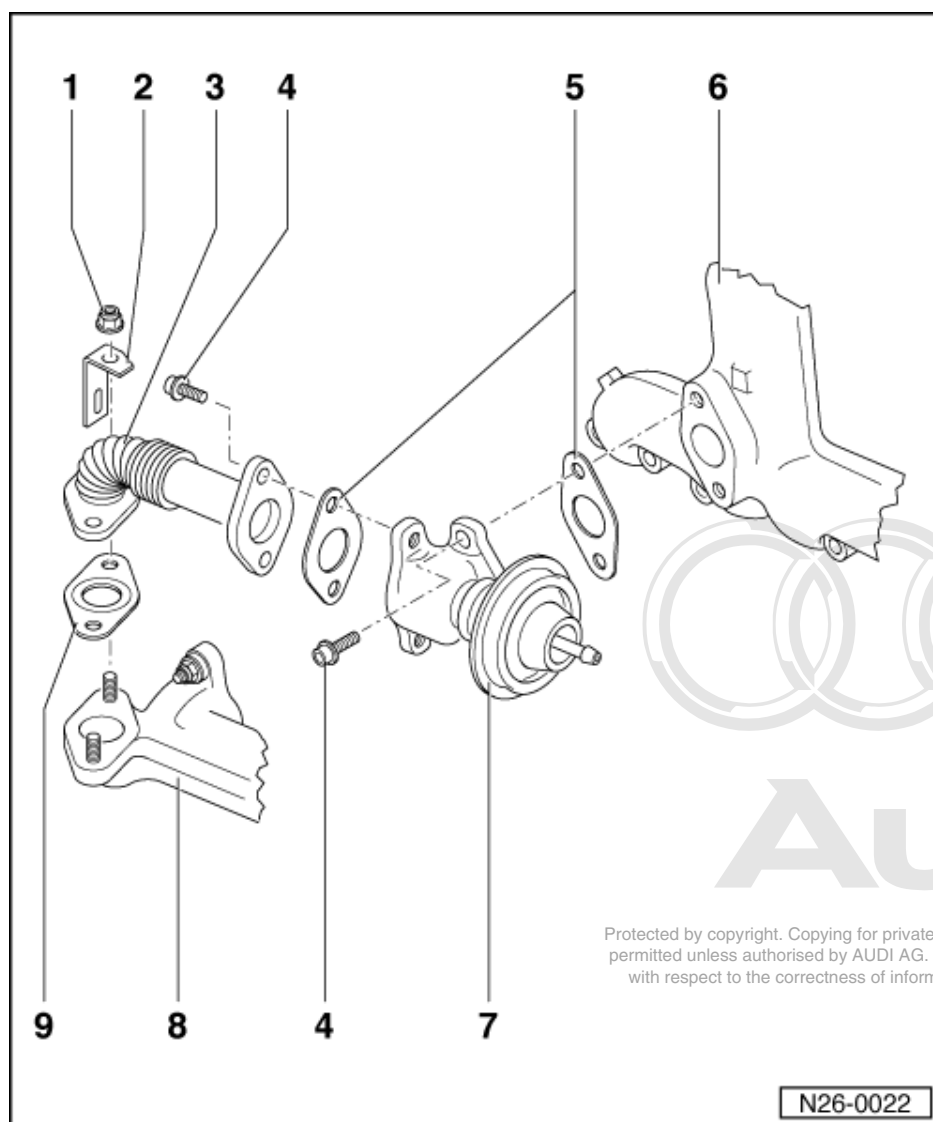
- ♦ The function/control of the exhaust gas recirculation system is undertaken by diesel direct injection system control unit (J248) via EGR valve (N18) to mechanical exhaust gas recirculation valve.
- ♦ The tapered plunger in the mechanical exhaust gas recirculation valve varies the opening cross section according to valve travel.
- ♦ Every conceivable valve position is possible through pulsed control.
- ♦ Secure all hose connections with the correct hose clips (same as original equipment):

=> Parts List

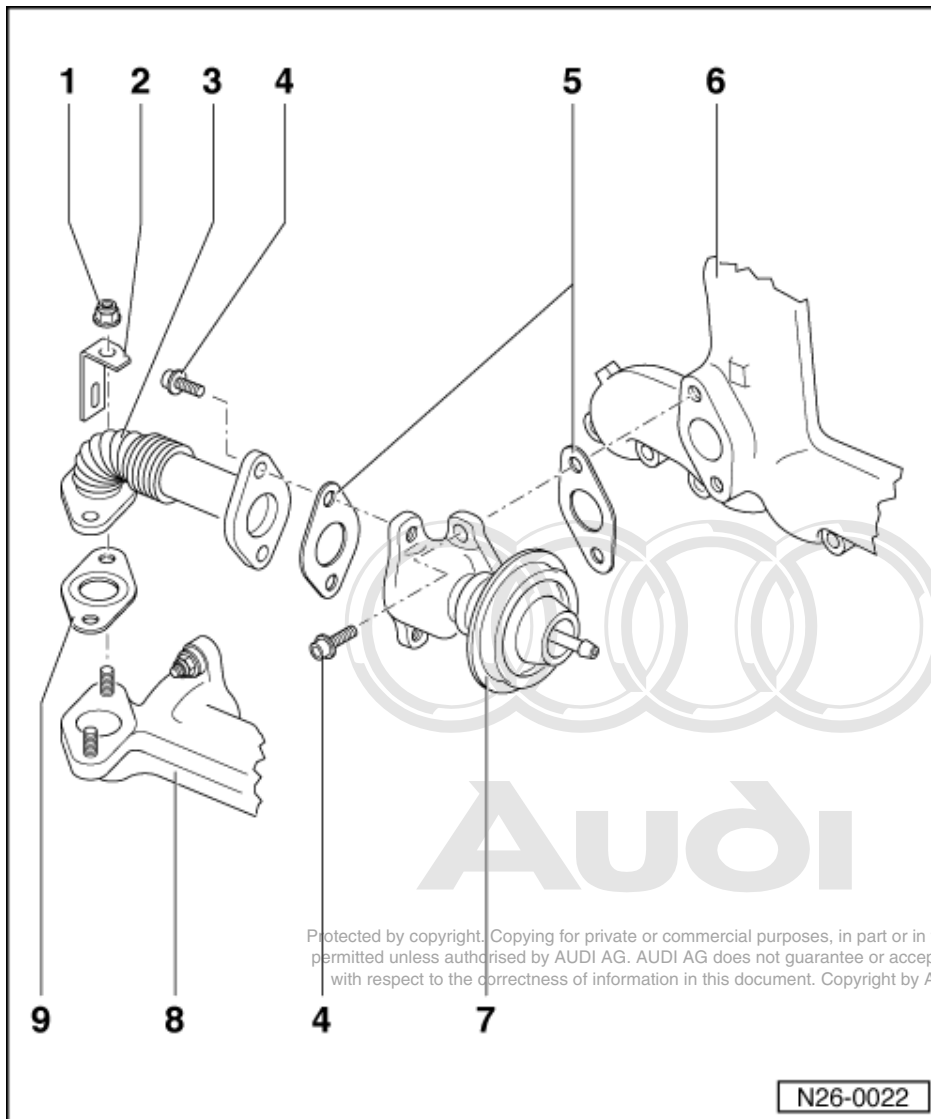
- ♦ Always replace seals, gaskets and self-locking nuts.

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2.2 - Removing and installing parts of exhaust gas recirculation

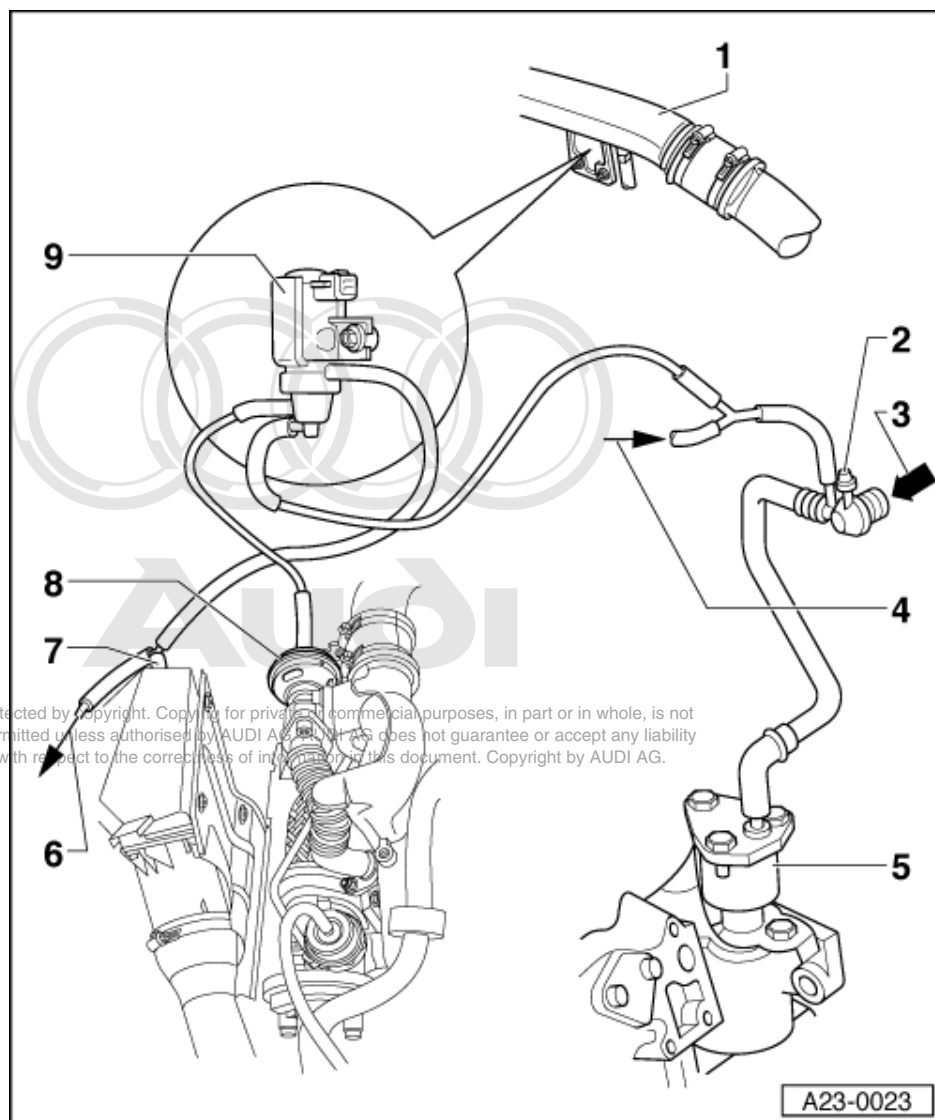


- 1 25 Nm
- 2 **Bracket**
 - ♦ For oil supply pipe of turbocharger
- 3 **Connecting pipe**
 - ♦ On removal slightly counter-tighten all bolted connections (parts must just move freely against each other). Only then tighten free of stress
- 4 25 Nm
- 5 **Gasket**
 - ♦ Replace



- 6 Intake pipe
- 7 Exhaust gas recirculation valve
 - ♦ Checking => Page 251
- 8 Exhaust manifold
 - ♦ Removing and installing
=> Page 240
- 9 Gasket
 - ♦ Replace

2.3 - Diagram of vacuum hose connections

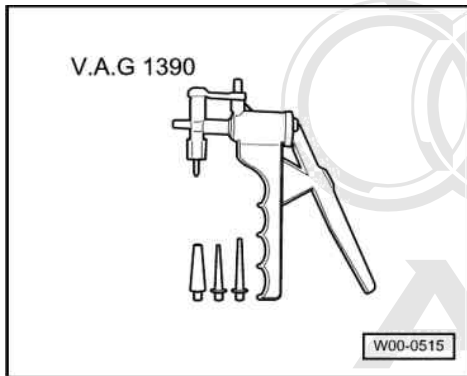


- 1 Air duct pipe, rear
- 2 Vacuum connection
 - ♦ For air conditioner
 - ♦ With filler cap on vehicles without air conditioner
- 3 From brake servo
- 4 Vacuum connection
 - ♦ For boost pressure control
- 5 Exhauster
 - ♦ For brake servo
- 6 Vent line
 - ♦ For boost pressure control



- 7 Vent line
 - ◆ To air cleaner
- 8 Mechanical EGR valve
- 9 EGR valve
-N18

2.4 - Checking mechanical EGR valve

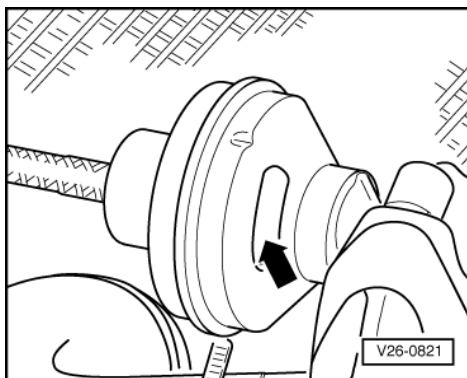


Special tools, testers and auxiliary equipment required

- ♦ V.A.G 1390

Test sequence

- Pull vacuum hose off mechanical EGR valve.
- Connect hand vacuum pump V.A.G 1390 to valve.
- Operate pump.
 - The membrane rod must move in direction of vacuum connection



Note:

-> Observe membrane rod through opening -arrow-.

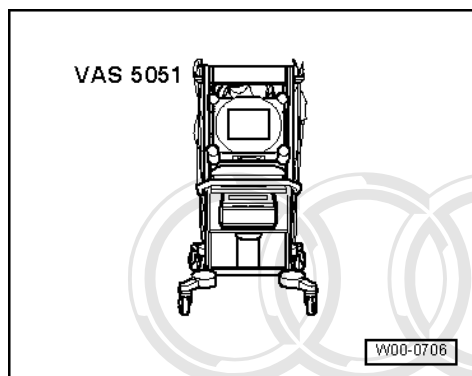
- Pull hose of hand vacuum pump hose off exhaust gas recirculation valve.
 - The valve must be clearly heard to close. The membrane rod moves in direction of intake pipe

2.5 - Testing exhaust gas recirculation > 06.97

The operation of the exhaust gas recirculation system is tested by measuring the intake air mass. If exhaust gas is being recirculated the proportion of fresh air detected by air mass meter will be smaller. The larger the quantity of recirculated exhaust gas, the weaker the signal from the air mass meter.



Special tools, testers and auxiliary equipment required



- ♦ VAS 5051

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test requirements:

- Coolant temperature at least 80 °C.

Test sequence

- Read measured value block, display group 001:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Reading measured value block Self diagnosis of diesel direct-injection system Reading measured value block

-> When adjacent display appears:

Read measured value block 1			
	840 rpm	6.5 mg/stroke	1.480
V	87.3	5C	

- Check display in display zone 4 (coolant temperature).
 - Specified value: at least 80 °C
- Do not continue with the test until the coolant has reached the specified temperature.
- Read measured value block, display group 003.

-> When indicated on display

Read measured value block 3			
	840 rpm	272 mg/stroke	268 mg/
stroke	54 %		

- Briefly depress the accelerator pedal, then allow the engine to continue running at idling speed.
- Observe displays in display zones 2 and 3

Display zone		Possible cause of fault
2 (specified)	3 (actual)	
230...0.370 mg/stroke	230...0.370 mg/stroke	OK

Display zone		Possible cause of fault
2 (specified)	3 (actual)	
230...370 mg/stroke	Greater than 370 mg/stroke	Engine too cold Load switched on Manifold temperature too high Injection pump too lean
230...0.370 mg/stroke	Less than 230 mg/stroke	Unmetered air Excessive exhaust gas recirculation
230...0.370 mg/stroke	Greater than 370 mg/stroke	not enough or no exhaust gas recirculation
230...370 mg/stroke	(constant 425 mg/stroke)	Fixed substitute value, due to break in cable to air mass meter or measurement of implausible air mass

Note:

If display zone 3 shows a constant reading of 425 mg/stroke, test air mass meter:

=> Diesel direct injection and glow plug system (4 cyl.) ä 06.97; Repair group 23; Servicing diesel direct-injection system; Testing air mass meter Servicing diesel direct-injection system Testing air mass meter

If the specified values are not obtained:

- Start final control diagnosis and actuate EGR valve -N18:

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 01; Self diagnosis of diesel direct-injection system; Final control diagnosis Self diagnosis of diesel direct-injection system Final control diagnosis

-> Display:

Final control diagnosis
EGR valve -N18

The injector valve should click.

If the injector does not click:

- Check EGR valve -N18 => Page 256

If the injector clicks:

- Check vacuum hoses => Page 249 .

If vacuum hoses are OK:

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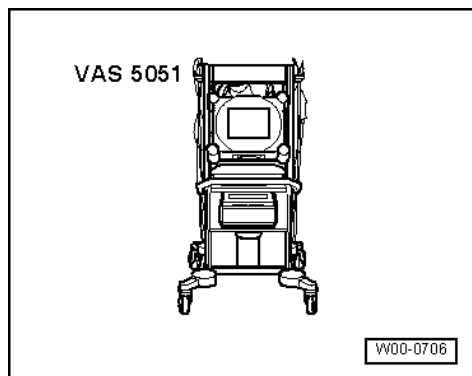
Test mechanical exhaust gas recirculation valve => Page 251 .



2.6 - Test exhaust gas recirculation 07.97 ä

Testing exhaust gas recirculation function is carried out in function "Basic Setting". Exhaust gas recirculation valve is cycled every 10 seconds during this procedure, so that extreme values for exhaust gas recirculation (air mass meter) can be checked in display group 003.

Special tools, testers and auxiliary equipment required



- ♦ VAS 5051

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test requirements:

- Coolant temperature at least 80 °C.

Test sequence

- Read measured value block, display group 001:

=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Reading measured value block Reading measured value block

-> When adjacent display appears:

Read measured value block 1			
840 rpm	6.5 mg/stroke	1.480	
V	87.3 5C		

- Check display in display zone 4 (coolant temperature).
 - Specified value: at least 80 °C
- Do not continue with the test until the coolant has reached the specified temperature.
- Start the basic setting, display group 003:

=> Diesel direction-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Basic setting Basic setting

-> When indicated on display

Basic setting 3			
840 rpm	EGR not active	500	
mg/stroke	0 %		

- Check display in zones 2 and 3.

Display in Display zone 2 1)	Specified value in display zone 3
EGR active	180 ... 280 mg/stroke

Display in Display zone 2 1)	Specified value in display zone 3
EGR not active	greater than 370 mg/stroke

- 1) Display changes every 10 seconds between "EGR active" and "EGR not active".

Note:

If a constant 550 mg/stroke is displayed in display zone 3, then a jamming mechanical exhaust gas recirculation valve or a defective air mass meter could be the cause. In the latter case, interrogate fault memory whether fault 00553 is stored:

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Self-diagnosis; Interrogating and erasing fault memory

Self-diagnosis, interrogating and erasing fault memory as a 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.

If the specified values are not obtained:

- Start final control diagnosis and actuate the EGR valve -N18:

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 01; Final control diagnosis
Final control diagnosis

-> When adjacent display appears:

Final control diagnosis EGR valve -N18

The injector valve should click.

If the injector does not click:

- Check EGR valve-N18 => Page 256

If the injector clicks:

- Check vacuum hoses => Page 249 .

If vacuum hoses are OK:

- Test mechanical exhaust gas recirculation valve => Page 251 .



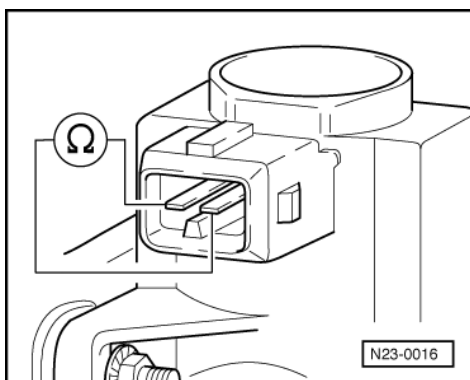
2.7 - Checking EGR valve -N18

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/18 	V.A.G 1598/22 
	G26-0001

Special tools, testers and auxiliary items required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/18
(Vehicles à 06.97)
- ♦ V.A.G 1598/22
(Vehicles 07.97 à)

Checking internal resistance



- -> Remove connector -1- from exhaust air recirculation valve -2-.
- Connect multimeter to valve to measure resistance.
 - Specified value: 14 ... 20 ω

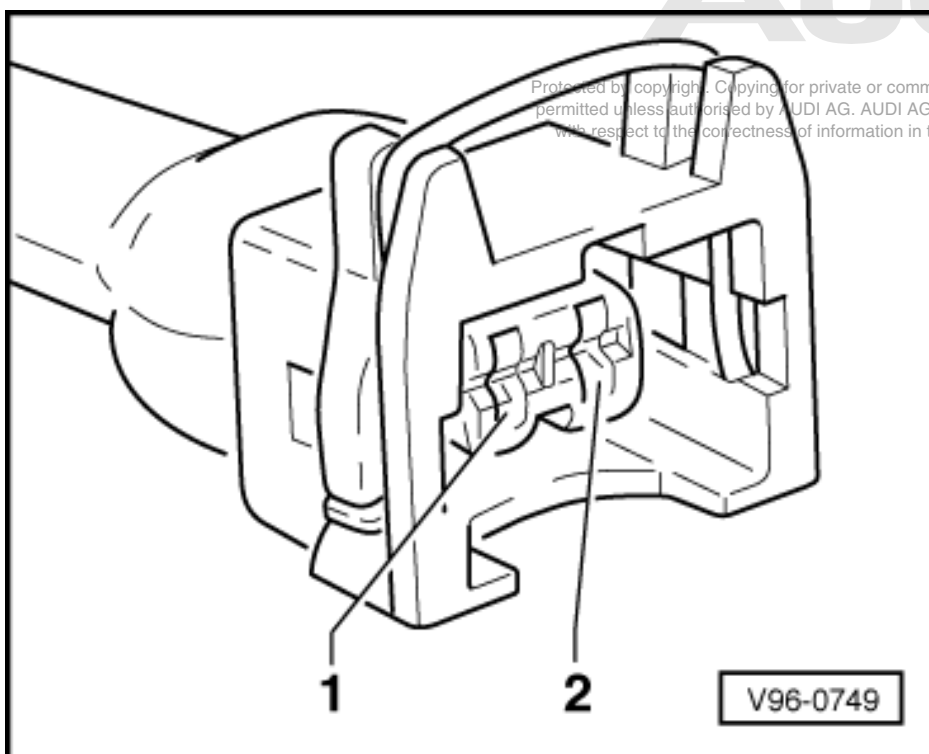
Note:

Resistance is in lower tolerance range at room temperature and in upper tolerance range when engine is warm.

If the specified value is not obtained:

- Replace EGR valve -N18.

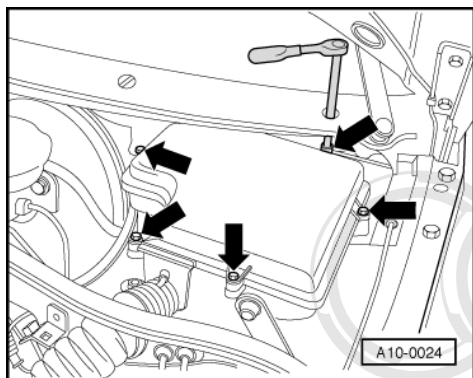
Checking power supply



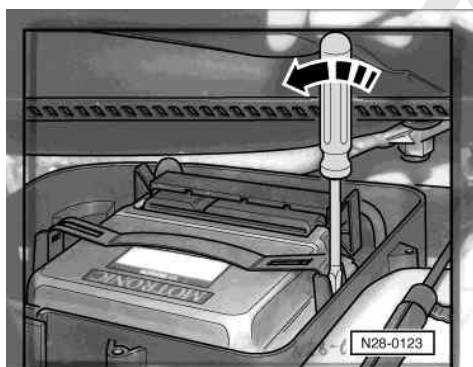
- -> Connect multimeter to contact 1 and earth to measure voltage.
- Switch the ignition on.
 - Specified value: approx. battery voltage



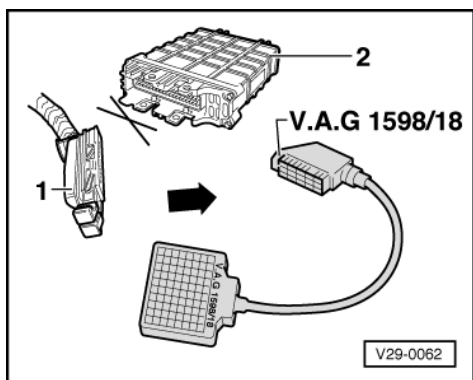
Testing control signal wiring



- -> Remove cover for electronics box (plenum chamber) -arrows-.

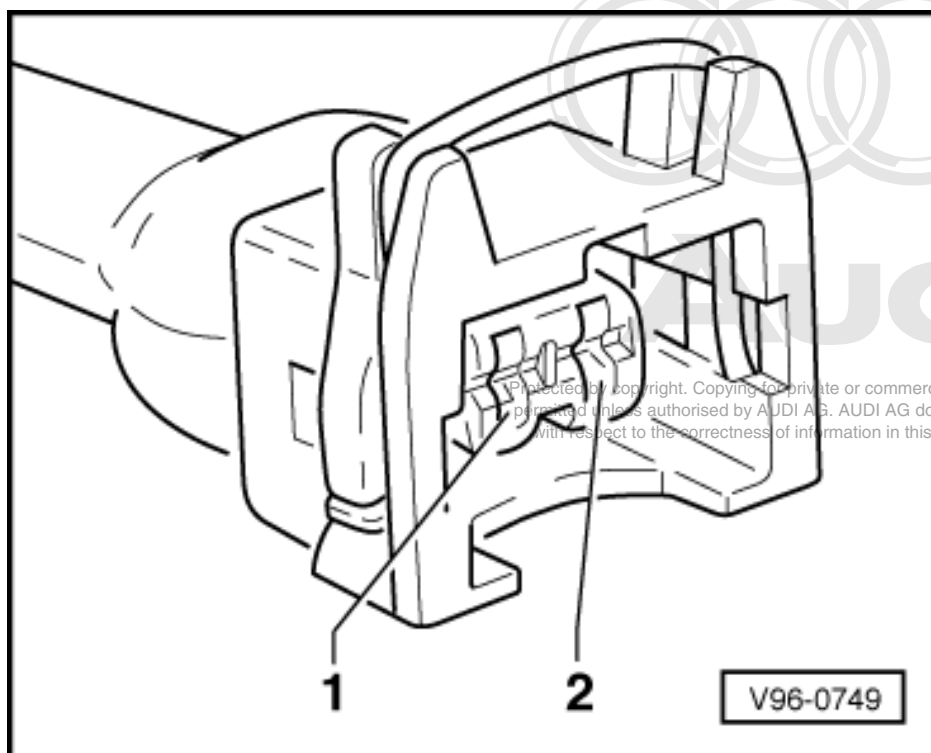


- -> Carefully lever off the retainer - arrow- using a screwdriver.
- Release catches and detach connectors from control unit.



Vehicles ä 06.97:

- -> With the ignition switched off, connect test box V.A.G 1598/18 to connector -1- (the control unit -2- remains disconnected).

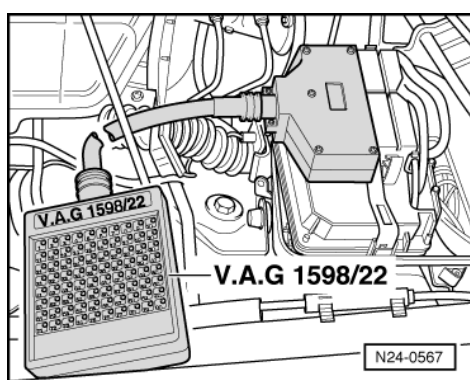


- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector for -N18 Contact	Test box V.A.G 1598/18 Socket
2	25

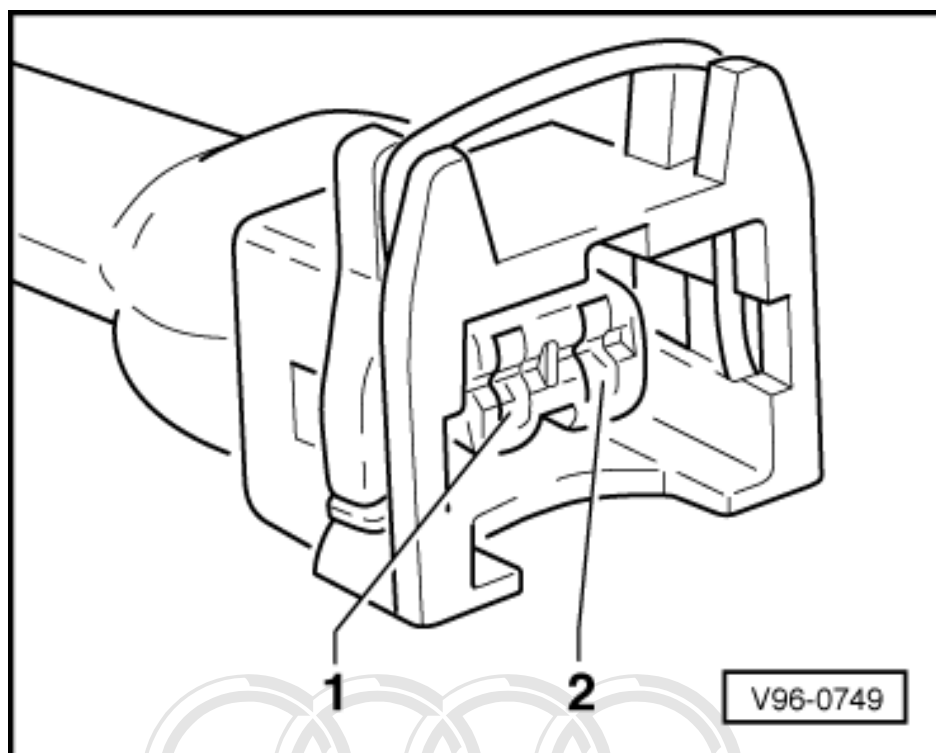
- Rectify any open/short circuit as necessary.
- If wiring connection is OK, replace engine control unit.

=> Diesel direct-injection and glow lamp system (4-cyl.) ä 06.97; Repair group 23; Replacing engine electronics control unit Replacing engine electronics control unit



Vehicles 07.97 ä:

- -> With ignition switched off, connect test box V.A.G 1598/22 only to connector (control unit remains disconnected).



- -> Check for open circuit and short to positive or earth in the following wiring connections:

Connector for -N18 Contact	Test box V.A.G 1598/22 Socket
2	29

- Rectify any open/short circuit as necessary.
- If wiring connection is OK, replace engine control unit.

=> Diesel direct-injection and glow lamp system (4-cyl.) 07.97 ä; Repair group 23; Replacing engine control unit Replacing engine control unit

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