



Audi

Audi 100 1991 ➤

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8-cylinder engine, mechanical components								
Engine ID	BAH	AEC	AHK					

Edition 02.2002

List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Audi 100 1991 ➤

8-cylinder engine, mechanical components

Repair Group

00 - Technical data

10 - Removing and installing engine

13 - Crankshaft group

15 - Cylinder head, Valve gear

17 - Lubrication

19 - Cooling system

20 - Fuel supply system

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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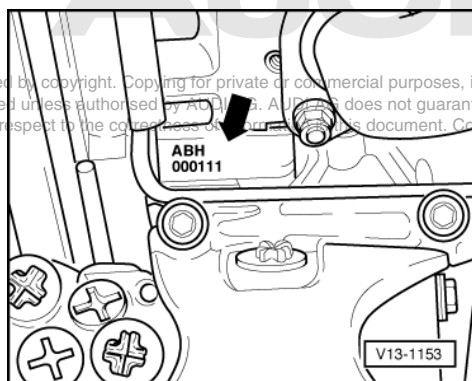
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00 - Technical data

1 - Technical data

1.1 - Technical data

1.2 - Engine number



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-> The engine number (engine code and serial number) is stamped on the left side of the cylinder block immediately above the hydraulic pump.

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

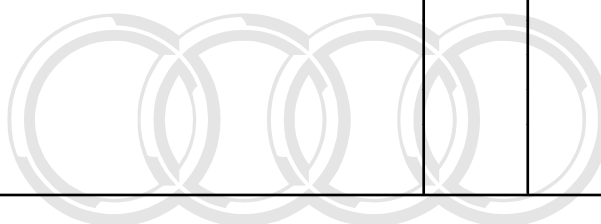
The engine code is also indicated on the vehicle data sticker.

1.3 - Engine data

Engine code		ABH	AEC	AHK
Production		.91 ä	07.94 ä	03.96 ä
Capacity	ltrs.	4.172	4.172	4.172
Output	kW at rpm	206/5800	213/5800	240/6500
Torque	Nm at rpm	400/4000	400/4000	400/3500
Bore	ø mm	84.5	84.5	84.5
Stroke	mm	93.0	93.0	93.0
Compression		10.6	10.8	11.6
ROZ/MOZ 98/88 recommended min. RON		91	98	98
Injection system		Motronic	Motronic	Motronic
Ignition		Motronic	Motronic	Motronic
Knock control		yes	yes	yes
Self-diagnosis		yes	yes	yes
Lambda control		yes	yes	yes
Catalytic converter		yes	yes	yes
Charging		no	no	no



Engine code	ABH	AEC	AHK
Valve timing with 1 mm valve lift and 0 mm valve clearance			
Inlet opens after TDC	7o	11o	7o
Inlet closes after BDC	29o	35o	46o
Exhaust opens before BDC	31o	30o	31o
Exhaust closes before TDC	2o	2o	2o



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10 - Removing and installing engine

1 - Removing and installing engine, ABH, AEC

1.1 - Removing and installing engine, ABH, AEC

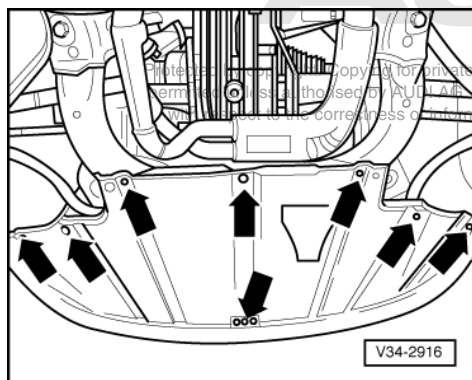
1.2 - Removing

- Take out engine upwards without gearbox.

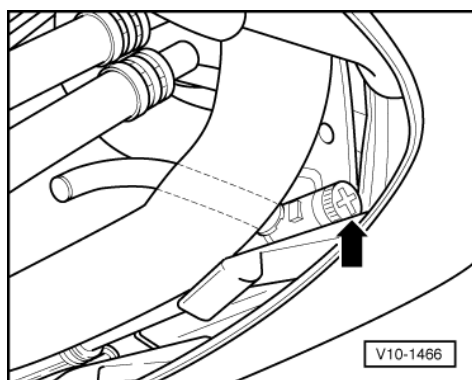
Notes:

- ◆ Ask customer for radio anti-theft code.
- ◆ Renew all cut and loosened cable ties. Refit cable ties in the same position when installing the engine.
- ◆ Battery is located on right of luggage compartment beneath trim.

- With the ignition switched off disconnect the battery earth strap.



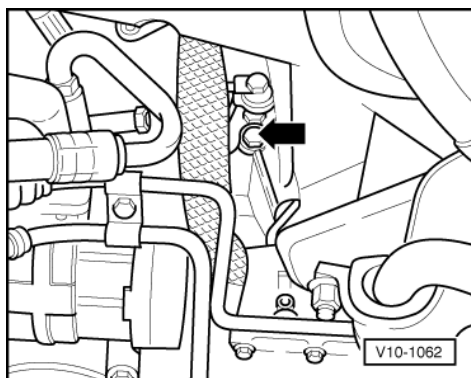
- -> Remove noise insulation.



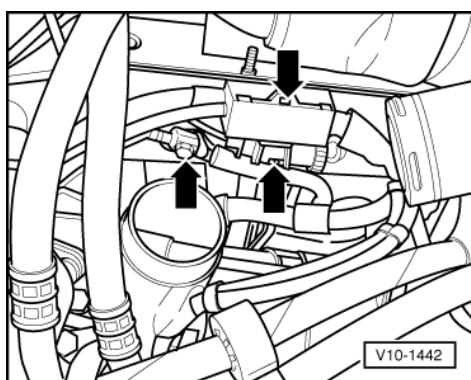
- -> Drain coolant at bottom right of radiator.

Notes:

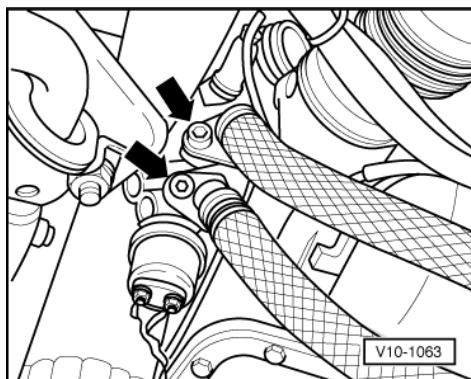
- ◆ Collect coolant for re-use.
- ◆ For draining coolant at radiator, attach hose to coolant drain cock.
- ◆ Only use clean vessel to collect coolant.



- -> Drain coolant at engine block on left beneath knock sensor and on right above oil filter.
- Detach air guide to the alternator.



- -> Unbolt engine earth strap and electric cable connections to the starter.
- Unbolt the bracket of the cables from the gearbox to the oil cooler at the oil sump.

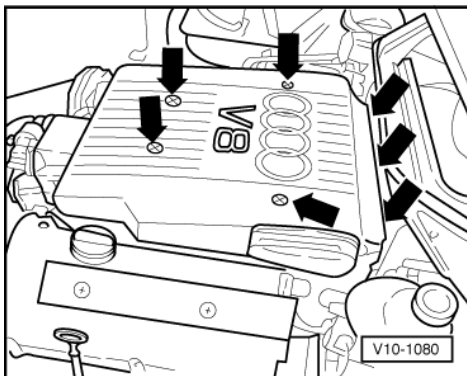


- -> Detach both hoses for oil cooler at oil filter housing.
- Collect oil in a vessel.

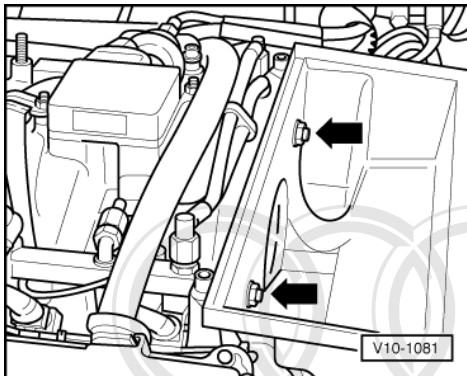




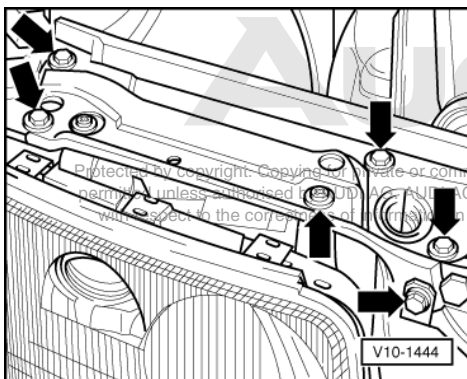
- -> Unbolt bracket for air guide pipes on left and right.
- Remove air guide pipes.
- Remove anti-roll bar.



- -> Unscrew top part of air filter housing.



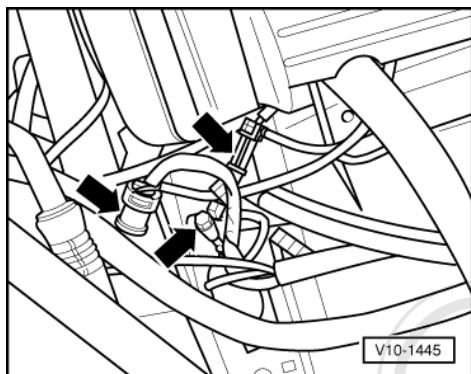
- -> Unscrew bottom part of air filter housing, press to rear and lift out upwards.



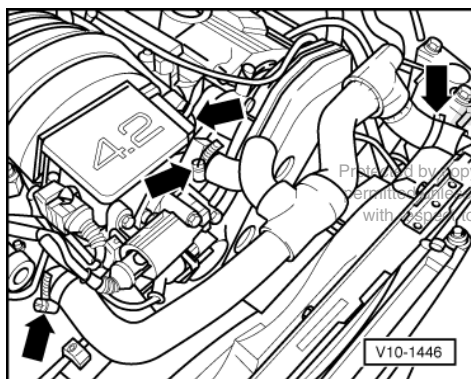
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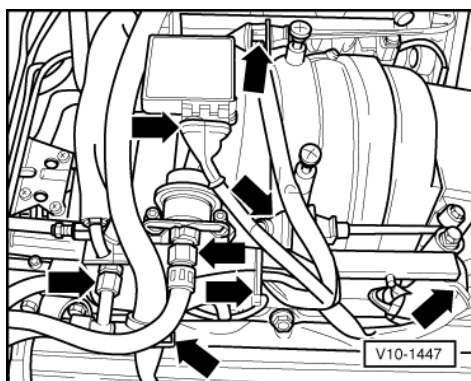
- -> Unbolt end plate at the top.
- Detach bonnet lock release cable.
- Take off end plate at the top.
- Unbolt air guides for air filter on left and right below end plate.



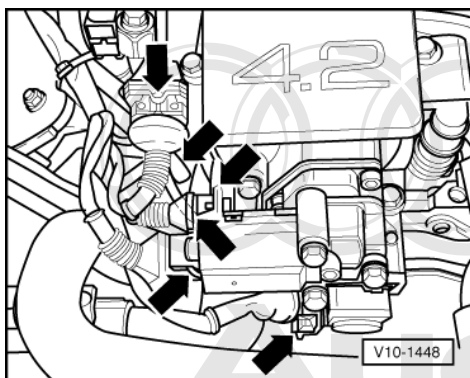
- -> Unplug connectors for AC compressor and air conditioner (two green connector housings on left side member behind headlight) and detach cables.
- Unbolt earth cable for radiator fan from the side member next to the connectors of the AC compressor.



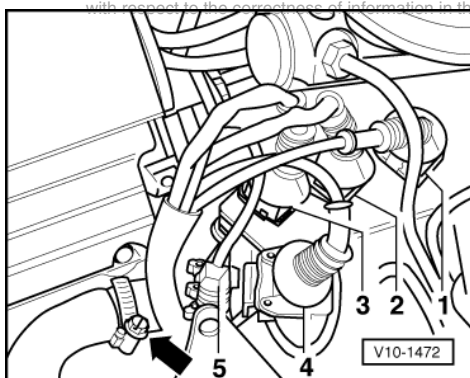
- -> Detach coolant hose and place to the side.
- Unplug connector at coolant temperature sensor.



- -> Disconnect fuel feed and fuel return pipes.
- Unplug connector of air mass meter and knock sensor.
- Cut open cable straps.
- Detach crankcase breather hose on right.
- Pull connectors off injectors on left and right.



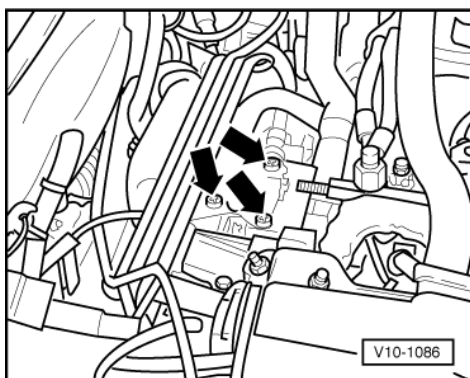
- -> Sunplug connectors for oil pressure sensor, idling stabilisation, throttle valve potentiometer and air temperature.
- Disconnect both cables to the activated charcoal filter at the throttle valve body.



- -> Unplug the connectors on the left next to the brake master cylinder (5 connections).
- Unbolt cable bracket. Cut open both cable straps at protective pipe, pull cable out of protective pipe and disconnect.

Connector assignment:		
1 = grey	3-pin	Engine speed sender
2 = brown	3-pin	Gearbox speed sender
3 = black	2-pin	Lambda probe heater
4 = black	3-pin	Checking ignition timing
5 = black	1-pin	Lambda probe

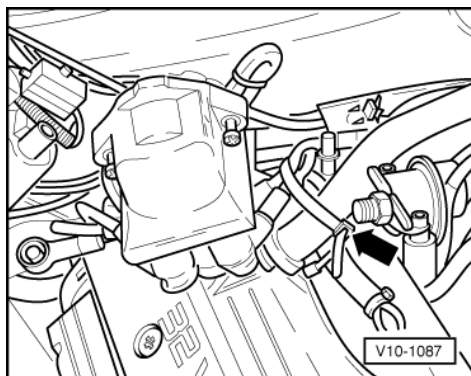
- Detach coolant hose -arrow-.
- Remove heat shield on left (2 screws).



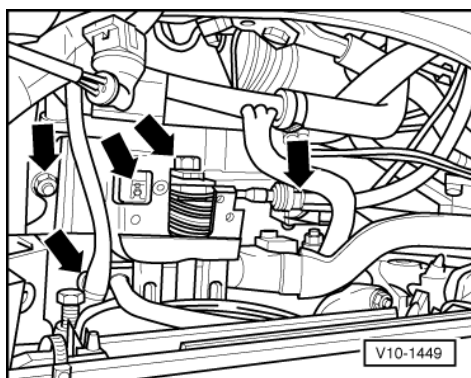
- -> Unbolt sheet metal support for ignition cable.



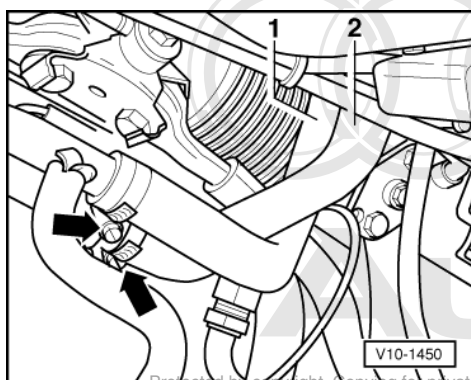
- Detach vacuum pipe from the intake manifold on the right next to the sheet metal support (below the ignition cables).



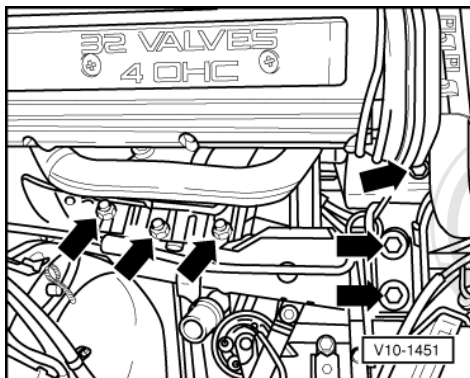
- Disconnect ignition cables from the ignition coils on the left and right.
- Unscrew distributor caps on left and right (cables remain connected).
- -> Use cable straps to attach both distributor caps to the crankcase breather hose.



- -> Detach and lay bare accelerator cable by unfastening clips.
- Detach clip for engine wiring harness.
- Pull off vacuum hose from intake manifold.



- -> Unscrew both coolant hoses to heat exchanger.
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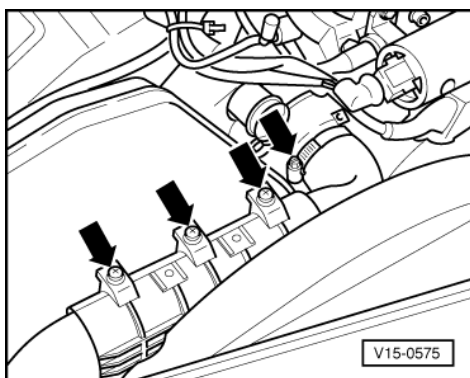


- -> Heat shield on right (3 screws).
- Unscrew engine support (pay attention to washers).

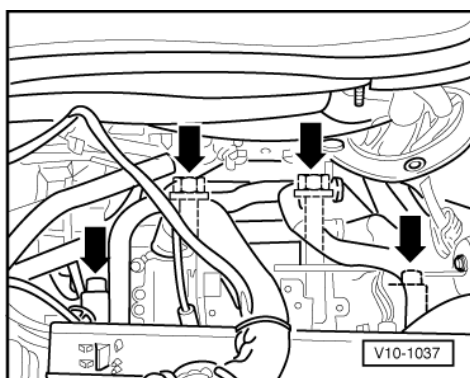
Note:

Pay attention to installation instructions when installing the engine support.

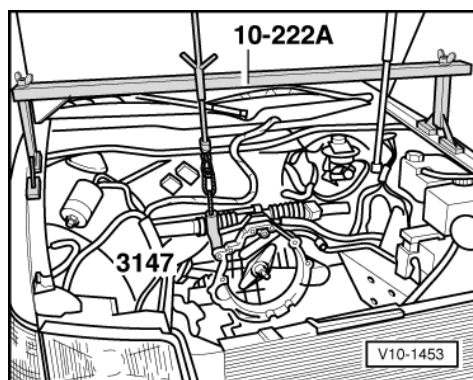
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- -> Open supporting clip for bottom coolant hose and take off top part.
- Unscrew hose at thermostat housing.



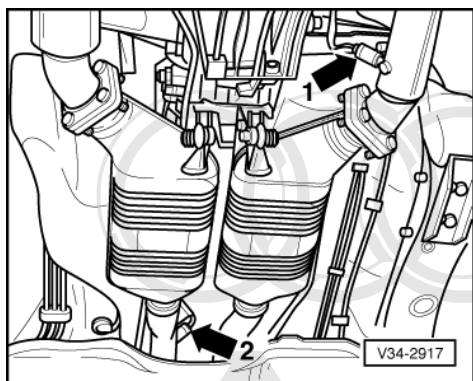
- -> Unscrew the top bolts connecting engine-gearbox with the exception of the topmost bolt.



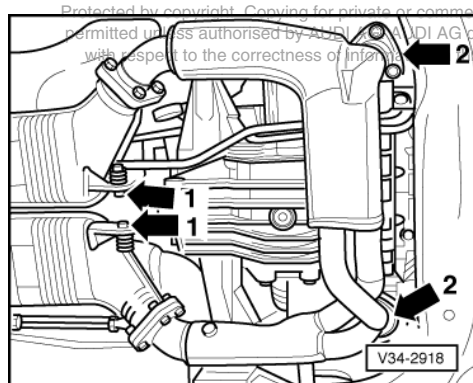
- -> Fit supporting device 10-222A onto the ledge of the wing.
- Insert gearbox mount 3147 into the gearbox mount as shown in illustration and latch into the supporting device.

Note:

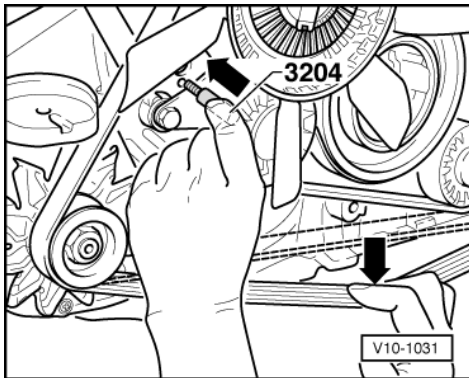
The supporting device is shown with the engine removed to simplify the illustration.



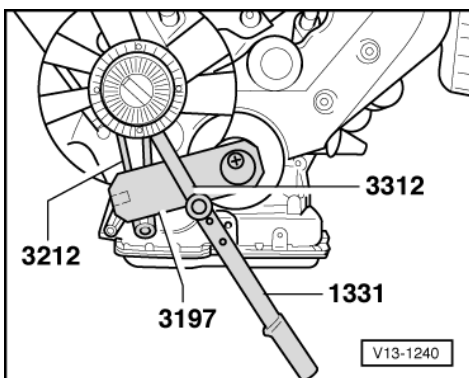
- -> Pull the cable of the lambda probe and lambda heater through and down, and unbolt lambda probe -1- and thermostatic sensor -2-.



- -> Unbolt exhaust system at the manifold on left and right and at the transmission suspension.
- Detach complete exhaust system at both silencers and take out.



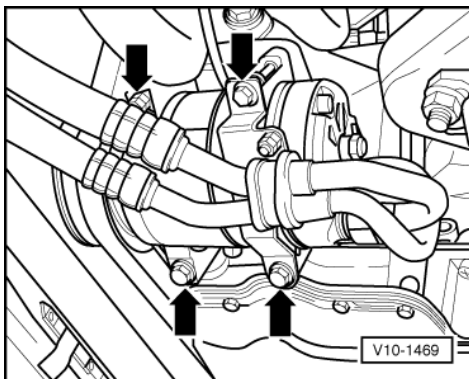
- -> Slacken off ribbed belt; to do so, pull belt by hand downwards from below and insert setting pin 3204.
- Remove belt.



- -> Unbolt viscous fan.

Notes:

- ◆ The viscous fan has a left-hand thread; turn to the right in order to unfasten.
- ◆ The two-hole nut turning tool 3212 is supported on the inside of the counterholder 3197 when slackening the nut.
- ◆ For ease of illustration, the viscous fan is shown on the removed engine.



Models with air conditioner.

- -> Unscrew AC compressor and hang up on side.

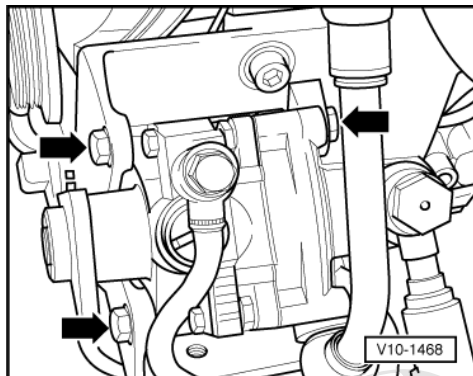
Notes:

- ◆ Do not open hydraulic connections.
- ◆ Take care not to bend pipes.

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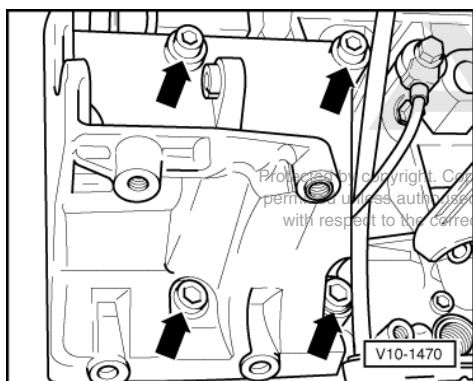
- ♦ Take care of dowel sleeves for guiding AC compressor at bracket.
- Unbolt ribbed belt pulley on hydraulic pump, using pin wrench 3212 as a brace.



Note:

Take care of shims behind ribbed belt sprocket. Re-use on assembly.

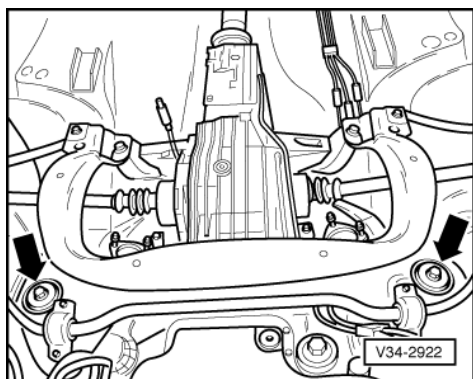
- -> Unbolt hydraulic pump, 2 bolts at belt pulley side, 1 bolt at opposite side.
- Pull hydraulic pump out of bracket and tie up to the side.



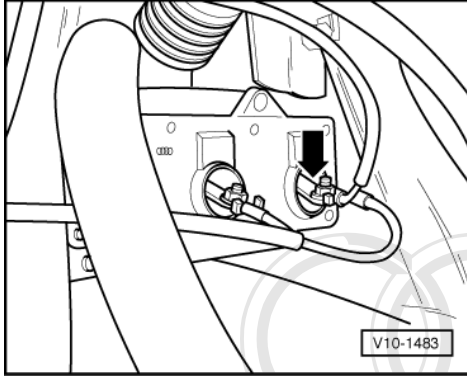
- -> Remove bracket for AC compressor and hydraulic pump.

Note:

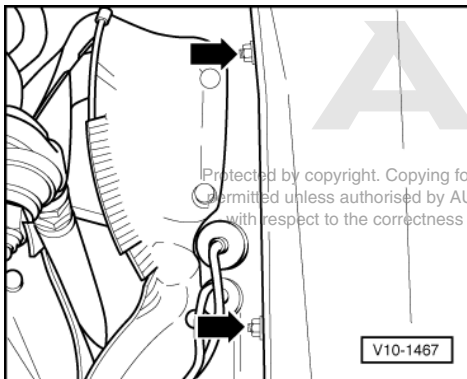
Pay attention to the dowel sleeves in the bracket for AC compressor and hydraulic pump.



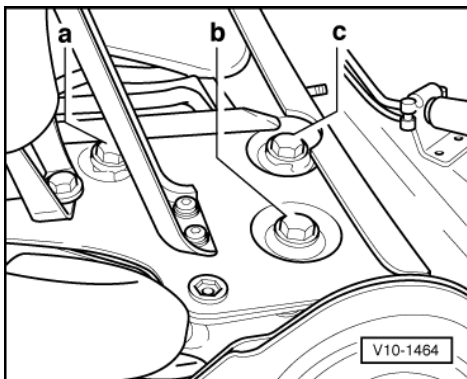
- -> Lower subframe at the front.
- Unscrew the bottom bolts connecting the engine and gearbox.



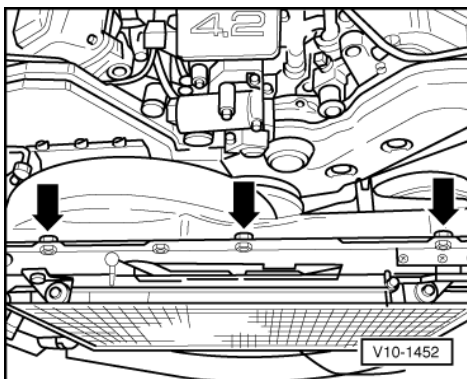
- -> Unscrew positive wire for electric radiator fan at series resistor between side member and bottom left wing.



- -> Unscrew both wheelhouse liners at the front suspension strut dome (2 nuts).

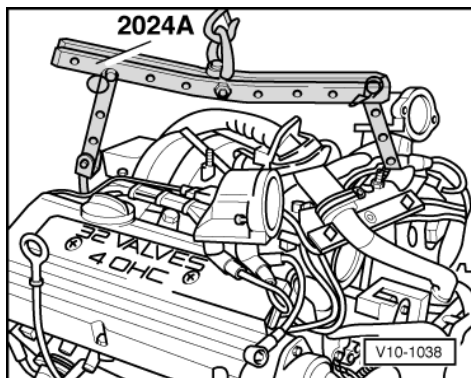


- -> Unscrew 2 bolts -a- and -b- each of the engine supporting bracket at the side member behind the wheelhouse liners.





- -> Unbolt fan shroud at the top of the radiator and lift up and out together with the electric fan.

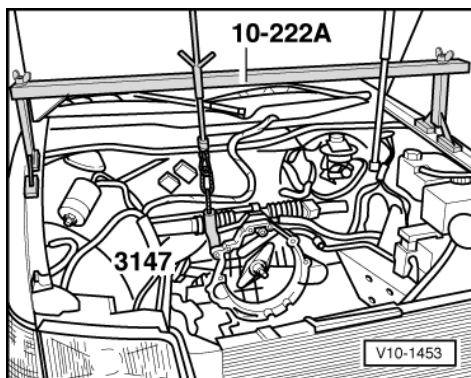


- -> Hook suspension device 2024A into place at the front left and rear right and secure.

Note:

The perforated rails of the lifting hooks must be inserted as shown in the illustration in order to match up with the centre of gravity of the engine.

- Move assembly crane into position (pay attention to AC compressor).
- Attach lifting tackle 2024 A to assembly crane.
- Carefully raise engine.
- Screw out top bolt of engine/gearbox connection.
- Unscrew engine mounting on left and right.



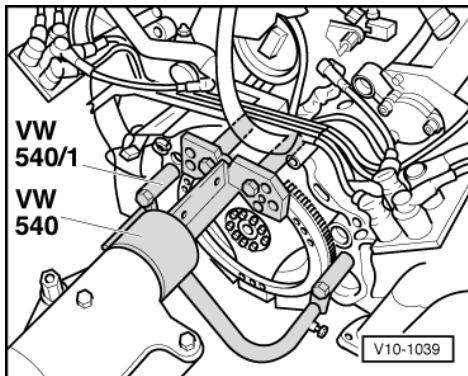
- -> Support gearbox with supporting device 10-222A and gearbox mount 3147 lift engine with assembly crane sufficiently far until the flywheel is clear above the subframe.
- Carefully pull engine forward and lift up and out.

Note:

Careful guidance of the engine is necessary on removal on order to avoid damage.

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1.3 - Attaching engine to engine stand



- -> The engine should be attached to the repair stand using engine holder VW 540 and additional parts VW 540/1 for performing removal and installation operations.

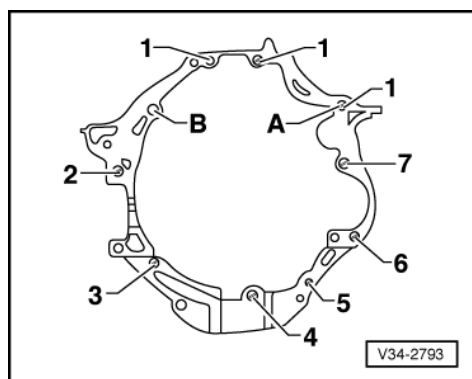
1.4 - Installing

Installation is carried out in the reverse order to removal, noting the following:

- Check whether the dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
 - Renew all self locking nuts.
 - Adjust throttle cable =>Page 130 .
 - Screw both coolant drain screws on engine back in.
 - Check whether spacers have been fitted between ribbed belt sprocket and hydraulic pump; check alignment of ribbed belt if necessary.
 - Check whether dowel sleeves have been fitted between engine block and AC compressor bracket, as well as between AC compressor bracket and AC compressor.
 - Check clutch release bearing for wear, renew if necessary.
 - Check hydraulic fluid level and top up, if necessary.
 - Topping up coolant =>Page 111 .
 - Check oil level before starting engine.
 - Align exhaust system free of stress.
- ABH => Page 141
AEC => Page 156
- Check fluid level in automatic gearbox.
 - The front engine support should be installed free of stress; fit on shims, if necessary.



1.5 - Tightening torques



- -> Engine/gearbox attachment (engine flange layout).

Item	Bolt	Quant.	Nm
1	M 12x75	3	65
2	M 12x90	1	65
3	M 10x40	1	45
4	M 10x45	1	45
5	M 8x45	1	25
6	M 10x120	1	45
7	M 12x110	1	65

Dowel sleeves for centring (A and B).

Bolted joint		Tightening torques
Bolts, nuts	M6	10 Nm
	M8	20 Nm
	M10	45 Nm
	M12	60 Nm
With the exception of engine support brackets to side member left and right		45 Nm
Front right engine support bracket to engine		45 Nm
Bracket for tandem pump and AC compressor		30 Nm
Tandem pump to bracket		25 Nm
AC compressor to bracket		20 Nm
Sub-frame to body		65 Nm + 90° turn further ¹⁾

1) Always replace screws.

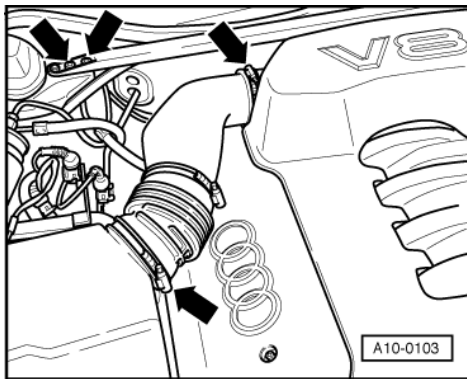
2 - Removing and installing engine, AHK

2.1 - Removing and installing engine, AHK

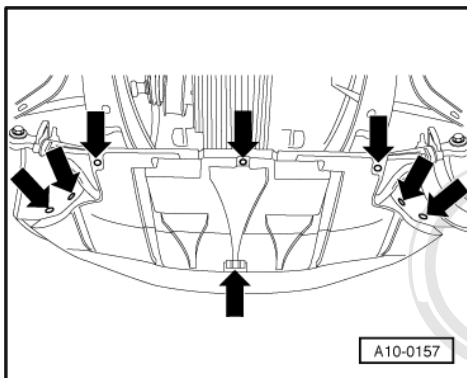
2.2 - Removing

Notes:

- ◆ Take out engine towards top without gearbox.
 - ◆ Ask customer for radio anti-theft code.
 - ◆ Renew all cut and loosened cable ties. Refit cable ties in the same position when installing the engine.
 - ◆ Battery is located on right of luggage compartment beneath trim.
- With the ignition switched off disconnect the battery earth strap.

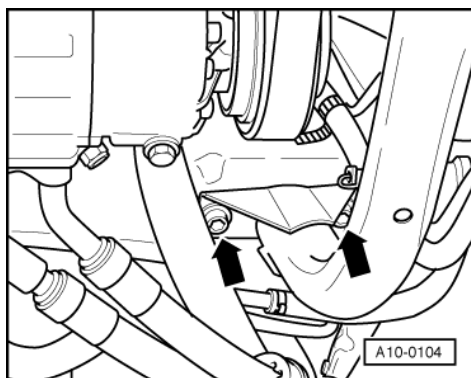


- -> Remove anti-roll bar.
- Remove air guide pipes.
- Remove top part of air filter housing and place to the side.
- Remove bottom part of air filter housing.
- Pull of connectors of Lambda probes on left and right, push out of holder and lay bare wiring.



- -> Remove noise insulation.

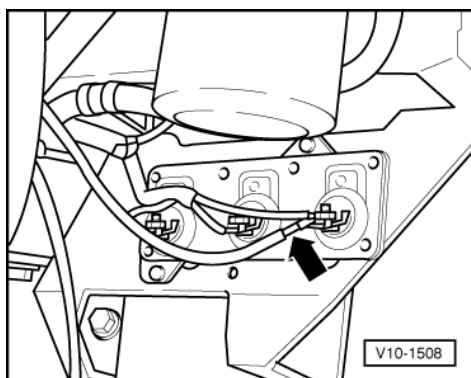
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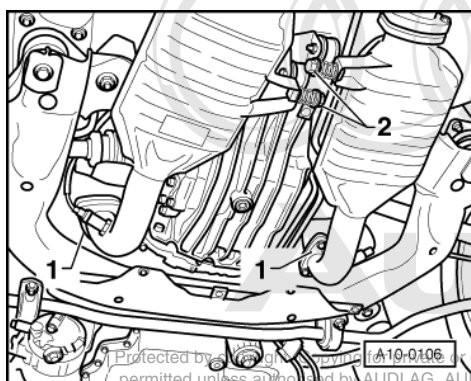
- Remove bumper

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

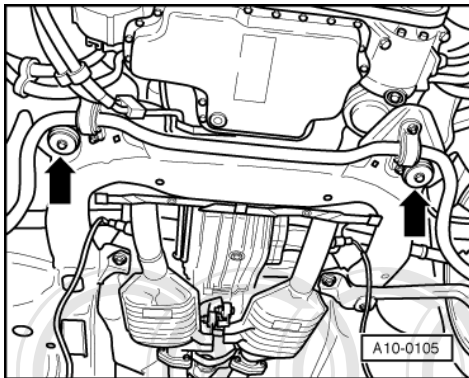
- -> Remove front strut at bottom.



- -> Unscrew positive wire for electric radiator fan at series resistor between side member and bottom left wing.



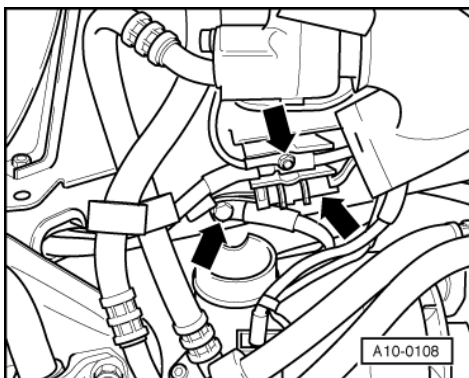
- Pull through cable of the lambda probe and lambda probe heater downward.
- -> Unbolt exhaust system at the left and right manifold -1- and the gearbox suspension -2-.



- Remove oil filter.
- -> Lower subframe at the front.

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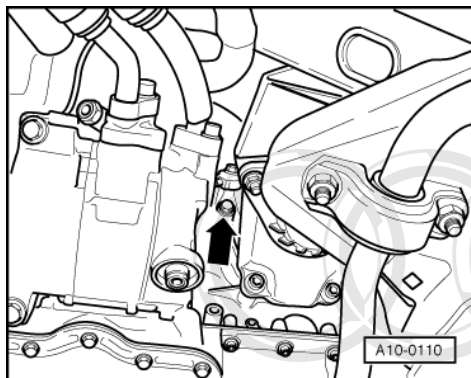
- -> Detach both hoses for oil cooler at oil filter housing.
- Collect oil in a vessel.
- Remove air guide to the alternator.



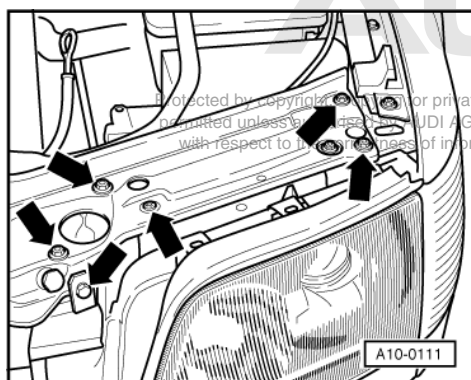
- -> Unbolt engine earth strap and electric cable connections to the starter.
- Unbolt the bracket of the cables from the gearbox to the oil cooler at the oil sump.
- Drain coolant at bottom right of radiator.

Notes:

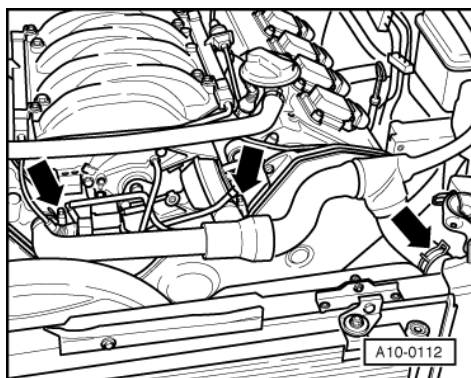
- ◆ Collect coolant for re-use.
- ◆ For draining coolant at radiator, attach hose to coolant drain cock.
- ◆ Only use clean vessel to collect coolant.
- Unscrew coolant hose at the bottom of radiator.



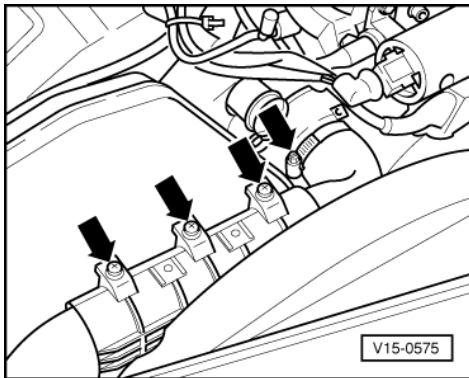
- -> Drain coolant at engine block on left beneath knock sensor and on right above oil filter.
- Detach oil pipes for manual gearbox at the engine.



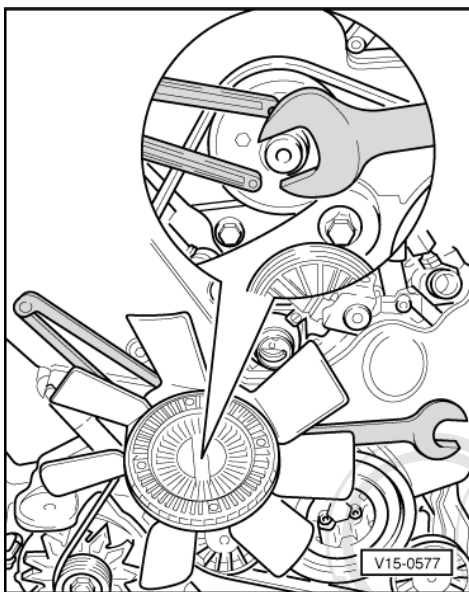
- -> Unbolt end plate at the top.
- Detach bonnet lock release cable.
- Take off end plate at the top.
- Unbolt air guides for air filter on left and right below end plate.



- -> Detach coolant hose and place to the side.
- Unplug connector at coolant temperature sensor.



- -> Open supporting clip for bottom coolant hose and take off top part.
- Unscrew hose at thermostat housing.

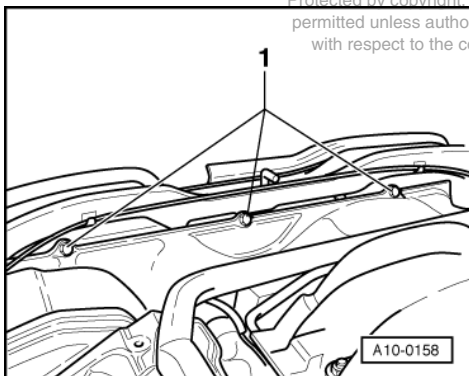


- -> Unbolt viscous fan.

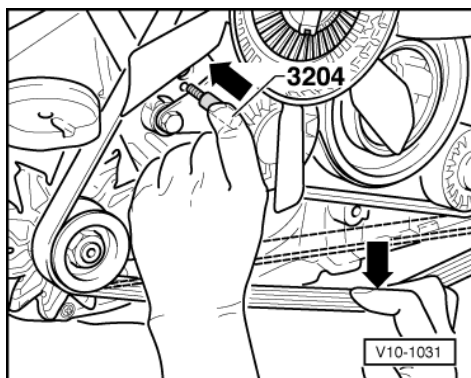
Notes:

- ◆ The viscous fan has a left-hand thread; turn to the right in order to unfasten.
- ◆ The two-hole nut turning tool 3212 is supported on the inside of the counterholder 3197 when slackening the nut.
- ◆ For ease of illustration, the viscous fan is shown on the removed engine.

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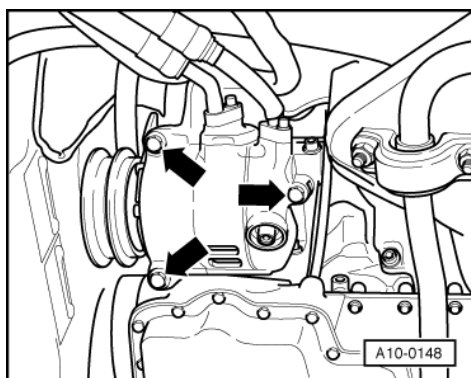
- -> Unbolt fan shroud at the top of the radiator and lift up and out together with the electric fan.



- -> Slacken off ribbed belt; to do so, pull belt by hand downwards from below and insert setting pin 3204.
- Remove belt.

Note:

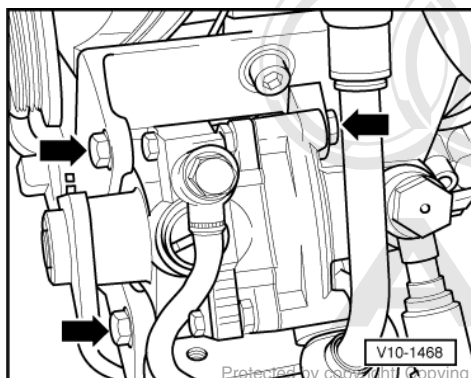
Mark direction of ribbed belt. Running belt in opposite direction can destroy it.



- -> Unscrew AC compressor and hang up on side.

Notes:

- ♦ Do not open hydraulic connections.
 - ♦ Take care not to bend pipes.
 - ♦ Take care of dowel sleeves for guiding AC compressor at bracket.
- Unbolt ribbed belt pulley on hydraulic pump, using pin wrench 3212 as a brace.

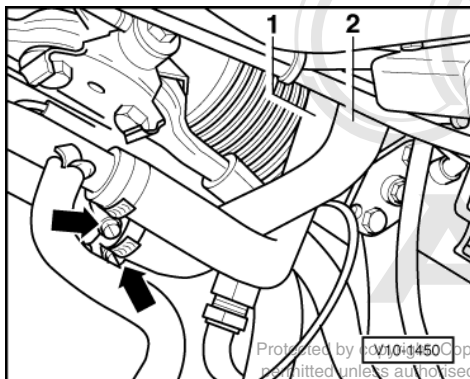


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Note:

Take care of shims behind ribbed belt sprocket. Re-use on assembly.

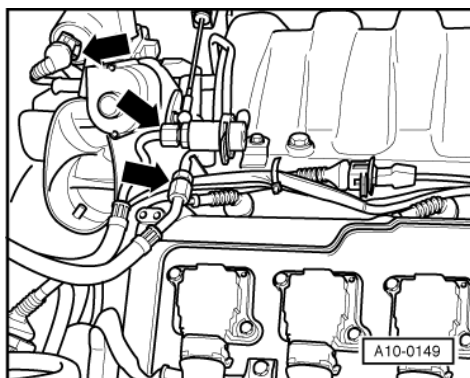
- -> Unbolt hydraulic pump, 2 bolts at belt pulley side, 1 bolt at opposite side.
- Pull hydraulic pump out of bracket and tie up to the side.
- Removing starter



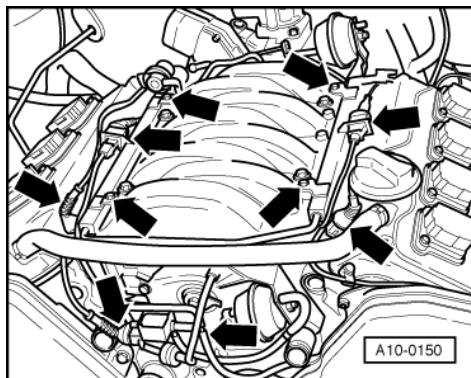
- Unscrew the bottom engine/gearbox connecting bolts.
- Detach and lay bare accelerator cable by unfastening clips.
- Detach hose for cruise control system.
- -> Unscrew both coolant hoses to heat exchanger.

Notes:

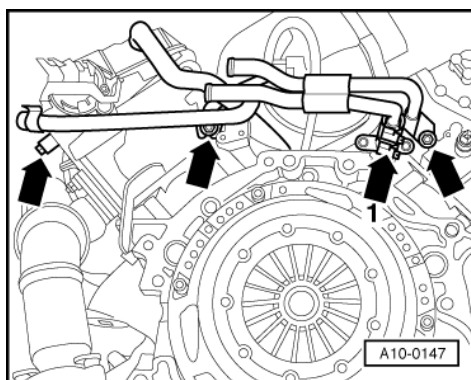
- ♦ Routing of hoses to heat exchanger.
- ♦ From engine to top hose -1- feed, top hose -2- return flow.



- ♦ To heat exchanger bottom hose -1- feed, top hose -2- return flow.
- -> Disconnect fuel feed and fuel return pipes.
- Cut open the tie bands.
- Unplug connector and detach vacuum hose from the 3-way valve for intake manifold changeover.
- Unplug connector for temperature sensor.



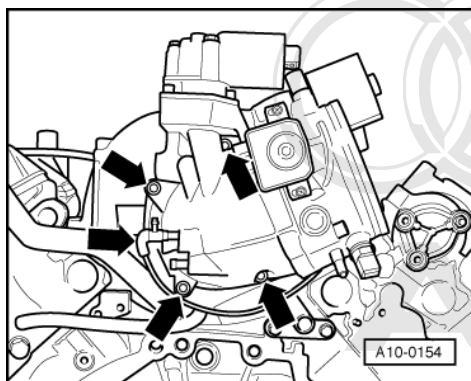
- -> Unplug the connectors from the knock sensor.
- Pull connectors off injectors on left and right.
- Remove fuel rail together with injectors; seal opening for injectors.



- -> Remove water pipe by unscrewing the bolts -arrows- and screw-type clip -1-.

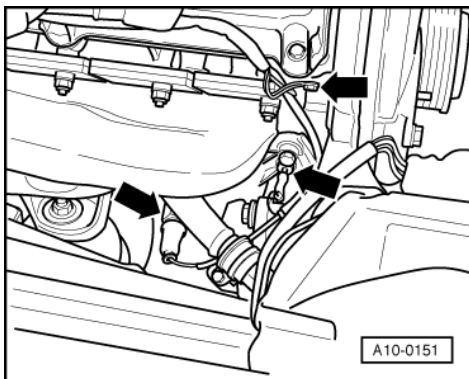
Note:

- ♦ The illustration shows the parts with the engine removed in order to simplify the illustration.
- ♦ Replace sealing rings.

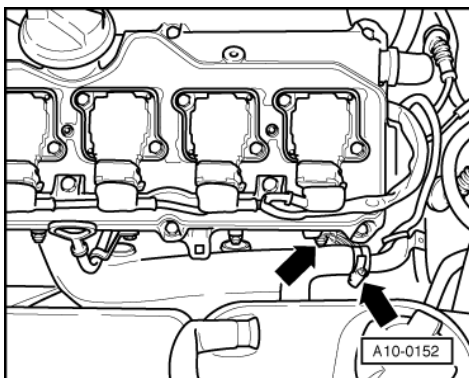


- -> Detach throttle valve body.

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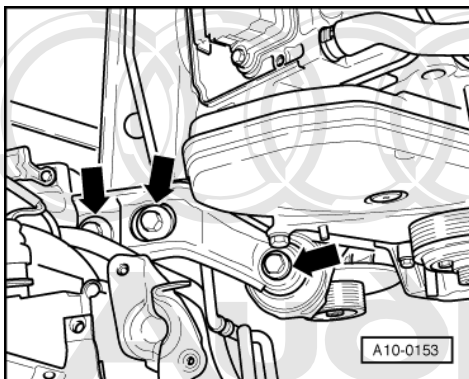


- -> Pull off plug for oil pressure switch.
- Unbolt earth connection at the right of the cylinder head.



- -> Unbolt earth connection at the left of the cylinder head.
- Unbolt water hose to the expansion reservoir.
- Unbolt electric connector on the right.
- Unbolt electric connector on the left.
- Detach vacuum hoses to the throttle valve body.

- Slacken off engine mountings on left and right.



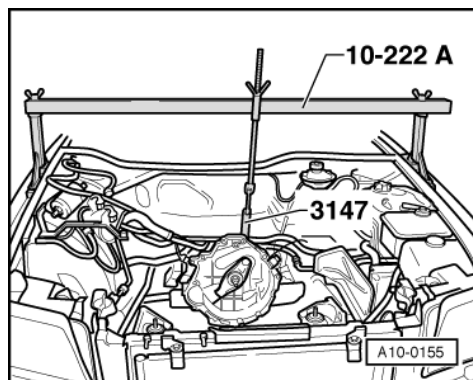
- -> Unbolt engine support (pay attention to washers).

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Note:

Pay attention to installation instructions when installing the engine support.

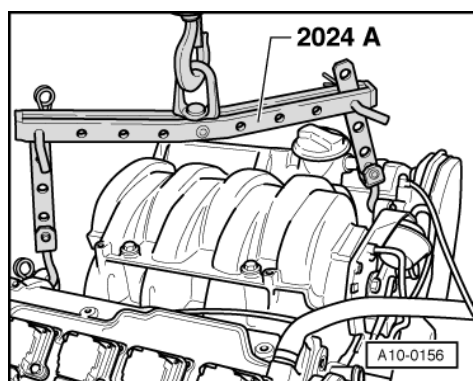
- Unscrew the top bolts connecting engine/gearbox with the exception of the topmost bolt.



- -> Fit supporting device 10-222A onto the ledge of the wing.
- Insert gearbox mount 3147 into the gearbox mount as shown in illustration and latch into the supporting device.

Note:

The supporting device is shown with the engine removed to simplify the illustration.

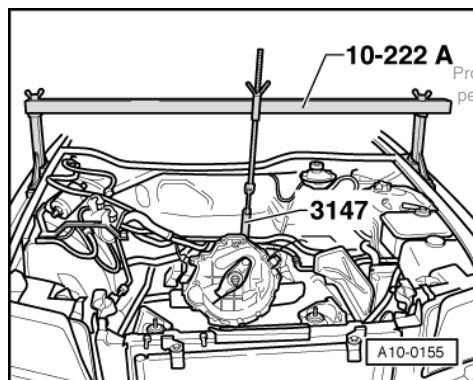


- -> Attach lifting tackle 2024A to front right and front left and secure.

Note:

The perforated rails of the lifting hooks must be inserted as shown in the illustration in order to match up with the centre of gravity of the engine.

- Move assembly crane into position (pay attention to AC compressor).
- Attach lifting tackle 2024 A to assembly crane.
- Carefully raise engine.



- Screw out last top bolt of engine/gearbox connection.
- Unscrew engine mounting on left and right.
- -> Support gearbox with supporting device 10-222A and gearbox mount 3147, lift engine with assembly crane sufficiently far until the flywheel is clear above the subframe.

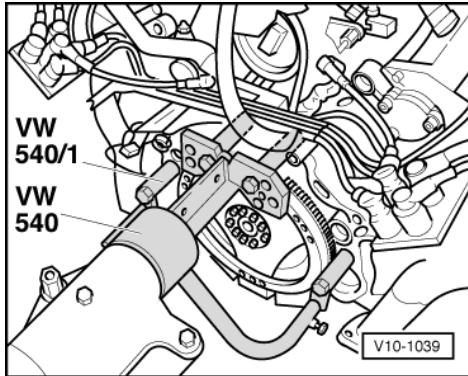
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- Carefully pull engine forward and lift up and out.

Note:

Careful guidance of the engine is necessary on removal on order to avoid damage.

2.3 - Attaching engine to engine stand



- -> When performing assembly work, attach engine with engine mount VW 540 and supplementary parts VW 540/1 to repair stand.

2.4 - Installing

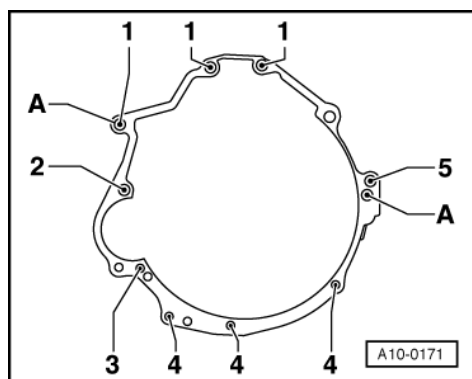
Installation is carried out in the reverse order to removal, noting the following:

- Check whether the dowel sleeves for centralising engine/gearbox are in the cylinder block. Install, if necessary.
- Renew all self locking nuts.
- Adjust throttle cable =>Page 130 .
- Screw both coolant drain screws on engine back in.
- Check whether spacers have been fitted between ribbed belt sprocket and hydraulic pump; check alignment of ribbed belt, if necessary.
- Check whether dowel sleeves have been fitted between engine block and AC compressor bracket, as well as between AC compressor bracket and AC compressor.
- Check clutch release bearing for wear, renew, if necessary.
- Check hydraulic fluid level and top up, if necessary.
- Topping up coolant =>Page 111 .
- Check oil level before starting engine.
- Align exhaust system free of stress

AHK => Page 156

- The front engine support should be installed free of stress; fit on shims, if necessary.

2.5 - Tightening torques



- -> Engine/gearbox attachment (gearbox flange layout).

Item	Bolt	Quant.	Nm
1	M 12x75	3	65
2	M 12x110	1	65
3	M 10x135	1	65
4	M 10x45	3	45
5	M 12x90	1	65

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Dowel sleeves for centring (A).

Bolted joint	Tightening torques
Bolts, nuts	
M6	10 Nm
M8	20 Nm
M10	45 Nm
M12	60 Nm
With the exception of	
Engine support brackets to side member left and right	45 Nm
Front right engine support bracket to engine	45 Nm
Bracket for tandem pump and AC compressor	30 Nm
Tandem pump to bracket	25 Nm
AC compressor to bracket	20 Nm
Subframe to body	65 Nm + 90° turn further1)

1) Always replace screws.

13 - Crankshaft group

1 - Crank assembly

1.1 - Crank assembly

1.2 - Note:

Note:

Repair Group 13 "Crank assembly" does not involve any repair operations. Repairs affecting bolted-on parts of crank assembly are covered by the Repair Groups 15- Cylinder head and 17- Lubrication system.

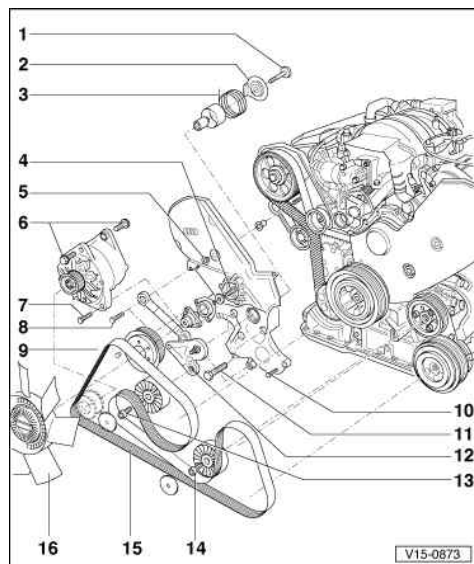
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15 - Cylinder head, Valve gear

1 - Cylinder head, valve gear

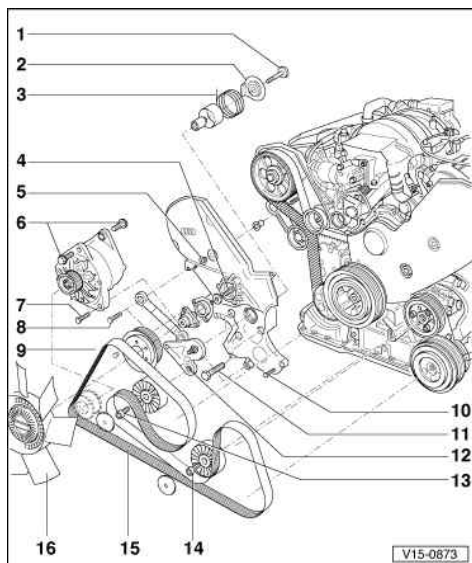
1.1 - Cylinder head, valve gear



1.2 - Removing and installing ribbed belt

- 1 35 Nm
- 2 Retaining plate
- 3 Long-arm spring
- 4 25 Nm
- 5 Flange nut, 10 Nm
- 6 45 Nm
- 7 25 Nm
- 8 25 Nm
- 9 10 Nm

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10 25 Nm

11 45 Nm

12 Swivel bracket

13 Screw M8 x 28 = 25 Nm

14 Screw M8 x 35 = 25 Nm

15 Ribbed belt

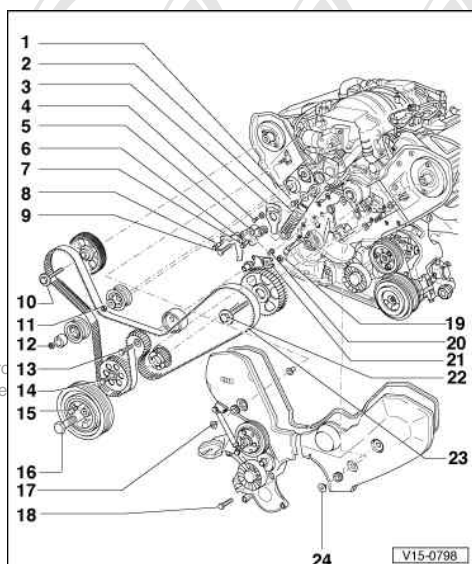
- ♦ Check alignment of ribbed belt => Page 88 .

16 Viscous fan

- ♦ Removing and installing => Page 33 .

2 - Removing and installing toothed belt, ABH, AEC

2.1 - Removing and installing toothed belt, ABH, AEC



1 25 Nm

2 Shock absorber

- ♦ Adjusting => Page 34 .

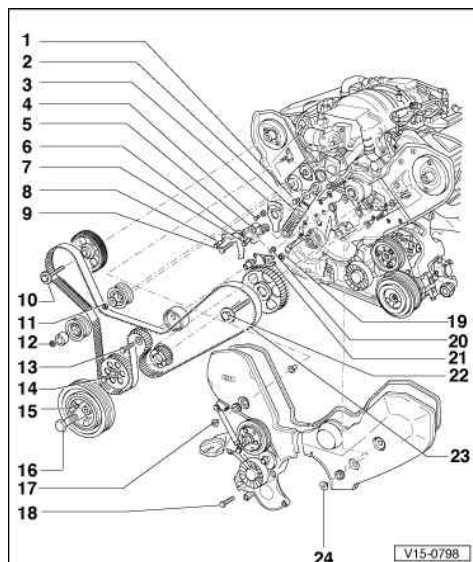
3 Stop plate

4 10 Nm

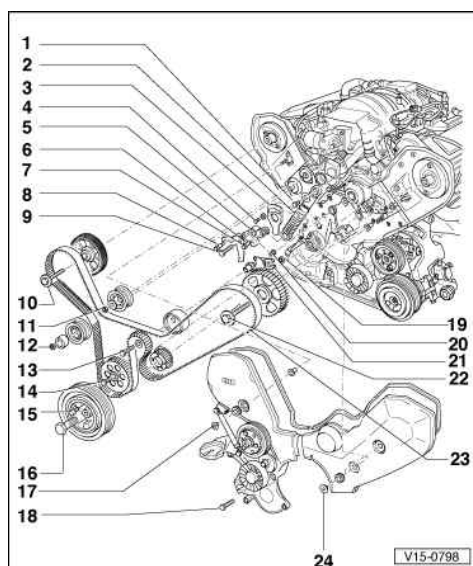
5 Tensioning lever



- 6 TDC indicator
- 7 Collar bolt
- 8 Collar bolt
- 9 25 Nm
- 10 Combi bolt, 55 Nm



- 11 25 Nm
- 12 25 Nm
- 13 25 Nm
- 14 80 Nm
- 15 25 Nm
- 16 Central bolt
 - ◆ With special tool 2079, 350 Nm
 - ◆ Without special tool 2079, 450 Nm
 - ◆ Use counterholder 3197 => Page 39 .
 - ◆ Replace bolt after loosening.
 - ◆ Slightly lubricate thread and bolt-head contact surface of central bolt.



- 17 Flange nut, 10 Nm
- 18 45 Nm
- 19 Slide block
- 20 10 Nm



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21 Lever for tensioner

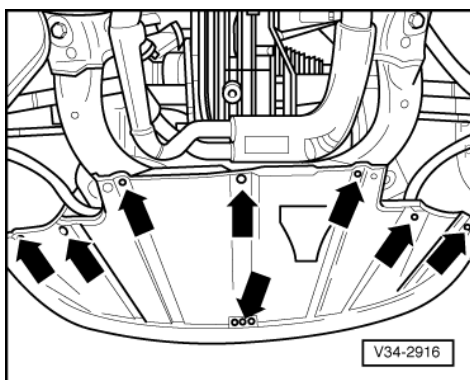
22 45 Nm

23 Toothed belt

- ♦ Removing and installing => Page 34 .

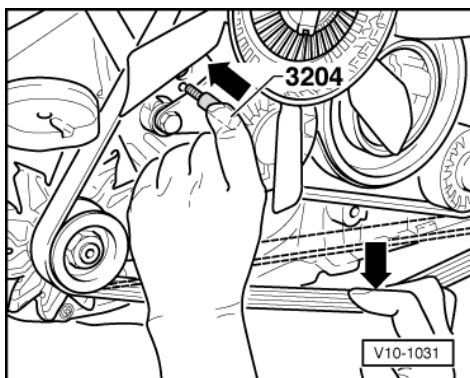
24 Flange nut, 10 Nm

2.2 - Removing and installing viscous fan



- -> Remove noise insulation panel.

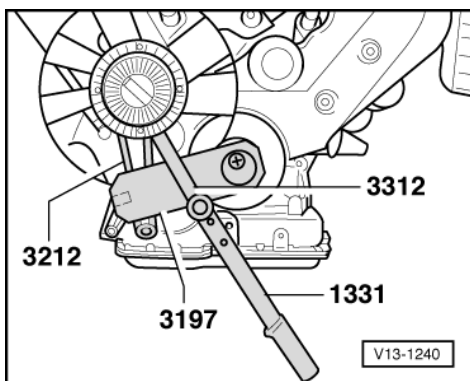
Removing ribbed belt



- -> Slacken ribbed belt by pulling belt down in the middle with your hand from below and inserting locking drift 3204.
- Remove belt.

Note:

Mark direction of ribbed belt. Running belt in opposite direction can destroy it.





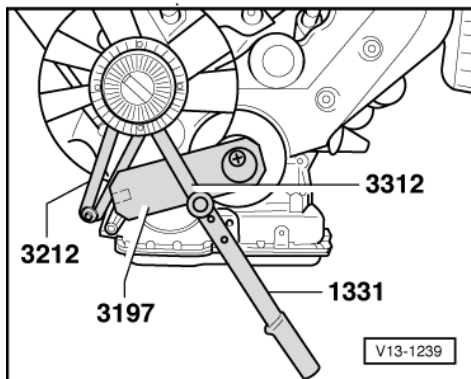
Removing viscous fan.

- -> Unbolt viscous fan.

Notes:

- ♦ The two-hole nut turning tool 3212 is supported on the inside of the counterholder 3197 when slackening the nut.
- ♦ Viscous fan has left-hand thread; turn clockwise to unfasten.
- ♦ For ease of illustration, the viscous fan is shown on the removed engine.

Installing viscous fan.



Further installation takes place in the reverse sequence to removal.

- -> Tightening torque with torque wrench 1331 and open-end wrench 3312, 37 Nm.

Notes:

- ♦ The two-hole nut turning tool 3212 is supported on the inside of the counterholder 3197 when slackening the nut.
- ♦ If a torque wrench of a different length is used refer to table. Length of torque wrench - square to centre of handle.

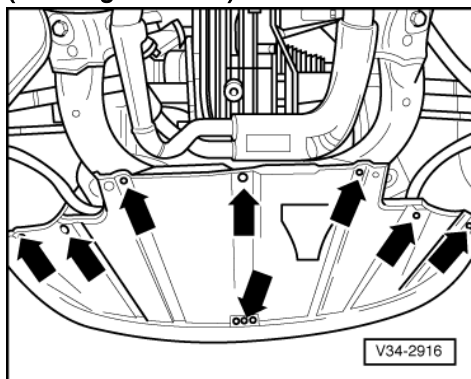
Length of torque wrench	Tightening torque
220 mm	33 Nm
280 mm	37 Nm
300 mm	39 Nm
440 mm	45 Nm

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Inspecting viscous fan

- Inspect viscous coupling for oil leaks. The coupling housing should be clean and dry on the rear.
- Inspect the ease of movement of the fan wheel when the engine is not running. It should be possible to crank the fan wheel without any appreciable resistance.
- Checking axial clearance. The clearance measured around the outer circumference of the fan wheel should not be greater than about 15 mm.

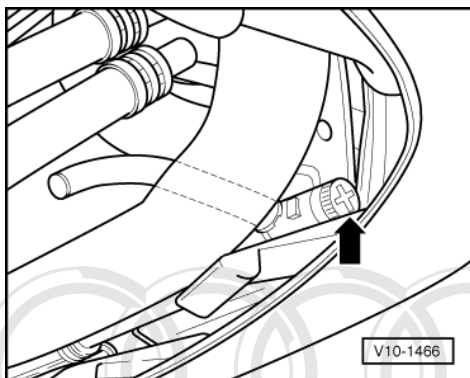
Removing and installing toothed belt (with engine in situ)



Removing:

Notes:

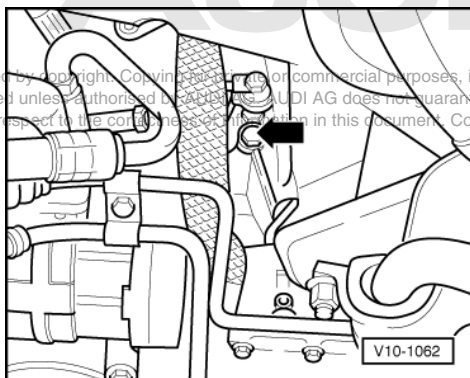
- ◆ Ask customer for radio anti-theft code.
- ◆ Battery is located on right of luggage compartment beneath trim.
- With the ignition switched off disconnect the battery earth strap.
- -> Remove noise insulation panel.



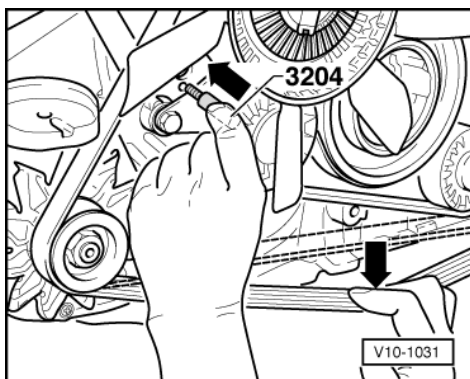
- -> Drain coolant at bottom right of radiator (collect coolant for re-using).

Notes:

- ◆ Open the cap of the expansion tank for the coolant carefully.
- ◆ Fit hose onto coolant drain cock for draining the coolant at the radiator.
- ◆ Only use clean vessel to collect coolant.



- -> Drain coolant at engine block on left beneath knock sensor and on right above oil filter.



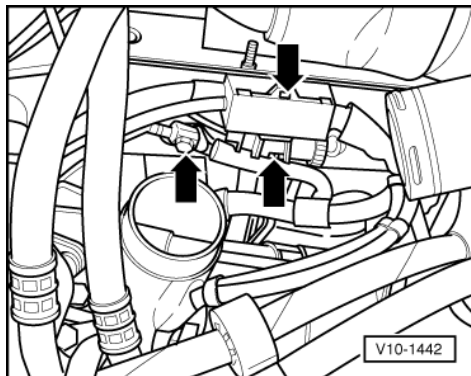
- -> Slacken off ribbed belt; to do so, pull belt by hand downwards from below and insert setting pin 3204.



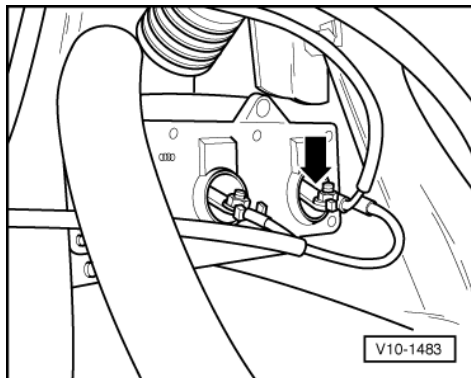
- Remove belt.

Note:

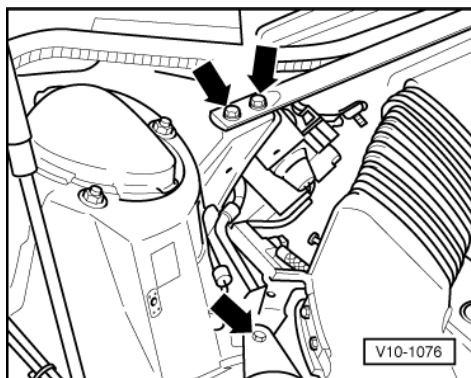
Mark direction of ribbed belt. Running belt in opposite direction can destroy it.



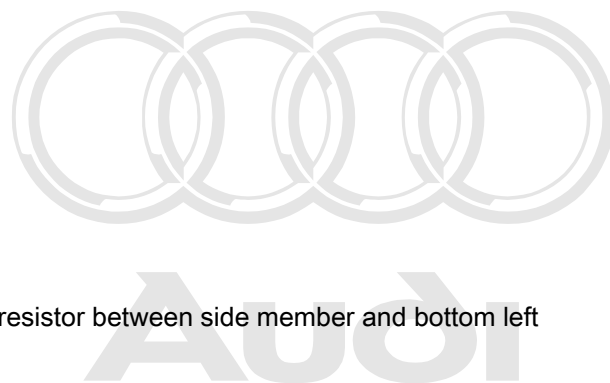
- Detach air guide to the alternator.
- -> Unbolt engine earth strap and electric cable connections to the starter.



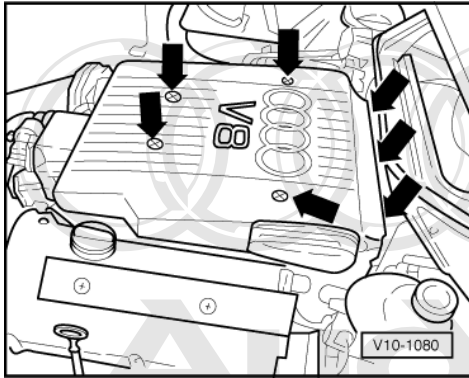
- -> Unscrew positive wire for electric radiator fan at series resistor between side member and bottom left wing.



- -> Unscrew left and right air guide pipes.
- Remove anti-roll bar.

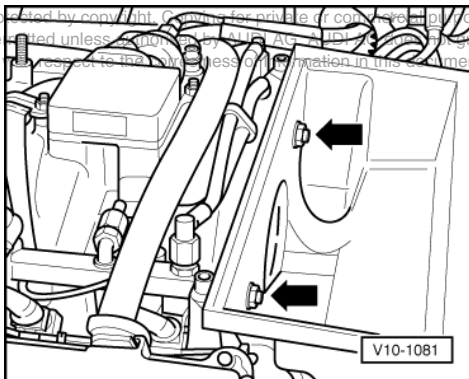


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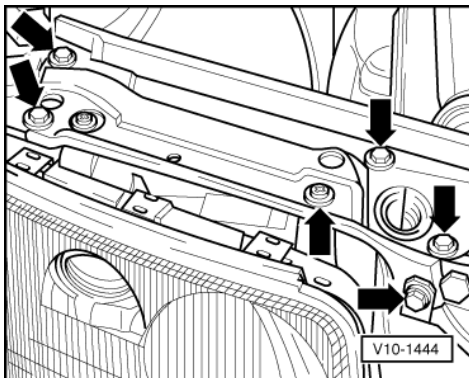


- -> Unscrew top part of air filter housing.

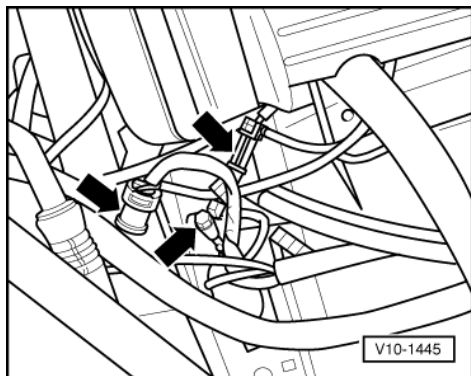
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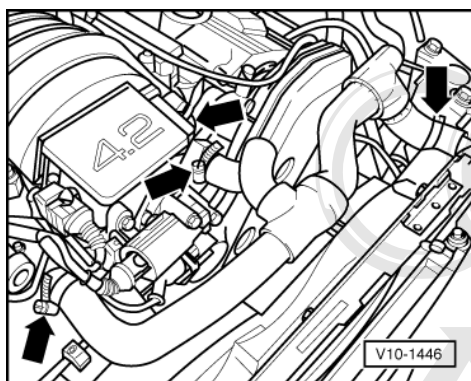
- -> Unscrew bottom part of air filter housing, press to rear and lift out upwards.



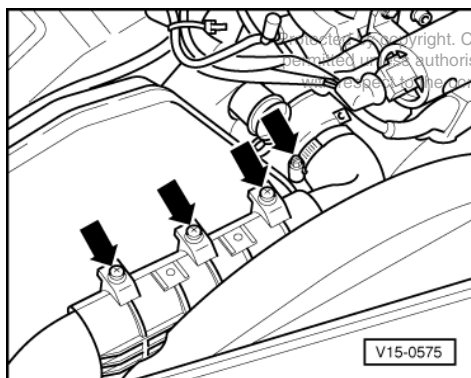
- -> Unbolt end plate at the top.
- Detach bonnet lock release cable.
- Take off end plate at the top.
- Unbolt air guides for air filter on left and right below end plate.



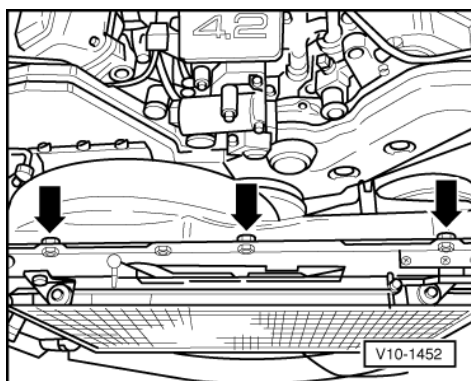
- -> Unbolt earth cable for radiator fan from the side member next to the connectors of the AC compressor.



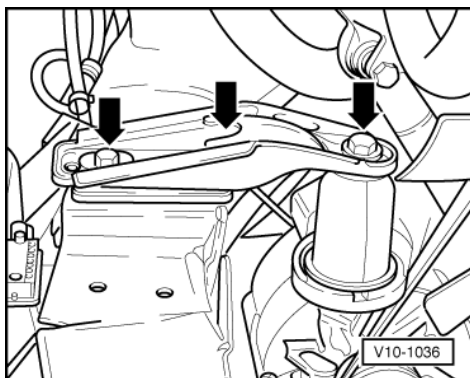
- -> Detach coolant hose and place to the side.



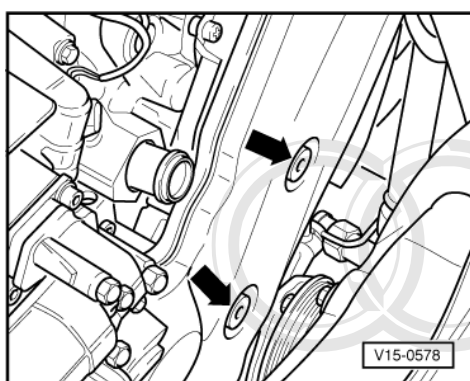
- -> Open supporting clip for bottom coolant hose and take off top part.
- Unscrew hose at thermostat housing.



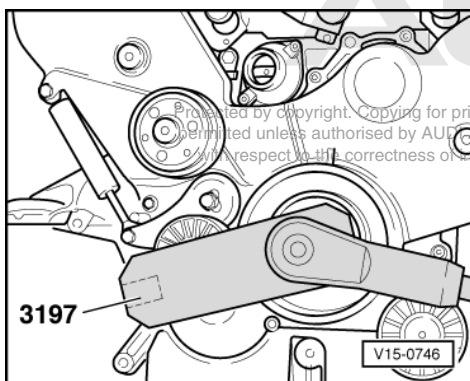
- -> Unbolt fan shroud at the top of the radiator and lift up and out together with the electric fan.



- -> Unbolt engine support at front (the same thickness of shims have to be re-inserted when installing).



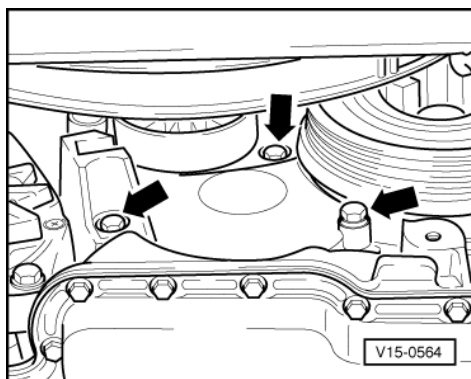
- -> Remove toothed belt guard on left.



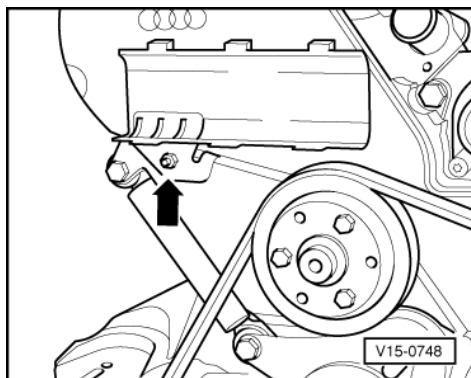
- -> Slacken off central bolt for vibration damper approx. 1 turn, making use of holding tool 3197.

Notes:

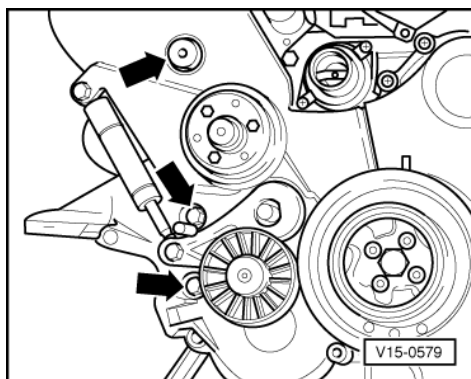
- ◆ For ease of illustration, the engine is shown removed.
- ◆ Unfastening and subsequent removal of the vibration damper with toothed belt sprocket are only necessary if the toothed belt is replaced or removal is required for other operations.



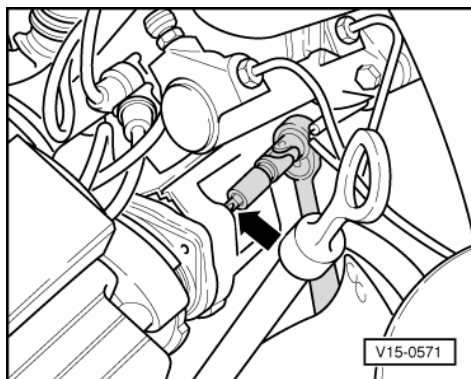
- -> Unscrew 3 bolts for the toothed belt guard on the right from below.



- -> Remove bottom part of supporting clip for coolant hose.

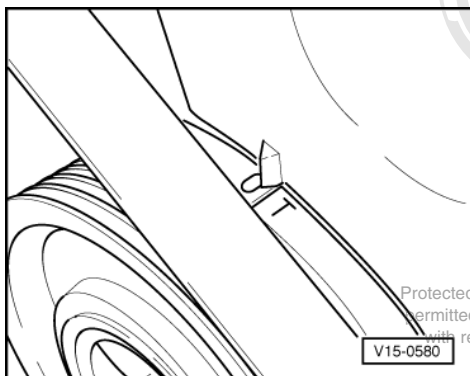


- -> Unscrew securing bolts for right toothed-belt guard.
- Take off toothed belt guard and carefully lift up and out.



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- -> Disconnect ignition cable (terminal 4) at the ignition coils.
- Unscrew both ignition distributor caps.

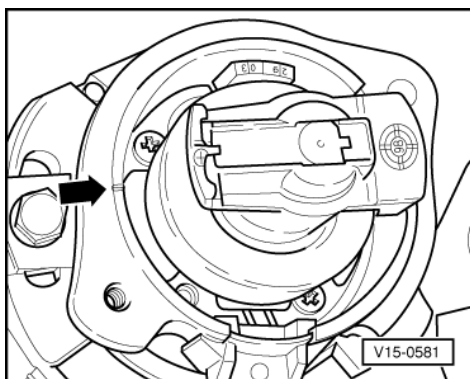


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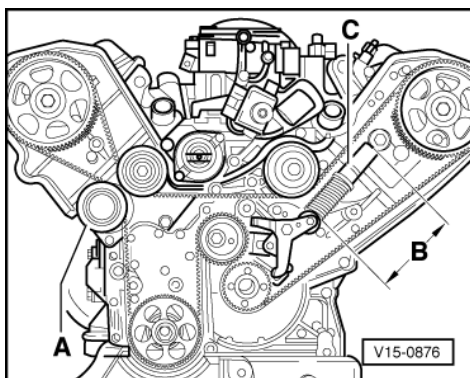
- -> Crank engine to TDC, mark at front of vibration damper).

Note:

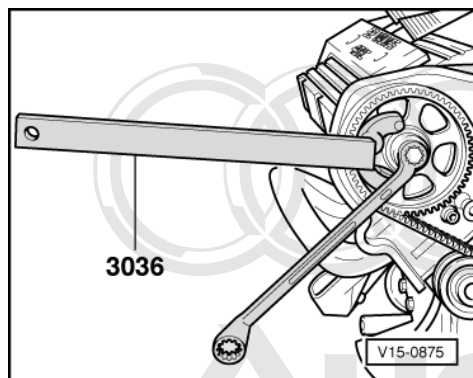
With vibration damper bolt unfastened, use holding tool 3197 to crank engine.



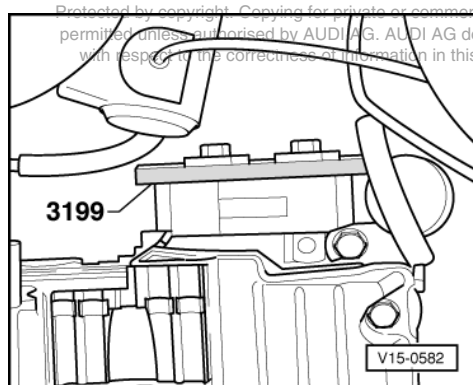
- -> Inspect whether distributor rotor arm is pointing toward the marking on the housing. If not crank engine one further revolution.
- Remove both distributors.



- -> Slacken tensioning pulley using eccentric insert -A- and turn to the lowest point with two-hole nut turning tool, e.g. Matra V-159.
- Compress damper for toothed belt tensioning device -C- by hand and pull off tensioning pulley -A-.
- Remove toothed belt from camshaft sprockets.



- -> Slacken the bolts attaching the camshaft sprockets about 2 turns; use counterholder 3036 for this step.



- -> Insert the locating flanges 3199 for each of the camshafts so that the dowel pin of the distributor flange is located in the slot of the locating flange (if necessary, rotate the particular camshaft slightly in the relevant direction with counterholder 3036 until the journals engage in the flanges).

Note:

The locating flanges for the camshafts should not be used as counterholders.

- Bolt the flanges tight using the bolts for attaching the distributors.
- Tap gently on rim of camshaft sprockets with plastic-headed hammer to release tapered connections.
- Unscrew the four bolts connecting the vibration damper / toothed belt sprocket.
- Unscrew central bolt.
- Take off vibration damper; do not pull off the toothed belt sprocket.

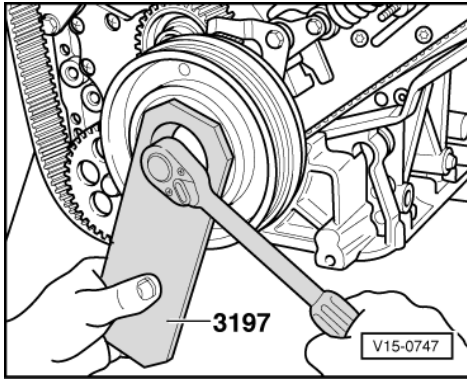
Note:

Mark the direction of running of the toothed belt with felt-tip pen or wax marker. Running belt in opposite direction can destroy it.

- Remove toothed belt.

Installing and tensioning

- Place toothed belt on crankshaft toothed-belt sprocket.
- Fit vibration damper at crankshaft.
- Screw in and hand-tighten the four vibration damper/toothed belt sprocket connecting bolts.

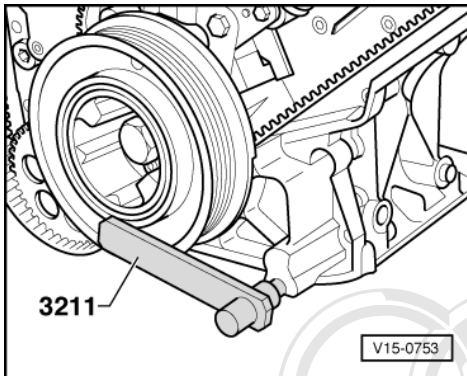


- Slightly lubricate thread and bolt-head contact surface of central bolt.
- -> Screw in and hand-tighten central bolt using holding tool 3197.

Note:

Replace central bolt.

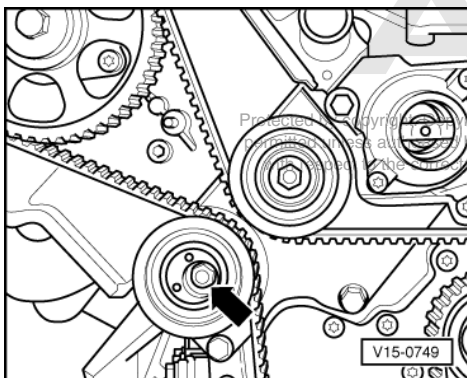
- Fit on camshaft sprockets; the sprockets should be loosely touching the taper of the camshaft. The securing bolts are slackened about one turn.



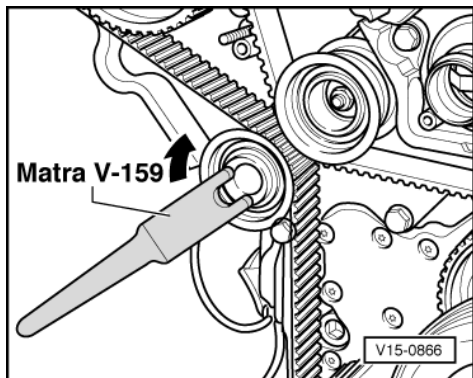
- -> Install locking device for vibration damper 3211.

Note:

This locking device must not be used as a counterholder for tightening the central bolt.

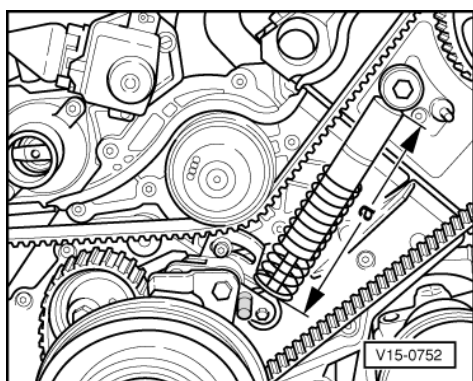


- Position toothed belt on all toothed belt sprockets and pulleys, as well as water pump impeller. Belt routing =>Page 31.
- -> Slip on toothed belt with tensioner and eccentric insert at threaded pin and tighten nut such that eccentric insert can still just be turned.



- Tighten the four toothed belt sprocket/vibration damper securing bolts. Tightening torque 25 Nm.
- -> For basic setting of toothed-belt tensioner, turn eccentric insert of tensioner in clockwise direction using commercially available pin-type face spanner e.g. Matra V-159 until...

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- -> ... damper length -a- is obtained.

Damper length -a-

When cold	136 - 139 mm
When warm	126 - 129 mm

- Secure tensioner 25 Nm.
- Secure camshaft sprockets (55 Nm) making use of holding tool 3036.

Note:

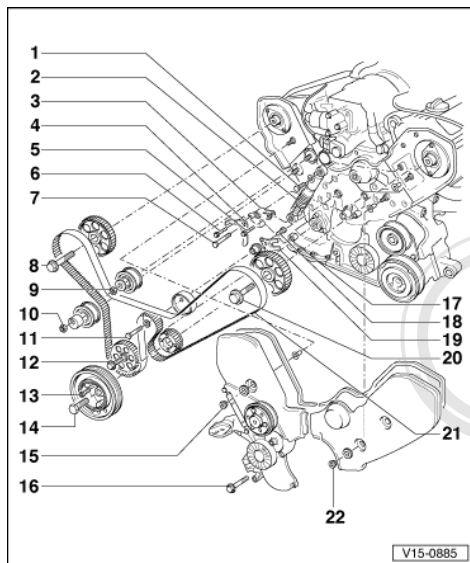
Always use counterholder 3036 for attaching the camshaft sprockets otherwise the locating flanges and the camshafts respectively will be damaged.

- Remove camshaft locking flanges.
- Remove locking device for vibration damper.
- Crank engine at least twice.
- Secure central bolt and always replace.

Tightening torque	
with special tool 2079	350 Nm
without special tool 2079	450 Nm

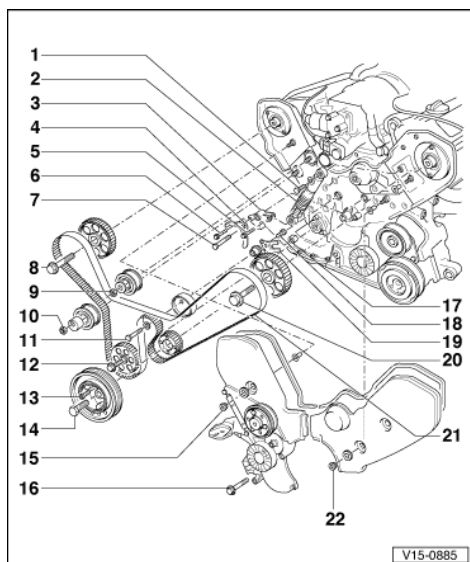
- Check and, if necessary, adjust damper length.
- Perform further installation of toothed belt in reverse order of removal.

2.3 - Removing and installing toothed belt, AHK



- 1 25 Nm
- 2 Shock absorber
 - ♦ Adjusting => Page 52
- 3 Tensioning lever
- 4 TDC indicator
- 5 Collar bolt
- 6 Collar bolt
- 7 25 Nm
- 8 Combi bolt, 55 Nm
- 9 25 Nm

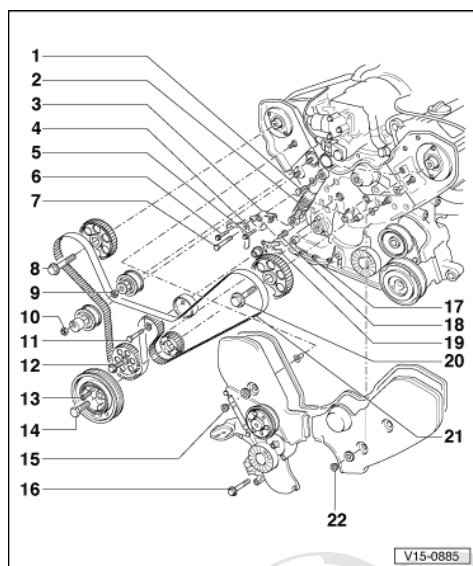
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- 10 25 Nm
- 11 25 Nm
- 12 80 Nm
- 13 25 Nm
- 14 Central bolt
 - ♦ with special tool 2079, 350 Nm
 - ♦ without special tool 2079, 450 Nm
 - ♦ Use holding tool 3197 => Page 49
 - ♦ Replace bolt after loosening.



- ♦ Use locking compound D 454 300 02.
- ♦ Lubricate bolts.



15 Flange nut, 10 Nm

16 45 Nm

17 Slide block

18 10 Nm

19 Lever for tensioner

20 45 Nm

21 Toothed belt

- ♦ Removing and installing => Page 46 .

22 Flange nut, 10 Nm

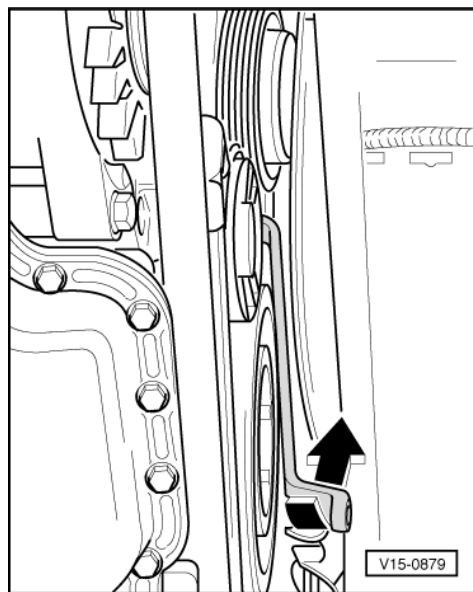
Removing and installing toothed belt

(with engine in situ)

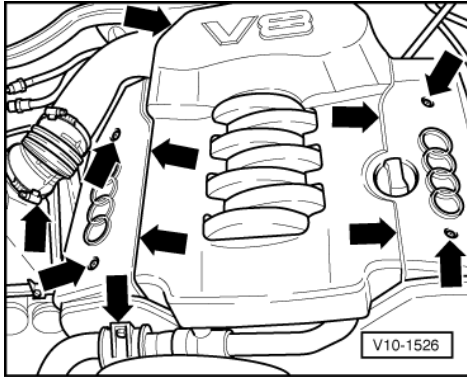
Removing:

Note:

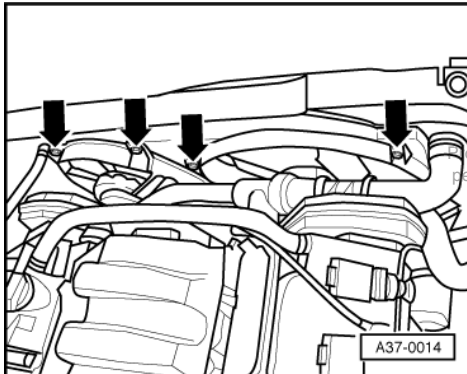
Ask customer for radio anti-theft code.



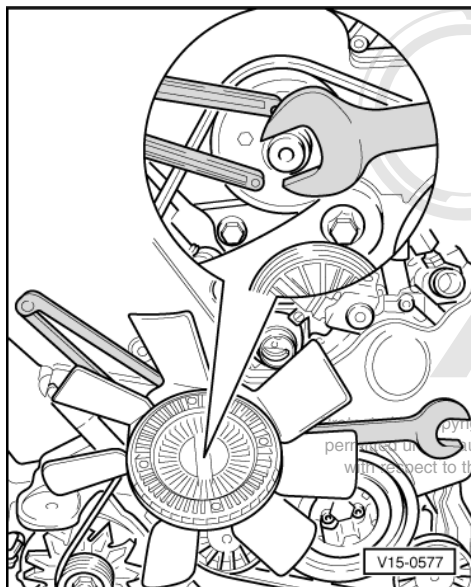
- Battery is located on right of luggage compartment beneath trim.
- With the ignition switched off disconnect the battery earth strap.
- Remove noise insulation panel.
- Remove vent grille in bumper on left.
- Attach approx. 12 mm dia. hose to coolant drain cock at bottom left of radiator.
- Drain coolant and collect for re-use.
- -> Slacken off ribbed belt; to do so, attach box wrench to hexagon socket of tensioner and slowly press upwards.



- -> Unscrew engine cover.
- Unscrew support clamp for coolant hose at toothed-belt guard on right.
- Remove air intake between air filter and throttle housing.



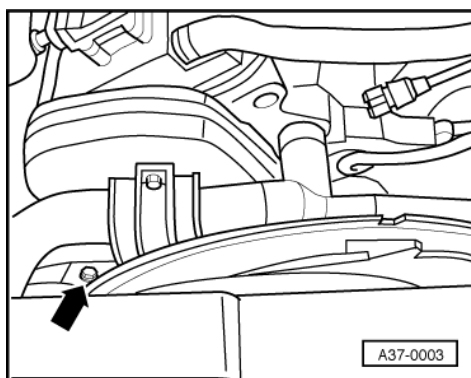
- -> Unscrew air duct for viscous fan and electric fan at top left of radiator, pull out upwards and put aside in engine compartment. Leave wiring connected.



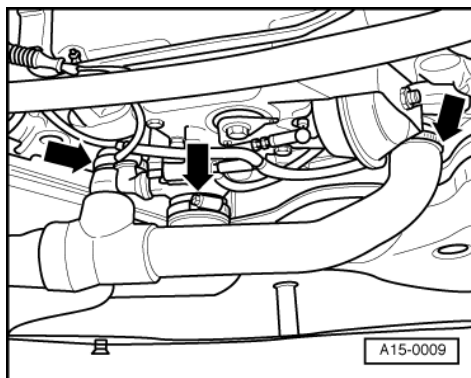
- -> Unscrew viscous fan; counterhold with pin-type face spanner 3212.

Notes:

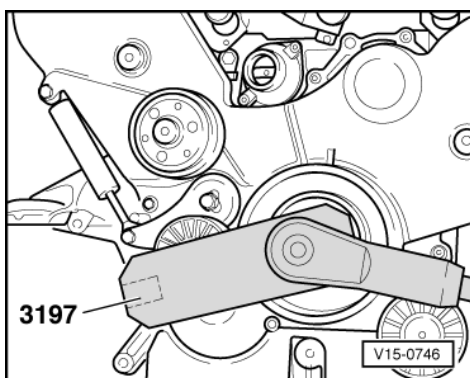
- ♦ Viscous fan has left-hand thread; turn clockwise to unfasten.
- ♦ For ease of illustration, the viscous fan is shown on the removed engine.
- Lift out viscous fan and air duct upwards.



- -> Unscrew front right engine mounting.



- -> Unscrew coolant hoses at engine.
- Unfasten coolant hose at top right of radiator and turn hose clockwise.

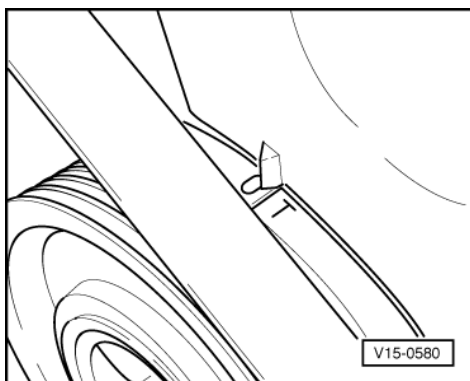


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- -> Slacken off central bolt for vibration damper approx. 1 turn, making use of holding tool 3197.

Notes:

- ◆ For ease of illustration, the engine is shown removed.
- ◆ Unfastening and subsequent removal of the vibration damper with toothed belt sprocket are only necessary if the toothed belt is replaced or removal is required for other operations.

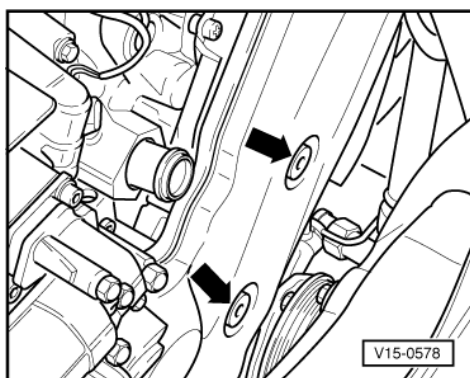


- -> Crank engine to TDC, mark at front of vibration damper.

Note:

With vibration damper bolt unfastened, use holding tool 3197 to crank engine.

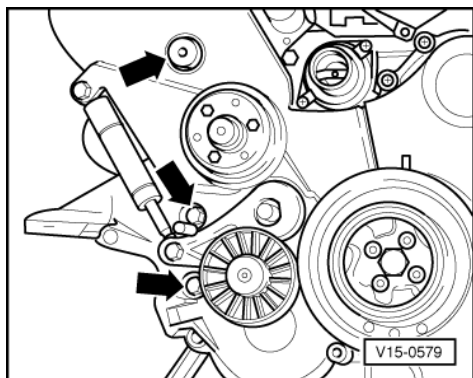
- Unbolt Hall sender housing at the rear left and camshaft end flange at the cylinder head and on the right.



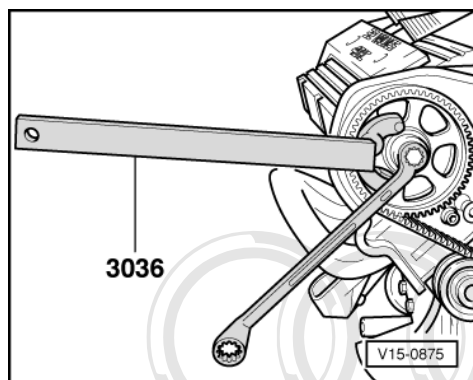
- Hall sender must be positioned behind window of barrier; if not, turn engine through 360°.
- -> Pull plug off switch for intake manifold changeover.
- Remove toothed belt guard on left.
- Unclip cap at pulley for ribbed belt at toothed-belt guard on right.



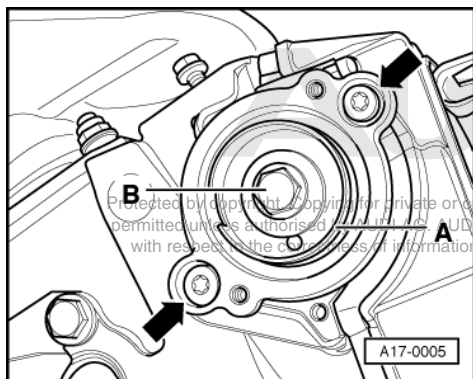
- Unscrew pulley.



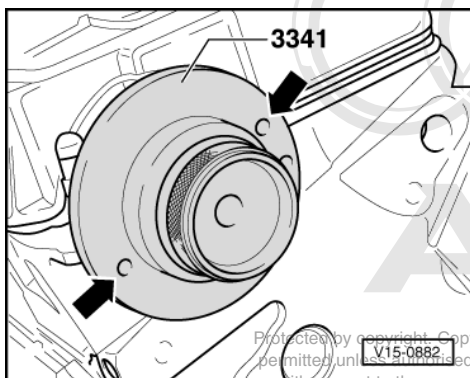
- -> Unscrew 6 securing bolts for right toothed-belt guard.
- Carefully remove right toothed-belt guard upwards.



- -> Unfasten securing bolts for camshaft sprockets; making use of holding tool 3036.



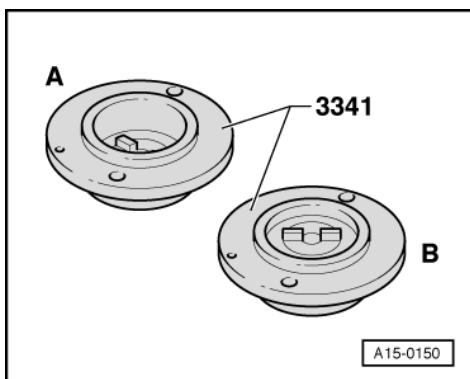
- -> Unscrew Hall barrier -B- and housing - arrows- at cylinder head on left.



- -> Insert camshaft locking flange 3341 at each cylinder head and secure.

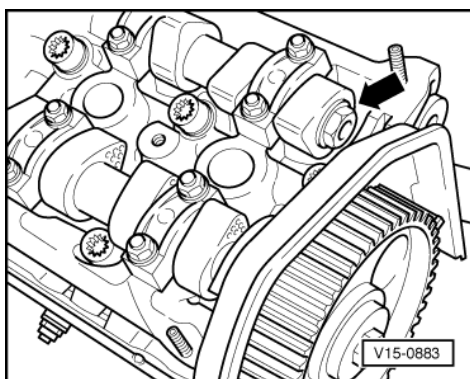
Note:

Do not use the camshaft locking flanges as holding tools.

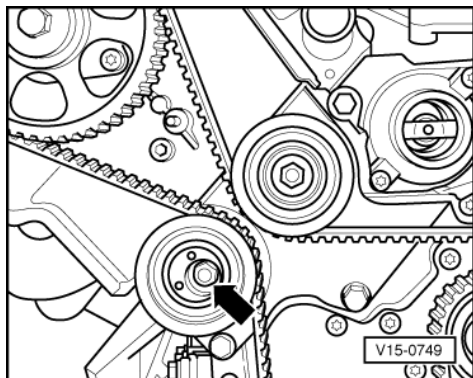


-> Camshaft locking flange -A- at cylinder bank 5 - 8.

Camshaft locking flange -B- at cylinder bank 1 - 4.



- -> To turn camshaft, unscrew cylinder head cover and turn at hexagon of camshaft.
- With toothed belt sprocket not yet unfastened and toothed belt removed only make use of holding tool 3036 to turn camshaft. Never turn at securing bolt for toothed belt sprocket.



- -> Unfasten tensioner with eccentric and turn to lowest point with pin-type face spanner (e.g. Matra V/159).
- Squeeze together damper for toothed-belt tensioner by hand and pull off tensioner.

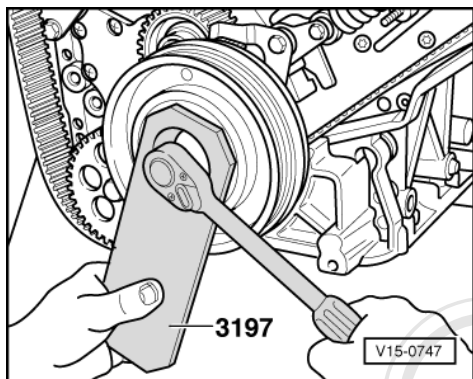
Note:

Mark direction of toothed belt with felt-tip pen or wax marker. Running belt in opposite direction can destroy it.

- Remove toothed belt from camshaft sprockets.
- Tap gently on rim of camshaft sprockets with plastic-headed hammer to release tapered connections.
- Unscrew four vibration damper/toothed belt sprocket connecting bolts.
- Unscrew central bolt.
- Remove vibration damper; do not pull gear wheel off crankshaft.
- Remove toothed belt.

Installing and tensioning

- Place toothed belt on crankshaft toothed-belt sprocket.
- Fit vibration damper at crankshaft.
- Screw in and hand-tighten the four vibration damper/toothed belt sprocket connecting bolts.

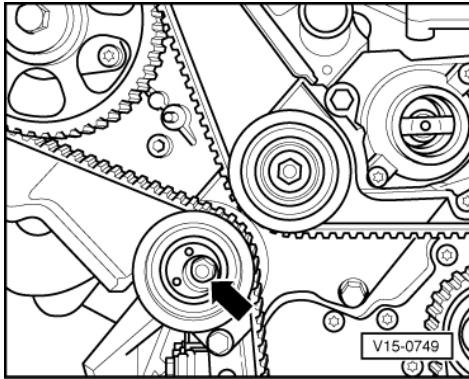


Note:

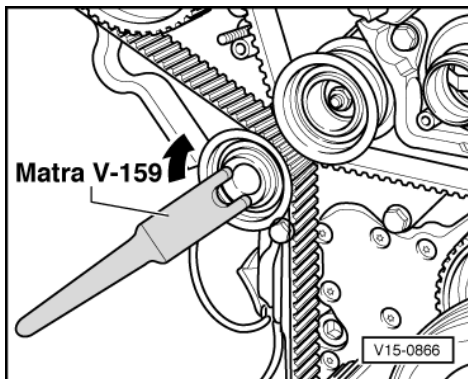
Replace central bolt.

- Slightly lubricate thread and bolt-head contact surface of central bolt.
- -> Screw in and hand-tighten central bolt using holding tool 3197.
- Fit on camshaft sprockets; the sprockets should be loosely touching the taper of the camshaft. The securing bolts are slackened about one turn.

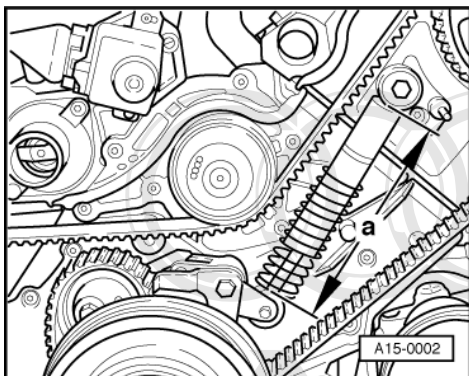
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- Position toothed belt on all toothed belt sprockets and pulleys, as well as water pump impeller. Belt routing =>Page 45.
- -> Slip on toothed belt with tensioner and eccentric insert at threaded pin and tighten nut such that eccentric insert can still just be turned.
- Tighten the four toothed belt sprocket/vibration damper securing bolts.
Tightening torque 25 Nm.



- -> For basic setting of toothed-belt tensioner, turn eccentric insert of tensioner in clockwise direction using commercially available pin-type face spanner (e.g. Matra V/159) until...

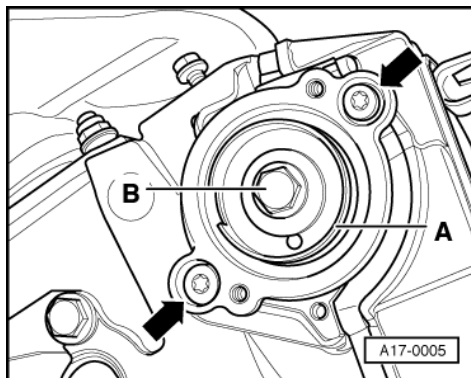


- -> ... damper length -a- is obtained.

Damper length -a-

When cold	136 - 139 mm
When warm	126 - 129 mm

- Secure tensioner 25 Nm.
- Tighten camshaft sprockets to 55 Nm making use of holding tool 3036.
- Remove camshaft locking flanges.



- -> Install housing behind Hall sender -arrows- (20 Nm)
- Hall barrier -A- must engage with locking lug in camshaft -B- 20 Nm.
- Crank engine at least twice.
- Secure central bolt and always replace.

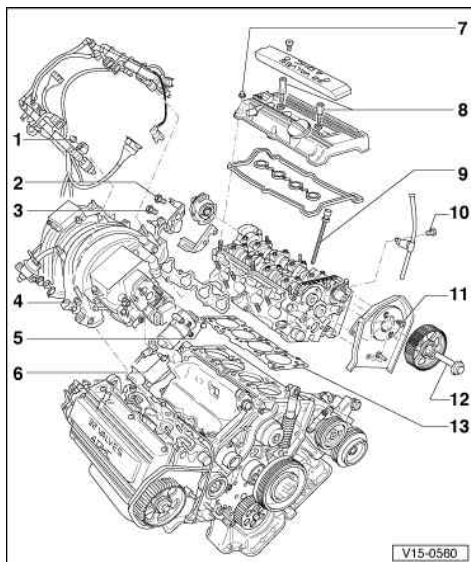
Tightening torque

with special tool 2079	350 Nm
without special tool 2079	450 Nm

- Check and, if necessary, adjust damper length.
- Perform further installation of toothed belt in reverse order of removal.

3 - Removing and installing cylinder head, ABH, AEC

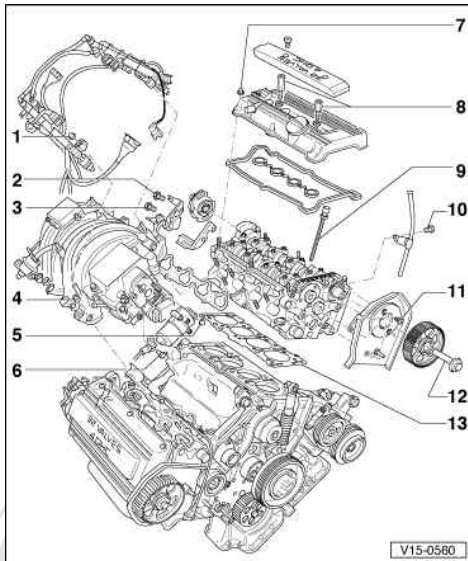
3.1 - Removing and installing cylinder head, ABH, AEC



- 1 10 Nm
- 2 25 Nm
- 3 45 Nm
- 4 20 Nm
- 5 Tightening torque of intake manifold
 - 1. Stage, 15 Nm
 - 2. Stage, 25 Nm
- 6 10 Nm
- 7 10 Nm



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8 10 Nm

- ◆ The longer hexagon of the bolts is inserted in the rear of the cylinder head.

9 Cylinder head bolts

- ◆ Replace
- ◆ Tightening method =>Page 60

10 25 Nm

11 10 Nm

12 Combi bolt, 55 Nm

- ◆ Use holding tool 3036

13 Cylinder head gasket

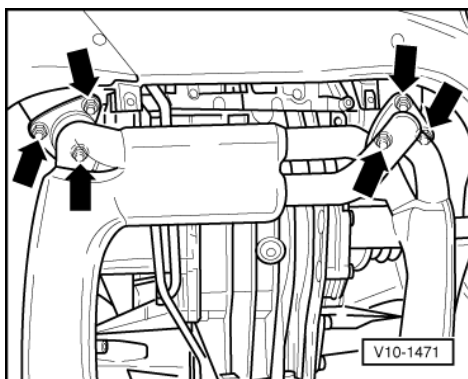
- ◆ Identification: Lettering must face upwards
- ◆ Inspect cylinder head for distortion =>Page 60 .

Removing

with engine in situ

Notes:

- ◆ Ask customer for radio anti-theft code.
- ◆ With the ignition switched off disconnect the battery earth strap. Battery is located on right of luggage compartment beneath trim.
- ◆ The vibration damper does not have to be unbolted or removed.
- ◆ Renew all cut and loosened cable ties. Refit cable ties in the same position when installing the engine.
- ◆ Renew all gaskets and seals.

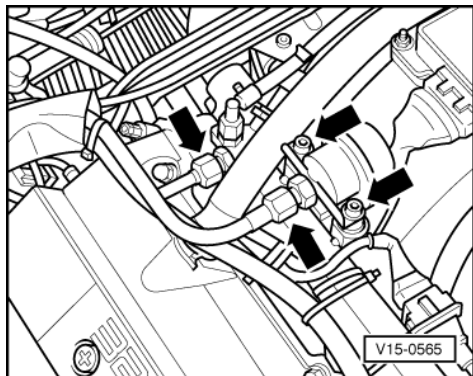


- Removing and installing toothed belt => Page 34 .

Notes:

The vibration damper does not have to be unbolted or removed.

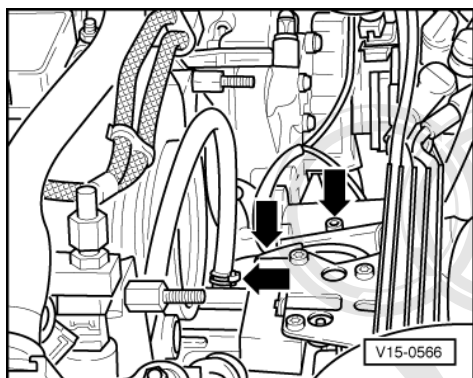
- -> Unbolt the exhaust pipe on the left and right.



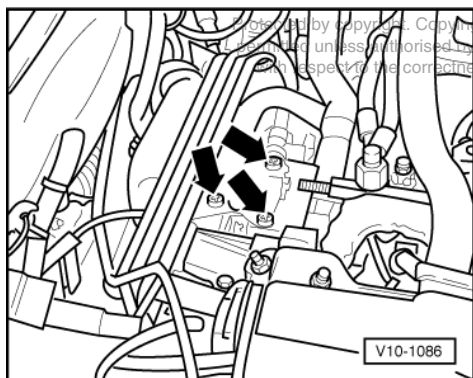
- -> Disconnect fuel feed and fuel return pipes.
- Unbolt the pressure regulator from the fuel rail.

Note:

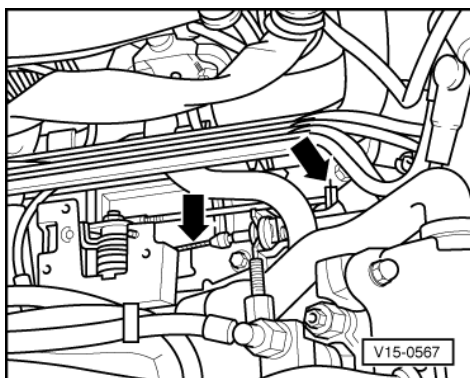
When installing fuel regulator first of all press fully into the seat of the O-ring seal; do not draw in with the bolts.



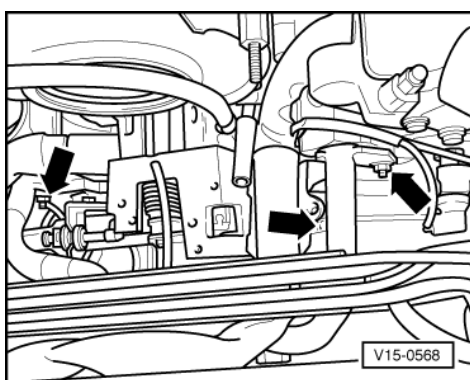
- -> Pull breather hose off intake manifold at rear.
- Pull off vacuum pipe.
- Unscrew upper part of support clamp for engine wiring loom.



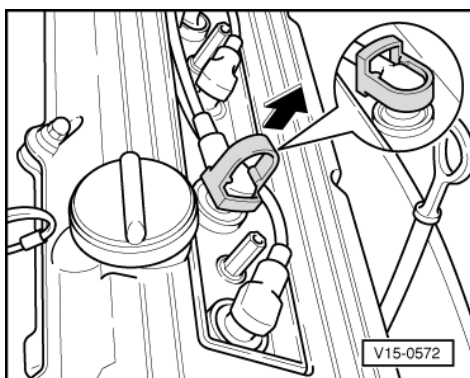
- -> Unbolt sheet metal support for ignition cable.



- -> Detach linkage for cruise control system (CCS).
- Detach throttle cable by unclipping both retaining clips.

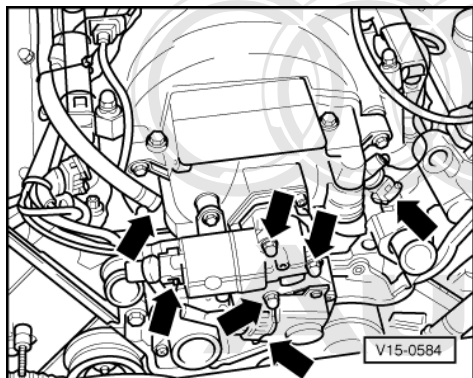


- -> Unbolt heating feeder pipe for coolant at the rear of both cylinder heads.
- Detach hose between the supporting clip for the engine wiring harness.

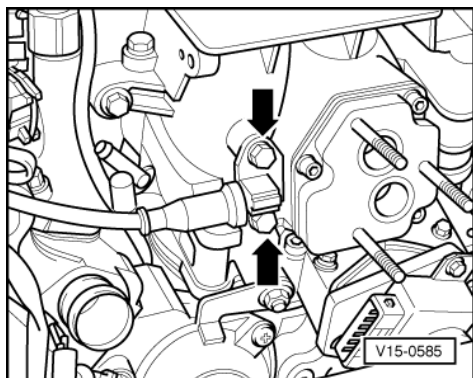


- Unbolt both covers for spark plugs.
- -> Unplug spark plug connectors (use detaching device).
- Take out ignition cables complete with distributor caps.
- Detach connector for knock sensor on left and right.
- Pull connector off hot-wire air-mass meter.

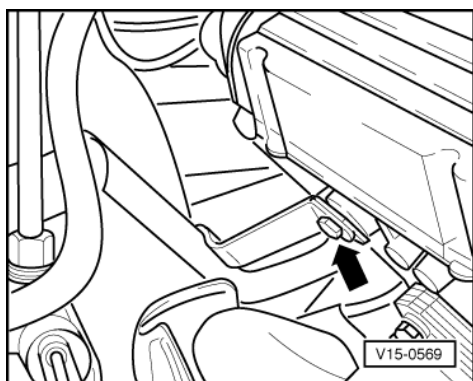
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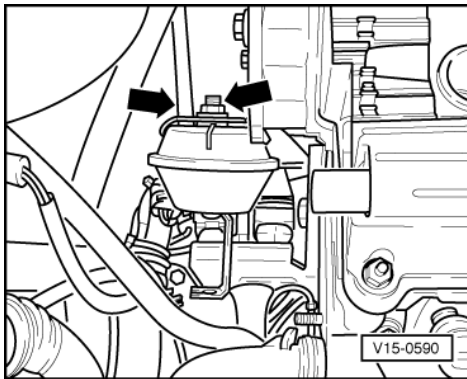
- -> Pull connector off throttle valve potentiometer.
- Pull connector off thermo switch.
- Remove connector at idling speed stabilisation valve.
- Remove idling speed stabilisation valve.
- Pull off hose to activated charcoal filter (ACF).



- -> Remove air temperature sensor.
- Remove the cable bracket behind the rear toothed belt guard on the right, and also on the left as appropriate.

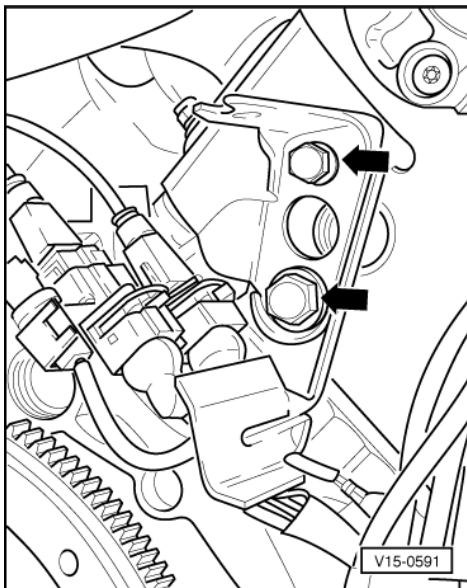


- -> Unbolt bracket for coolant pipe at the rear of the right cylinder head.
- Remove heater unit feed pipe from cylinder heads at rear.

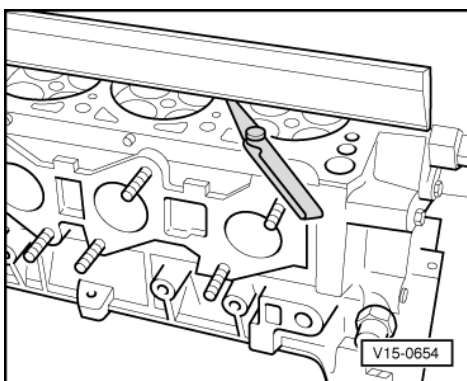


- -> Unbolt vacuum unit for cruise control system (CCS) (only when removing the left-hand cylinder head).

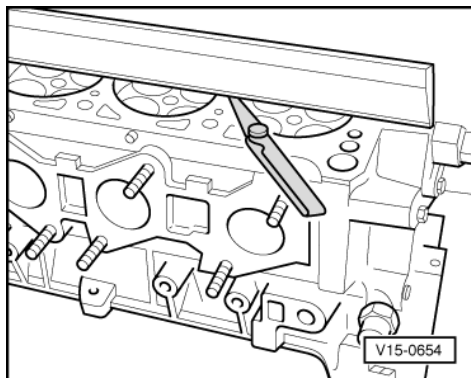
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- -> Unbolt bracket for CCS vacuum unit (do not forget deflector plate when installing).

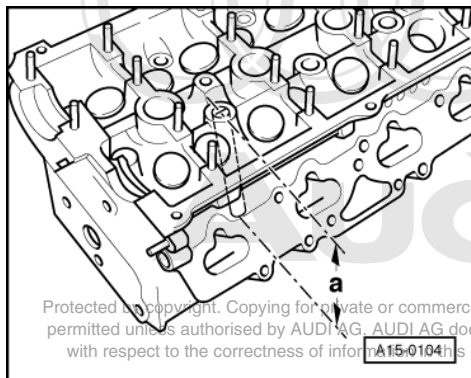


- -> Unfasten cylinder head bolts. This is to be done in the reverse order of tightening => Page 61 .
- Lift off cylinder head.



-> Checking cylinder head for distortion

- Measure at several points with bevelled rule.
Distortion: no more than 0.1 mm



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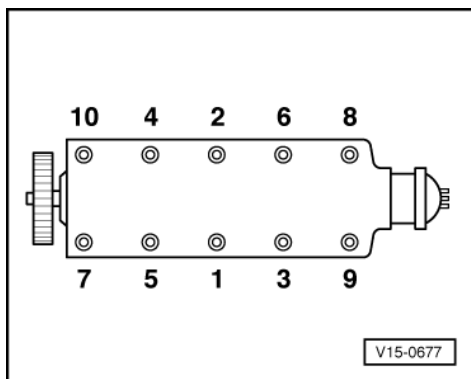
-> Rework cylinder head

- Reworking of cylinder head (face grinding) is only permitted to minimum dimension $a = 139.25$ mm.

Installing:

- Clean sealing surfaces.
- Cylinder head gasket: Mark "top" must face cylinder head.
- Fit cylinder head, paying attention to centring pins in cylinder block.
- Always replace cylinder head bolts.
- Insert cylinder head bolts and tighten by hand.

Cylinder head tightening method



- -> Sequence see illustration

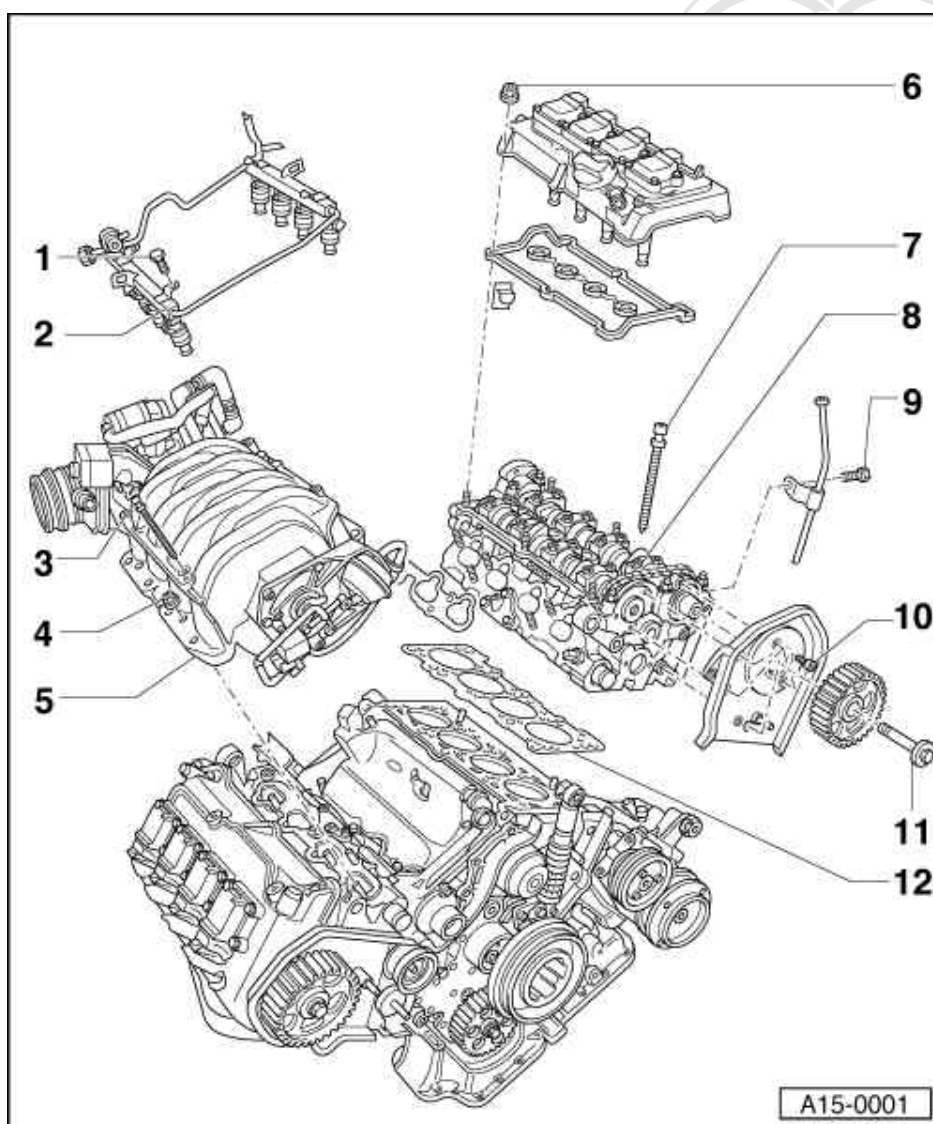
Tightening torque (engine cold)	
1. Stage	40 Nm
2. Stage	60 Nm
3. Stage	1/2 turn (180°)

- Continue tightening in one operation using fixed wrench. 2 x 90° further turning is permitted.

Notes:

- ♦ Cylinder head bolts do not have to be retightened when performing standard service or following repairs.
- ♦ Before installing intake manifold, first attach front breather hose beneath intake manifold to engine.
- ♦ Installing cylinder head covers => Page 66.

3.2 - Removing and installing cylinder head, AHK



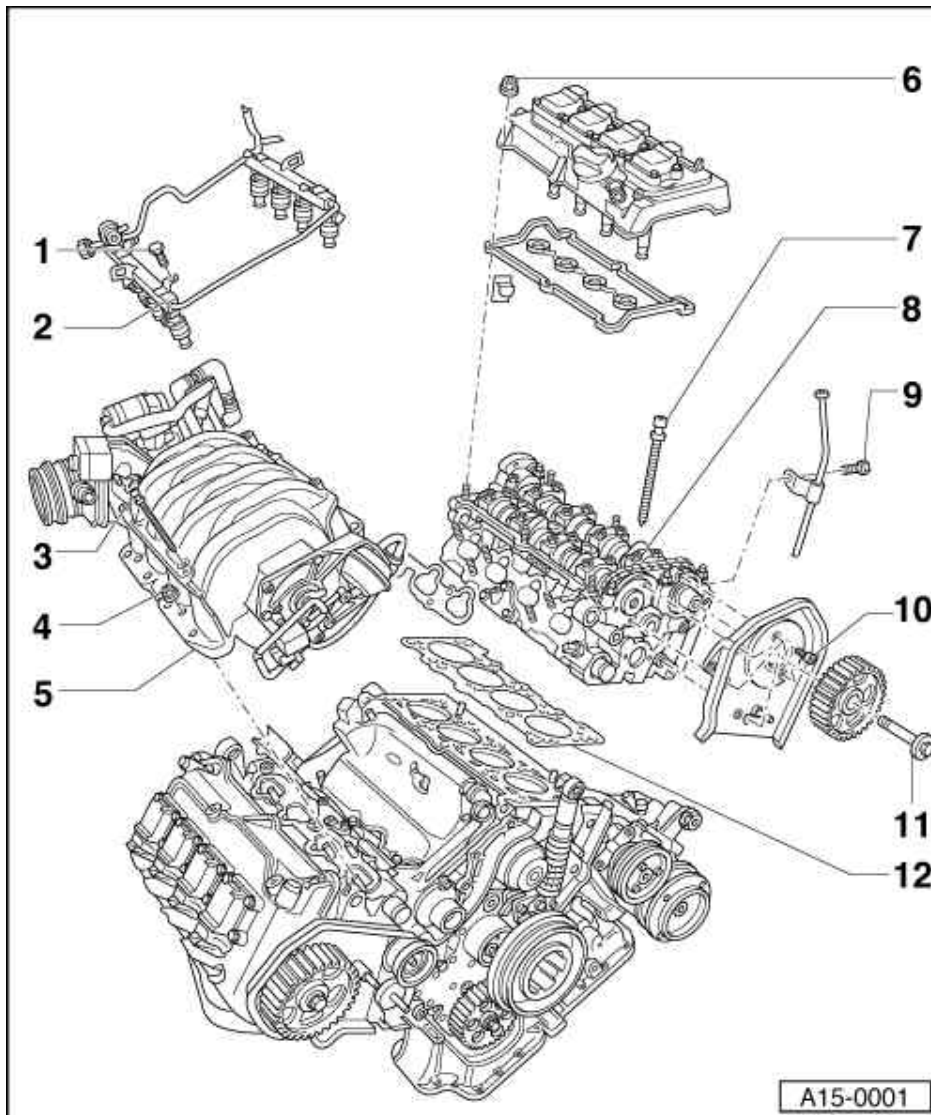
- 1 10 Nm
- 2 Fuel manifold
- 3 20 Nm
- 4 20 Nm
- 5 Intake manifold



6 10 Nm

7 Cylinder head bolts

- ♦ Replace
- ♦ Tightening method =>Page 60



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8 Cylinder head

- ♦ Inspecting for distortion =>Page 65
- ♦ Reworking dimension
=>Page 60

9 10 Nm

10 10 Nm

11 55 Nm

- ♦ Use holding tool 3036

12 Cylinder head gasket

- ♦ Identification: Lettering must face upwards.

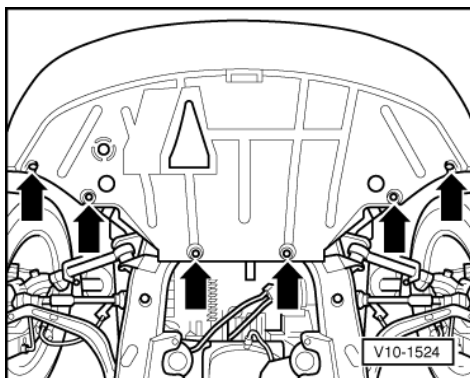
Removing

with engine in situ

Notes:

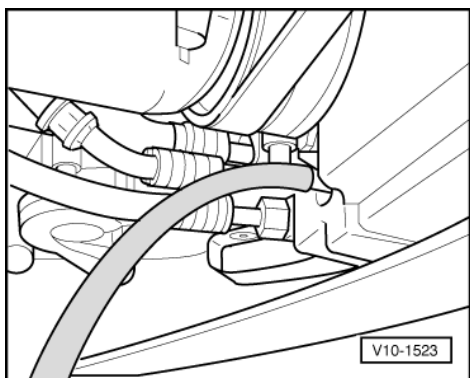
- ♦ Ask customer for radio anti-theft code.
- ♦ Battery is located on right of luggage compartment beneath trim.

- ♦ With the ignition switched off disconnect the battery earth strap.

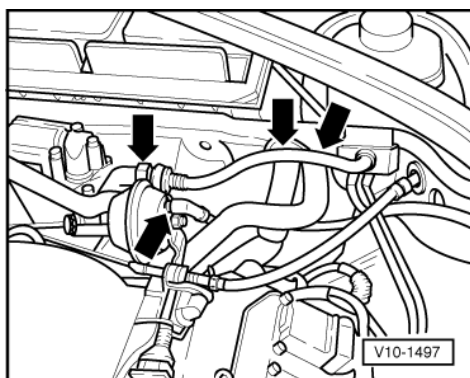


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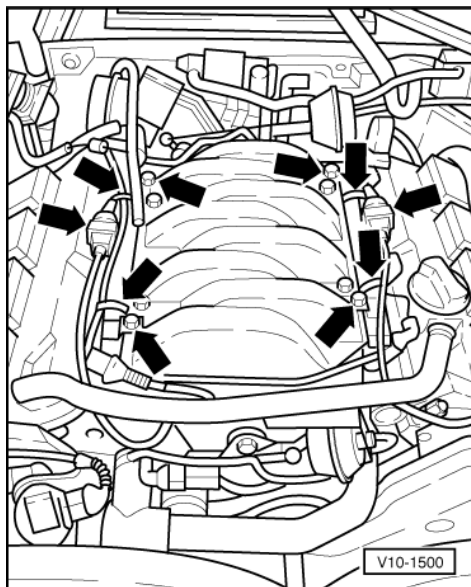
- ♦ Renew all cut and loosened cable ties. Refit cable ties in the same position when installing the engine.
- ♦ Renew all gaskets and seals.
- -> Remove noise insulation.
- Remove vent grille in bumper on left.
- Detach exhaust pipes from manifold.



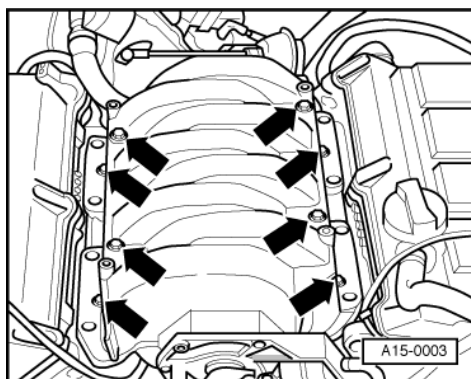
- -> Drain off coolant; to do so, attach hose to drain cock.
- Removing and installing toothed belt => Page 45 .



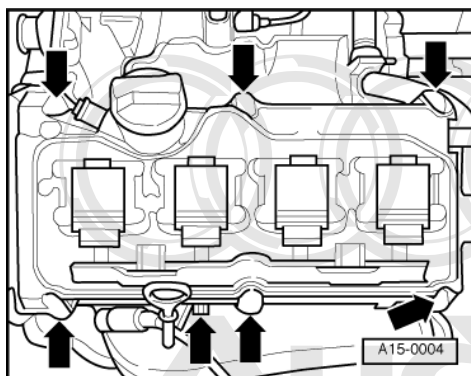
- -> Detach pipe of servo unit.
- Pull off vacuum pipe at cruise control unit.
- Detach accelerator cable.
- Detach coolant pipe to heating (supply and return) at bleeder valves.



- -> Detach connector for knock sensor on left and right at fuel manifold; cut open the four tie bands.
- Pull off connectors at injectors.
- Unscrew fuel manifold and set aside carefully together with injectors.



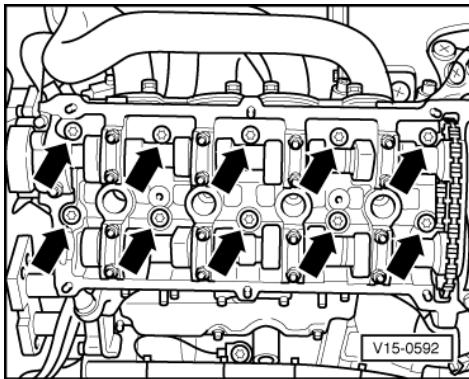
- -> Unscrew and lift out intake manifold.
- Unscrew top manifold/front pipe connection.
- Pull off connectors at ignition coils.
- Unscrew coolant pipe at rear between the two cylinder heads on left and right and pull out.



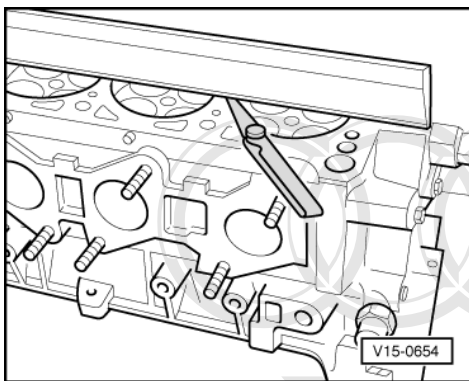
- -> Remove cylinder head covers.

Only when removing left cylinder head:

- Unscrew and pull out guide tube for dipstick.



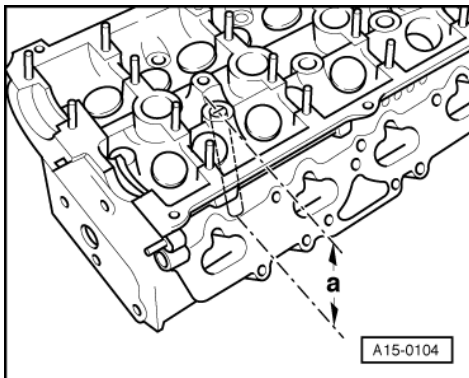
- -> Unfasten cylinder head bolts. This is to be done in the reverse order of tightening => Page 60 .
- Lift off cylinder head.



-> Checking cylinder head for distortion

- Measure at several points with bevelled rule.
 Distortion: no more than 0.1 mm

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-> Rework cylinder head

- Reworking of cylinder head (face grinding) is only permitted to minimum dimension $a = 139.25$ mm.

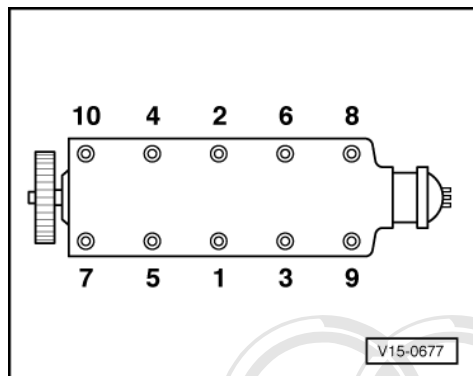
Installing:

- Clean sealing surfaces.
- Cylinder head gasket: Mark "top" must face cylinder head.
- Fit cylinder head, paying attention to centring pins in cylinder block.
- Always replace cylinder head bolts.



- Insert cylinder head bolts and tighten by hand.

Cylinder head tightening method



- -> Sequence-see illustration

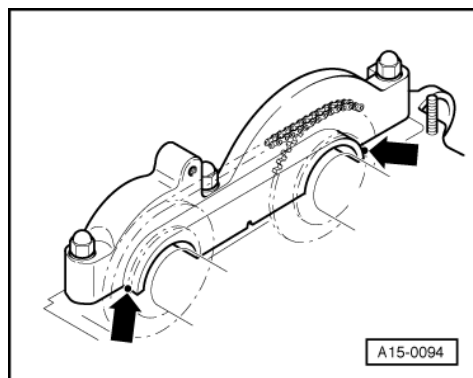
Tightening torque (engine cold)	
1. Stage	40 Nm
2. Stage	60 Nm
3. Stage	1/2 turn (180°)

- Continue tightening in one operation using fixed wrench. 2 x 90° further turning is permitted.

Notes:

- ♦ Cylinder head bolts do not have to be retightened when performing standard service or following repairs.
- ♦ Before installing intake manifold, first attach front breather hose beneath intake manifold to engine.
- ♦ Installing cylinder head covers => Page 66.

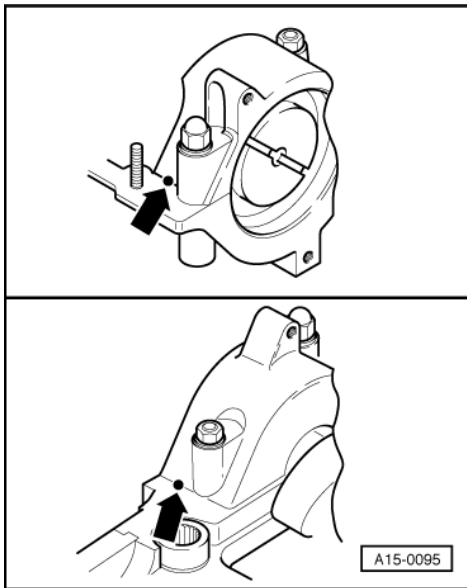
3.3 - Installing cylinder head covers



Note:

Before fitting, coat inside and outside of gasket for cylinder head cover with small quantity of silicone lubricant D 007 000 04.

- -> Use a small screwdriver to carefully apply sealant D 454 300 A2 to the two edges -arrows- at the sealing surfaces of the cylinder head opposite the timing chain end.



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- -> Use a small screwdriver to carefully apply sealant D 454 300 A2 to the two edges, arrows at the sealing surfaces of the cylinder head opposite the timing chain end.

3.4 - Checking compression pressure

Test requirements

- Engine oil temperature at least 30 °C.
- Throttle valve fully open.
- Remove fuse 17 (fuse in fuel pump relay) to avoid damage to the catalytic converter; reinstall fuse after conducting the test.
- Check compression pressure using compression pressure tracer V.A.G 1381 and adapter V.A.G 1381/5.

Note:

Refer to operating instructions for how to use tracer.

- Actuate starter until measuring instrument shows no further increase in pressure.

Compression pressure in bar over pressure		
Engine code letters	New	Wear limit
ABH	10 - 13 bar	7.5 bar
AEC	13 bar	8.5 bar
AHK	14 bar	9 bar

- Permissible difference between all cylinders: 3 bar

4 - Servicing valve gear

4.1 - Servicing valve gear

Engine code ABH => Page **68**

Engine code AEC up to engine number

-004 708 with manual gearbox

-004 841 with automatic gearbox => Page **68**

Engine code AEC from engine number

-004 709 with manual gearbox

-004 842 with automatic gearbox => Page **70**

Engine code AHK=> Page **73**

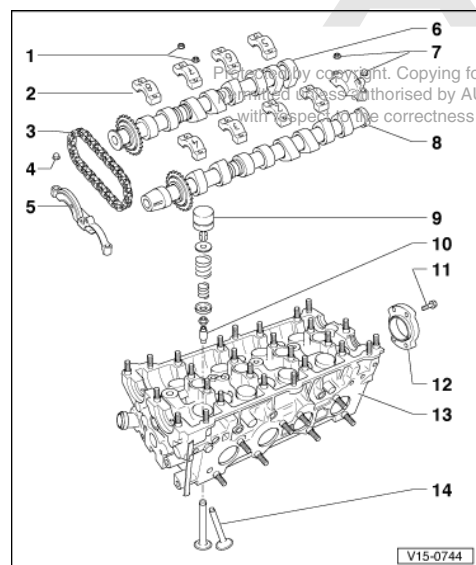
Engine code numbers ABH and AEC up to engine number

-004 708 with manual gearbox

-004 841 with automatic gearbox

Notes:

- ♦ Cylinder heads with cracks between the valve seats or between a valve seat ring and the spark plug thread can still be used without any reduction in service life, provided that these are only incipient cracks not more than 0.3 mm in width or provided that only the first four turns of the spark plug thread are cracked.
- ♦ After installing new bucket tappets engine is not to be started for roughly 30 minutes (otherwise valves will strike pistons), then crank crankshaft twice.
- ♦ Check valve guides for wear => Page **83**.



1 15 Nm

2 Bearing cap

- ♦ Installation position =>Page **80**.
- ♦ Installation sequence => Installing camshaft, Page **78**

3 Drive chain

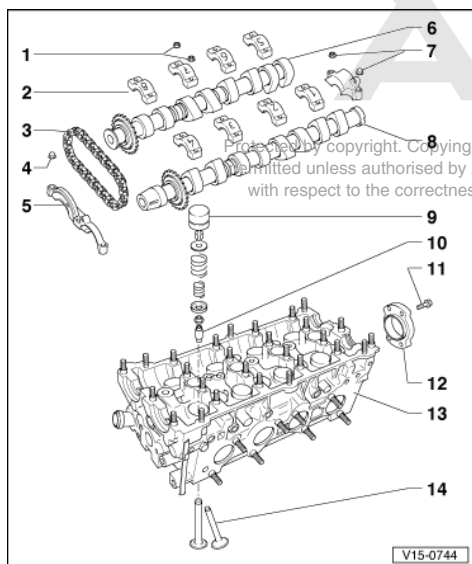
4 15 Nm

5 Bearing cap in front of chain

6 Inlet camshaft

- ♦ Checking axial play => Page 79
- ♦ Removing and installing => Page 78 .
- ♦ Check radial play with Plastigage: Wear limit 0.1 mm
- ♦ Runout 0.01 mm

7 15 Nm



8 Exhaust camshaft

- ♦ Check as for inlet camshaft

9 Hydraulic bucket tappets

- ♦ Inspecting => Page 80 .
- ♦ Lubricate bearing surface before installing
- ♦ Set down with cam bearing surface facing downwards.

10 Valve guide

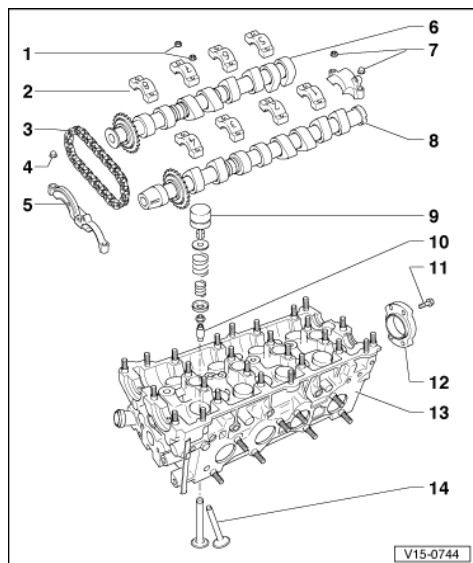
- ♦ Inspecting for wear => Page 83 .

11 10 Nm

12 Flange

13 Cylinder head

- ♦ Reworking valve seats => Page 85 .



14 Valves

- ♦ Exhaust valves filled with sodium: Observe notes=>Page 83

Warning!

Worn sodium-filled exhaust valves cannot simply be scrapped. They must be cut in two with an iron saw between centre of stem and valve disc. They must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time). Then step back because a chemical reaction occurs when the sodium filling burns. Following such treatment, the parts can then be handled as normal scrap.

Engine code AEC from engine number

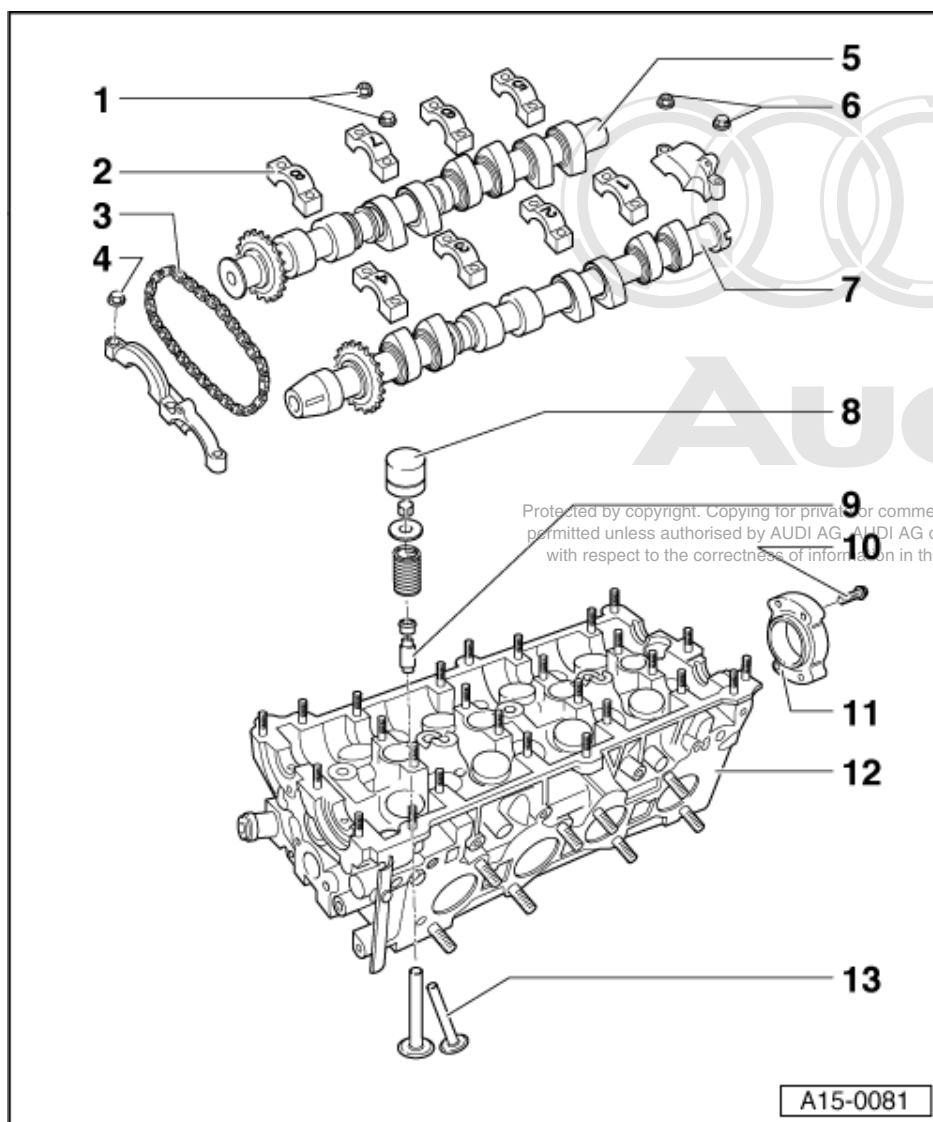
-004 709 with manual gearbox

-004 842 with automatic gearbox

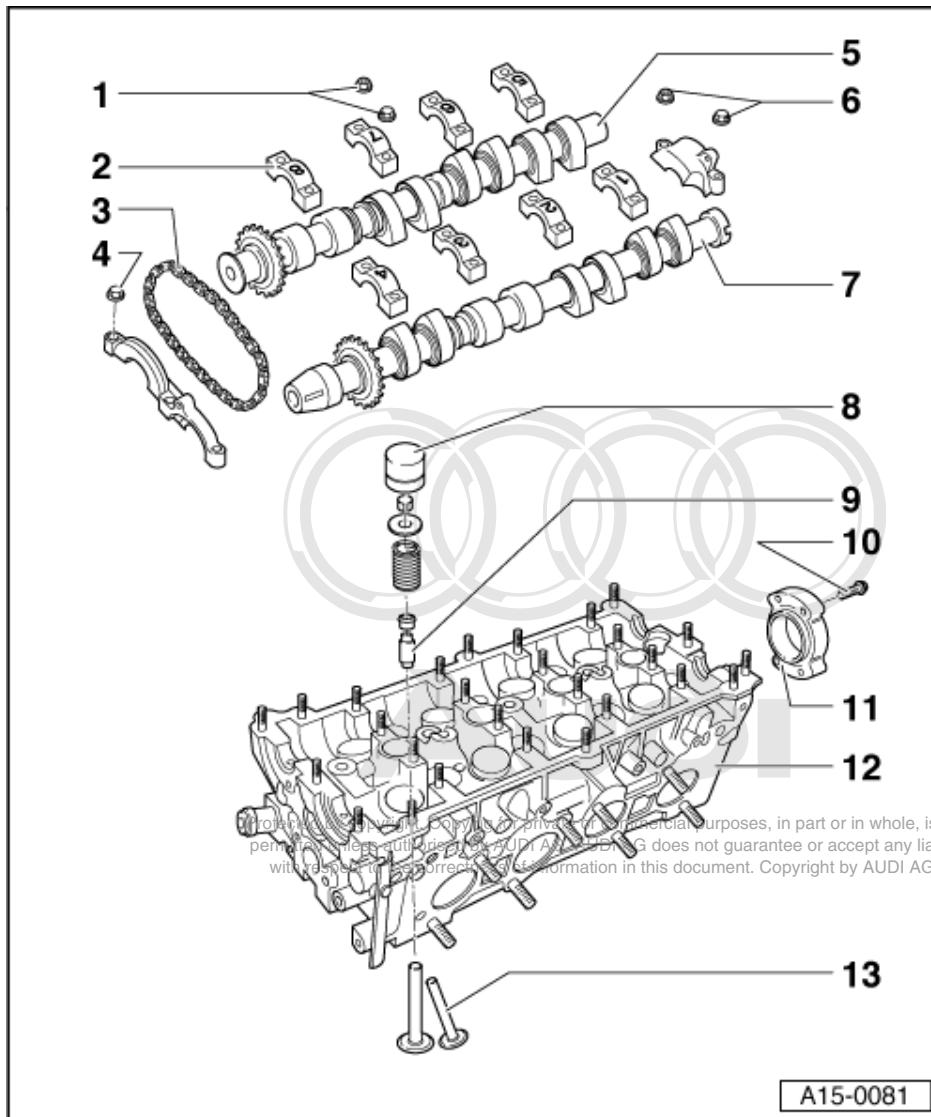
Notes:

- ♦ Cylinder heads with cracks between the valve seats or between a valve seat ring and the spark plug thread can still be used without any reduction in service life, provided that these are only incipient cracks not more than 0.3 mm in width or provided that only the first four turns of the spark plug thread are cracked.
- ♦ After installing new bucket tappets engine is not to be started for roughly 30 minutes (otherwise valves will strike pistons), then crank crankshaft twice.
- ♦ Check valve guides for wear => Page 83

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- 1 15 Nm
- 2 Bearing cap
 - ♦ Installation position => Page 80
 - ♦ Installation sequence => Installing camshaft, Page 78
- 3 Drive chain
- 4 15 Nm
- 5 Inlet camshaft
 - ♦ Checking axial play => Page 79
 - ♦ Removing and installing => Page 78
 - ♦ Check radial play with Plastigage: Wear limit 0.1 mm
 - ♦ Runout 0.01 mm
- 6 15 Nm

**7 Exhaust camshaft**

- ◆ check as for inlet camshaft

8 Hydraulic bucket tappets

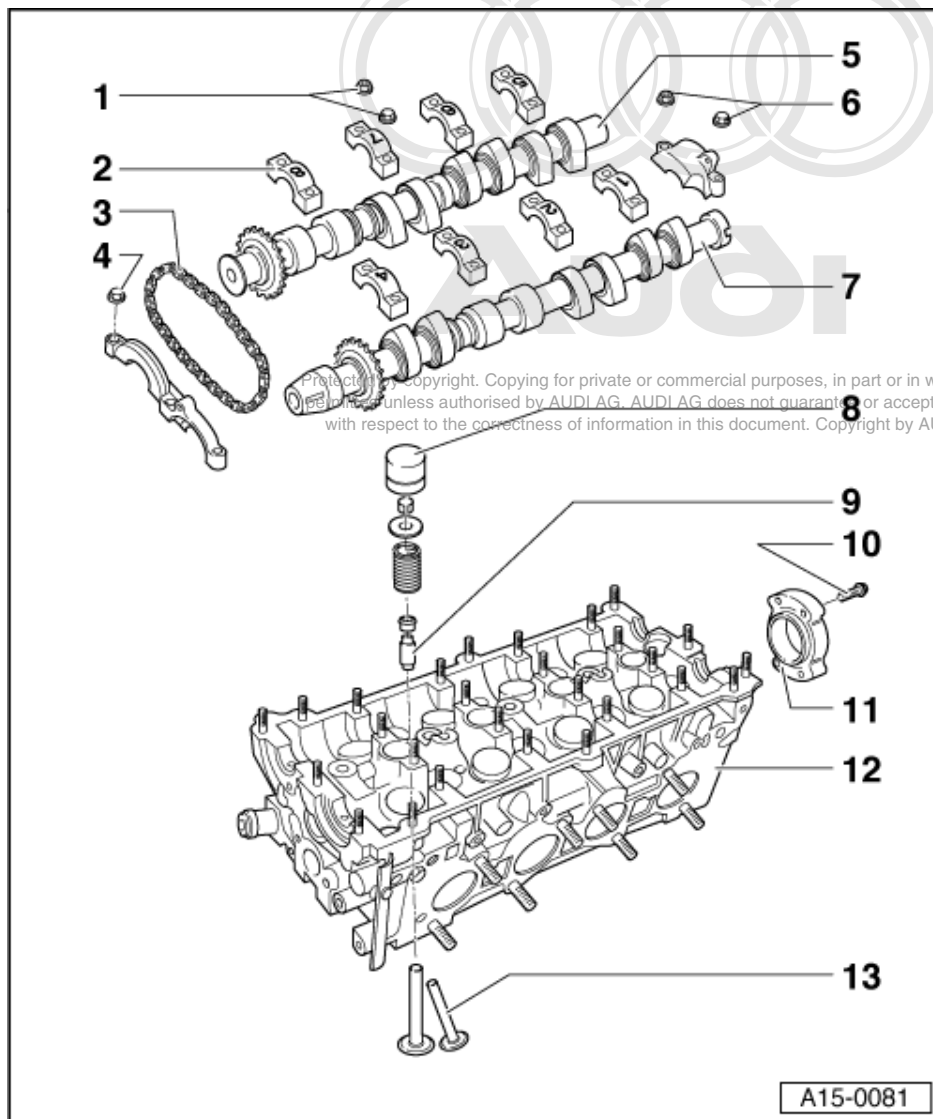
- ◆ Inspecting => Page 80
- ◆ Lubricate bearing surface before installing
- ◆ Set down with cam bearing surface facing downwards.

9 Valve guide

- ◆ Inspecting for wear =>Page 83 .

10 10 Nm**11 Flange****12 Cylinder head**

- ◆ Reworking valve seats
=>Page 85 .



13 Valves

- ♦ Inspecting=>Page 83
- ♦ Exhaust valve is sodium-filled and cannot simply be scrapped.

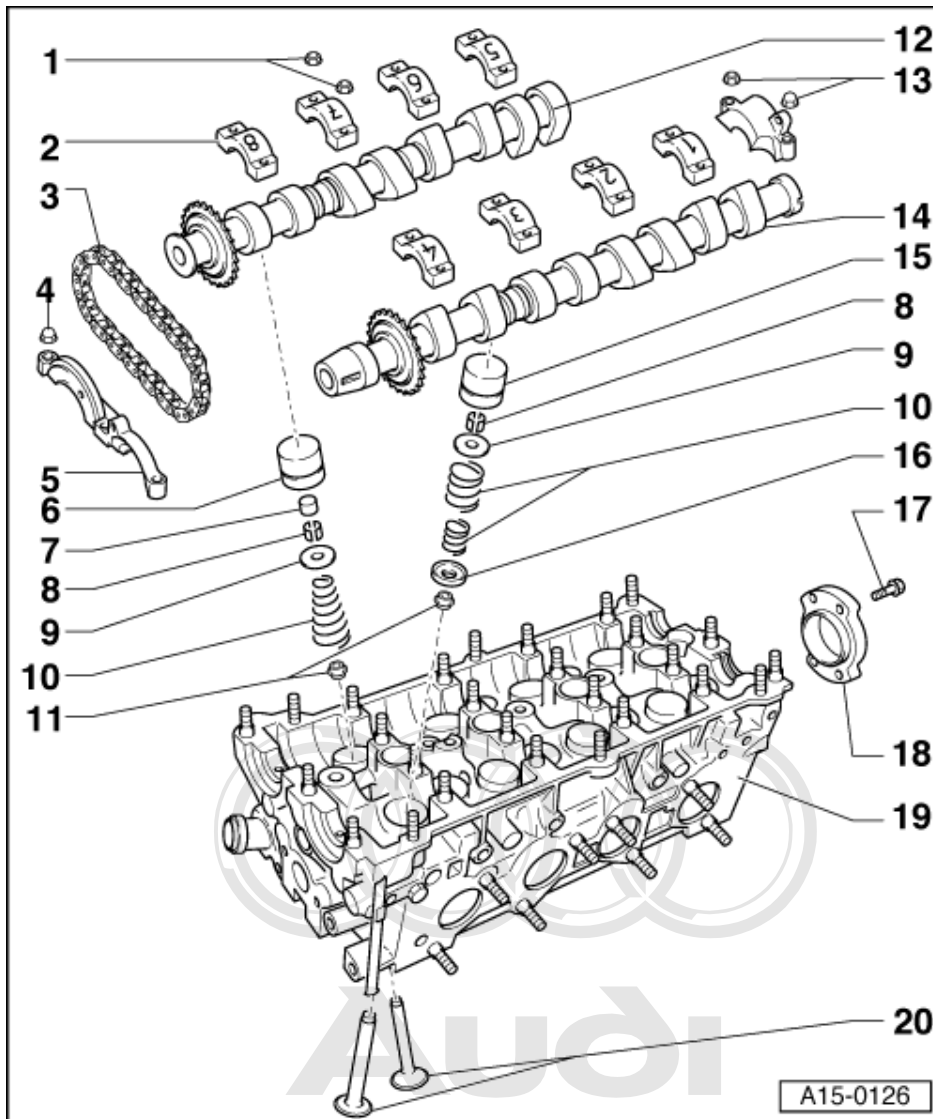
Warning!

Worn sodium-filled exhaust valves cannot simply be scrapped. They must be cut in two with an iron saw between centre of stem and valve disc. They must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time). Then step back because a chemical reaction occurs when the sodium filling burns. Following such treatment, the parts can then be handled as normal scrap.

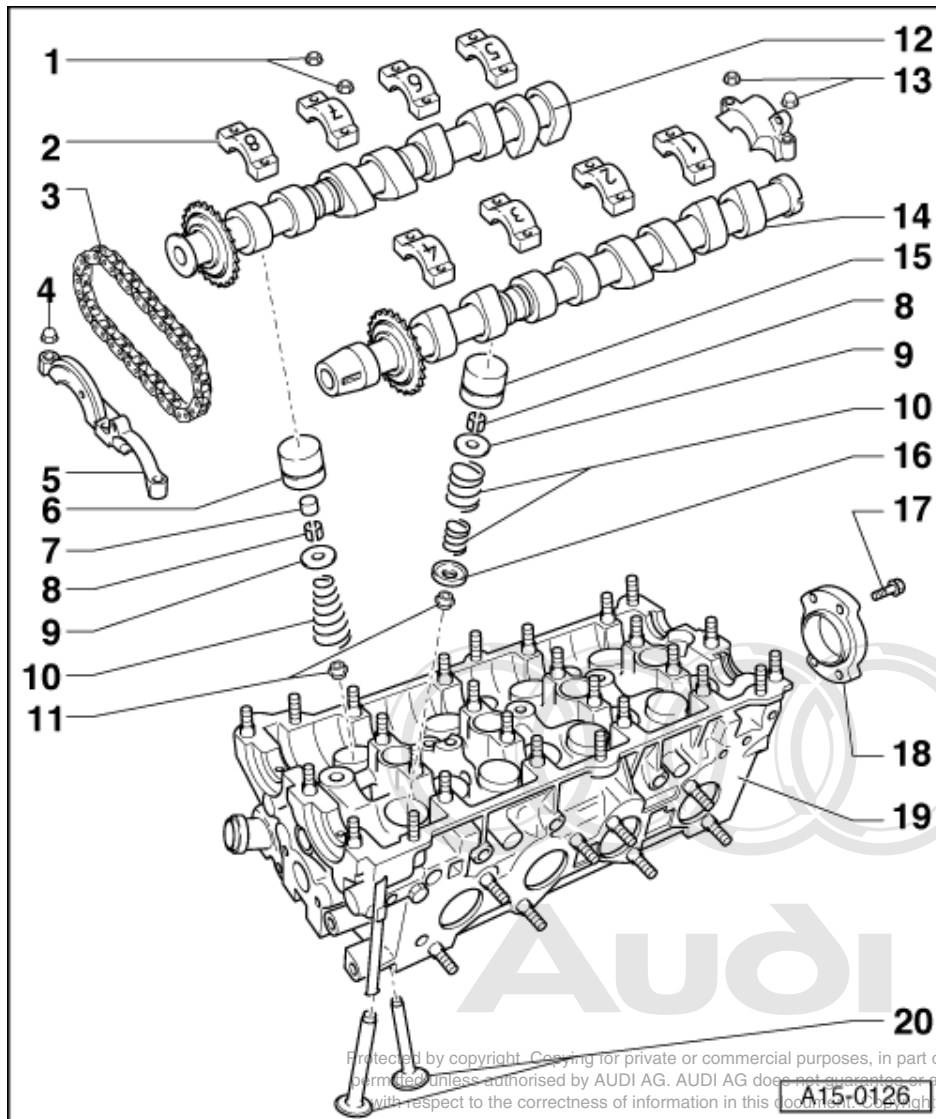
Servicing valve gear, engine code AHK

Notes:

- ♦ Cylinder heads with cracks between the valve seats or between a valve seat ring and the spark plug thread can still be used without any reduction in service life, provided that these are only incipient cracks not more than 0.3 mm in width or provided that only the first four turns of the spark plug thread are cracked.
- ♦ After installing new bucket tappets engine is not to be started for roughly 30 minutes (otherwise valves will strike pistons), then crank crankshaft twice.
- ♦ Check valve guides for wear => Page 83 .



- 1 15 Nm
- 2 **Bearing cap**
- ♦ Installation position => Page 80
 - ♦ Installation sequence => Installing camshaft, Page 78
- 3 Drive chain
- 4 15 Nm
- 5 Bearing cap in front of chain
- 6 Tappet
- 7 Compensating element
- 8 Cotters
- 9 Upper valve spring retainer



10 Valve springs

11 Valve stem seal

- ♦ Replacing => Page 81

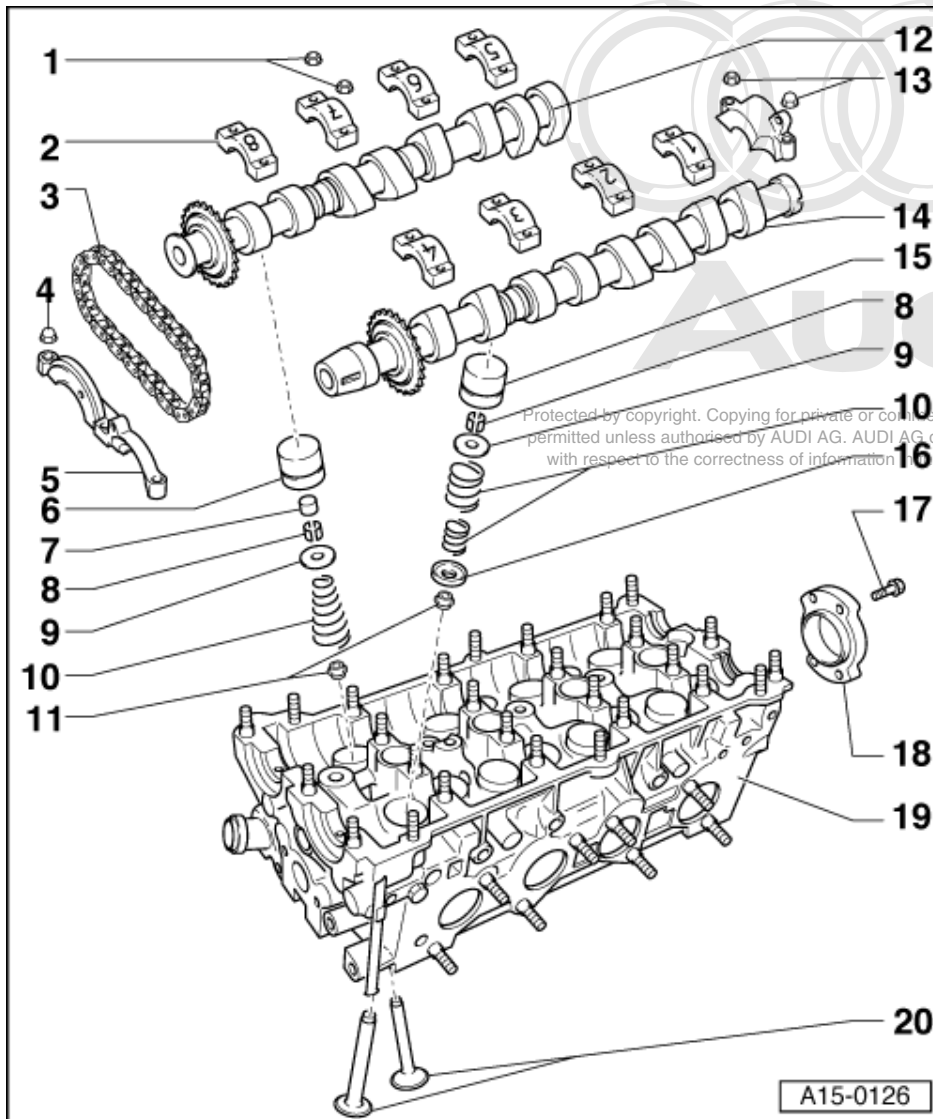
12 Inlet camshaft

- ♦ Checking axial play => Page 79
- ♦ Removing and installing => Page 78
- ♦ Check radial play with Plastigage: Wear limit 0.1 mm
- ♦ Runout 0.01 mm

13 15 Nm

14 Exhaust camshaft

- ♦ Check as for inlet camshaft



15 Hydraulic bucket tappets

- ♦ Inspecting => Page 80 .
- ♦ Lubricate bearing surface before installing
- ♦ Set down with cam bearing surface facing downwards.

16 Lower valve spring retainer

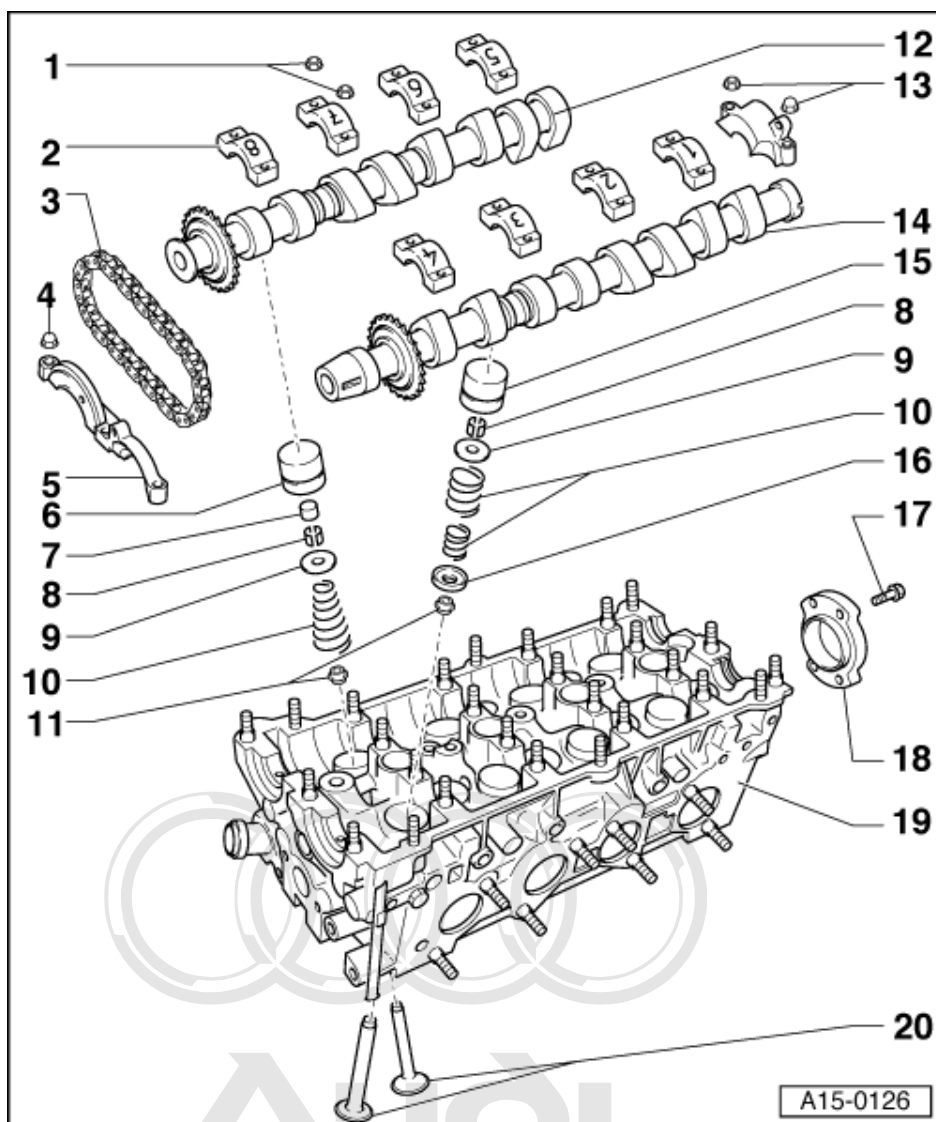
- ♦ Exhaust end only

17 10 Nm

18 Flange

19 Cylinder head

- ♦ Reworking valve seats
=>Page 85 .



20 Valves

- ♦ Adjusting, inlet side only => Page 77 .
- ♦ Inspecting=>Page 83
- ♦ Exhaust valve is sodium-filled and cannot simply be scrapped.

Warning!

Worn sodium-filled exhaust valves cannot simply be scrapped. They must be cut in two with an iron saw between centre of stem and valve disc. They must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time). Then step back because a chemical reaction occurs when the sodium filling burns. Following such treatment, the parts can then be handled as normal scrap.

Adjusting valve clearance

Note:

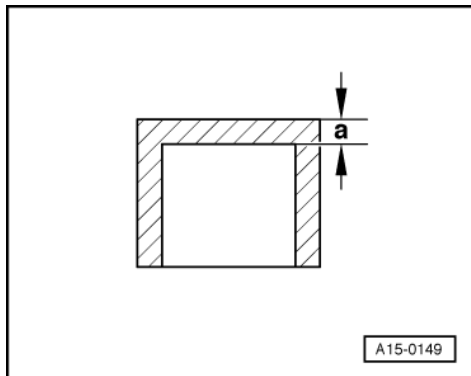
Valve clearance only has to be checked/adjusted following valve gear repairs and can only be adjusted at the inlet camshaft.

- Turn crankshaft until cam pair of inlet camshaft of cylinder to be adjusted is facing upwards.
- Check valve clearance between camshaft and tappet.



Setting dimension 0.10... 0.20 mm

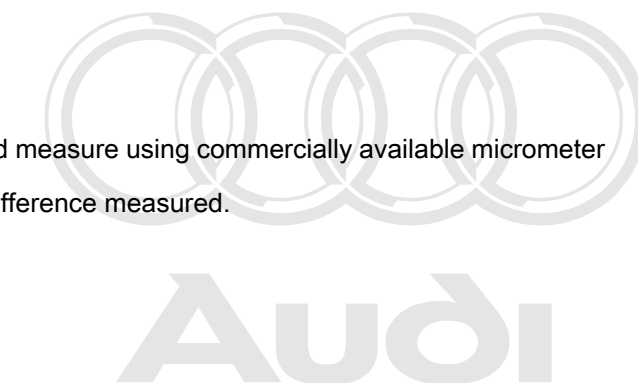
- Note down test values of valves which are outside setting dimension tolerance.
- Removing camshafts => Page 78 .
- Remove tappet.



- -> Remove compensating element from valve stem and measure using commercially available micrometer caliper with offset measuring faces (max. $\varnothing$. 6 mm).
- Replace compensating element by one to match the difference measured.

Example:	
Measured setting dimension	0.30 mm
Prescribed setting dimension	- 0.15 mm
Difference	0.15 mm

0.15 mm thicker compensating element must be fitted.



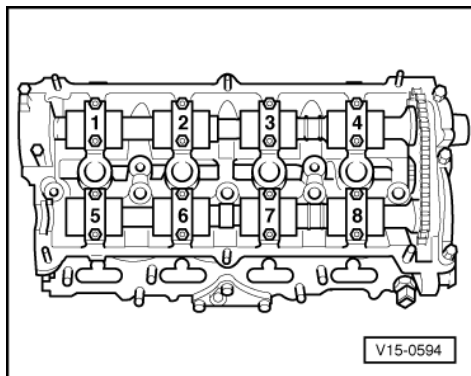
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4.2 - Removing and installing camshafts

Removing:

- Removing toothed belts, engine codes ABH, AEC => Page 31 .
- Removing toothed belts, engine code AHK => Page 45 .
- Remove cylinder head cover.
- Remove camshaft sprocket.

Outlet camshaft:

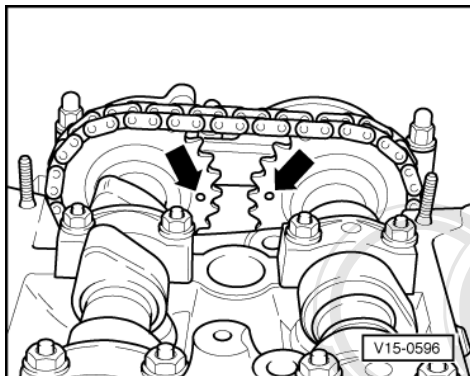


- -> Unscrew intermediate flange and bearing cap for ignition distributor. Remove bearing cap in front of chain as well as bearing caps 2 and 3.
- Loosen bearing caps 1 and 4 alternately and diagonally.

Inlet camshaft:

- Remove bearing caps 6 and 7.
- Loosen bearing caps 5 and 8 alternately and diagonally.

Installing



- -> Install camshaft with chain such that mark on sprocket wheels coincide.
- arrow-

Notes:

- ◆ When installing the bearing cap ensure that the numbers stamped are legible from the intake side.
- ◆ Before fitting, apply thin coat of sealant D 454 300 02 to the contact surfaces of the two outer bearing caps.

Inlet camshaft:

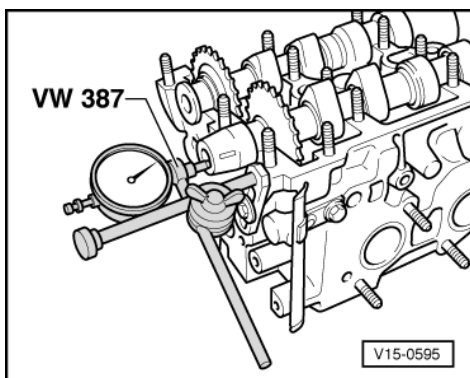
- Secure bearing caps 5 and 8 alternately and diagonally.

Outlet camshaft:

- Secure bearing caps 1 and 4 alternately and diagonally.
- Install other bearing caps.

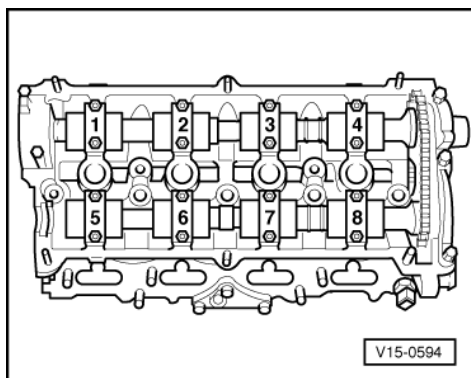
Tightening torque

Tightening torque bearing cap 15 Nm.



-> Checking the axial clearance of camshaft

- Wear limit: 0.15 mm
- Take measurements with bucket tappets removed and first and last bearing caps fitted.



-> Installation position of camshaft bearing caps

- The numbers on the bearing caps must be legible from the intake end.

Checking hydraulic bucket tappets

Notes:

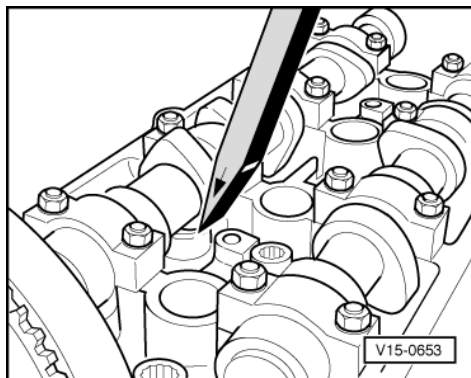
- ♦ After installing new bucket tappets engine is not to be started for roughly 30 minutes (otherwise valves will strike pistons).
- ♦ Set down bucket tappets removed on a clean surface with bearing surface (camshaft end) facing downwards.
- ♦ Bucket tappets cannot be adjusted.
- ♦ After working on valve gear, carefully crank engine at least twice to stop valve striking when starting.
- ♦ Irregular valve noises when starting engine are normal.
- Start engine and run until the radiator fan has switched on once.
- Increase engine speed for 2 minutes to roughly 2500 rpm.

Note:

If irregular valve noise disappears but is repeatedly encountered when travelling short distances, replace oil retention valves => Pages 17-12.

If hydraulic bucket tappets are still loud determine the defective tappets as follows:

- Remove cylinder head cover.
- Turn crankshaft in clockwise direction until cam of bucket tappet to be tested is at top.



- -> Use wooden or plastic wedge to press down bucket tappet. Replace tappet if it is possible to insert a 0.20 mm feeler gauge between camshaft and bucket tappet.



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Note:

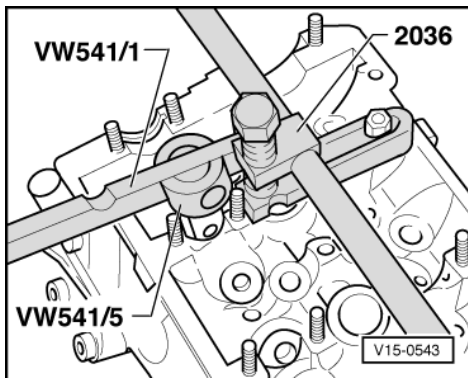
After installing new bucket tappets engine is not to be started for roughly 30 minutes (otherwise valves will strike pistons).

4.3 - Renewing valve stem seals

(with cylinder head in situ)

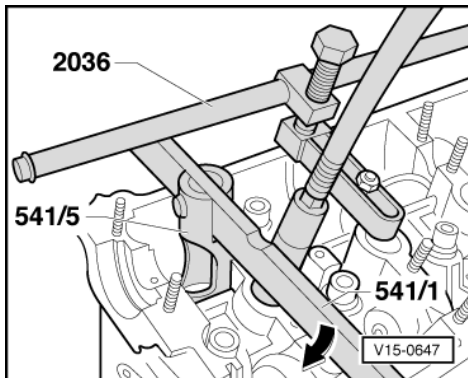
- Removing camshafts and bucket tappets => Page 78 .
- Unscrew spark plugs.
- Move piston of respective cylinder to BDC.
- Screw pressure hose VW 653/3 with seal into spark plug thread so as to be hand-tight and apply constant pressure, min 6 bar over pressure.

Inlet end:



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- -> Insert assembly tool 2036 and set mount to stud bolt height.
- Use assembly lever VW 541/1 and thrust piece VW 541/5 to remove valve spring.



-> Exhaust end:

Note:

Tight cotters can be loosened by tapping lightly on the lever.



Engine code ABH => Page **82**

Engine code AEC up to engine number

-004 708 with manual gearbox

-004 841 with automatic gearbox => Page **82**

Engine code AEC from engine number

-004 709 with manual gearbox

-004 842 with automatic gearbox => Page **82**

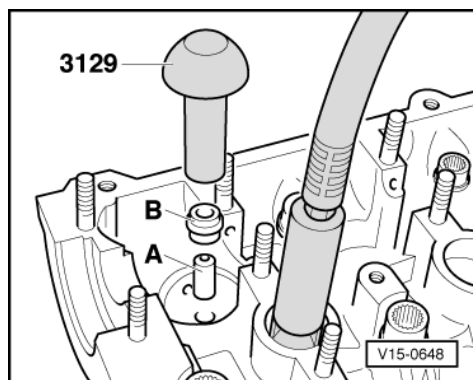
Engine code AHK => Page **82**

Engine code ABH

Engine code AEC up to engine number

-004 708 with manual gearbox

-004 841 with automatic gearbox



- Use 3047 A to remove valve stem seals.
- -> Install valve stem seals. Attach plastic sleeve -A- to valve stem. Lubricate valve stem seal -B- insert in pressing-on tool 3129 and slip carefully onto valve guide.

Note:

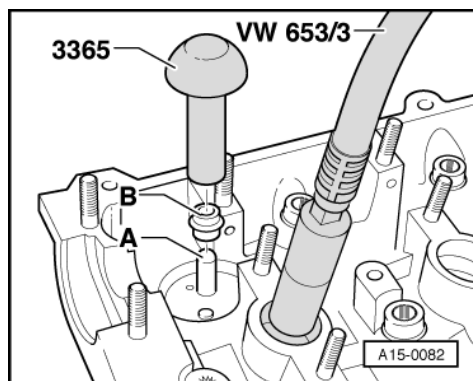
Always make use of plastic sleeve when installing valve stem seals so as to avoid damage.

Engine code AEC from engine number

-004 709 with manual gearbox

-004 842 with automatic gearbox

Engine code AHK



- Use 3364 to remove valve stem seals.
- -> Install valve stem seals. Attach plastic sleeve -A- to valve stem.
- Lubricate valve stem seals-B-, insert in pressing-on tool 3365 and slip carefully onto valve guide.

Note:

Always make use of plastic sleeve when installing valve stem seals so as to avoid damage.

Check valves

- Visually inspect stem and seat for running-in marks. Replace valves in the case of severe running-in marks.

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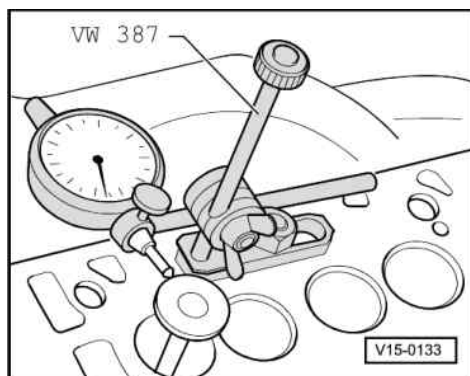
Warning!

Worn sodium-filled exhaust valves cannot simply be scrapped. They must be cut in two with an iron saw between centre of stem and valve disc. They must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time). Then step back because a chemical reaction occurs when the sodium filling burns. Following such treatment, the parts can then be handled as normal scrap.

4.4 - Checking valve guides

Check valve guide

When repairing engines with leaking valves, it is not sufficient to reface the valve seats and renew the valves. The valve guide must also be checked for wear. This is particularly important on high-mileage engines.



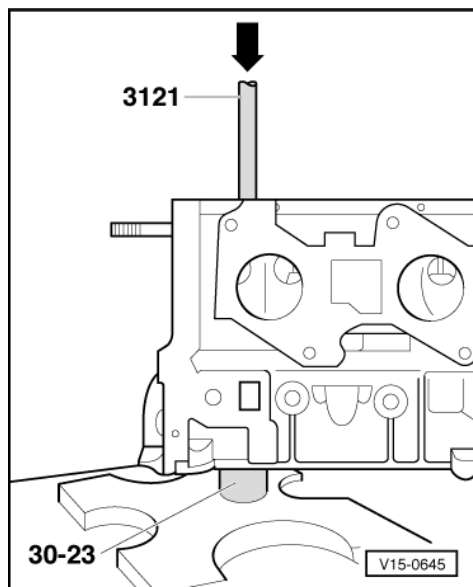
- -> Set valve in guide. Valve stem end must be flush with guide. Due to the slight difference in stem diameters, ensure that only an inlet valve is used in the inlet guide and an exhaust valve in the exhaust guide.
- Determine lateral play.

Wear limit:	
Inlet valve guide	1.0 mm
Outlet valve guide	1.3 mm

4.5 - Renewing valve guides

Note:

The valve guides are not replaced on engines with engine code AEC from engine number 004 709 with manual gearbox and from engine number 004 842 with automatic gearbox and also not on engine code AHK.



Engine code ABH

Engine code AEC up to engine number

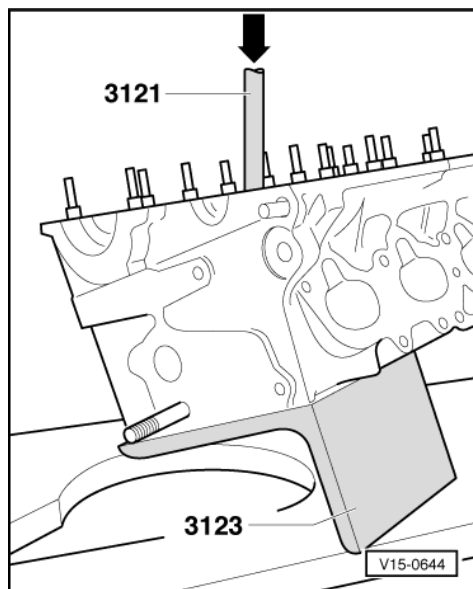
-004 708 with manual gearbox

-004 841 with automatic gearbox

Replace cylinder heads where valve seat rings can no longer be reworked, as well as those where minimum reworking dimension has already been reached.

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- -> Use special tool 3121 to press out worn valve guides from combustion chamber end. Employ sleeve 30-23 for support.



- -> Clean new guides with oil and press in with 3121 from the camshaft side (cylinder head cold) until shoulder makes contact.

Notes:

- ♦ Use rest 3123 when pressing in inlet valve guides.

- ◆ Once guides have made contact with collar in cylinder head insertion pressure is not to be increased to in excess of 1.0 t as otherwise collar could break off.
- Ream valve guides with hand reamer 3120. Always use drilling fluid.
- Reworking valve seats.

Note:

*When reworking valve seats pay attention to minimum dimension, => Page **85**.*

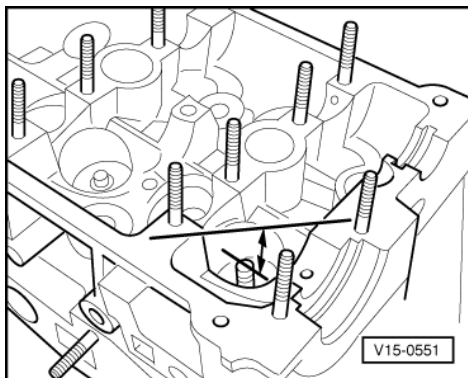
4.6 - Reworking valve seats

Notes:

- ◆ Valve seats are only to be reworked to the extent necessary to achieve a proper appearance of the bearing surface. Before starting to rework the valve seats, calculate the maximum permissible reworking dimension.
- ◆ Hydraulic valve clearance compensation function is no longer guaranteed if reworking dimension is exceeded.

Calculate max. perm. reworking dimension.

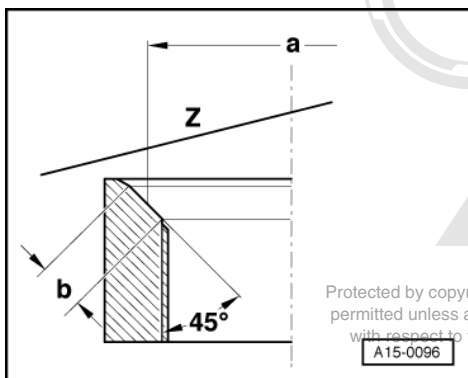
- Insert valve in valve seat and press firmly against valve seat.



- -> Measure distance between valve stem end and top edge of cylinder head.

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

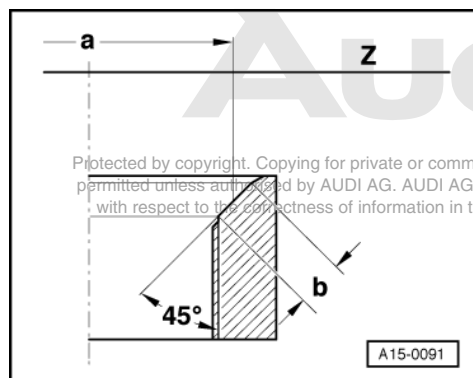
Minimum dimension:	ABH	AEC	AHK
Inlet valve	36.0 mm	36.4 mm	25.7 mm
Exhaust valve	36.3 mm	36.4 mm	36.4 mm



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-> Reworking inlet valve seat

	ABH	AEC, AHK
A =	ø 31.2 mm centre chamfer	ø 31.6 mm centre chamfer
b =	1.5 mm - 1.8 mm; rework valve seat ring, if appropriate with 45° taper milling tool	
Z =	Lower edge of cylinder head	
45° =	Valve seat angle 1)	



-> Reworking exhaust valve seat

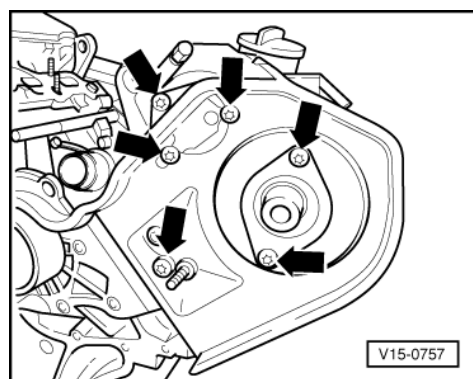
	ABH	AEC, AHK
A =	ø 27.6 mm centre chamfer	ø 25.2 mm centre chamfer
b =	1.5 - 1.8 mm	1.1 - 1.8 mm
	Rework valve seat ring, if appropriate, with 45° taper milling tool	
Z =	Lower edge of cylinder head	
45° =	Valve seat angle 1)	

- 1) Pay attention to max. perm. reworking dimension
=> Page 85

Renewing camshaft oil seal

Removing:

- Removing toothed belts, engine codes ABH, AEC => Page 31 .



- Removing toothed belts, engine code AHK => Page 45 .

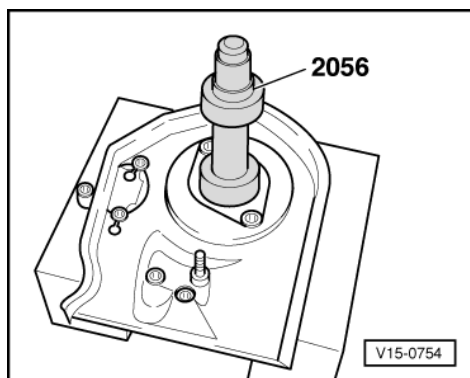
Note:

The vibration damper does not have to be unbolted or removed.

- Remove camshaft sprocket on left and right.
- -> Remove toothed-belt guard on left and right.

Note:

There are two sealing rings and a shaft seal in the left toothed-belt guard. The right toothed-belt guard features one sealing ring and one shaft seal.

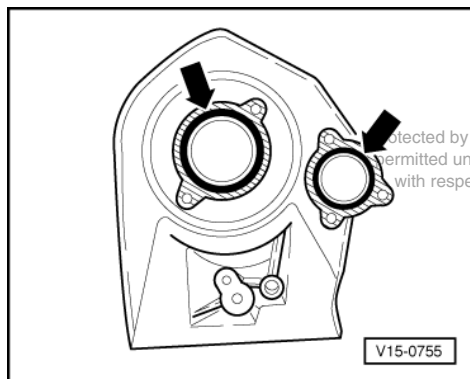


- -> Use mandrel 2056 to knock out shaft seal.
- On insertion make sure shaft seal is flush with front edge of toothed-belt guard.

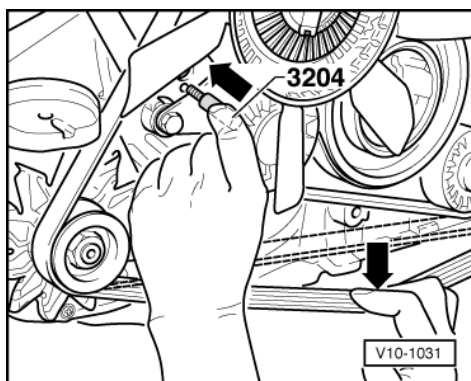
Note:

Replace both sides if one shaft seal is leaking.

- Fit camshaft sprocket.
- Installing toothed belts, engine codes ABH, AEC => Page 42 .
- Installing toothed belts, engine code AHK => Page 52 .

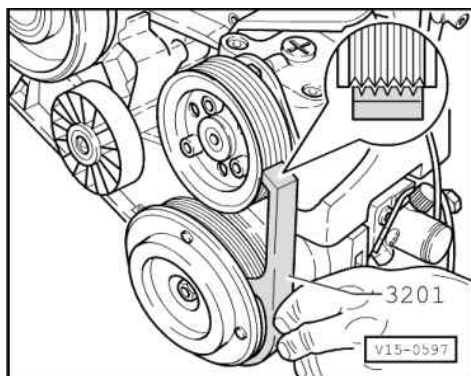


- -> Clean sealing surface on back and at cylinder head.
- Replace sealing ring.
- Apply thin coat of D 454 300 02 to sealing ring.
- Fit rear toothed-belt cover.
- Tightening torque: 10 Nm

Checking and adjusting ribbed belt alignment.

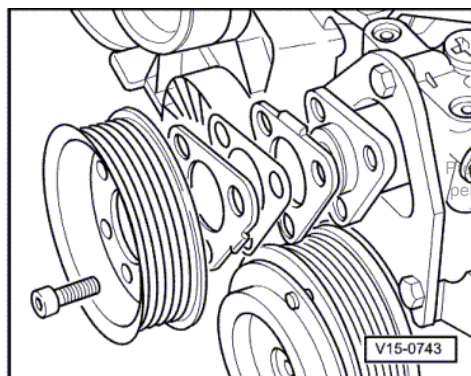
Check alignment of ribbed belt between AC compressor and hydraulic pump so as to avoid the possibility of ribbed belt damage.

- -> Remove ribbed belt; to do so, firmly press down belt at bottom in centre by hand and insert setting pin 3204.



- -> Position alignment gauge 3201 on ribbed belt pulley of AC compressor. Ribbed belt pulley of central hydraulic pump must coincide with that of AC compressor.

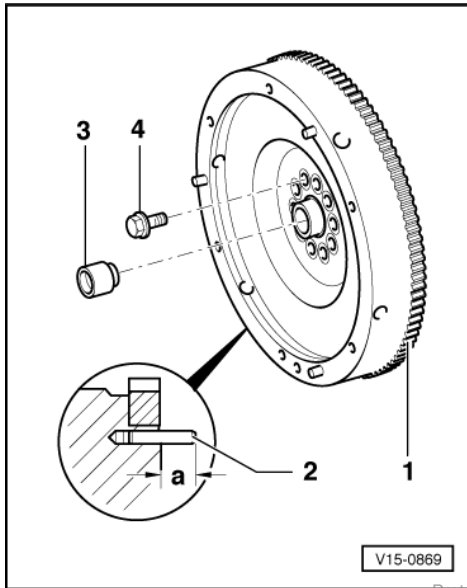
If the two pulleys do not coincide:



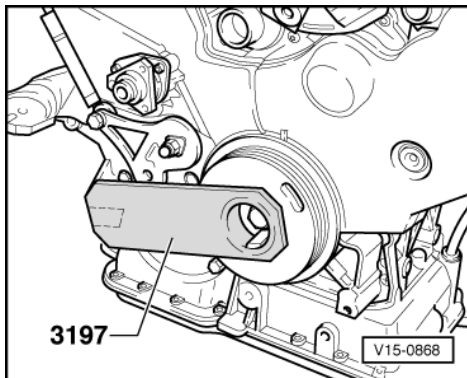
- -> Unscrew ribbed belt pulley of central hydraulic pump. Install appropriate shims available in the Parts Programme in thicknesses 0.5, 1.0, and 1.5 so that both ribbed belt pulleys are then aligned.

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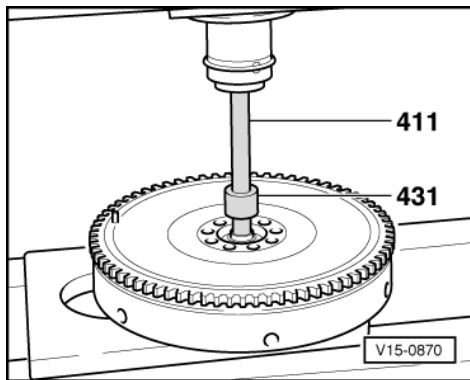
4.7 - Servicing flywheel



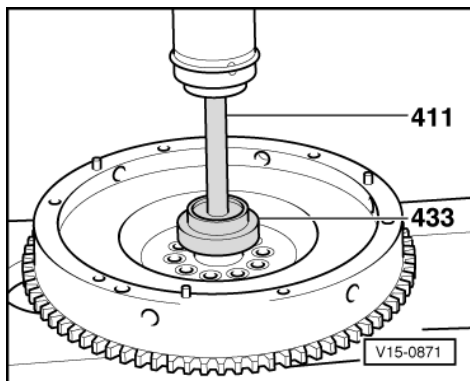
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- 1- Ring gear
 - heat to 200o C before installing.
 - Pin is installed at ring gear side.
 - 2- Cylinder pin for TDC sensor
 - Distance -a- 10 mm
 - 3- Needle bush
 - Press in and out again => Page 90
 - 4- Bolts
 - always replace
 - Tightening torque 30 Nm + 90o (1/4 turn) further.



- -> Loosen flywheel bolts using holding tool 3197.
- Installation is carried out in the reverse order.



- -> Press out needle bushing using VW 411 and VW 431.



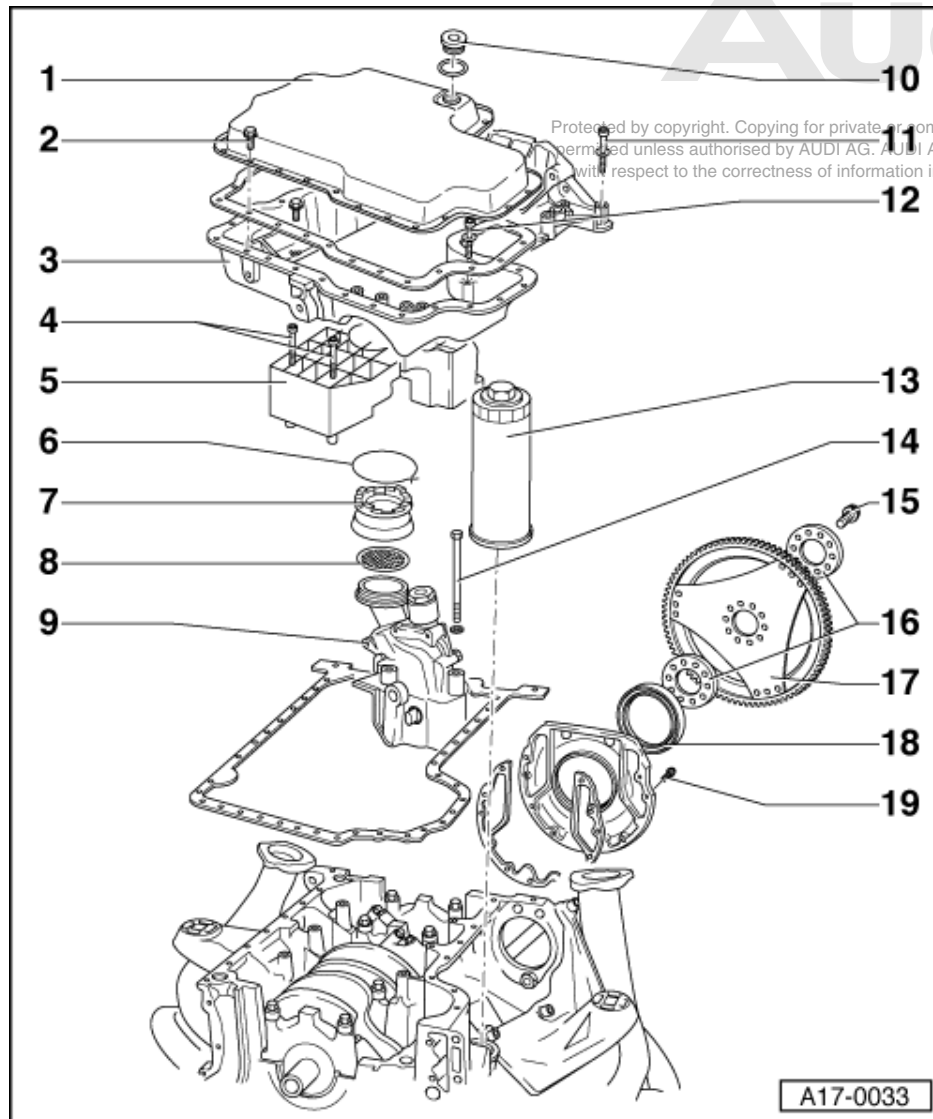
- -> Use VW 411 and VW 433 to press in needle bushing such that it is flush.

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17 - Lubrication

1 - Removing and installing parts of the lubrication system

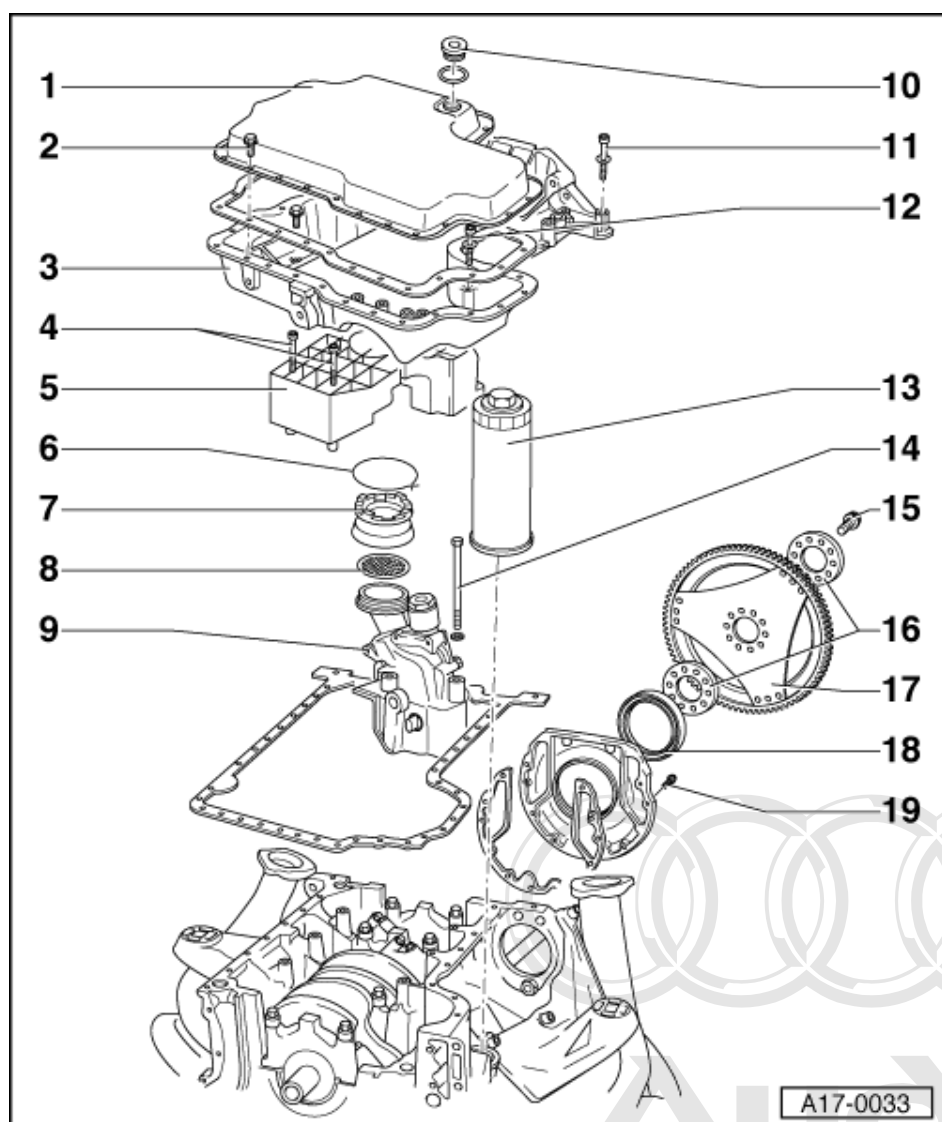
1.1 - Removing and installing parts of the lubrication system



Note:

Always replace seals and gaskets.

- 1 Bottom part of oil sump
- 2 10 Nm
- 3 Top part of oil sump
- 4 10 Nm
- 5 Honeycomb insert
- 6 Circlip



-
- 7 Rubber intake piece
 - 8 Strainer
 - 9 Oil pump
 - ◆ Removing => Page 97
 - ◆ Only replace as complete unit

10 35 Nm

11 25 Nm

12 10 Nm

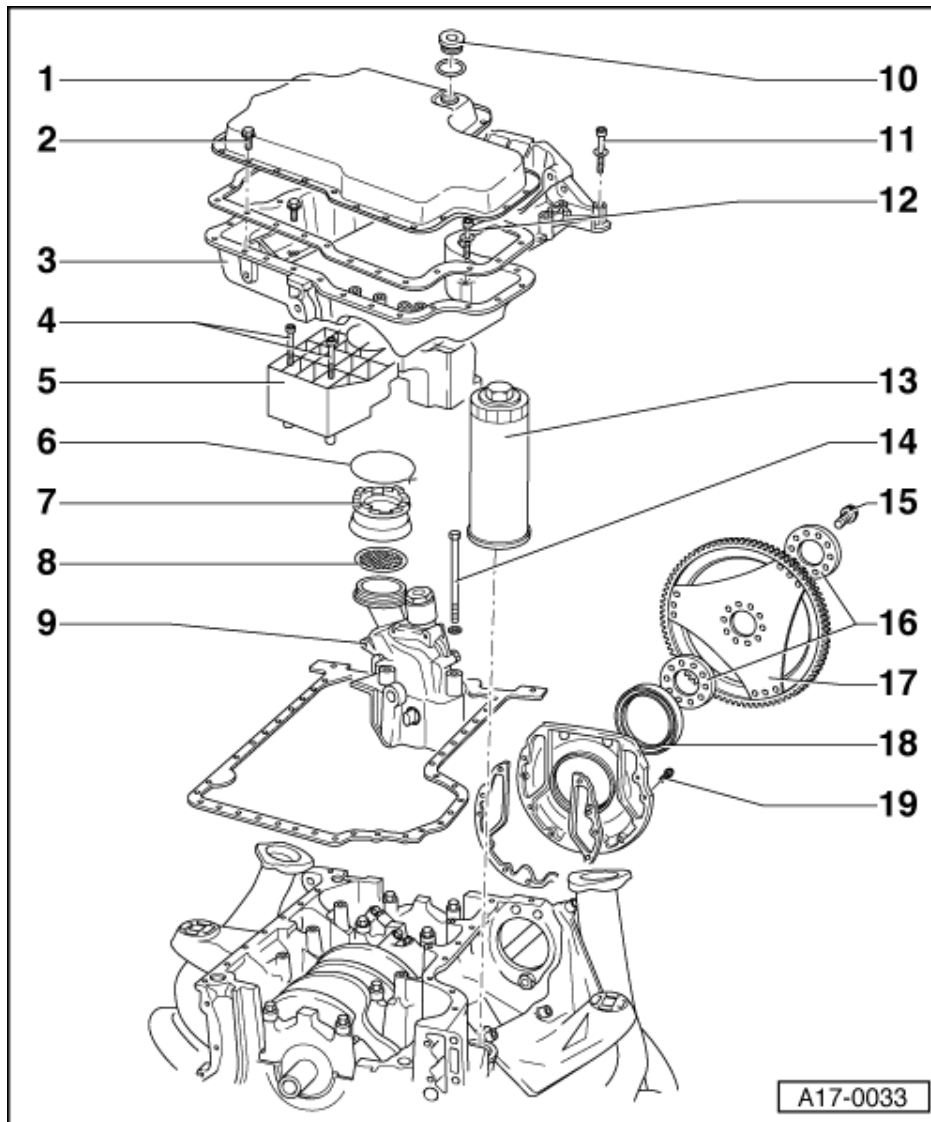
13 Oil filter, 15 Nm

14 25 Nm

15 30 Nm + 90o further

- ◆ Use locking compound D 454 300 02 when fitting
- ◆ Always replace

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16 Washer

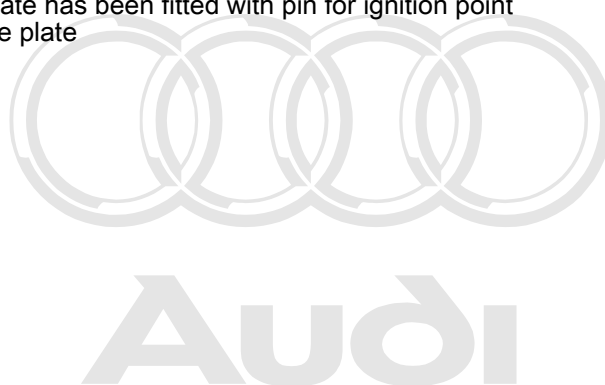
17 Drive plate

- ♦ On assembly, make sure drive plate has been fitted with pin for ignition point
- ♦ Pin length 20 to 22 mm from drive plate

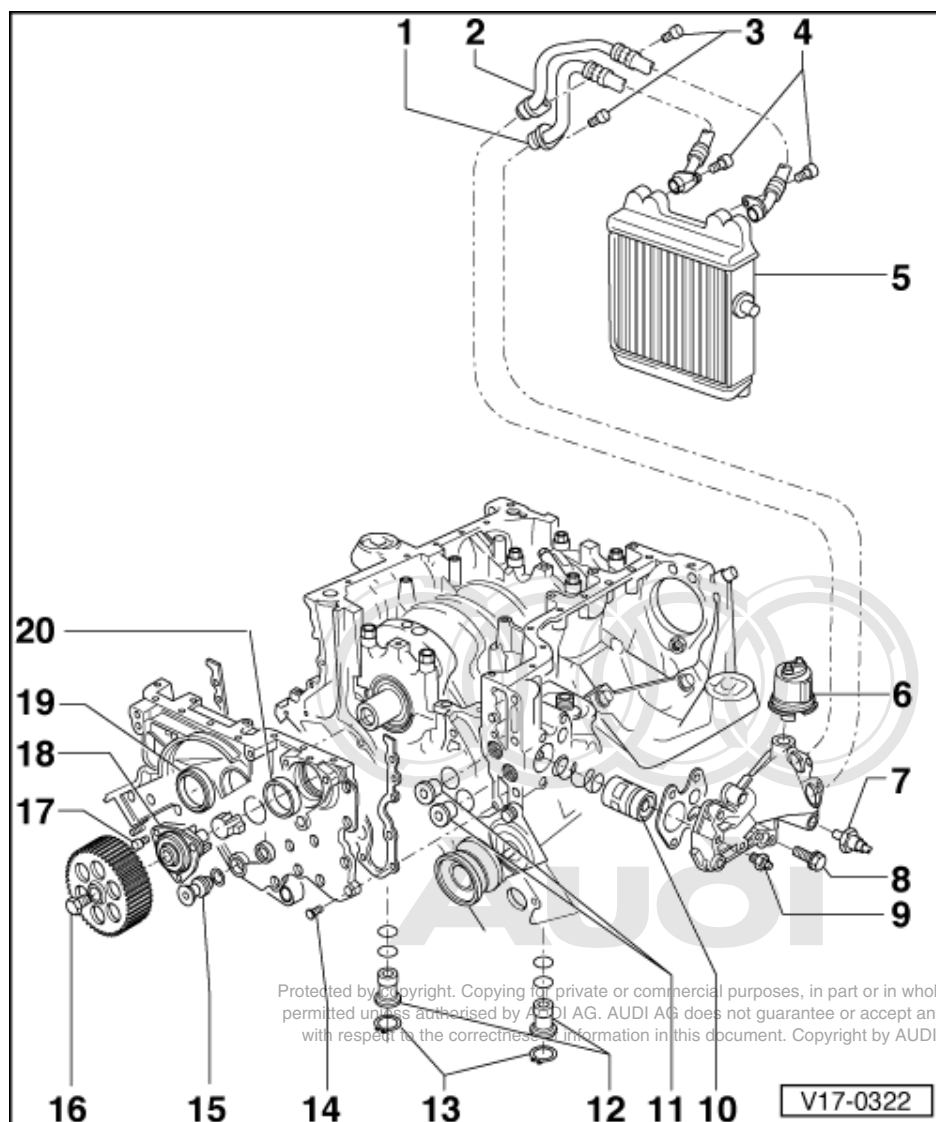
18 Oil seal

- ♦ Replacing => Page 98

19 10 Nm



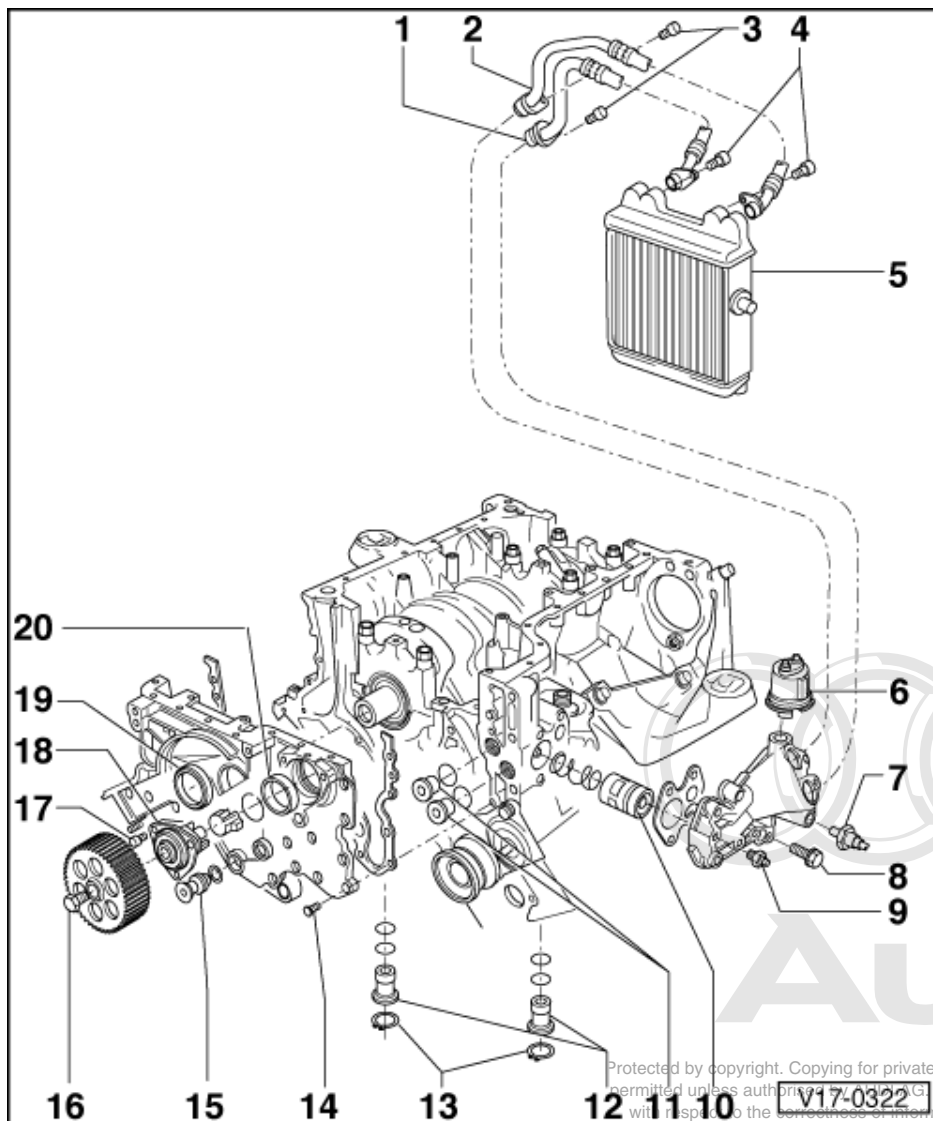
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Note:

- ♦ All the components illustrated can be removed and installed without taking out the engine.
- ♦ Always replace seals and gaskets.
- ♦ Oil fill with filter replacement 7.5 litres.

- 1 Oil return pipe
- 2 Oil supply pipe
- 3 25 Nm
- 4 25 Nm
- 5 Oil cooler
- 6 Oil pressure sensor 30 Nm
 - ♦ Use pipe wrench 3200 for removing



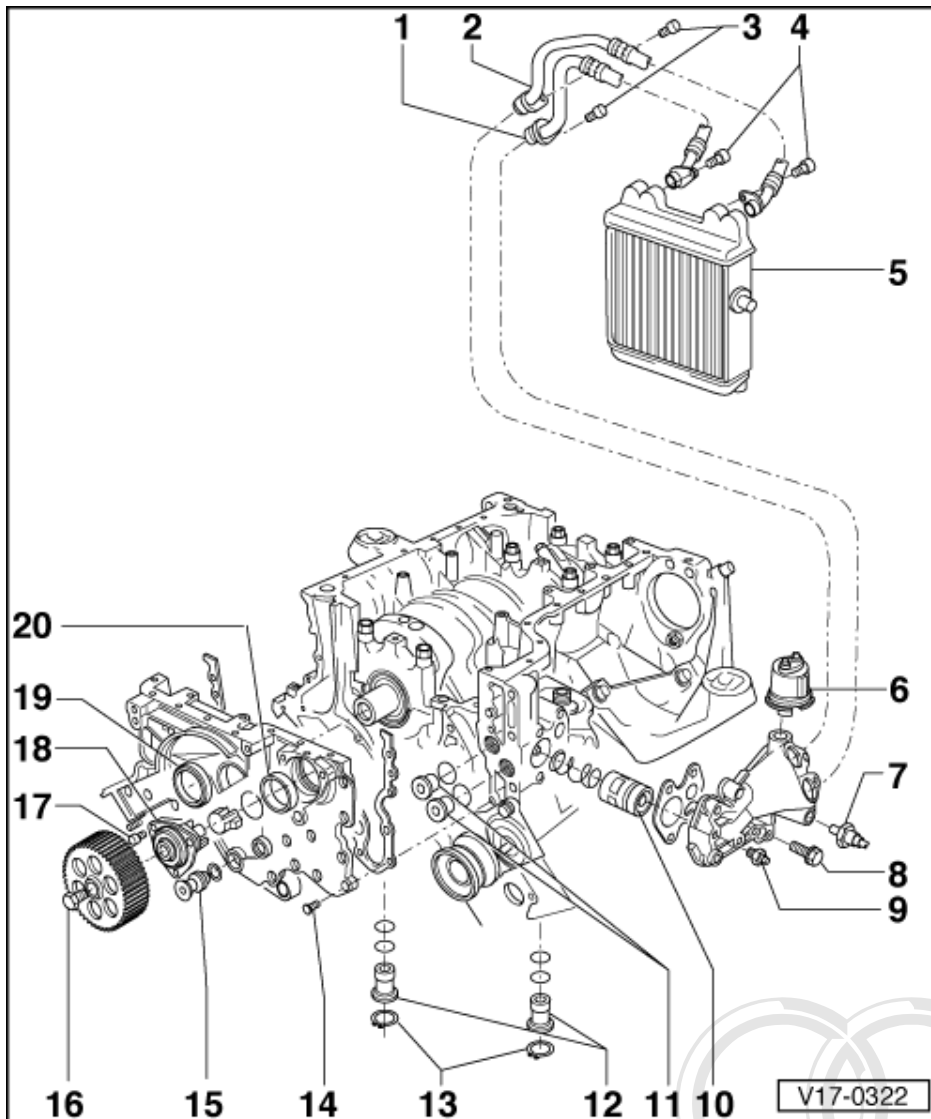
- 7 Oil pressure switch
- 8 25 Nm
- 9 Oil temperature sensor, 10 Nm
- 10 Oil thermostat for oil cooler
- 11 Plug, 35 Nm
- 12 Oil retention valve
 - ♦ Replacing => Page 99

Note:

Inspect oil pressure sensor, oil pressure switch and oil temperature sensor.

=> Electrical System; Repair Group 90; Repair dash panel insert Repair dash panel insert

- 13 Circlips
- 14 10 Nm



15 35 Nm

16 80 Nm

17 10 Nm

18 Oil pump drive

19 Crankshaft seal

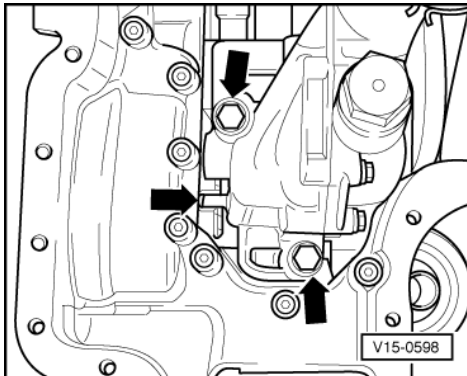
♦ Replacing => Page 97

20 Oil pump drive seal

♦ Replacing => Page 98

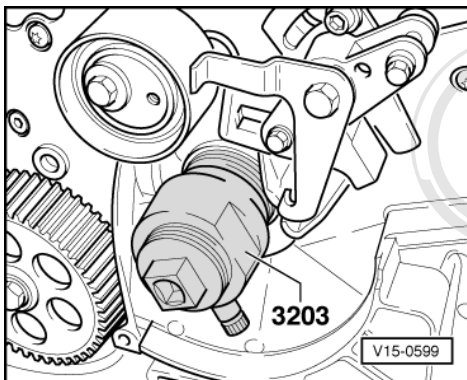
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1.2 - Removing oil pump



- Pull out dipstick.
- Drain engine oil.
- Unscrew bottom part of oil sump.
- -> Turn engine until opening (centre arrow) in oil pump drive is at bottom.
- Unscrew oil pump and pull out downwards.

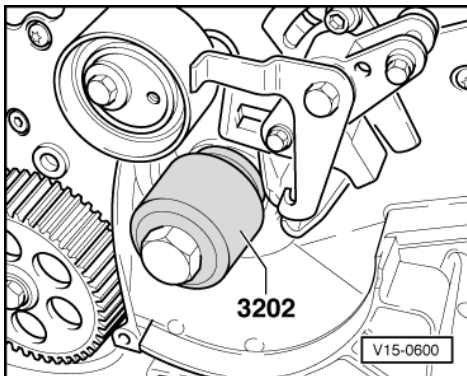
1.3 - Replacing crankshaft seal



A-Seal on toothed belt end

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- Removing toothed belts, engine codes ABH, AEC => Page 31.
- Removing toothed belts, engine code AHK => Page 45.
- Remove vibration damper.
- -> Use puller 3203 to extract seal.

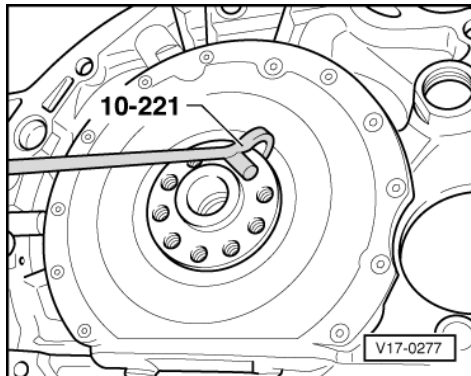


- Position seal over fitting tool from 3202.
- -> Press in seal flush with insertion sleeve 3202 and securing bolt of vibration damper.

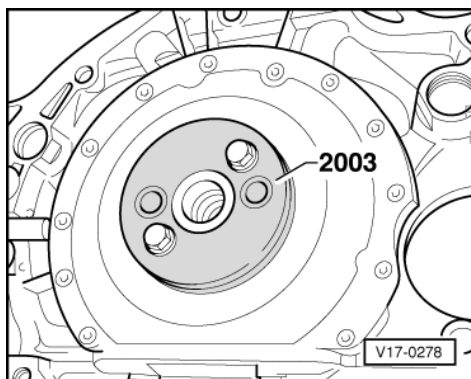
Note:

Press in seal as far as it will go if crankshaft reveals running-in marks.

B-Seal on gearbox end

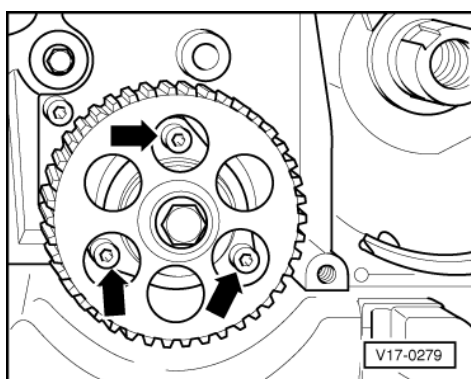


- Unscrew drive plate.
- -> Prise out seal with extractor 10-221 and holding tool (height approx. 6 mm).



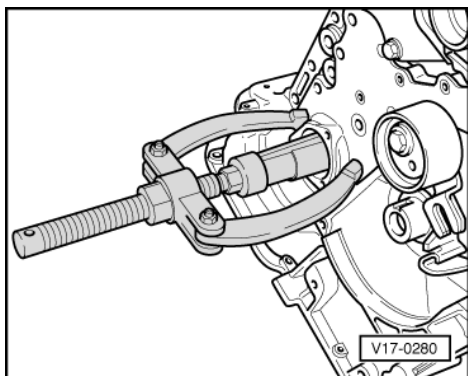
- -> Press home seal with insertion tool 2003 and bolts for drive plate.

1.4 - Replacing seal for oil pump drive

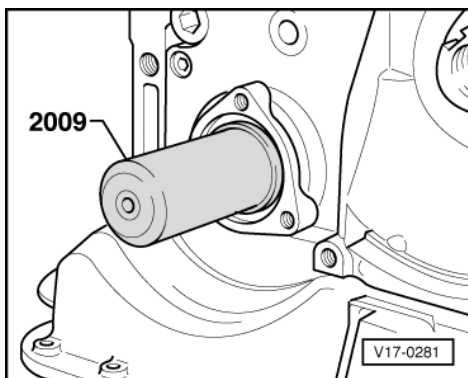


- Remove end cover at front => Page 6 .
- Removing toothed belts, engine codes ABH, AEC => Page 31 .
- Removing toothed belts, engine code AHK => Page 45 .
- Remove vibration damper.

- -> Remove oil pump drive.

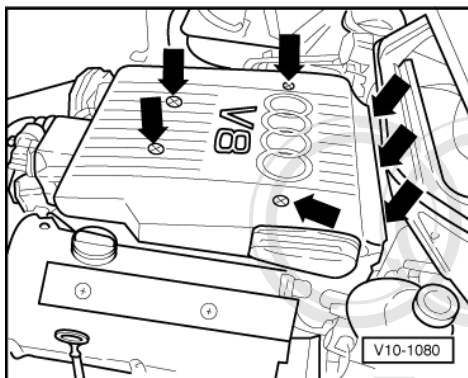


- -> Use commercially available extractor to pull out oil pump seal, e.g. Kukko No. 21/6, 37-46 mm into seal. Hand-tighten and carefully pull out with extractor Kukko 22-2.



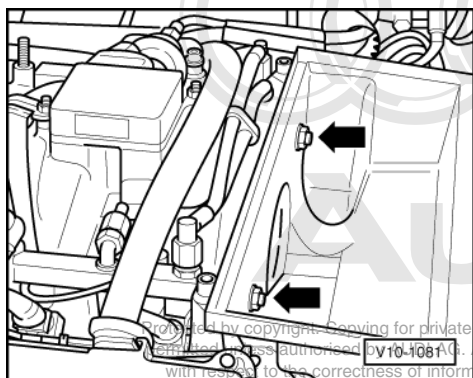
- -> Drive in seal with fitting sleeve 2009. Prior to assembly, make sure bearing of oil pump drive is running smoothly. If not: Replace oil pump drive.

1.5 - Replacing oil retention valves

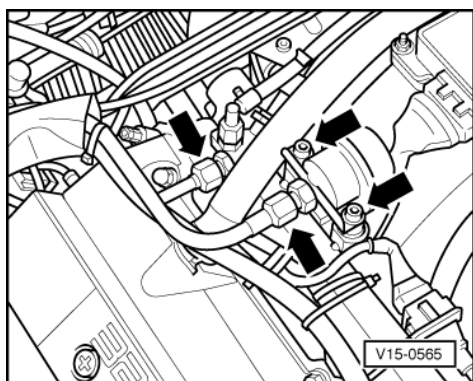


Notes:

- ◆ In the event of irregular valve noise which disappears after a lengthy journey but is repeatedly encountered when travelling short distances, replace oil retention valves.
 - ◆ The oil retention valves are located between the two cylinder banks beneath the intake manifold.
- -> Unscrew top part of air filter housing.



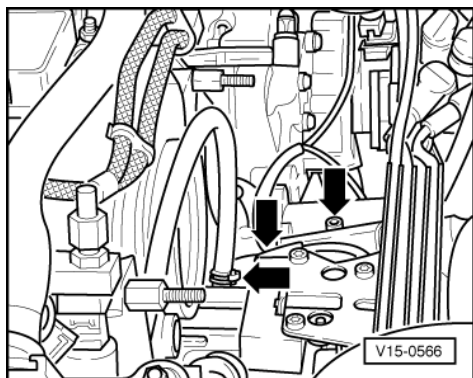
- -> Unscrew bottom part of air filter housing, press to rear and lift out upwards.



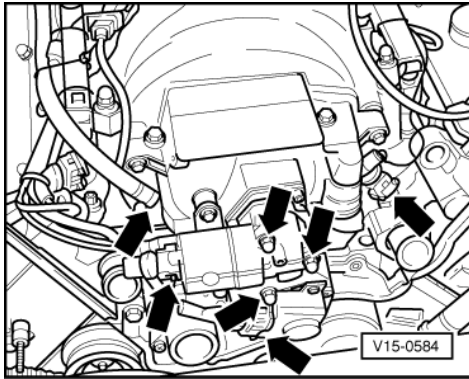
- -> Unbolt the feed pipe at the fuel manifold.
- Unscrew return pipe at fuel pressure regulator.
- Unbolt the pressure regulator from the fuel rail.

Note:

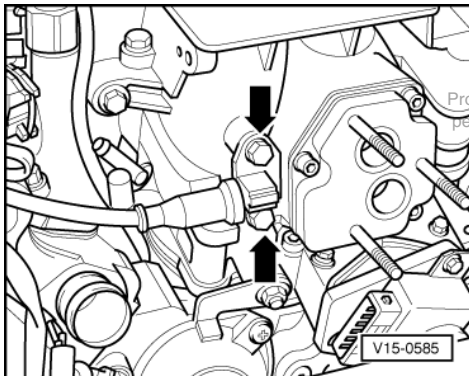
When installing fuel pressure regulator first of all press fully into the seat of the O-ring seal; do not draw in with the bolts.



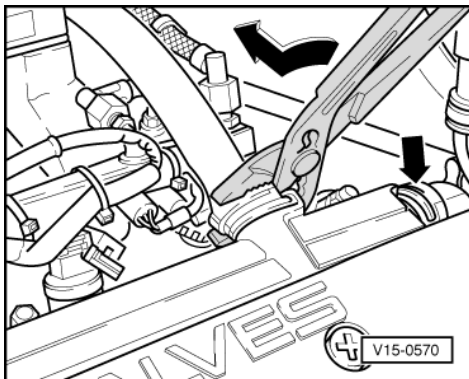
- -> Pull breather hose off intake manifold at rear.
- Pull off vacuum pipe.
- Unscrew upper part of support clamp for engine wiring loom.



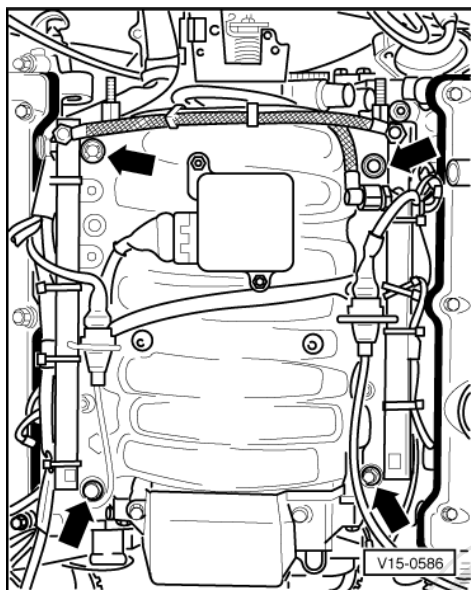
- -> Detach connector for knock sensor on left and right.
- Pull connector off hot-wire air-mass meter.
- Pull connector off throttle valve potentiometer.
- Pull connector off thermo switch.
- Remove connector at idling speed stabilisation valve.
- Remove idling speed stabilisation valve.
- Pull off hose to activated charcoal filter (ACF).



- -> Remove air temperature sensor.



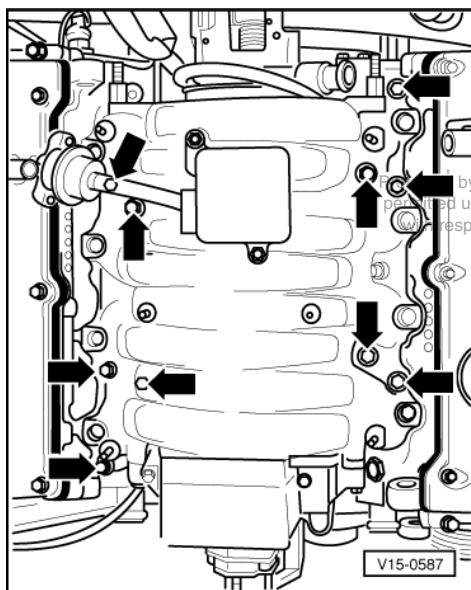
- -> Remove breather hose at top (use pliers to turn hose until retaining lug disengages).
- Remove breather hose at rear left of cylinder head.



- -> Unscrew fuel manifolds, pull out upwards complete with injectors and set down at plenum chamber.

Note:

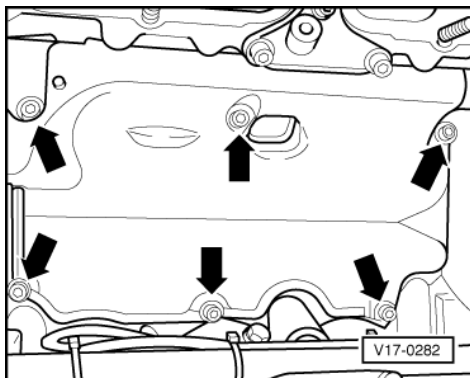
On installation, take care not to damage O-rings at injectors.



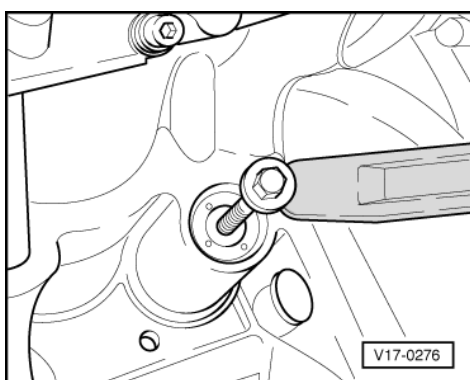
- -> Unscrew and lift out intake manifold (pay attention to front breather hose beneath intake manifold).

Note:

When installing intake manifold, first attach breather hose to engine



- -> Unscrew cover for crankcase breather.
- Remove cover and bulkhead.



- Remove retaining rings of all retention valves.
- Screw M6 x 50 bolt with large washer into oil retention valves.
- -> Lift out oil retention valves.

Note:

Before installing intake manifold, first attach front breather hose beneath intake manifold to engine.

1.6 - Checking oil pressure switch and oil pressure

Checking oil pressure switch

Visual and acoustic oil pressure indicator

Read measured value block, Audi A8 Workshop Manual, Electrical System

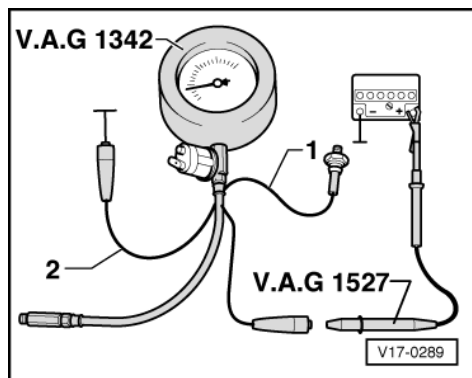
Test requirements

- Measured value block OK
- Oil level OK.
- Oil pressure warning lamp (K3) must light with ignition switched on.
- On models fitted with Auto-Check-System the OK display should come on (Select symbol)
- Engine oil temperature approx. 80°C (radiator fan must have been in operation once).

Checking oil pressure switch.

- Detach cable from the brown 0.3 bar oil pressure switch.

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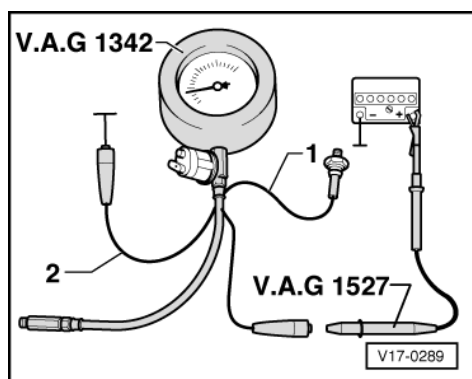
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- -> Unscrew oil pressure switch and screw in oil pressure tester V.A.G 1342.
- Connect wire -2- (brown) to earth (-).
- Connect wire -1- (blue) to oil pressure switch.
- Connect diode test lamp V.A.G 1527 to wire -1- and battery positive (+).
- Start engine and check switching points with the necessary engine speed.

Oil pressure at idling speed	1 to 2.5 bar
Oil pressure at 3000 rpm	3 to 5 bar

Notes:

- ♦ 0.3 bar oil pressure switch (brown insulation), switch opens as of 0.15 to 0.45 bar
- ♦ 1.8 bar oil pressure switch (white insulation), switch closes as of 1.6 to 2.0 bar

**Checking oil pressure**

- -> Unscrew oil pressure switch and screw in V.A.G 1342.
- Screw oil pressure switch into V.A.G 1342.
- Start engine.
- Engine oil temperature at least 80°C.

Oil pressure at idling speed	1 to 2.5 bar
Oil pressure at 3000 rpm	3 to 5 bar

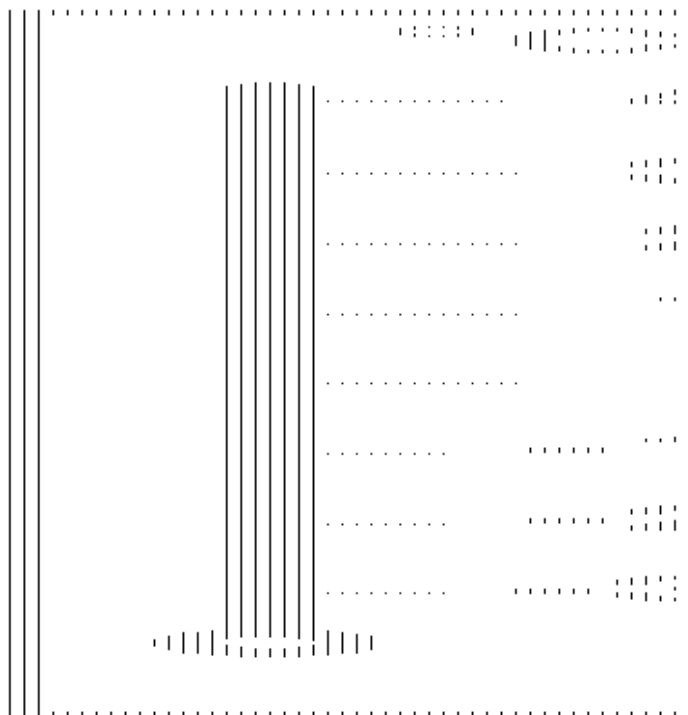
Note:

If the oil pressure is far too high (relief valve sticking or incorrectly installed) too much pressure will be exerted on the hydraulic tappets. The engine cuts out shortly after being started and the next time starting is attempted, it is revved at a noticeably high level by the starter due to lack of compression.

1.7 - Engine oil

The engine is factory-filled with a special quality multi-grade oil which can be used as an all seasons oil except in extremely cold climatic zones.

The specific stated here must be indicated individually or together with other specifications on the container.



When topping up, different types of oil may be mixed, if necessary.

-> The viscosity class of the oil should be selected in accordance with the chart opposite. If the outside temperature briefly exceeds the ranges stated it is not necessary to change the oil.

Engine code AHK

When topping up/replacing engine oil only synthetic oils of viscosity class SAE 5W-40 in conjunction with VW-Standard 500 001) may be used.

- 1) The date given after the VW specification must not be earlier than 10.91.

A- Multigrade high-lubricity oils, specification VW 500 001)

B- Multigrade-high-lubricity oils, specification VW 501 011)

- Multigrade-high-lubricity oils, specification API-SF2)or SG2)

- 1) The date given after the VW specification must not be earlier than 10.91.
- 2) These oils may only be used if no approved engine oil is available.

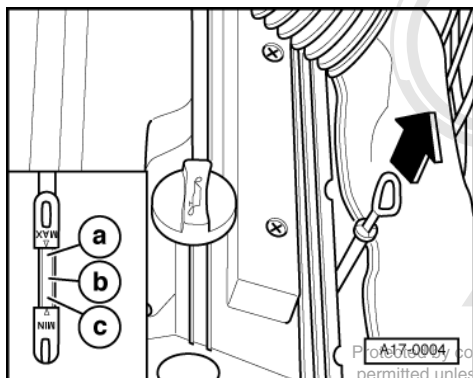
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1.8 - Checking oil level

Notes:

- ♦ Engine must be warm (oil temperature greater than 60 °C) when checking oil level.
- ♦ The car must be standing on level ground when checking the oil level.
- ♦ After switching off the engine wait a few minutes to allow the oil to flow back into the sump.
- Pull out dipstick, wipe with a clean cloth and insert it again as far as it will go.



- 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.
After doing so, it may be that the oil level is then in range a.
- c - Oil must be topped up.
After topping up it is sufficient for the oil level to be somewhere in the range b (knurled area).

Oil fill with filter replacement: 7.5 ltr.

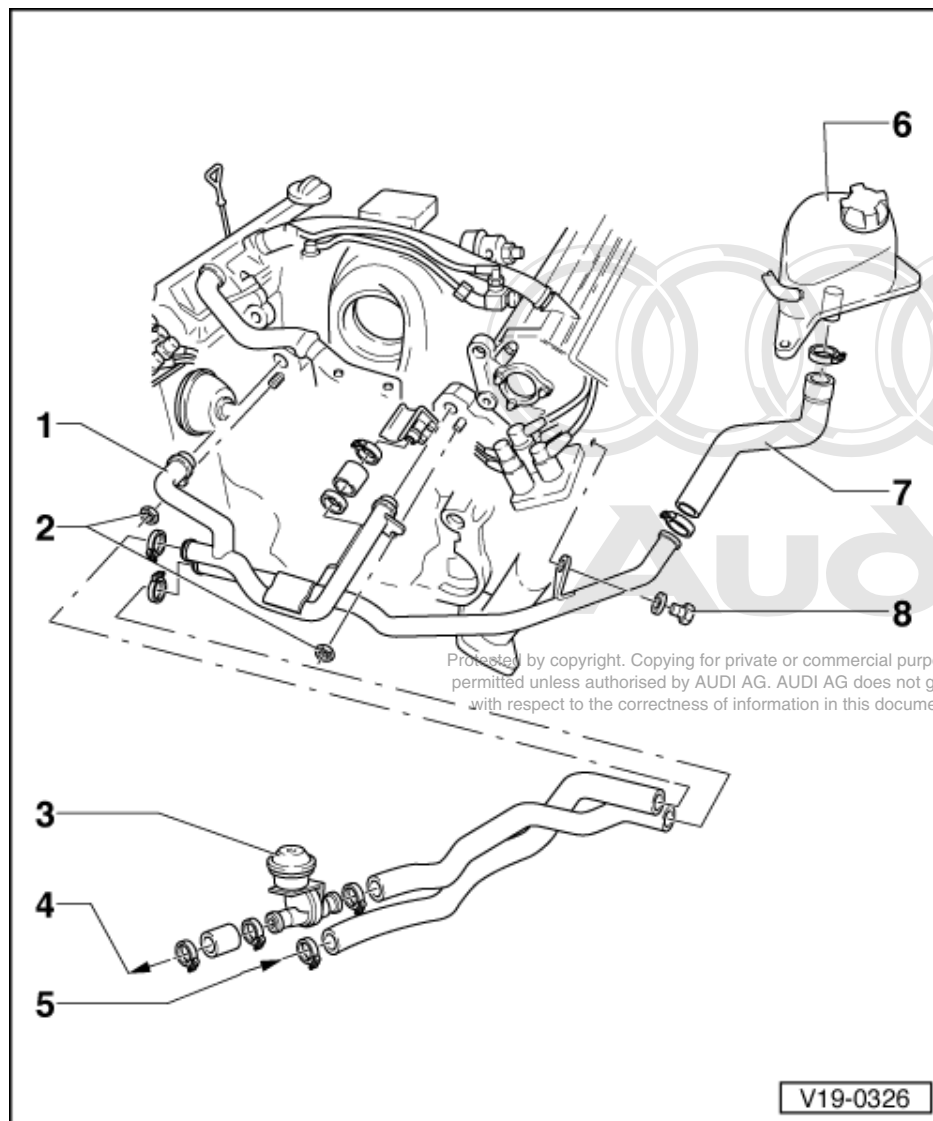
Note:

The oil level must not exceed the max. marking 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



Notes:

- ♦ Renew all gaskets and seals.
- ♦ Draining off and topping up coolant =>Page 110 .
- ♦ Checking cooling system for leaks => Page 113 .

1 Expansion tank

2 Lower coolant hose

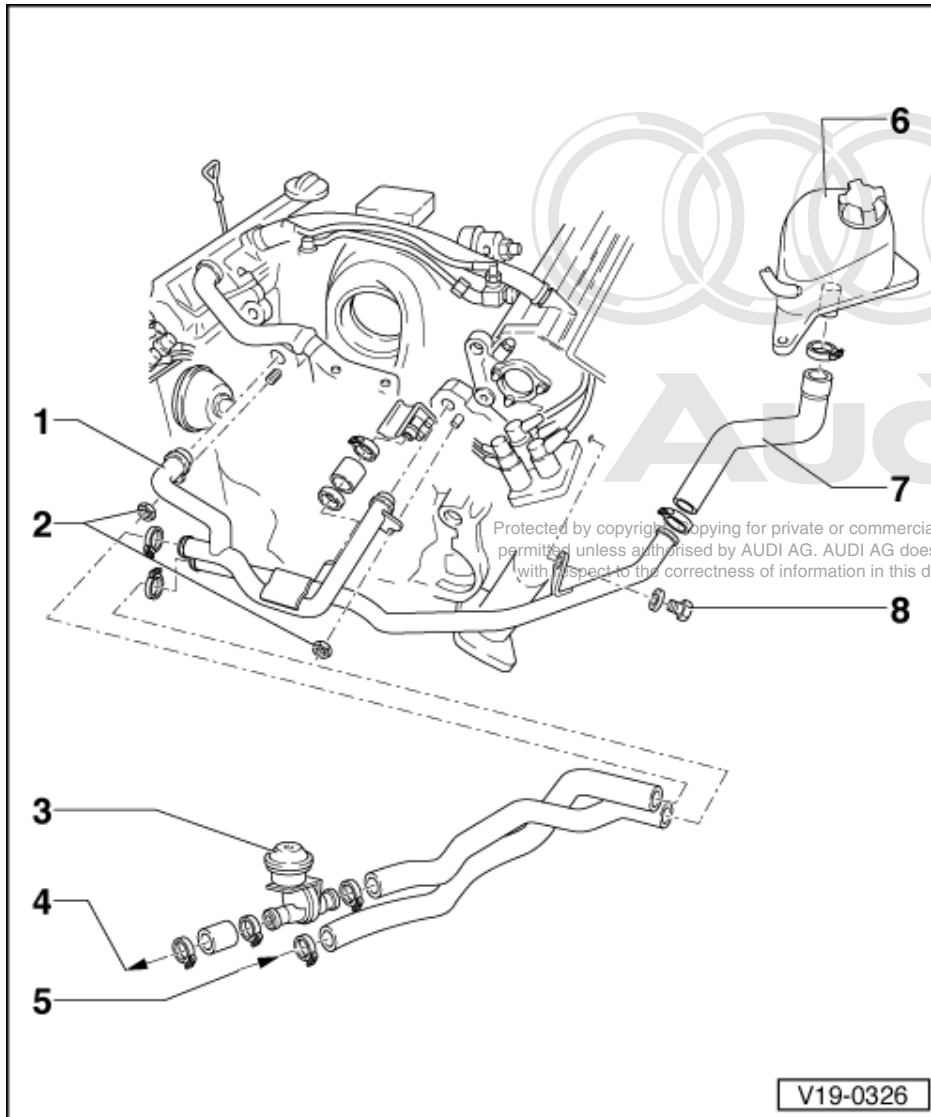
3 Thermostat

- ♦ Installation position =>Page 110
- ♦ Start of opening approx. 87o
- ♦ End of opening approx. 102o

4 10 Nm



- 5 Upper coolant hose
- 6 Vent pipe

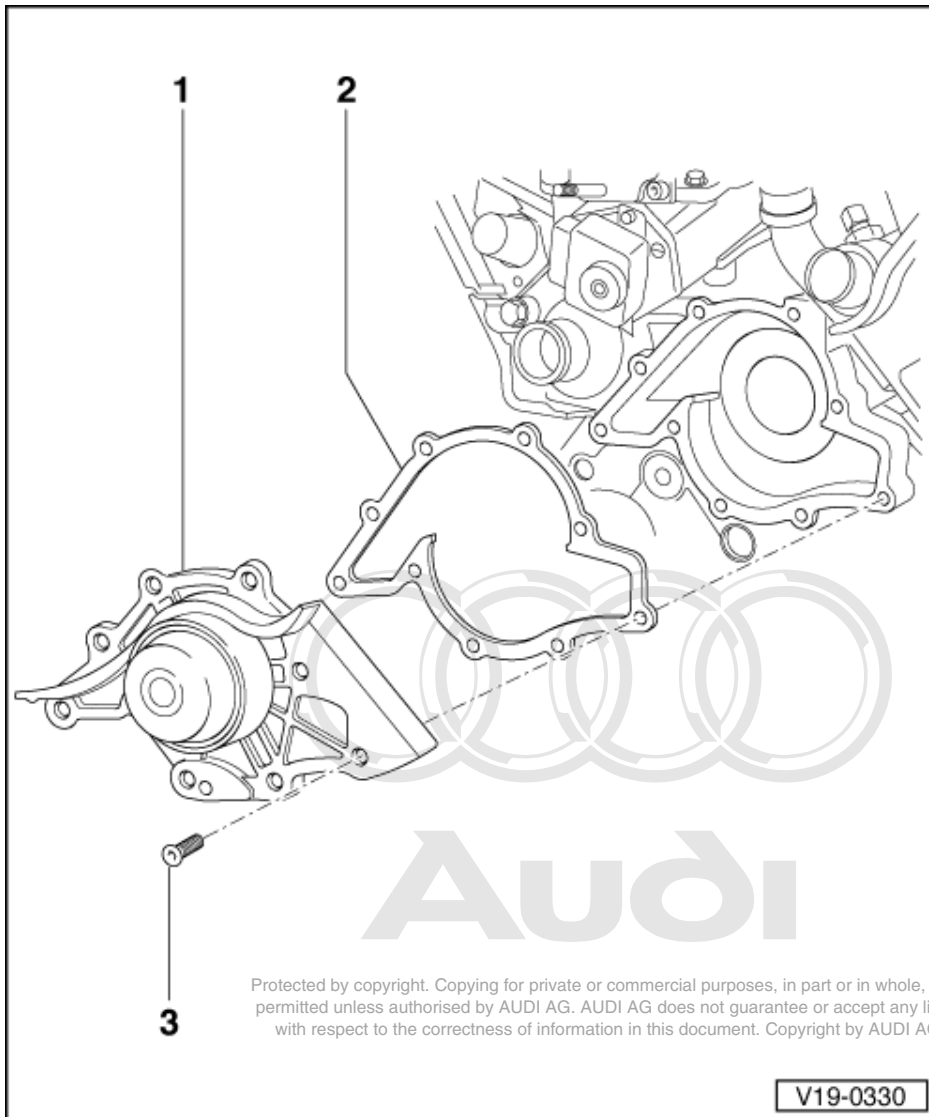


- 1 Coolant pipe
- 2 10 Nm
- 3 Coolant shut-off valve
 - ♦ Checking

=> Heating, Air Conditioner; Repair Group 01

- 4 From heating-system heat exchanger
- 5 To heating-system heat exchanger
- 6 Expansion tank
- 7 Coolant expansion pipe

1.2 - Coolant pump



Notes:

- ♦ Always replace seals and gaskets.
- ♦ Draining off and topping up coolant =>Page 110 .

1 Coolant pump

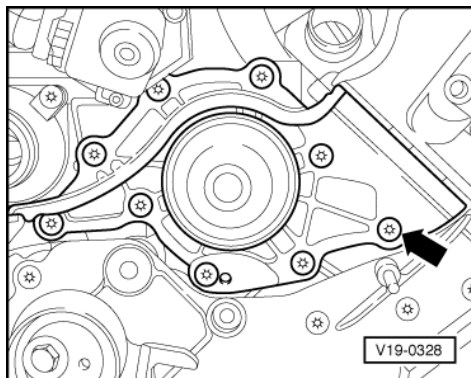
- ♦ Removing => Page 110

2 Gasket

3 10 Nm

Removing coolant pump

- Removing toothed belts, engine codes ABH, AEC => Page 31 .



- Removing toothed belts, engine code AHK => Page 45 .

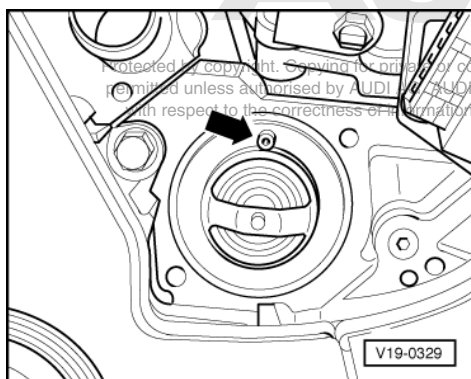
Notes:

The vibration damper does not have to be unbolted or removed.

- Unscrew toothed-belt tensioner.
- -> Remove coolant pump (9 x Torx screws).

Replacing thermostat.

- The thermostat is located at the front right of the engine beneath the intake manifold.



- -> Installation position of thermostat

Note:

Install with bleeder valve facing upwards.

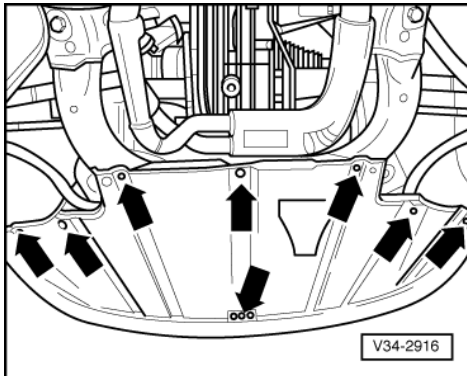
Starts to open	87o
Fully open	102o
Opening travel	8 mm

Draining and filling cooling system

Notes:

- ♦ The cooling system is filled all year round with water, anti- freeze and anti- corrosion agent G 011V 8B. G 011 V 8B prevents frost and corrosion damage and a formation of scale. G 011 V 8B in addition raises the boiling temperature of the coolant. For these reasons the cooling system must be filled all year round with the correct anti - freeze and anti - corrosion additive. G 011 V 8B.

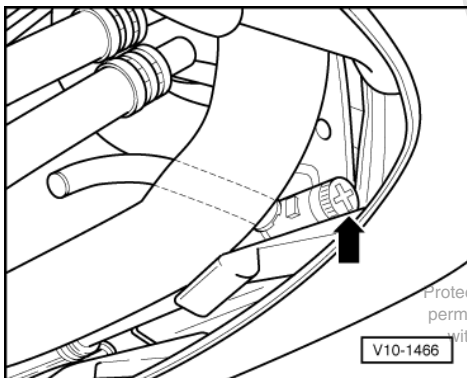
- ♦ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.



- ♦ Recommended mixture ratio: 50:50
- ♦ Coolant quantity approx. 8.5 l

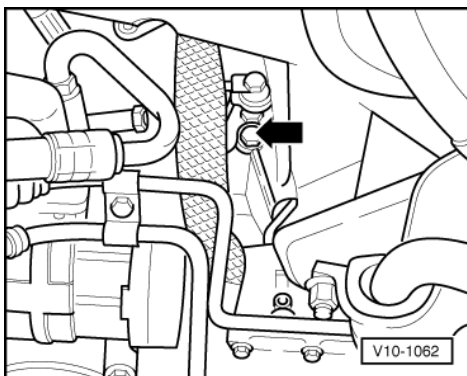
Draining

- Carefully unscrew filler cap on expansion tank to relieve pressure then tighten again.
- -> Remove noise insulation panel.

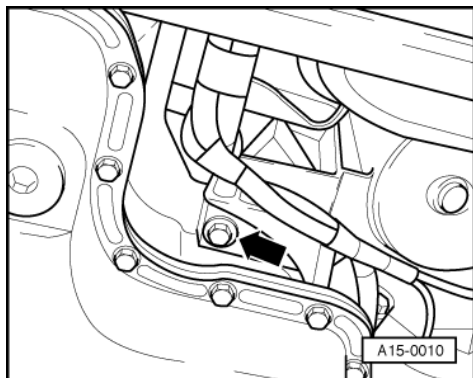


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- Place collection container V.A.G 1306 under vehicle.
- -> Attach auxiliary hose $\varnothing$ approx. 12 mm of dia. to drain cock of radiator and drain off coolant.



- -> Open drain screw on engine on left beneath knock sensor.



- -> Open drain screw at oil cooler housing behind oil filter.
- Unscrew return pipe from radiator to expansion tank at radiator.
- Close off pipe connection at radiator with finger.
- Blow compressed air into the detached return pipe until no further coolant emerges at any of the three drain openings.
- Reconnect bleeder pipe to radiator.
- Close drain cock at radiator and pull hose off connection piece.
- Screw in (20 Nm) the two coolant drain screws on the left and right of the engine block. Replace gaskets.

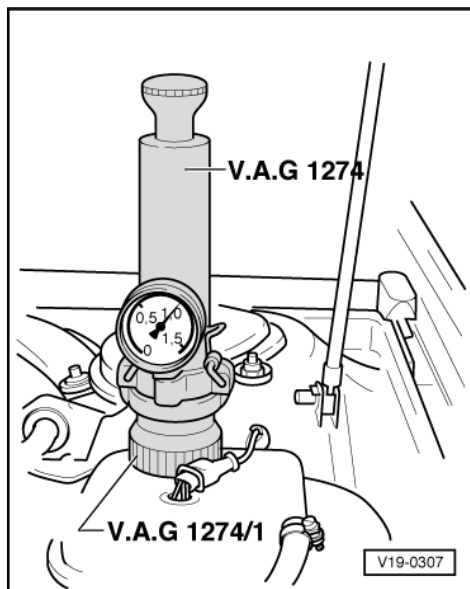
Fill up

Note:

Only use the coolant additive G 011 V 8B.

- Switch ignition on.
- Set air conditioner to HI.
- Switch off ignition.
- Open bleeder screw at heating-system heat exchanger approx. 2 turns.
- Put in coolant. Squeezing the top hose several times will help to force out the air.
- Allow engine to warm up. Leave AC set to HI until a coolant temperature of slightly less than 100°C is indicated. The engine is to be warmed up at a speed of between 2000 and 3000 rpm with several brief increases to 4000 and 5000 rpm.
- Stop engine. Wait for about 5 - 10 minutes and then carefully open filler cap on expansion tank (system will be under pressure).
- Top up coolant to max. mark.
- Close filler cap on expansion tank.
- Run engine and repeat topping up procedure as necessary.

1.3 - Checking cooling system for leaks

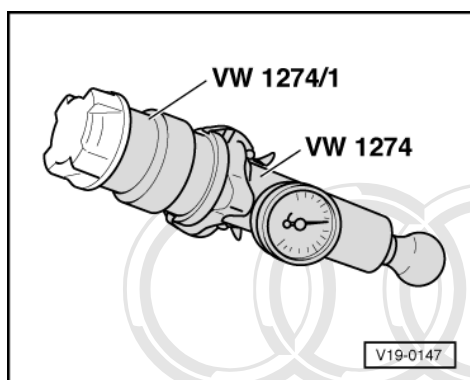


Note:

Engine must be at operating temperature.

- -> Fit tester onto expansion reservoir.
- Use hand pump of tester to generate a pressure of 1.0 bar. If this pressure is not maintained, locate and rectify leaks.
- Insert noise insulation.

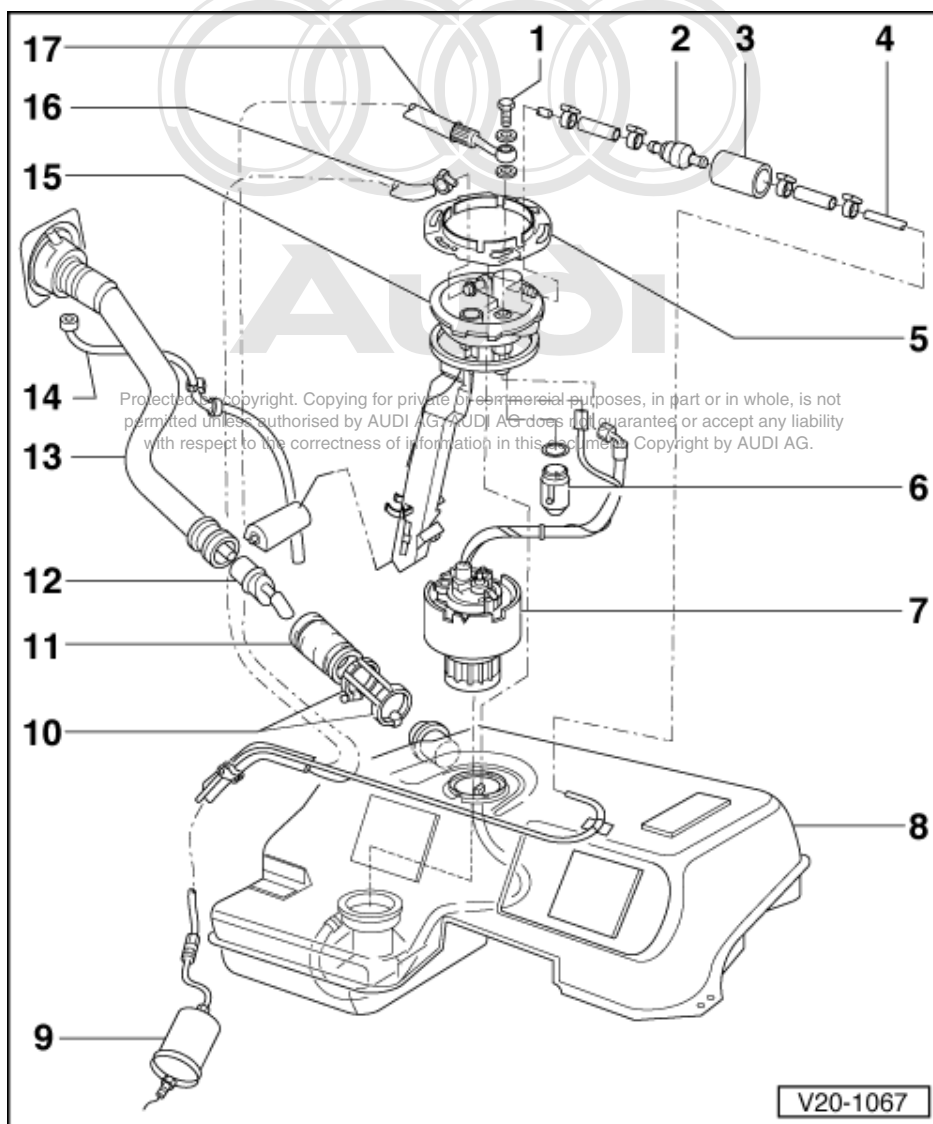
1.4 - Checking pressure relief valve in cap



- -> Fit filler cap on tester.
- Build up pressure with hand pump.

Pressure relief valve should open at an overpressure of 1.2 - 1.5 bar.

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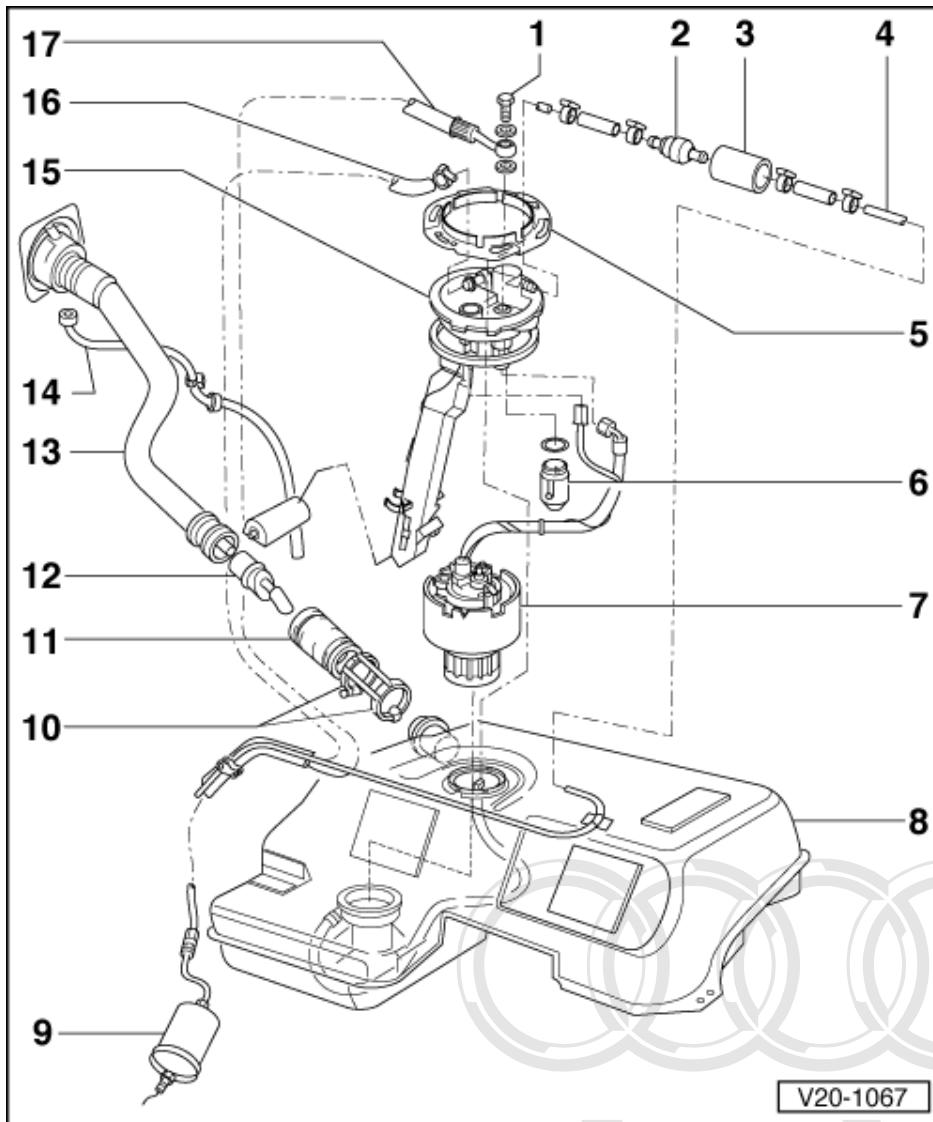


♦ Testing fuel pump relay

=> Motronic fuel injection and ignition system (8-cylinder); Repair Group 24; Servicing Motronic fuel injection system; Testing fuel pump relay Servicing Motronic fuel injection system Testing fuel pump relay

- ♦ Take care not to damage wiring when removing and installing fuel gauge sender.
- ♦ Pay attention to cleanliness rules=> Page 118 .

- 1 Union screw, 20 Nm
- 2 Air admission and release valve
- 3 Protective sheathing
- 4 Vent pipe to activated charcoal filter
- 5 Locking ring
 - ♦ Removing => Page 119



6 Gravity valve

7 Fuel pump

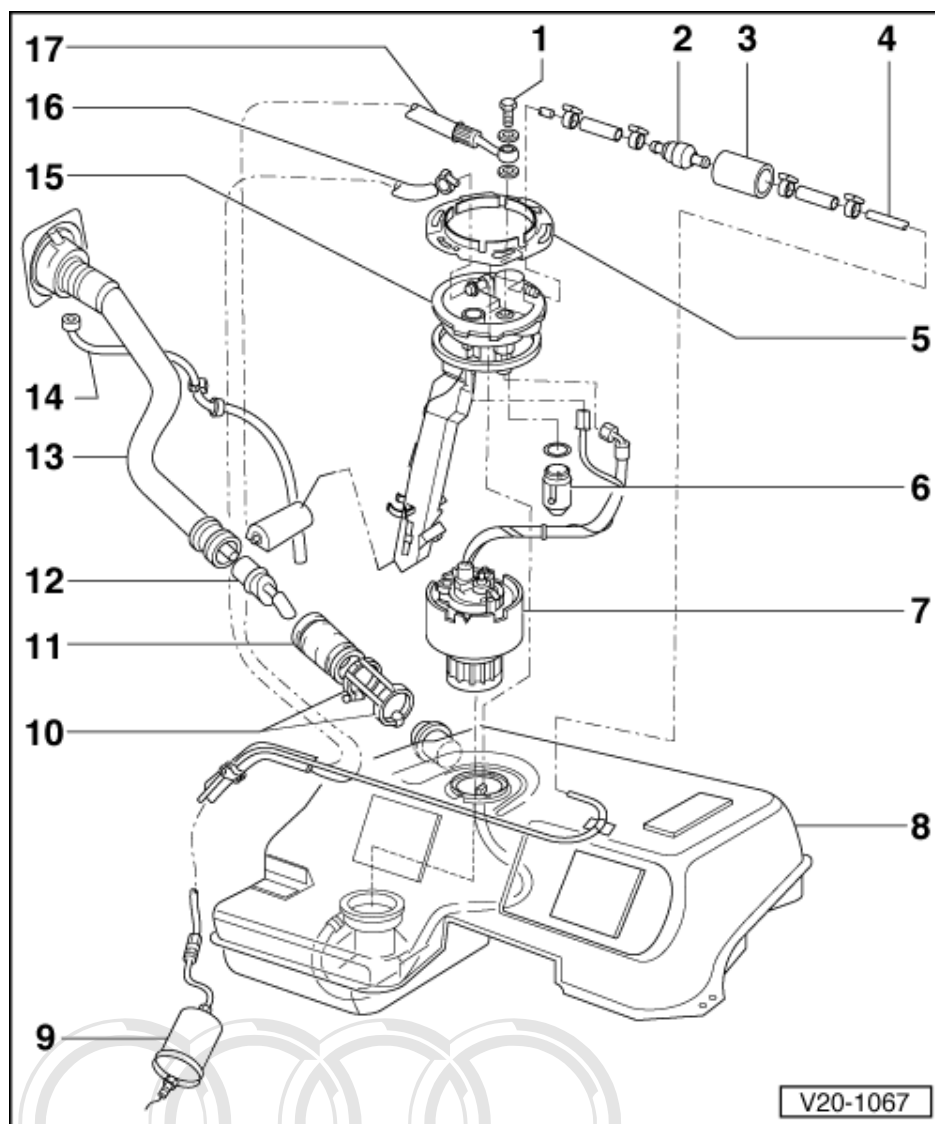
- ♦ Removing and installing => Page 120
 - ♦ Disassembling and assembling => Page 121
 - ♦ Inspecting => Page 121
 - ♦ Checking delivery => Page 123
 - ♦ Checking non-return valve => Page 124
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8 Fuel tank

9 Fuel filter

- ♦ Installation position =>Page 118

10 Twin clamp



- 11 Hose for filler pipe
- 12 Check flap
- 13 Filler pipe
- 14 Overflow hose
- 15 Fuel gauge sender
- 16 Return pipe
- 17 Supply pipe

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1.2 - Safety precautions when performing work on fuel tank

Pay attention to the following when removing fuel gauge sender or fuel pump from or installing them in completely or partially filled fuel tanks:

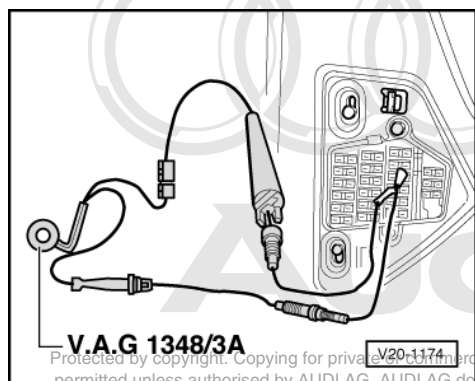
- The fuel tank must not be more than 2/3 full; if necessary, draw off fuel with extractor V.A.G 1433 A.
- Prior to commencement of work the extraction hose of an exhaust extraction system must be positioned close to the assembly opening of the fuel tank in order to be able to immediately extract the fuel vapours emerging after opening the cap. If no exhaust extraction system is available use can be made of a radial fan with a delivery volume of more than 15 m³/h (fan motor not in air flow).

- Always wear fuel-resistant gloves if removal or installation of fuel pump involves coming into contact with fuel.

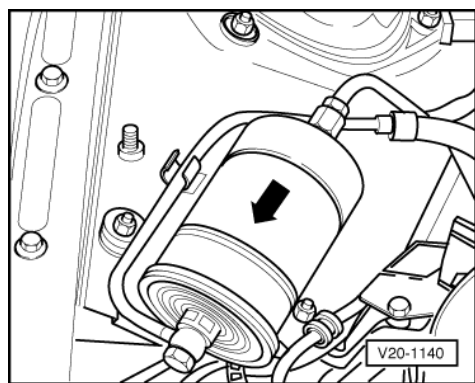
1.3 - Cleanliness rules when working on fuel supply system

- Thoroughly clean all connections and the surrounding areas before disconnecting.
- Place removed parts on a clean surface and cover. Use foil or paper. Do not use fibrous cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean parts.
- Do not remove replacement parts from their wrapping until immediately prior to installation.
- Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- Avoid moving vehicle when systems are open.

1.4 - Connecting remote control V.A.G 1348/3A



- Remove the cover for the fuse holder in the left of the dash panel.
- Remove fuse no. 17 (10 A) for fuel pump and fuse 19 (25A) for diagnostic connection from the fixture.
- -> Connect remote control V.A.G 1348/3 A using auxiliary cables from V.A.G 1594.



-> Installation position of fuel filter

The fuel filter is on the underside of the vehicle at the rear right beneath the trim in front of the rear axle.

- Unscrew trim.

Note:

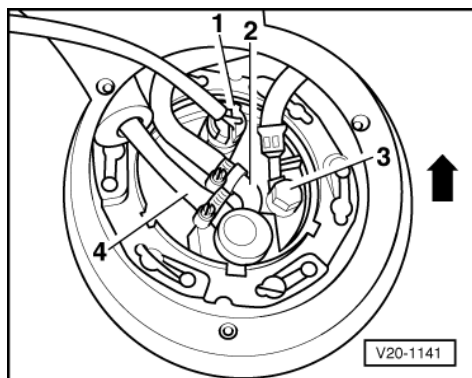
The arrow shows the direction of flow to the engine.

1.5 - Removing and installing sender for fuel supply display

Removing

Notes:

- ◆ Observe safety precautions => Page 117
- ◆ The fuel tank should not be more than 1/2 filled. Use fuel extraction device V.A.G 1433 A to empty the fuel tank as much as necessary.
- ◆ Ask customer for radio anti-theft code.
- ◆ Battery is located on right of luggage compartment beneath trim.

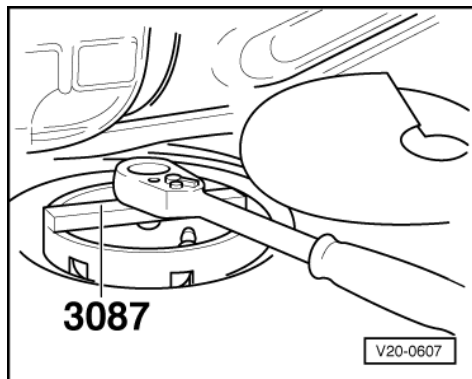


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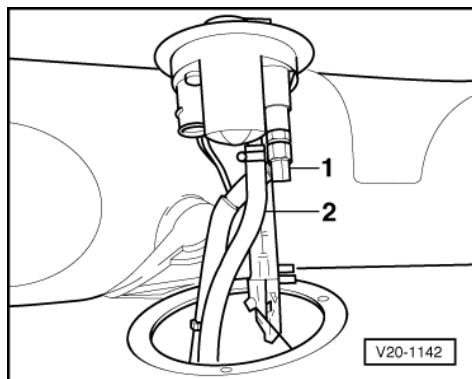
- With the ignition switched off disconnect the battery earth strap.
- Remove the trim panel of the rear axle tunnel in the luggage compartment.
- -> Unplug the electrical connection for the fuel gauge and fuel pump-1-.
- Disconnect fuel feed -3- and fuel return -2- and vent pipe-4-.

Note:

The arrow in illustration points in drive direction.



- -> Use special tool 3087 to open the end ring and carefully lift sensor.



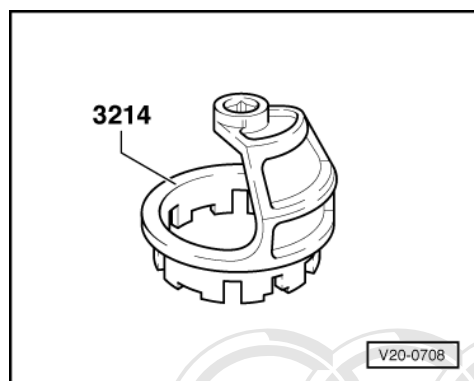


- -> Disconnect feed pipe -1- and return flow pipe -2- on the inside of the sensor housing.
- Unplug electrical connection to the fuel pump.

Note:

When installing ensure that the cables/pipes as shown in the illustration are installed in such a way that they cannot affect proper operation of the fuel gauge sender.

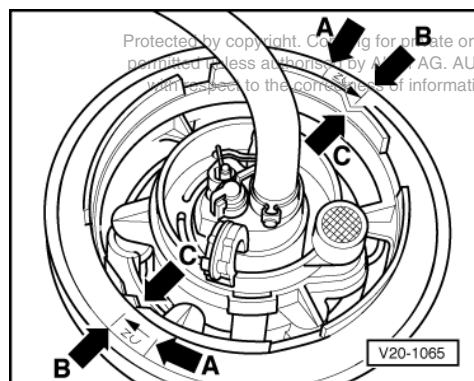
1.6 - Removing and installing fuel pump



Removing

- Remove fuel gauge sender => Page 119.
- -> Use special tool 3214 to turn pump housing in the fuel tank about 15 mm to the left.
- Carefully lift pump up and out.

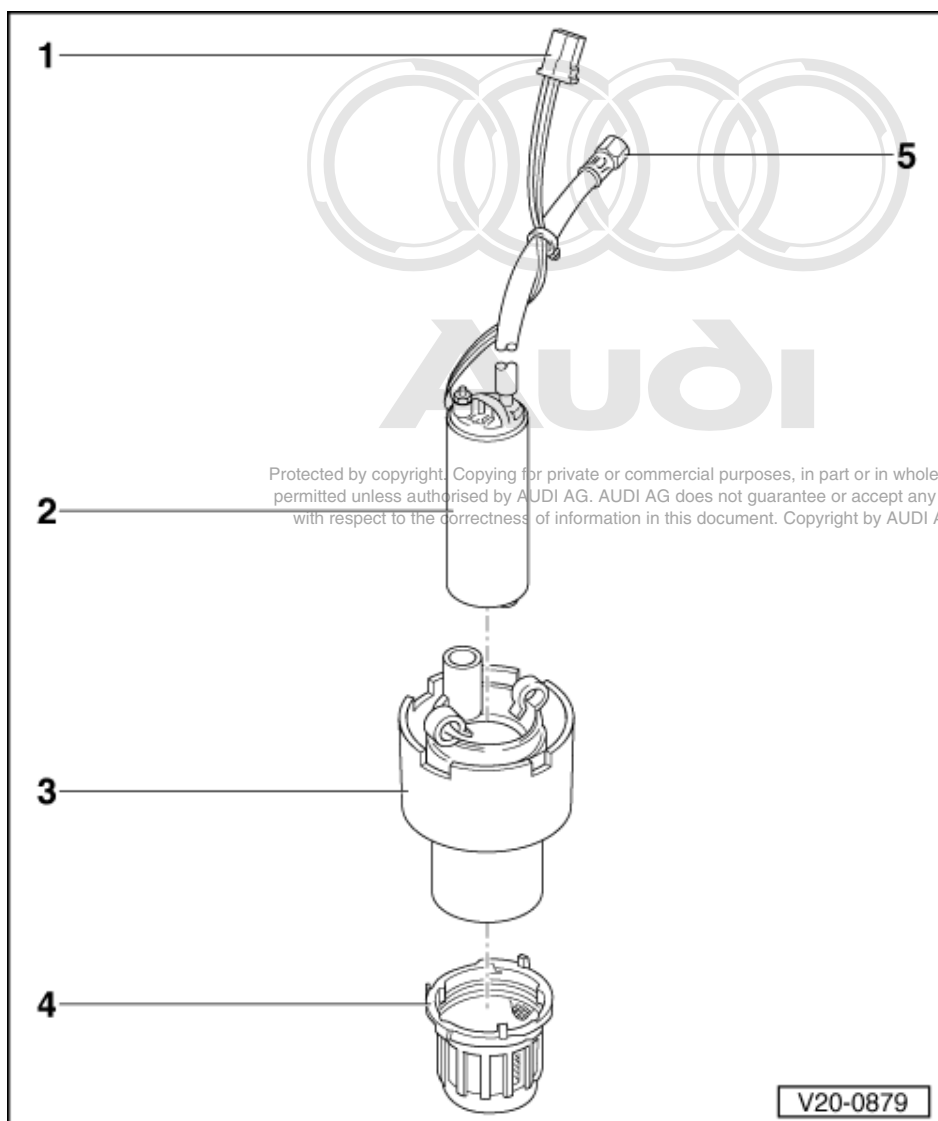
Installing:



- -> Insert fuel pump into the reservoir housing so that the notch -C- is aligned with the marking -A-.
- Fit special tool 3214 onto the fuel pump.
- Turn fuel pump until the notch -C- is positioned at the marking -B-.
- Further installation takes place in the reverse sequence to removal.

2 - Dismantling and assembling fuel pump

2.1 - Dismantling and assembling fuel pump



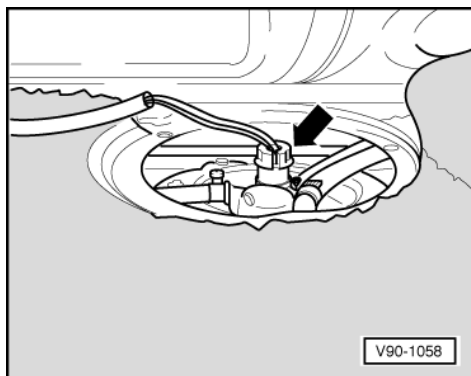
- 1 Electrical connection for fuel pump
- 2 Fuel pump
 - ♦ Inspecting => Page 121 .
- 3 Baffle housing
- 4 Strainer
- 5 Supply pipe

2.2 - Testing fuel pump

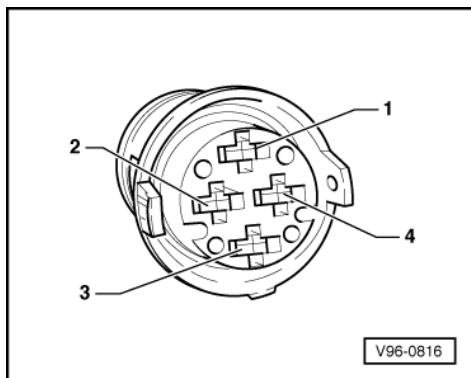
Test requirements

- Fuse no. 17 in fuse holder in left of dash panel OK.
- Fuel filter OK

- Battery fully charged (at least 12 V).
- Connect remote control => Page 118



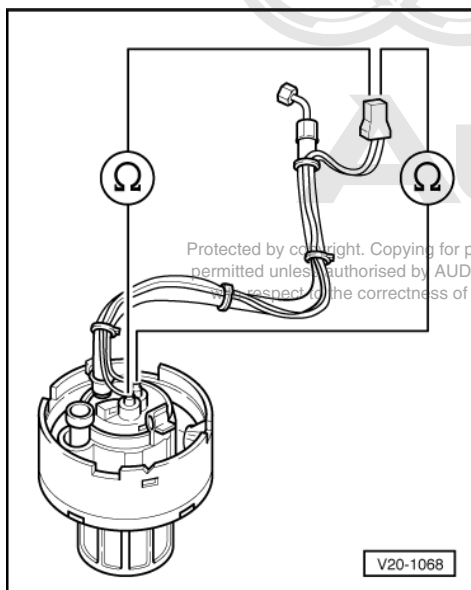
- Remove cover for fuel gauge sender and fuel pump under trim in luggage compartment (right side).
- -> Pull off connectors for fuel pump and fuel gauge.



- -> Use voltmeter to check voltage at connector between contact 1 (green/yellow) and 4 (brown); to do so, keep switch on remote control constantly pressed.

Specification: Approx. battery voltage

- If desired value is not attained, eliminate cable break or short circuit.
- If specified value is attained, reattach connector.



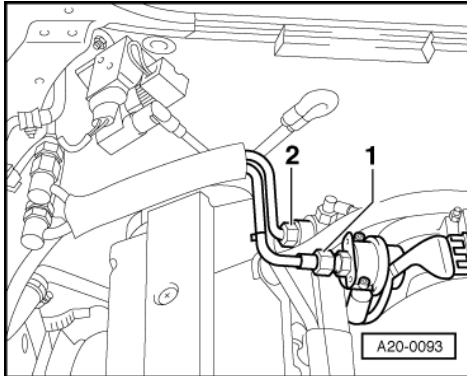
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- Press remote control switch. If fuel pump is not running audibly, remove fuel pump => Page 120 .
- -> Use an ohmmeter to test the cable between connector and fuel pump for continuity.

Specification: 0 Ohms

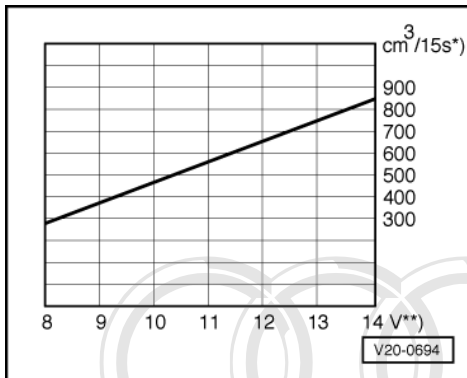
- If specified value is not attained replace wiring.
- If specified value is attained replace fuel pump.

2.3 - Checking fuel pump delivery rate



Test requirements

- Fuse no. 17 in fuse holder in left of dash panel OK.
- Fuel filter OK
- Battery fully charged (at least 12 V). 12 V).
- Connect remote control => Page 118
- -> Disconnect return flow pipe -arrow-.
- Hold feed pipe in measuring glass.



- -> Test delivery; to do so actuate switch on remote control V.A.G 1348/3 A for 15 seconds (keep button constantly pressed).

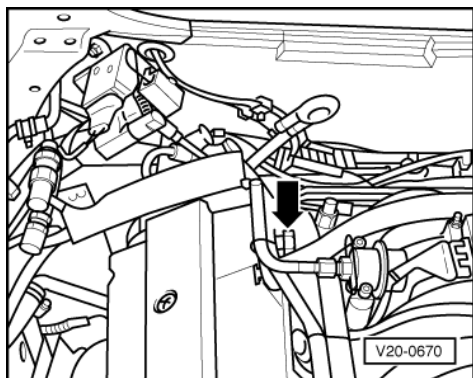
Refer to the diagram for the specifications for testing the minimum delivery.

*) Minimum quantity cm³/15 s measured at the feed pipe.

**) Voltage at fuel delivery pump with engine stationary and pump running (approx. 2 volts less than battery voltage).

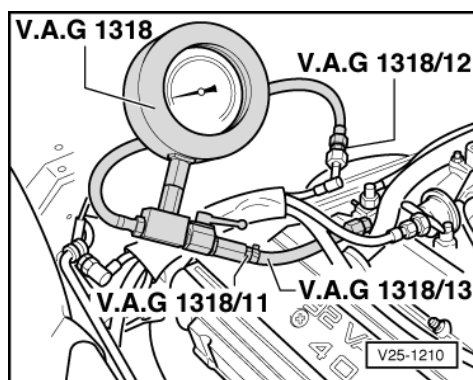
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2.4 - Testing non-return valve of fuel pump



Notes:

- ♦ Testing requires that pressure regulator, fuel pump and injectors are functioning properly and that there are no leaks in the piping system.
- ♦ The lever of the pressure measuring device must remain closed during the measurement.
- -> Unscrew fuel feed pipe at fuel distributor.



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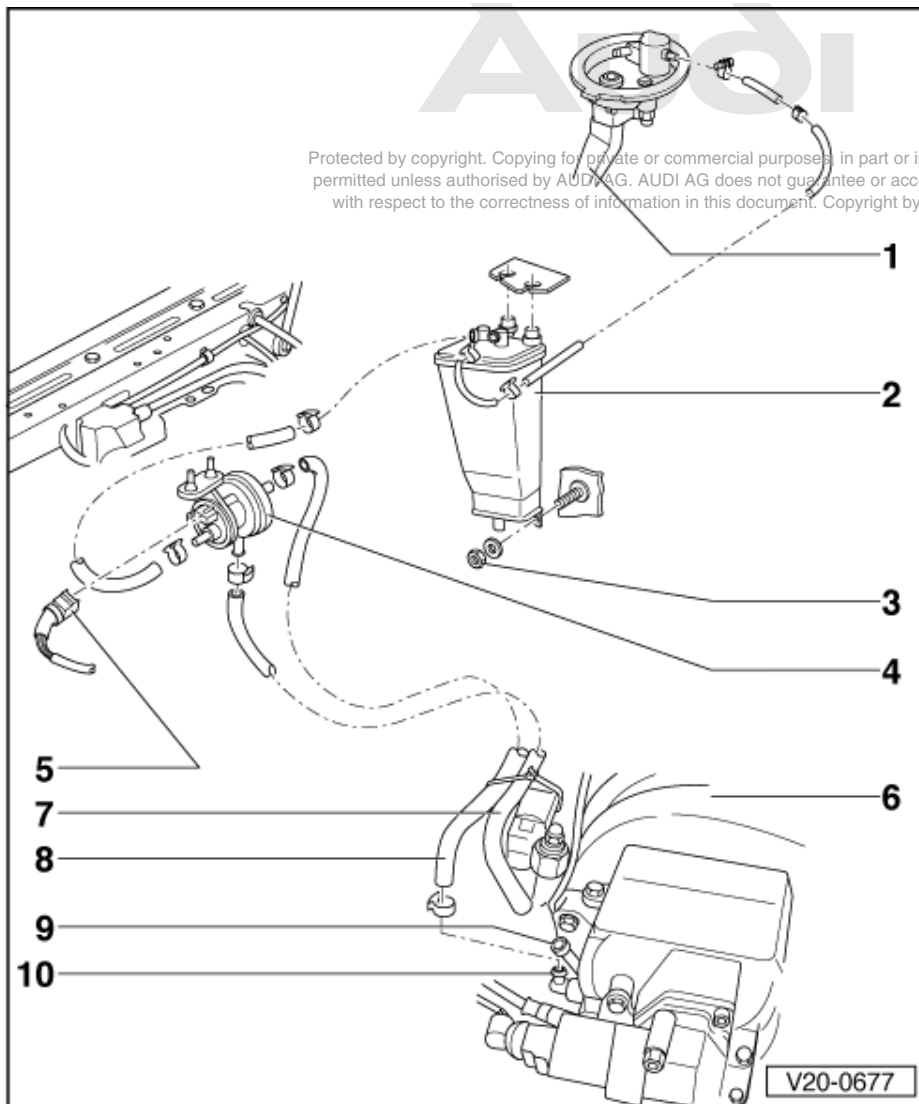
- -> Connect pressure measuring device V.A.G 1318 between the fuel feed pipe and the fuel rail at the engine.
Lever on pressure measuring device in "open" position.
- Press switch on remote control for approx. 30 seconds.
- Lever on pressure measuring device in "closed" position.
- Briefly operate switch of the remote control until a pressure of max. 5.3 bar is indicated.
- Observe drop in pressure. Max. drop in pressure after 10 minutes: 0.5 bar

If specified value is not attained, perform the following tests:

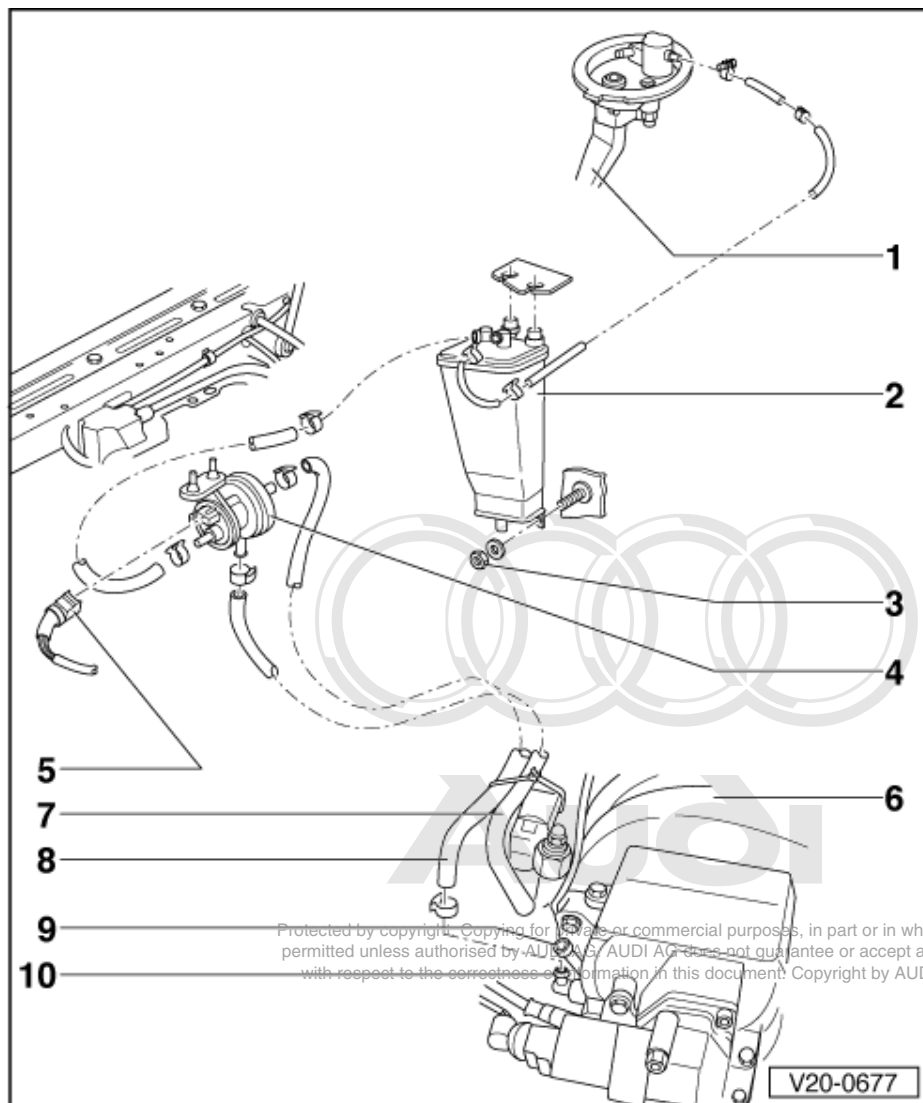
- Perform leak test on connections of pressure-measuring device.
- Perform leak test on fuel line.
- If there are no leaks present the non-return valve in the electric fuel pump is faulty.
- Renew fuel pump =>Page **120** .

3 - Servicing fuel tank breather with activated charcoal filter

3.1 - Servicing fuel tank breather with activated charcoal filter

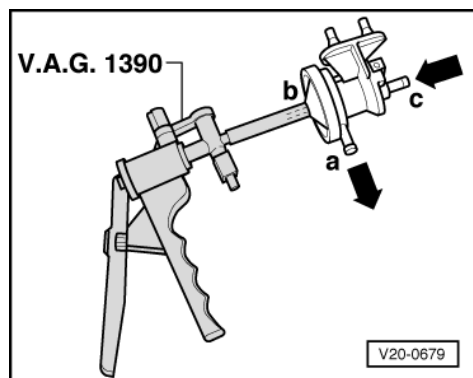


- 1 Fuel gauge sender
- 2 Activated charcoal filter
- 3 10 Nm
- 4 Solenoid valve for activated charcoal filter
 - ♦ Inspecting => Page [126](#)
- 5 Connector for activated charcoal filter valve
- 6 Intake manifold



- 7 Vent pipe
- 8 Vacuum line
- 9 Connection for drain pipe
- 10 Connection for vacuum pipe

3.2 - Testing solenoid valve for activated charcoal filter



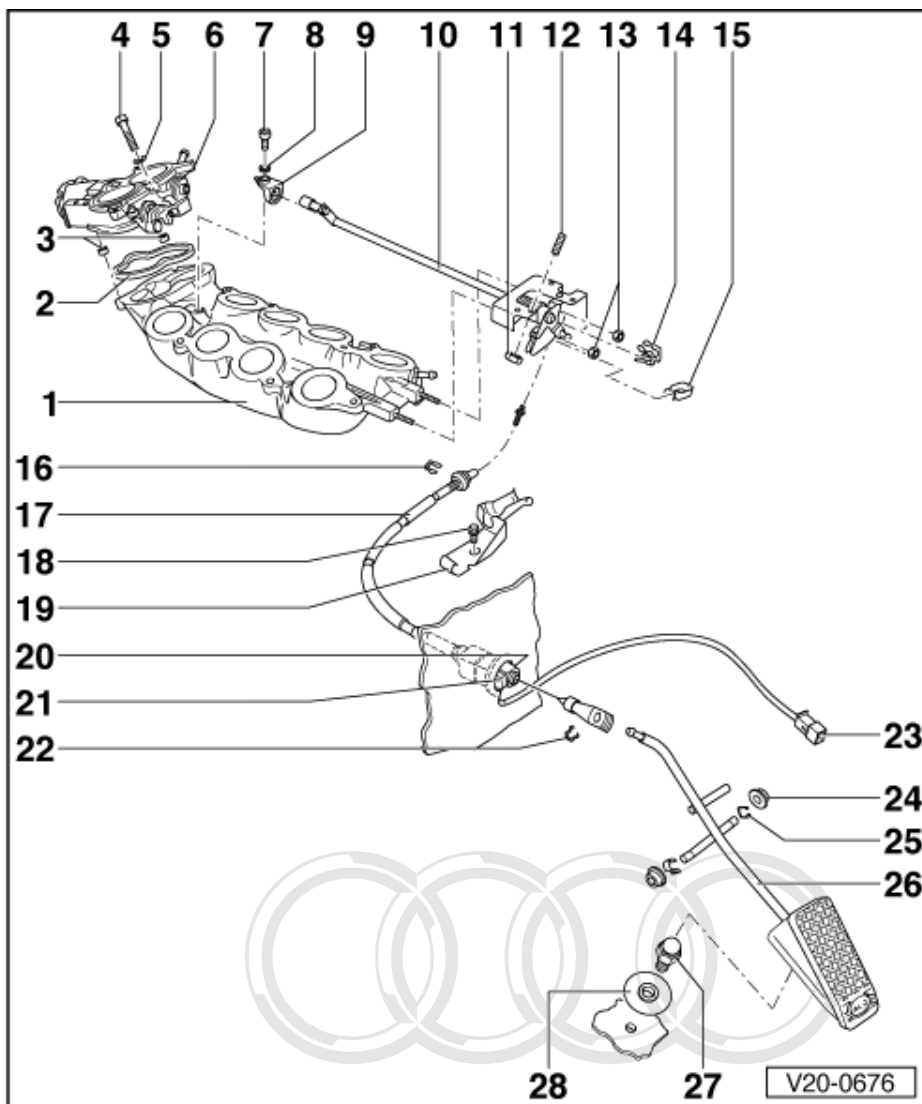
- Remove solenoid valve for activated charcoal filter
- Blow into connection -c- (arrow), passage not clear. If passage is clear replace valve.

- -> Fit the vacuum pump onto connection -b- and operate. Blow into the connection -c- ; a clear passage should exist between connections -c- and -a-. If no clear passage exists replace solenoid valve.
- Testing activation of activated charcoal filter valve.

=> Motronic fuel injection and ignition system (8-cylinder); Repair Group 24; Servicing Motronic injection and ignition system; Testing activated charcoal filter solenoid valve. Servicing Motronic injection and ignition system Testing activated charcoal filter solenoid valve.

4 - Servicing throttle mechanism

4.1 - Servicing throttle mechanism

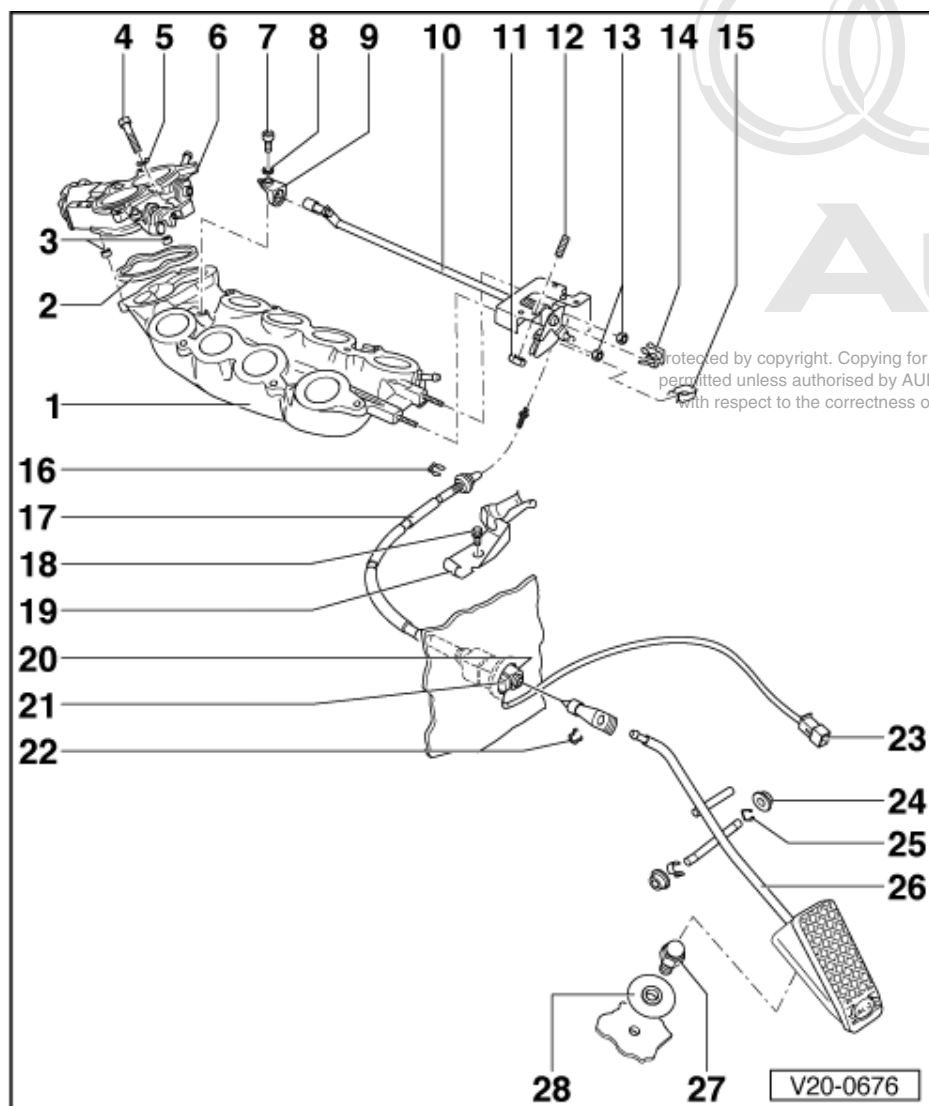


- 1 Bottom part of intake manifold
- 2 Shaped gasket
 - ♦ Replace
- 3 Sleeve
- 4 10 Nm
- 5 Washer
- 6 Throttle valve unit
- 7 10 Nm
- 8 Circlip
- 9 Mounting

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10 Throttle mechanism



11 Nut for full throttle stop

12 Bolt for full throttle stop

- ♦ Secure with AMV 197 000

13 10 Nm

- ♦ Secure with AMV 197 000

14 Locking clip

15 Clip

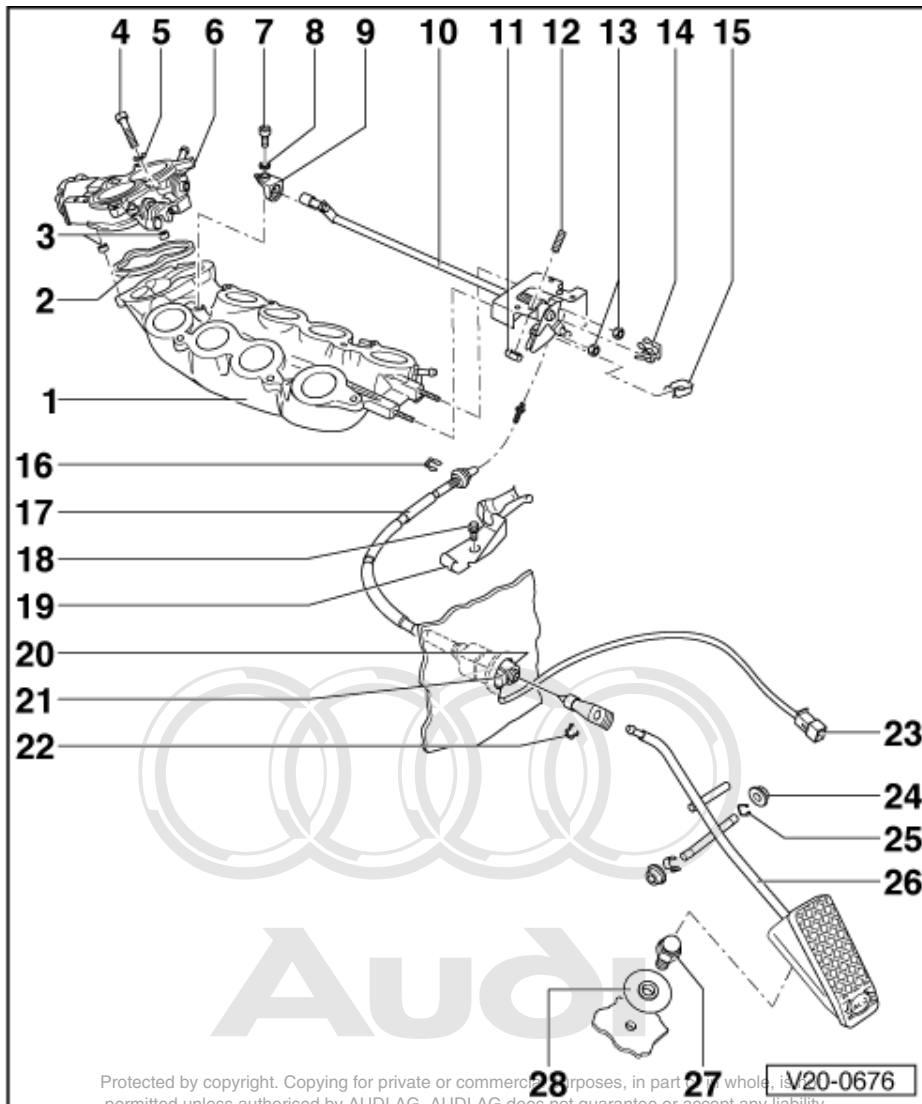
16 Locking element for fore-and-aft adjustment

17 Throttle cable

- ♦ Adjusting => Page [130](#)

18 10 Nm

19 Supporting ring



20 Four-point bearing

21 Kickdown switch

- ♦ Vehicles with automatic gearbox only:

22 Locking clip

23 Connector for kick-down switch

24 Bush

25 Locking clip

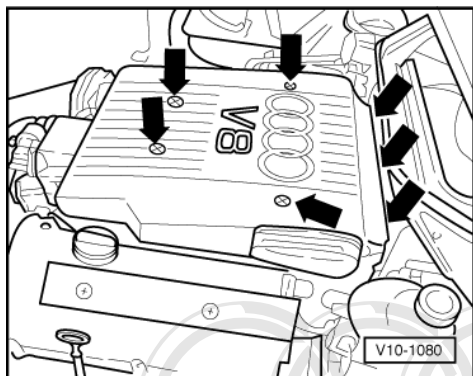
26 Accelerator

27 Stop bolt for accelerator pedal

28 Washer

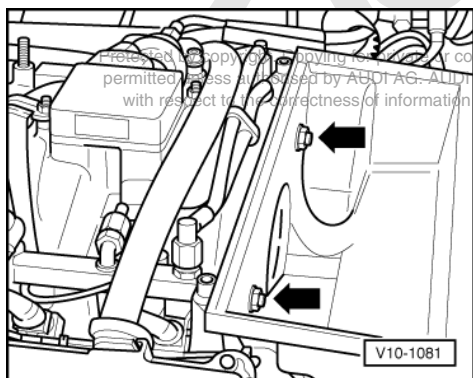
4.2 - Adjusting throttle cable

Notes:

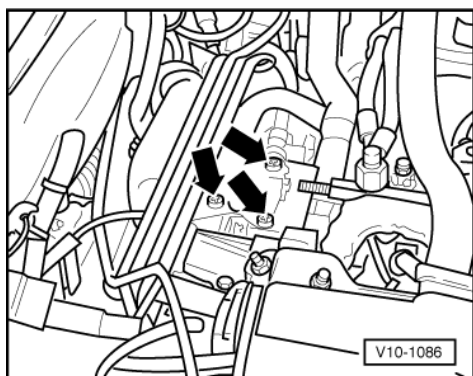


- ♦ The throttle cable is extremely susceptible to kinking and is therefore to be handled with great care on installation.
- ♦ A single slight kink can lead to subsequent breakage whilst driving. Once they have been kinked throttle cables are therefore not to be installed.
- ♦ When installing the throttle cable, ensure that it is aligned straight between its supporting mounts and the cable attachment points.

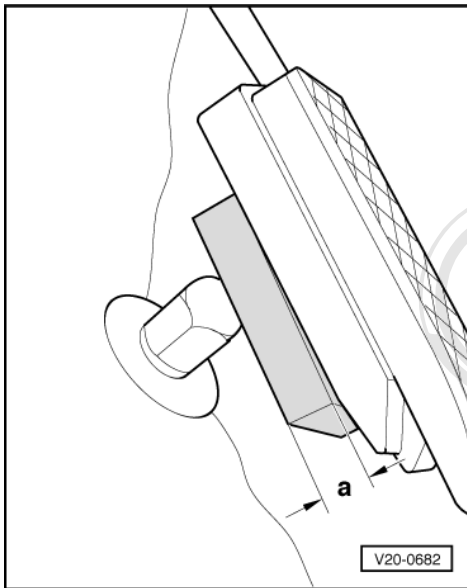
- -> Unscrew top part of air filter.



- -> Remove bottom part of air filter.



- -> Remove the plate attaching the ignition cable bracket.

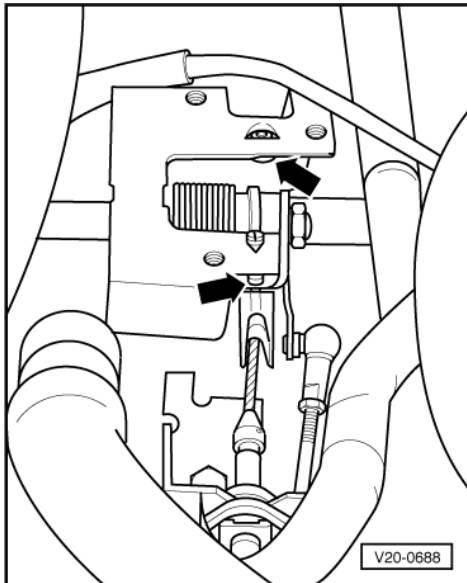


Note:

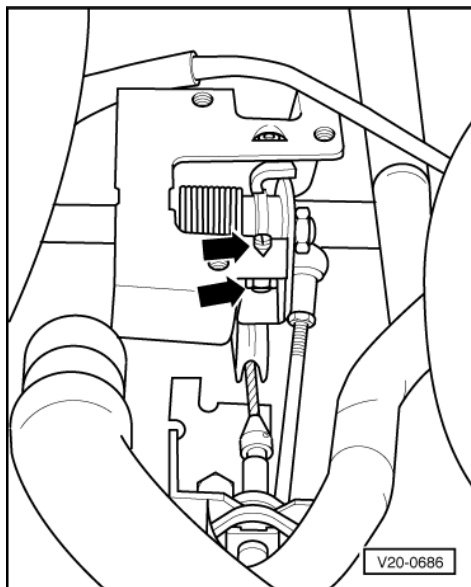
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Throttle cable attached to pedal and cam. Longitudinal adjuster at throttle-cable sleeve not fixed by locking element.

- -> Fit spacer $a = 15$ mm between accelerator pedal and stop screw and secure (insulating tape).



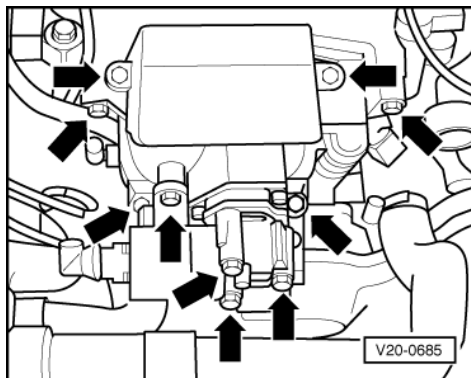
- -> Pull accelerator cable sleeve back sufficiently until the lever of the cruise control system is resting against the screw for full throttle stop; after this fix the locking element in position.



Inspection

- Throttle valve in idling position
- -> Press cams by hand as far as idle speed stop.
- Depress accelerator pedal into full throttle (kick-down).

Lever of the cruise control system must be resting against the screw for full throttle stop.



Setting full throttle stop at accelerator linkage.

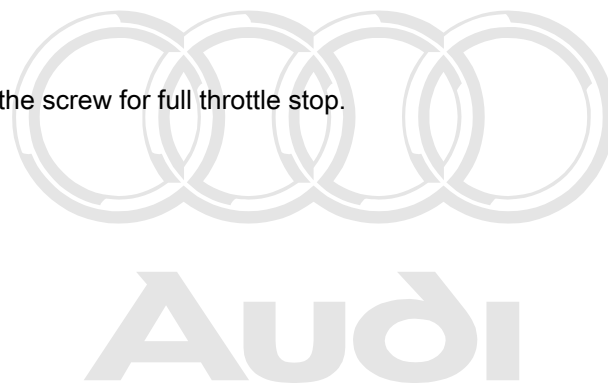
- -> Take off air temperature sensor and idling stabilisation valve.
- Unbolt connection fitting at the intake manifold.

Note:

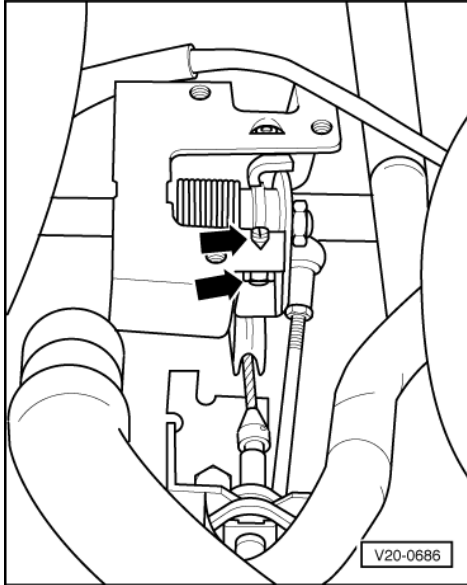
When installing the connection fitting tighten the bolts by hand.

Tightening sequence

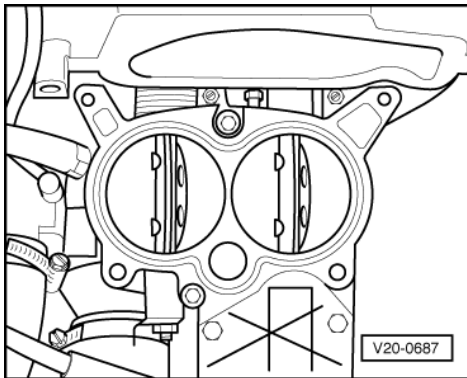
Tightening torque 10 Nm.



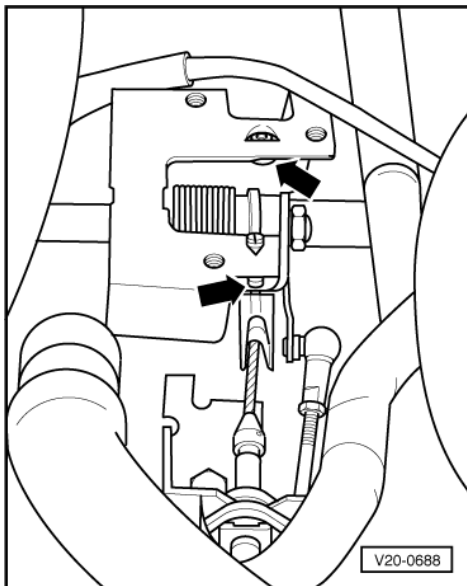
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1. Bolts in top part of intake manifold.
 2. Bolts located at rear in throttle valve body.
 3. Bolts located at front in throttle valve body.
- -> Unscrew the lock nut of the full throttle stop, unscrew the bolt for full throttle stop.



- -> Open the throttle valves fully when carrying out the setting.



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- -> Moisten the bolt for full throttle stop with locking fluid AMV 197 00.
- Insert bolt for full throttle stop sufficiently until it is touching the lever of the cruise control system.
- Lock bolt for full throttle stop with nut.

Inspection

- Operate accelerator linkage until the lever of the cruise control system is resting against the full throttle stop bolt; pay attention to the full opening angle (90°) of the throttle valves.

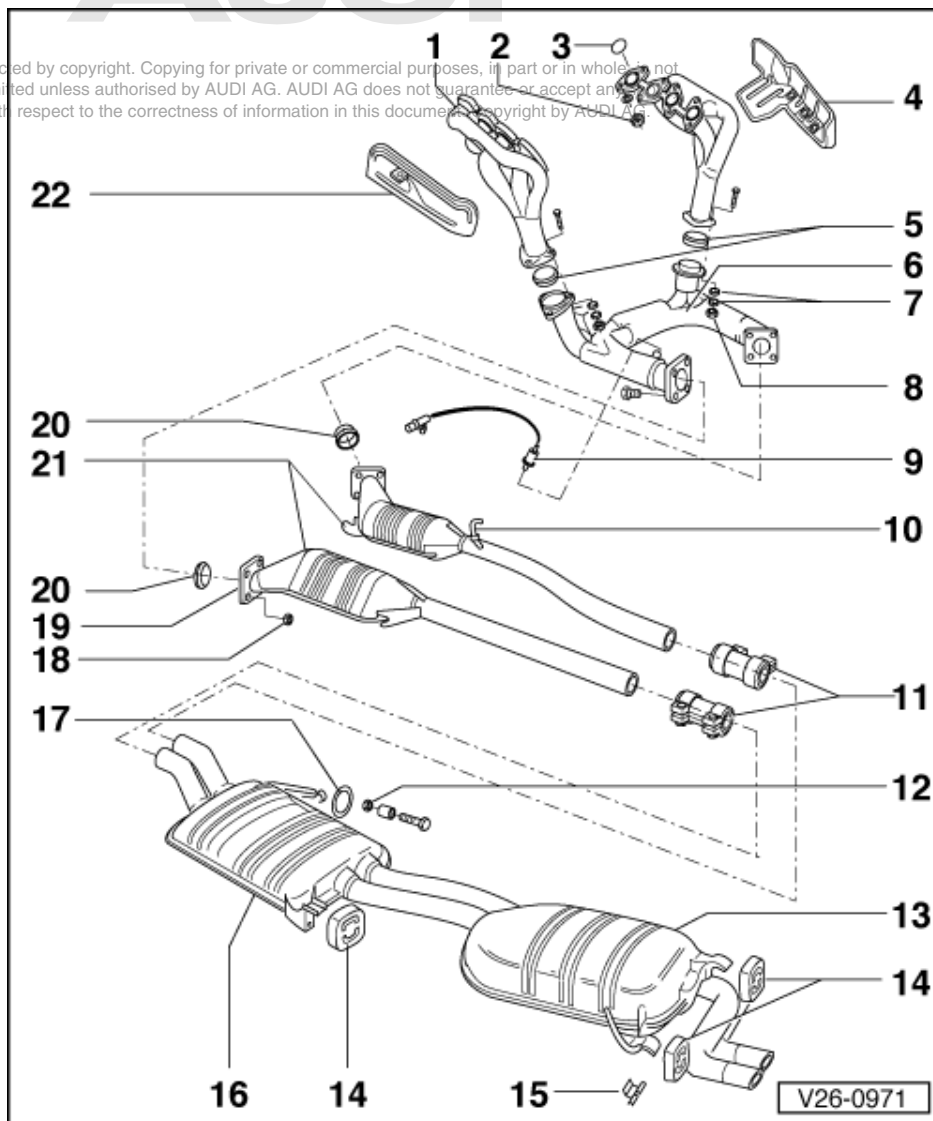


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26 - Exhaust system

1 - Removing and installing exhaust system, ABH

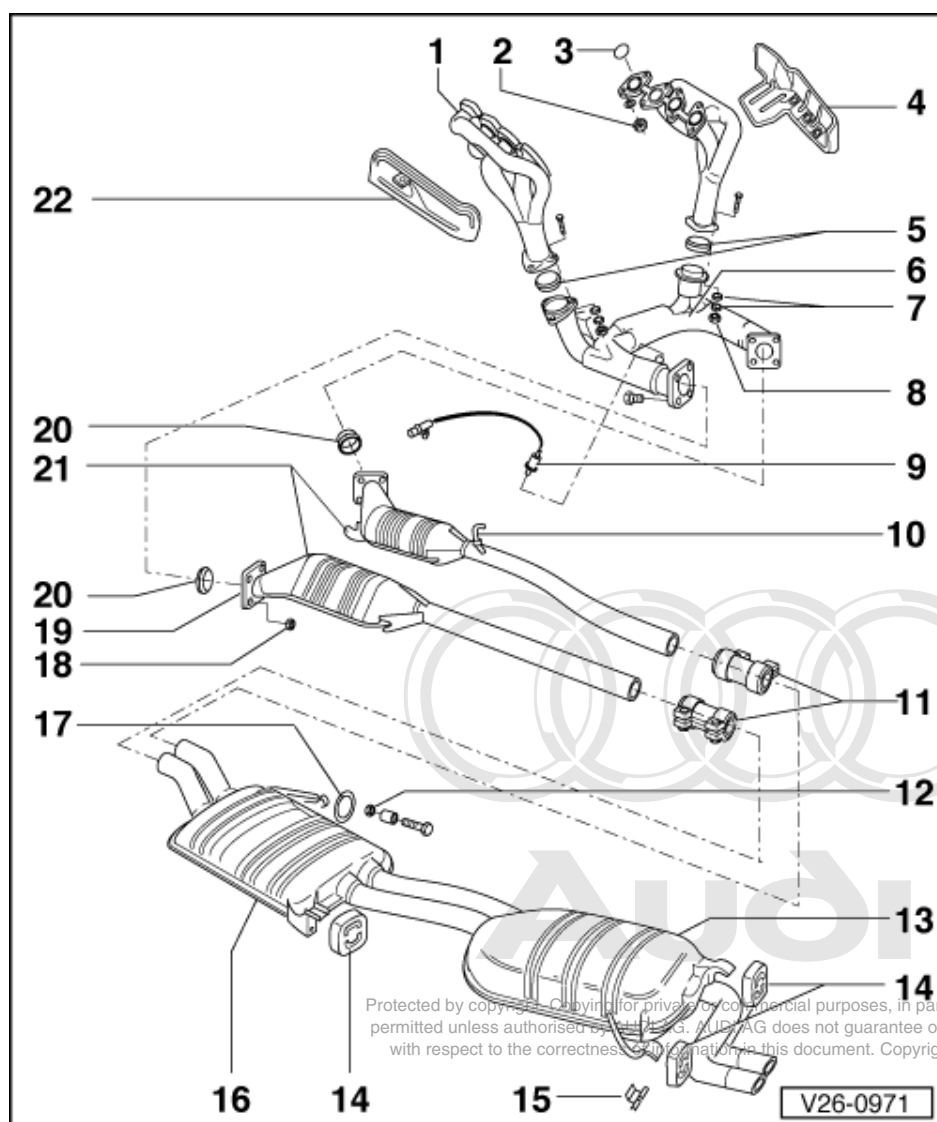
1.1 - Removing and installing exhaust system, ABH



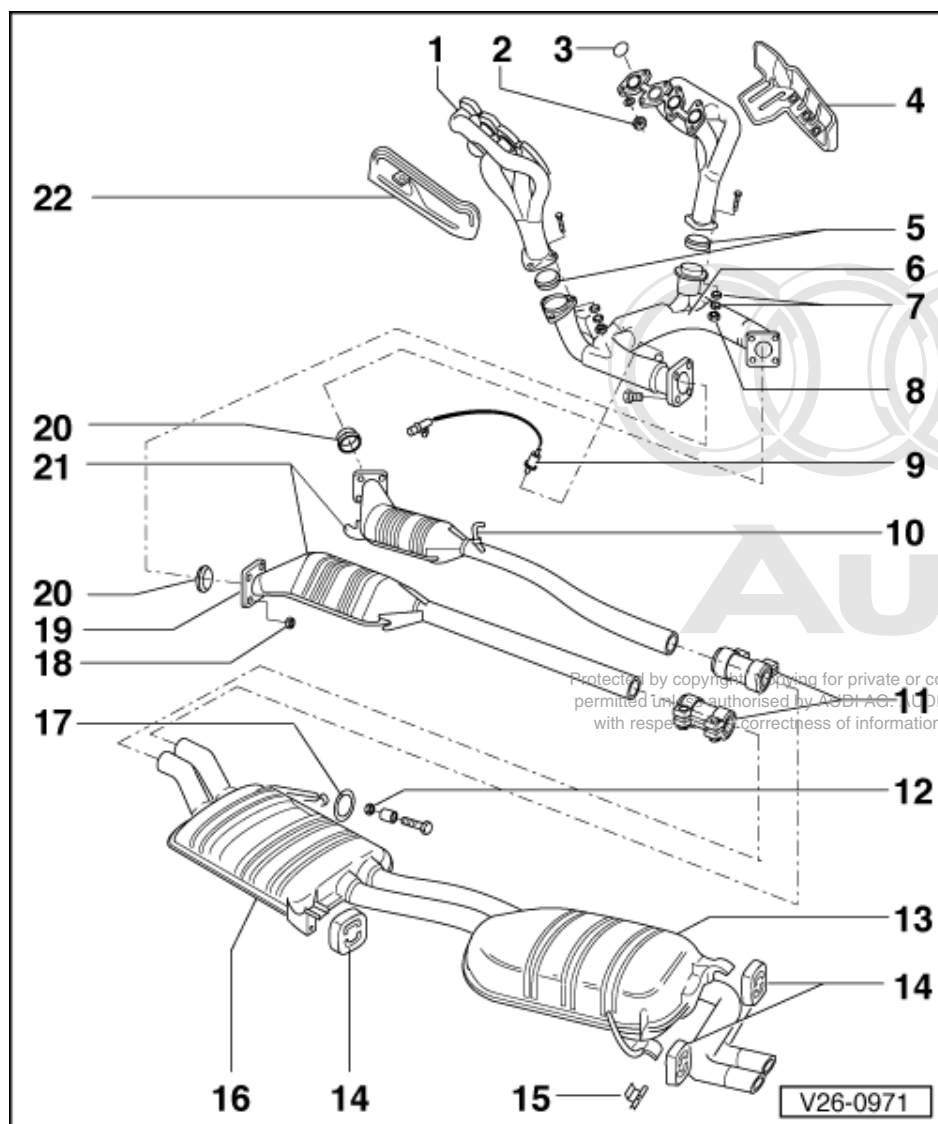
Notes:

- ◆ Align exhaust system free of stress, =>Page 141
- ◆ Checking exhaust system for leaks
=>Page 143
- ◆ Joint between centre and rear silencer
=>Page 140 Fig. 1
- ◆ Renew all gaskets and hexagon nuts.
- ◆ Ensure that the load is evenly distributed over the hangers of the exhaust system.
- ◆ Aligning flange connections of the exhaust system =>Fig. 141

1 Exhaust manifold



- 2 Hexagon nut
 - ♦ 25 Nm
- 3 Exhaust manifold gasket
 - ♦ Insert beading in exhaust manifold groove
- 4 Heat shield
 - ♦ Plate nut, 1.5 Nm
- 5 Seals
- 6 Front exhaust pipe
- 7 Spring washers
 - ♦ Installing spring washers => Fig. 141
- 8 Hexagon nut 25 Nm



Warning!

The flange connections of the exhaust manifold/front exhaust pipe should be retightened to the specific torque of 25

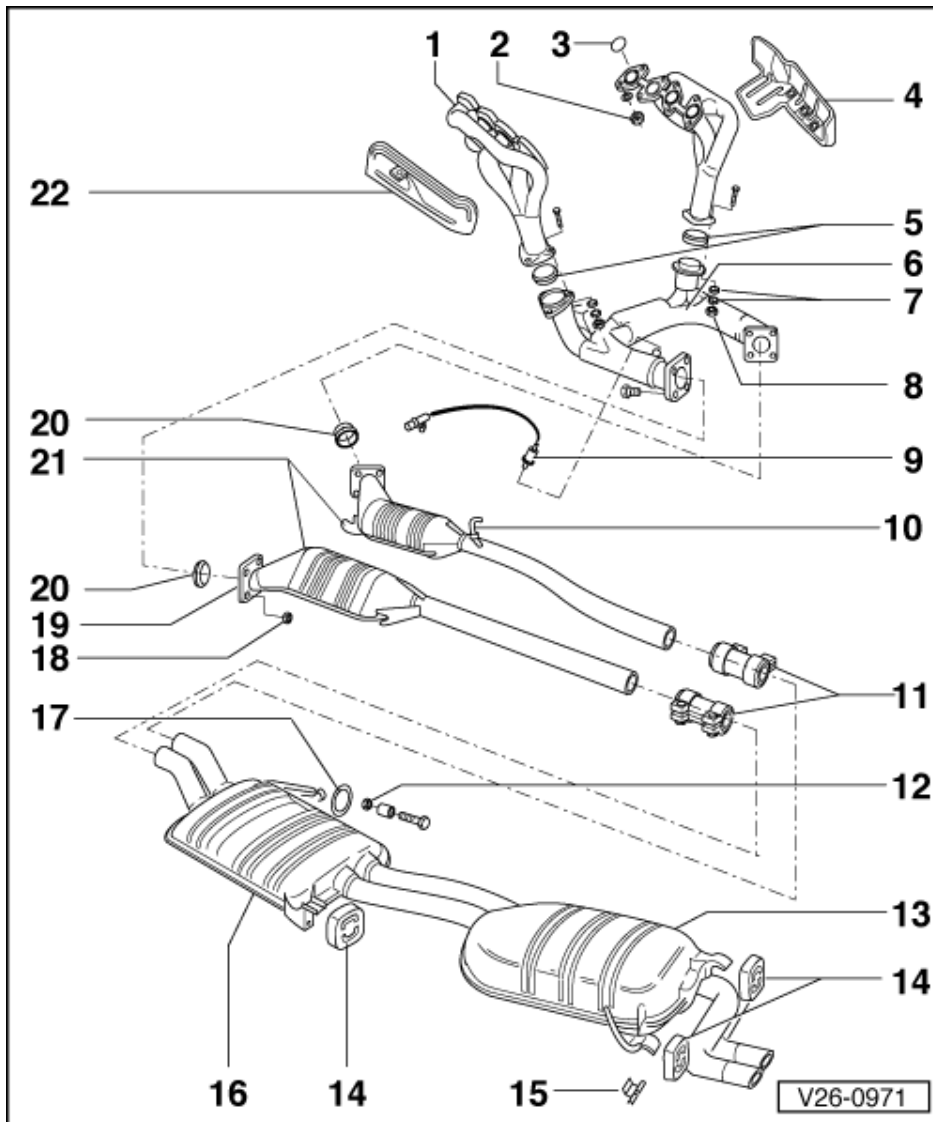
9 Lambda probes, 50 Nm

- ♦ Testing

=> Motronic fuel injection and ignition system; Repair Group 24; checking Lambda control checking Lambda control

- ♦ Grease thread with G5. Keep grease away from slits in probe body.

10 Temperature sensor 30 Nm



11 Twin clamps

- ♦ Tighten evenly, 40 Nm
- ♦ Installation position => Page 143
- ♦ Always replace after unfastening union.

12 Hexagon nut 25 Nm

13 Rear silencer

- ♦ Adjusting => Page 143
- ♦ Aligning tail pipes => Page 142

14 Retaining ring

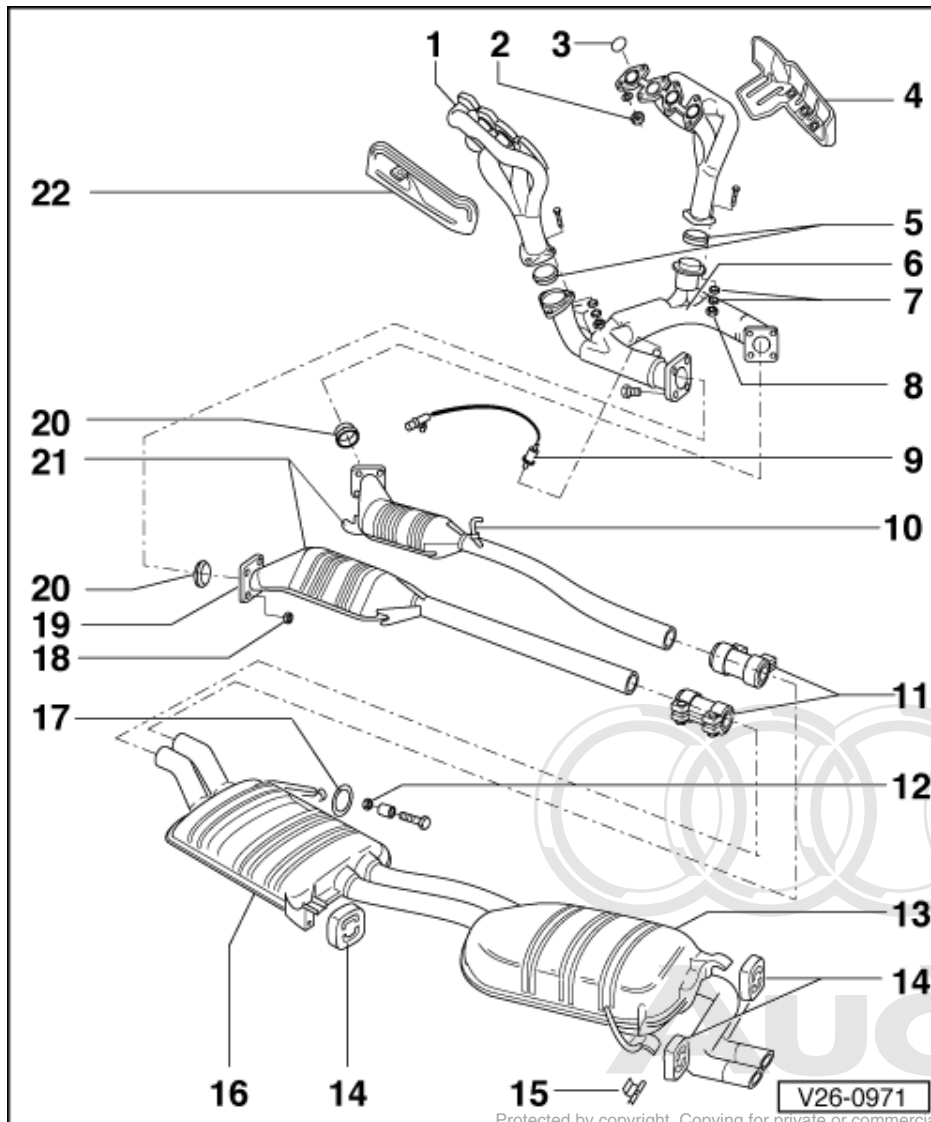
15 Bracket for rear silencer

- ♦ Hexagon nut 25 Nm

16 Centre silencer

- ♦ Setting prestress of exhaust system => Page 142

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17 Retaining ring

18 Hexagon nut 25 Nm

19 Catalytic converter

- ♦ Adjusting => Fig. 140
- ♦ Lock not of CO sampling connection 25 Nm

20 Oil seal

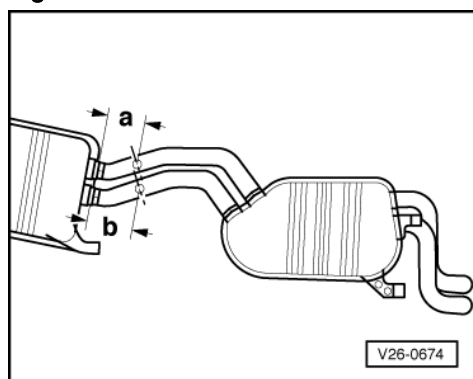
21 Catalytic converter mounting

- ♦ Component layout => Fig. 141

22 Heat shield

- ♦ Hexagon nut 3 Nm

Fig.1 Joint between centre and rear silencer

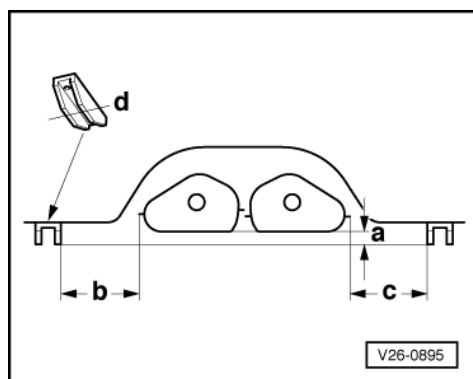


- -> A joint is provided for replacing the centre/rear silencer.

Dimension -a- 126.5 mm

Dimension -b- 142 mm

- Two short double clips are provided for connecting the centre silencer and the tail silencer when carrying out repairs.
- Twin clamps are to be installed horizontally.
- Aligning tail pipes =>Page 142 .
- Rear silencer alignment, => Page 143

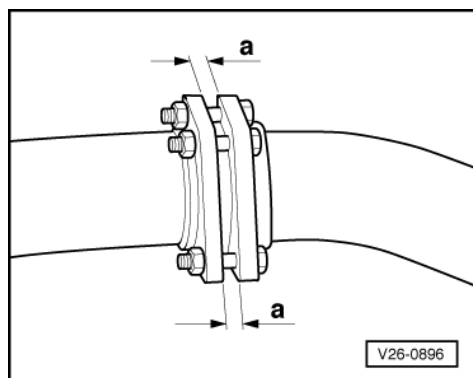


-> Fig.2 Aligning catalytic converters

Dimension a =	11 mm
Dimension b =	183 mm
Dimension c =	176 mm

Note:

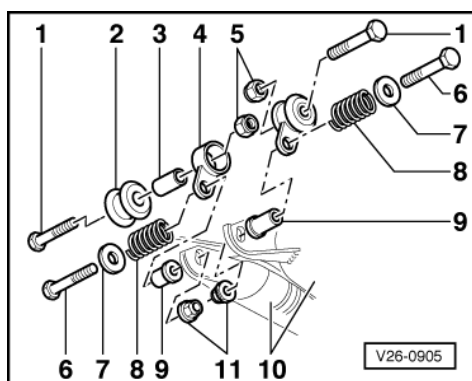
- ♦ The exhaust system is shown looking from the rear toward the catalytic converters.
- ♦ The measurements should be carried out in the middle -d- of the catalytic converter collision guard.
- ♦ The dimension between cross member and exhaust pipe should be 30 - 40 mm.



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-> Fig.3 Aligning flange connections of the exhaust system

- The bolted connections at the flanges of the exhaust system should be tightened in such a way that the flanges have the same clearance to each other -a- all round.



-> Fig.4 Catalytic converter mounting

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Component layout

- 1 - Hexagon bolt
- 2 - Rubber bush
- 3 - Spacer
- 4 - Plate
- 5 - Hexagon nut, 25 Nm
- 6 - Hexagon bolt
- 7 - Washer
- 8 - Pressure spring
- 9 - Spacer sleeves
- 10 - Catalytic converters
- 11 - Hexagon nuts, 25 Nm

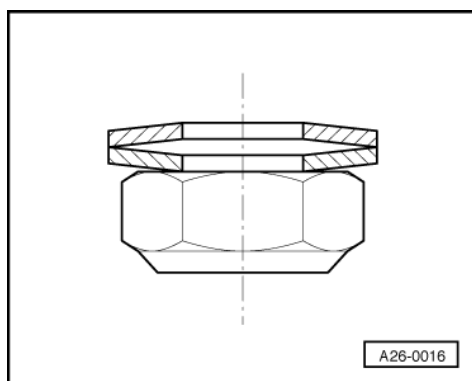
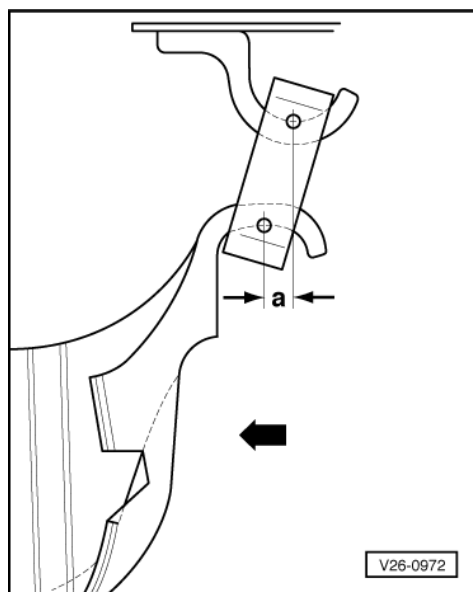


Fig.5 -> The spring washers should be installed as shown in the illustration.

1.2 - Stress-free exhaust system alignment, engine code ABH

Perform stress-free alignment of exhaust system as follows to avoid noise and corrosion.

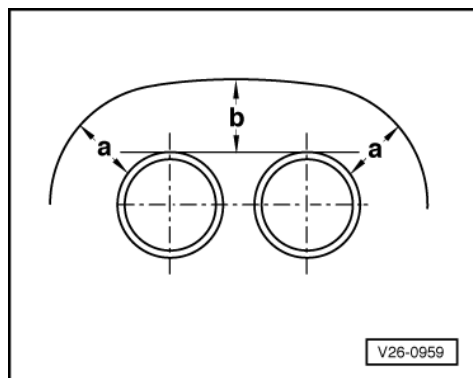
Notes:



- ♦ The catalytic converters should be aligned as shown in Fig. 140. The flanged connections of exhaust manifold/front exhaust pipe and front exhaust pipe/catalytic converters have to be tightened. All the other bolted connections should be slackened.
- ♦ The exhaust system is aligned when cold.
- ♦ The following work must be performed in the specified sequence.
- ♦ The dimensions illustrated are approximate.

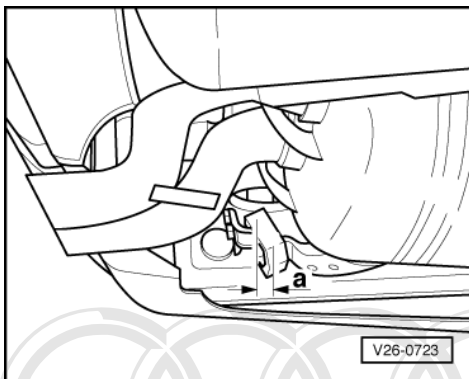
Setting pretension of exhaust system

- The prestress is set at the rear loop at the centre silencer.
- -> Dimension -a- 10 - 12 mm should be set to the correct size by altering the position in the double clips => Pos. 11 Page 135; arrow points in direction of travel.



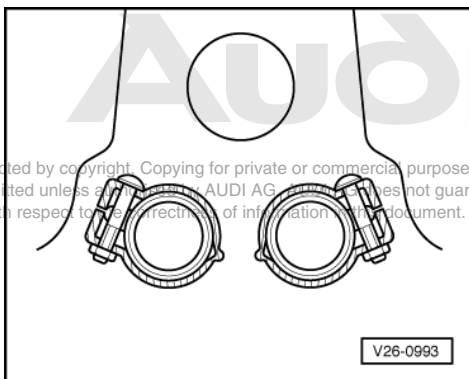
Aligning tailpipes

- -> Perform tailpipe alignment as shown; Spacing -a- right = distance -a- left
- Distance -b- from bumper recess to top approx. 33 mm.



Rear silencer alignment

- -> The prestress -a- should be set to 10 -12 mm by altering the position in the short double clips between centre silencer and rear silencer.



Fitting location of double clips

- -> The screw connection of the double clips should be aligned as shown in the illustration.

Notes:

- ◆ Twin clamps are shown from rear in direction of travel.
- ◆ Twin clamps are to be replaced after unfastening screw connections.

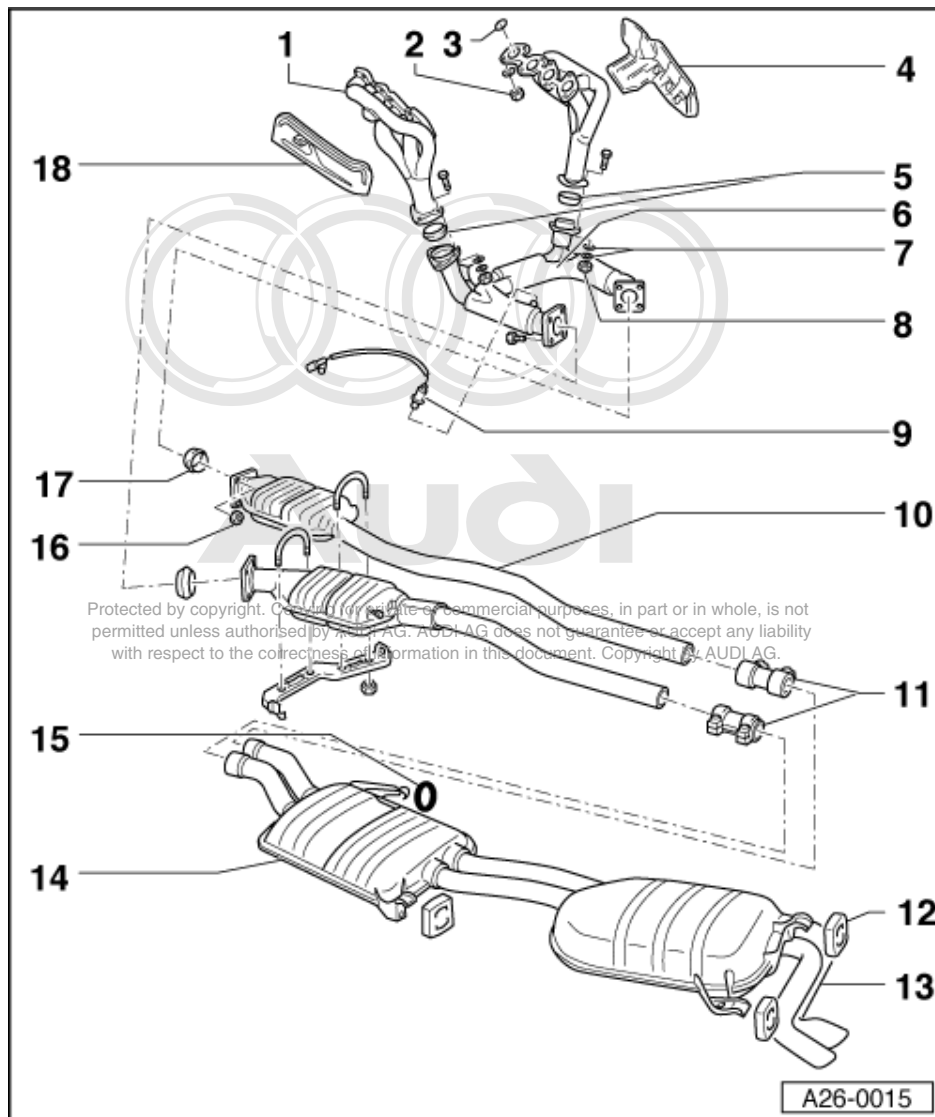
1.3 - Checking exhaust system for leaks

The exhaust system is to be checked for leaks as follows:

- Run engine.
- Plug tailpipes (with rags or stoppers, etc.) until check is completed.
- Connection points:
Inspect cylinder head / exhaust manifold, exhaust manifold / front exhaust pipe etc. for leaks by listening.
- Rectify any leaks that are found.

2 - Removing and installing exhaust system, AEC, AHK

2.1 - Removing and installing exhaust system, AEC, AHK

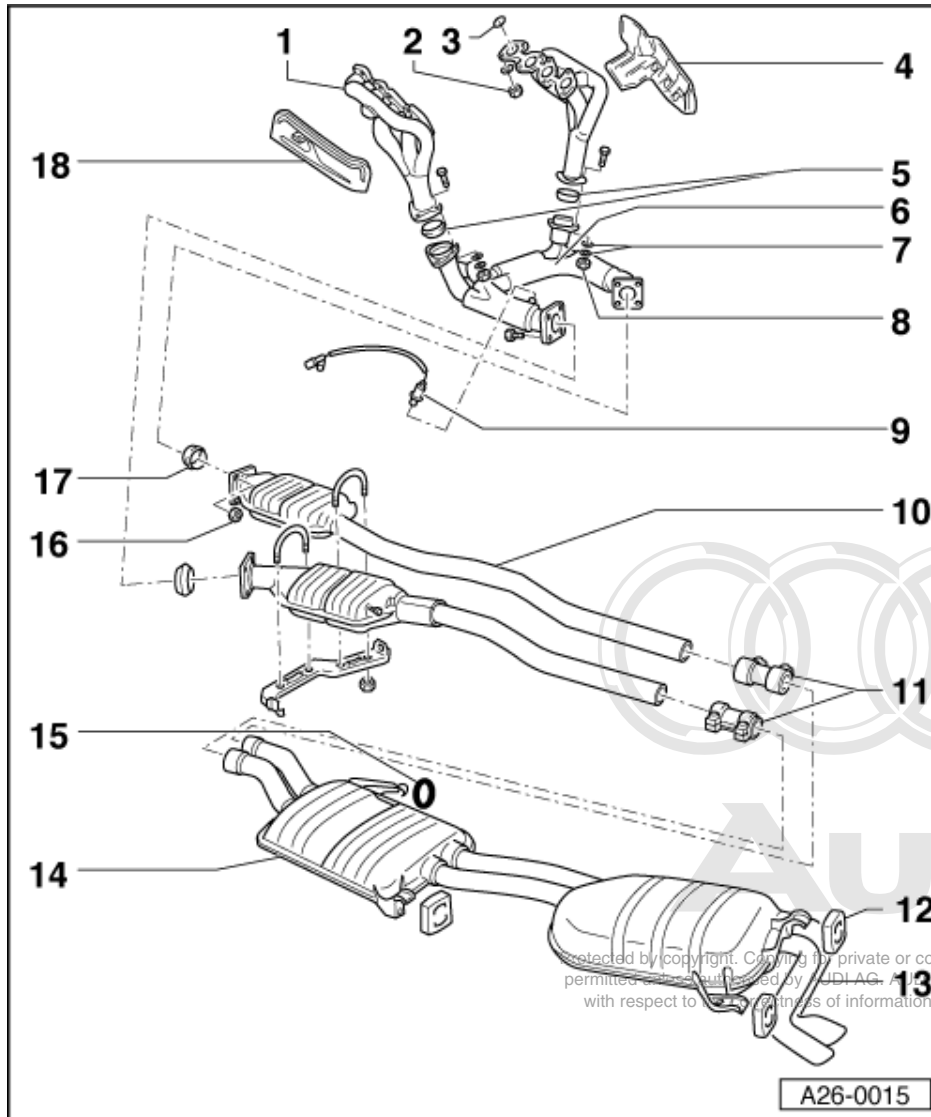


Notes:

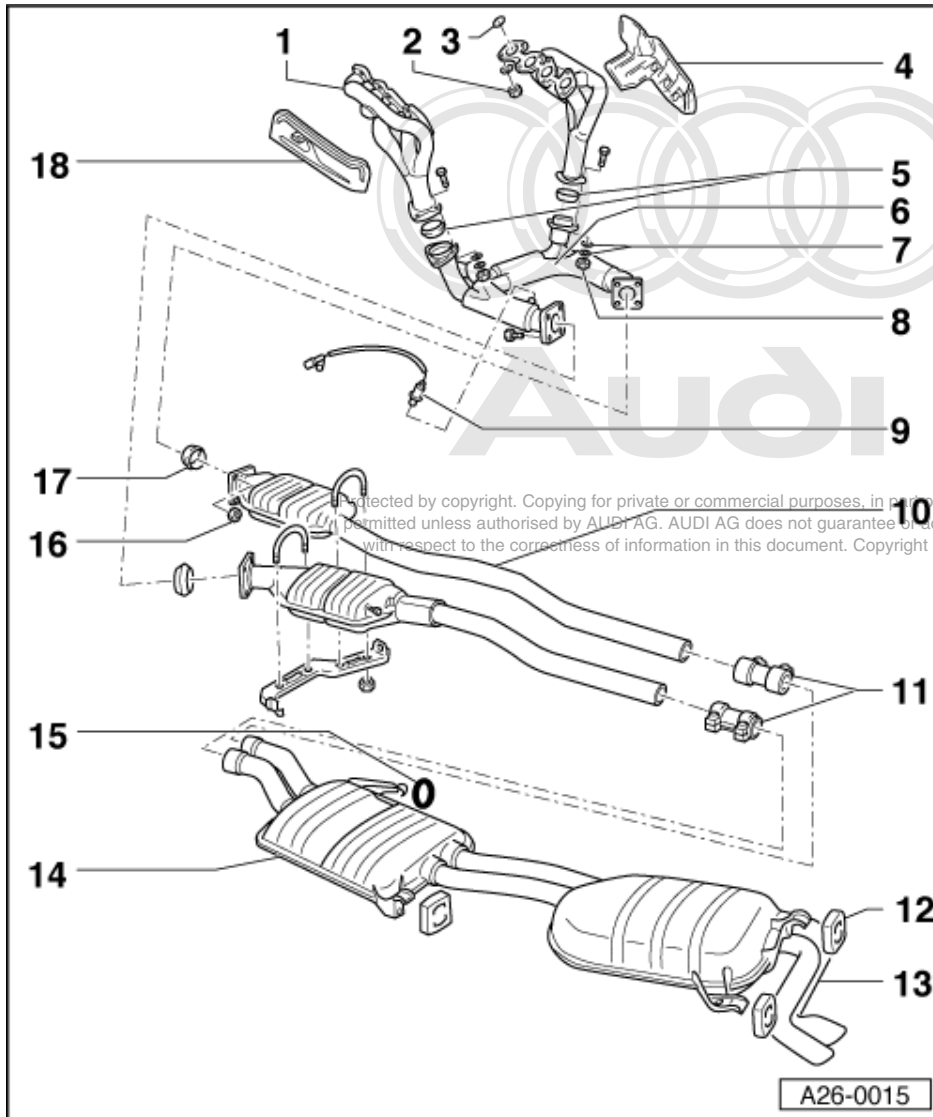
- ♦ Aligning exhaust system free of stress, => Page 156 .
- ♦ Checking exhaust system for leaks=> Page 157 .
- ♦ Separation point between centre silencer and rear silencer => Fig. 148 .
- ♦ Renew all gaskets and hexagon nuts.
- ♦ The retaining loops of the centre and rear silencer are of identical design but have a different elasticity, see Parts-Microfilm.

1 Exhaust manifold

- ♦ Removing => Page 151



- 2 Hexagon nut
 - ♦ 25 Nm
- 3 Oil seal
 - ♦ Beading of the seal should point toward exhaust manifold.
- 4 Heat shield
 - ♦ Plate nut, 1.5 Nm
- 5 Oil seal
- 6 Front pipe
- 7 Spring washers
 - ♦ Installation position => Fig. 148
- 8 Hexagon nut 25 Nm



9 Lambda probes, 50 Nm

- ♦ Testing

=> Motronic fuel injection and ignition system; Repair Group 24; checking Lambda control checking Lambda control

- ♦ Grease thread with G5. Keep grease away from slits in probe body.

10 Catalytic converter

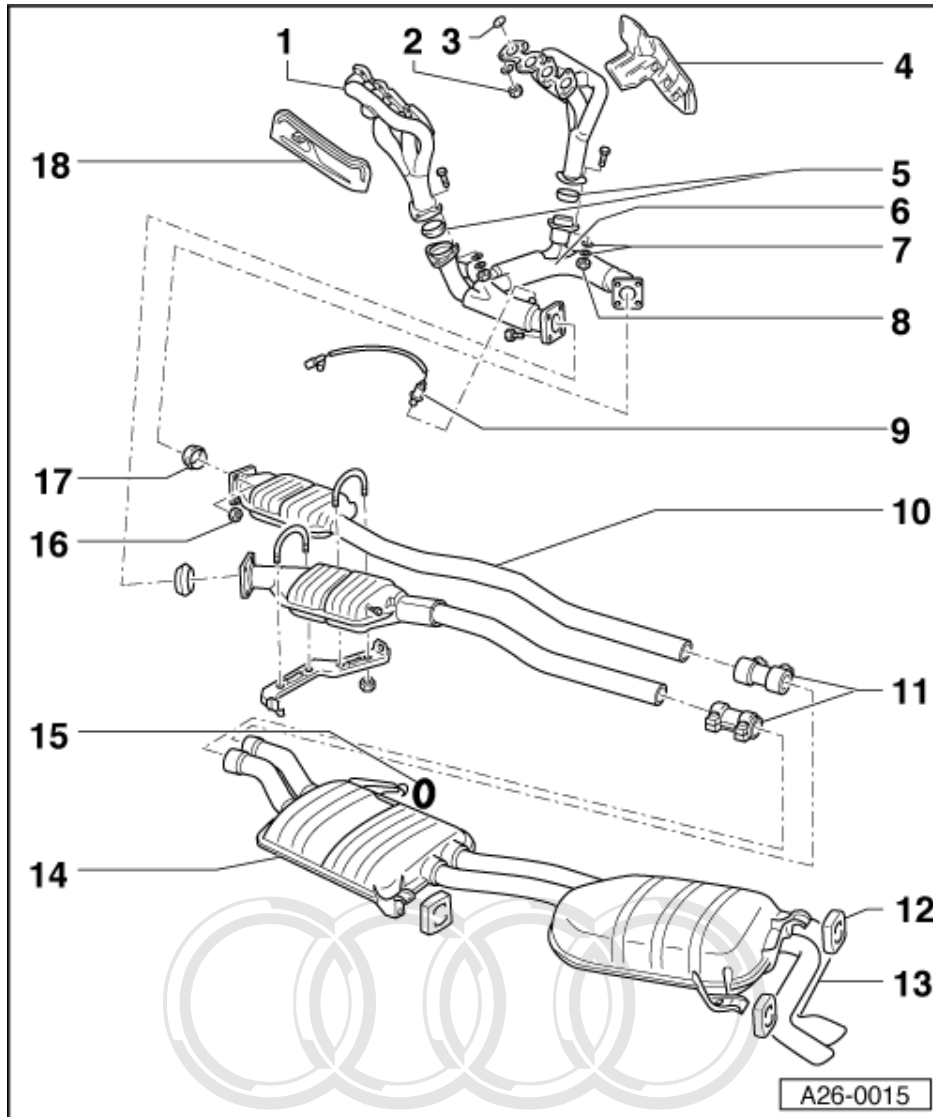
11 Clamping sleeve, 40 Nm

- ♦ Tighten evenly
- ♦ Installation position => Fig. 148

12 Retainer

13 Rear silencer

- ♦ Separation point => Fig. 148



14 Centre silencer

15 Retaining ring

16 Hexagon nut 25 Nm

17 Oil seal

18 Heat shield

♦ Hexagon nut 3 Nm

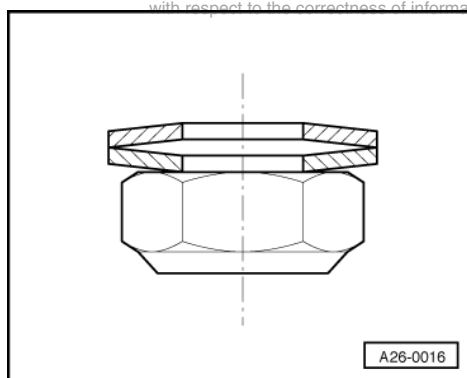


Fig.1 -> The spring washers should be installed as shown in the illustration.

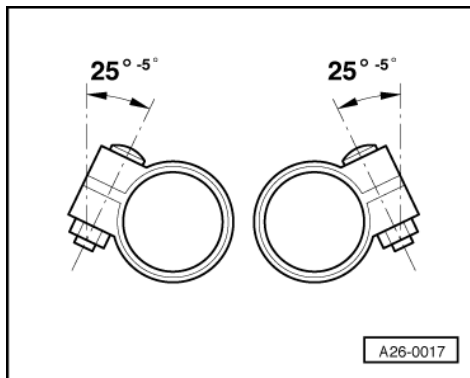
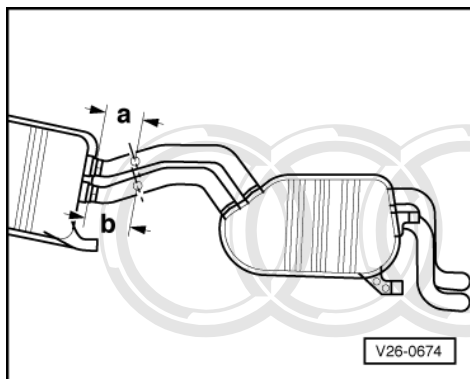


Fig.2 -> Installation position of the clamping sleeves. Viewed from the front. Tighten clamping sleeves evenly to 40 Nm.

Fig.3 Joint between centre and rear silencer

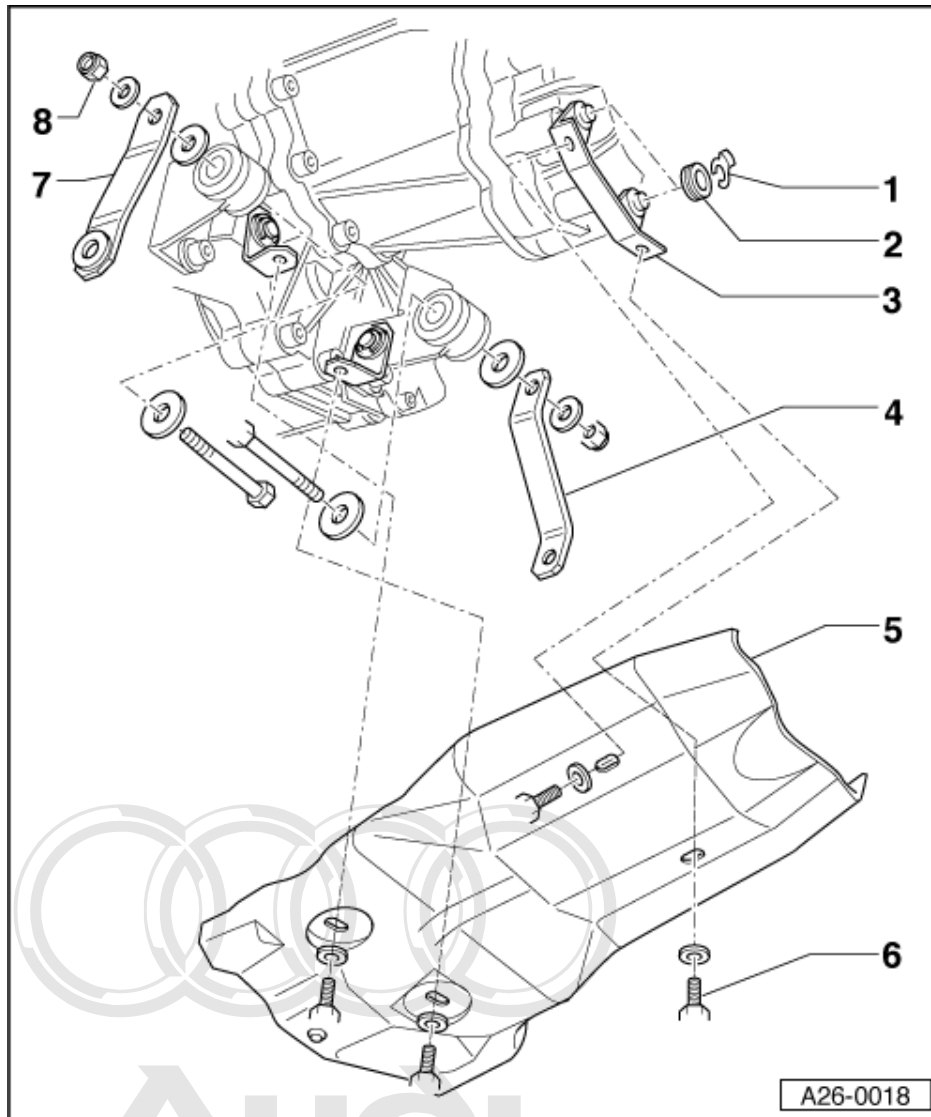


- -> A joint is provided for replacing the centre/rear silencer.

Dimension -a- =	126 mm
Dimension -b- =	142 mm

- For performance of repairs two short twin clamps are provided for connection of centre and rear silencer.
- Twin clamps are to be installed horizontally.

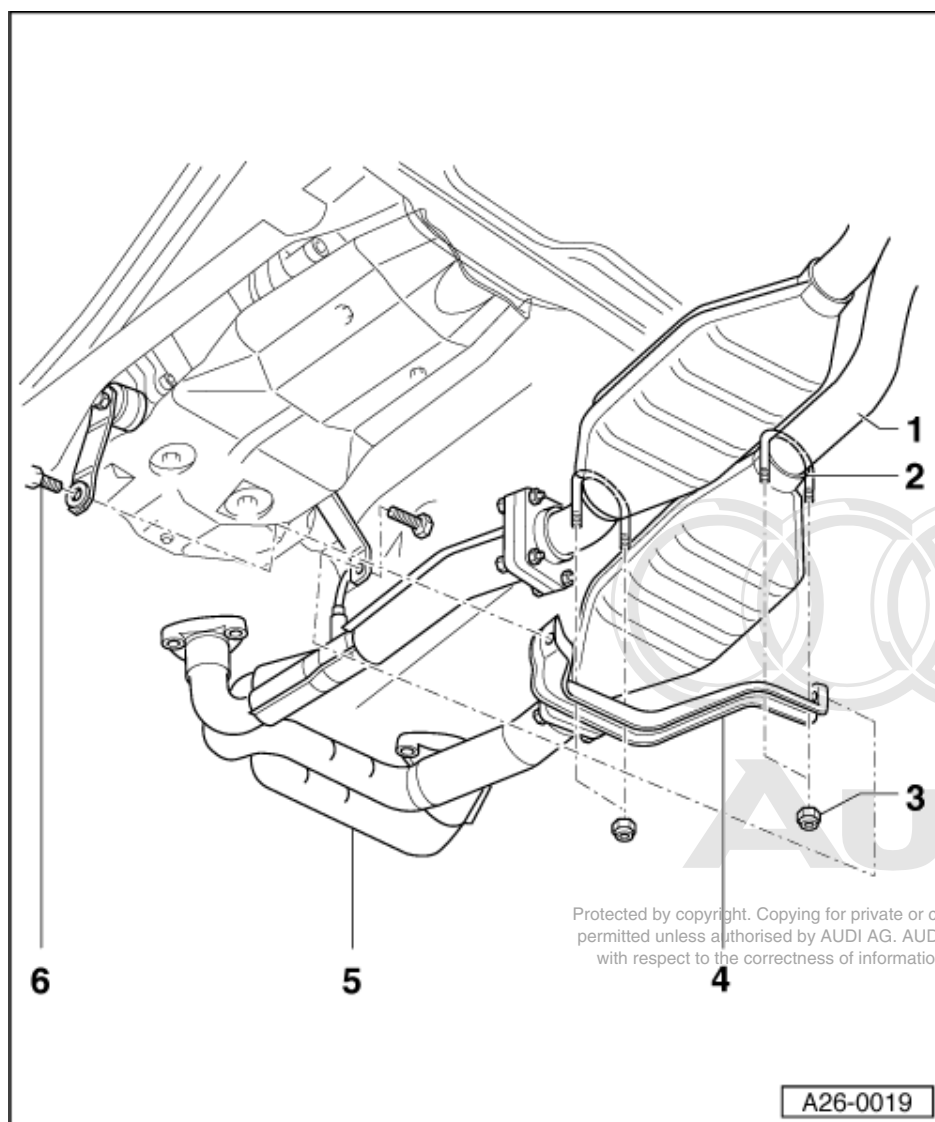
2.2 - Suspension of catalytic converters and heat shield



Installation of lugs and heat shield

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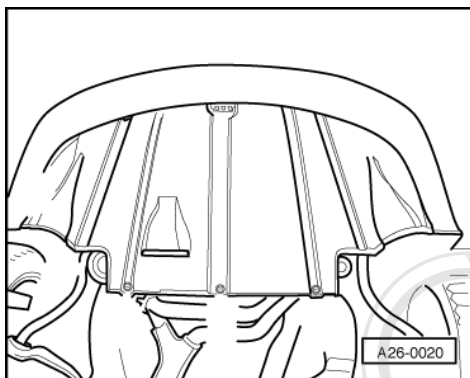
- 1 Circlip**
- 2 Socket**
- 3 Bracket**
- 4 Right lug**
- 5 Heat shield**
- 6 Hexagon bolt, 8 Nm**
- 7 Left lug**
- 8 Lock nut, 25 Nm**



Catalytic converter mounting

- 1 Catalytic converter
- 2 Bracket
- 3 Hexagon nut 8 Nm
- 4 Bracket
- 5 Front pipe
- 6 Hexagon bolt, 25 Nm

2.3 - Removal of exhaust manifold



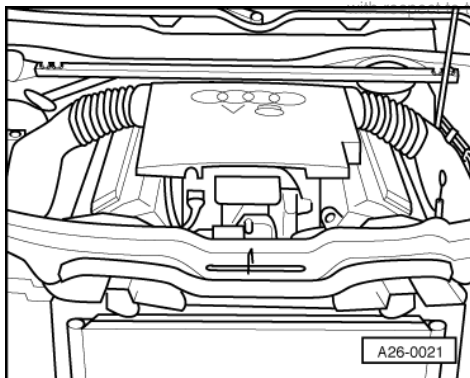
The operations described below should be carried out for removing both exhaust manifolds.

- -> Take off noise insulation panel (arrows indicate bolted connections).
- Unbolt exhaust manifold from front exhaust pipe. Remove bolts from the exhaust manifolds.

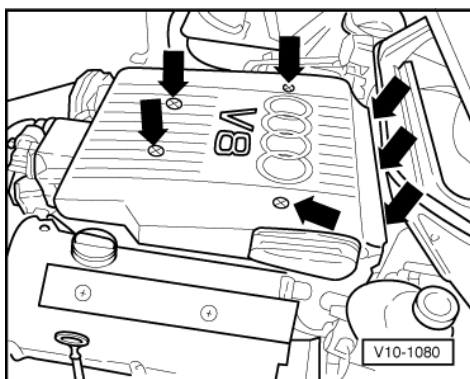
Note:

The tapered seals are very sensitive to shocks; do not drop them.

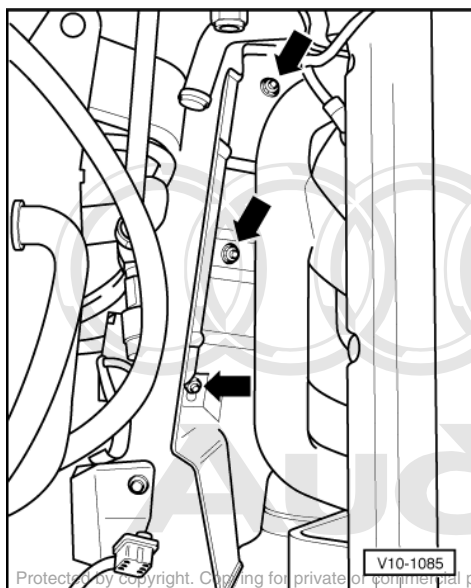
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- -> Unbolt bracket for air guide pipes on left and right.
- Remove air guide pipes.
- Remove dome strut.

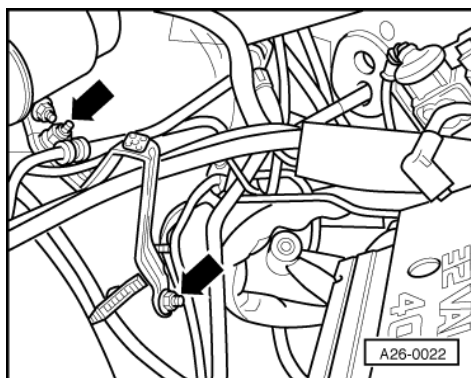


- -> Unscrew top part of air filter housing (4 screws on the housing, 3 screws at rear of the housing).



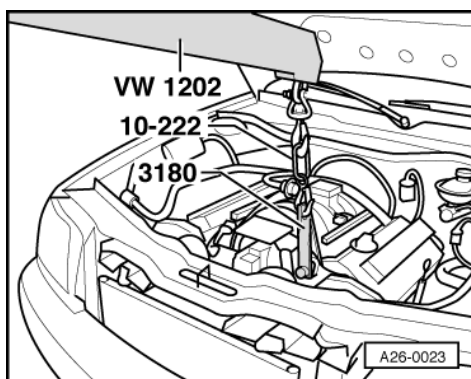
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➤ Remove heat shield on left and right.



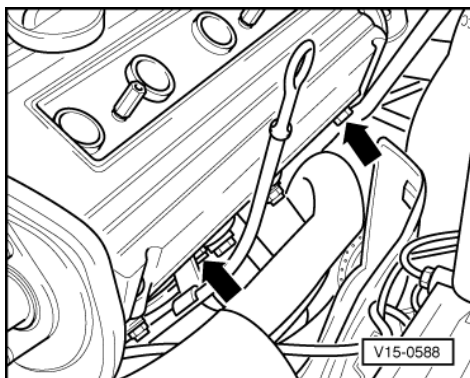
The operations described below should be carried out for removing the right-hand exhaust manifold only.

- ➤ Unbolt the fixture for the electric connections from the side panel of the engine.

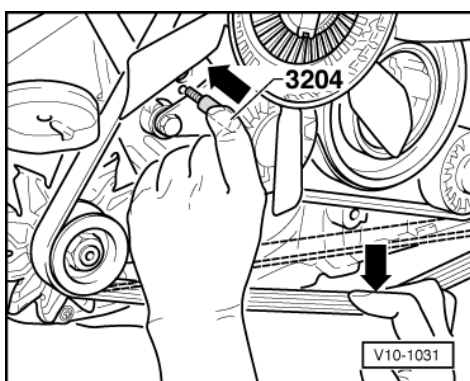


- ➤ Attach lifting device into mounting hole at the rear right of the engine (lifting device is shown attached at the front left in the illustration to simplify the presentation).
- Raise engine-gearbox unit carefully (about 10 mm at the suspension point).
- Unbolt exhaust manifold and lift up and out of the vehicle.

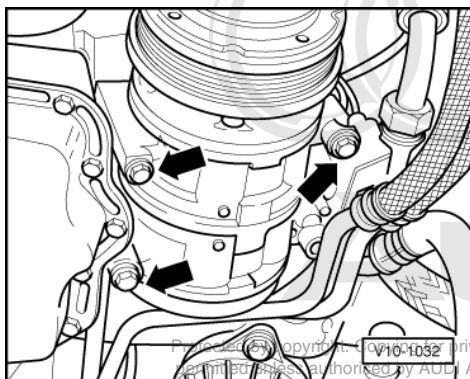
The operations described below should be carried out for removing the left-hand exhaust manifold.



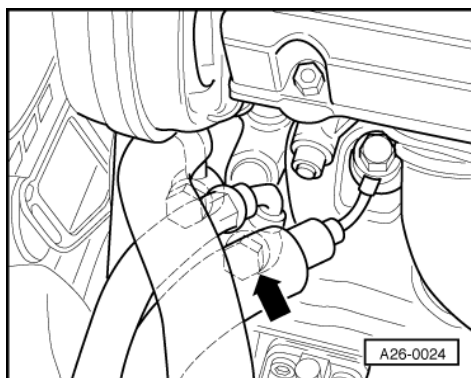
- -> Unscrew and pull out guide tube for dipstick.



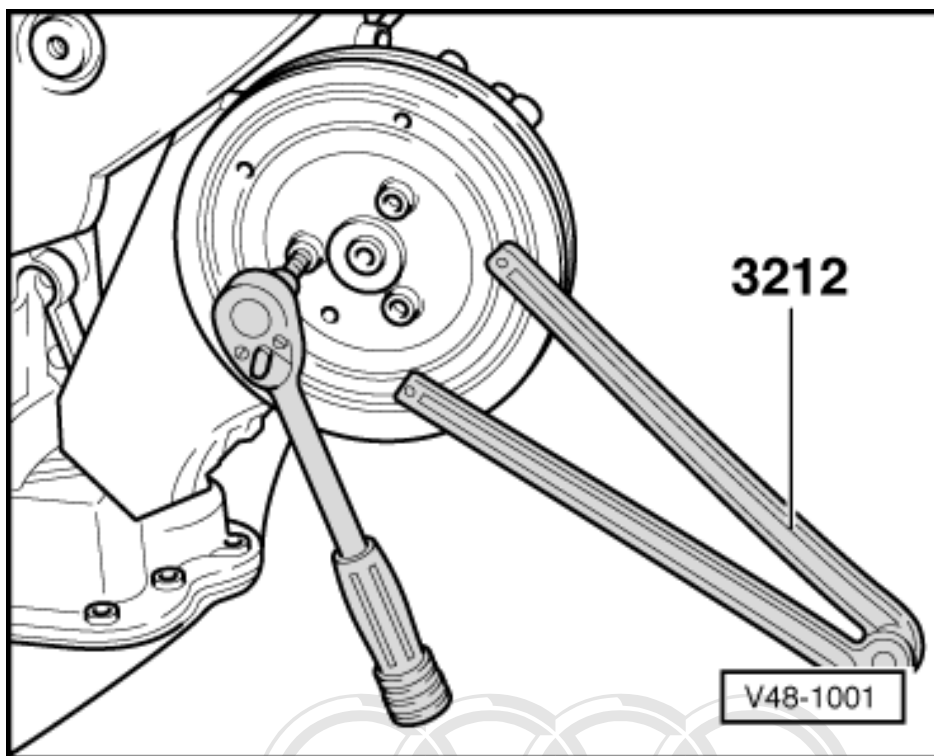
- -> Slacken ribbed belt; to do so, firmly press down belt at bottom in centre by hand and insert setting pin 3204.
- Remove belt.



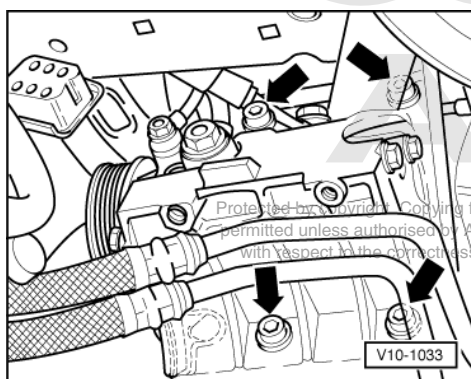
- -> Unbolt AC compressor (pay attention to dowel sleeves).
- Unplug the connectors of the electrical connections for the compressor.
- Allow AC compressor to hang down out of the vehicle (pipe/wiring remain connected).



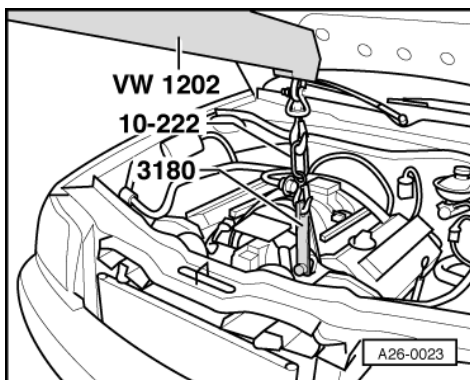
- -> Use hose clamp 3094 to pinch off suction hose of the power-steering pump reservoir.



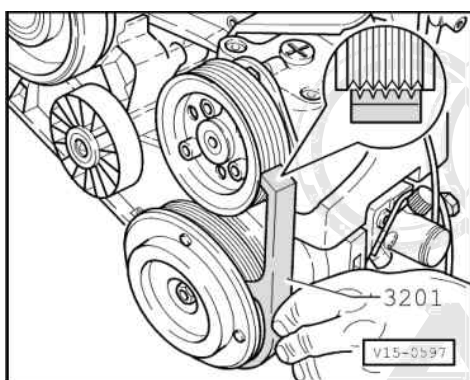
- -> Unbolt ribbed belt pulley. Counterhold with two-hole nut turning tool 3212.
- Unbolt hydraulic pump from its fixture and allow to hang down out of the vehicle. Expansion hose remains connected.



- -> Unscrew bracket for AC compressor and hydraulic pump.



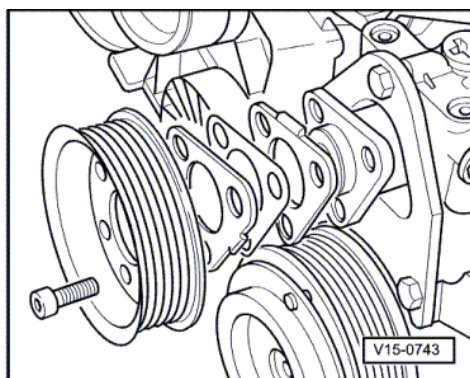
- -> Attach lifting device into mounting hole at the front left of the engine.
- Raise engine-gearbox unit carefully (about 10 mm at the suspension point).
- Unbolt exhaust manifold and lift up and out of the vehicle.



Installing exhaust manifold is carried out in reverse order of removal.

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- -> When installing compressor and hydraulic pump fit alignment gauge 3201 onto the belt pulley of the AC compressor.
- The belt pulley of the hydraulic pump should be aligned with the belt pulley of the AC compressor.



- -> Unscrew belt pulley for vane pump. Use the shims available in the Parts Programme to ensure that both belt pulleys are properly aligned.

2.4 - Stress-free exhaust system alignment, engine codes AEC, AHK

Perform stress-free alignment of exhaust system as follows to avoid noise and corrosion.

Notes:

- ♦ Unfasten all screw connections of exhaust system (except exhaust manifold) including catalytic converter mounting.
- ♦ The exhaust system is aligned when cold.
- ♦ The following work must be performed in the specified sequence.
- ♦ The dimensions illustrated are approximate.

Tightening bolt connections

Note:

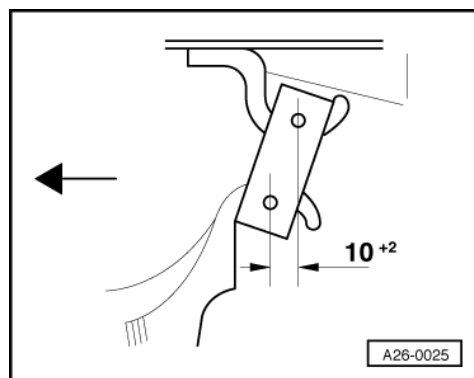
The bolted connections of the flanges should be tightened in several stages so that the flanges have the same clearance to each other all round.

Tightening torques

Exhaust manifold, front exhaust pipe	25 Nm
Front exhaust pipe/catalytic converters flanged connections	25 Nm
Suspension of catalytic converters at the U-bolts	8 Nm

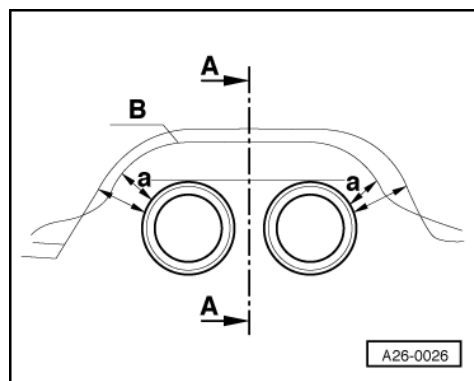
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Setting the prestress

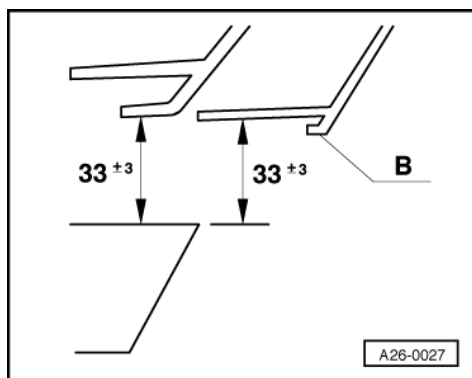


- -> The prestress is set at the rear retaining loop of the main silencer by altering the position of the silencer pipes in the clamping sleeves. Arrow points in direction of travel.

Aligning the silencers



- -> Perform tailpipe alignment as shown; Item -B- corresponds to the USA version.



- -> Section A-A clearance of tail pipes from bumper cut-out Item -B- corresponds to the USA version.

2.5 - Checking exhaust system for leaks

The exhaust system is to be checked for leaks as follows:

- Run engine.
- Plug tailpipes (with rags or stoppers, etc.) until check is completed.
- Connection points:
Cylinder head/manifold, manifold/front exhaust pipe etc. for leaks by listening.
- Eliminate any leaks found.



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