



Golf 1992 , Vento 1992 ➤

4-Cyl. diesel engine, Mechanics									
Engine ID	AAZ	AEY	AFN	1Y	1Z	AHU	ALE	AVG	

Edition 04.1996



List of Workshop Manual Repair GroupsList of Workshop Manual
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Golf 1992 , Vento 1992 ➤

4-Cyl. diesel engine, Mechanics

Repair Group

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



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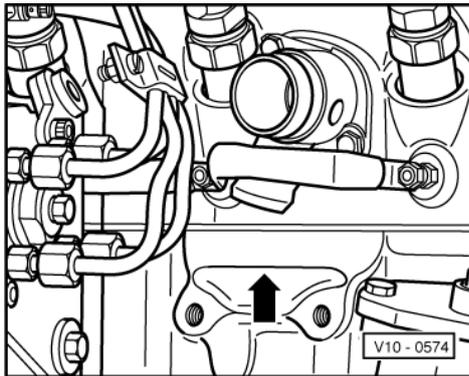


00 - Technical data

1 - Technical data

1.1 - Technical data

1.2 - Engine number



-> The engine number ("Code letters" and "Serial number") can be found between injection pump and exhauster on cylinder block.

Additionally there is a sticker on the toothed belt guard with "Engine code" and "Serial number".

The engine code is also included on the vehicle data plate.

1.3 - Engine data

Code letters	1Y	1Z	AAZ	AEY
Manufactured	10.91 ▶	11.93...07.96 ▶	10.91 ▶	08.95 ▶
Capacity ltr.	1.9	1.9	1.9	1.9
Output kW at rpm	47/4400	66/4000	55/4200	47/4200
Torque Nm at rpm	124/2000...3000	202/1900	150/2400...3400	125/2200...2800
Bore ø mm	79.5	79.5	79.5	79.5
Stroke mm	95.5	95.5	95.5	95.5
Compression ratio	22.5:1	19.5:1	22.5:1	19.5:1
CN min.	49	49	49	49
Firing order	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Catalyst	x	x	x	x
Exhaust gas recirculation	x1)	x	x1)	x
Charging	-	x	x	-
Charge air cooling	-	x	-	-

1)08.94 ▶

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Code letters		AFN	AHU	ALE	AVG
Manufactured		01.96 ▶	08.96 ▶	06.97 ▶	10.99 ▶
Capacity	ltr.	1.9	1.9	1.9	1.9
Output	kW at rpm	81/4150	66/4000	66/3750	81/4150
Torque	Nm at rpm	235/1900	202/1900	210/1900	235/1900
Bore	ø mm	79.5	79.5	79.5	79.5
Stroke	mm	95.5	95.5	95.5	95.5
Compression ratio		19.5	19.5	19.5	19.5
CN	min.	49	49	49	49
Firing order		1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Catalyst		x	x	x	x
Exhaust gas recirculation		x	x	x	x
Charging		x	x	x	x
Charge air cooling		x	x	x	x
Exhaust emissions fulfil		-	-	D3 standard	-

Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>



10 - Removing and installing engine

1 - Removing and installing engine

1.1 - Removing and installing engine

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Pliers V.A.G 1921 for spring type clips
- ◆ Lifting tackle 2024 A
- ◆ Grease G 000 100 (vehicles with manual gearbox)
- ◆ V.A.G 1331 Torque wrench (5...50 Nm)
- ◆ V.A.G 1332 Torque wrench (40...200 Nm)
- ◆ Cable tie

1.2 - Notes on removing

- The engine is removed forwards together with the gearbox.
- With ignition switched off disconnect battery earth strap.

Note:

If necessary the anti-theft coding for the radio must be obtained first.

- All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.
- Drain coolant => Page 99
- Removing lock carrier with attachments:

=> General body repairs; Repair group 50; Body front; Servicing lock carrier with attachments Body front Servicing lock carrier with attachments

Vehicles with air conditioner:

- Observe additional information and removal instructions => Page 9 .

Engine codes 1Z, AHU, AFN, AVG, ALE

- Remove connecting pipe between charged air cooler and intake manifold pressure hose.

Engine codes 1Y, AAZ

- Disconnect throttle cable at injection pump lever, remove securing clip on support bracket and release throttle cable.
- Disconnect CSA cable (if fitted).

Continued for all engine codes

- Remove power assisted steering reservoir and lay to side.
- Remove power assisted steering vane pump with bracket and lay to side; hoses remain connected.

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes



Vehicles with manual gearbox

With cable operated clutch:

- Disconnect clutch cable:

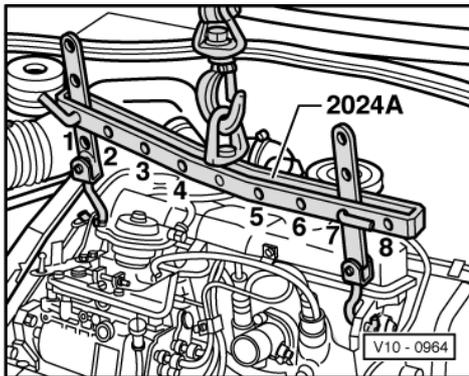
=> 5-Speed manual gearbox 020; Repair group 30; Servicing clutch control; removing and installing clutch cable Servicing clutch control removing and installing clutch cable

With hydraulically operated clutch:

- Remove hydraulic clutch slave cylinder:

=> 5-Speed manual gearbox 02A; Repair group 30; Servicing clutch release mechanism Servicing clutch release mechanism

- Disconnect selector mechanism from gearbox.



=> 5-Speed manual gearbox 02A; Repair group 34; Servicing selector mechanism Servicing selector mechanism

- -> Attach lifting tackle 2024A as follows and lift slightly with workshop crane:

Pulley end:

2nd hole in hook at position 1

Flywheel end:

2nd hole in hook at position 7

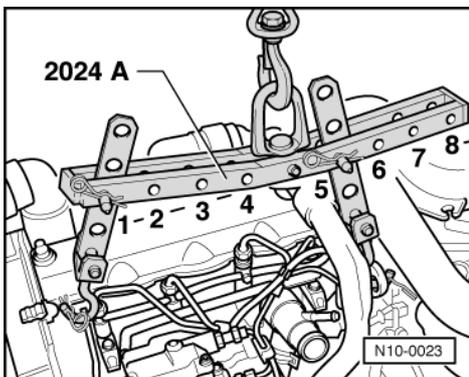
Warning!

The hooks and locating pins must be secured with locking pins.

Notes:

- ♦ The positions marked 1...4 on the bar must be towards the pulley end.
- ♦ The holes in the hook rails are counted up from the hook.

Vehicles with automatic gearbox





- -> Attach lifting tackle 2024A as follows and lift slightly with workshop crane:

Pulley end:
2nd hole in hook at position 1

Flywheel end:
2nd hole in hook at position 5

Warning!
The hooks and locating pins must be secured with locking pins.

Notes:

- ◆ The positions marked 1...4 on the bar must be towards the pulley end.
- ◆ The holes in the hook rails are counted up from the hook.

Continuation for all vehicles

- Remove front engine mounting complete.
- Lever out assembly forwards.

Note:

When the assembly is lifted off, it must be carefully guided to prevent damage to the bodywork.

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

1.3 - Notes on installing

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

With cable operated clutch:

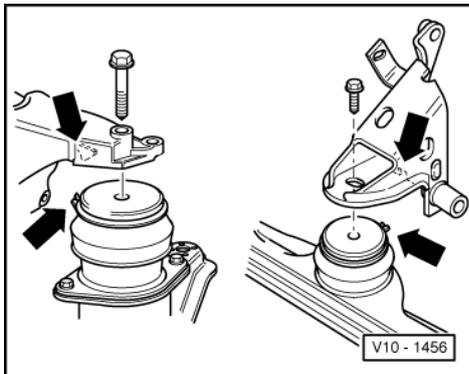
- Lightly grease input shaft splines with G 000 100.

With hydraulically operated clutch:

- Check clutch release bearing for wear, renew if necessary.
- Lightly grease clutch release bearing, release bearing guide sleeve and splines on input shaft with G 000 100.

Both versions:

- Check whether the dowel sleeves for centralising engine/gearbox are in the cylinder block, install if necessary.
- When lowering the assembly, ensure that clearance exists between assembly and drive shafts.





- -> When installing the engine mounting ensure that the rib on the rear right console also the recess on the front console locates on the lugs of the bonded rubber mounting -arrows-.
- Align engine mountings stress-free by rocking.

With cable operated clutch:

- Install clutch cable:

=> 5-Speed manual gearbox 020; Repair group 30; Servicing clutch control; removing and installing clutch cable Servicing clutch control removing and installing clutch cable

With hydraulically operated clutch:

- Install hydraulic clutch slave cylinder:

=> 5-Speed manual gearbox 02A; Repair group 30; Servicing clutch release mechanism Servicing clutch release mechanism

- Install gear selector mechanism:

=> 5-Speed manual gearbox 02A; Repair group 34; Servicing selector mechanism Servicing selector mechanism

- If necessary adjust selector cables:

=> 5-Speed manual gearbox 02A; Repair group 34; Servicing selector mechanism Servicing selector mechanism

Both versions:

- Installing air conditioner compressor:

=> Heating, Air conditioning; Repair group 87; Air conditioning with manual control Air conditioning with manual control

- Installing lock carrier with attachments:

=> General body repairs; Repair group 50; Body front; Servicing lock carrier with attachments Body front Servicing lock carrier with attachments

- Installing P.A.S. vane pump:

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

Engines with ribbed belt without tensioner:

- Installing ribbed belt=>Page 25 .

- Filling with coolant => Page 99
- Electrical connections and routing:

=> Electrical system; Repair group 97

- Check headlight adjustment and adjust if necessary:

=> Maintenance

Engine codes 1Y, AAZ

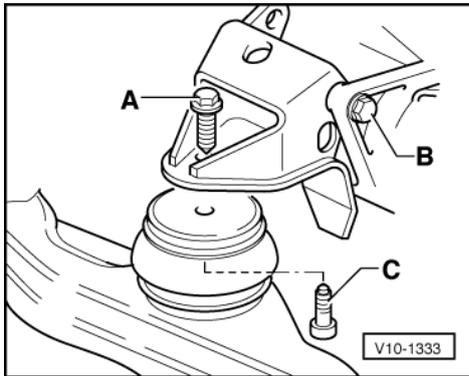
- Adjust CSA operating cable =>Page 119
- Adjusting throttle cable => Page 118



1.4 - Tightening torques

Bolted connection		Tightening torque
Engine to gearbox	M10	60 Nm
	M12	80 Nm
Drive shafts to flanged shafts		45 Nm
Front exhaust pipe to turbocharger		25 Nm
Exhaust pipe to manifold		40 Nm
Engine carrier to body		50 Nm

1.5 - Assembly mountings



Tightening torques

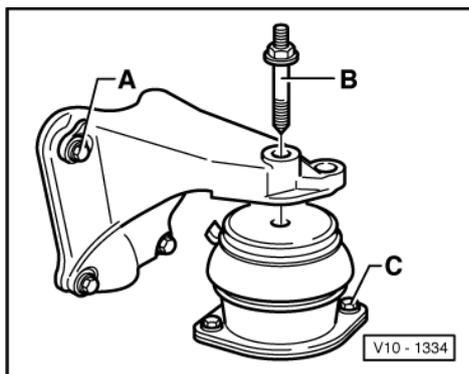
(Bolts oiled)

-> Front assembly mounting

A = 50 Nm

B = 55 Nm

C = 50 Nm

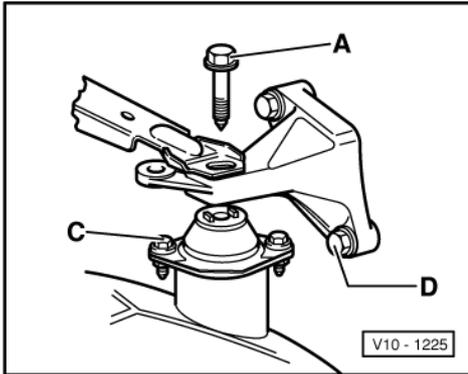


-> Rear right assembly mounting

A = 25 Nm

B = 50 Nm

C = 25 Nm



-> Rear left engine mounting

A = 50 Nm
C = 25 Nm
D = 25 Nm

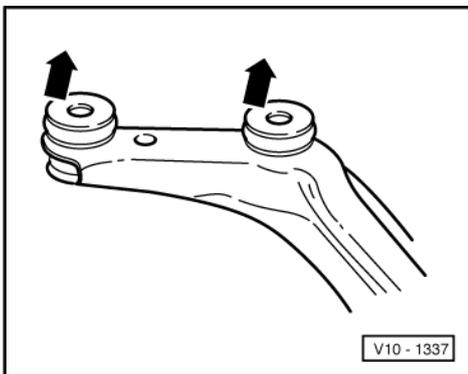
1.6 - Renewing engine carrier rubber mounting

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

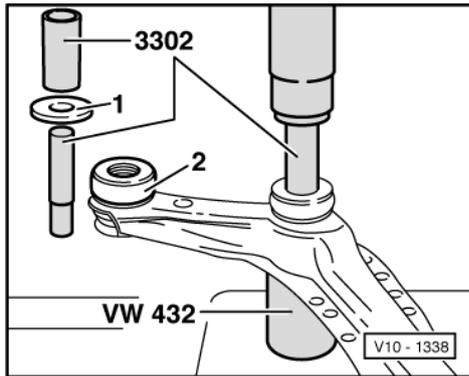
- ♦ Engine support bracket 10-222A with legs 10-222A/1
- ♦ Peening tool 3302
- ♦ Press tool VW 432

Work sequence

- Fit engine support bracket 10-222A with legs 10-222A/1.



- Locate support bracket in lifting eye on left of cylinder head and take-up weight of engine.
- Remove engine carrier.
- -> Lever off washers from the spacer sleeves with pliers (replace any washers which are damaged e.g. bent washers).
- Pull out spacer sleeves and detach rubber mounting.
- Fit new rubber mounting and insert spacer sleeves as far as possible.



- -> Fit washers -1- over peening tool 3302 onto the rubber mounting -2-.
- Fit press sleeve of peening tool 3302 and using a press, press the washers onto the spacer sleeves and peen. Use VW 432 as packing.
- Remove any resulting protrusion/burr on the peening.

1.7 - Additional information and removal instructions for vehicles with air conditioner

Warning!
The air conditioning system refrigerant circuit must not be opened.

Note:

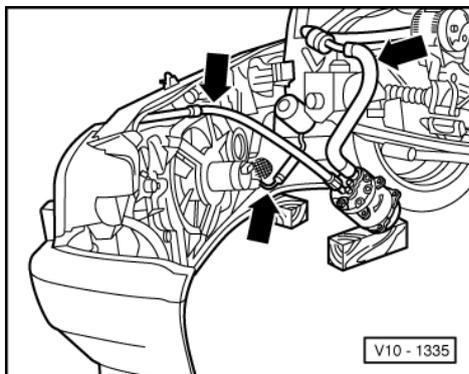
The opening of the refrigerant circuit can only be carried out in workshops, which have trained personnel and the necessary range of tools and workshop equipment.

To facilitate removing and installing the engine without opening the refrigerant circuit:

- Unbolt air conditioner fluid reservoir and allow to hang free.
- Remove ribbed belt => Page 24 .
- Remove and lower lock carrier with attachments:

=> General body repairs; Repair group 50; Body front; Servicing lock carrier with attachments Body front Servicing lock carrier with attachments

- Remove refrigerant pipe bracket from longitudinal member.



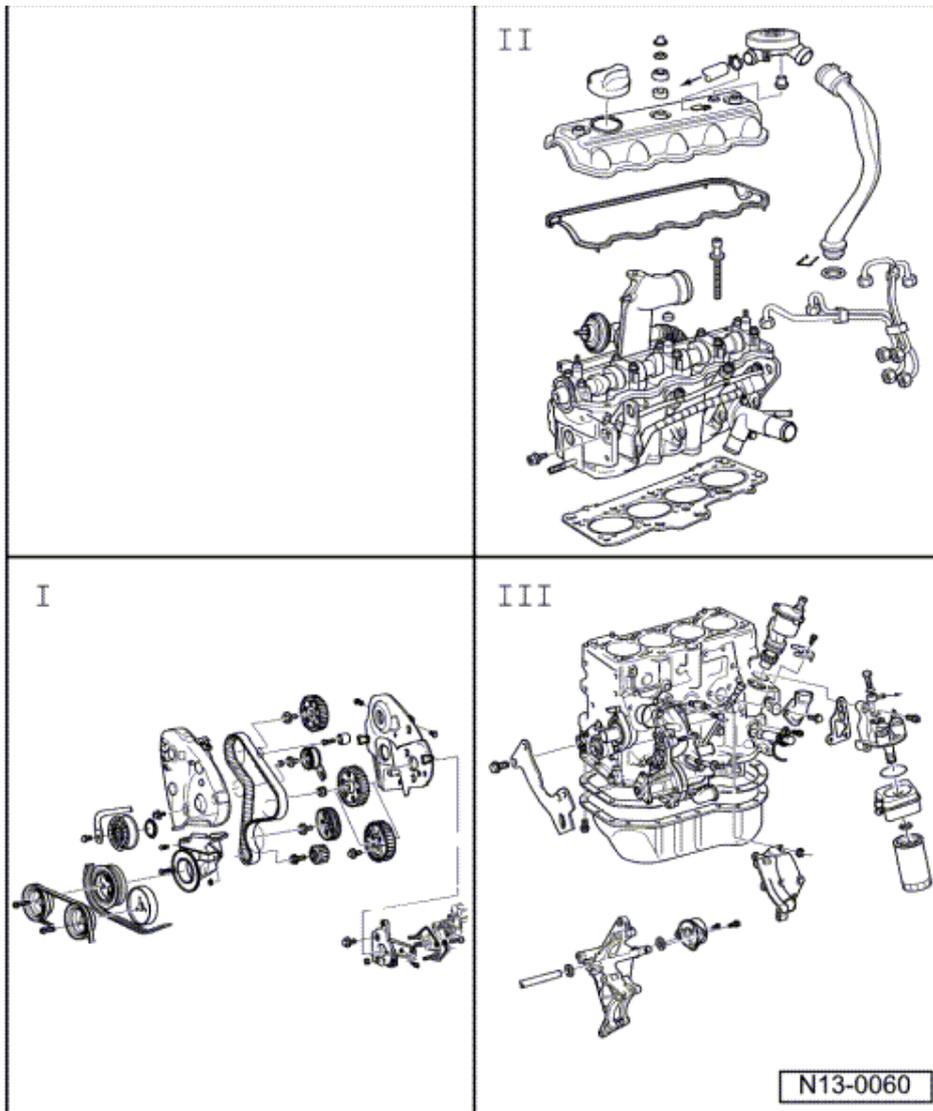
- -> Remove air conditioner compressor and lay to one side with lock carrier so that the refrigerant hoses - arrows- are not stressed.



13 - Crankshaft group

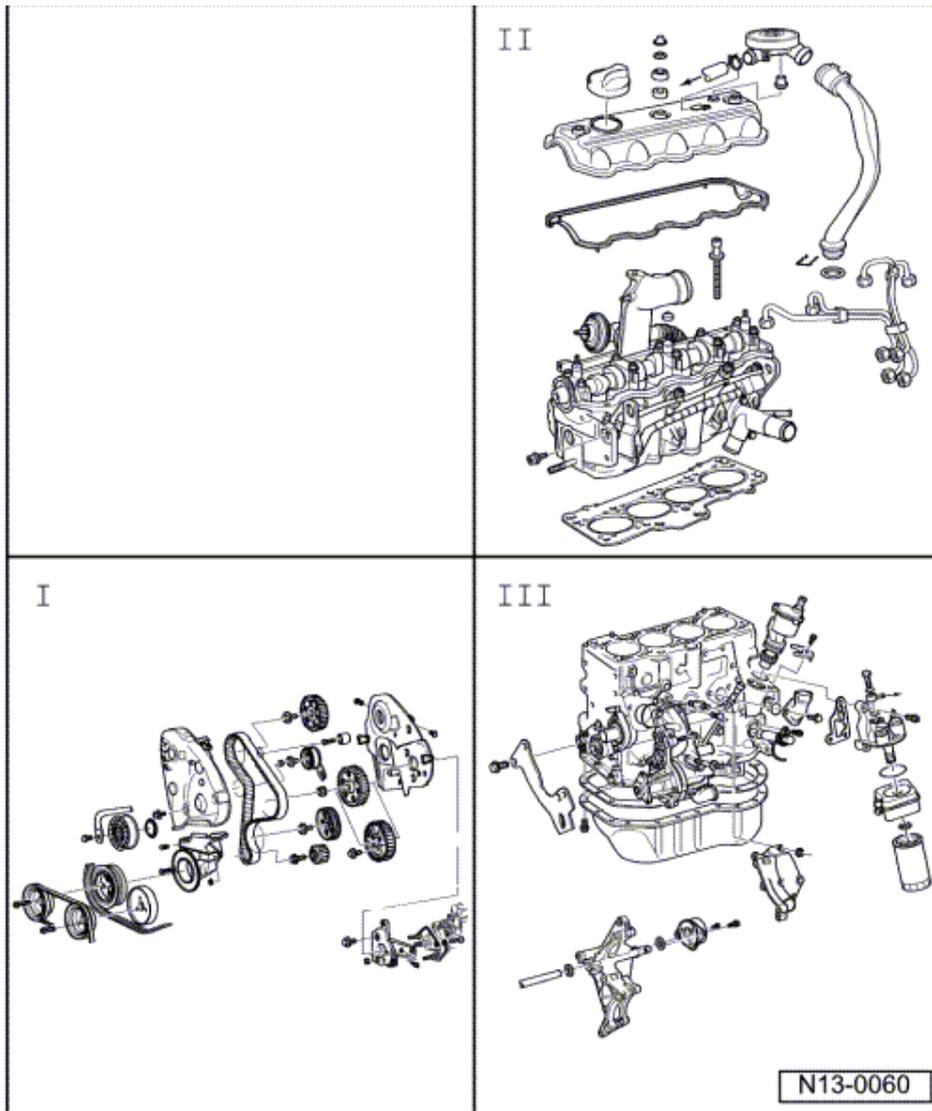
1 - Dismantling and assembling engine

1.1 - Dismantling and assembling engine



Notes:

- ♦ If during repair work, metal shavings or larger quantities of small metal particles are found in the engine oil - caused, for example, by partial seizure of the crankshaft and conrod bearings - then, apart from thoroughly cleaning out the oil passages, it is necessary to renew the oil cooler.
- ♦ Defective injectors can cause violent knocking noises in the engine which sound like defective bearings. When this occurs, run engine at idling speed and slacken off injector pipe unions one after the other. If knocking stops when a union is loosened, this indicates that the injector concerned is defective.



Servicing injectors.

Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

=> Repair group 23; Servicing diesel direct injection system; Servicing injectors Servicing diesel direct injection system Servicing injectors

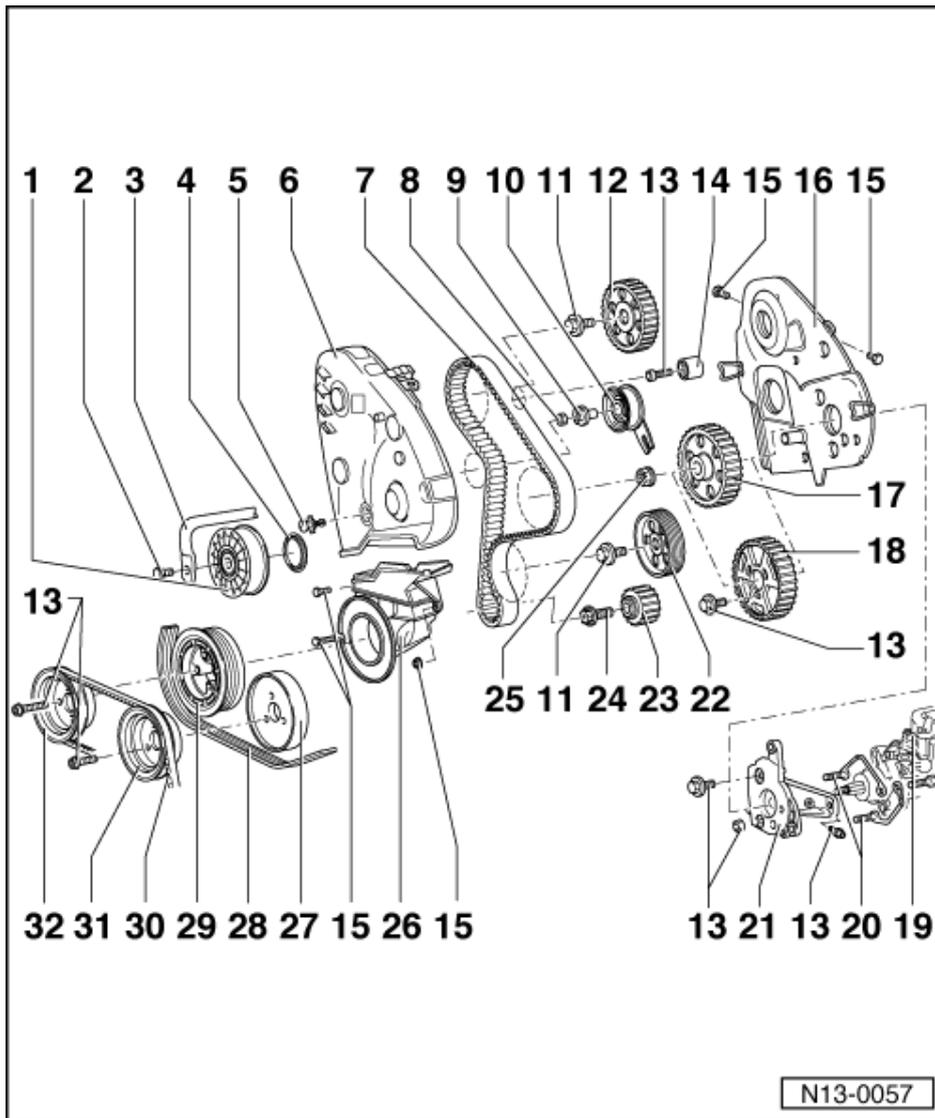
Engine codes 1Y, AAZ

=> Repair group 23; Servicing fuel injection system; Servicing injectors Servicing fuel injection system Servicing injectors

I =>Page 12

II =>Page 17

III =>Page 20

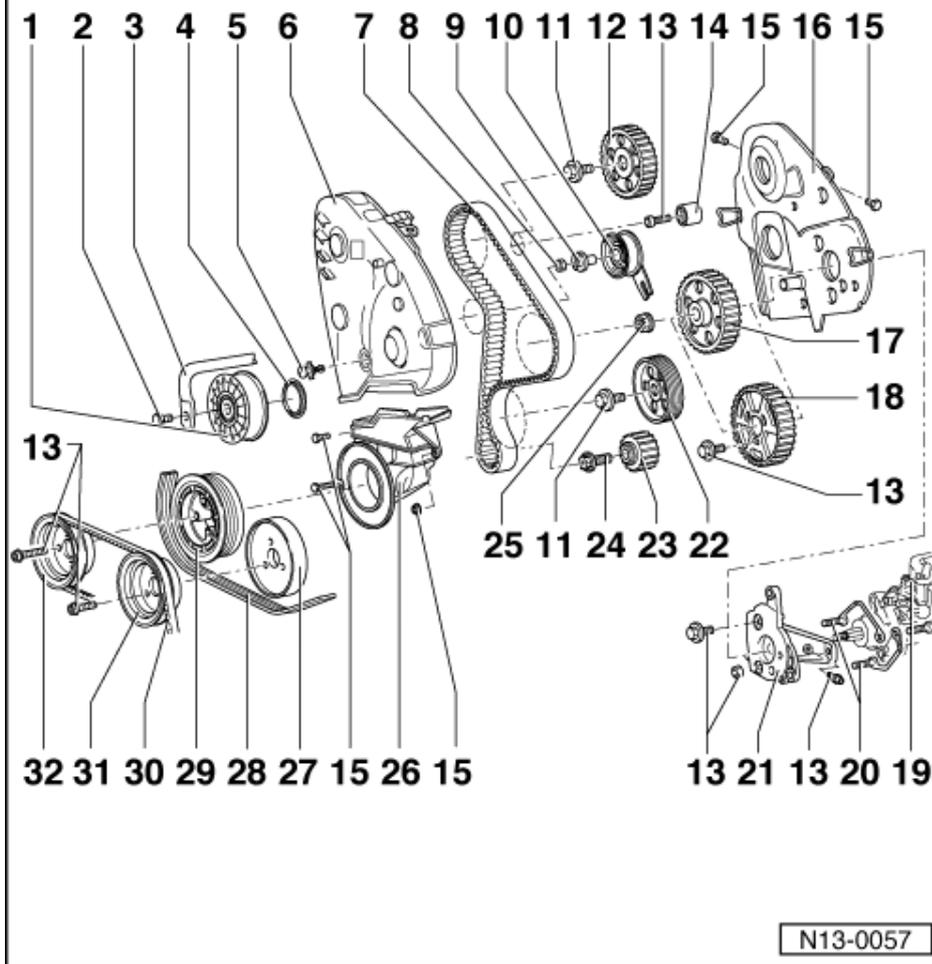


Part I

- 1 Tensioner
- 2 20 Nm
- 3 Tensioning lever
 - ◆ Lubricate with G 000100
- 4 Dust cap
- 5 Spreader clip
- 6 Toothed belt guard - upper part
- 7 Toothed belt
 - ◆ Mark D.O.R. before removing
 - ◆ Check for wear
 - ◆ Do not kink
 - ◆ Removing, installing and tensioning
=> Page 27
- 8 45 Nm
 - ◆ 20 Nm for semi-automatic tensioning roller



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9 Eccentric

- ◆ For semi-automatic tensioning roller

10 Tensioning roller

- ◆ The semi-automatic tensioning roller is illustrated
- ◆ Checking semi-automatic toothed belt tensioning roller
=> Page 33

11 45 Nm

12 Camshaft sprocket

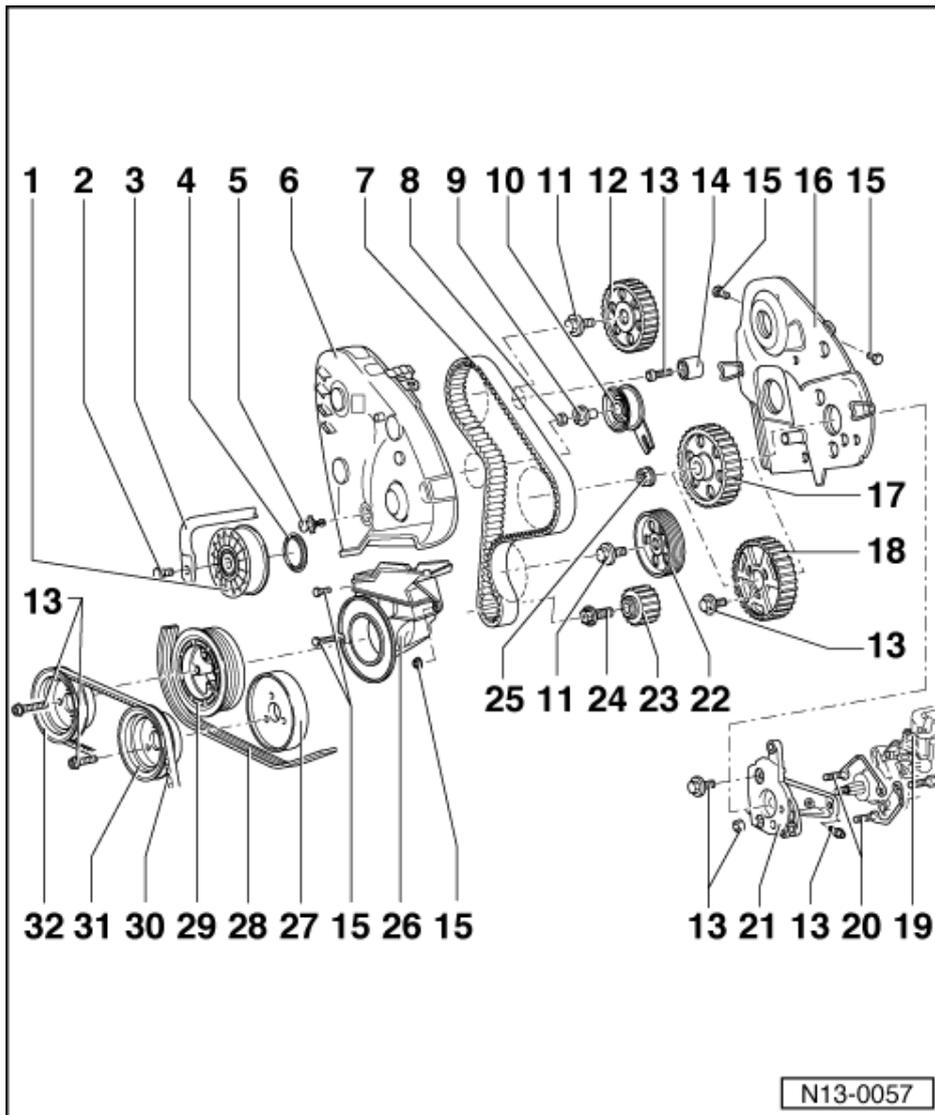
- ◆ Drive off camshaft taper using hammer and drift through toothed belt guard openings

13 25 Nm

14 Idler wheel

- ◆ Engine codes: 1Z, AHU, AEY, AFN, AVG, ALE

15 10 Nm



16 Rear toothed belt guard

17 Injection pump sprocket

- ◆ Single part
- ◆ Engine codes: 1Z, AHU, AEY, AFN, AVG, ALE
- ◆ Engine codes:
1Y, AAZ > 09.94
- ◆ Removing =>Page **33**

18 Injection pump sprocket

- ◆ Two part
- ◆ Engine codes:
1Y, AAZ > 10.94

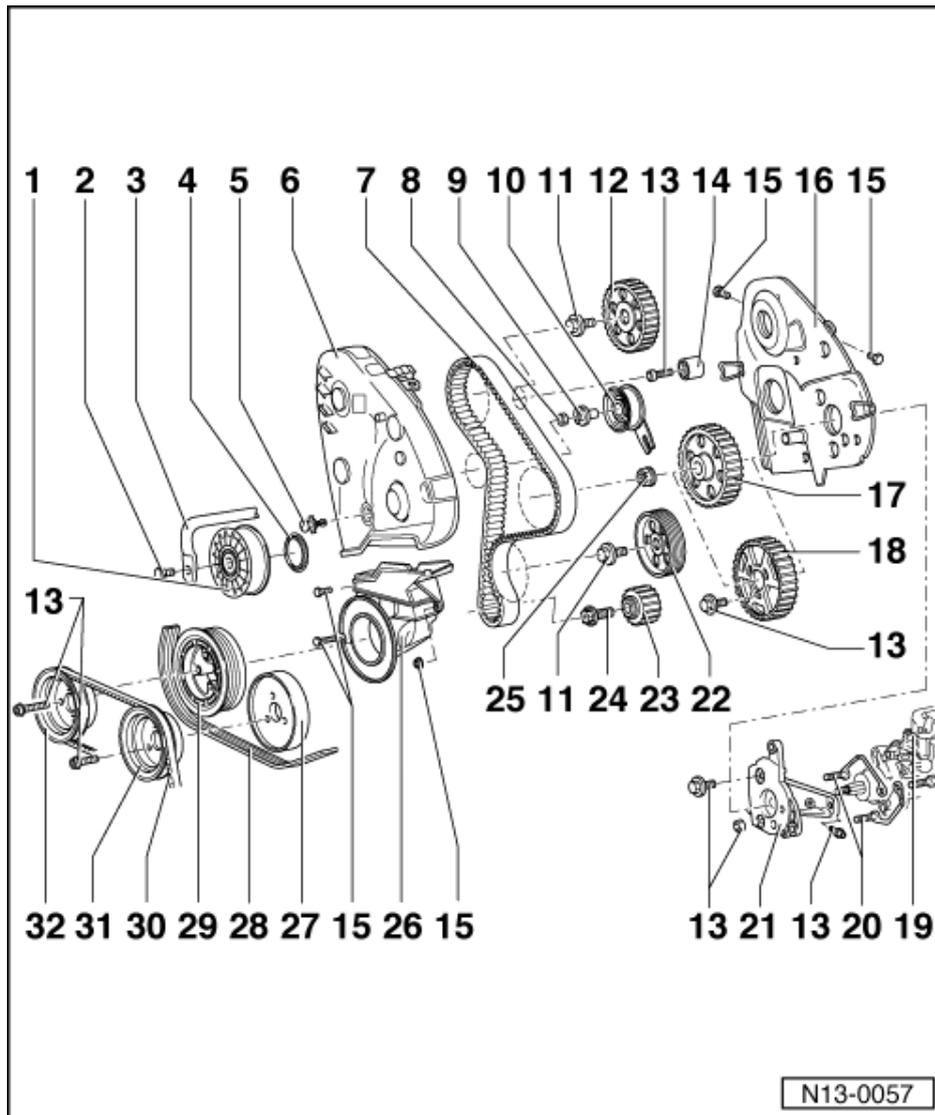
19 Injection pump

- ◆ Removing and installing for engine codes 1Z, AHU, AEY, AFN, AVG, ALE

=> Repair group 23; Servicing diesel direct injection system; Removing and installing injection pump Servicing diesel direct injection system Removing and installing injection pump

- ◆ Removing and installing for engine codes: 1Y, AAZ

=> Repair group 23; Servicing fuel injection system; Removing and installing injection pump Servicing fuel injection system Removing and installing injection pump



20 Bracket

- ◆ Engine codes: 1Z, AHU, AEY, AFN, AVG, ALE
- ◆ Engine codes
 1Y, AAZ ▶ 09.94

21 Console

22 Intermediate shaft sprocket

23 Crankshaft toothed belt sprocket

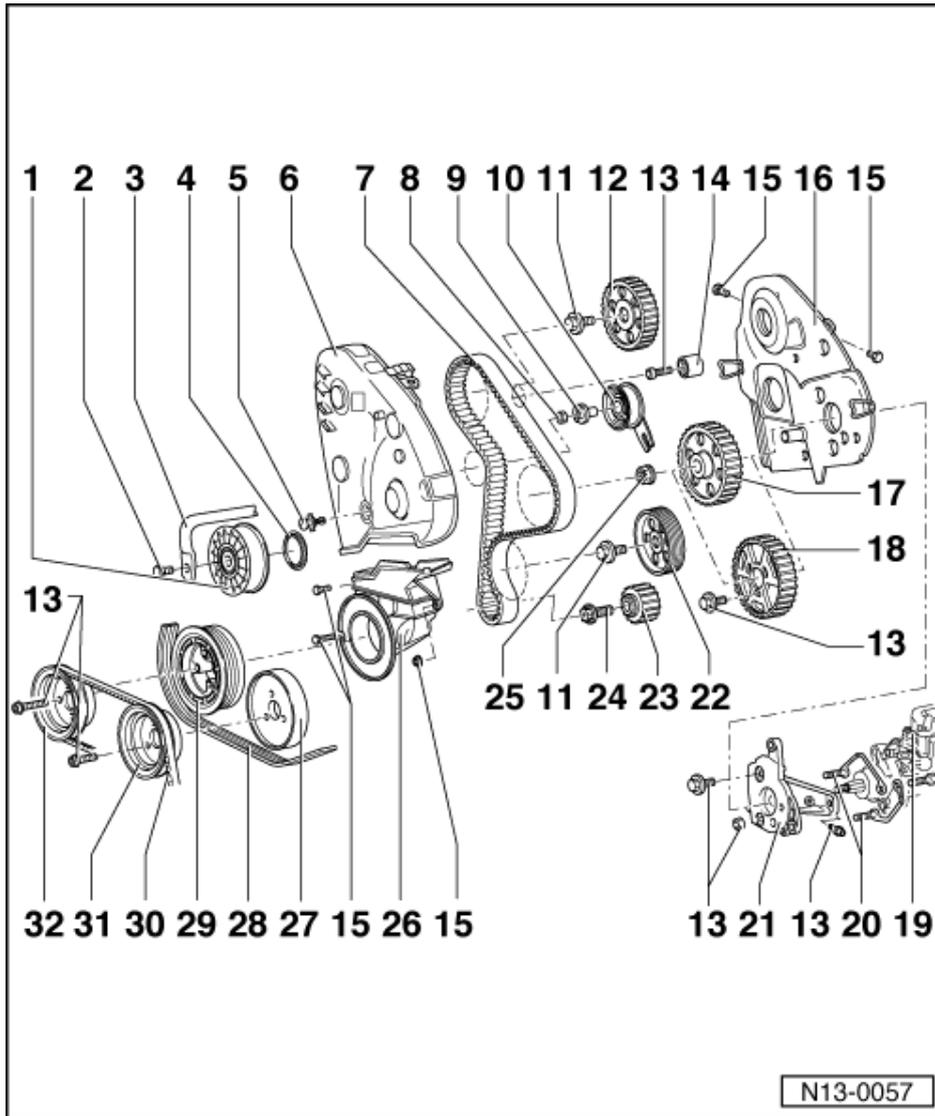
24 90 Nm + 1/4 turn (90 °) further

- ◆ Counter-hold with 3099 to loosen and tighten
- ◆ Renew
- ◆ Threads and shoulder must be free of oil and grease
- ◆ The quarter turn further can be done in several stages.

25 55 Nm

- ◆ 45 Nm for engine codes: 1Y, AAZ

26 Toothed belt guard - lower part



27 Pulley

- ◆ For coolant pump
- ◆ Version for ribbed belt

28 Ribbed belt

- ◆ Mark direction of rotation before removing
- ◆ Removing and installing
=> Page 24

29 Belt pulley/vibration damper

- ◆ Can only be installed in one position. Holes are off-set

30 V-belt

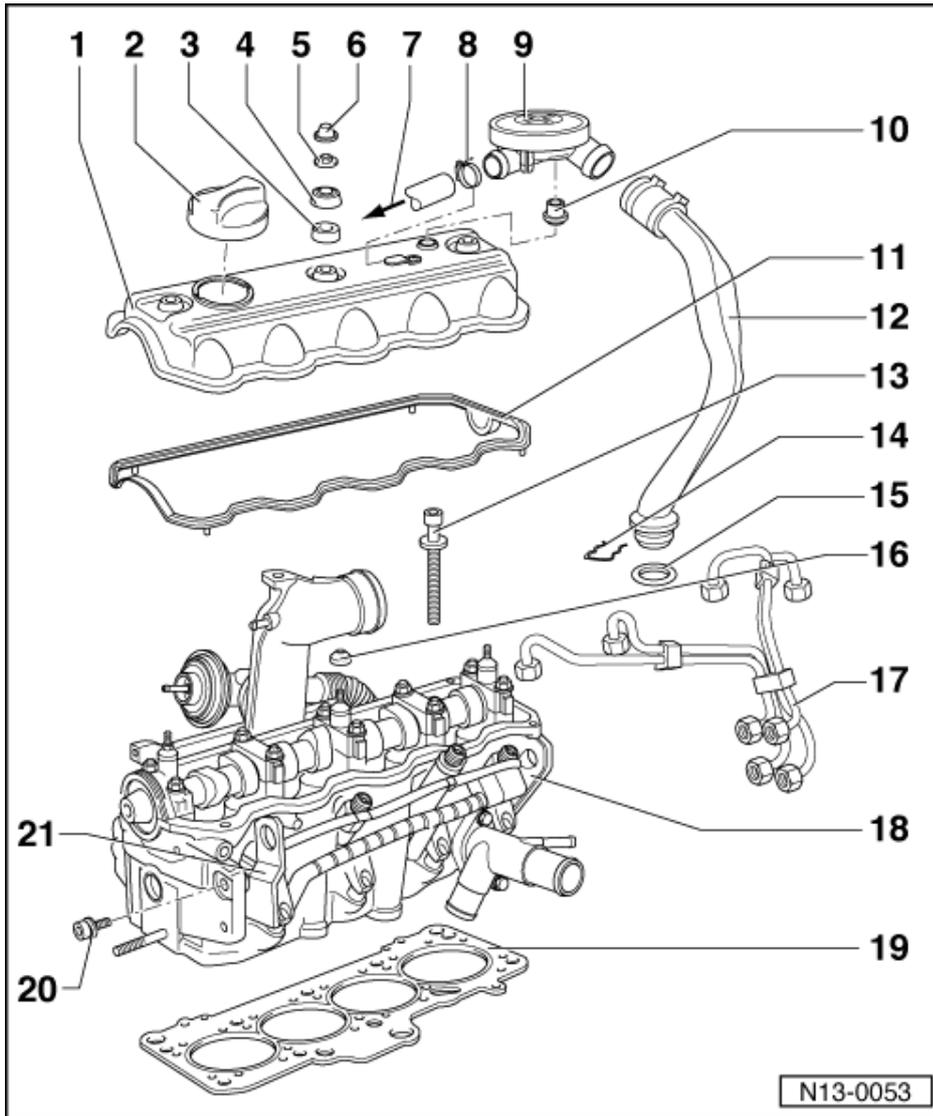
- ◆ Adjusting V-belt tension:

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

31 Pulley

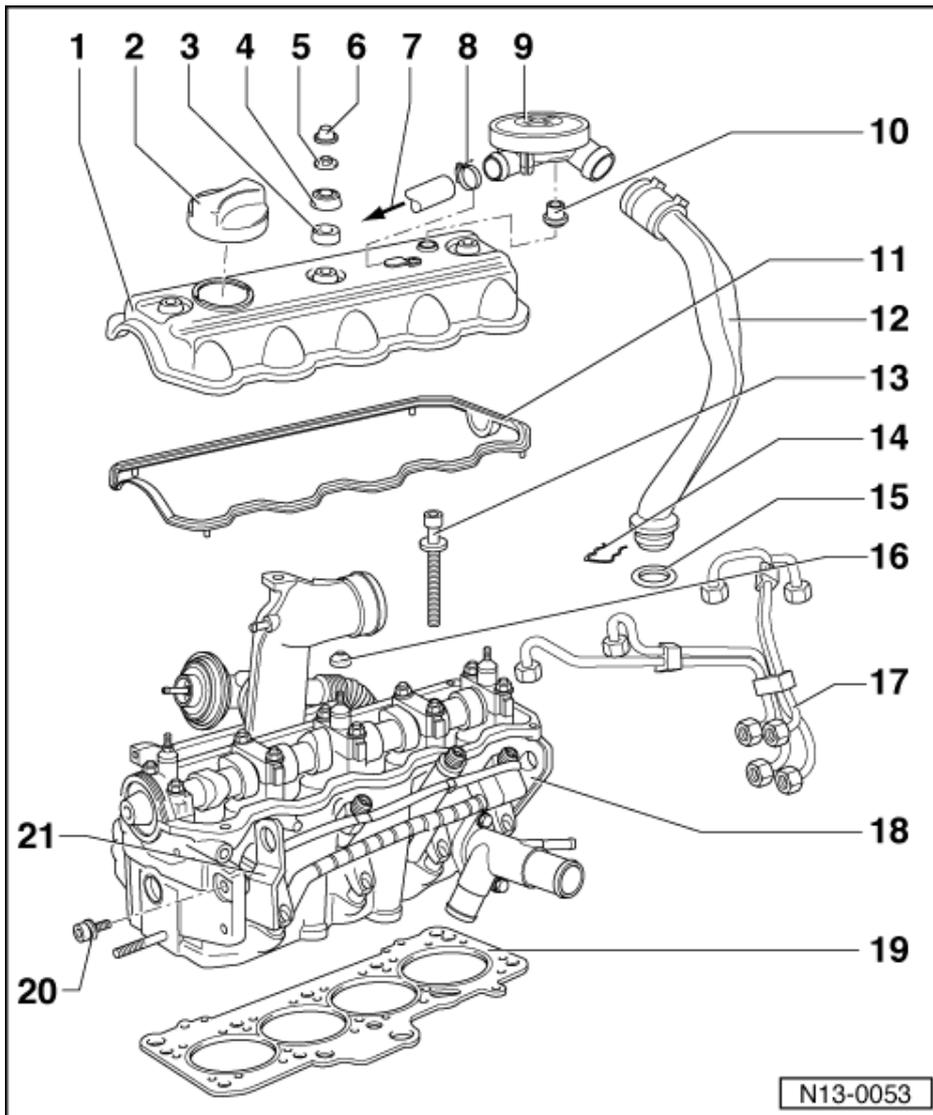
- ◆ For coolant pump
- ◆ V-belt version

32 Belt pulley



Part II

- 1 Cylinder head cover
- 2 Cap
 - ◆ Renew seal if damaged
- 3 Upper sealing washer
- 4 Dished washer
- 5 10 Nm
- 6 Cap
- 7 To intake hose
- 8 Retaining clip
- 9 Pressure regulating valve
 - ◆ For crankcase breather
- 10 Gasket
 - ◆ Renew if damaged



18 Cylinder head

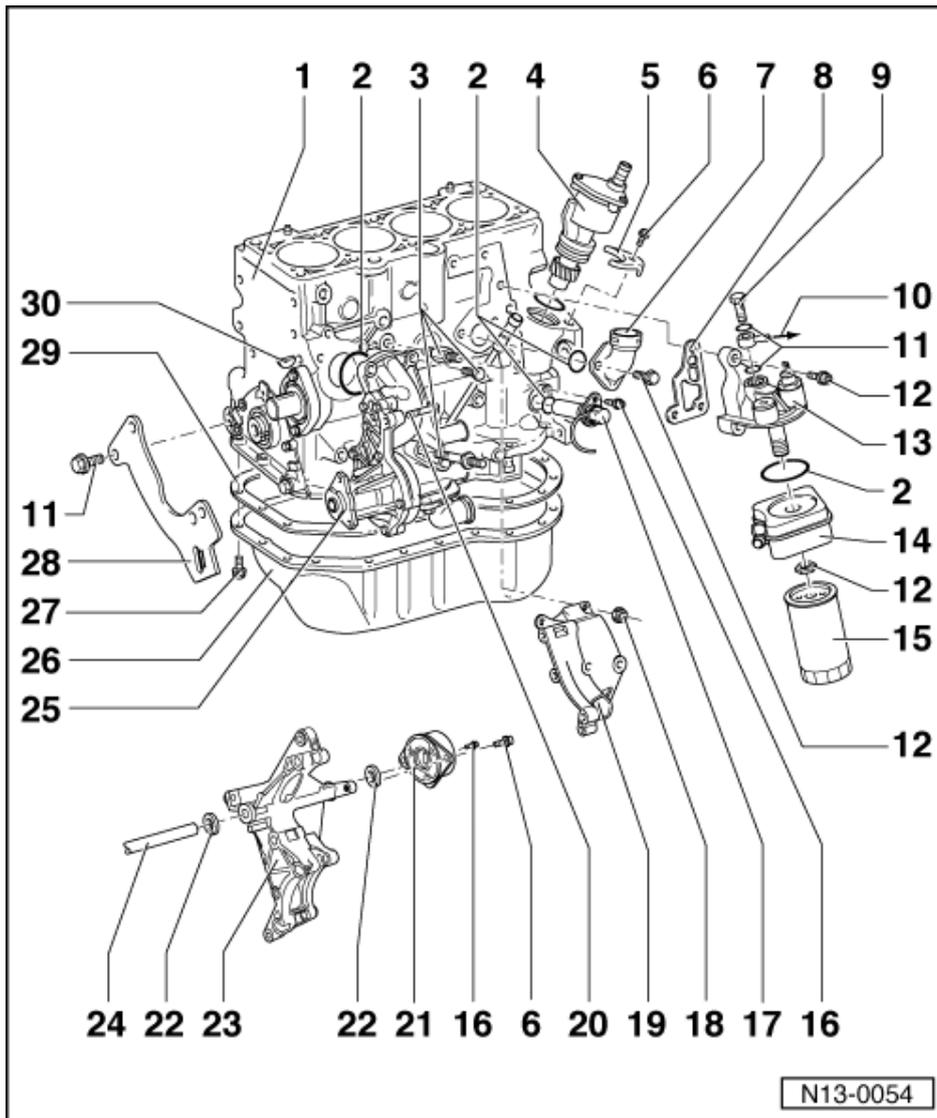
- ◆ Removing and installing
=> Page 56
- ◆ If replaced renew the complete coolant

19 Cylinder head gasket

- ◆ Renew
- ◆ Note marking
=>Page 55
- ◆ If replaced renew the complete coolant

20 20 Nm

21 Lifting eye



Part III

1 Cylinder block

- ◆ Removing and installing sealing flange and pressure plate/flywheel/drive plate
=> Page 34
- ◆ Removing and installing crankshaft => Page 43
- ◆ Dismantling and assembling pistons and conrods
=> Page 47

2 O-ring

- ◆ Renew if damaged

3 Turn 20 Nm + 1/4 turn (90 °) further

- ◆ Renew

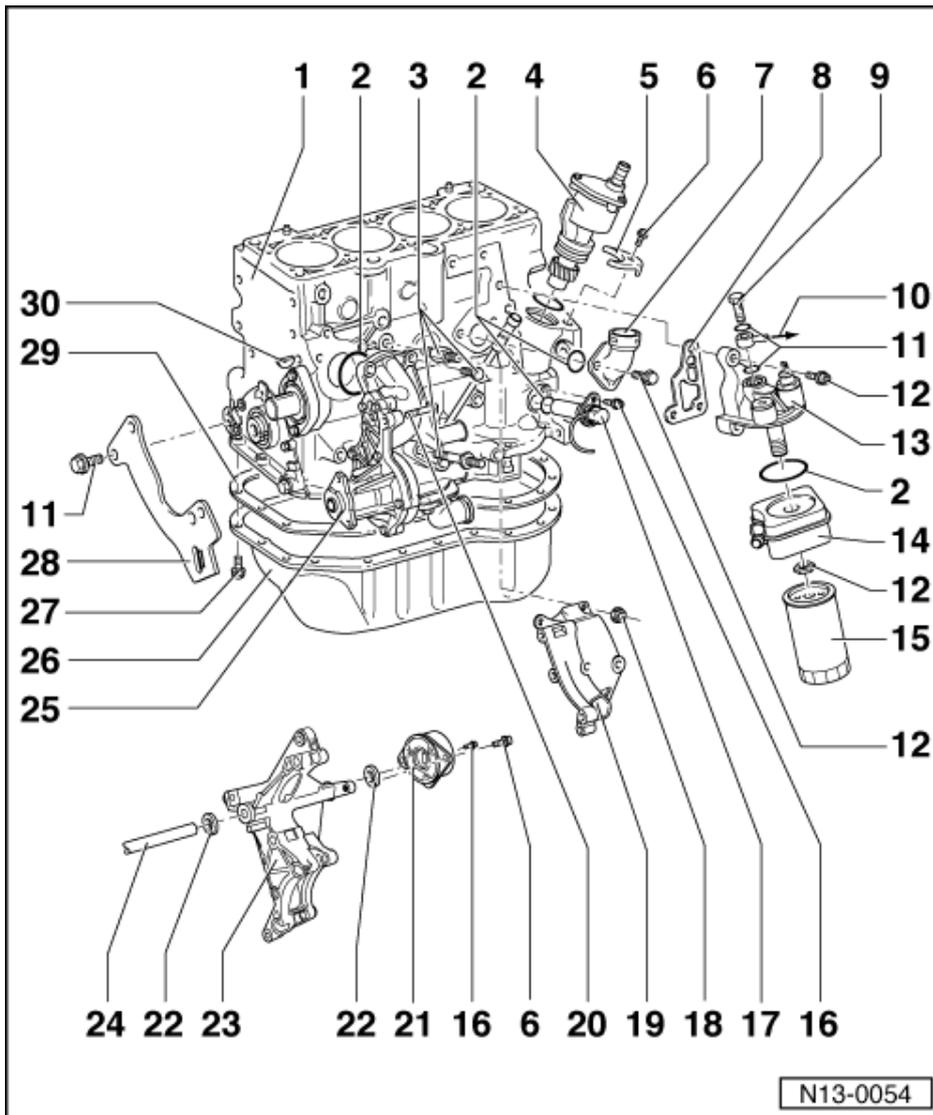
4 Vacuum pump

5 Clamp

6 20 Nm

7 Connection

- ◆ For crankcase breather



8 Gasket

- ◆ Renew

9 Banjo bolt, 25 Nm

10 To turbo charger

- ◆ Engine codes
1Z, AHU, AAZ, AFN, AVG, ALE

11 Sealing ring

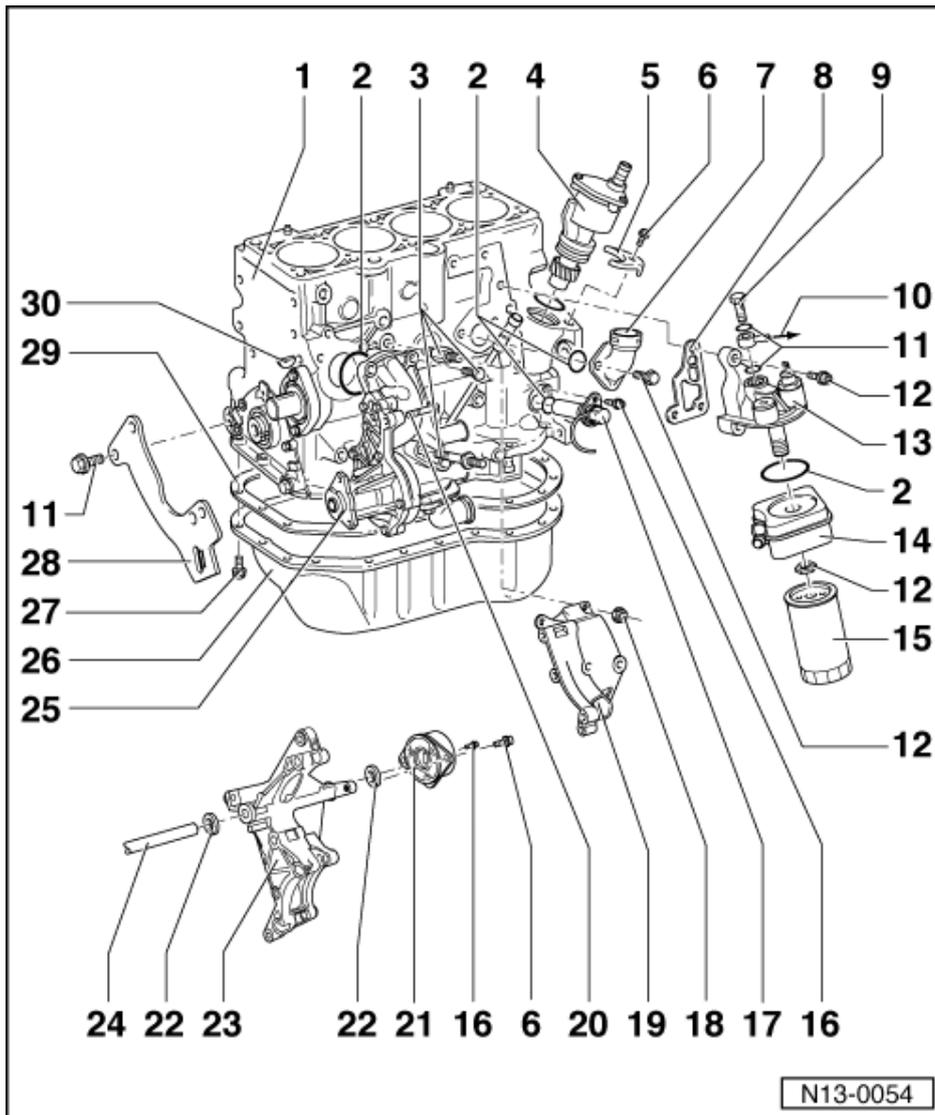
- ◆ Renew

12 25 Nm

13 Oil filter bracket

14 Oil cooler

- ◆ Coat contact area to flange, outside the seal, with AMV 188 100 02
- ◆ Ensure clearance to adjacent components
- ◆ See note
=> Page **10**



15 Oil filter

- ◆ Loosen with strap wrench
- ◆ Tighten by hand
- ◆ Note instructions on filter when installing

16 10 Nm

17 Engine speed sender

18 30 Nm

19 Bracket

- ◆ For ribbed belts without tensioner

20 Hammer head bolt

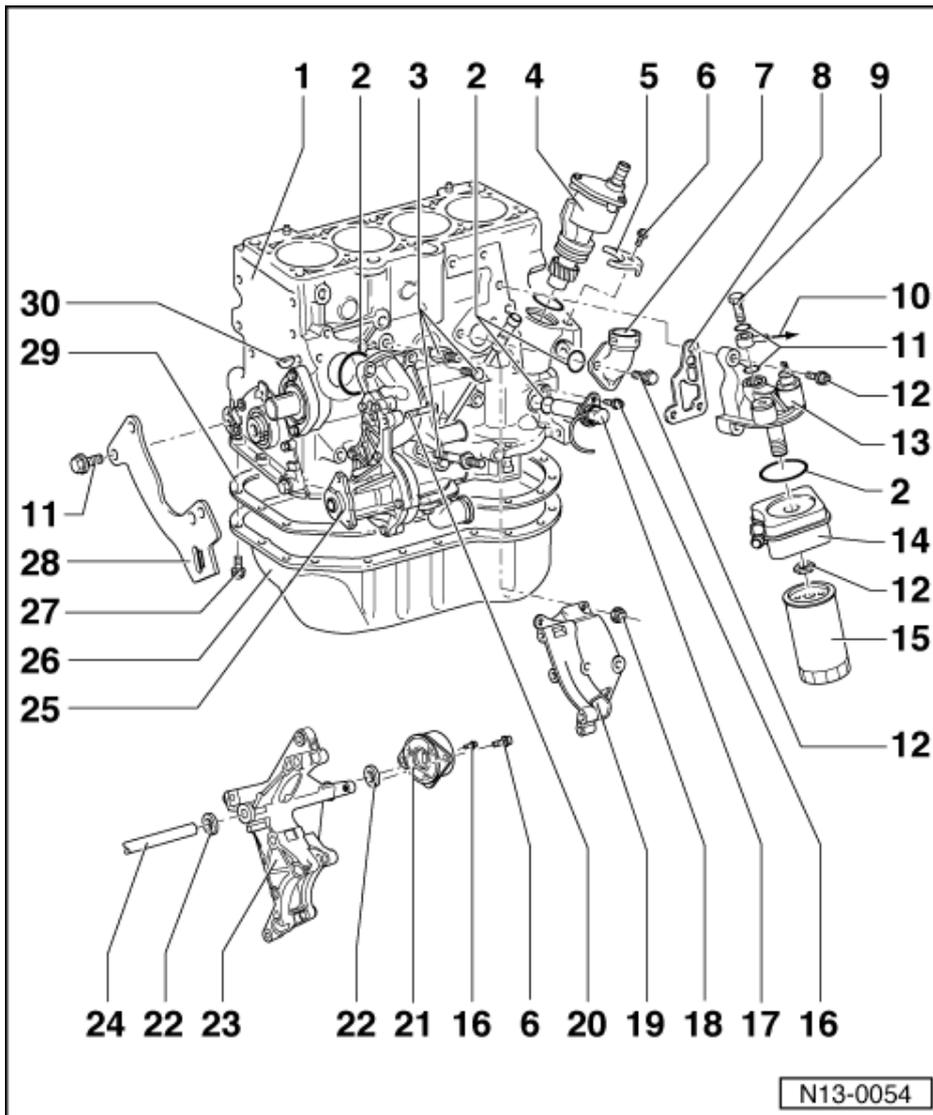
21 Tensioning element

22 Sealing ring

- ◆ Renew if damaged

23 Bracket

- ◆ For ribbed belts with tensioner



24 Tensioning lever

- ◆ Lubricate with G 000100

25 Coolant pump

- ◆ Dismantling and assembling => Page 98

26 Sump

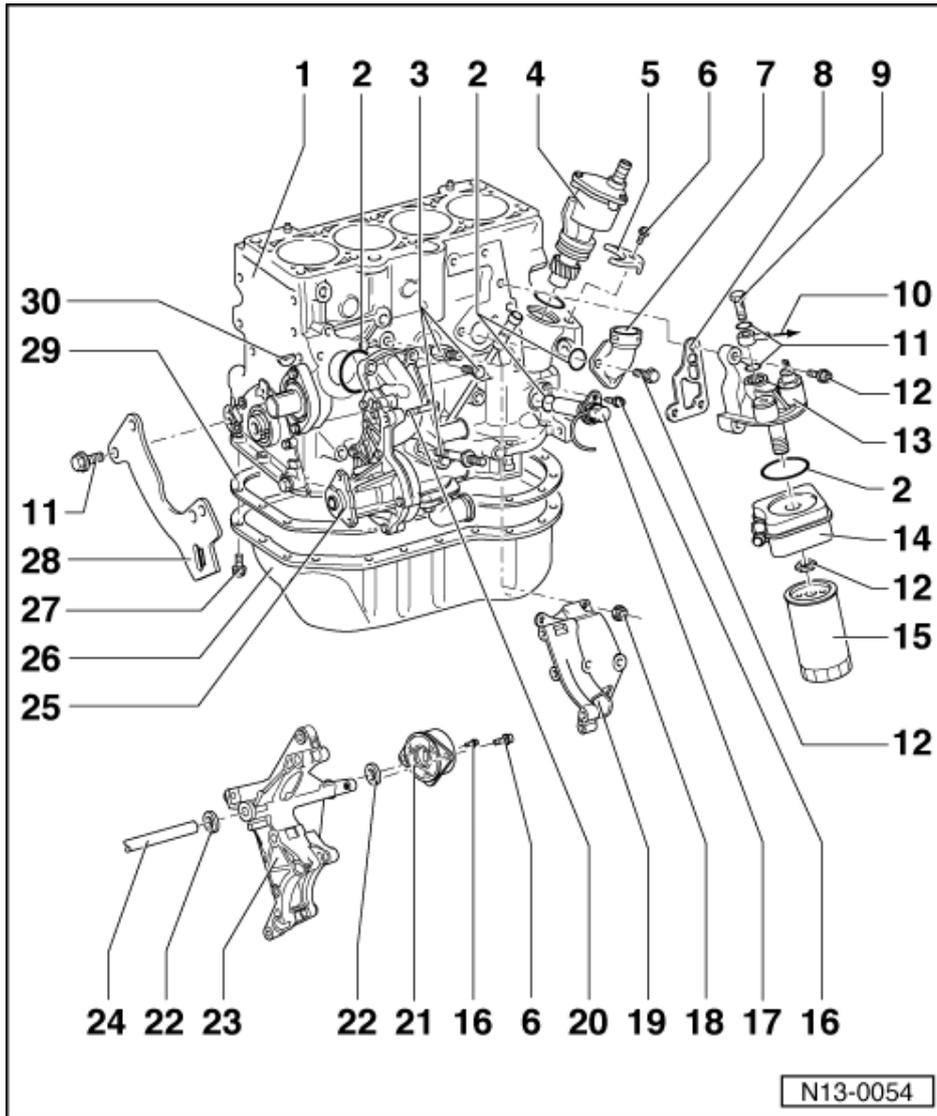
- ◆ Clean sealing surface before installing
- ◆ Engine codes AEY, AFN, AVG with oil sump cover
- ◆ Removing and installing oil sump cover =>Page 90

27 20 Nm

- ◆ Remove and install both rear bolts gearbox end with jointed spanner 3185

28 Bracket

- ◆ For vane pump



29 Gasket

- ◆ Renew
- ◆ On engine codes 1Y, AAZ with baffle plate: Replace seal if damaged
- ◆ Before fitting gasket coat sump flange/cylinder block flange with "D2"

30 Woodruff key

- ◆ Check for tight fit

1.2 - Removing and installing ribbed belt

Note:

Before removing the ribbed belt mark the direction of rotation. When installing the belt ensure it is correctly seated in the pulley.

Belt drive without tensioner

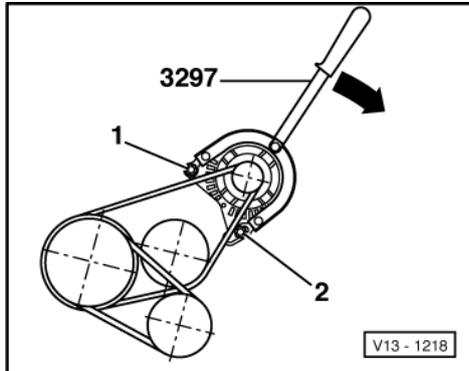
(Belt drive with tensioner =>Page 26)



Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Lever 3297

Removing ribbed belt



- -> Loosen alternator securing bolts -1- and -2- at least one turn.
- Press alternator down with lever 3297 and remove ribbed belts from the alternator pulley.
- Remove power assisted steering vane pump V-belt:

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

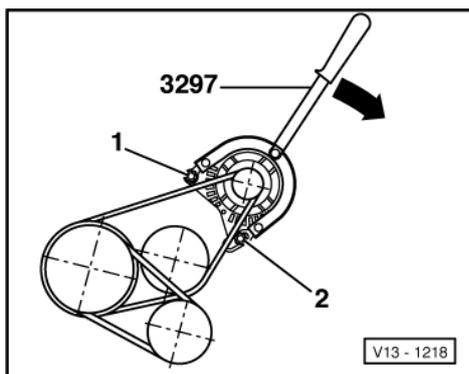
- Remove ribbed belt.

Installing ribbed belt

- Place ribbed belt on crankshaft pulley/vibration damper and coolant pump pulley.
- Fit power assisted steering vane pump V-belt:

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

- Push generator down onto stop at least 3 times with lever 3297, to ensure it moves freely.



- -> Push alternator down with 3297 and fit ribbed belt.

Note:

If the engine has not yet been fitted, carry on with sequence after the engine has been installed.

- Run engine for at least 10 seconds at idling with the alternator still loose.



Note:

When tightening the alternator bolts observe tightening sequence, do not use alternator for support and do not touch ribbed belt.

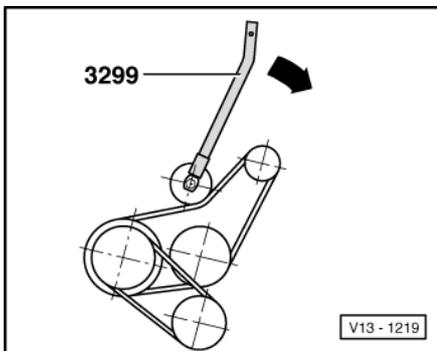
- Tighten securing bolt -2- to 25 Nm
- Tighten securing bolt -1- to 25 Nm.

Belt drive with tensioner

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Lever 3299

Removing ribbed belt



- -> Lift tensioning roller with lever 3299 and remove ribbed belt from the alternator pulley.
- Remove power assisted steering vane pump V-belt:

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

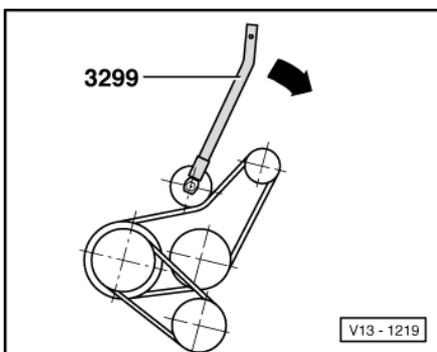
- Remove ribbed belt.

Installing ribbed belt

- Place ribbed belt on crankshaft pulley/vibration damper.
- Fit power assisted steering vane pump V-belt:

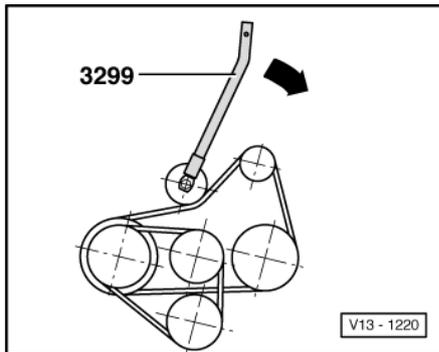
=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

- Lift tensioning roller with 3299 and fit ribbed belt.





-> Belt drive without air conditioner compressor



-> Belt drive with air conditioner compressor

1.3 - Removing and installing toothed belt

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Lever 3297 (for ribbed belt drive without tensioning roller).
- ◆ Lever 3299 (for ribbed belt drive with tensioning roller).
- ◆ Setting bar 2065 A
- ◆ Pin 2064 (for single part injection pump sprocket)
- ◆ Pin 3359 (for two part injection pump sprocket)
- ◆ Counter-hold tool 3036
- ◆ Pin wrench Matra V159
- ◆ V.A.G 1331 Torque wrench (5...50 Nm)

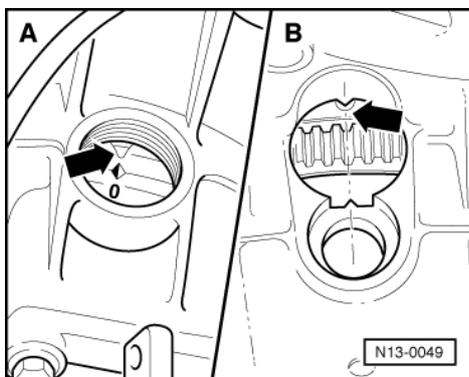
Engines without semi-automatic tensioning roller:

- ◆ V- and toothed belt test unit VW 210

Belt drive with single part injection pump sprocket

Belt drive with two part injection pump sprocket =>Page 31

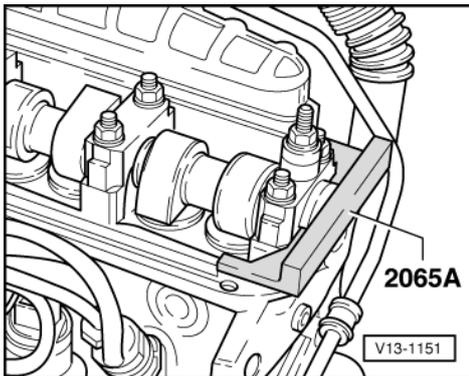
Removing



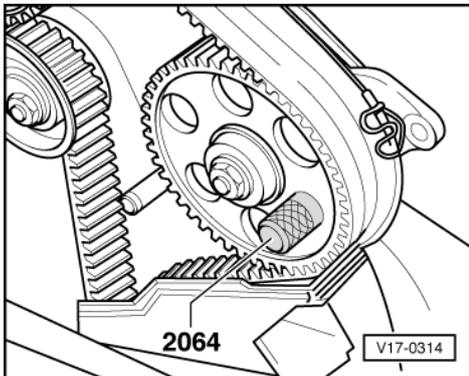
- Remove ribbed belt => Page 24 .
- If fitted remove ribbed belt tensioning roller.
- Remove upper toothed belt guard and cylinder head cover.
- -> Turn crankshaft to TDC No. 1 cylinder.
A: Engine codes 1Y, AAZ, AEY



B: Engine codes 1Z, AHU, AFN, AVG, ALE



- -> Lock camshaft with setting bar.
- Centralize setting bar as follows:
Turn camshaft so that one end of setting bar contacts the cylinder head. Using feeler gauge establish the gap at the other end of the setting bar. Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until the setting bar contacts the feeler gauge. Place a 2nd feeler gauge, of same thickness, at the other end between setting bar and cylinder head.



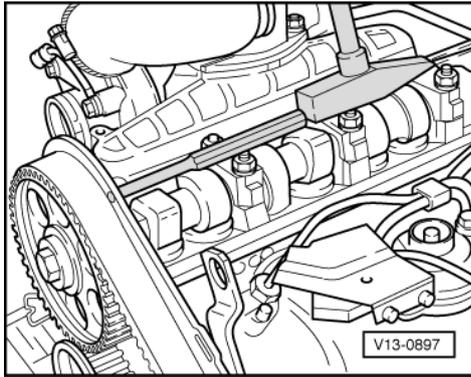
- -> Lock injection pump sprocket with pin.
- Loosen tensioner.
- Remove vibration damper and belt pulley.
- Remove lower toothed belt guard.
- Mark D.O.R. of toothed belt.

Engines with semi-automatic tensioning roller:

- Remove idler roller.
- Take off toothed belt.

Installing

- Check whether TDC mark on flywheel and reference mark are aligned.

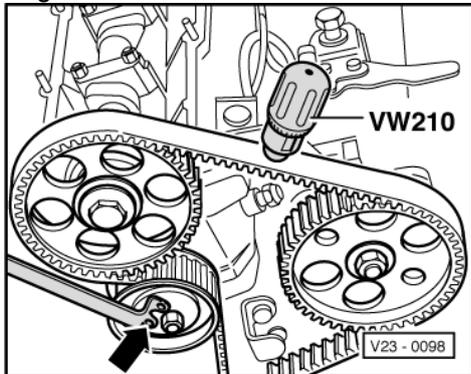


Note:

Never use setting bar as a counter hold when loosening and tightening the camshaft sprocket, use retainer 3036.

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

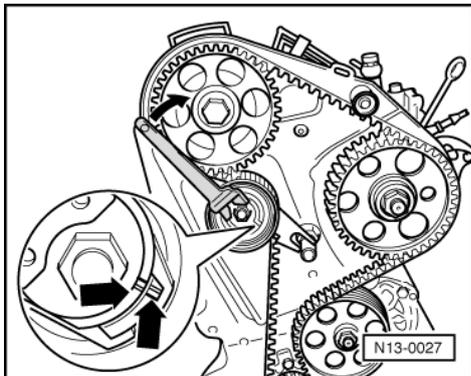
Engines without semi-automatic tensioning roller:



- -> Fit toothed belts (note D.O.R.) and remove pin from fuel injection pump sprocket.
- Tension toothed belts (turn tensioner with pin wrench e.g. Matra V159 -arrow- to right).
Scale value: 12 ... 13
measured between camshaft sprocket and injection pump sprocket.
- Tighten lock nut on the tensioner.
Tightening torque: 45 Nm
- Tighten camshaft sprocket securing bolt to 45 Nm.
- Remove setting bar.
- Turn crankshaft two rotations in engine D.O.R. and again check toothed belt tension.

Engines with semi-automatic tensioning roller:

- Fit toothed belt (note direction of rotation) and remove pin from injection pump sprocket.
- Install idler roller.
Tightening torque: 25 Nm





- -> Turn tensioning roller with pin wrench (e.g. Matra V159) to right until notch aligns with raised portion (arrows).

Note:

If the eccentric has been turned too far the tensioning roller must be relieved completely and retensioned. The eccentric must never be turned back when it has been turned too far.

- Tighten lock nut on tensioning roller.
Tightening torque: 20 Nm
- Check again whether TDC mark on flywheel and reference mark are aligned.
- Tighten camshaft sprocket securing bolt to 45 Nm.
- Remove setting bar.
- Turn crankshaft two rotations in engine D.O.R. until crankshaft is set to TDC No. 1 cylinder again.
- Check if
 - the TDC mark on flywheel
 - the setting bar on camshaft
 - the mandrel 2064 in injection pump sprocket
 - the tensioning roller setting (notch/raised mark)align/are fitted correctly.
- If notch and raised mark do not align, tension the tensioning roller. To do this, hold tensioning roller with pin wrench Matra V159, loosen securing nut, turn eccentric clockwise further until notch and raised mark align opposite one another and tighten securing nut to 20 Nm.
- Turn crankshaft two rotations in engine D.O.R. until crankshaft is set to TDC No. 1 cylinder again.
- Repeat check.

Continuation for all engines

- Install toothed belt guard, vibration damper, belt pulley, and cylinder head cover.
- Install ribbed belt => Page 24 .

Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

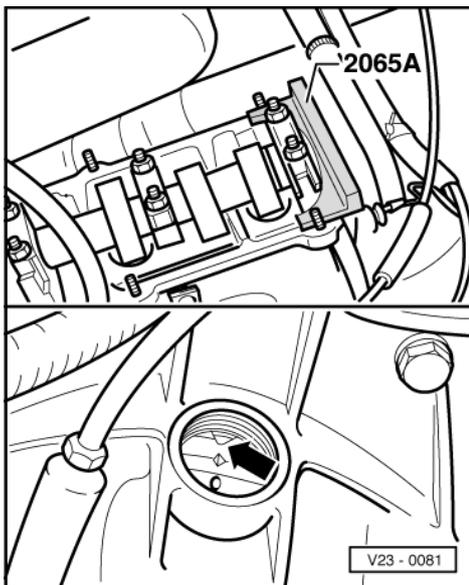
- Checking injection pump commencement of delivery:

=> Repair group 23; Servicing Diesel direct injection system; Dynamically checking and adjusting injection pump commencement of delivery. Servicing Diesel direct injection system Dynamically checking and adjusting injection pump commencement of delivery.

Engine codes 1Y, AAZ

- Check injection pump commencement of delivery:

=> Repair group 23; Servicing Diesel injection system; Checking and adjusting injection pump commencement of delivery (static). Servicing Diesel injection system Checking and adjusting injection pump commencement of delivery (static).

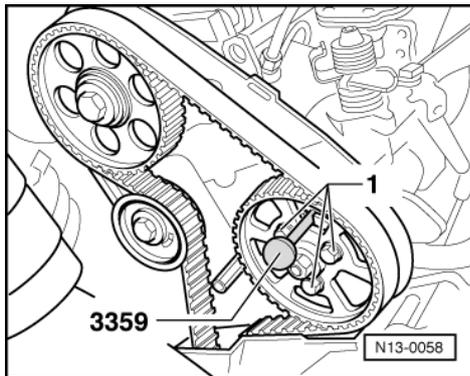




Belt drive with two part injection pump sprocket

Removing

- Remove ribbed belt => Page 24 .
- If fitted remove ribbed belt tensioning roller.
- Remove upper toothed belt guard and cylinder head cover.
- -> Turn crankshaft to TDC No. 1 cylinder -arrow-.
- Lock camshaft with setting bar.
- Centralize setting bar as follows:
Turn camshaft so that one end of setting bar contacts the cylinder head. Using feeler gauge establish the gap at the other end of the setting bar. Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until the setting bar contacts the feeler gauge. Place a 2nd feeler gauge, of same thickness, at the other end between setting bar and cylinder head.



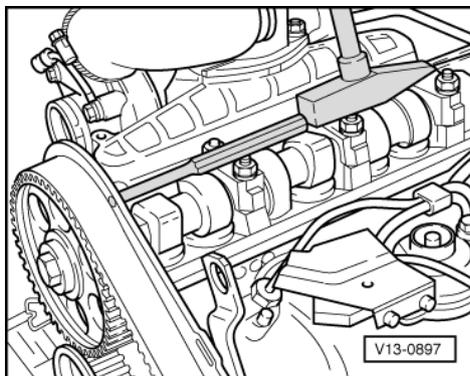
- -> Lock injection pump sprocket with pin 3359.
- Loosen injection pump sprocket securing bolts -1-.
- Loosen tensioner.
- Remove vibration damper and belt pulley.
- Remove lower toothed belt guard.
- Mark D.O.R. of toothed belt.
- Take off toothed belt.

Installing

- Check whether TDC mark on flywheel and reference mark are aligned.

Note:

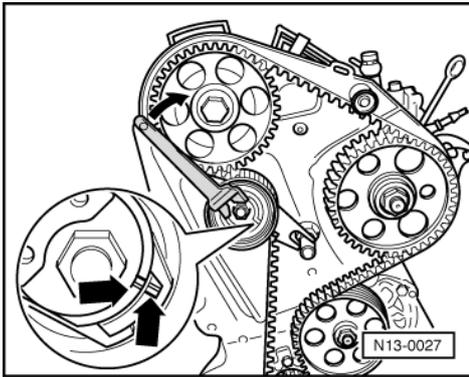
Never use setting bar as a counter hold when loosening and tightening the camshaft sprocket, use retainer 3036.



- -> Loosen camshaft sprocket securing bolt 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through rear toothed belt guard opening).
- Fit toothed belts (note D.O.R.) on crankshaft toothed belt sprocket, intermediate wheel, injection pump sprocket and tensioning roller.



- Fit camshaft sprocket together with toothed belt and locate with securing bolt (camshaft sprocket can still turn).

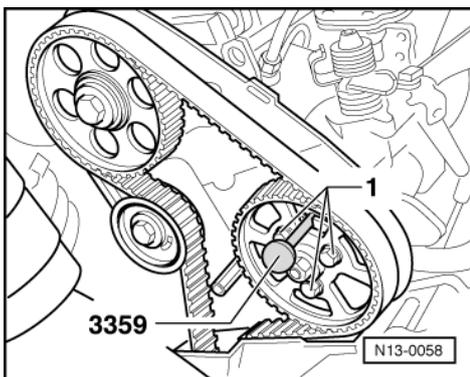


- -> Turn tensioning roller with pin wrench (e.g. Matra V159) to right until notch aligns with raised portion (arrows).

Note:

If the eccentric has been turned too far the tensioning roller must be relieved completely and retensioned. The eccentric must never be turned back when it has been turned too far.

- Tighten lock nut on tensioning roller.
Tightening torque: 20 Nm
- Check again whether TDC mark on flywheel and reference mark are aligned.
- Tighten camshaft sprocket securing bolt to 45 Nm.
- Tighten injection pump sprocket securing bolts to 25 Nm.
- Remove setting bar 2065 A from camshaft and pin 3359 from injection pump sprocket.
- Turn crankshaft two rotations in engine D.O.R. until crankshaft is set to TDC No. 1 cylinder again.
- Check if
 - the TDC marking on flywheel
 - the setting bar on camshaft
 - the pin 3359 in injection pump sprocket
 - the tensioning roller setting (notch/raised mark)align/are fitted correctly.
- If notch and raised mark do not align, tension the tensioning roller. To do this, hold tensioning roller with pin wrench Matra V159, loosen securing nut, turn eccentric clockwise further until notch and raised mark align opposite one another and tighten securing nut to 20 Nm.



-> *If the injection pump sprocket cannot be locked with pin 3359:*

- Loosen injection pump securing bolts -1-.
- Turn injection pump sprocket hub until the pin fits.
- Tighten injection pump sprocket securing bolts to

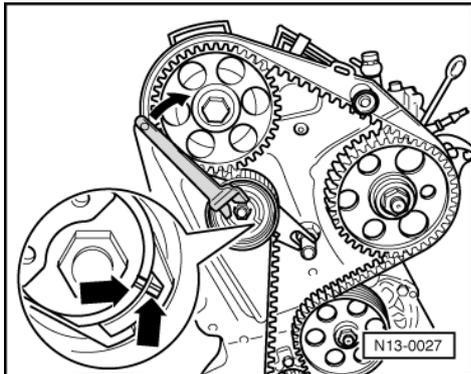


25 Nm.

- Turn crankshaft two rotations in engine D.O.R. until crankshaft is set to TDC No. 1 cylinder again.
- Repeat check.
- Install toothed belt guard, vibration damper, belt pulley, and cylinder head cover.
- Install ribbed belt => Page 24 .

1.4 - Checking semi-automatic toothed belt tensioning roller

Test conditions

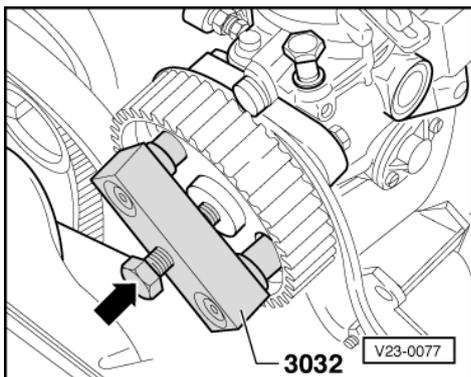


- Toothed belt installed and tensioned

Test sequence

- -> Tension toothed belt with firm thumb pressure. Notch and raised portion -arrows- must move apart.
- Release thumb pressure on toothed belt. The tensioning roller must move back to its initial position. (Notch and raised portion align again).

1.5 - Removing single part injection pump sprocket

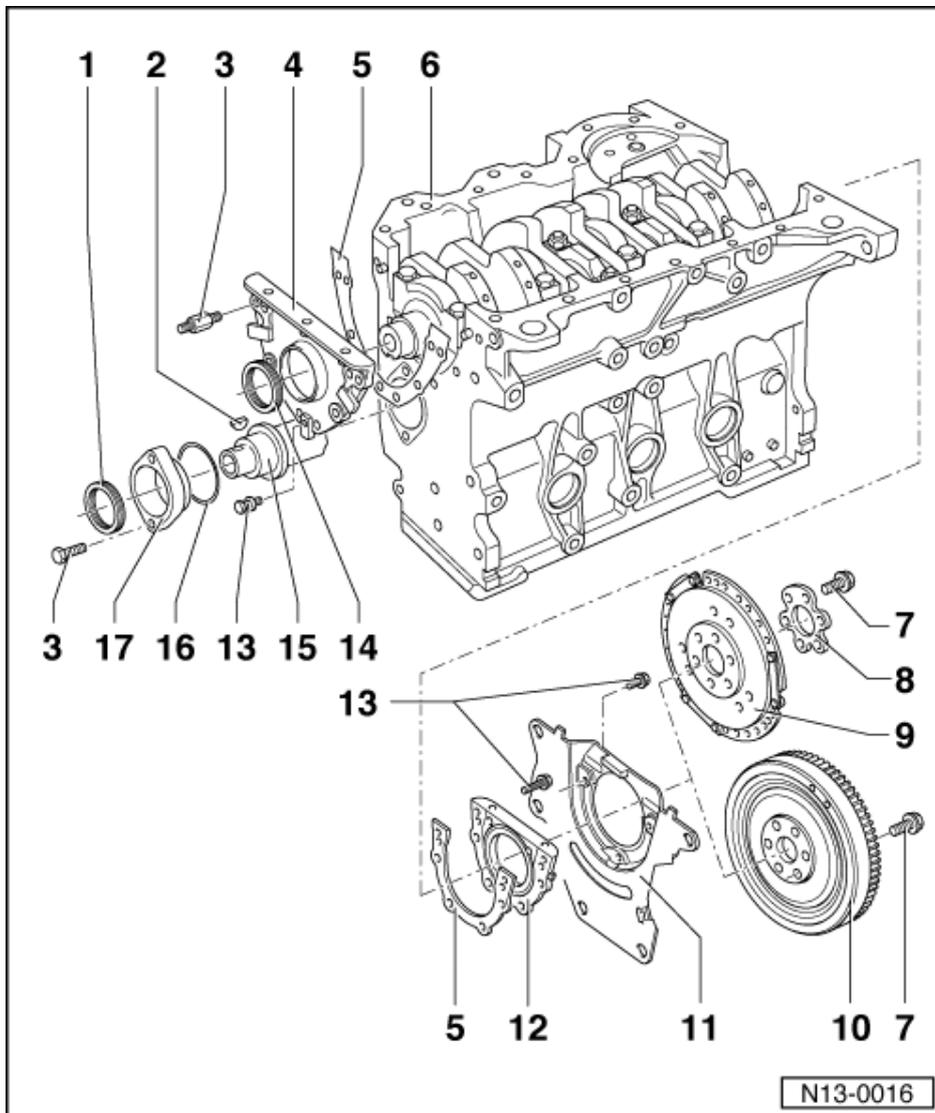


- Remove injection pump sprocket securing nut.
- -> Loosen puller arms and offer up.
- Locate puller arms through holes in injection pump sprocket and tighten.
- Place injection pump sprocket under tension with puller.
- Release injection pump sprocket from injection pump taper by tapping on spindle of puller -arrow- (thereby hold sprocket so that it does not fall off).



2 - Removing and installing sealing flange and pressure plate/flywheel/drive plate

2.1 - Removing and installing sealing flange and pressure plate/flywheel/drive plate



Note:

For repairs to the clutch:

=> 5 Speed manual gearbox 02A; Repair group 30; servicing clutch servicing clutch

=> 5 Speed manual gearbox 020; Repair group 30; servicing clutch servicing clutch

1 Oil seal

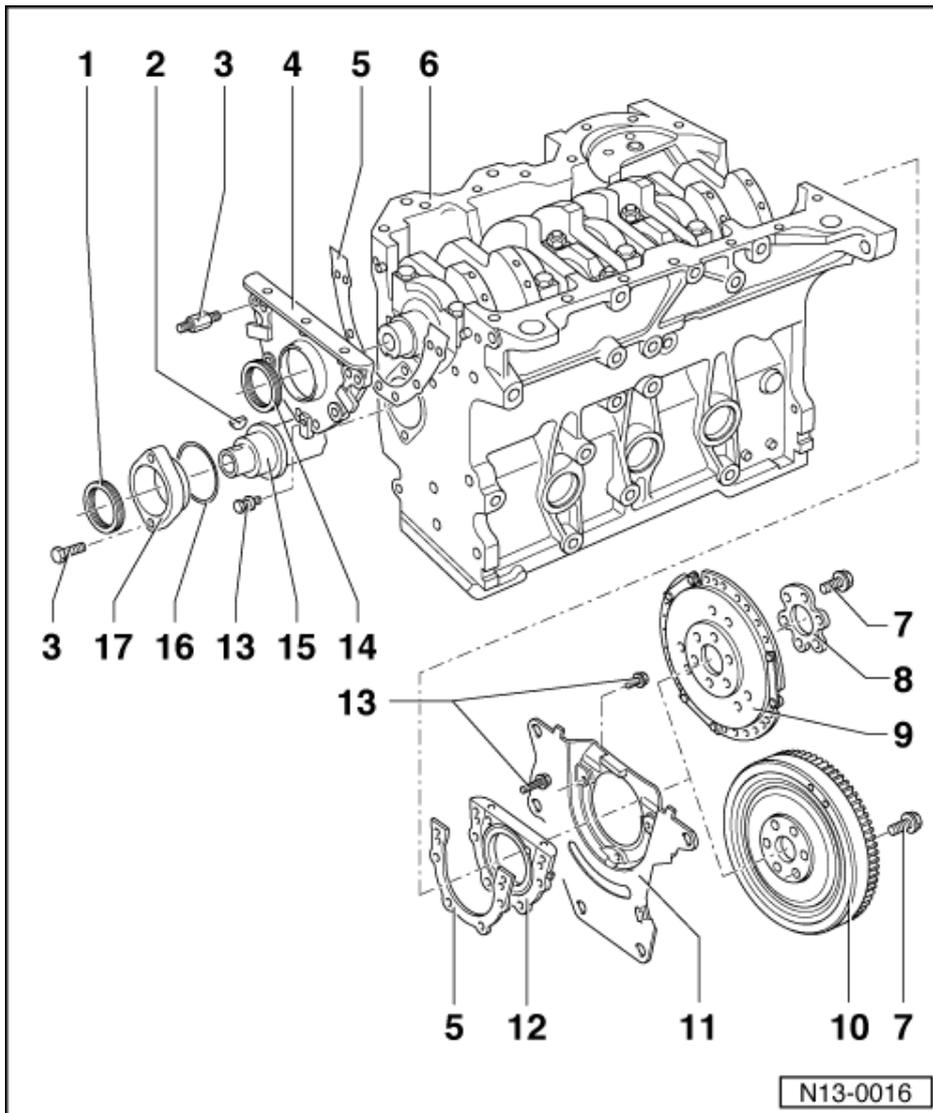
- ◆ To remove oil seal, remove sealing flange
- ◆ Install with 10-203
- ◆ Lightly oil sealing lip

2 Woodruff key

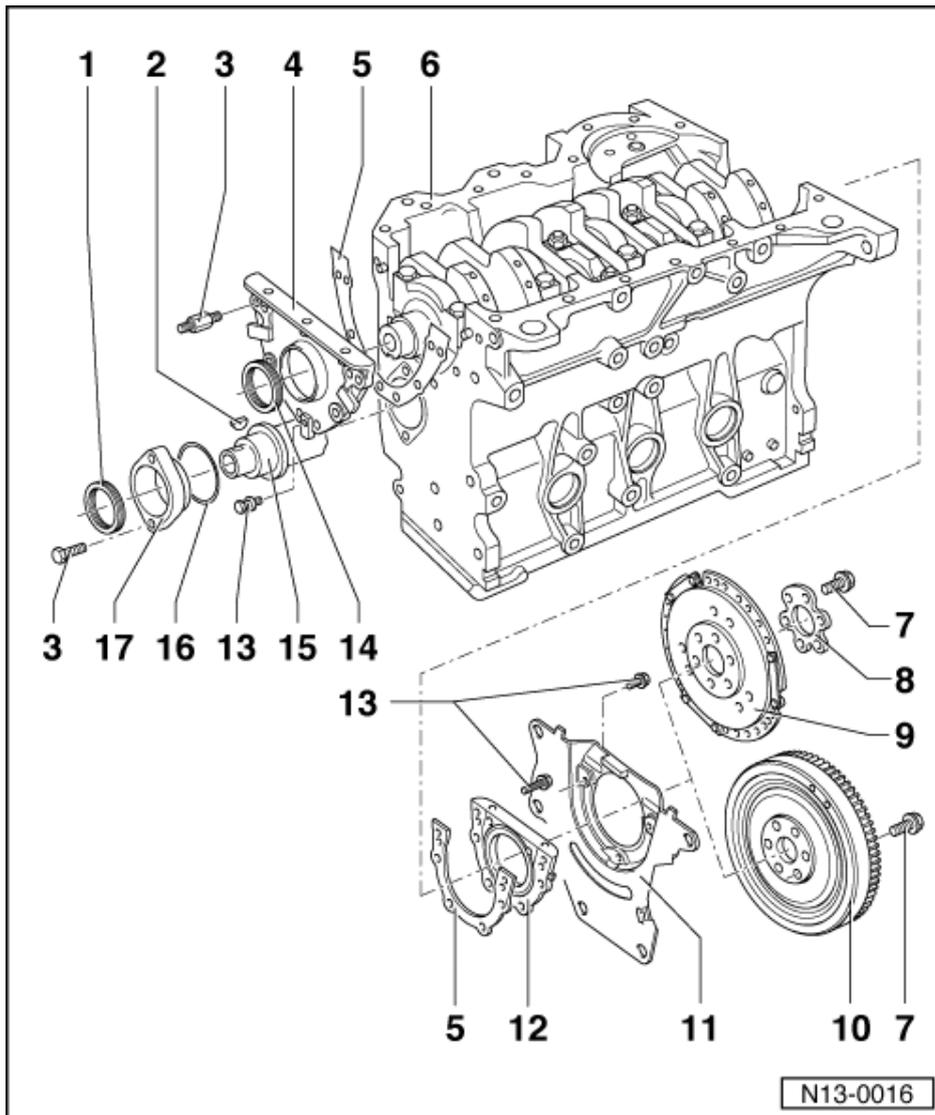
- ◆ Ensure tight fit

3 25 Nm

4 Sealing flange



- 5 Gasket**
 - ◆ Renew
- 6 Cylinder block**
 - ◆ Removing and installing crankshaft => Page [43](#)
 - ◆ Dismantling and assembling pistons and conrods => Page [47](#)
- 7 60 Nm + 1/4 turn (90 °) further**
 - ◆ Renew
- 8 Plate**
 - ◆ Observe fitting position
- 9 Pressure plate/drive plate**
 - ◆ Engine codes: 1Y, AAZ, AEY
 - ◆ Removing and installing pressure plate =>Fig. [1](#)



10 Flywheel/drive plate

- ◆ Engine codes 1Z, AHU, AFN, AVG, ALE
- ◆ To remove and install flywheel counter-hold with 3067
- ◆ Removing and installing drive plate =>Page 39

11 Intermediate plate

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

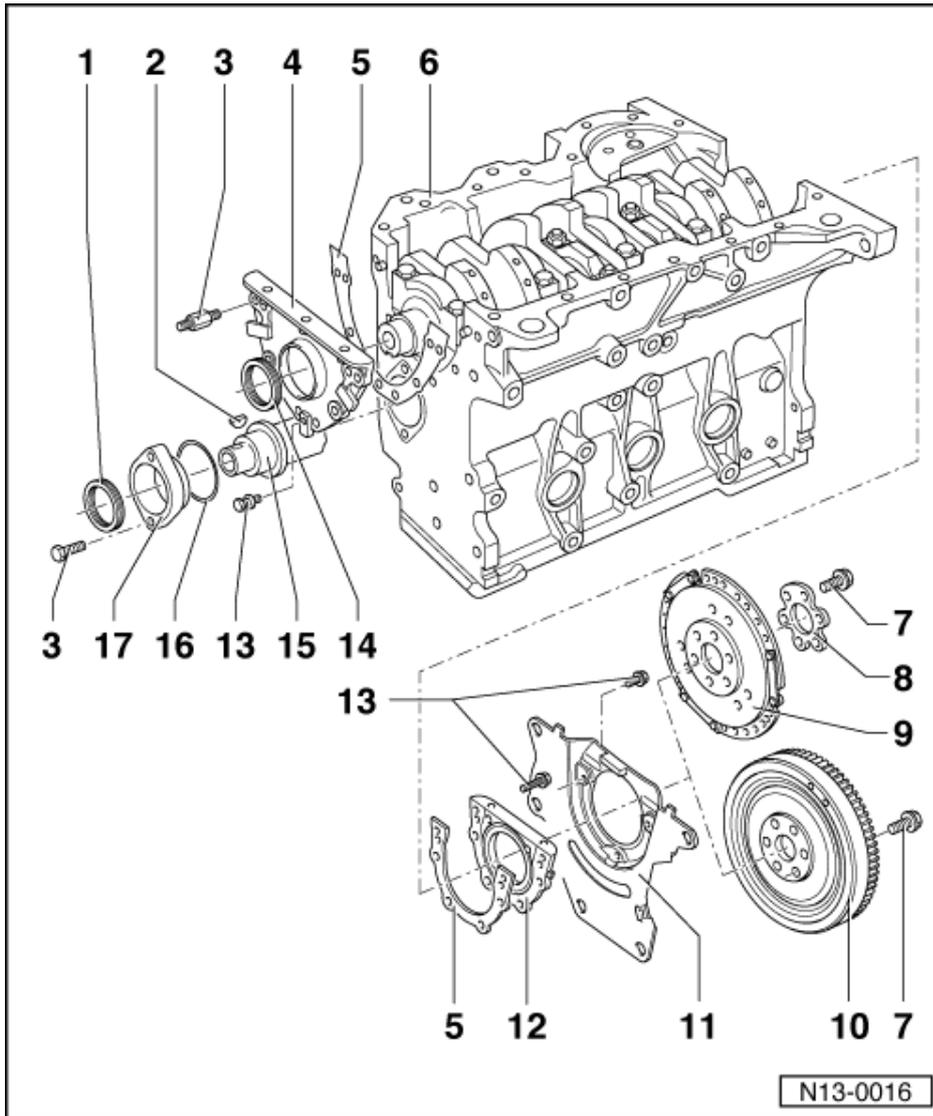
12 Sealing flange with oil seal

- ◆ Only renew complete
- ◆ Lightly oil sealing lip of oil seal

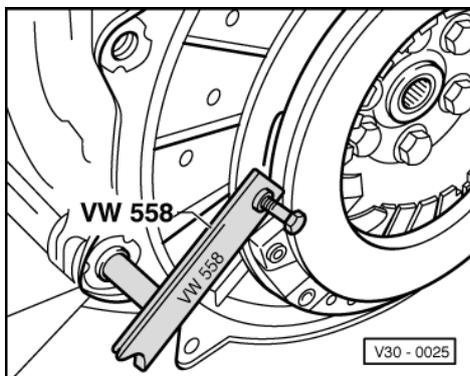
13 10 Nm

14 Oil seal

- ◆ Renewing => Page 38



- 15 Intermediate shaft
- 16 O-ring
 - ◆ Renew if damaged
- 17 Sealing flange intermediate shaft





-> Fig.1 Removing and installing pressure plate

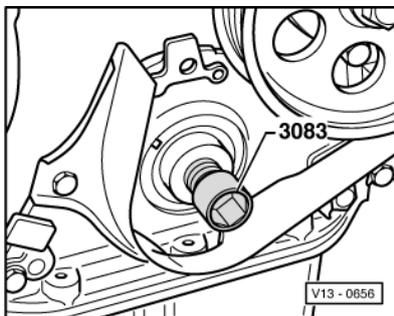
2.2 - Renewing crankshaft oil seal - pulley end -

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

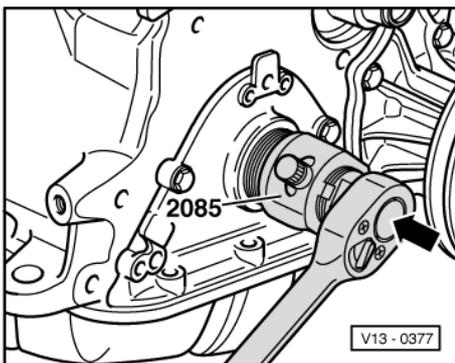
- ◆ Counter-hold tool 3099
- ◆ Oil seal extractor 2085
- ◆ Oil seal fitting tool 3083

Removing

- Remove ribbed belt => Page 24 .



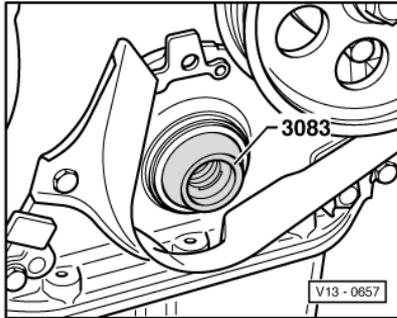
- Remove toothed belt => Page 27 .
- Remove crankshaft sprocket. To do this counter-hold sprocket with 3099.
- -> To guide the oil seal extractor, screw bolt from 3083 into crankshaft as far as it will go.
- Unscrew inner part of the oil seal extractor 2085 two turns (approx. 3 mm) out of the outer part and lock with knurled screw.



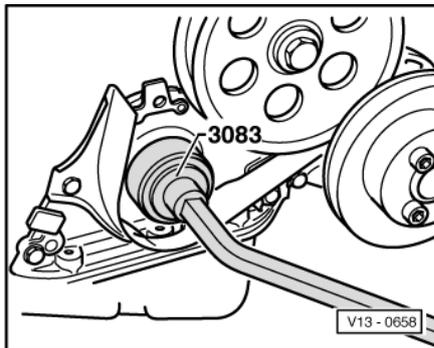
- -> Lubricate threaded head of oil seal extractor, place it in position and exerting firm pressure screw it as far as possible into oil seal.
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.

Installing

- Lightly oil sealing lip of oil seal.



- -> Place guide sleeve from 3083 onto crankshaft journal.
- Slide oil seal over guide sleeve.



- -> Press oil seal in onto stop with press sleeve from 3083.
- Install and tension toothed belt => Page 27

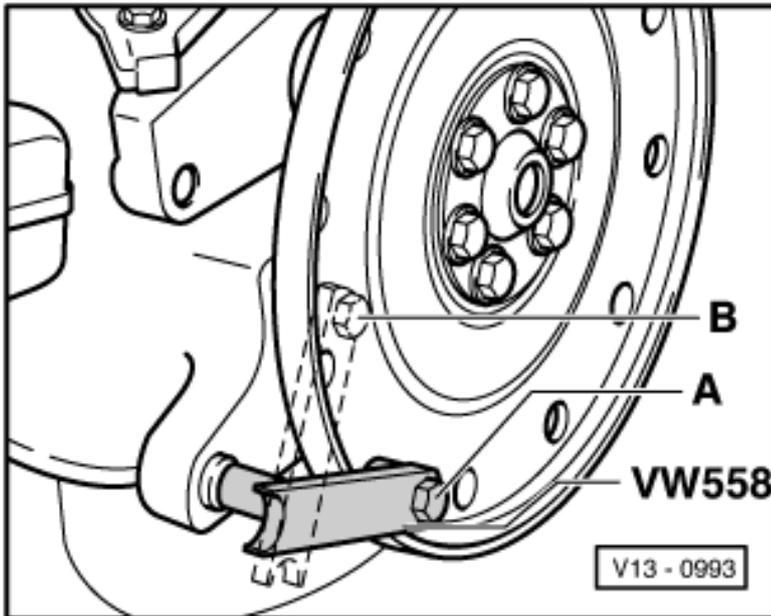
2.3 - Removing and installing drive plate

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Counter-hold tool VW 558
- ◆ Hexagon bolt M8x45 and two M10 hexagon nuts
- ◆ Depth gauge



Loosening and tightening drive plate



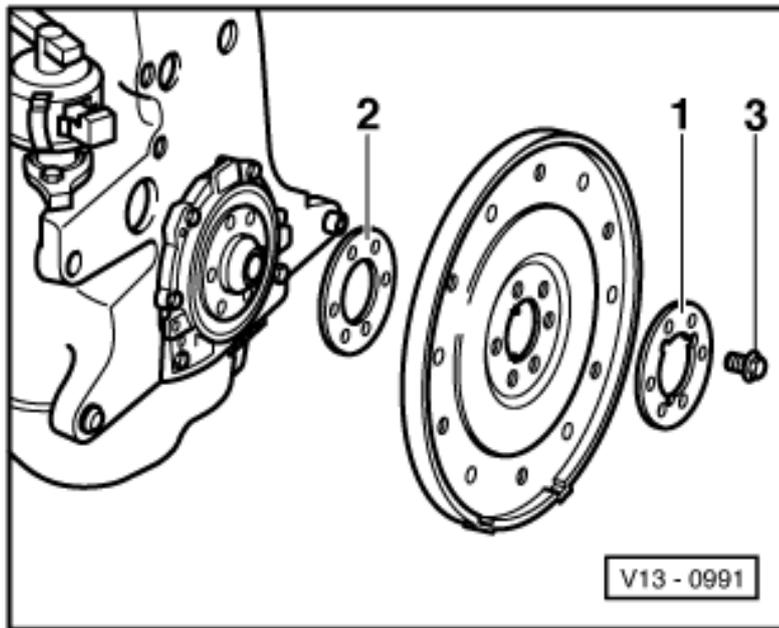
- -> Secure counter-hold tool VW 558 to the drive plate with a hexagon bolt M8x45. Place two M10 hexagon nuts between counter-hold tool and drive plate.

Position of counter-hold tool:

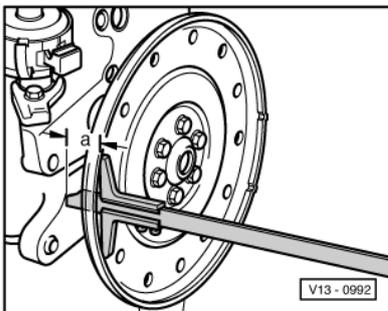
- A - To loosen
- B - To tighten



Installing drive plate

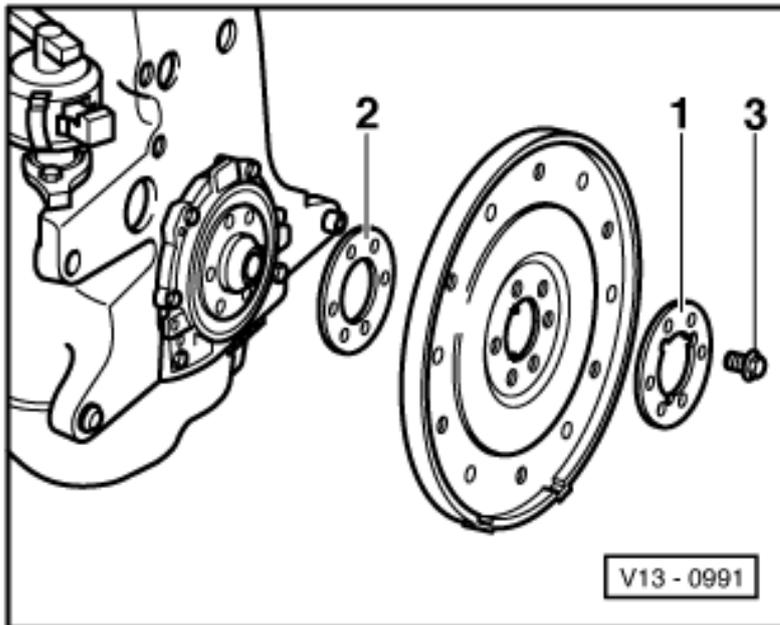


- -> Locate drive plate and packing plate with recesses -1-.
- Fit new bolts -3- and tighten to 30 Nm.



- -> Check dimension -a- at three points and calculate average.
Specification: 19.5...21.1 mm

If the specification is not attained:

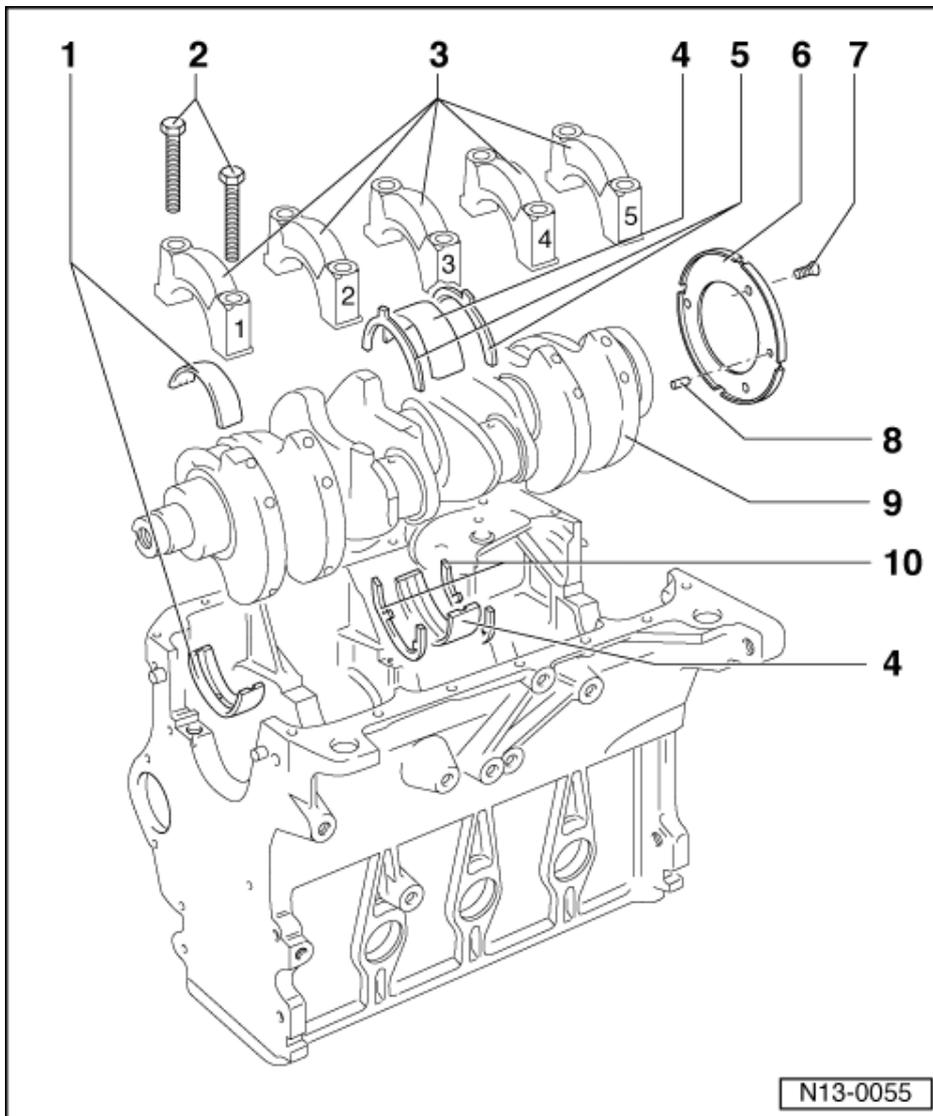


- -> Remove drive plate again and fit shim -2-. Again tighten bolts -3- to 30 Nm.
- Tighten bolts -3- to 60 Nm and turn 90° (1/4 turn) further (the additional 1/4 turn can be done in several stages).



3 - Removing and installing crankshaft

3.1 - Removing and installing crankshaft



1 Bearing shells 1, 2, 4 and 5

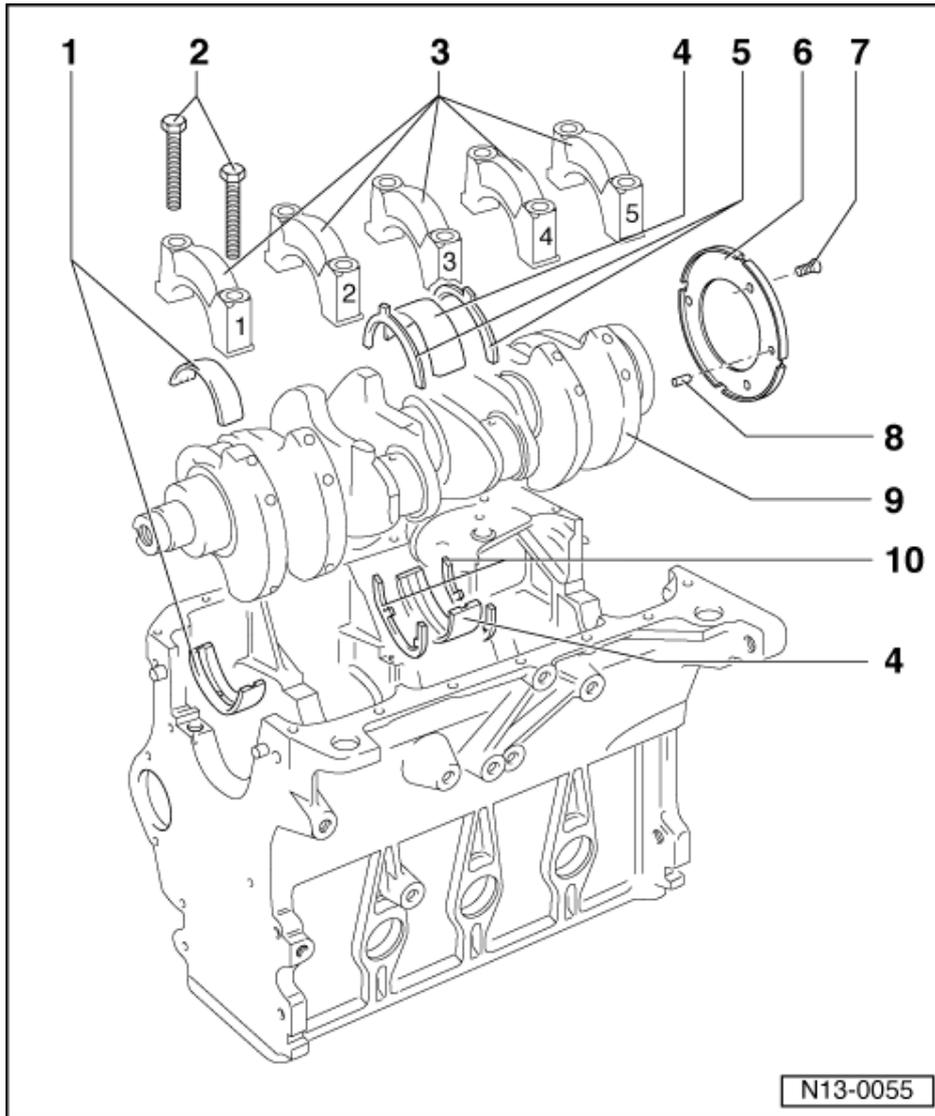
- ◆ For bearing caps without oil groove
- ◆ For cylinder block with oil groove
- ◆ Do not interchange used bearing shells (mark)

2 65 Nm + 1/4turn (90 °) further

- ◆ Renew
- ◆ To measure radial clearance tighten to 65 Nm but not further

3 Bearing cap

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



4 Bearing shell 3

- ◆ For bearing cap without oil groove
- ◆ For cylinder block with oil groove

5 Thrust washer

- ◆ For bearing cap 3
- ◆ Note fixing arrangement

6 Sender wheel

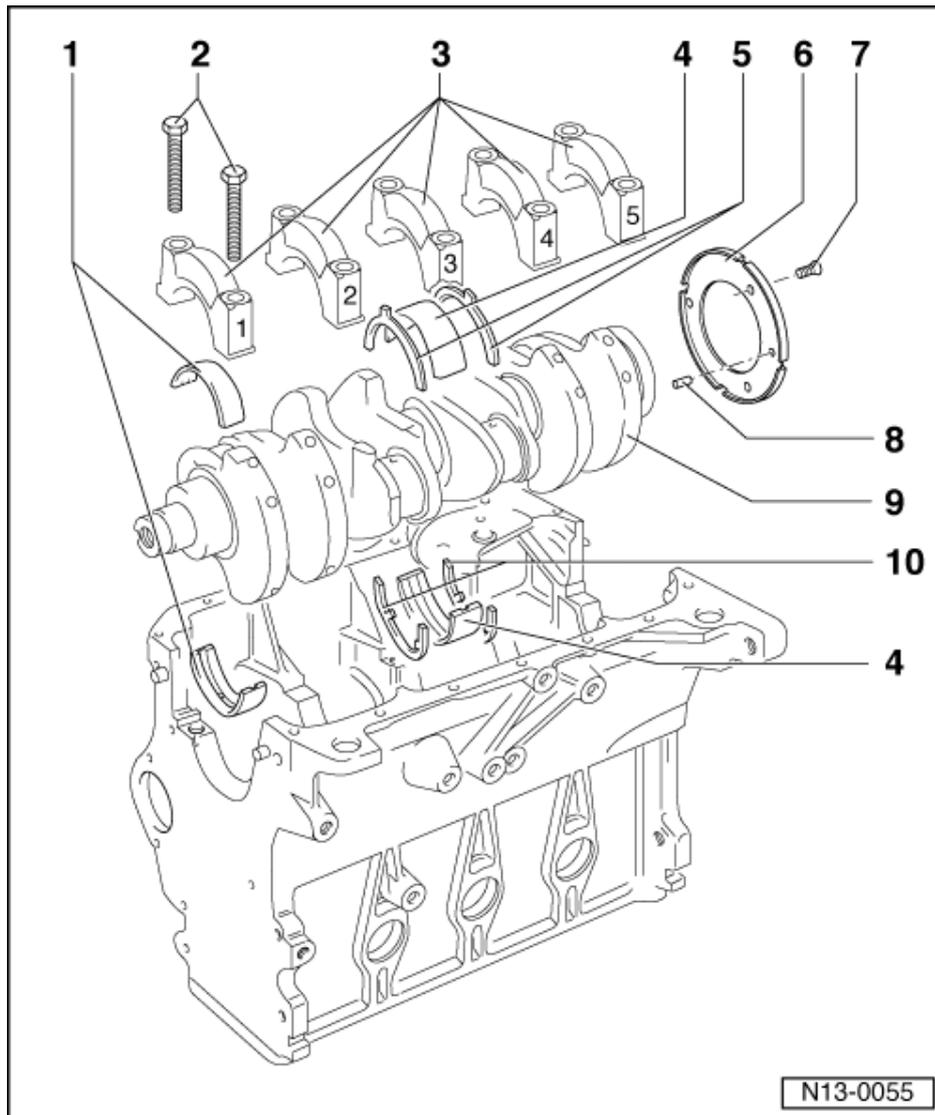
- ◆ Engine codes: 1Z, AHU, AEY, AFN, AVG, ALE
- ◆ For speed sender

7 10 Nm + 1/4 turn (90 °) further

- ◆ Renew

8 Fitted pin

- ◆ Engine codes: 1Z, AHU, AEY, AFN, AVG, ALE
- ◆ Checking projection from crankshaft => Fig. 1

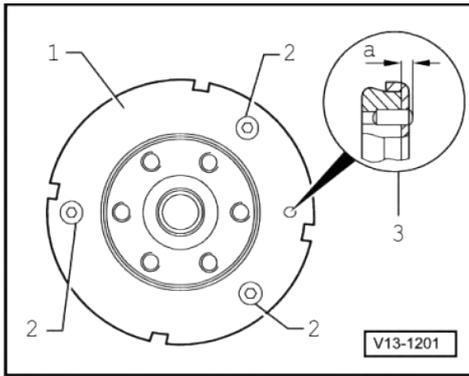


9 Crankshaft

- ◆ Axial clearance new: 0.07...0.17 mm
Wear limit: 0.37 mm
- ◆ Check radial clearance with Plastigage
New: 0.03...0.08 mm
Wear limit: 0.17 mm
- ◆ Do not rotate the crankshaft when checking the radial clearance
- ◆ Crankshaft dimensions
=> Page 46

10 Thrust washer

- ◆ For cylinder block, bearing 3



-> Fig. 1 Checking fitted pin projection out of crankshaft

Dowel pin projection -3- out of crankshaft
a = 2.5...3.0 mm

3.2 - Crankshaft dimensions

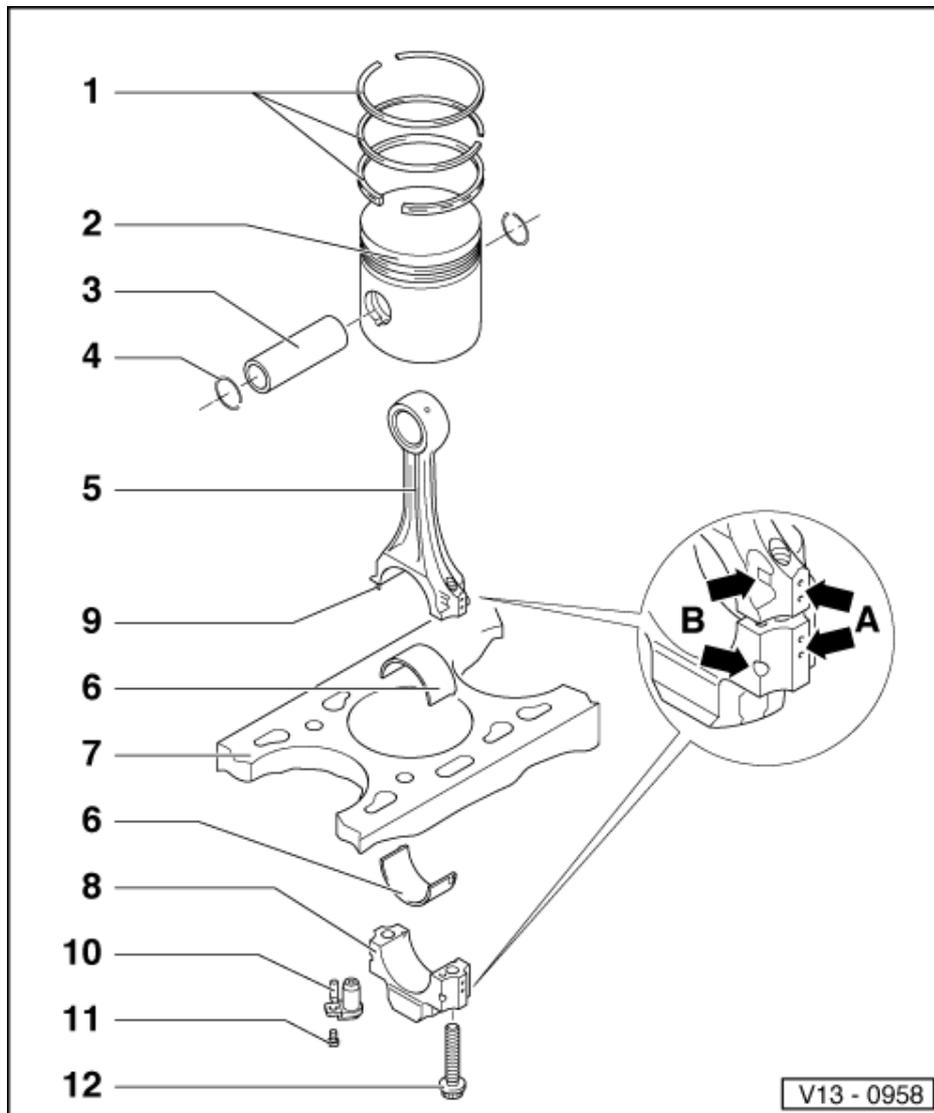
(in mm)

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



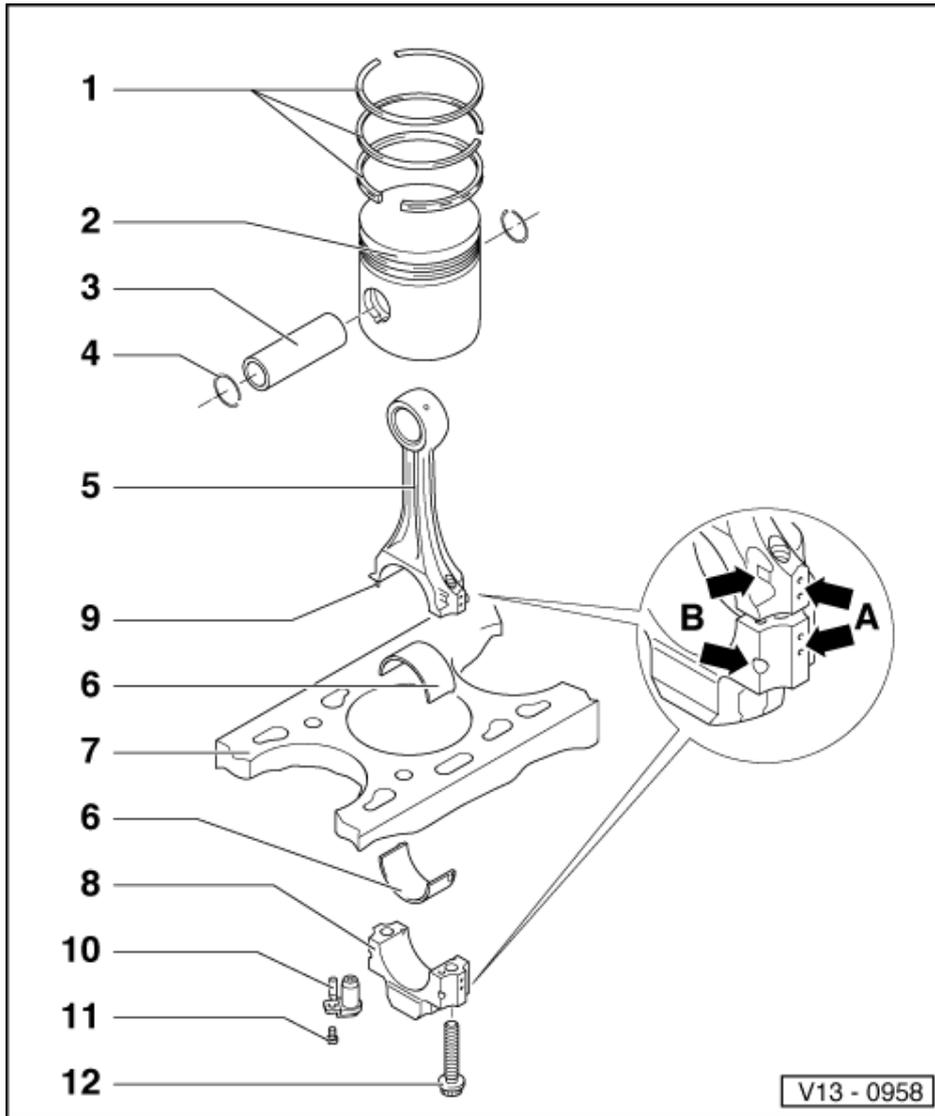
4 - Dismantling and assembling pistons and conrods

4.1 - Dismantling and assembling pistons and conrods



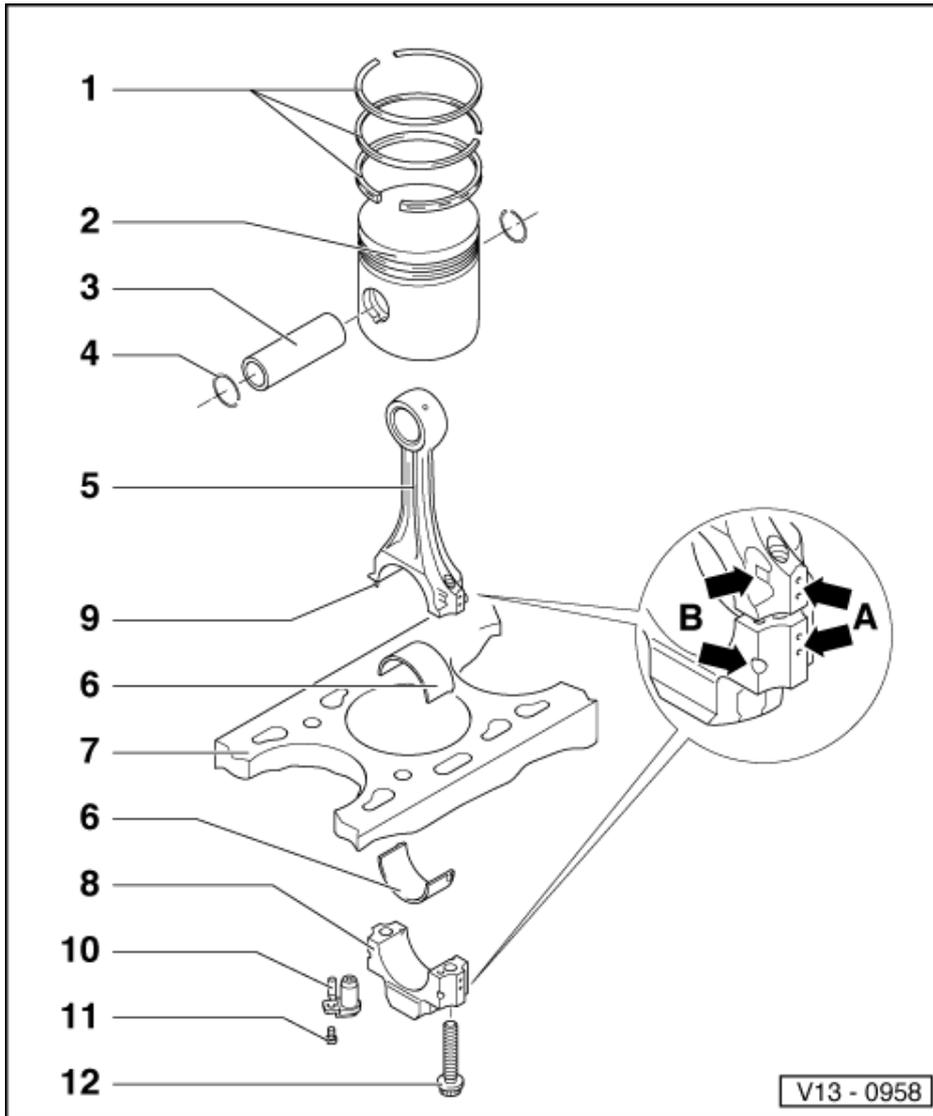
1 Piston ring

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



2 Piston

- ◆ Engine codes 1Z, AHU, AEY, AFN, AVG, ALE with combustion chamber
- ◆ Mark installation position and cylinder number
- ◆ Mark installation position and allocation piston/cylinder for engine codes 1Z, AHU, AEY, AFN, AVG, ALE
=> Fig. 4
- ◆ Arrow on piston crown points to pulley end
- ◆ Install using piston ring clamp
- ◆ Cracks on piston skirt, renew piston
- ◆ Checking piston projection at TDC
=>Page 54



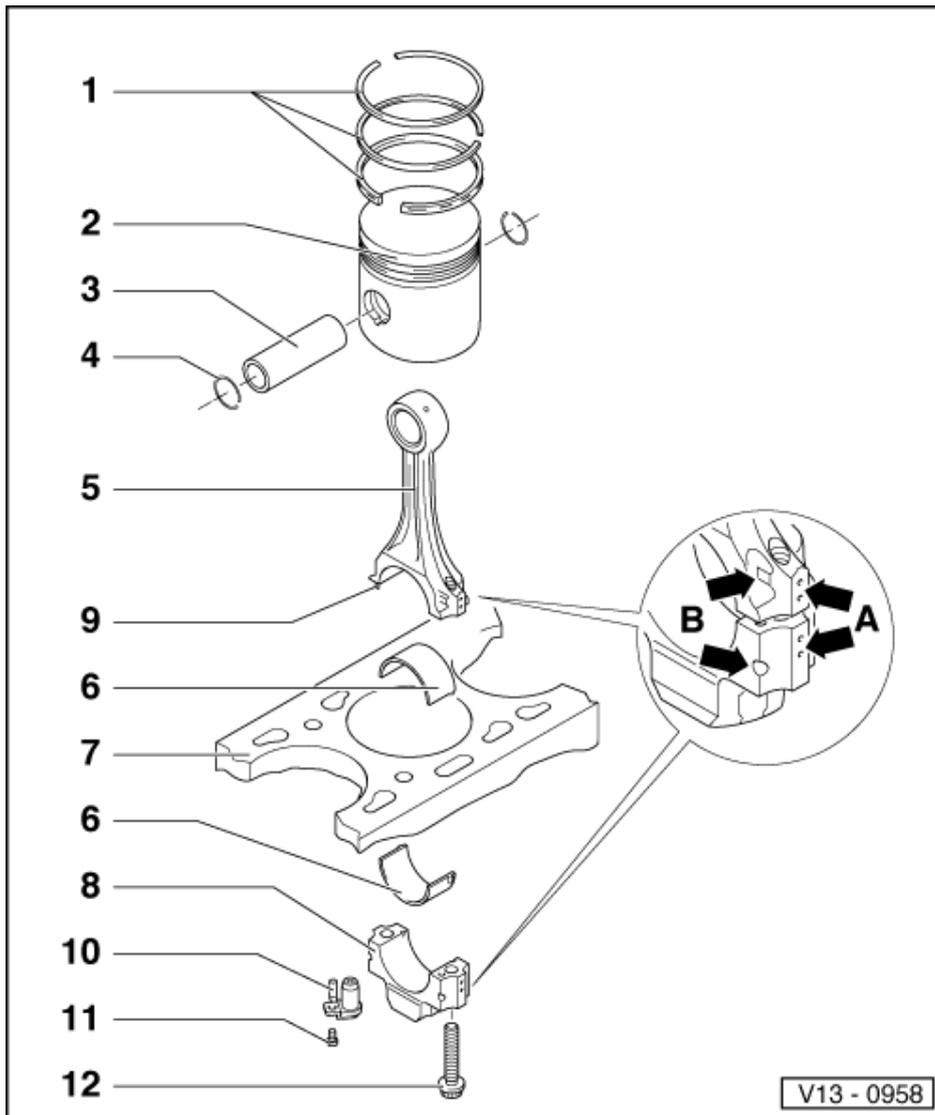
3 Piston pin

- ◆ If difficult to remove, heat piston to 60 °C
- ◆ Remove and install with VW 222a
- ◆ $\varnothing = 26$ mm for engine codes 1Z, AHU, AAZ, AEY, AFN, AVG, ALE
- ◆ $\varnothing = 24$ mm for engine code 1Y

4 Circlip

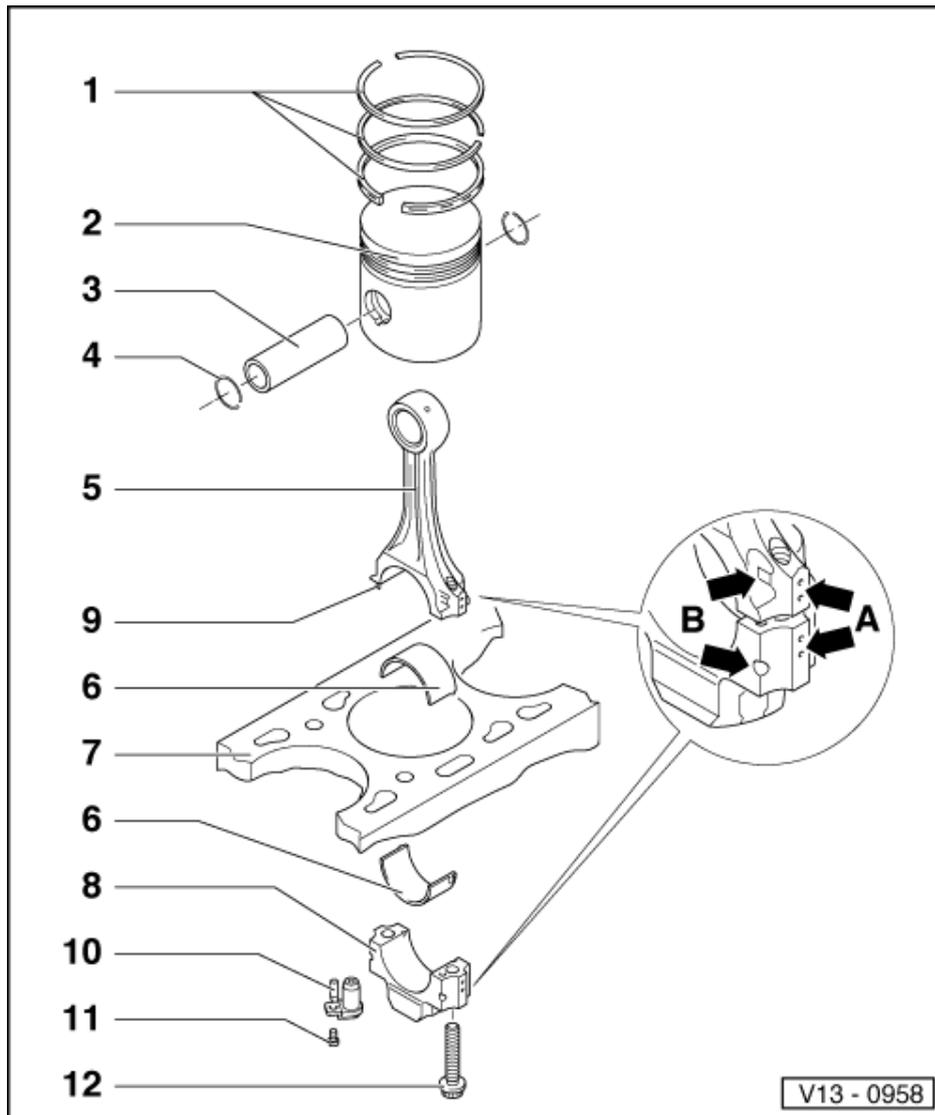
5 Conrod

- ◆ Only renew as a set
- ◆ Mark cylinder number -A-
- ◆ Installation position:
 Marking -B- faces towards pulley end
- ◆ Length:
 Engine codes
 1Z, AHU, AAZ, AEY, AFN, AVG, ALE
 = 144 mm
 1Y = 150 mm



6 Bearing shell

- ◆ Note version:
for engine code AFN, AVG upper bearing shell (faces towards piston) of more durable material
Identification:
Black line on running surface in area of joint
- ◆ Note installation position
- ◆ Do not interchange used bearing shells
- ◆ Ensure retaining lugs fit tightly in recesses
- ◆ Axial clearance
Wear limit: 0.37 mm
- ◆ Check radial clearance with Plastigage:
Wear limit: 0.08 mm
Do not rotate crankshaft when checking radial clearance
- ◆ Width:
Engine codes
1Z, AHU, AAZ, AEY, AFN, AVG,
ALE = 20 mm
1Y = 19 mm



7 Cylinder block

- ◆ Checking cylinder bores
=>Fig. 3
- ◆ Piston and cylinder dimensions
=>Page 55

8 Conrod bearing cap

- ◆ Note installation position

9 Fitted pin

- ◆ The fitted pin must seat securely in the conrod, not in the bearing cap

10 Oil spray jet

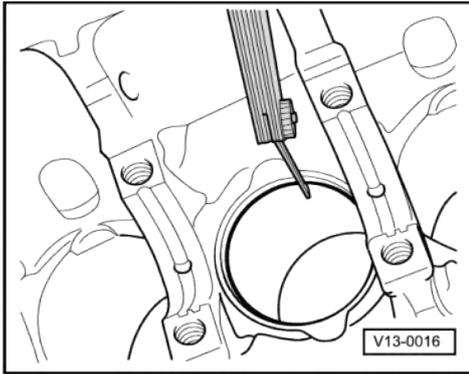
- ◆ For piston cooling

11 10 Nm

- ◆ Install with AMV 188 100 02

12 Conrod bolt, 30 Nm + 1/4 turn (90 °) further

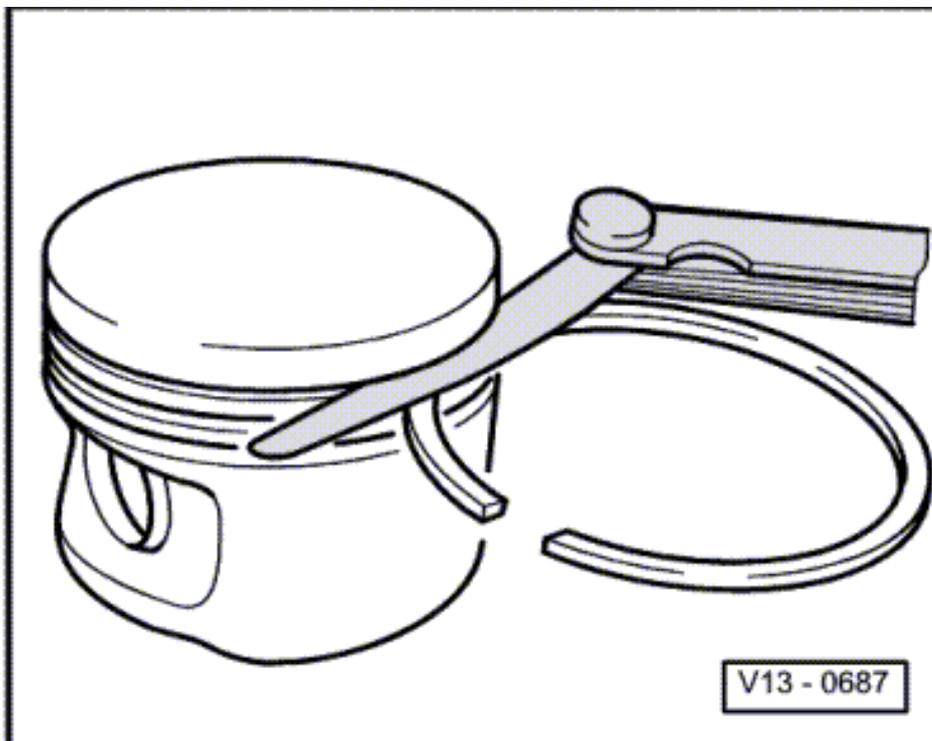
- ◆ Renew
- ◆ Oil threads and contact surface
- ◆ To measure radial clearance use old bolts



-> Fig. 1 Checking piston ring gap

- Push ring squarely from above down to approx. 15 mm from bottom end of cylinder.

Piston ring Dimensions in mm	New	Wear limit
1st Compression ring 1Z, AHU, AEY, AFN, AVG, ALE 1Y, AAZ	0.20...0.40 0.20...0.40	1.0 1.2
2nd Compression ring 1Z, AHU, AEY, AFN, AVG, ALE 1Y, AAZ	0.20...0.40 0.20...0.40	1.0 0.6
Oil scraper ring 1Z, AHU, AEY, AFN, AVG, ALE 1Y, AAZ	0.25...0.50 0.25...0.50	1.0 1.2

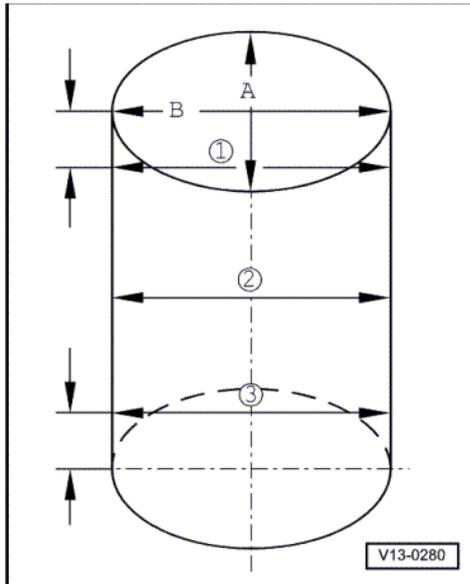




-> Fig. 2 Checking ring to groove clearance

Clean groove before check.

Piston ring Dimensions in mm	New	Wear limit
1st Compression ring 1Z, AHU, AEY, AFN, AVG, ALE 1Y, AAZ	0.06...0.09 0.09...0.12	0.25 0.25
2nd compression ring	0.05...0.08	0.25
Oil scraper ring	0.03...0.06	0.15



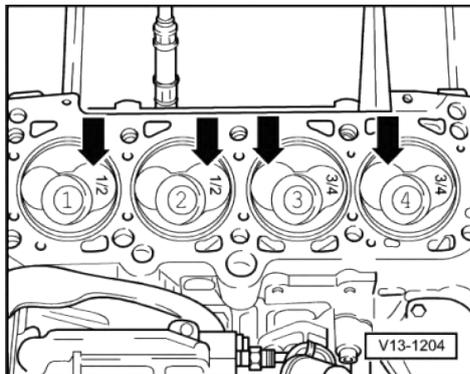
-> Fig. 3 Checking cylinder bores

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Internal dial gauge 50...100 mm
- Take measurements at 3 positions in both lateral -A- and longitudinal -B- directions, as illustrated. Deviation from nominal dimension max. 0.10 mm

Note:

Measuring the cylinder bores must not be done when the cylinder block is mounted on a repair stand with adapter bracket VW 540, as incorrect measurements would then be possible.





-> Fig.4 Piston installation position and piston/cylinder allocation

Piston in cylinders 1 and 2:

Larger inlet valve chamber towards flywheel -arrows-

Piston in cylinders 3 and 4:

Larger inlet valve chamber towards belt pulley side -arrows-.

Note:

New piston allocation to cylinders is shown by a coloured marking on piston crown.

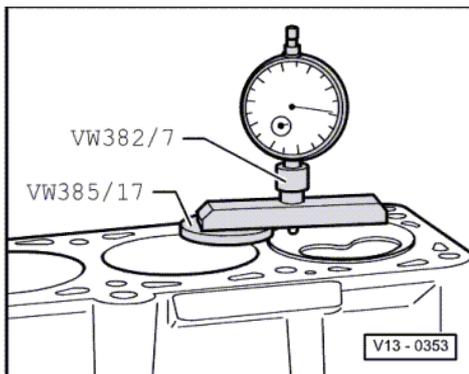
- ◆ Piston for cylinder 1 and 2:
marked 1/2
- ◆ Piston for cylinder 3 and 4:
marked 3/4

4.2 - Checking piston projection at TDC

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ VW 382/7
- ◆ VW 385/17

Test sequence

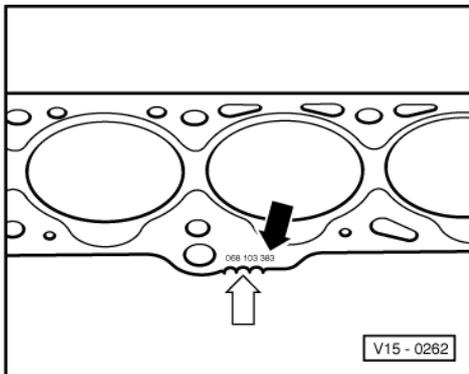


-> Piston projection at TDC must be measured when installing new pistons or a short engine. Depending upon piston projection, install the corresponding cylinder head gasket according to following table:

Engine codes 1Z, AHU, AEY, AFN, AFN, ALE

Piston projection	Identification Holes/notches
0.91 mm ... 1.00 mm	1
1.01 mm ... 1.10 mm	2
1.11 mm ... 1.20 mm	3

Engine codes: 1Y, AAZ





Piston projection	Identification Holes/notches
0.66 mm ... 0.86 mm	1
0.87 mm ... 0.90 mm	2
0.91 mm ... 1.02 mm	3

-> Cylinder head gasket identification

- ◆ Part No. = black arrow
- ◆ Holes/notches = white arrow

Note:

If differing figures are obtained when measuring piston projection, the highest figure should be taken when selecting the gasket.

4.3 - Piston and cylinder dimensions

Engine codes 1Z, AHU, AEY, AFN, AFN, ALE

Honing dimension	Piston- \emptyset	Cylinder bore- \emptyset
Basic dimen. mm	79.47	79.51
1st oversize mm	79.72	79.76
2nd oversize mm	79.97	80.01

Engine codes: 1Y, AAZ

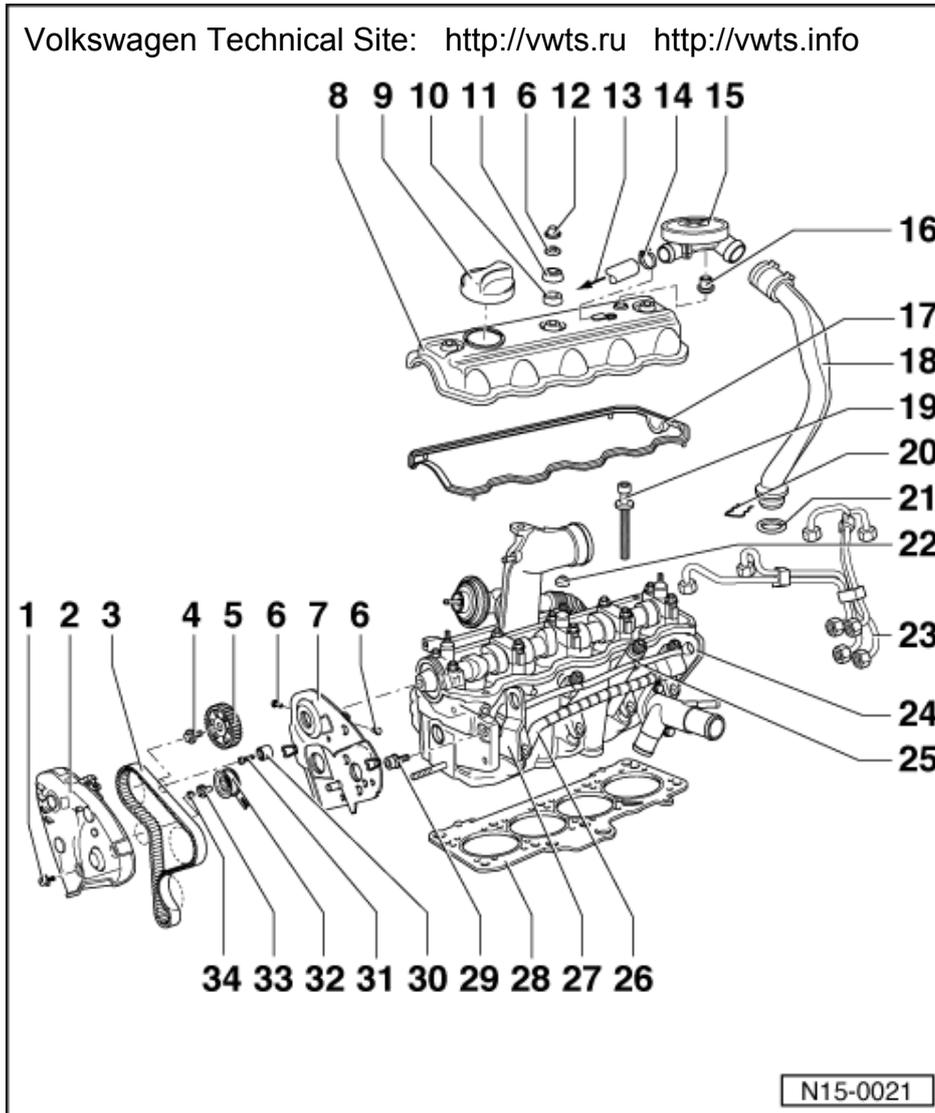
Honing dimension	Piston- \emptyset	Cylinder bore- \emptyset
Basic dimen. mm	79.48	79.51
1st oversize mm	79.73	79.76
2nd oversize mm	79.98	80.01



15 - Cylinder head, Valve gear

1 - Removing and installing cylinder head

1.1 - Removing and installing cylinder head



Checking compressions

=> Page 65

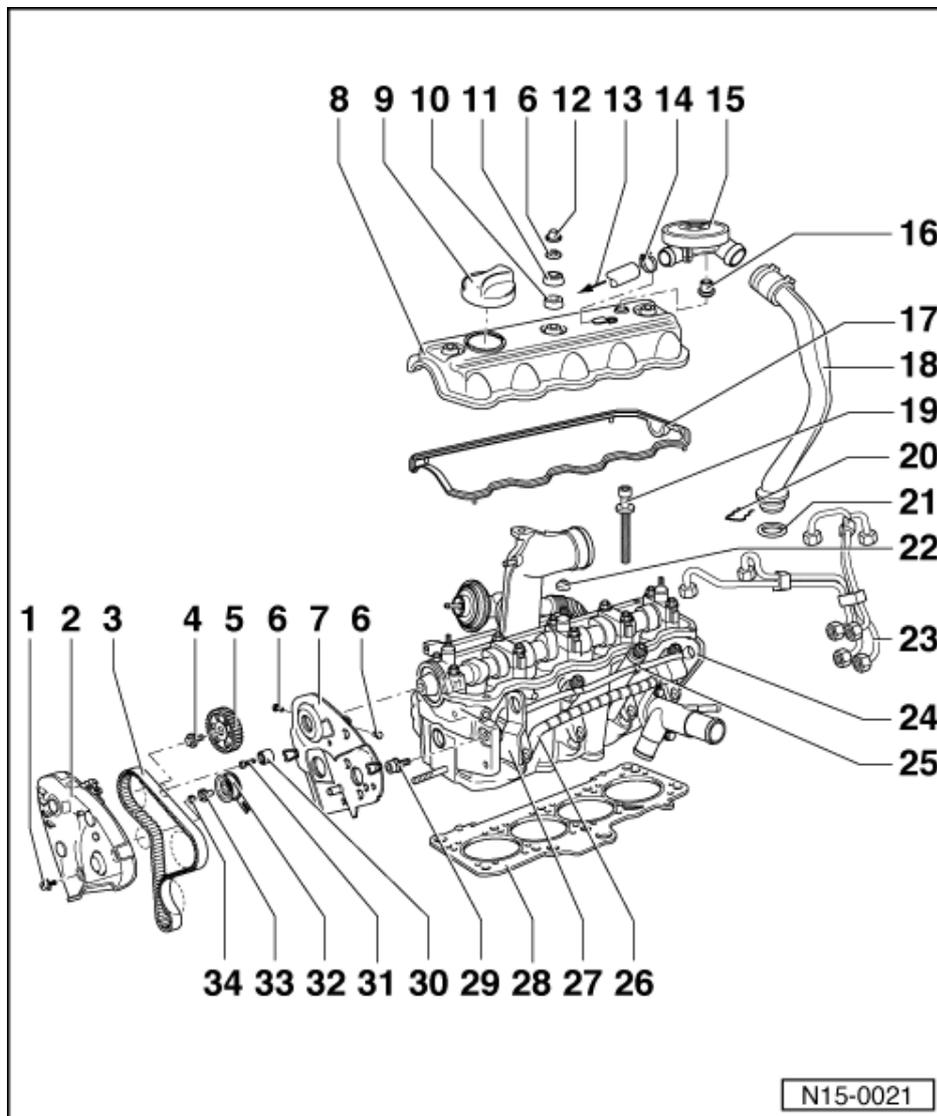
Notes:

- ♦ When installing an exchange cylinder head with fitted camshaft, the contact surfaces between bucket tappet and cam must be oiled after installation.
- ♦ The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.



- ◆ When replacing the cylinder head the complete coolant must be renewed.

- 1 Expanding clip
- 2 Toothed belt guard - upper part



3 Toothed belt

- ◆ Mark D.O.R. before removing
- ◆ Check for wear
- ◆ Do not kink
- ◆ Removing, installing and tensioning
=> Page 27

4 45 Nm

5 Camshaft sprocket

- ◆ Drive off camshaft taper using hammer and drift through toothed belt guard openings

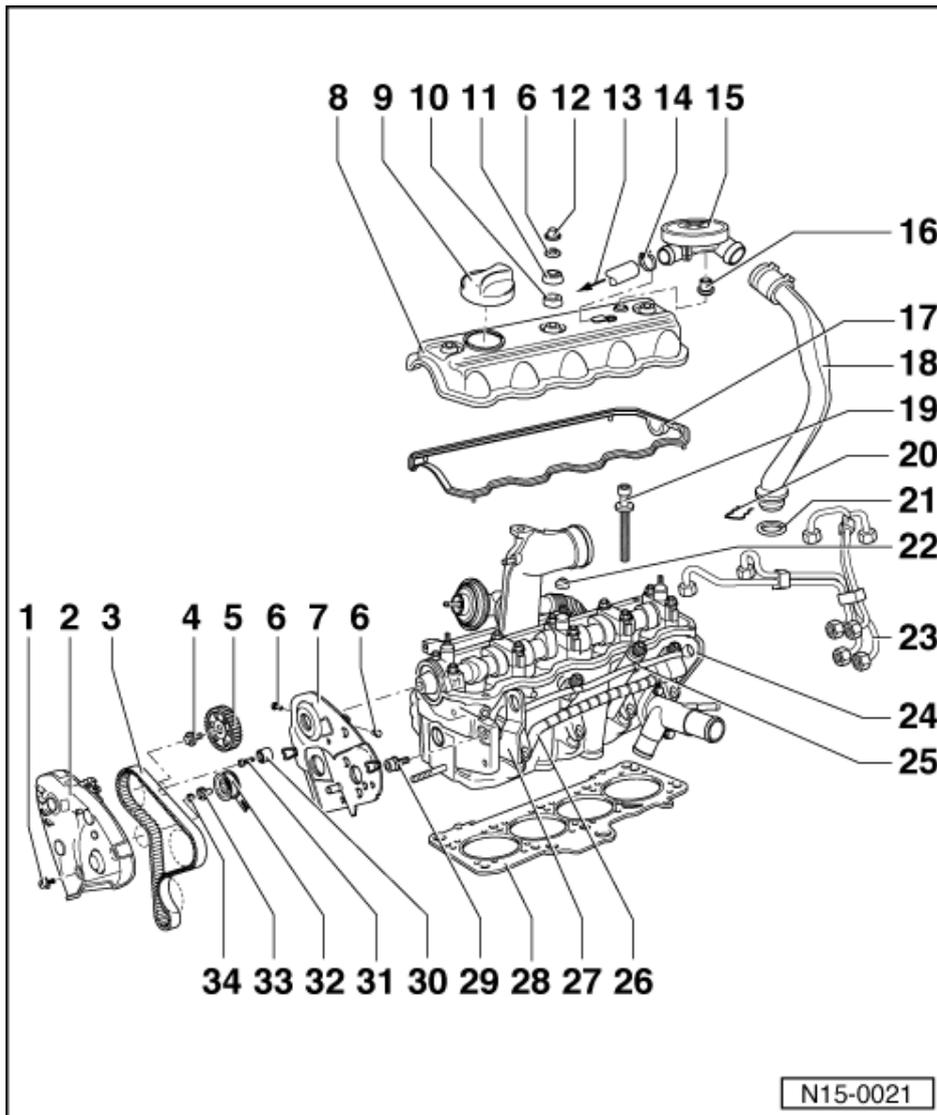
6 10 Nm

7 Rear toothed belt guard

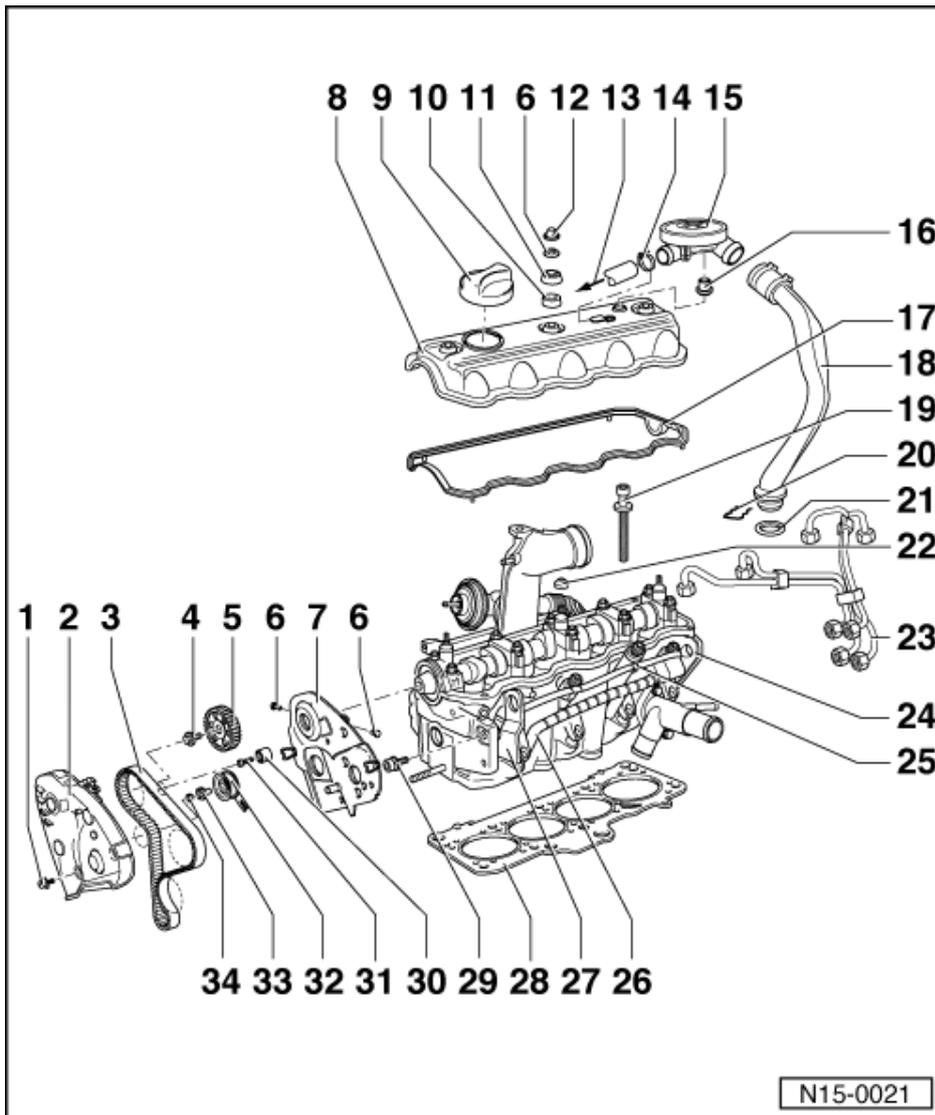
8 Cylinder head cover

9 Cap

- ◆ Renew seal if damaged



- 10 Upper sealing washer
 - ◆ Renew if damaged
- 11 Dished washer
- 12 Cap
- 13 To intake hose
- 14 Retaining clip
- 15 Pressure regulating valve
 - ◆ For crankcase breather
- 16 Gasket
 - ◆ Renew if damaged
- 17 Cylinder head cover gasket
 - ◆ Renew if damaged
 - ◆ Insert projections into holes on cylinder head
- 18 Crankcase breather



19 Cylinder head bolt

- ◆ Renew
- ◆ Note sequence when loosening and tightening
 => Page 63 , removing and installing cylinder head

20 Securing clip

21 O-ring

- ◆ Renew

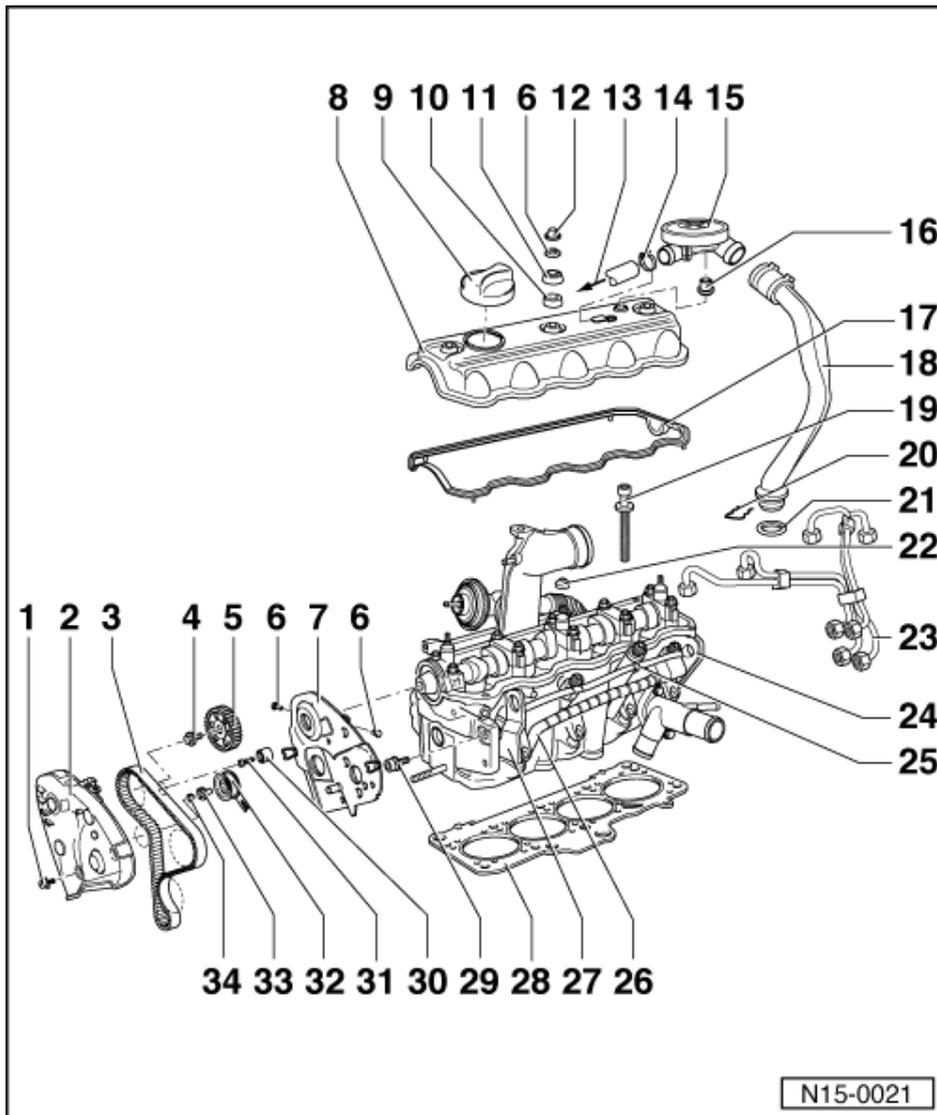
22 Lower sealing cone

23 Injector pipes

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

24 Cylinder head

- ◆ Check for distortion => Fig. 1
- ◆ Removing and installing
 => Page 63
- ◆ If replaced renew the complete coolant



25 Injector

- ◆ Removing and installing for engine codes 1Z, AHU, AEY, AFN, AVG ALE

=> Repair group 23; Servicing Diesel direct system; Removing and installing injectors Servicing Diesel direct system Removing and installing injectors

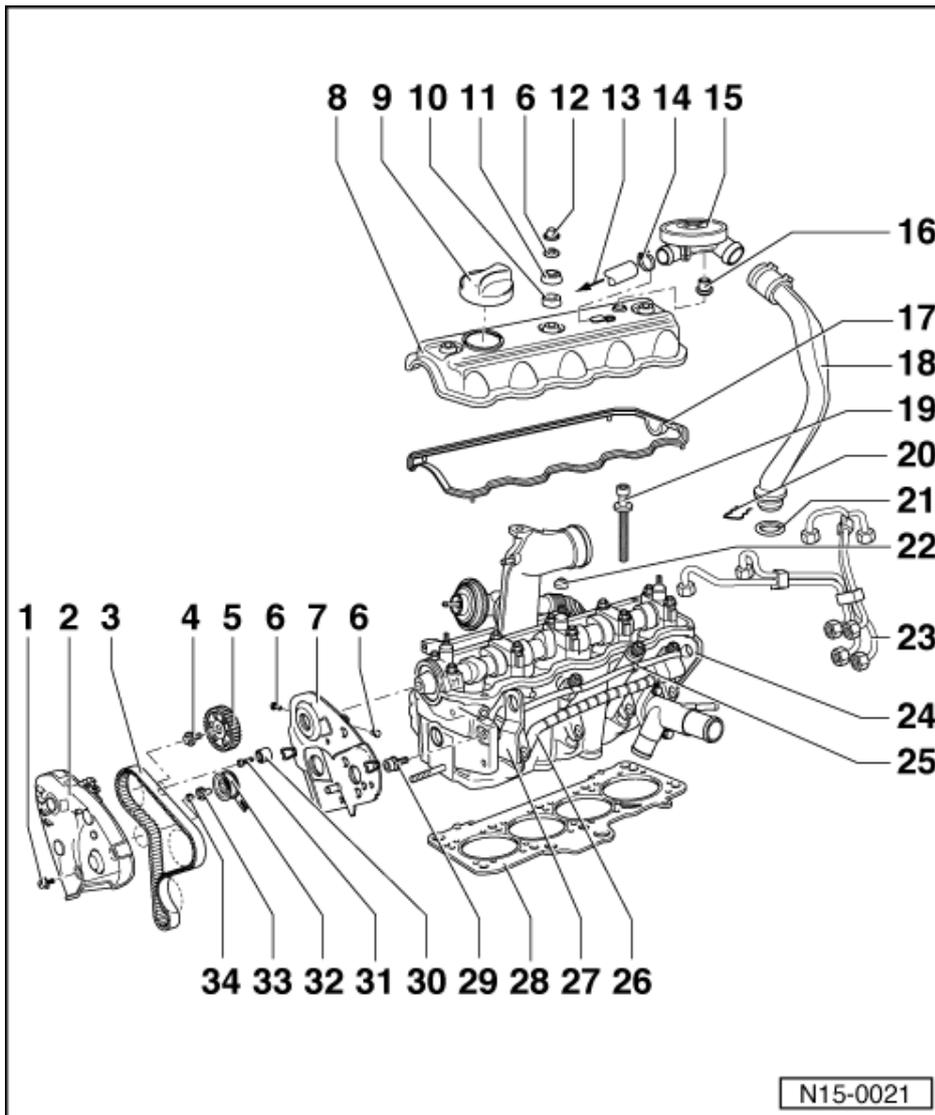
- ◆ Removing and installing for engine codes: 1Y, AAZ

=> Repair group 23; Servicing fuel injection system; Removing and installing injectors Servicing fuel injection system Removing and installing injectors

26 Glow plug

- ◆ For engine codes 1Z, AHU, AEY, AFN, AVG, ALE tighten to 15 Nm
- ◆ for engine codes 1Y, AAZ tighten to 25 Nm
- ◆ Checking

=> Repair group 28; Checking glow plug system; Checking glow plugs Checking glow plug system Checking glow plugs



27 Lifting eye

28 Cylinder head gasket

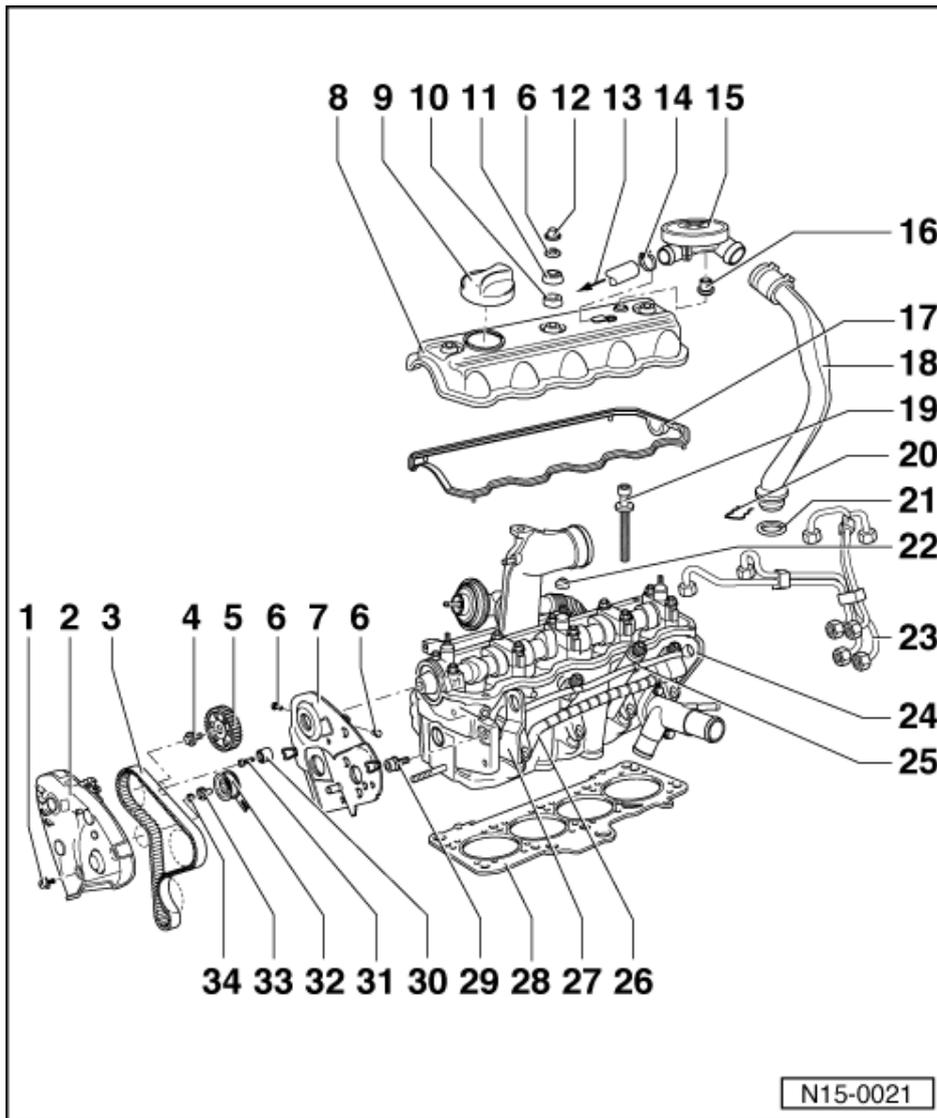
- ◆ Renew
- ◆ 11.93 ▶ metal cylinder head gasket
- ◆ For vehicles ▶ 10.93 with soft material cylinder head gasket. In cases of repair install a new metal cylinder head gasket and replace swirl chambers => Page 81
- ◆ Note marking => Fig. 2
- ◆ If replaced renew the complete coolant

29 20 Nm

30 Idler roller

- ◆ Engine codes:
1Z, AHU, AEY, AFN, AVG, ALE

31 25 Nm



32 Tensioning roller

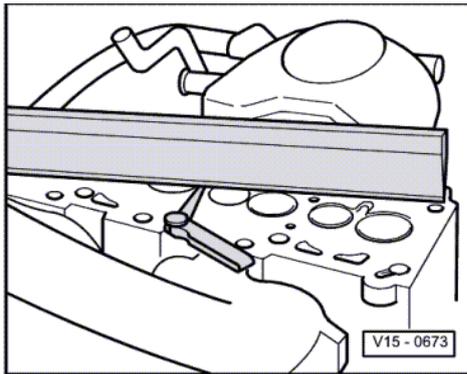
- ◆ The semi-automatic tensioning roller is illustrated
- ◆ Checking semi-automatic toothed belt tensioning roller
=> Page **33**

33 Eccentric

- ◆ For semi-automatic tensioning roller

34 45 Nm

- ◆ 20 Nm for semi-automatic tensioning roller

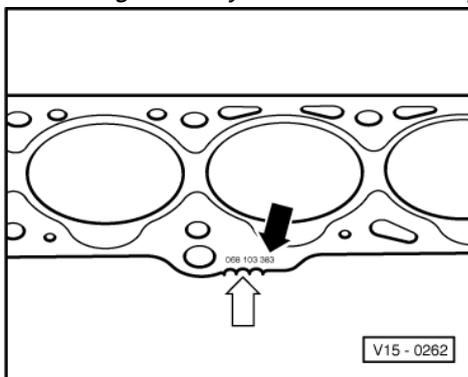


-> Fig. 1 Checking cylinder head for distortion

Max. permissible distortion: 0.1 mm

Note:

Reworking diesel cylinder heads is not permissible.



-> Fig.2 Cylinder head gasket identification

- ◆ Part No. = black arrow
- ◆ Holes/notches = white arrow

Note:

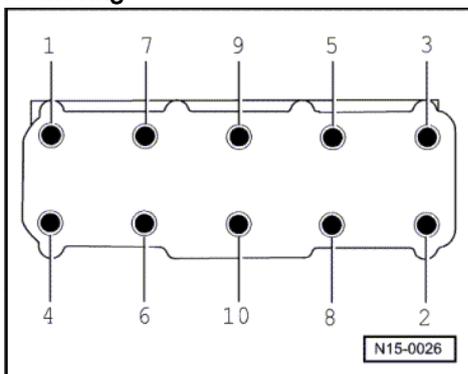
Different thicknesses of cylinder head gasket are fitted depending on the piston projection. When replacing the cylinder head gasket, install a new gasket with the same identification.

1.2 - Removing and installing cylinder head

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ V.A.G 1332 Torque wrench (40...200 Nm)
- ◆ Guide pins 3070

Removing



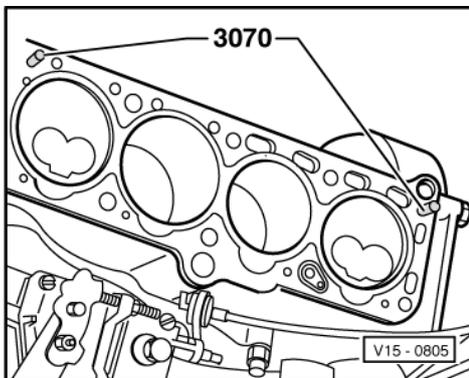


- -> Maintain sequence when loosening and tightening cylinder head bolts.

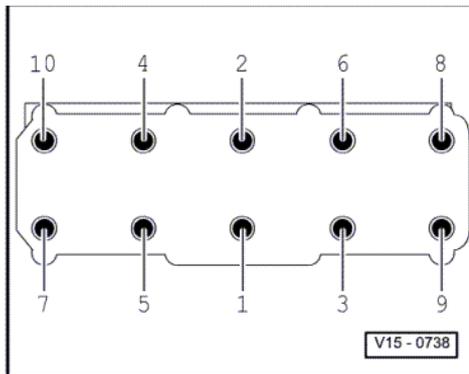
Installing

Notes:

- ♦ Always renew cylinder head bolts.
 - ♦ In cases of repair carefully remove gasket remains from cylinder head and cylinder block. Ensure that no long grooves or scratches are created. When using abrasive paper do not use a grade less than 100.
 - ♦ Remove new cylinder head gasket from packaging, just before installation.
 - ♦ Carefully remove emery and abrasive remains.
 - ♦ Handle gasket extremely carefully. Damaging the silicone layer or the indented area will lead to leaks.
 - ♦ For vehicles >10.93 with soft material cylinder head gasket. In cases of repair install a new metal cylinder head gasket and replace swirl chambers => Page 81 .
- Turn crankshaft to TDC marking before fitting cylinder head.
 - Turn crankshaft against engine direction of rotation until all pistons are approximately equally placed below TDC.
 - Place cylinder head gasket on.



- -> To centralize, screw guide pins from 3070 into the outer threaded holes on the intake side.
- Fit cylinder head, screw in 8 remaining cylinder head bolts and tighten by hand.
- Remove guide pins with removal tool from 3070 and install cylinder head bolts.



- -> Tighten cylinder head in four stages in sequence shown as follows:
- 1. Tighten initially with torque wrench:
 - Stage I = 40 Nm
 - Stage II = 60 Nm
- 2. Turn further with normal spanner:
 - Stage III = 1/4 turn (90 °)
 - Stage IV = 1/4 turn (90 °)

Notes:

- ♦ Loosening cylinder head: Reverse sequence.



- ◆ Pulling-down cylinder head after repairs is not necessary.
- After tightening the cylinder head turn camshaft so that the cams for No. 1 cylinder point evenly upwards. Turn crankshaft, in engine D.O.R., To TDC before fitting toothed belt.

1.3 - Checking compressions

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Compression tester V.A.G 1381 or V.A.G 1763

Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

- ◆ Adapter V.A.G 1381/12
- ◆ Jointed spanner 3220

Engine codes 1Y, AAZ

- ◆ Adapter V.A.G 1381/2A
- ◆ Ring spanner 3035

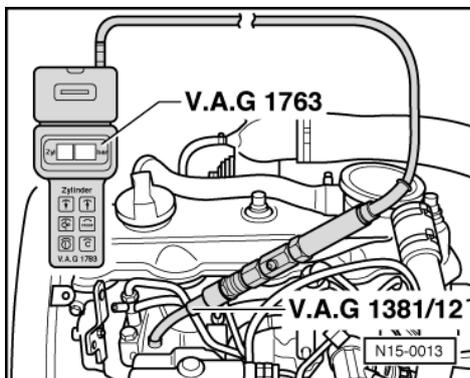
Test conditions

- Engine oil temperature min. 30 °C.

Test sequence

Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

- Pull connector off fuel cut-off valve on injection pump.



- Separate connector to quantity adjuster on injection pump.
- Remove all glow plugs using socket spanner 3220.
- -> Screw in adapter V.A.G 1381/12 in place of the glow plugs.
- Check compressions with compression tester V.A.G 1381 or V.A.G 1763.

Note:

Using the compression tester => Operating instructions.

- Operate starter until tester shows no further pressure increase.

Compression pressure:

New: 25...31 bar
Wear limit: 19 bar



Permissible difference between all cylinders: 5 bar

- Install glow plugs with socket and jointed extension 3220
Tightening torque: 15 Nm.
- Interrogate fault memory:

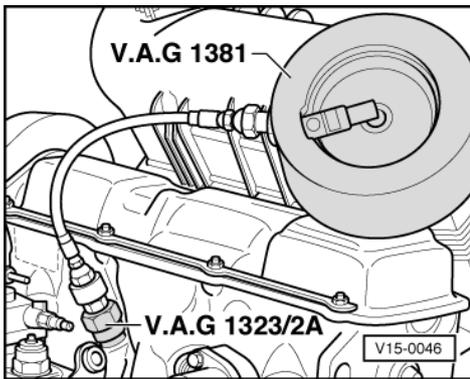
=> Repair group 01; Fault memory; Interrogating fault memory Fault memory Interrogating fault memory

Note:

Faults will have been stored because the connector to injection pump has been separated. Therefore interrogate and erase fault memory.

Engine codes: 1Y, AAZ

- Pull wire off engine stop on injection pump, insulate and lay to side.
- Remove injection pipes with slotted ring spanner 3035.
- Unscrew all injectors and take out heat shields.



- -> Screw in adapter V.A.G 1323/2A in place of the injectors.
Insert old heat shield between adapter and cylinder head.
- Screw compression pressure recorder V.A.G 1381 or V.A.G 1763 into the adapter by hand.

Note:

Using the compression tester => Operating instructions.

- Operate starter until tester shows no further pressure increase.

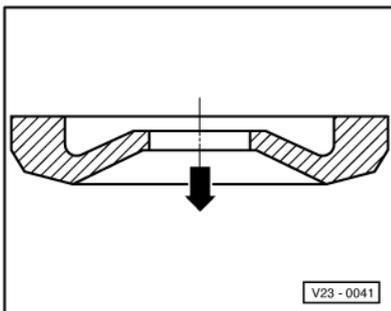
Compression pressure:

New: 34 bar
Wear limit: 26 bar

Permissible difference between all cylinders: 5 bar

Note:

Always renew heat shield seals between cylinder head and injectors.



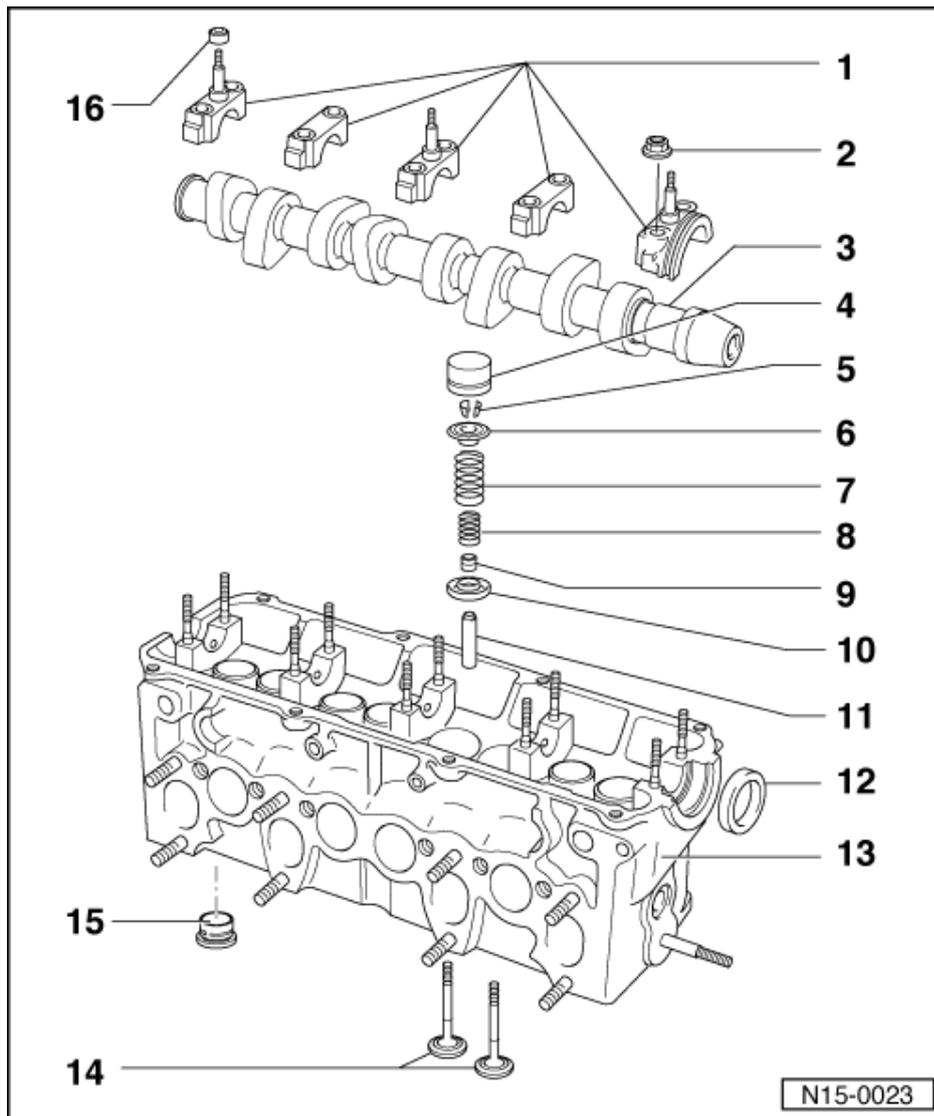


-> Installation position of heat shield:
Arrow points towards cylinder head.

- ◆ Tightening torques:
 - Injector pipes = 25 Nm
 - Injectors = 70 Nm

2 - Servicing valve gear

2.1 - Servicing valve gear



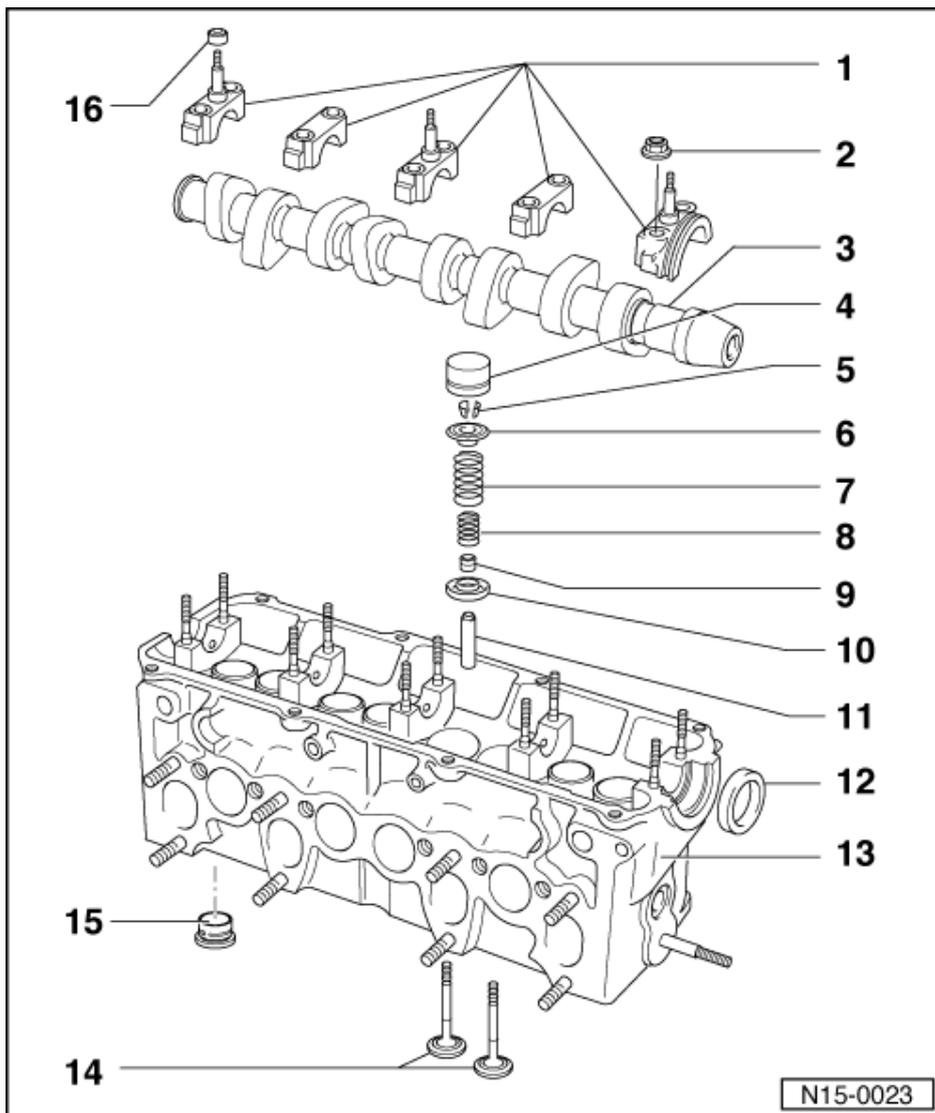
Note:

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

1 Bearing cap

- ◆ Installation position => Fig. 2
- ◆ Installation sequence
=> Page 78 , removing and installing camshaft

2 20 Nm



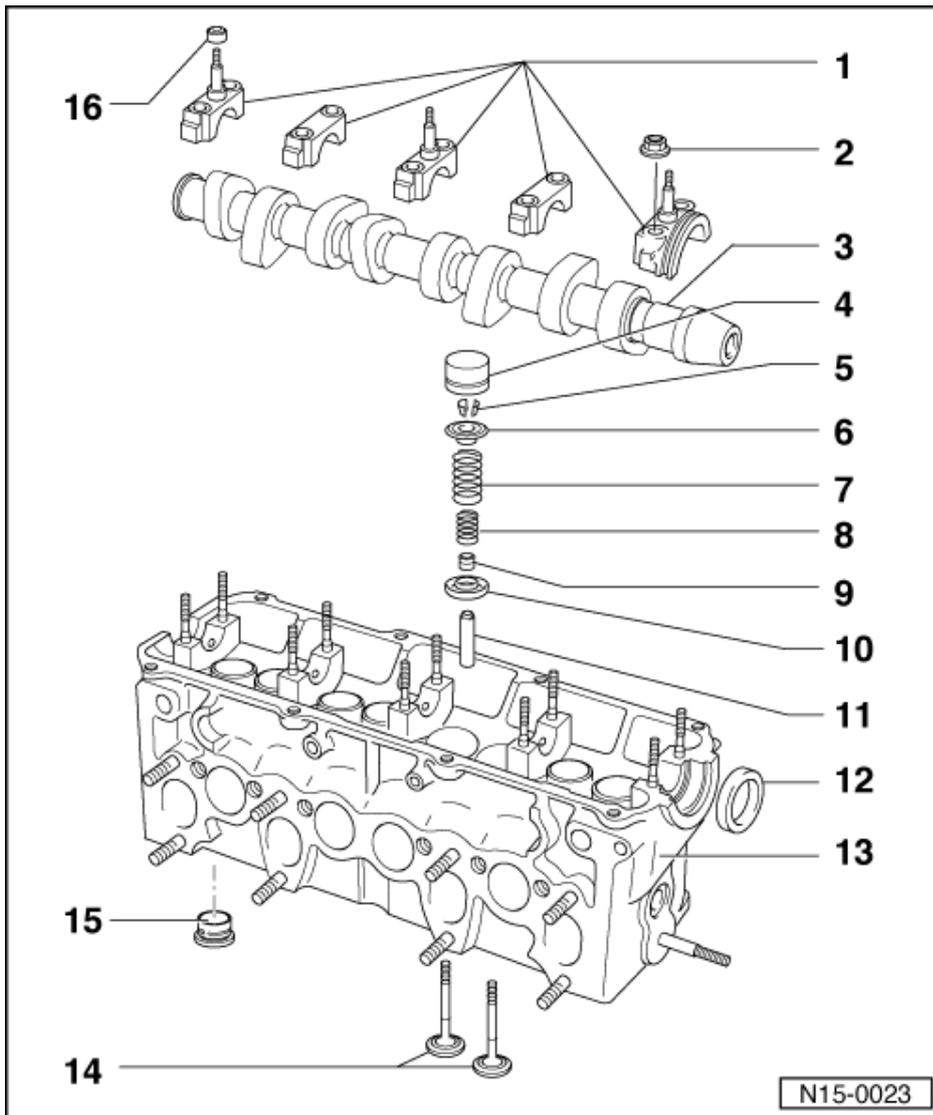
3 Camshaft

- ◆ Checking axial clearance => Fig. 1
- ◆ Removing and installing
=> Page 78
- ◆ Checking radial clearance with plastigage
Wear limit: 0.11 mm
- ◆ Run-out: max. 0.01 mm
- ◆ Identification and valve timing
=> Fig. 4

4 Bucket tappet

- ◆ Do not interchange
- ◆ With hydraulic valve clearance compensation
- ◆ Checking => Page 80
- ◆ Store with cam lobe contact surface downwards
- ◆ Before installing check camshaft axial clearance => Fig. 1
- ◆ Oil contact surface

5 Cotter pins



6 Upper valve spring plate

7 Valve spring

- ◆ 10.94 > only one-part valve spring
- ◆ Removing and installing:
 Cylinder head
 removed: with 2037
 installed: => Page 76 , renewing valve stem seals

8 Inner valve spring

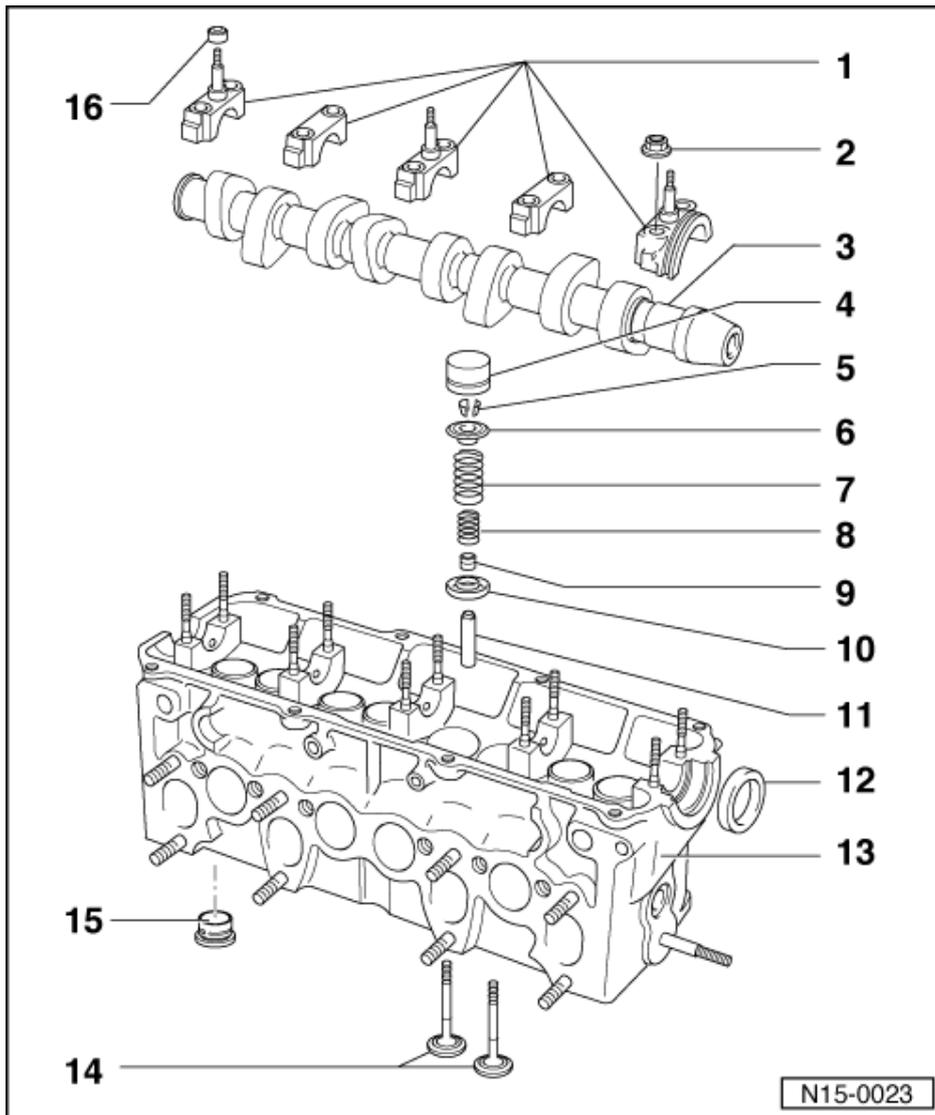
- ◆ >09.94
- ◆ Removing and installing:
 Cylinder head
 removed: with 2037
 installed: => Page 76 , renewing valve stem seals

9 Valve stem seal

- ◆ Renewing=> Page 76

10 Lower valve spring plate

- ◆ Remove and install with 3047A
- ◆ >09.94



11 Valve guide

- ◆ Checking => Page 75
- ◆ Renewing => Page 76
- ◆ Service version with collar

12 Oil seal

- ◆ To remove and install, remove bearing cap
- ◆ Removing and installing toothed belt =>Page 27

13 Cylinder head

- ◆ See note
=> Page 67
- ◆ Reworking valve seats
=> Page 73

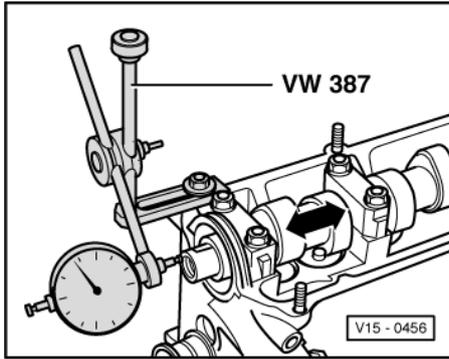
14 Valves

- ◆ Valve dimensions => Fig. 3

15 Swirl chamber

- ◆ Engine codes
1Z, AAZ
- ◆ Renew if damaged
- ◆ Renewing => Page 81

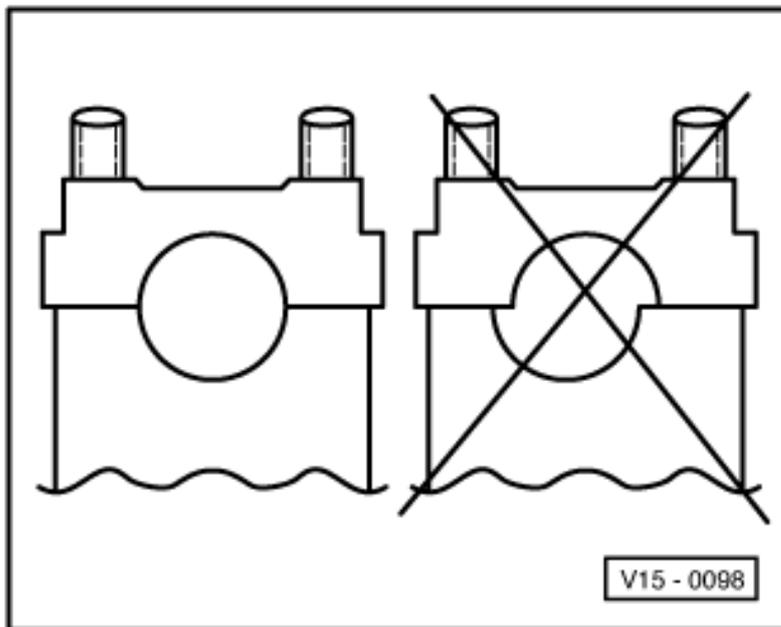
16 Lower sealing cone



-> Fig. 1 Checking camshaft axial clearance

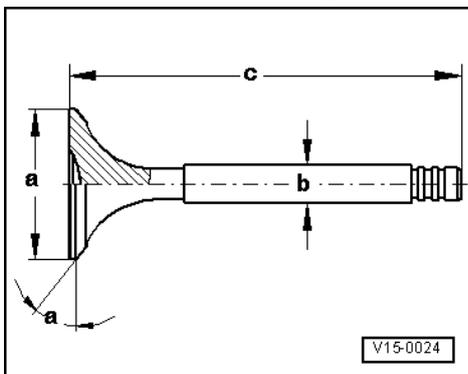
Wear limit: max. 0.15 mm

Check with bucket tappets removed and with first and last bearing caps fitted.



-> Fig. 2 Fitting position of camshaft bearing caps

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





-> Fig. 3 Valve dimensions

Note:

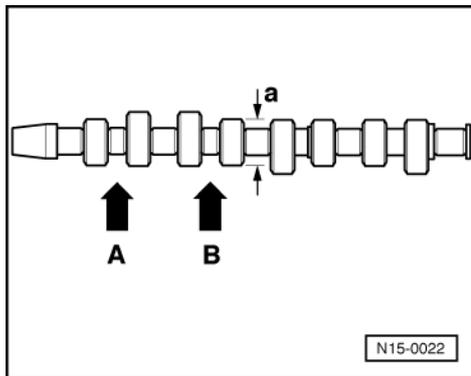
Valves must not be reworked. Only lapping-in is permitted.

Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

Dimension	Inlet valve	Exhaust valve
øa mm	35.95	31.45
øb mm	▷06.95: 7.97 07.95 ▷: 6.97	▷06.95: 7.95 07.95 ▷: 6.95
c mm	AEY: 96.35 1Z, AHU, AFN, AVG,ALE:96.85	AEY: 96.35 1Z, AHU, AFN, AVG,ALE:96.85
α <°	45	45

Engine codes 1Y, AAZ

Dimension	Inlet valve	Exhaust valve
øa mm	36.0	31.0
øb mm	▷06.95: 7.97 07.95 ▷: 6.97	▷06.95: 7.95 07.95 ▷: 6.95
c mm	95.0	95.0
α <°	45	45



-> Fig.4 Camshaft identification, valve timing

Identification

- ♦ Cam base diameter: a = 38 mm ø
- ♦ Identification by stamped numbers and letters between inlet and exhaust cams:

Engine code	1Y	1Z	AAZ	AEY	AFN	AHU	ALE	AVG
Cylinder 1 -arrow A-	W	W	W	W	W	W	W	W
Cylinder 2 -arrow B-	028 D	028 F	028 D	028 E	028 F	028 F	028 F	028 F



Valve timing at 1 mm valve lift

Engine code	1Y	1Z	AAZ	AEY	AFN	AHU	ALE	AVG
Inlet opens after TDC	6 °	16 °	6 °	11 °	16 °	16 °	16 °	16 °
Inlet closes after BDC	20 °	25 °	20 °	25 °	25 °	25 °	25 °	25 °
Exhaust opens before BDC	25.5 °	28 °	25.5 °	40 °	28 °	28 °	28 °	28 °
Exhaust closes before TDC	6.5 °	19 °	6.5 °	10 °	19 °	19 °	19 °	19 °

2.2 - Reworking valve seats

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Depth gauge
- ◆ Valve seat refacing tool

Notes:

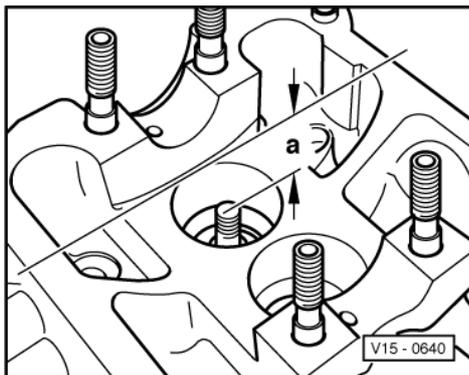
- ◆ When repairing engines with leaking valves, it is not always sufficient to reface or renew valve seats and valves. It is also necessary to check the valve guides for wear. This is particularly important on high mileage engines.
- ◆ The valve seats should only be reworked just enough to produce a perfect seating pattern. The maximum permissible reworking dimension must be calculated before work is carried out. If the reworking dimension is exceeded, the function of the hydraulic tappets can no longer be guaranteed and therefore the cylinder head should be renewed.

Calculating max. permissible reworking dimension

- Insert valve and press firmly against seat.

Note:

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



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

Minimum dimension:

Inlet valve 35.8 mm

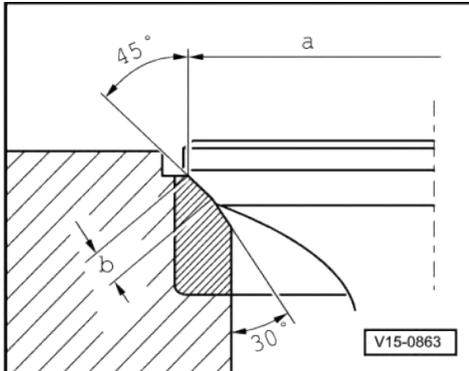
Exhaust valve 36.1 mm

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



Example:

- Measured distance	36.5 mm
Minimum dimension	35.8 mm
= max. perm. rework dimension	0.7 mm

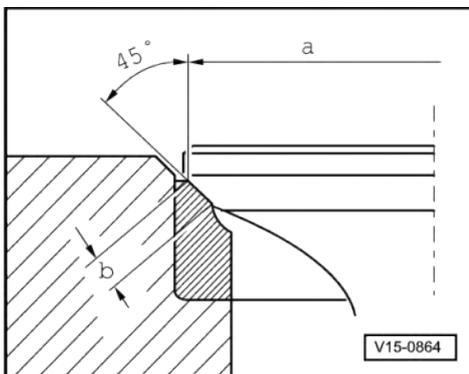


Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

-> Reworking inlet valve seat

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

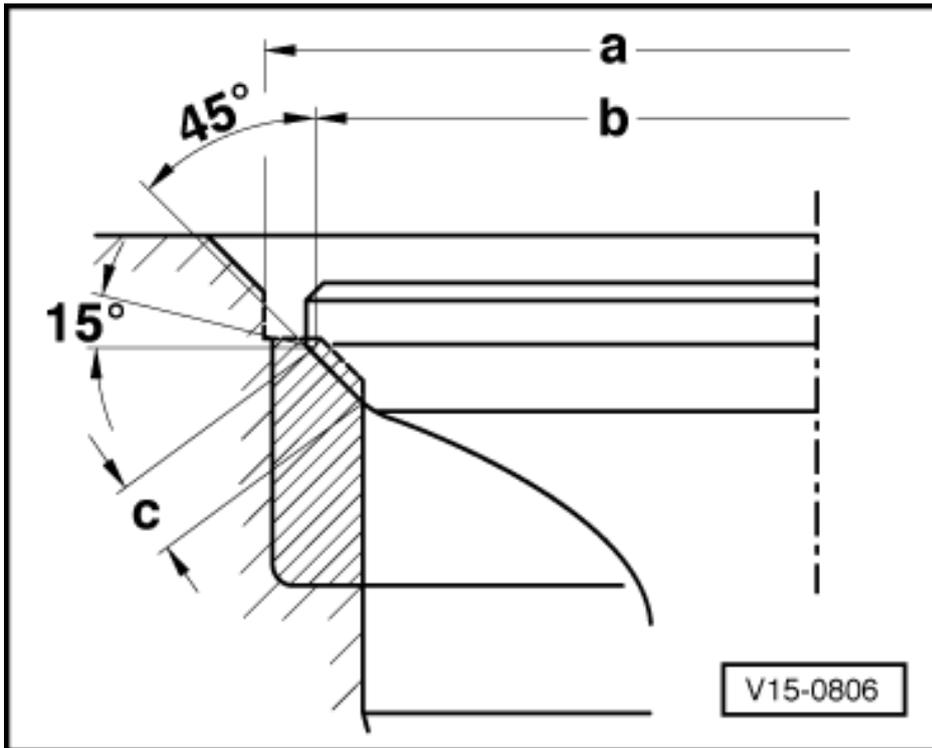
Note:



The 30 ° lower valve seat chamfer is necessary to ensure that the inlet channel flow characteristics are maintained.

-> Reworking exhaust valve seat

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



Engine codes 1Y, AAZ
-> Reworking valve seats

Dimen.	In. valve seats	Ex. valve seats
øa mm	37.201)	33.201)
øb mm	34.80	30.40
c mm	2.70	2.05
45°	Valve seat angle	
30°	Correction angle	

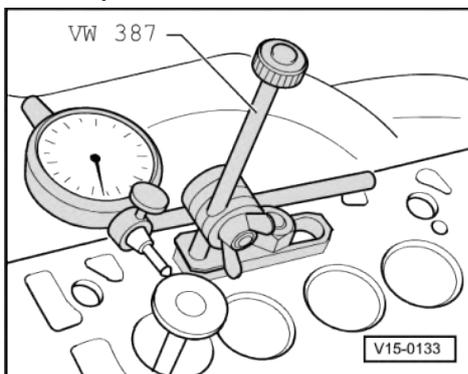
1) max. external diameter of correction cutter

2.3 - Checking valve guides

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ♦ VW 387 Universal dial gauge bracket
- ♦ Dial gauge

Test sequence





- -> Insert new valve into guide until end of valve stem is flush with end of guide. Due to the slight difference in stem dimensions, ensure that only an inlet valve is used in the inlet guide and an exhaust valve in the exhaust guide.
- Rock: Max. 1.3mm

2.4 - Renewing valve guides

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

Valve stem \varnothing 8 mm:

- ◆ Drift 3121
- ◆ Hand reamer 3120 and cutting fluid

Valve stem \varnothing 7 mm:

- ◆ Drift 3121
- ◆ Hand reamer 3120 and cutting fluid

Removing

- Clean and check cylinder head. Cylinder heads in which the valve seats can no longer be reworked, or cylinder heads which have already been machined to the minimum dimension, should not have the valve guides replaced.
- Press worn valve guides out with
Valve stem \varnothing 8 mm: 10-206
Valve stem \varnothing 7 mm: 3121
from the camshaft side (valve guides with collar -service version- from the combustion chamber side).

Installing

- Coat new guides with oil and press in with 10-206/3121 from the camshaft side with head cold until shoulder makes contact.

Note:

When the shoulder on guide makes contact, the pressure must not exceed 1.0 t otherwise shoulder may break off.

- Ream guides out with hand reamer
Valve stem \varnothing 8 mm: 10-215
Valve stem \varnothing 7 mm: 3120
using plenty of cutting fluid.
- Rework valve seats => Page 73 .

2.5 - Renewing valve stem seals

(with cylinder head fitted)

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Puller 3047A
- ◆ Assembly tool 2036
- ◆ Lever VW 541/1A with press piece VW 541/5

Valve stem \varnothing 8 mm:

- ◆ Fitting tool 3129

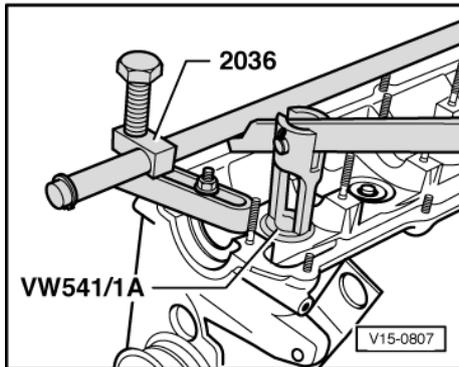


Valve stem \varnothing 7 mm:

- ◆ Fitting tool 3129

Removing

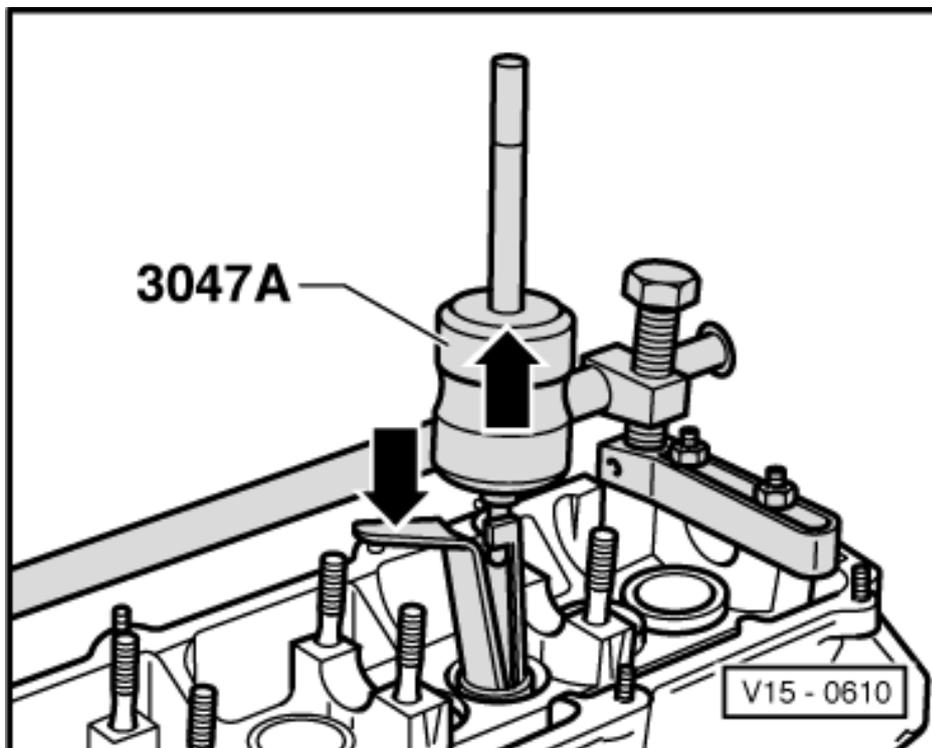
- Remove camshaft => Page 78 .
- Remove bucket tappets (do not interchange) and store with the contact surface downwards.
- Set piston of respective cylinder to top dead centre (TDC).



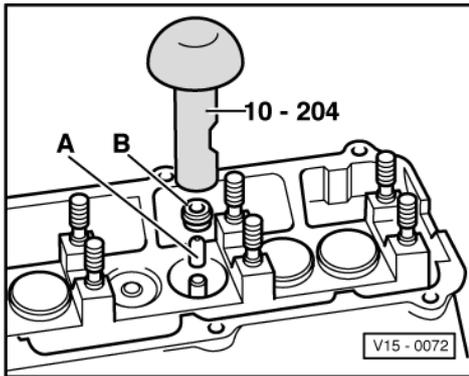
- -> Fit assembly tool 2036 and adjust mountings to height of studs.
- Remove valve springs with lever VW 541/1A and press piece VW 541/5.

Note:

The valves are supported by the piston crown.



- -> Pull off valve stem seals with 3047A.

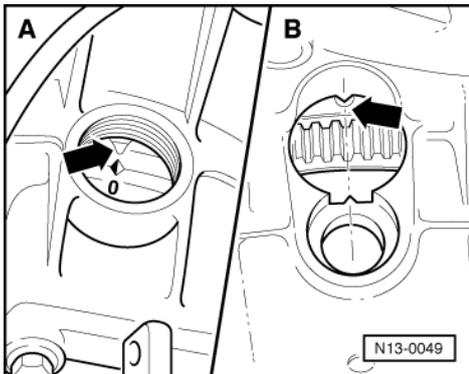


Installing

- -> To prevent damage to the new valve stem seals, place plastic sleeve -A- on valve shaft.
- Oil valve stem seal -B-, place it in tool
Valve shaft \varnothing 8 mm: 10-204
Valve stem \varnothing 7 mm: 3129
and push carefully onto the valve guide.

2.6 - Removing and installing camshaft

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required



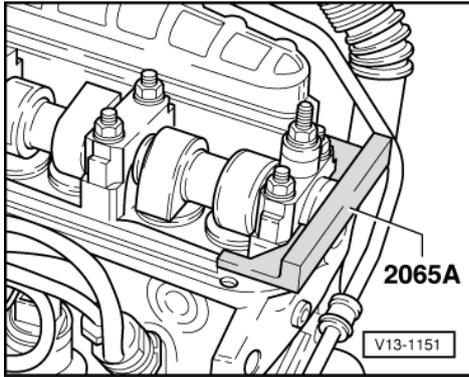
- ♦ V.A.G 1331 Torque wrench (5...50 Nm)

Removing

- Remove upper toothed belt guard and cylinder head cover.
- -> Turn crankshaft to TDC No. 1 cylinder.
A: Engine codes 1Y, AAZ, AEY
B: Engine codes 1Z, AHU, AFN, AFN, AVG,
ALE
- Loosen tensioner.

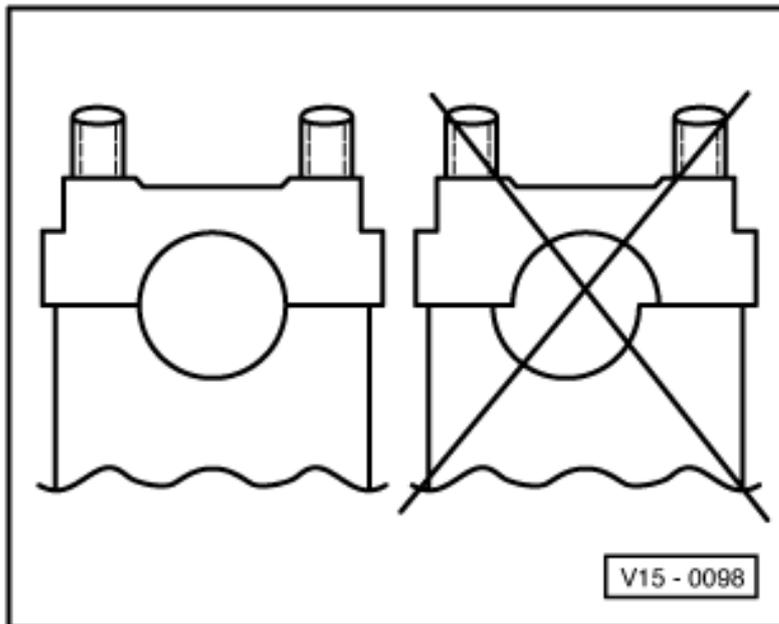
Engines with semi-automatic tensioning roller:

- Remove relay roller.
- Take off toothed belt.



- -> Lock camshaft with setting bar.
- Loosen camshaft sprocket securing bolt 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through rear toothed belt guard opening).
- Take off camshaft sprocket.
- First remove bearing caps 5, 1 and 3. Then loosen bearing caps 2 and 4 alternately and diagonally.

Installing



Notes:

- ◆ When installing the camshaft No. 1 cylinder cams must point upwards.
- ◆ -> When installing the bearing cap note offset, before installing camshaft fit bearing caps and determine fitting position.
- Oil camshaft running surfaces.
- Tighten bearing caps 2 and 4 alternately and diagonally to 20 Nm.
- Install bearing caps 5, 1 and 3 and also tighten to 20 Nm.
- Locate bearing cap 5 by tapping lightly on the end of the camshaft.
- Install camshaft sprocket.



- Install and tension toothed belt => Page 27 .

Note:

When new tappets have been installed the engine must not be started for about 30 minutes. Hydraulic compensation elements must settle (otherwise valves will strike pistons).

2.7 - Checking hydraulic bucket tappets

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ♦ Feeler gauge
- ♦ Wood or plastic wedge

Notes:

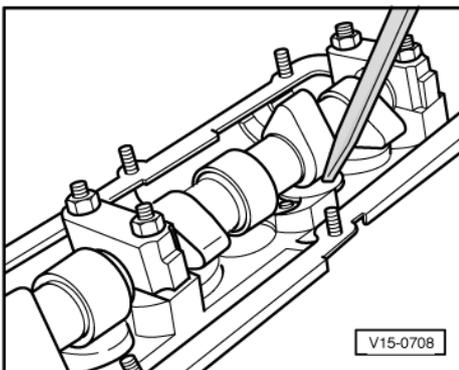
- ♦ Renew defective tappet complete (cannot be adjusted or repaired).
- ♦ Irregular valve noises when starting engine are normal.

Test sequence

- Start engine and run until the radiator fan has switched on once.
- Increase engine speed to about 2500 rpm for 2 minutes.

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

- Remove cylinder head cover.
- Rotate crankshaft clockwise, until cam of the tappet to be checked is pointing upwards.
- Determine play between cam and bucket tappet.
- If the play is in excess of 0.1 mm, renew bucket tappet. If the play is less than 0.1 mm or no play, proceed with check as follows:



- -> Press tappet down with a wooden or plastic wedge. If free travel in excess of 1 mm is felt before tappet contacts valve, renew tappet.

Note:

After installing new tappets the engine must not be started for approx. 30 minutes. Hydraulic compensation elements must settle (otherwise valves will strike pistons).



2.8 - Replacing swirl chambers

(Engine codes 1Y, AAZ)

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

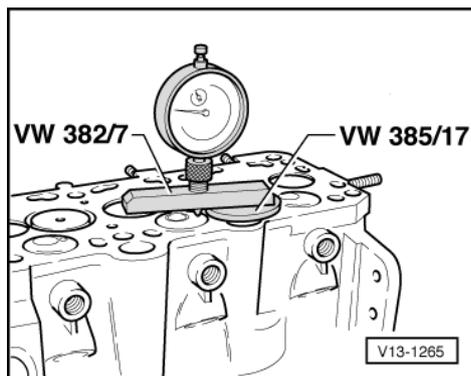
- ◆ VW 382/7
- ◆ VW 385/17

Work sequence

- Cylinder head removed
- Remove all injectors

=> Repair group 23; Servicing fuel injection; Removing and installing injectors. Servicing fuel injection Removing and installing injectors.

- Remove glow plugs.
- Drive swirl chamber out using a suitable drift through injector opening.
- Clean off combustion residue from swirl chamber contact surfaces in cylinder head.
- Fit new swirl chamber in position, installation position is determined by guide lug and groove.
- Drive swirl chamber in using a synthetic head hammer.



- -> Measure the swirl chamber projection.
Specification: max. 0.07 mm

If the specification is exceeded:

- Replace cylinder head.



17 - Lubrication

1 - Removing and installing parts of the lubrication system

1.1 - Removing and installing parts of the lubrication system

Notes:

- ♦ If large quantities of metal particles or other deposits (caused, for example, by partial seizure of the crankshaft or conrod bearings) are found in the engine oil when performing repairs, clean the oil passages thoroughly and renew the oil cooler in order to prevent further damage from occurring later.
- ♦ The oil level must not be above the max. mark - danger of damage to catalyst!

Checking oil pressure => Page **89**

Oil system capacity1):

without oil filter 3.8 ltrs.
with oil filter 4.3 ltrs.

- 1) Up-to-date figures:

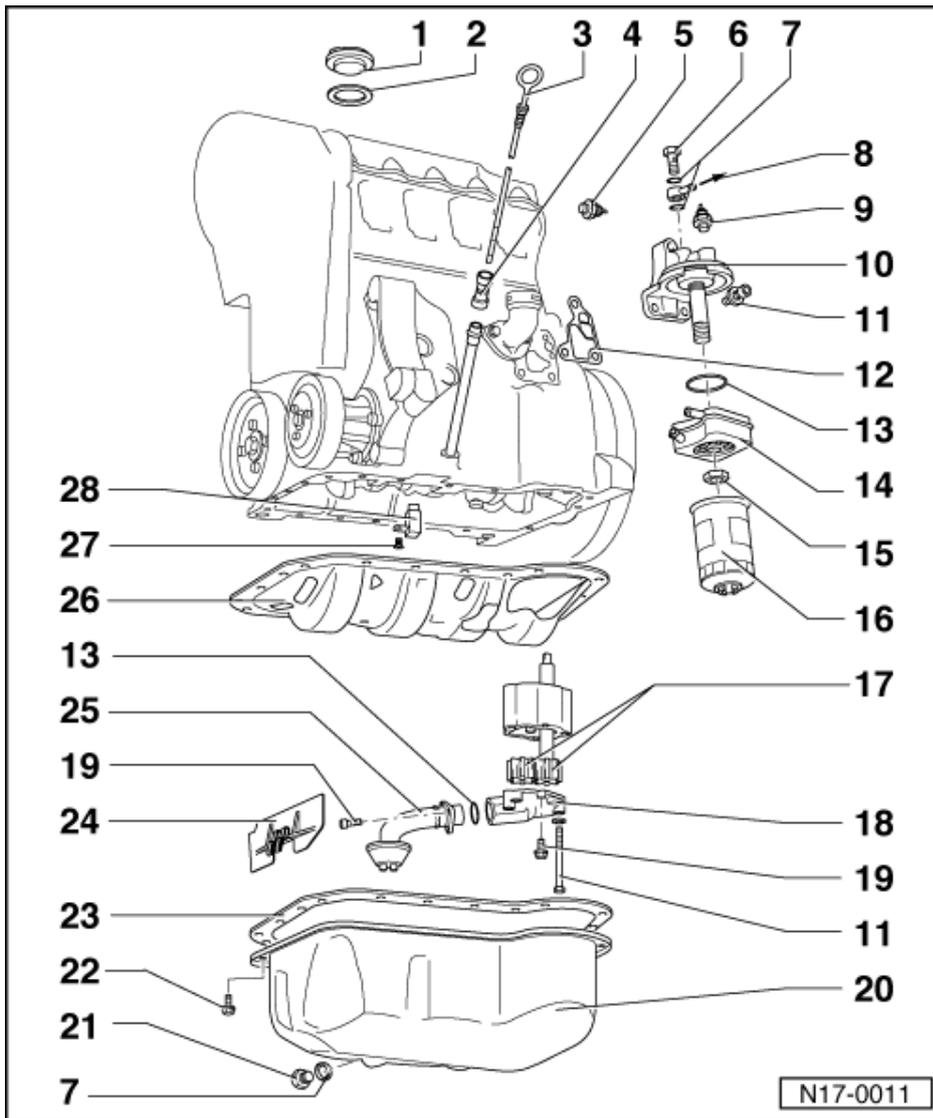
=> Exhaust emissions test binder

Engine oil specifications:

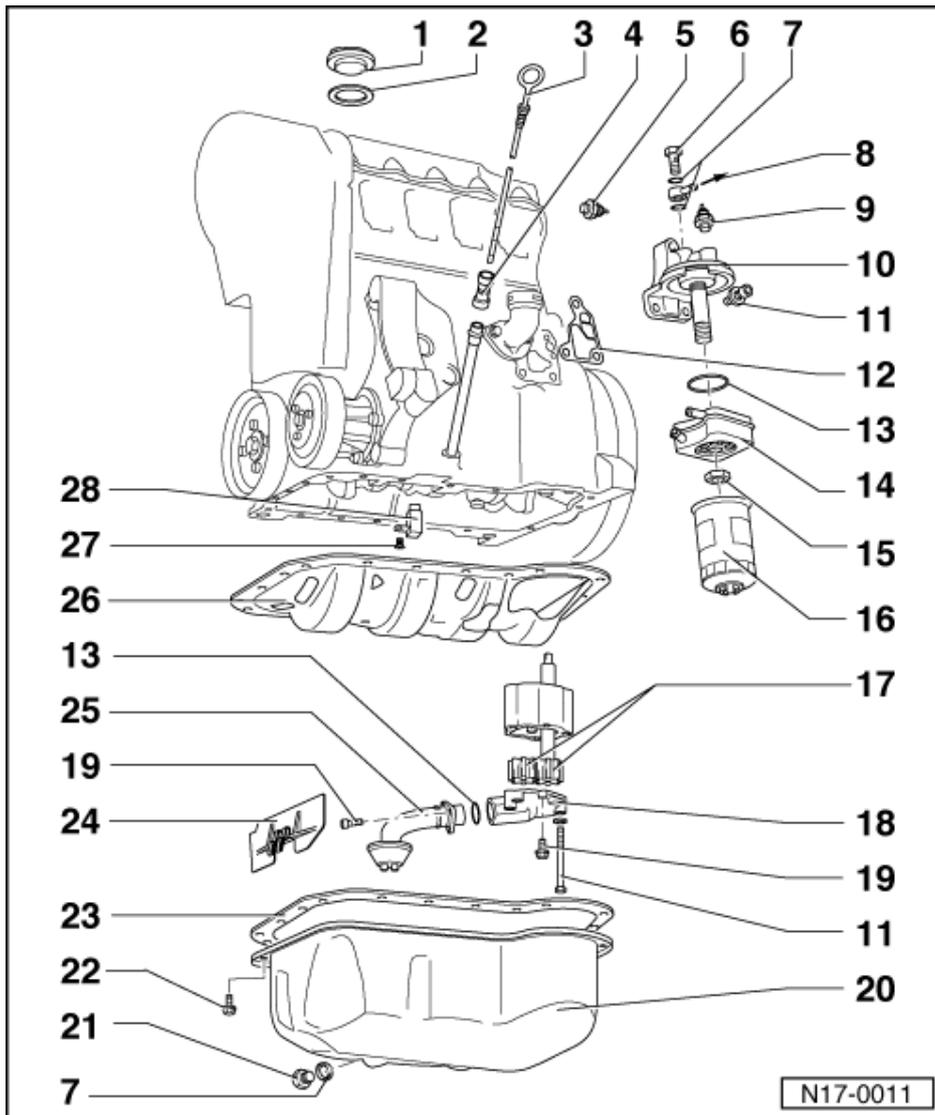
Turbo Diesel:
Only use engine oil conforming to VW standard 50500.

Naturally aspirated Diesel:
Only use engine oil conforming to VW standard 50000, 50101, 502001) or 50500 or multi-grade oil to API-CD.

- 1) Only in conjunction with VW standard 50500



- 1 Cap
- 2 Gasket
 - ◆ Renew if damaged
- 3 Dipstick
 - ◆ The oil level must not be above the max. mark!
 - ◆ Area above shaded zone up to max. mark: Do not top up with engine oil!
 - ◆ Oil level in shaded zone: Engine oil can be topped up
 - ◆ Area min. mark up to shaded zone: Top-up engine oil
- 4 Guide
 - ◆ Pull off to extract oil



5 Oil pressure switch (F22), 25Nm

- ◆ 0.3 bar switch: brown or 0.25 bar: blue
- ◆ Wiring: blue/black
- ◆ Checking => Page 89
- ◆ If sealing ring is leaking nip open and replace.

6 Banjo bolt, 25 Nm

7 Seal

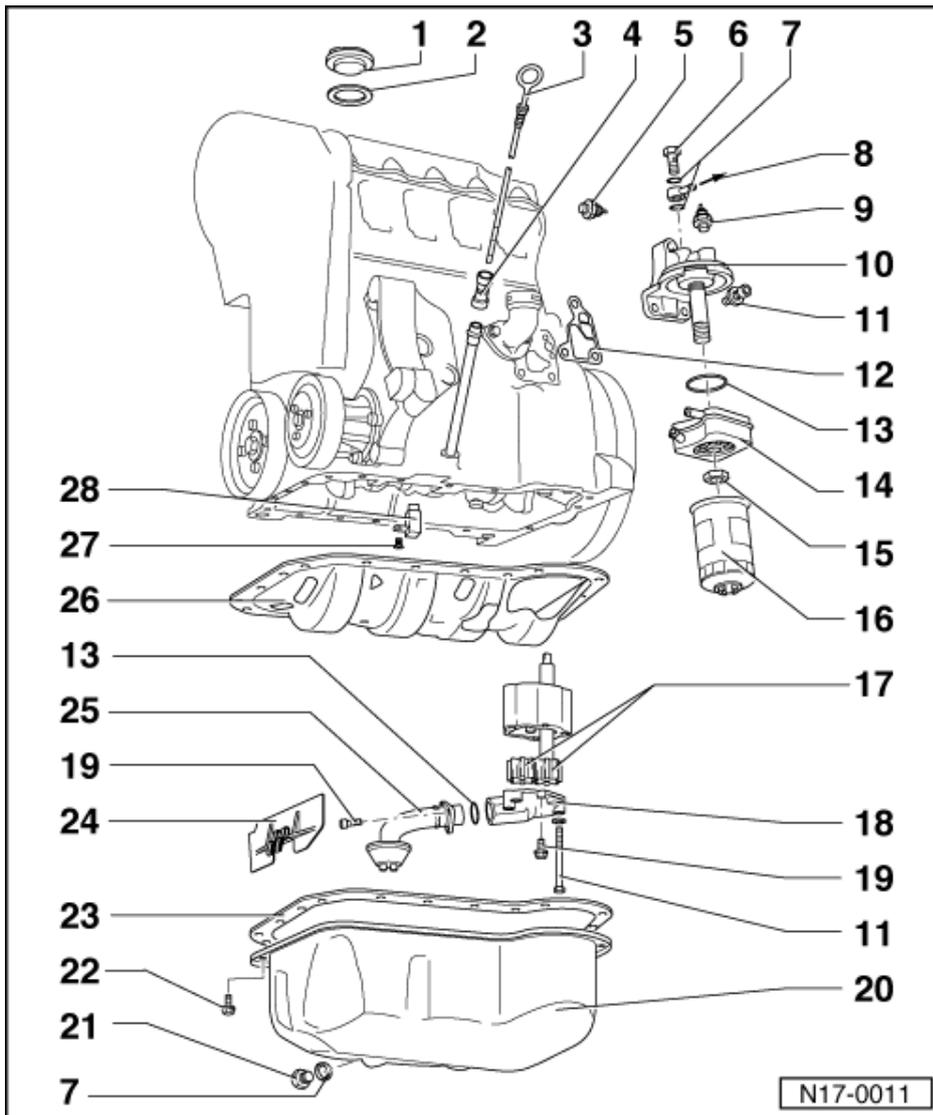
- ◆ Renew

8 To turbocharger

- ◆ Engine codes 1Z, AHU, AAZ, AFN, AVG, ALE

9 0.9 bar oil pressure switch (F1), 25 Nm

- ◆ Grey
- ◆ Wiring: yellow
- ◆ Checking => Page 89
- ◆ If sealing ring is leaking nip open and replace.



10 Oil filter bracket

11 25 Nm

12 Gasket

- ◆ Renew

13 O-ring

- ◆ Renew

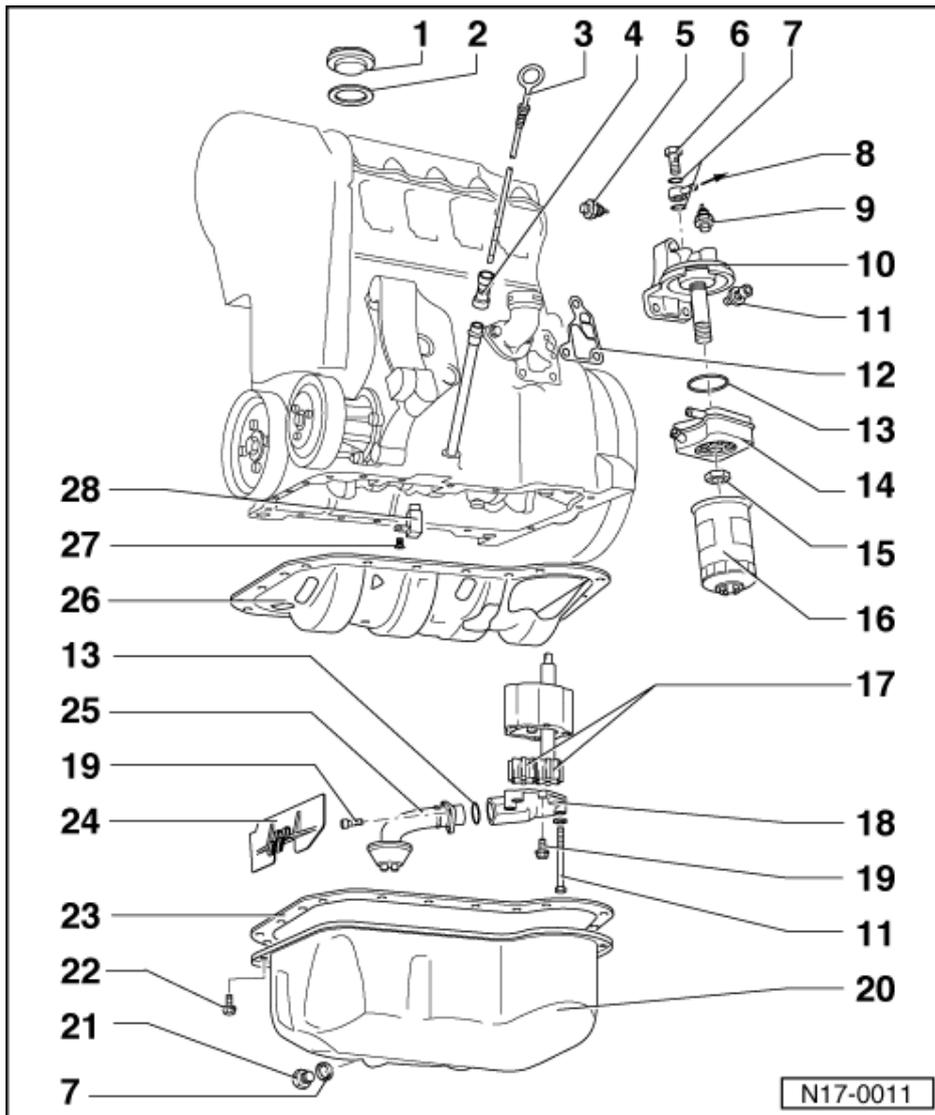
14 Oil cooler

- ◆ Coat contact area to flange, outside the seal, with AMV 188 100 02
- ◆ Ensure clearance to adjacent components
- ◆ See note
=> Page 82

15 25 Nm

16 Oil filter

- ◆ Loosen with strap wrench
- ◆ Tighten by hand
- ◆ Observe installation instructions on oil filter



17 Gears

- ◆ Checking backlash
=> Fig. 1
- ◆ Checking axial clearance
=> Fig. 2

18 Oil pump cover with pressure relief valve

- ◆ Opening pressure: 5.7...6.7 bar

19 10 Nm

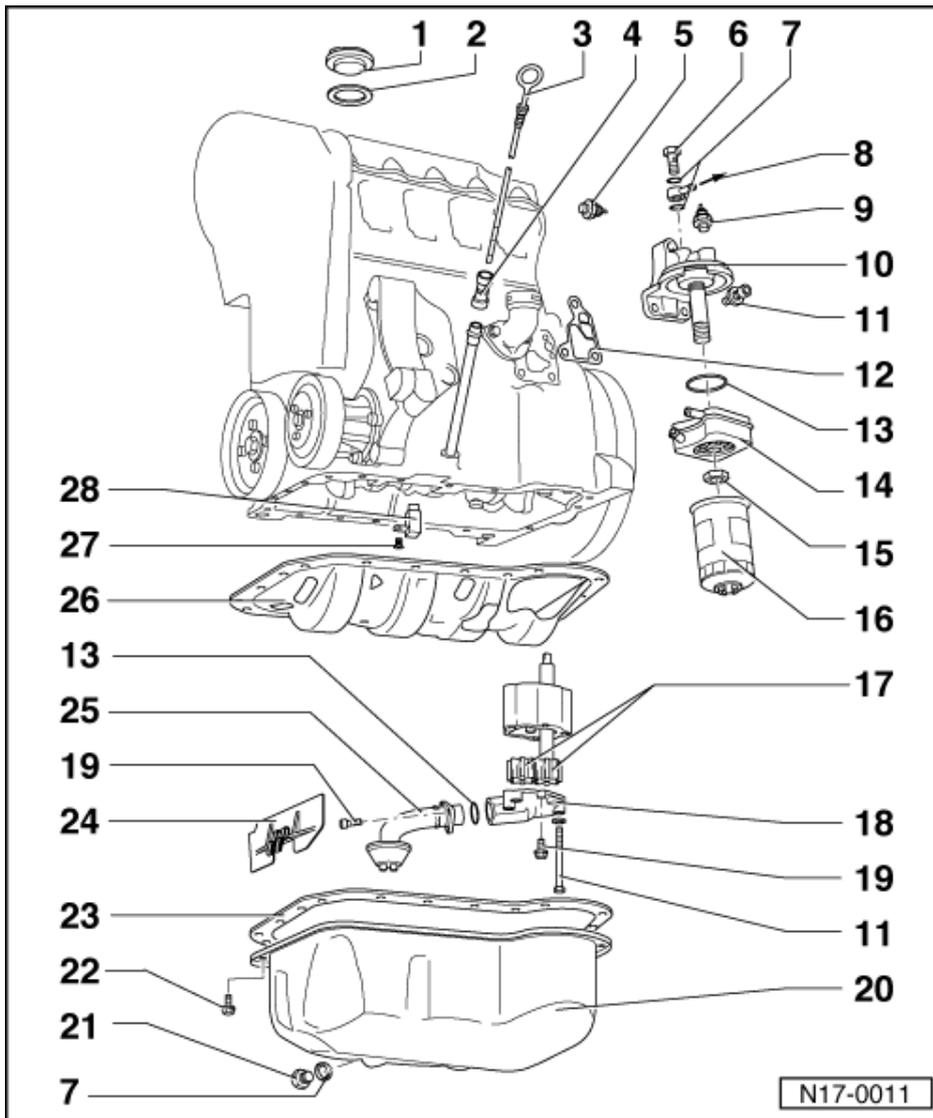
20 Sump

- ◆ Clean sealing surface before installing
- ◆ Engine codes AEY, AFN, AVG with oil sump cover
- ◆ Removing and installing oil sump cover =>Page 90

21 Oil drain plug, 30 Nm

22 20 Nm

- ◆ Remove and install both rear bolts gearbox end with jointed spanner 3185



23 Gasket

- ◆ Engine codes: 1Z, AHU, AEY, AFN, AVG, ALE
- ◆ Renew
- ◆ Before fitting gasket coat sump flange/cylinder block flange with "D2"

24 Baffle plate

25 Suction pipe

- ◆ Clean strainer if soiled

26 Baffle plate

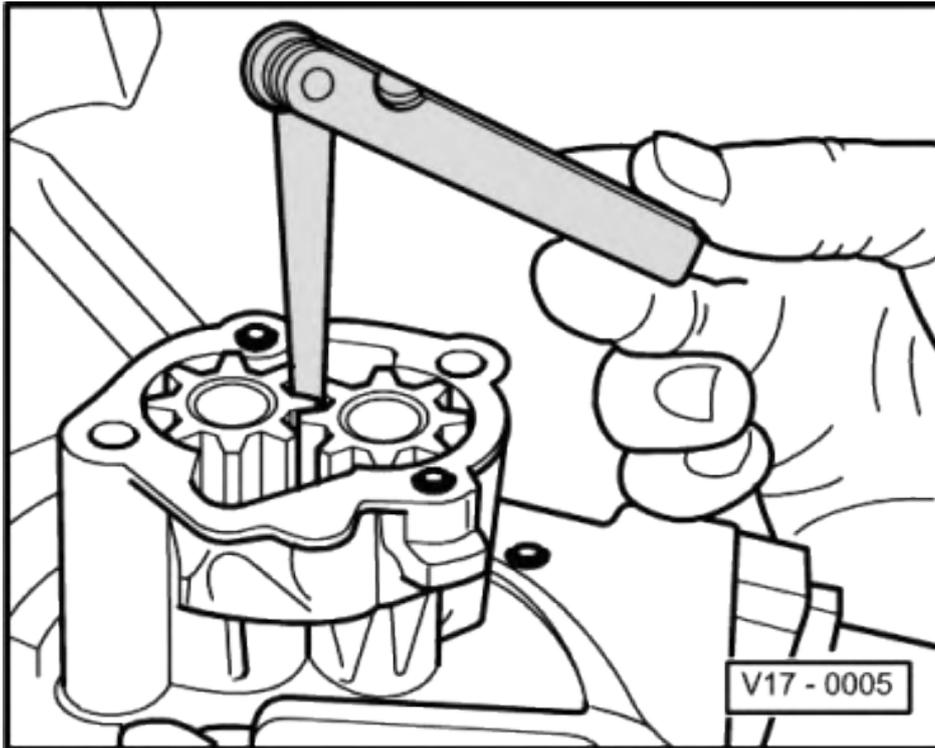
- ◆ Engine codes: 1Y, AAZ
- ◆ With gasket
- ◆ Renew gasket if damaged

27 10 Nm

- ◆ Insert with AMV 188 100 02

28 Oil spray jet

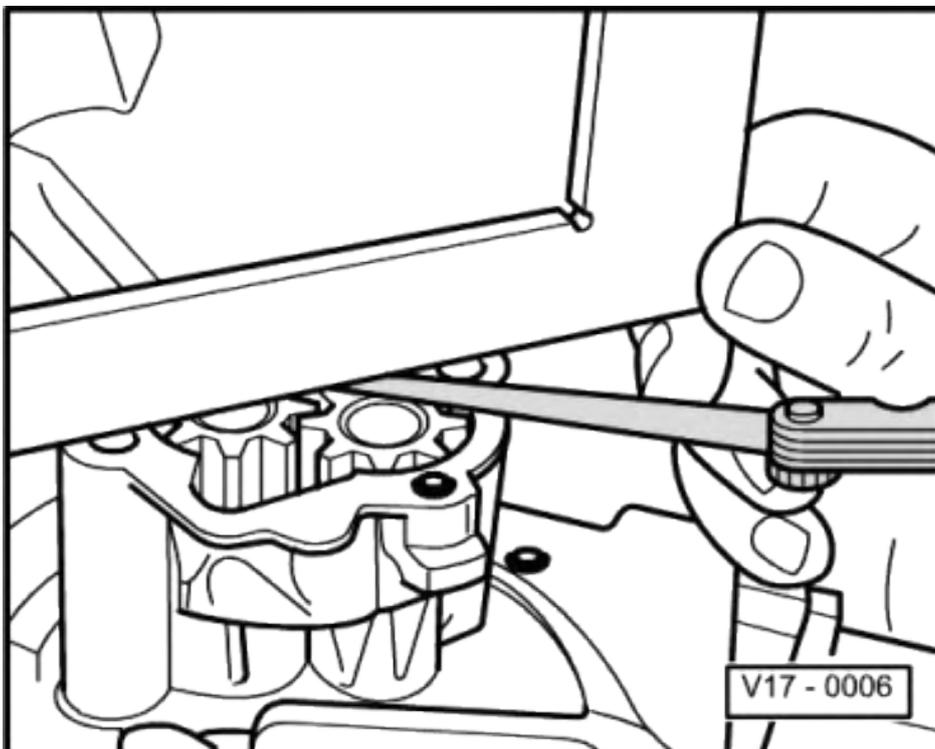
- ◆ For piston cooling



-> Fig. 1 Checking oil pump backlash

New: 0.05 mm

Wear limit: 0.20 mm





-> Fig. 2 Checking oil pump axial clearance

Wear limit: 0.15 mm

1.2 - Checking oil pressure and oil pressure switch

Note:

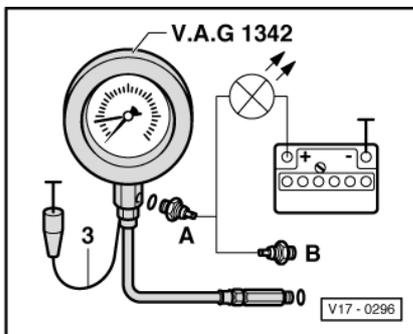
Functional check and servicing the optical and acoustic oil pressure warning:

=> Current flow diagrams, Electrical fault finding and Fitting locations

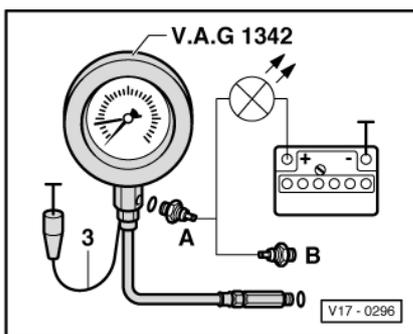
Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Oil pressure tester V.A.G 1342
- ◆ Diode test lamp V.A.G 1527
- ◆ Adapter set V.A.G 1594

Test sequence



- -> Remove 0.25 or 0.3 bar oil pressure switch (blue or brown insulation) and screw into tester.
- Screw tester into the cylinder head in place of the oil pressure switch.
- Connect brown wire -3- of tester to earth (-).



- -> Connect diode test lamp V.A.G 1527 with aux. cables from V.A.G 1594 to battery positive (+) and to 0.25 or 0.3 bar oil pressure switch (F22, blue or brown insulation) -B-. LED must light up.
- Start engine and slowly raise rpm. At
 - 0.25 bar switch: 0.15...0.35 bar
 - 0.3 bar switch: 0.15...0.45 bar
 the LED must go out, otherwise renew oil pressure switch.
- Connect diode test lamp to 0.9 bar oil pressure switch (F1) -B-. At
 - 0.75...1.05 bar
 The LED must light up, otherwise renew oil pressure switch.



- Increase engine speed further.
At 2000 rpm and an oil temperature of 80 °C the oil pressure should be at least 2.0 bar.

At higher engine speed the oil pressure must not exceed 7.0 bar. If necessary renew oil pump cover with pressure relief valve.

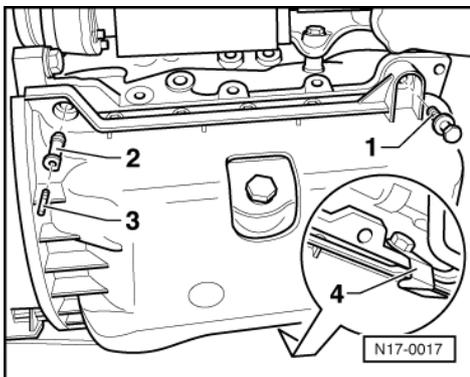
1.3 - Removing and installing oil sump cap

(Engine codes AEY, AFN, AVG)

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ♦ V.A.G 1331 Torque wrench (5...50 Nm)

Removing



- -> Unscrew securing bolt -1- and remove spreader pin -3- from retaining clip -2-.
- Lift clamping spring -4- and take cover off oil sump.

Installing

- Fit cap and retaining clip and engage clamping spring.
- Tighten securing bolt -1- to
10 Nm.
- Push in spreader pin -3-.



19 - Cooling system

1 - Removing and installing parts of cooling system

1.1 - Removing and installing parts of cooling system

Notes:

- ◆ When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- ◆ Hoses are secured with spring-type clips. In cases of repair only use spring-type clips.
- ◆ V.A.G 1921 pliers are recommended when installing spring-type clips.

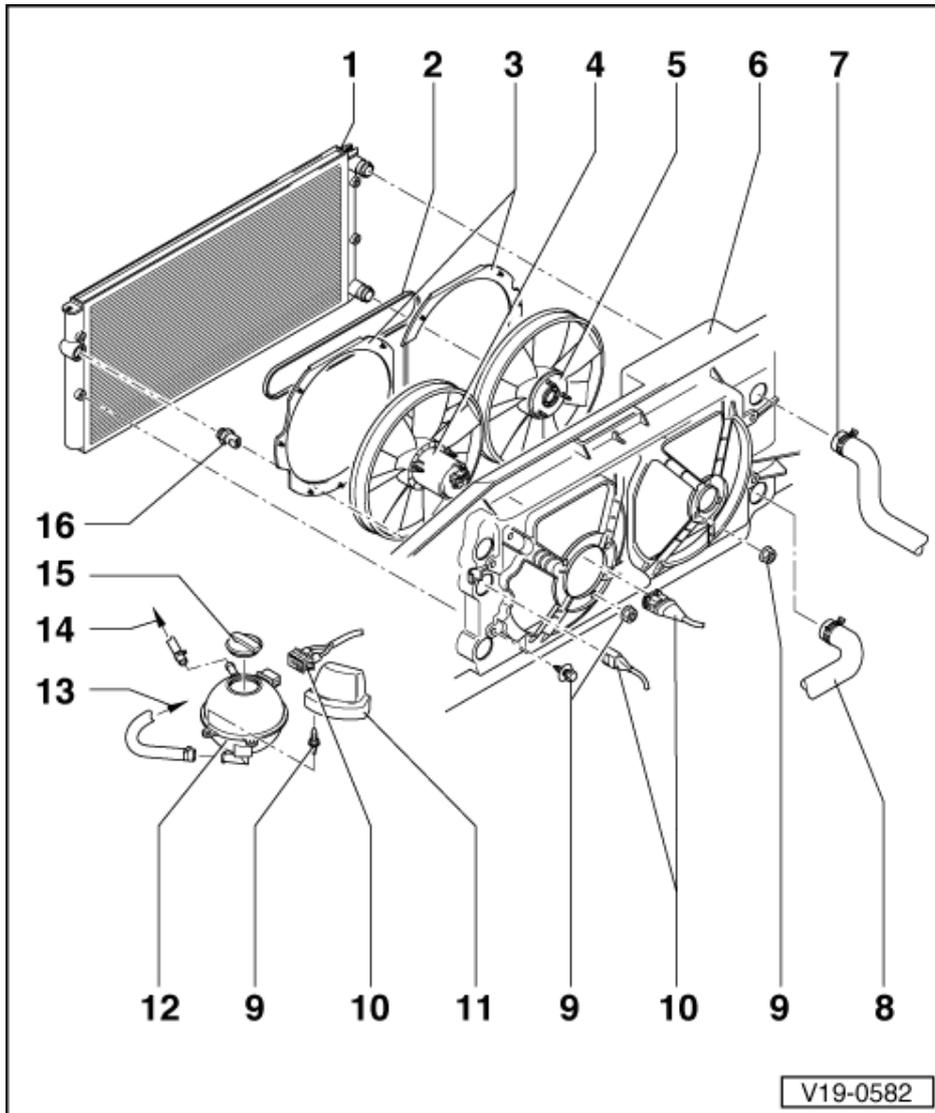
Draining and filling with coolant=> Page 99

Coolant mixture ratios => Page 99 , draining and filling with coolant

Carry out cooling system leakage check with V.A.G 1274 and 1274/3.



1.2 - Parts of cooling system body side



1 Radiator

- ◆ Removing and installing
=>Page 101
- ◆ After replacing renew entire coolant

2 V-belt

- ◆ Only with optional extras

3 Guide ring

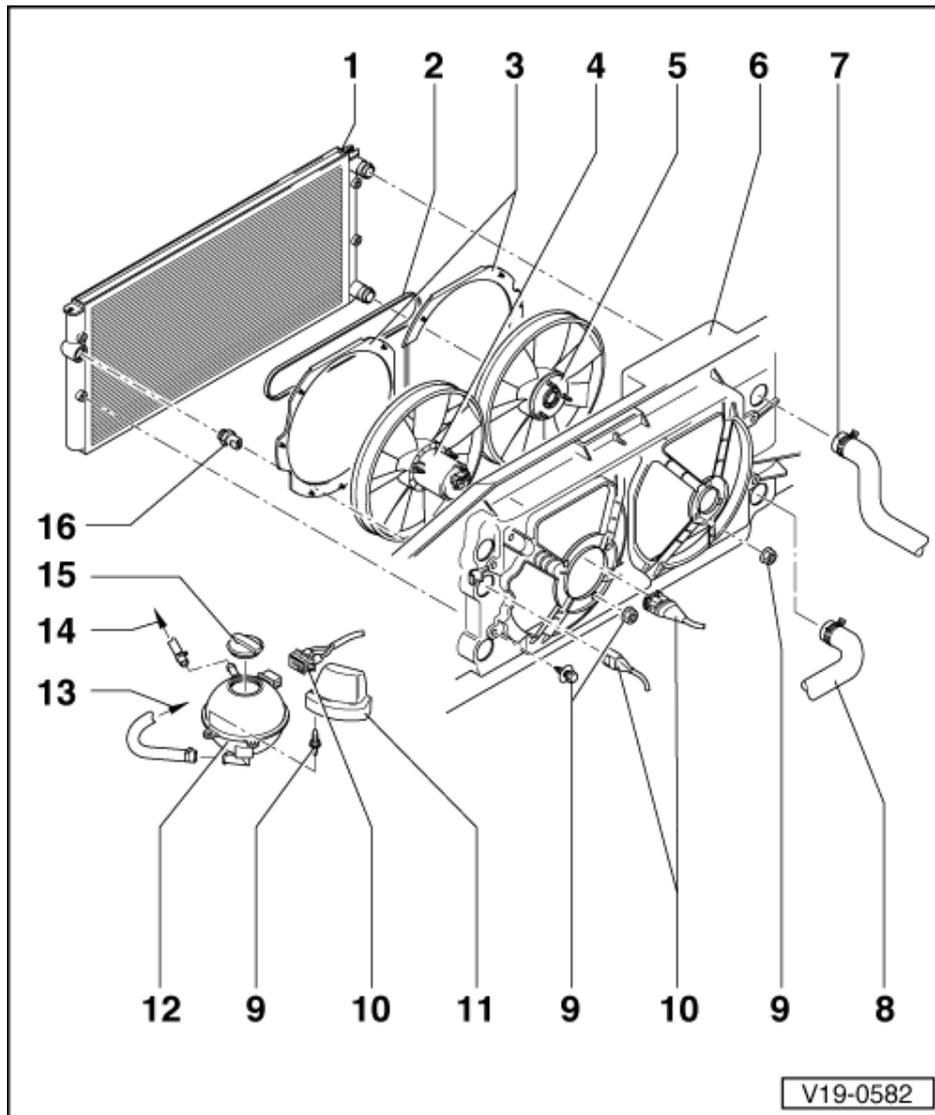
- ◆ Note fitting position
- ◆ Secured on lock carrier item 6 with clips

4 Radiator fan

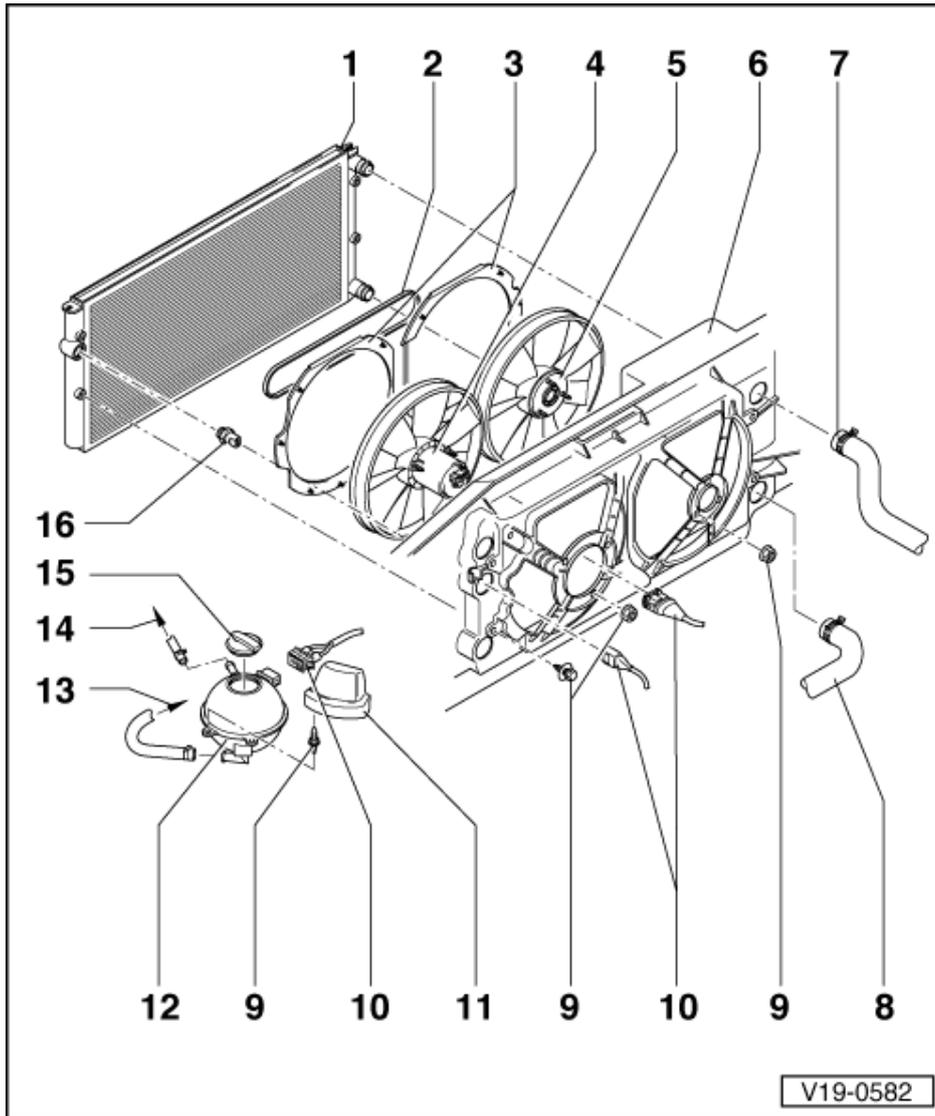
- ◆ Removing and installing
=>Page 101

5 Additional fan

- ◆ Only with optional extras
- ◆ Removing and installing
=>Page 101



- 6 Lock carrier
- 7 Upper coolant hose
 - ◆ To connection
=>Page 97 , Item 19
- 8 Lower coolant hose
 - ◆ To coolant pump
=>Page 96 , Item 13
- 9 10 Nm
- 10 Connector
- 11 Cover
- 12 Expansion tank
- 13 To coolant pipe
 - ◆ =>Page 96 , Item 9
- 14 To connection
 - ◆ =>Page 96 , Item 3



15 Cap

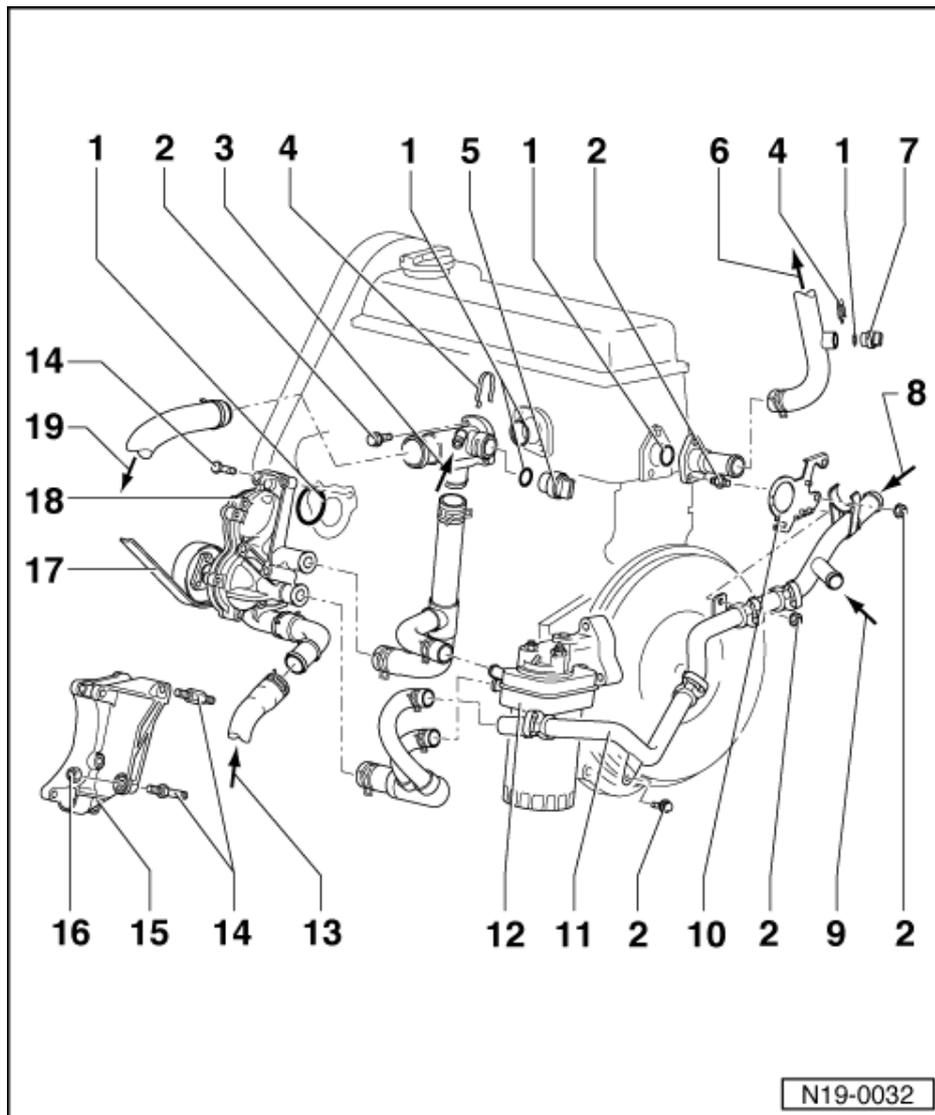
- ◆ Check with V.A.G 1274 and 1274/4
- ◆ Test pressure 1.4...1.6 bar

16 Thermo-switch (F18), 35 Nm

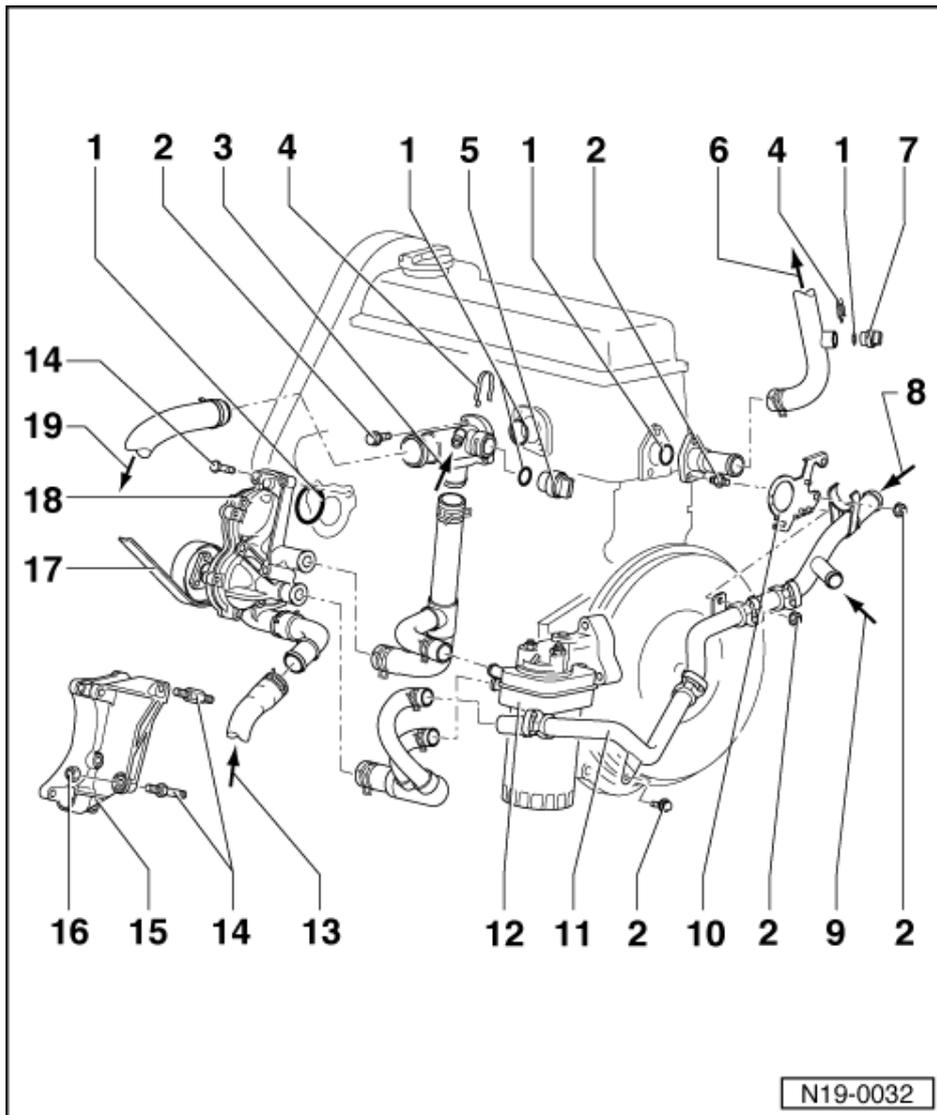
- ◆ For electric fan
- ◆ Switching temperatures:
 - Stage 1
 - on: 92...97 °C
 - off: 84...91 °C
 - Stage 2
 - on: 99...105 °C
 - off: 91...98 °C
- ◆ Only with optional equipment, additional thermo switch (F165) for 3rd stage



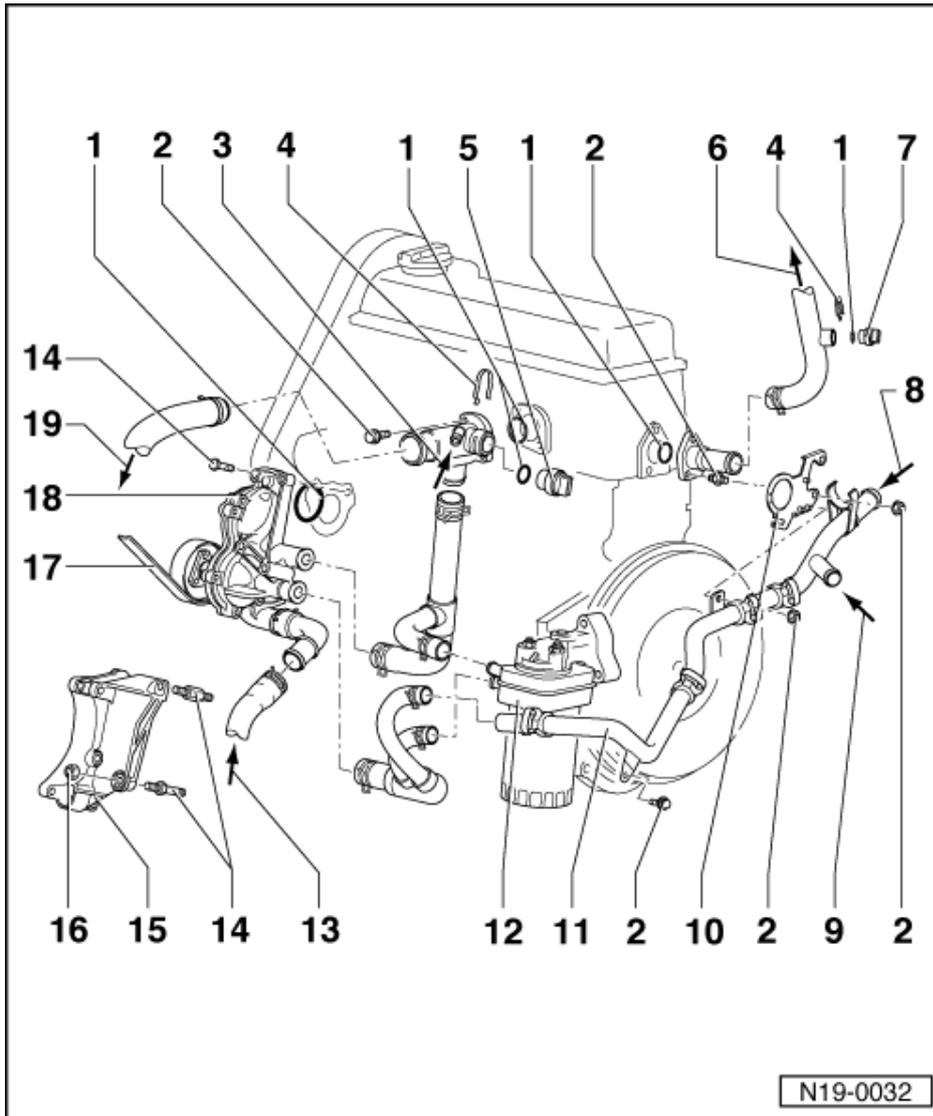
1.3 - Parts of cooling system - engine side



- 1 O ring
 - ◆ Renew
- 2 10 Nm
- 3 From expansion tank
 - ◆ =>Page 93 , Item 14
- 4 Retaining clip
- 5 Coolant temperature sender (G62) or temperature sender (G27)
 - ◆ With coolant temperature gauge sender (G2)
- 6 To heat exchanger
- 7 Thermoswitch (F165)
 - ◆ For electric fan stage 3
 - ◆ Only with optional extra
 - ◆ Switching temperatures
 - On: 110...115 °C
 - Off: 105...110 °C



- 8 From heat exchanger
- 9 From expansion tank
 - ◆ =>Page 93 , Item 13
- 10 Bracket
- 11 Coolant pipe
- 12 Oil cooler
 - ◆ Removing and installing
=>Page 85 , Item 14
- 13 From bottom of radiator
 - ◆ =>Page 93 , Item 8
- 14 20 Nm + 1/4 turn (90 °) further
 - ◆ Renew
- 15 Bracket
 - ◆ For ribbed belts without tensioner



16 30 Nm

17 V-belt/ribbed belt

- ◆ Removing and installing ribbed belt => Page 24
- ◆ Adjusting V-belt tension:

=> Running gear; Repair group 48; Assembly overview: vane pump, reservoir, hydraulic pipes Assembly overview: vane pump, reservoir, hydraulic pipes

18 Coolant pump

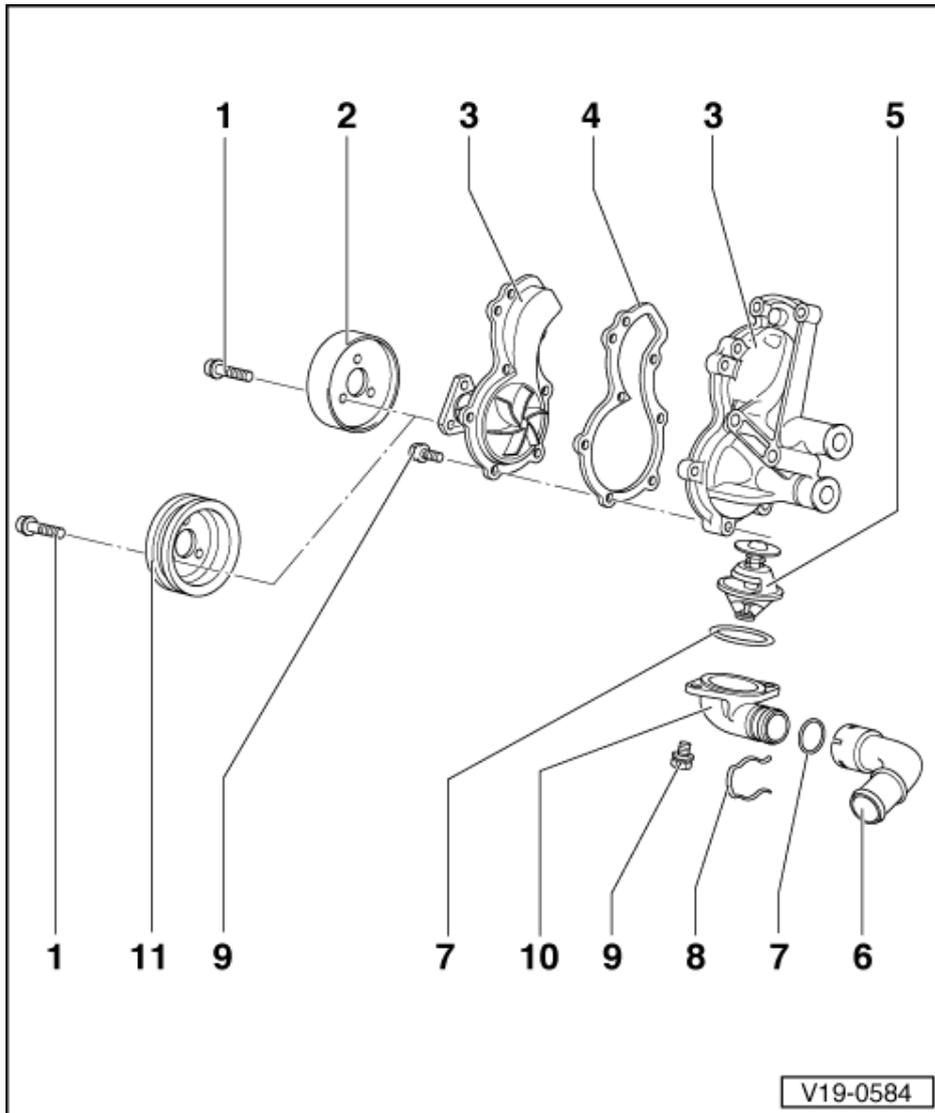
- ◆ Dismantling and assembling => Page 98

19 To top of radiator

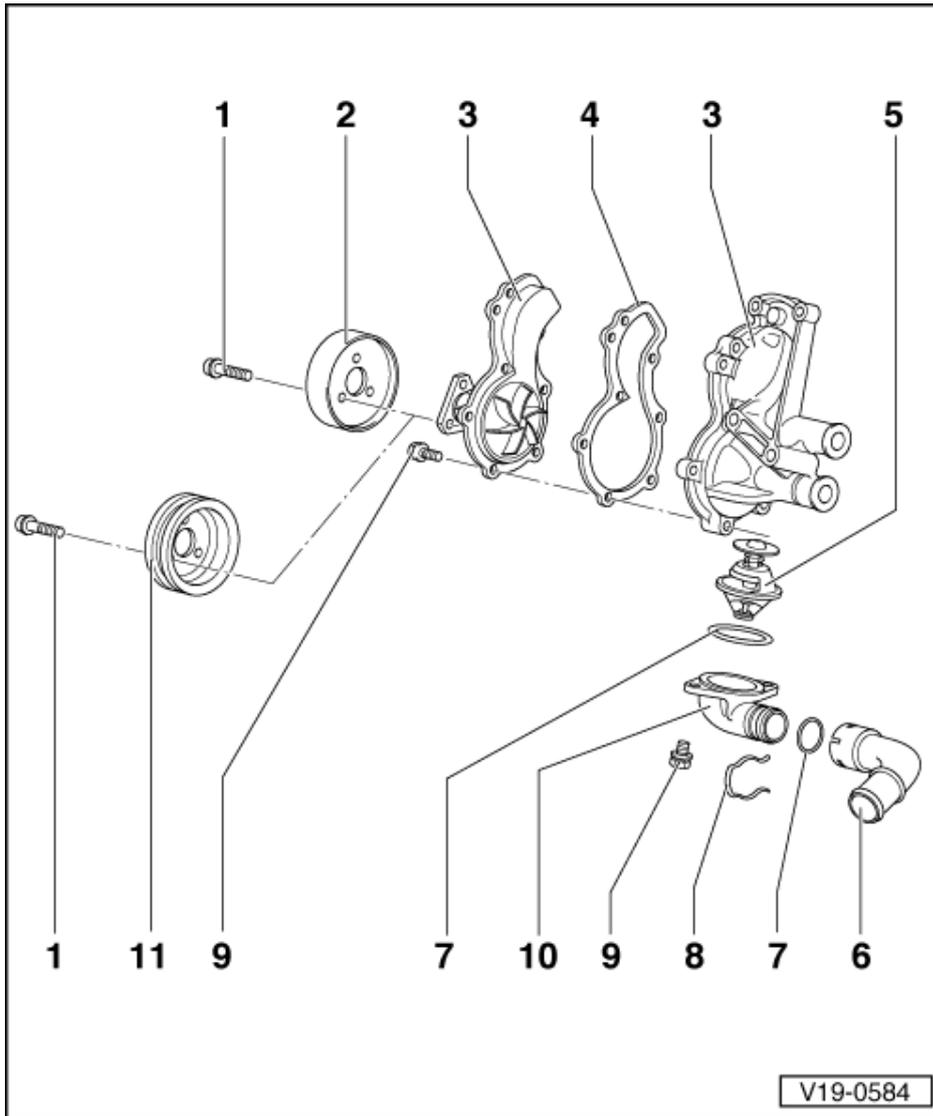
- ◆ =>Page 93 , Item 7



1.4 - Dismantling and assembling coolant pump



- 1 25 Nm
- 2 **Belt pulley**
 - ◆ Version for ribbed belt
- 3 **Coolant pump**
 - ◆ Check for ease of movement
- 4 **Gasket**
 - ◆ Renew
- 5 **Coolant thermostat**
 - ◆ Checking: heat-up thermostat in water
 - ◆ Opening commences approx. 85 °C
 - ◆ Ends approx. 105 °C
 - ◆ Opening lift min. 7 mm
- 6 **Connection**



- 7 O-ring
 - ◆ Renew
- 8 Retaining clip
- 9 10 Nm
- 10 Flange
- 11 Pulley
 - ◆ Version for V-belt

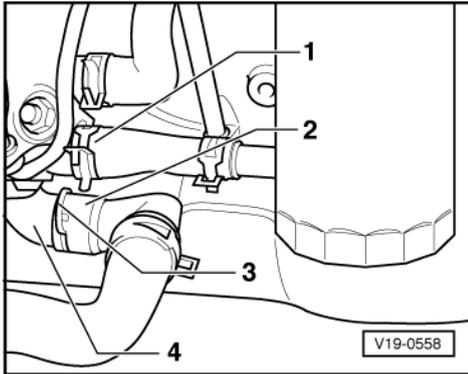
1.5 - Draining and filling cooling system

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Drip tray V.A.G 1306
- ◆ Pliers V.A.G 1921 for spring type clips
- ◆ Anti-freeze tester
- ◆ Cooling system charging unit VAS 6096

Draining

- Remove cap from coolant expansion tank.



- -> Pull out retaining clip -3-, pull connection -2- off thermostat flange -4- and pull off coolant hose -1- or remove thermostat flange -4-.

Note:

Observe disposal regulations!

Filling

Notes:

- ♦ Only use coolant additive G 12 in accordance with TL VW 774 F.
Distinguishing feature: coloured violet
- ♦ G 12 violet (in accordance with TL VW 774 F) can be mixed with the previous coolant additives G 11 and G 12 red!
- ♦ G 12 and coolant additives marked "In accordance with TL VW 774 F" prevent frost and corrosion damage, scaling and also raise boiling point of coolant. For this reason the system must be filled all year round with frost and corrosion protection additives.
- ♦ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ♦ Protection against frost must be assured to about -25 °C (in arctic climatic countries to about -35 °C).
- ♦ The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti-freeze ratio must be at least 40 %.
- ♦ If for climatic reasons a greater frost protection is required, the amount of G 12 can be increased, but only up to 60 % (frost protection to about -40 °C), as otherwise frost protection is reduced again and cooling effectiveness is also reduced.
- ♦ If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, do not reuse old coolant.
- ♦ When refilling the coolant system only use G 12.

Recommended mixture ratios:

Frost protection to	Anti-freeze amount1)	G 112)	Water2)
-25 °C	40 %	2.6 ltr.	3.9 ltr.
-35 °C	50 %	3.25 ltr.	3.25 ltr.

1) The amount of anti-freeze must not exceed 60 %; frost protection and cooling effect will decrease if amount of anti-freeze is too high.

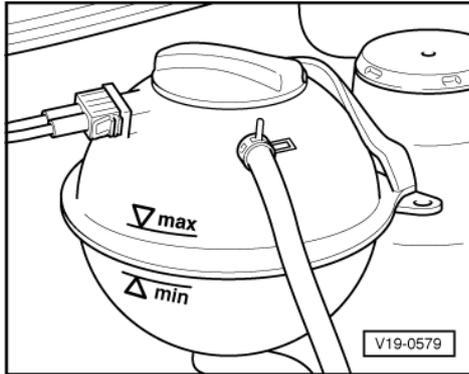
2) The quantity of coolant can vary depending upon the vehicle equipment.

With cooling system charging unit VAS 6096:

- Screwadapter from V.A.G 1274, suitable for this vehicle, onto expansion tank.
- Fill coolant circuit using cooling system charging unit VAS 6096.

Without cooling system charging unit VAS 6096:

- Press down top radiator hose.



- -> Slowly fill with coolant up to max. mark on expansion tank (filling time approx. 5 minutes).
- Start engine and run at approx. 1500 rpm for max. 2 minutes and at the same time fill with coolant up to over-flow hole on expansion tank.
- Fit expansion tank cap.
- Run engine until radiator fan cuts-in.
- Check coolant level and replenish as necessary. When the engine is at normal operating temperature, the coolant level must be on the max. mark, when the engine is cold, between the min. and max. marks.

1.6 - Removing and installing radiator and radiator fan

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Pliers V.A.G 1921 for spring type clips

Removing

- Drain coolant => Page 99
- Removing front bumper:

=> General body repairs; Repair group 63; servicing bumper; removing and installing front bumper servicing bumper removing and installing front bumper

- Pull coolant hoses off radiator.
- Pull connectors off thermo-switch and radiator fan.
- Remove headlights:

=> Electrical system; Repair group 94; servicing headlights servicing headlights

- Remove radiator securing bolts and take out radiator to the front.

Vehicles with air conditioning system:

- Observe additional information and removal work => Page 102 .

Installing

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

- Filling with coolant => Page 99
- Check headlight adjustment and adjust if necessary:

=> Maintenance



Additional information and removal work on vehicles with air conditioner

Warning!
The air conditioning system refrigerant circuit must not be opened.

Note:

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

- Remove air cleaner.
- Remove air conditioner fluid reservoir and allow to hang free.
- Remove radiator securing bolts.
- Remove retaining clamp(s) from refrigerant pipes.
- Remove condenser from radiator and pull forward as far as is possible.
- Pull radiator out between condenser and lock carrier.



20 - Fuel supply system

1 - Removing and installing parts of fuel supply system

1.1 - Removing and installing parts of fuel supply system

Fuel tank with attachments:

Front wheel drive => Page 104

Four wheel drive => Page 107

Removing and installing fuel filter:

Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

=> Repair group 23; Servicing diesel direct injection system; Servicing fuel filter Servicing diesel direct injection system Servicing fuel filter

Engine codes 1Y, AAZ

=> Repair group 23; Servicing fuel injection system Servicing fuel injection system

Observe safety precautions=> Page 111 .

Observe rules for cleanliness => Page 112 .

Servicing accelerator mechanism => Page 116

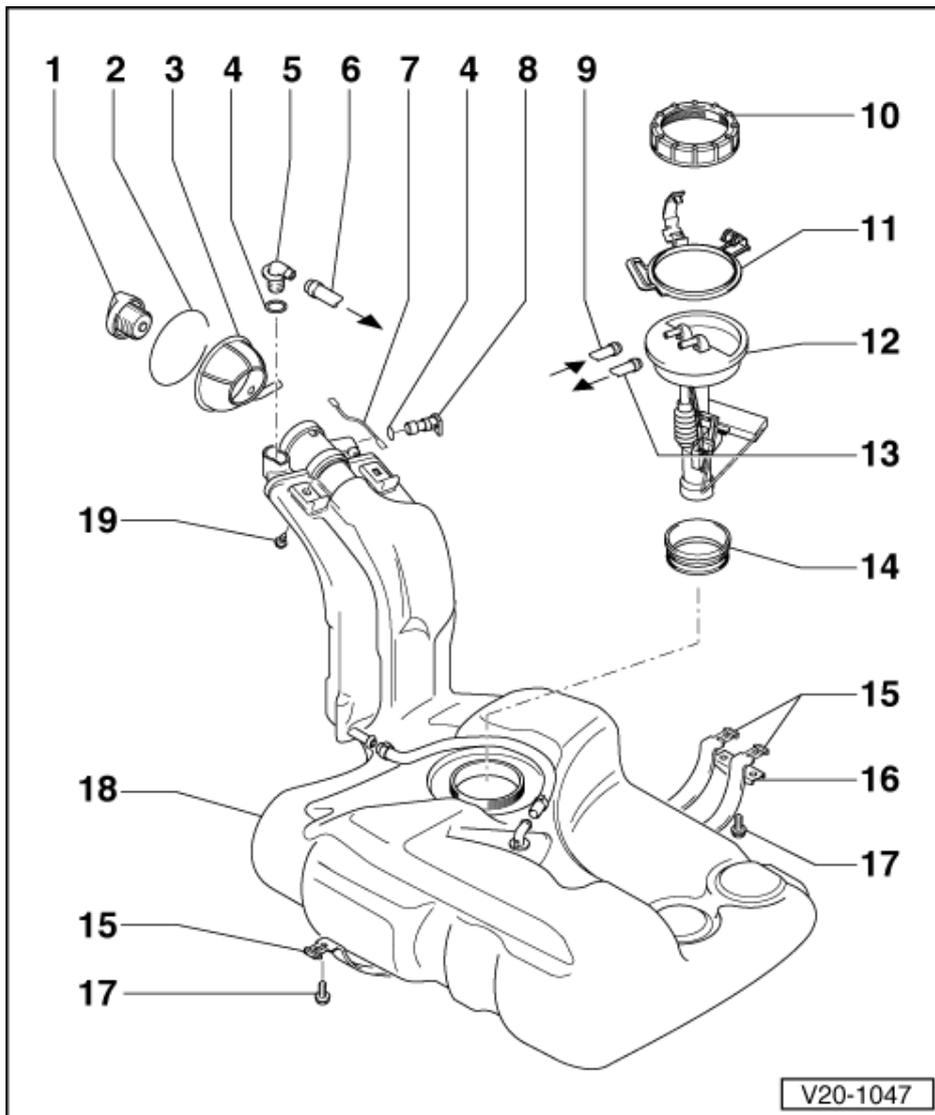
Servicing cold start accelerator operating cable =>Page 118

Notes:

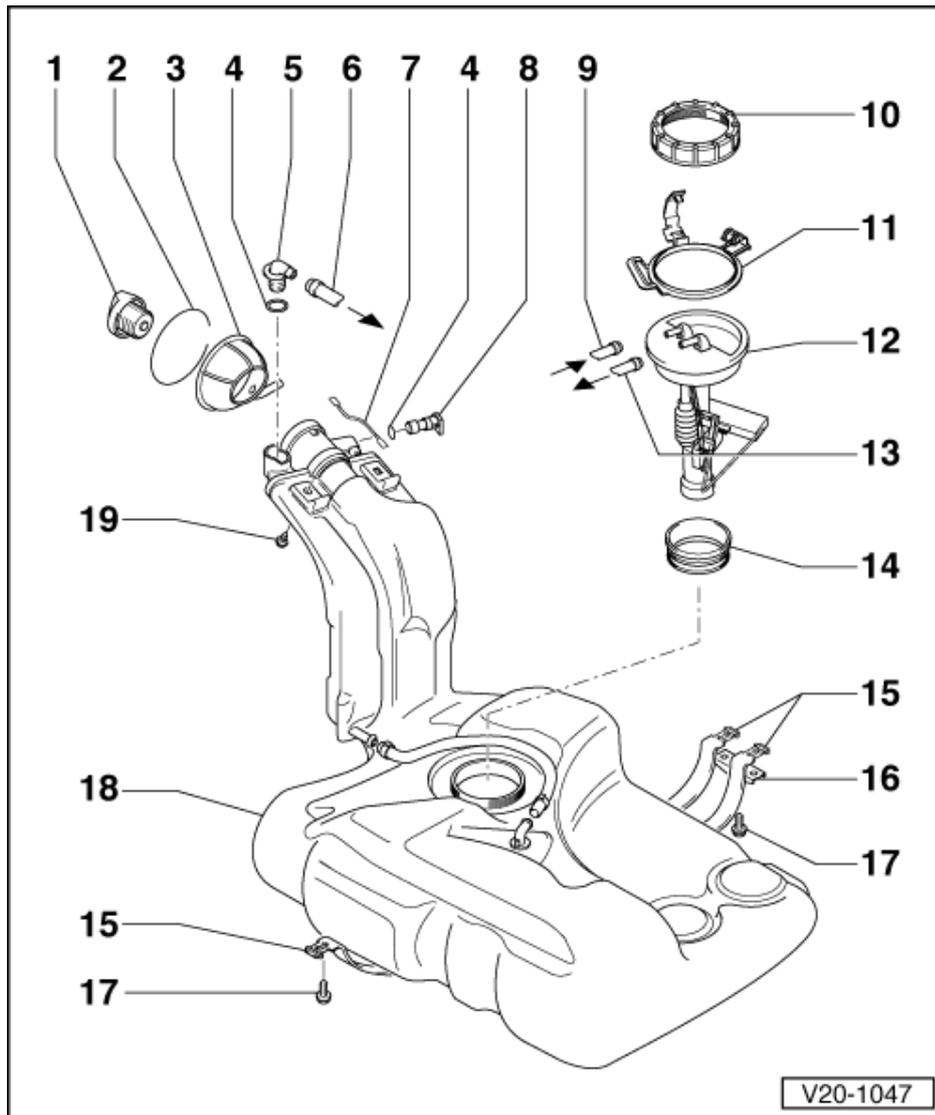
- ◆ Hose connections are secured with either screw-type or spring-type clips.
- ◆ Always replace spring-type clips with screw-type clips.



1.2 - Removing and installing fuel tank with its attachments, front drive



- 1 Cap
- 2 Retaining ring
- 3 Rubber cup
- 4 O-ring
 - ◆ Renew if damaged
- 5 Gravity valve
 - ◆ To remove valve unclip upwards out of filler neck
 - ◆ Check valve for through-flow
valve vertical: open,
valve tilted 45 °: closed
- 6 Vent pipe
- 7 Earth connection



8 Vent valve

- ◆ Checking =>Page 111 , Fig. 2

9 Return pipe

- ◆ Blue

10 Union nut

- ◆ Remove and install with 3217

11 Hose guide

12 Fuel gauge sender

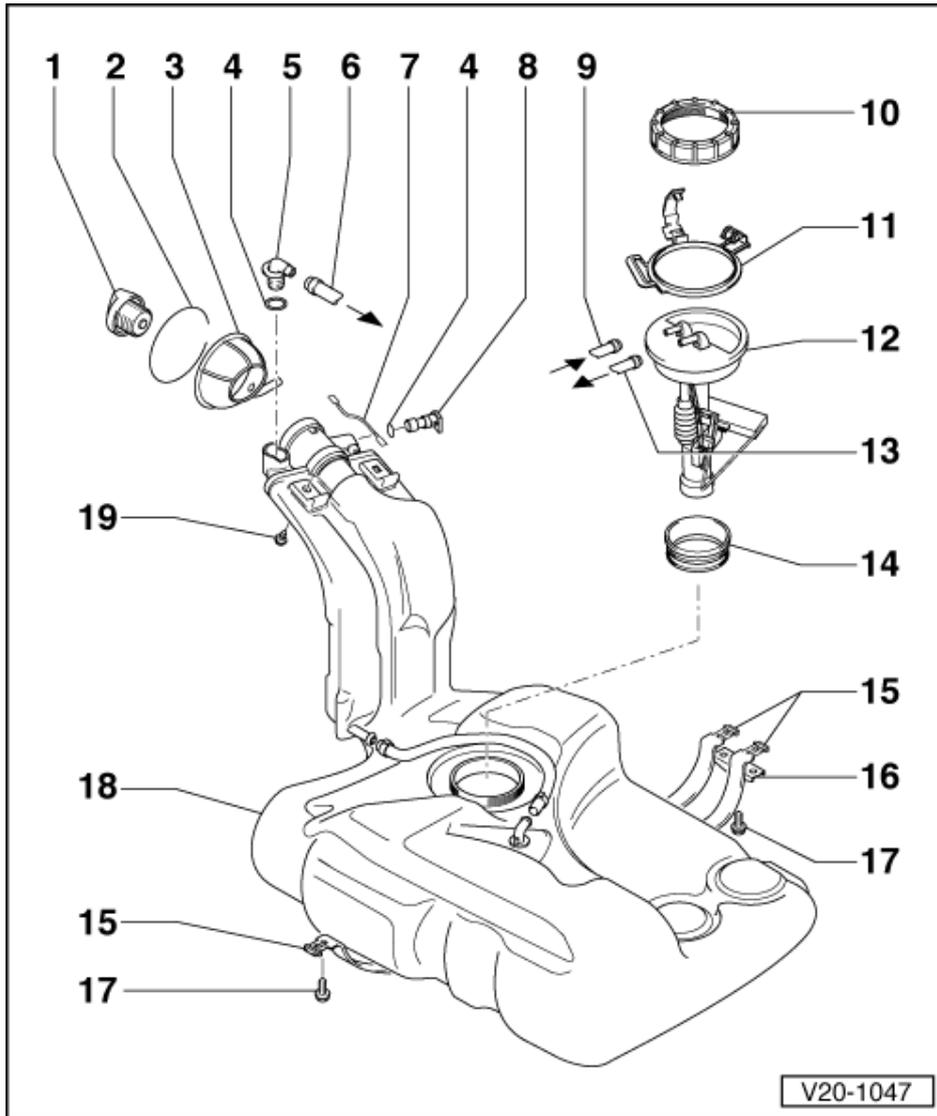
- ◆ Note fitting position on fuel tank => Page 111 , Fig. 1
- ◆ Sender with strainer telescopic to upper part

13 Supply pipe

- ◆ Black

14 Sealing ring

- ◆ Coat with fuel when installing
- ◆ Renew if damaged



15 Securing strap

- ◆ Note differing length

16 Bracket

- ◆ For securing straps

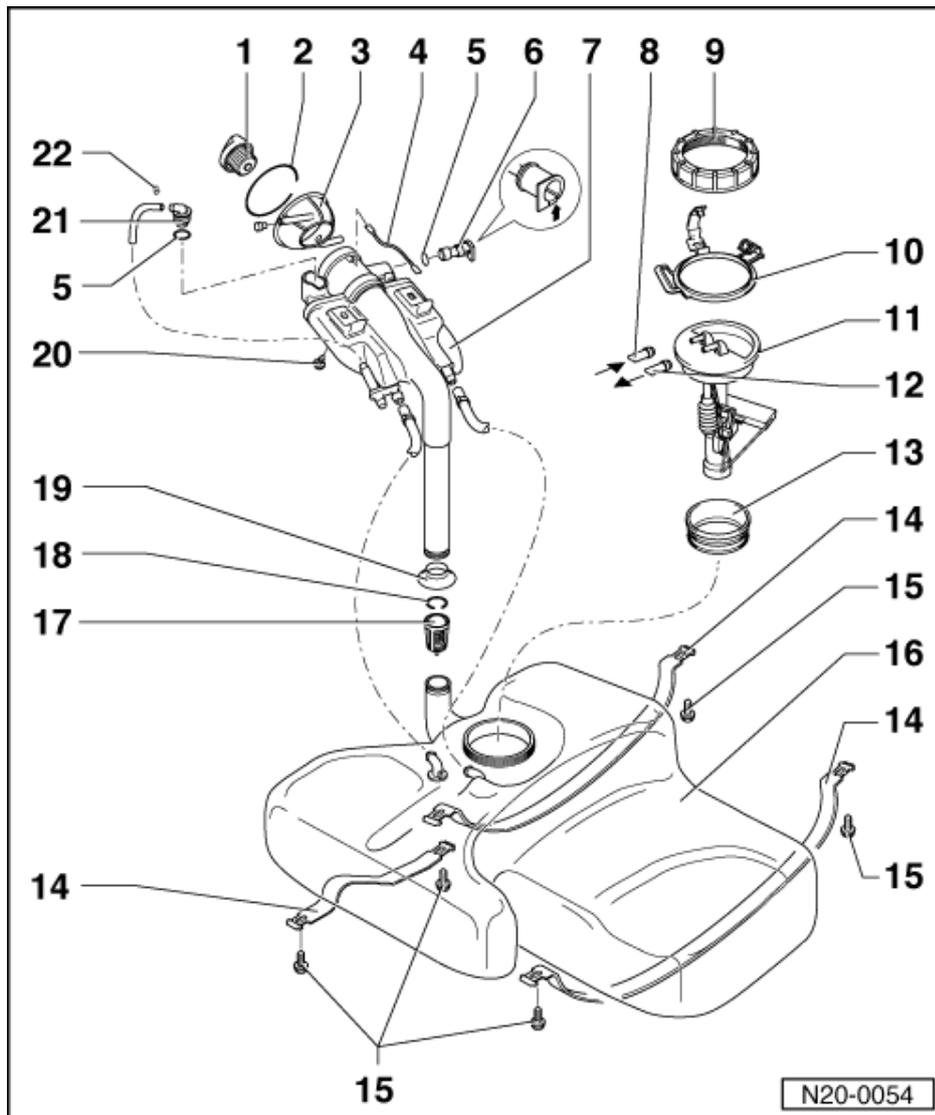
17 25 Nm

18 Fuel tank

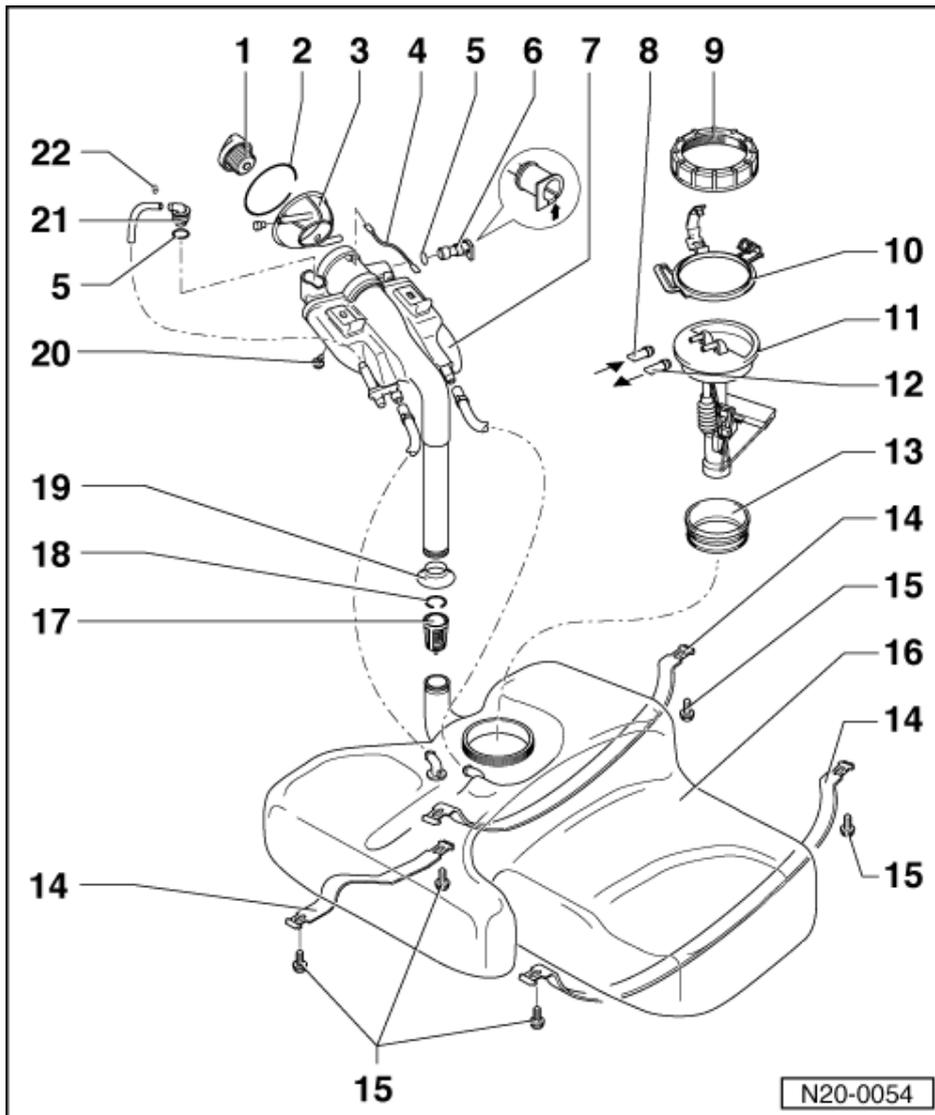
- ◆ Support with engine and gearbox jack V.A.G 1383 A when removing
- 19 10 Nm**



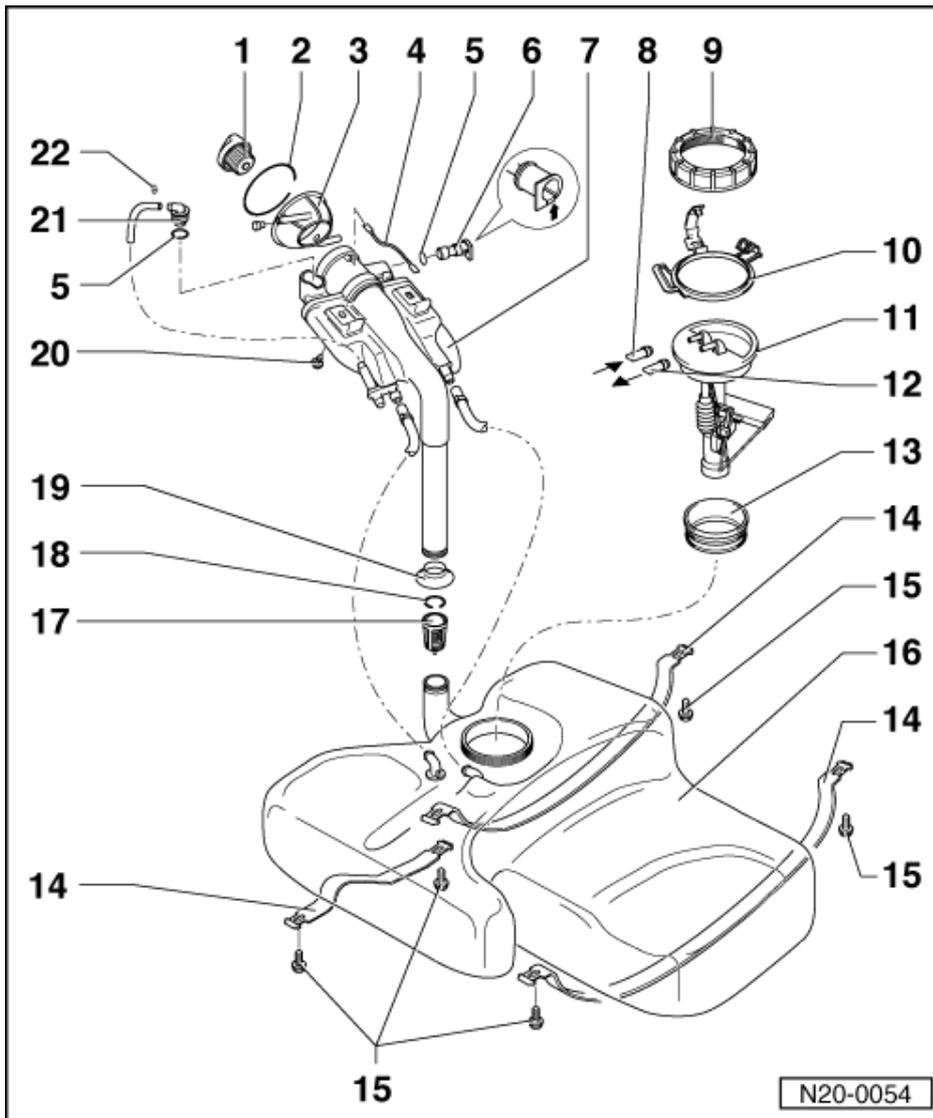
1.3 - Fuel tank with its attachments, four wheel drive



- 1 Cap
 - ◆ Renew seal if damaged
- 2 Retaining ring
- 3 Rubber cup
- 4 Earth connection
- 5 O-ring
 - ◆ Renew if damaged
- 6 Vent valve
 - ◆ Checking =>Fig. 2
 - ◆ To remove pull locking latch lightly -arrow- and pull valve out



- 7 Filler neck
 - ◆ Type shown: Saloon
 - ◆ Estate => Fig. 3
- 8 Return pipe
 - ◆ Blue
- 9 Union nut
 - ◆ Remove and install with 3217
- 10 Hose guide
- 11 Fuel gauge sender
 - ◆ Note fitting position on fuel tank => Fig. 1
 - ◆ Sender with strainer telescopic to upper part
- 12 Supply pipe
 - ◆ Black



13 Sealing ring

- ◆ Coat with fuel when installing
- ◆ Renew if damaged

14 Securing strap

- ◆ Note differing length

15 25 Nm

16 Fuel tank

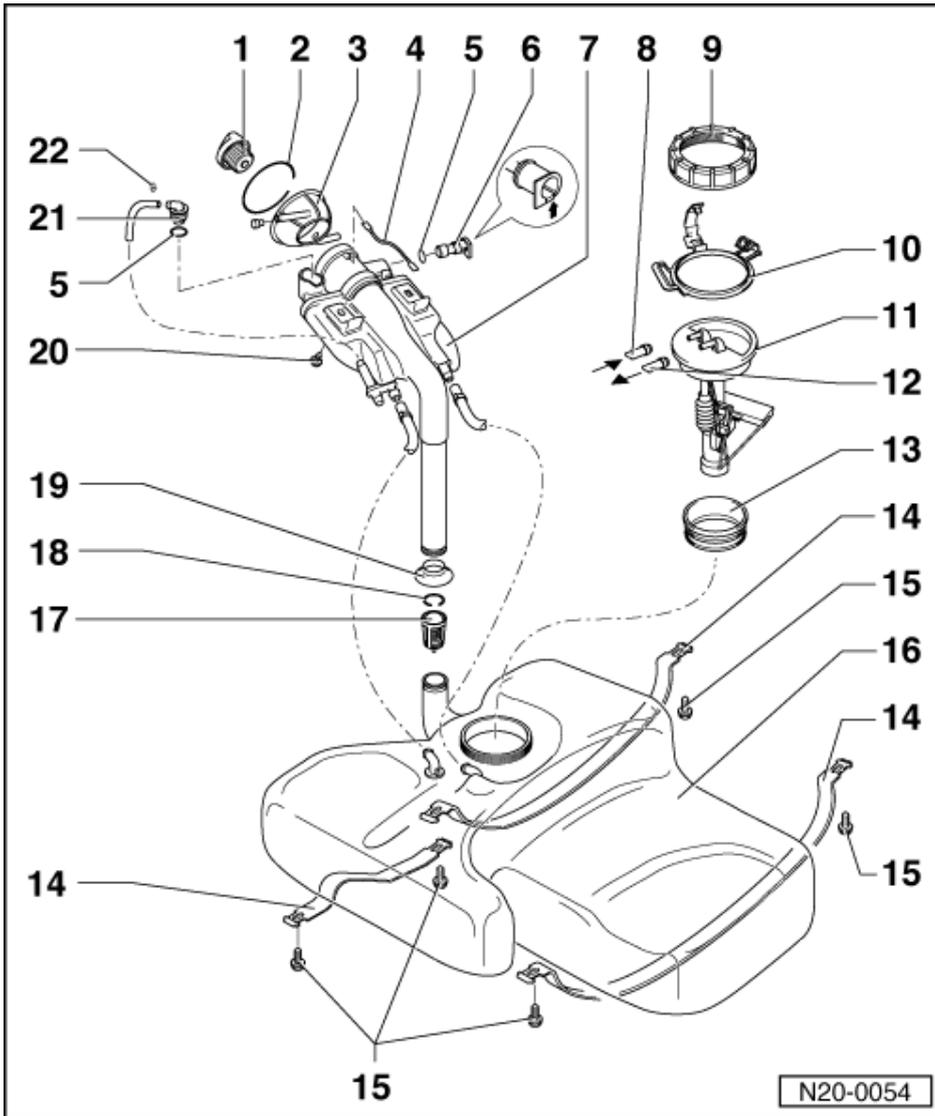
- ◆ Removing and installing
 => Page 112

17 Non-return valve

18 Circlip

19 Sealing collar

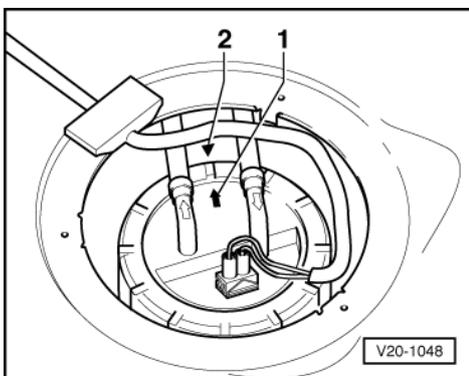
20 10 Nm



21 Gravity valve

- ◆ To remove valve unclip upwards out of filler neck
- ◆ Check valve for through-flow
valve vertical: open,
valve tilted 45 °: closed

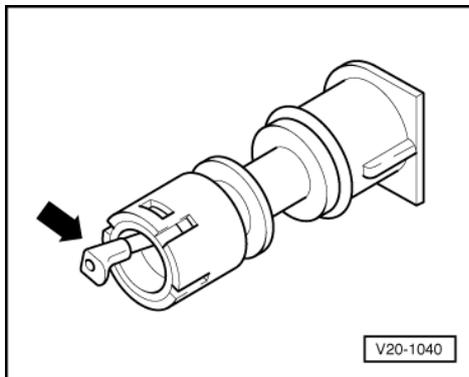
22 Spacer bush





-> Fig. 1 Installation position of fuel gauge sender

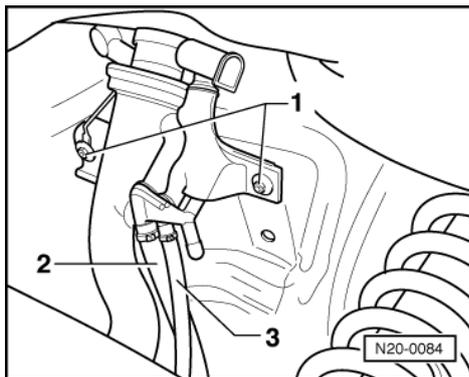
Marking on the sender -1- must align with marking on the fuel tank -2-.



-> Fig. 2 Checking vent valve

Lever in rest position: Closed

Lever pushed in direction of arrow: Open



-> Fig.3 Fuel filler neck Golf Estate

- 1 - Securing bolt (10 Nm)
- 2 - Return pipe (from gravity valve)
- 3 - Vent pipe (to vent valve)

1.4 - Safety precautions when working on the fuel supply system

When removing and installing the fuel gauge sender from a full or partly full fuel tank the following must be observed:

- ◆ Before commencing work, switch on exhaust extraction system and place an extraction hose close to the sender opening in the fuel tank to extract escaping fuel fumes.
If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a displacement greater than 15 m³/h can be used.
- ◆ Prevent skin contact with fuel! Wear fuel-resistant gloves!



1.5 - Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following "5 rules":

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover opened components or seal, if the repair cannot be carried out immediately.
- ◆ Only install clean components:
Only unpack replacement parts immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.
- ◆ Also ensure that no diesel fuel runs onto the coolant hoses. Hoses coming in contact with fuel must be cleaned immediately. Damaged hoses must be replaced.

1.6 - Removing and installing fuel delivery unit, four wheel drive

Notes:

- ◆ Always renew self-locking nuts.
- ◆ Always renew corroded bolts/nuts.
- ◆ Rear axle tightening torque:

=> Running gear; Repair group 42; Assembly overview rear axle, vehicles with four wheel drive Assembly overview rear axle, vehicles with four wheel drive

- Observe safety precautions => Page 111 .
- Observe safety precautions => Page 112 .

Note:

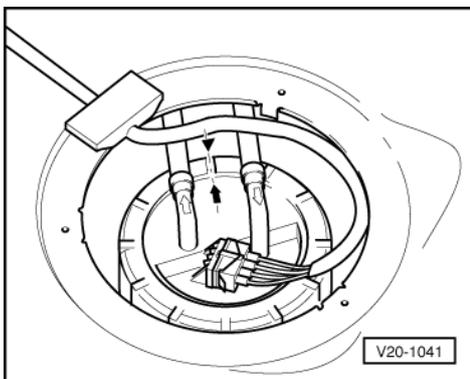
Check whether a coded radio is installed as during the forthcoming work sequences the battery earth strap must be disconnected. Obtain radio code first if necessary.

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Gearbox jack V.A.G 1383 A

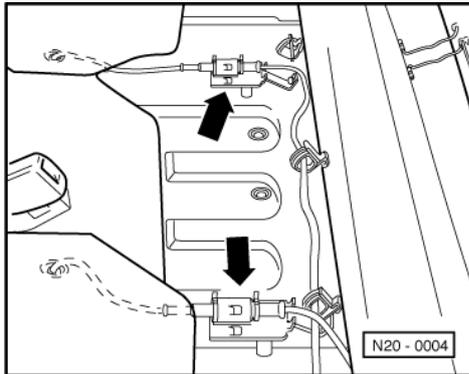
Removing

- With ignition switched off disconnect battery earth strap.
- Drain fuel tank.
- Loosen both rear wheel securing bolts.
- Remove cap, retaining ring and rubber cup from fuel filler neck.





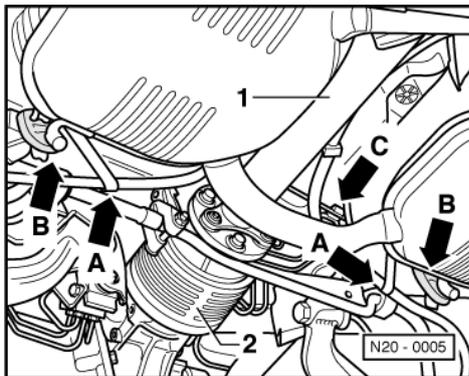
- Remove cover in luggage boot floor.
- -> Pull connector and supply and return pipes off flange.



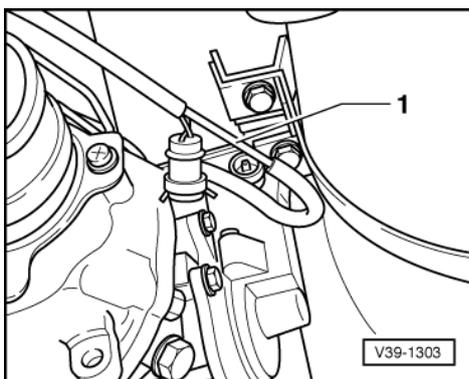
- -> Unclip ABS sensor wire connectors (if fitted) from retainers under rear seat -arrows- and guide the rubber grommets through the floor plate.

Note:

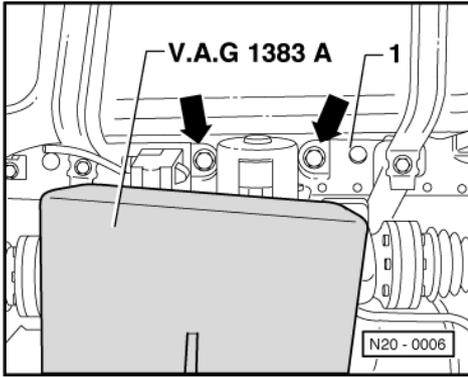
Makes it possible to lower the rear axle.



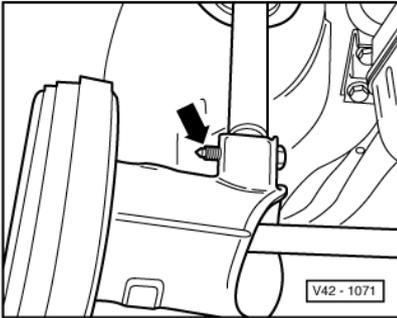
- -> Unhook handbrake cable -arrows A- from retainers.
- Unhook exhaust system -arrows B- from axle beam.
- Unclip brake pipes -arrow C- from the retainer.
- Disconnect propshaft -1- from the viscous coupling -2- flexible joint (first mark fitting position).



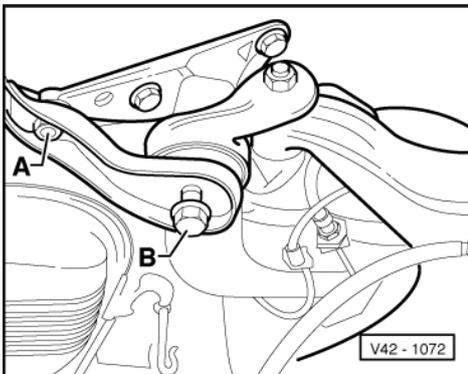
- -> Pull vent pipe -1- out of wiring loom insulation tubing.
- Pull connector off the positioning element.



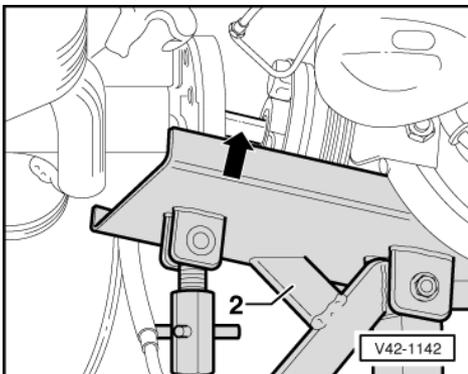
- -> Place engine and gearbox jack V.A.G 1383A under final drive.
- Remove securing bolts -arrows- from final drive mounting bracket on cross member -1-.



- -> Disconnect wishbone from shock absorber -arrow-.



- -> Remove bolts -A- and -B-.



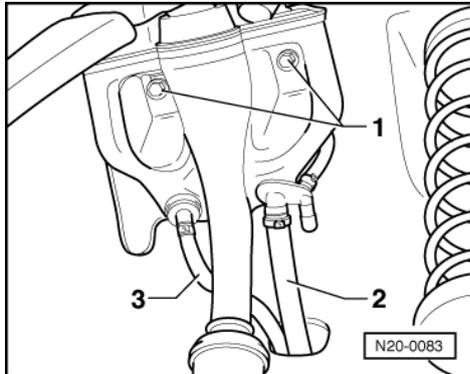
- -> Lower rear axle with engine and gearbox jack V.A.G 1383A and separate propshaft from the viscous coupling with a lever.



Note:

When lowering ensure that the viscous coupling centralizing nut -arrow- in the propshaft is not canted and that the oil seal in the propshaft is not damaged.

When lowering set the angle of the engine and gearbox jack plate -2- so that the rear of the final drive lowers first.



- -> Remove filler neck securing bolts -1- .
- Pull hoses off from return pipe -2- from gravity valve and vent pipe -3- to vent valve of filler neck.

Golf Estate:

Wiring connections => Page 111 , Fig. 3

- Remove fuel tank securing straps.
- Remove fuel tank heat shield, first remove rear silencer mounting.
- Remove cross-brace under fuel tank.

Note:

When removing the cross-brace the fuel tank must be supported.

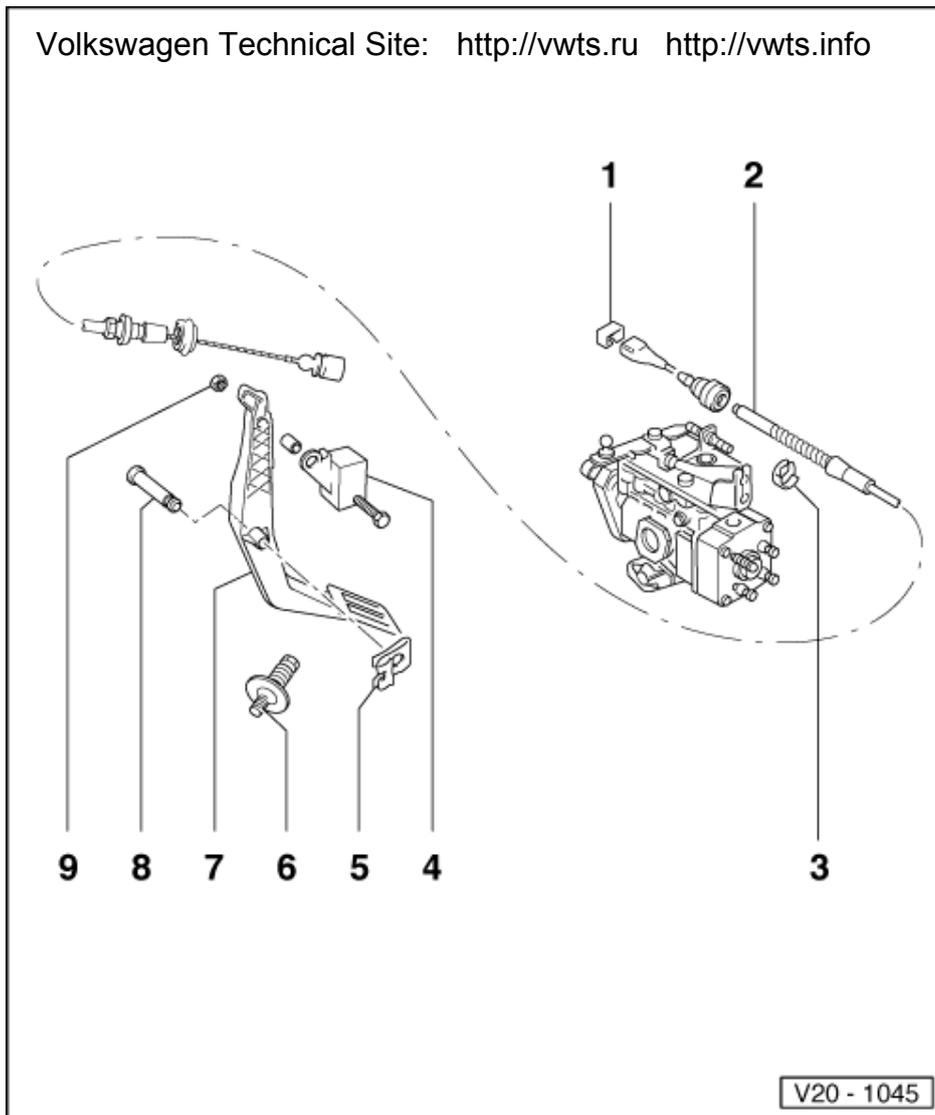
- Take out fuel tank downwards.

Installing

Installation is done in the reverse sequence.



1.7 - Servicing accelerator mechanism

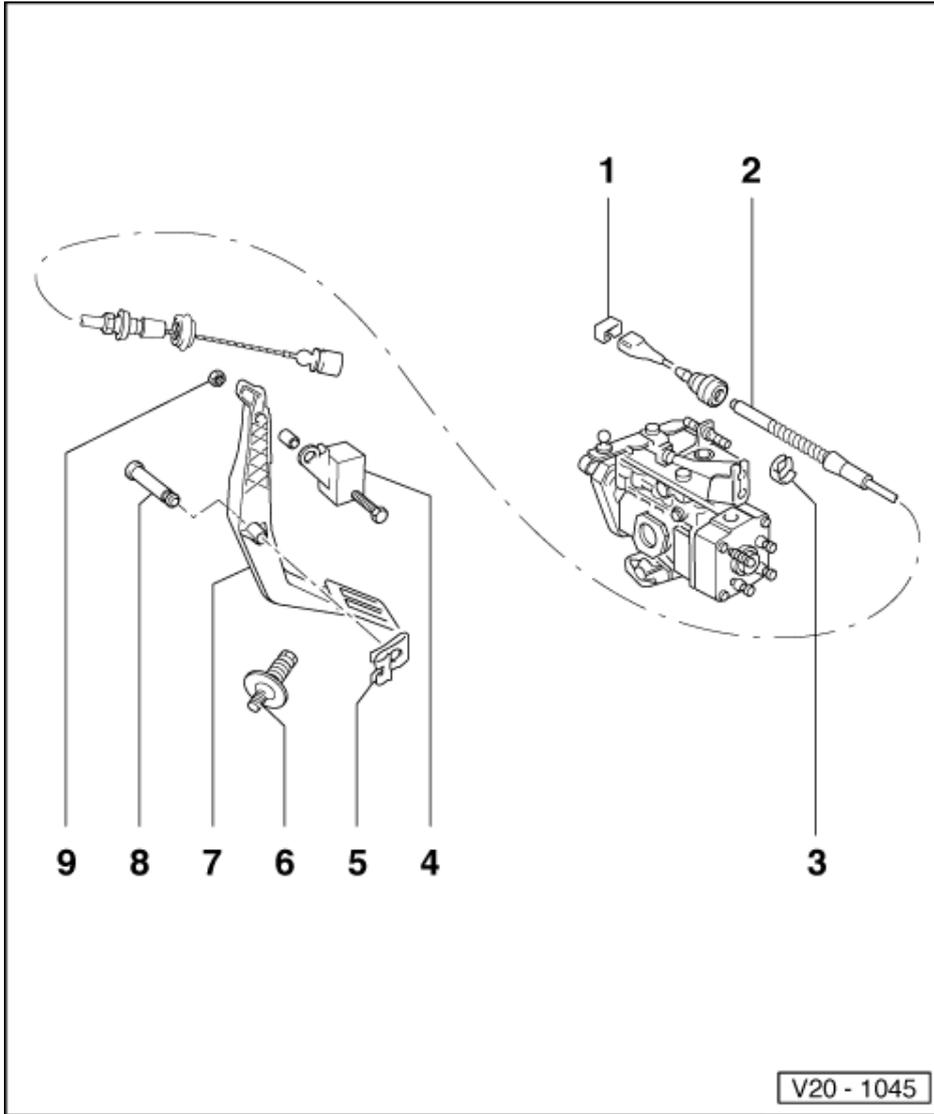


Engine codes 1Y, AAZ

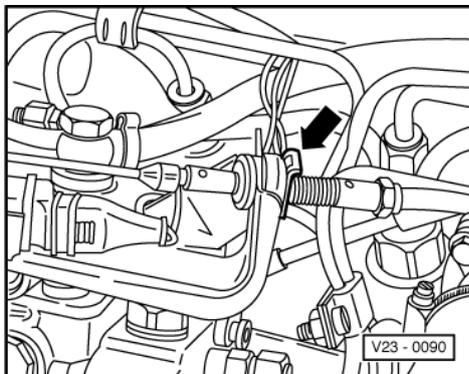
Engine codes 1Z, AHU, AEY, AFN, AVG, ALE

=> Repair group 23; Servicing diesel direct injection system; Servicing accelerator mechanism Servicing diesel direct injection system Servicing accelerator mechanism

- 1 Retainer
- 2 Accelerator cable
 - ◆ Adjust by moving position of securing clip (retainer) on outer cable grooves
=> Page 118 , Fig. 1
- 3 Securing clip
- 4 Balance weight
- 5 Securing clip



- 6 Accelerator pedal stop
- 7 Accelerator pedal
- 8 Pivot pin
- 9 10 Nm

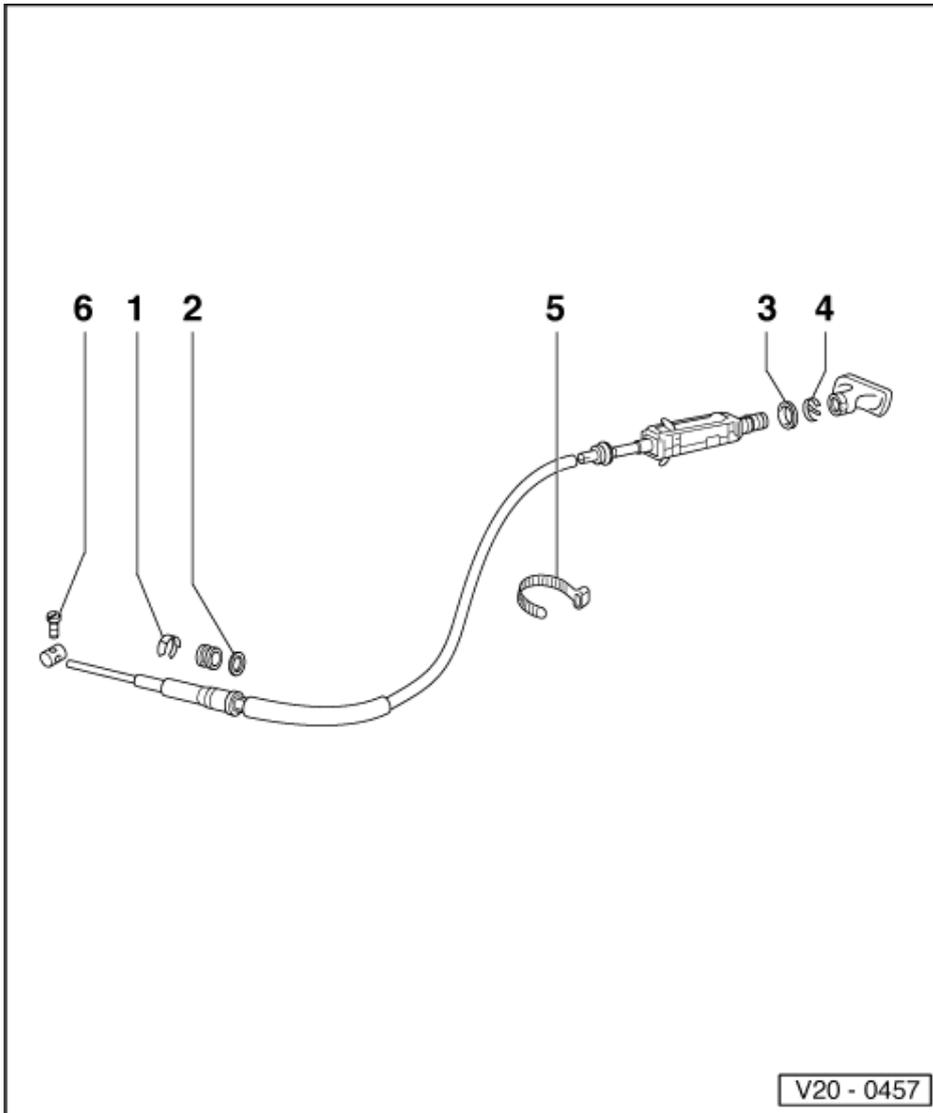




-> Fig. 1 Adjusting accelerator cable

With the accelerator cable in full throttle position, adjust cable by positioning the securing clip -arrow- in the outer cable grooves, so that the injection pump lever just contacts the stop and is not under stress.

1.8 - Servicing cold start accelerator (CSA) operating cable



Engine codes 1Y, AAZ
>09.94

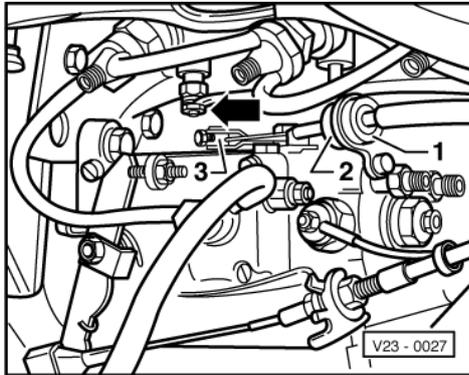
- 1 Securing clip
- 2 Washer
- 3 Nut
- 4 Securing clip
- 5 Cable tie
 - ◆ In engine compartment
- 6 Locking screw



- ♦ Adjusting => Page 119

1.9 - Adjusting CSA operating cable

Engine codes 1Y, AAZ ▶09.94



- -> Slide washer -1- on operating cable and secure cable with securing clip -2-.
- Set operating lever in 0 position -direction of arrow-.
- Pull inner cable taut and secure in pin -3- with locking screw.



21 - Charging

1 - Charge air system with turbocharger

1.1 - Charge air system with turbocharger

1.2 - Removing and installing turbocharger with attachments

Observe rules for cleanliness => Page [132](#) .

Engine codes 1Z, AHU, ALE => Page [121](#)

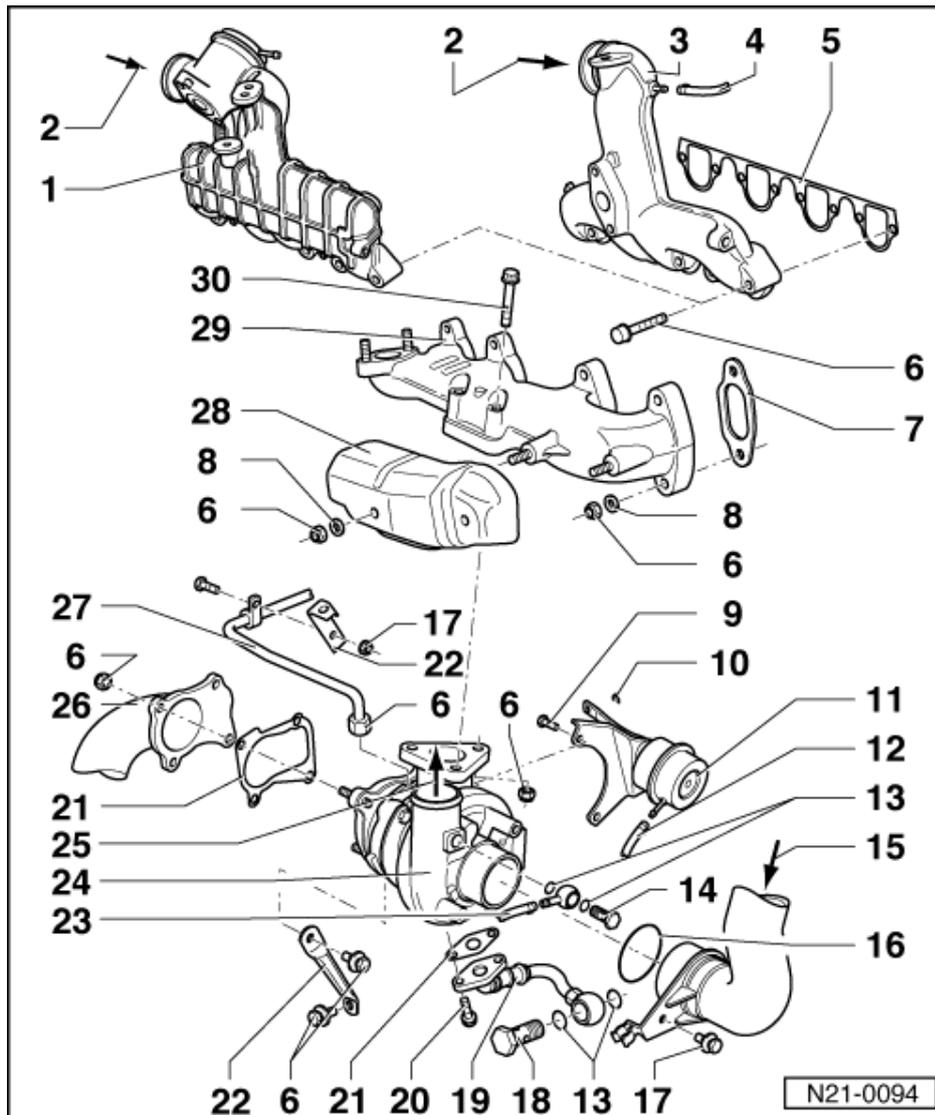
Engine codes AFN, AVG =>Page [125](#)

Engine code AAZ =>Page [128](#)

Turbocharger hose connections => Page [133](#) .

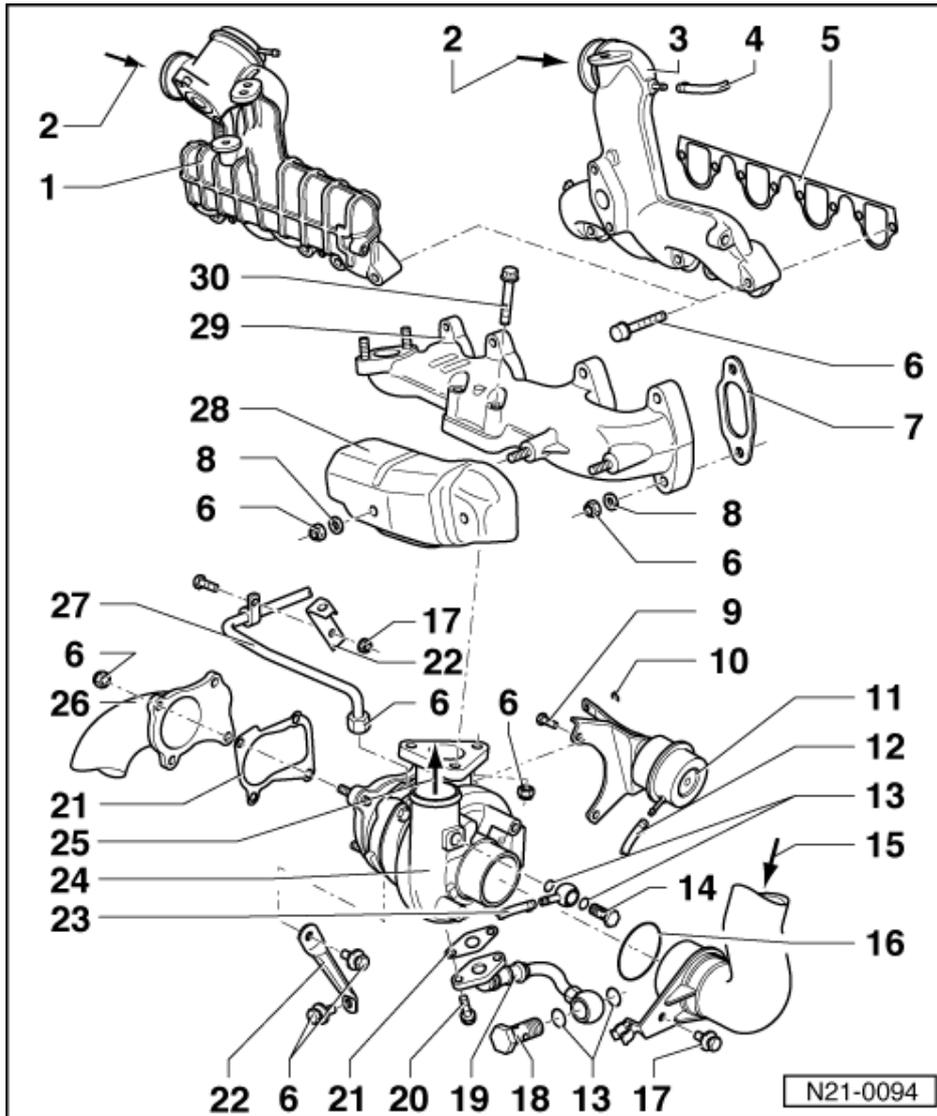
Notes:

- ◆ All hose connections are secured with clips.
- ◆ Charge air system must be free of leaks.
- ◆ Renew self-locking nuts.
- ◆ Before screwing on oil supply pipe fill turbocharger at connection with engine oil.



Engine codes 1Z, AHU, ALE

- 1 Intake manifold
 - ◆ Engine codes ALE
- 2 From charge air cooler
- 3 Intake manifold
 - ◆ Engine codes 1Z, AHU
- 4 Hose
 - ◆ Black
 - ◆ To diesel direct injection system control unit (J248)
- 5 Gasket
 - ◆ Renew
 - ◆ Coating (beading) towards intake manifold
- 6 25 Nm
- 7 Gasket
 - ◆ Note installation position



8 Washer

9 10 Nm

- ◆ Install with D6

10 Circlip

11 Pressure unit

- ◆ For charge pressure regulating valve
- ◆ Checking =>Page 142
- ◆ Removing and installing => Page 143

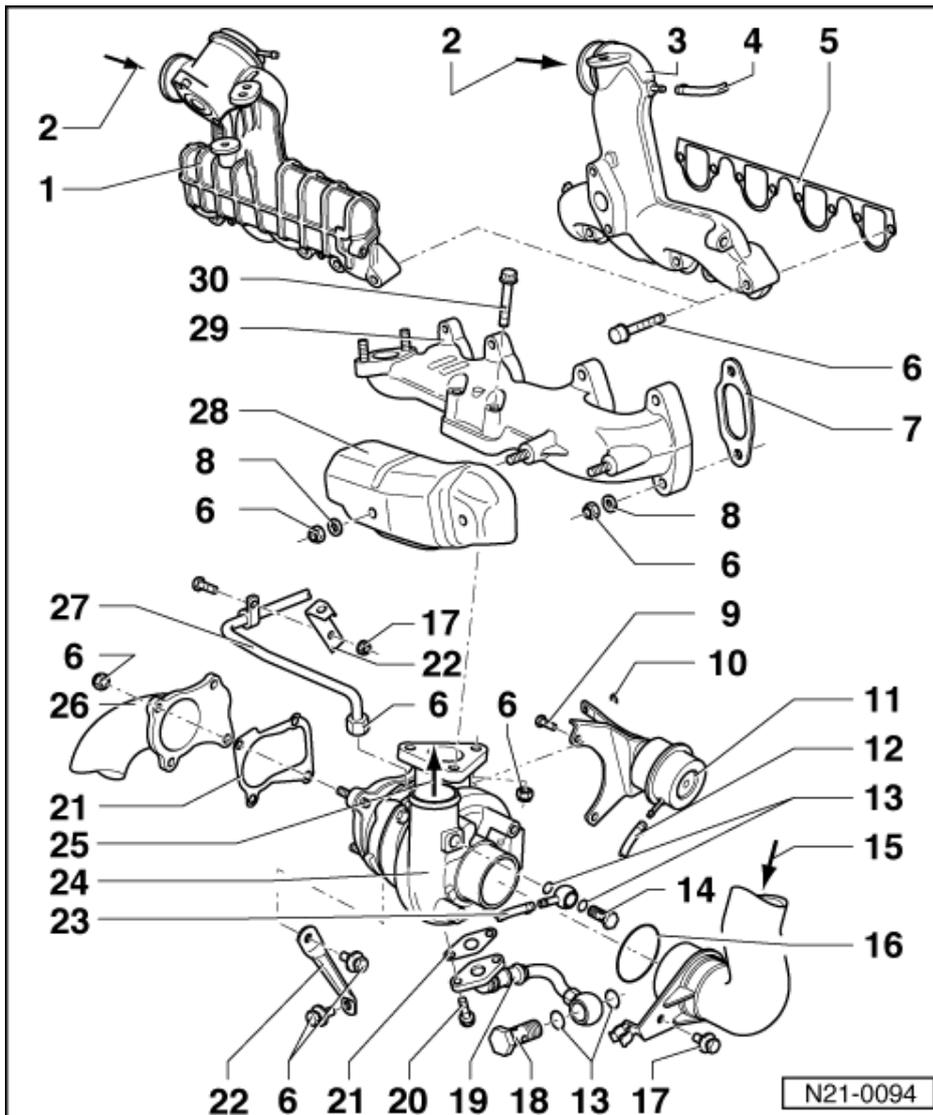
12 Hose

- ◆ Blue
- ◆ To charge pressure control solenoid valve (N75) => Page 133 , turbocharger hose connections

13 Seal

- ◆ Renew

14 Banjo bolt, 15 Nm



15 From air cleaner

16 O-ring

- ◆ Renew if damaged

17 10 Nm

18 Banjo bolt, 30 Nm

19 Oil return pipe

- ◆ To cylinder block

20 20 Nm

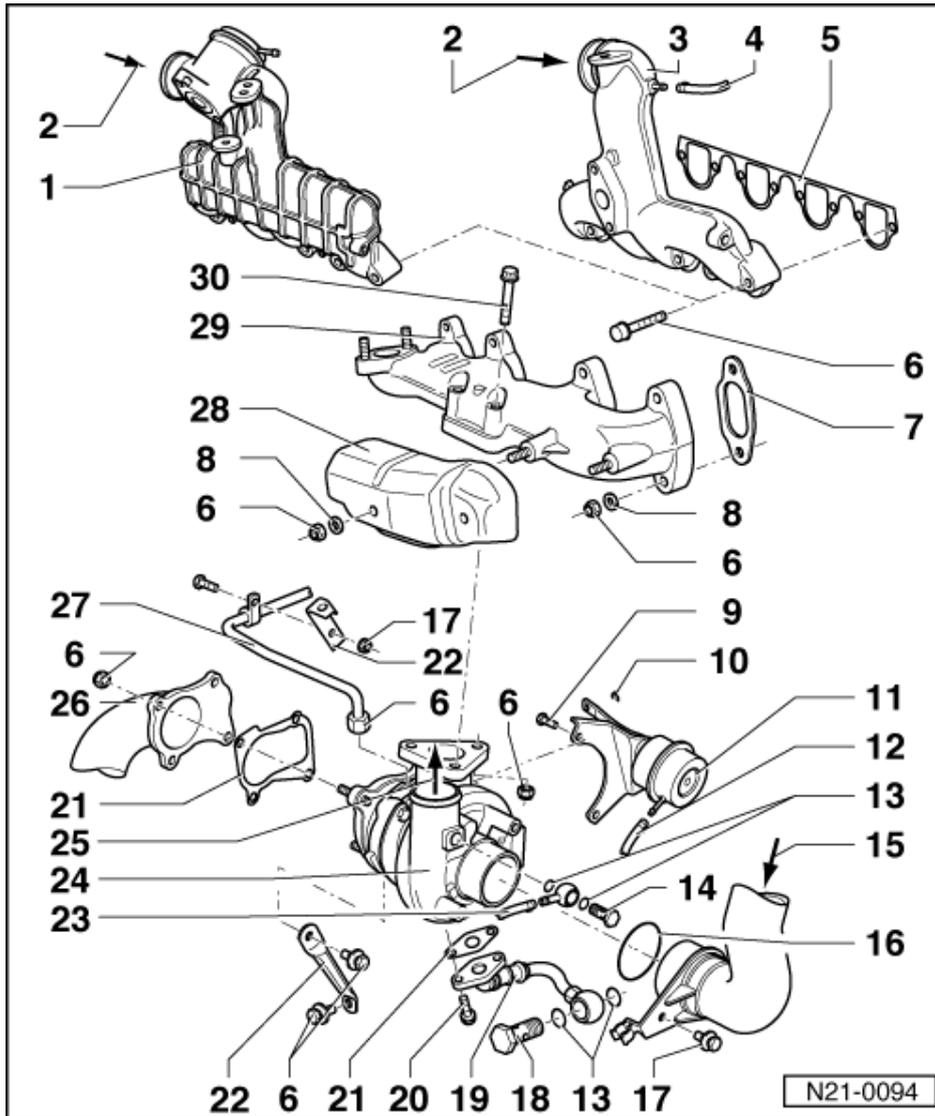
21 Gasket

- ◆ Renew

22 Retainer

23 Hose

- ◆ rot
- ◆ To charge pressure control solenoid valve (N75) => Page 133 , turbocharger hose connections



24 Turbocharger

- ◆ Removing and installing
=> Page 135
- ◆ Checking boost pressure
=> Page 139

25 To charge air cooler

26 Front exhaust pipe

27 Oil supply pipe

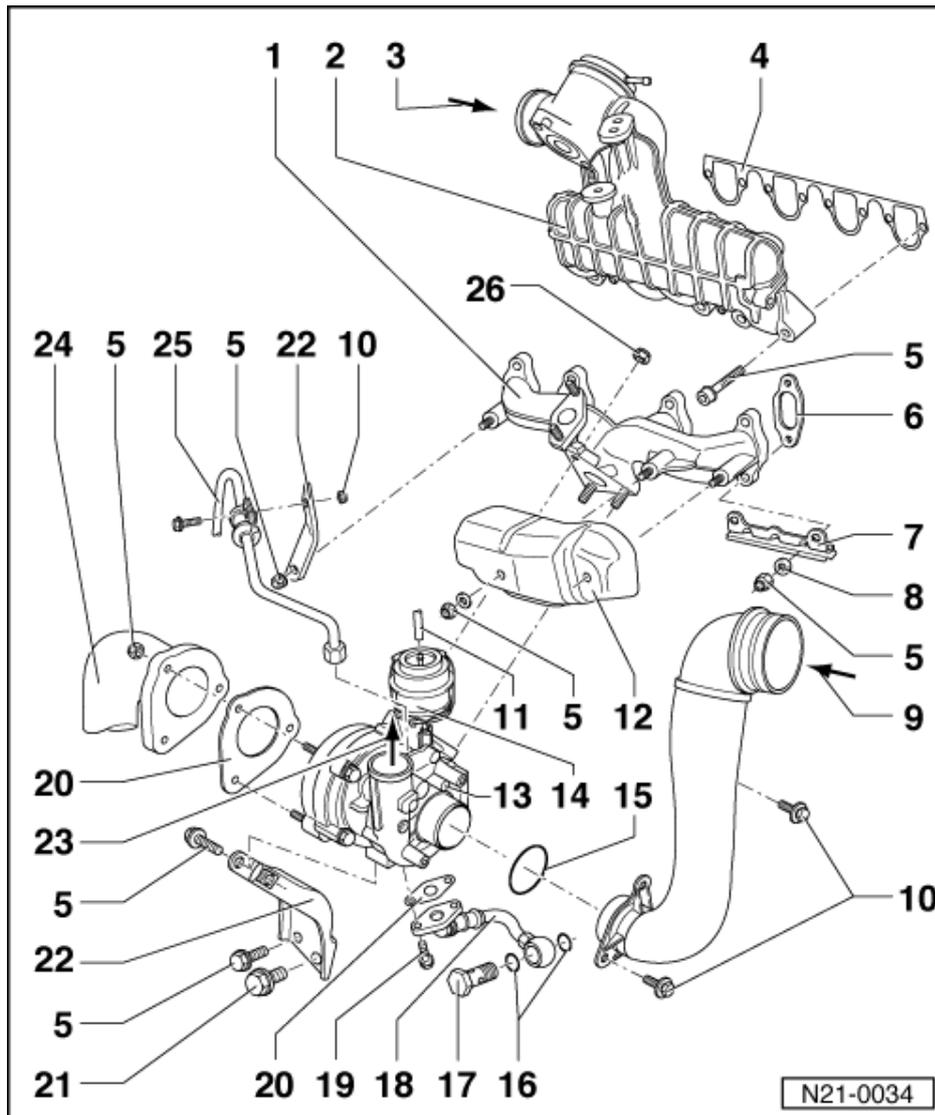
- ◆ From oil filter bracket
=> Page 84 , item 8
- ◆ Before installing, fill turbocharger with engine oil via oil supply pipe connection

28 Heat shield

29 Exhaust manifold

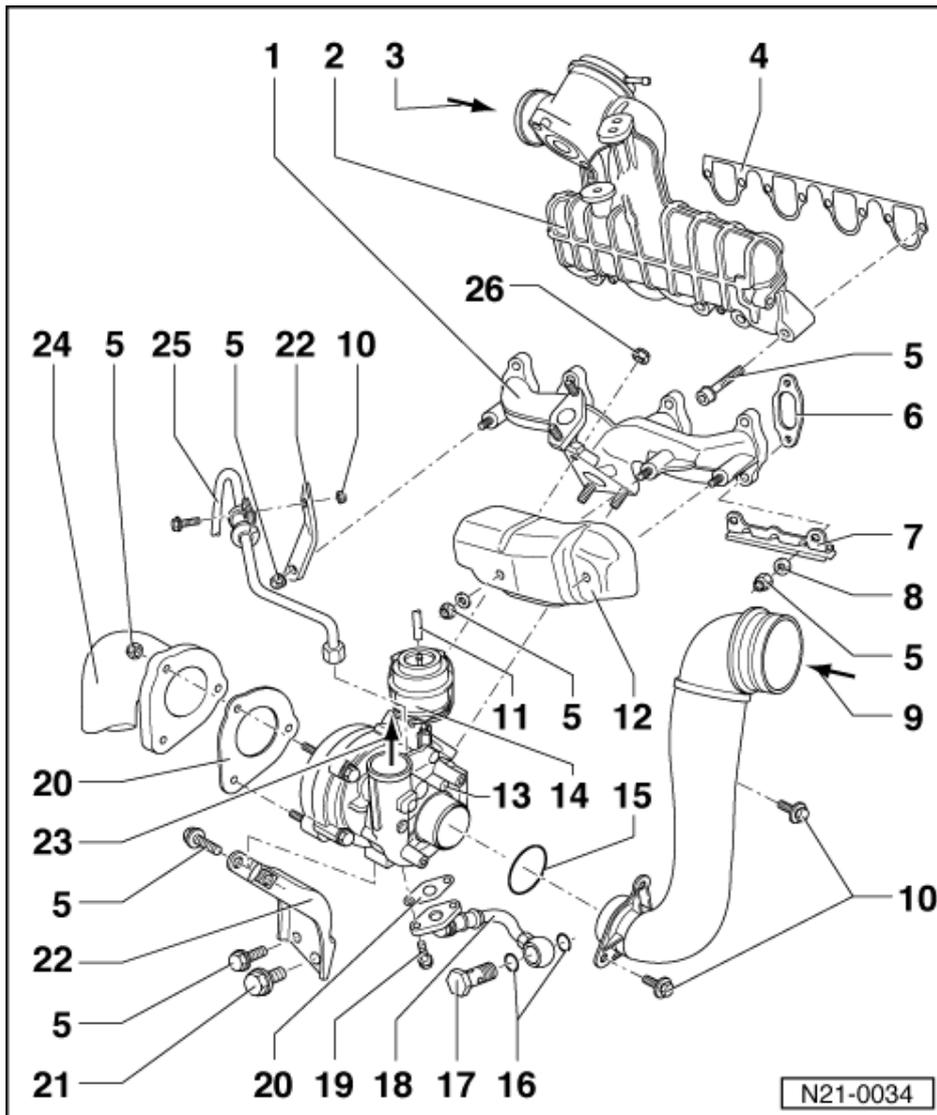
30 35 Nm

- ◆ Renew
- ◆ Coat threads and bolt head seating surface with G000500



Engine codes AFN, AVG

- 1 Exhaust manifold
- 2 Intake manifold
 - ◆ With exhaust gas recirculation valve
- 3 From charge air cooler
- 4 Gasket
 - ◆ Renew
 - ◆ Coating (beading) towards intake manifold
- 5 25 Nm
- 6 Gasket
 - ◆ Note installation position
- 7 Retainer
 - ◆ For heat shield item 12
- 8 Washer
- 9 From air cleaner
- 10 10 Nm



11 Hose

- ◆ To charge pressure control solenoid valve (N75) => Page 133 , turbocharger hose connections

12 Heat shield

- ◆ Engage in bracket item 7

13 Turbocharger

- ◆ Removing and installing
=> Page 135
- ◆ Checking charge pressure

=> Repair group 23; Checking components and function; Checking charge pressure control Checking components and function Checking charge pressure control

14 Pressure unit

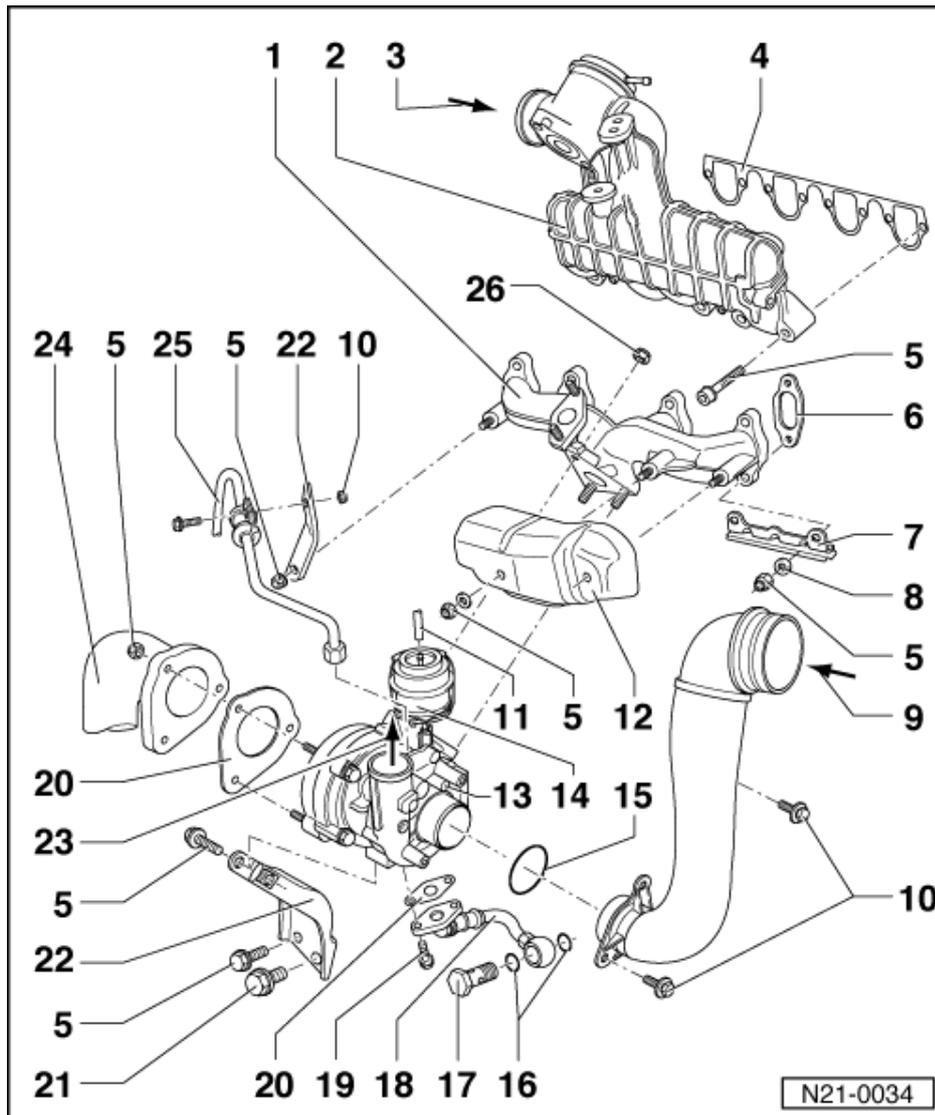
- ◆ For charge pressure control
- ◆ Integral part of turbocharger cannot be replaced

15 O-ring

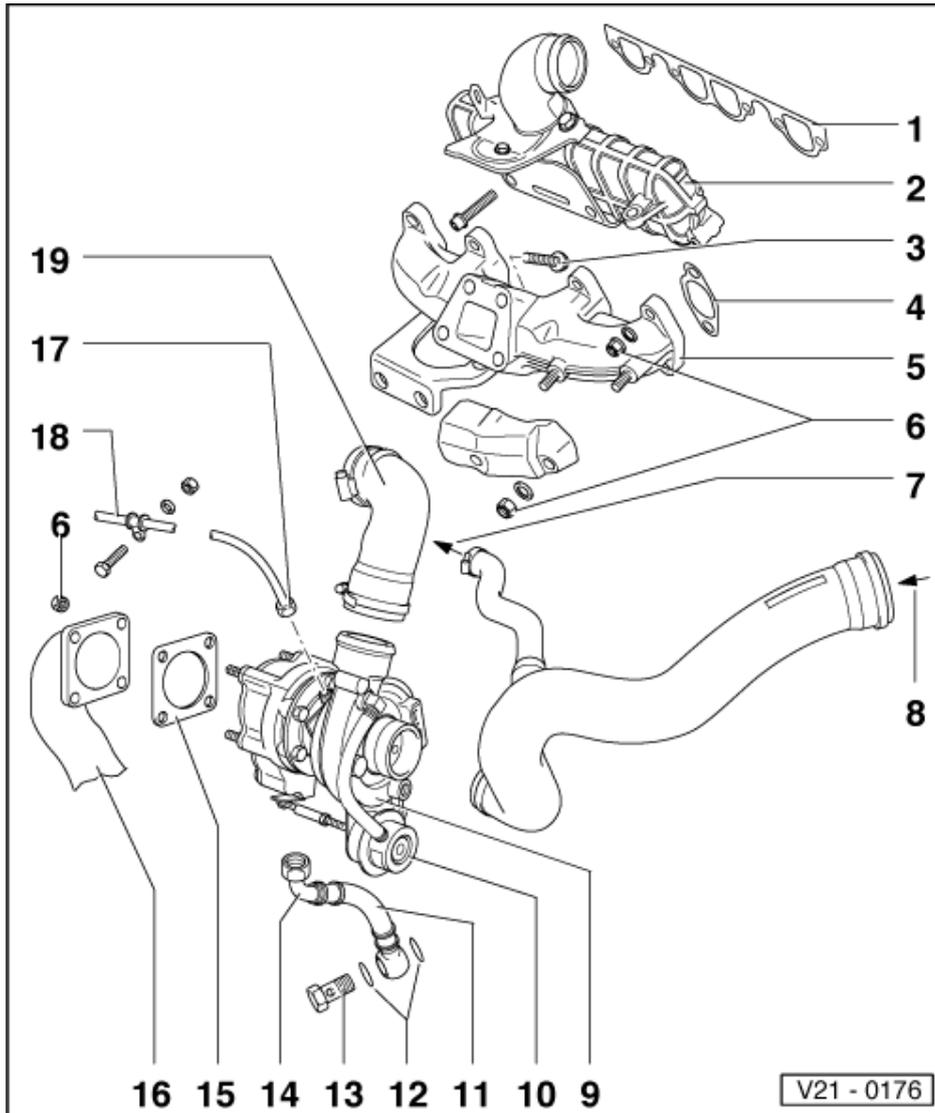
- ◆ Renew if damaged

16 Seal

- ◆ Renew



- 17 Banjo bolt, 30 Nm
- 18 Oil return pipe
 - ◆ To cylinder block
- 19 20 Nm
- 20 Gasket
 - ◆ Renew
- 21 30 Nm
- 22 Retainer
- 23 To charge air cooler
- 24 Front exhaust pipe
- 25 Oil supply pipe
 - ◆ From oil filter bracket
=> Page 84 , item 8
 - ◆ Before installing, fill turbocharger with engine oil via oil supply pipe connection
- 26 25 Nm
 - ◆ Renew
 - ◆ Coat threads and bolt head seating surface with G 000 500

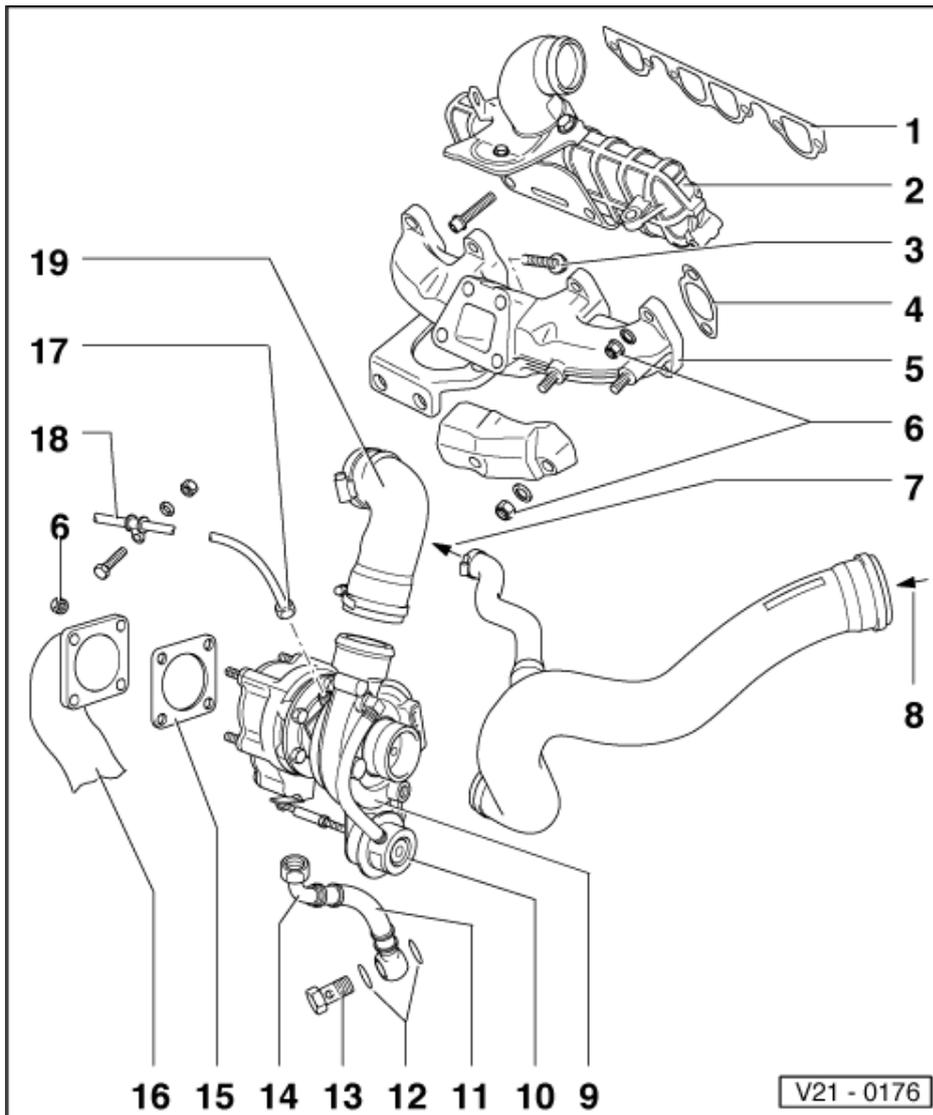


Engine code AAZ

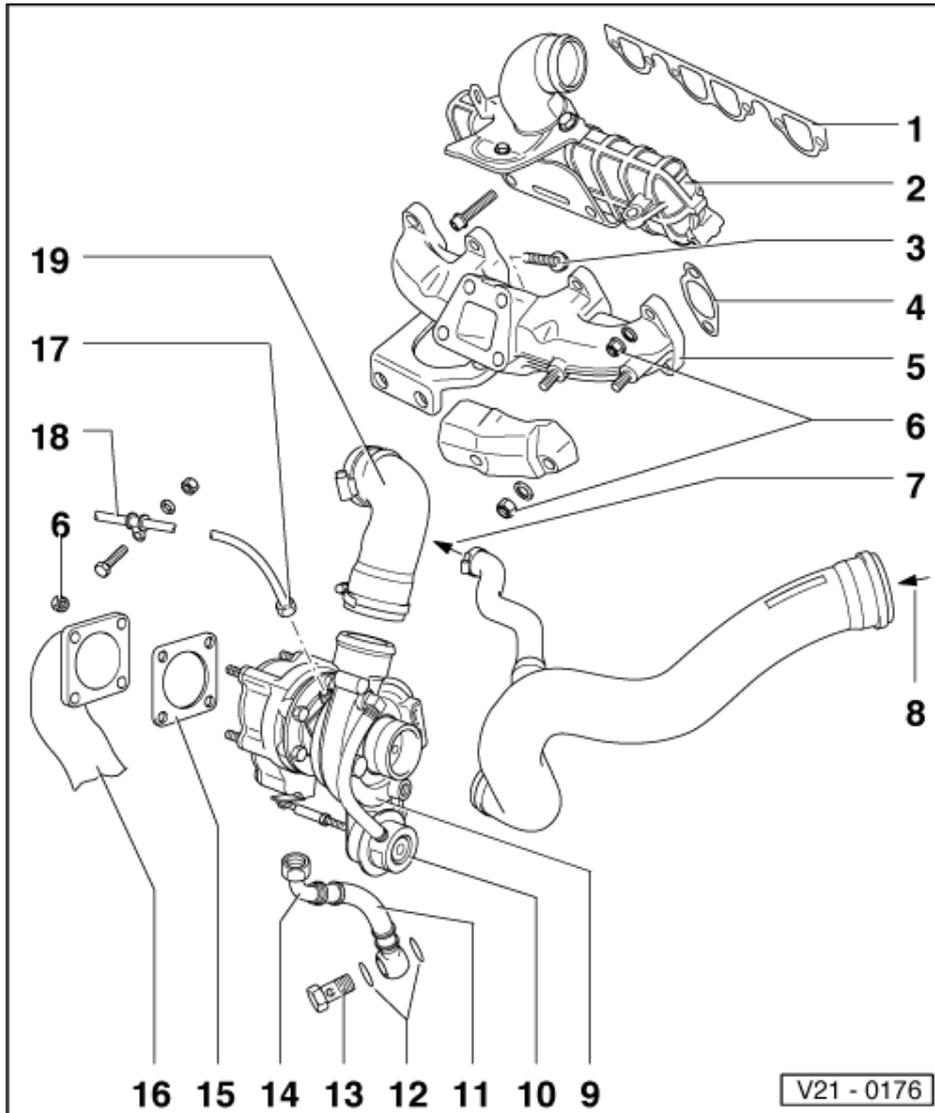
Note:

- ◆ The charge pressure control is switched off during part throttle openings by the automatic glow period control unit via the exhaust gas recirculation two-way valve.
- ◆ Checking two-way valve
=> Page 163

- 1 Gasket**
 - ◆ Coating (beading) towards intake manifold
- 2 Intake manifold**
- 3 45 Nm**
 - ◆ Coat threads and bolt head seating surface with G000500
 - ◆ Renew
- 4 Gasket**
 - ◆ Note installation position
- 5 Exhaust manifold**



- 6 25 Nm
- 7 To crankcase breather
- 8 From air cleaner
- 9 Turbocharger
 - ◆ Removing and installing
=> Page 135
 - ◆ Checking boost pressure
=> Page 139
- 10 Charge pressure regulating valve
 - ◆ Integral part of turbocharger cannot be replaced
 - ◆ Hose/pipe connections
=> Page 133
- 11 Oil return pipe
 - ◆ To cylinder block
- 12 Sealing ring
 - ◆ Renew
- 13 50 Nm
- 14 40 Nm



15 Gasket

16 Exhaust pipe

17 25 Nm

18 Oil supply pipe

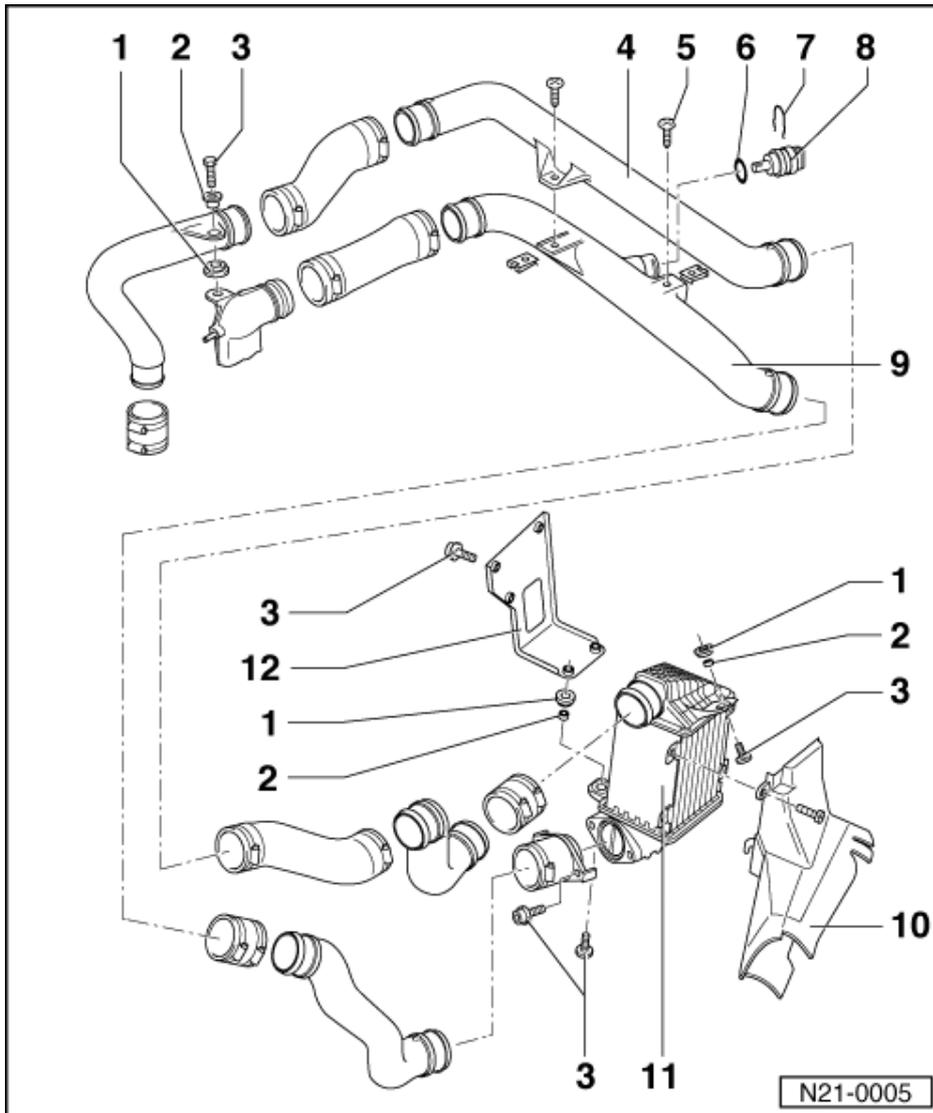
- ◆ From oil filter bracket
=> Page 84 , item 8

- ◆ Before installing, fill turbocharger with engine oil via oil supply pipe connection

19 Air hose



1.3 - Removing and installing parts of charge air cooling system

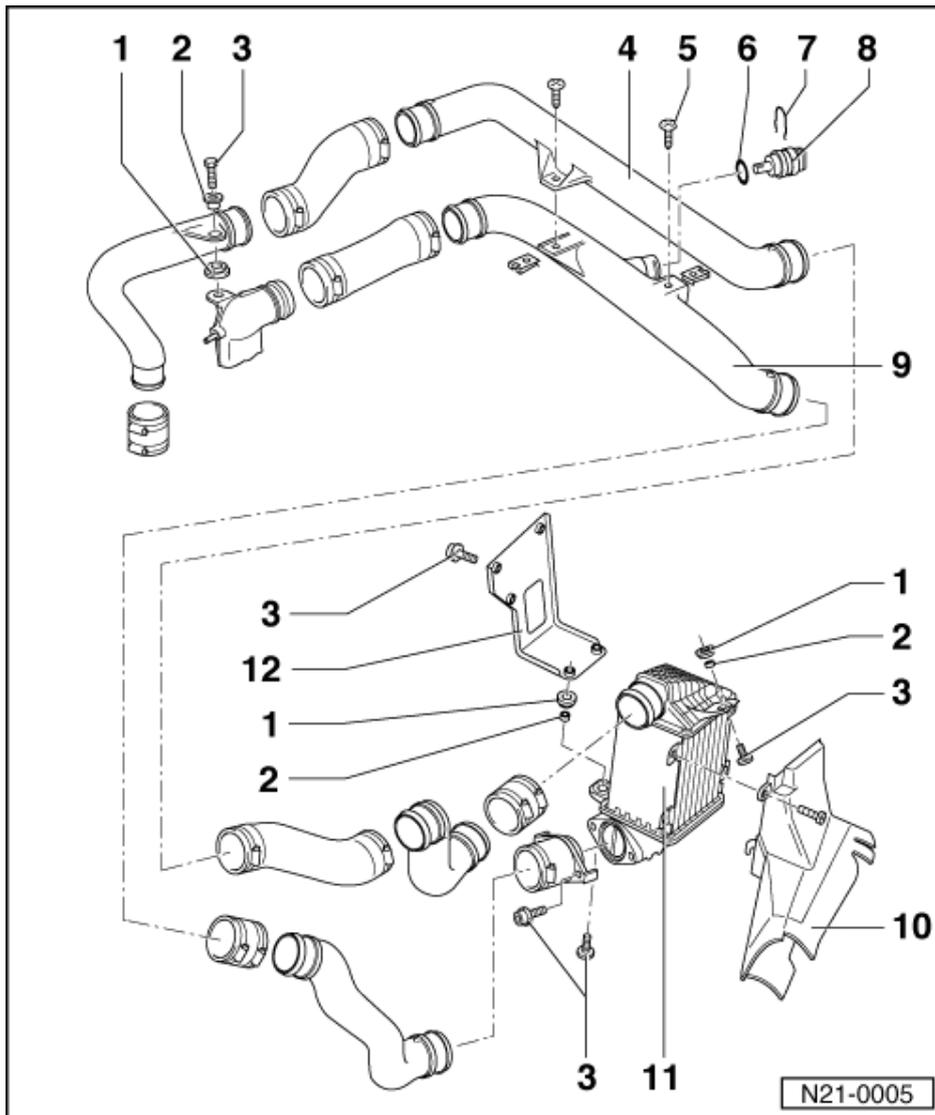


Engine codes 1Z, AHU, AFN, AVG, ALE

Notes:

- ◆ All hose connections secured by clips.
- ◆ Charge air system must be free of leaks.

- 1 Rubber mounting
- 2 Spacer
- 3 10 Nm
- 4 Connecting pipe
 - ◆ Charge air cooler/turbocharger
- 5 10 Nm



- 6 O-ring
 - ◆ Renew if damaged
- 7 Retaining clip
- 8 Intake manifold temperature sender (G72)
- 9 Connecting pipe
 - ◆ Charge air cooler/intake manifold
- 10 Air ducting
- 11 Charge air cooler
- 12 Retainer

1.4 - Rules for cleanliness

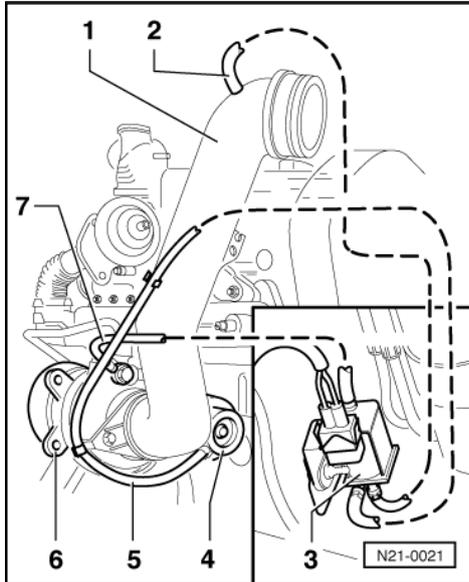
When working on the exhaust gas turbocharger, pay careful attention to the following "5 rules":

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover opened components or seal, if the repair cannot be carried out immediately.
- ◆ Only install clean components:
 - Only unpack replacement parts immediately prior to installation.
 - Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open:



Do not work with compressed air if this can be avoided.
 Do not move vehicle unless absolutely necessary.

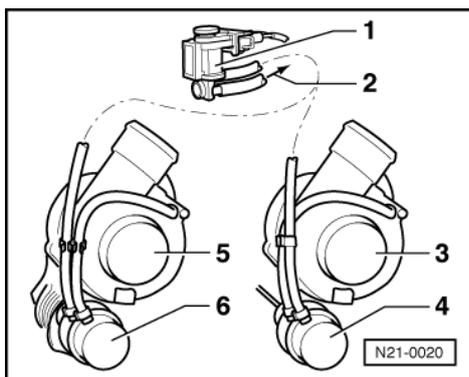
1.5 - Turbocharger hose/pipe connections



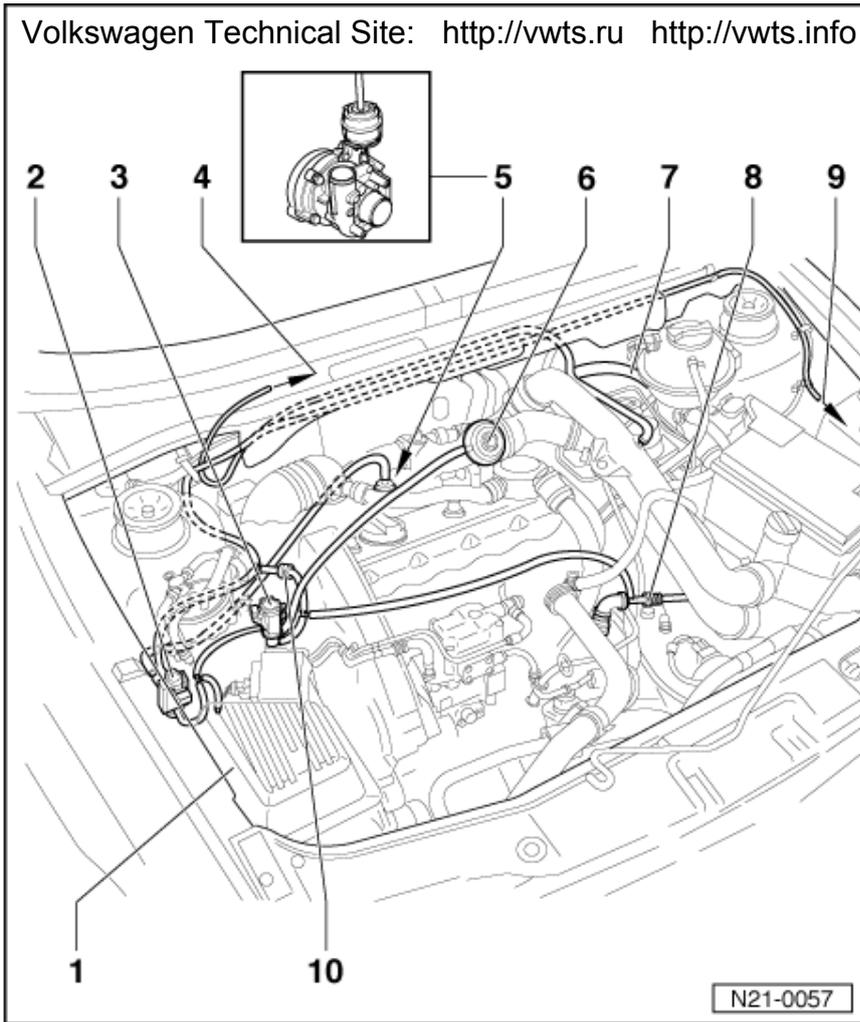
Engine codes 1Z, AHU, ALE

- 1 - -> Intake hose
- 2 - Hose, black
- 3 - Charge pressure control solenoid valve (N75)
- 4 - Charge air control pressure unit
- 5 - Hose, blue
- 6 - Turbocharger
- 7 - Hose, red

Engine code AAZ

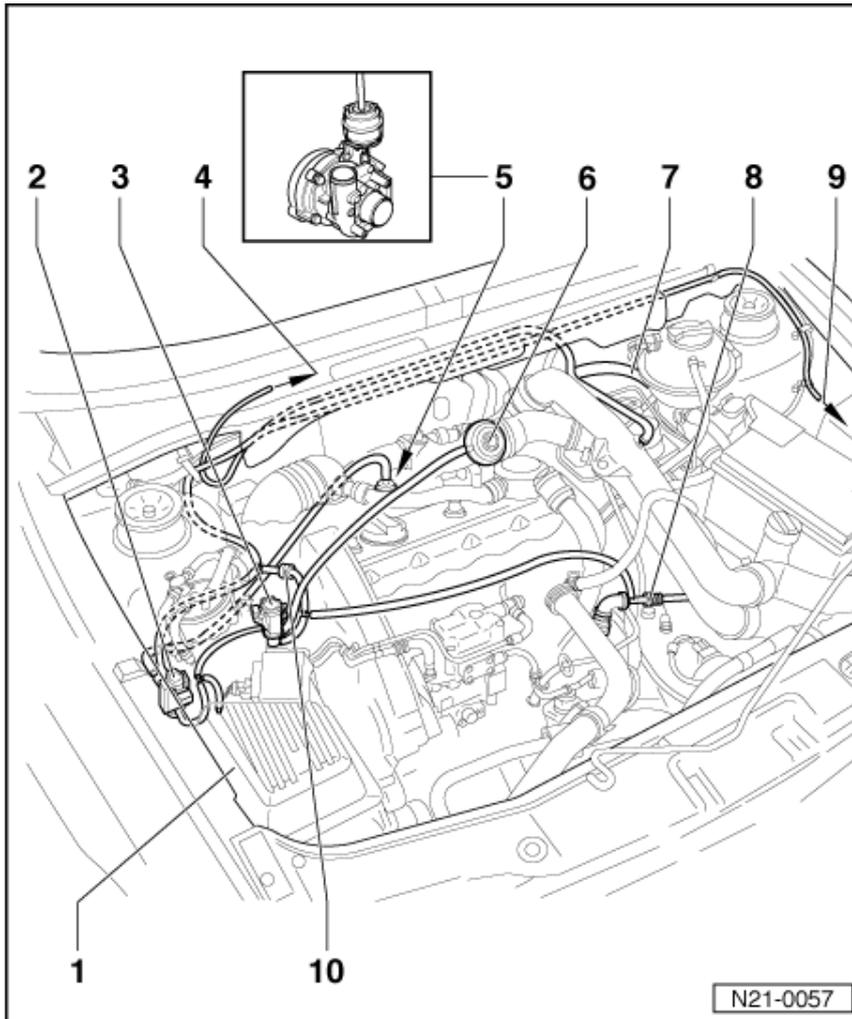


- 1 - -> Two-way valve
- 2 - To vacuum pump
- 3 - Turbocharger (KKK)
- 4 - Charge pressure control valve
- 5 - Turbocharger (Garrett)
- 6 - Charge pressure control valve



Engine codes AFN, AVG

- 1 Air cleaner
- 2 Solenoid valve for charge pressure control (N75)
- 3 Exhaust gas recirculation valve (N18)
- 4 To Diesel direct injection system control unit (J248)
- 5 Pressure unit
 - ◆ For charge pressure control
- 6 Exhaust gas recirculation valve (mechanical)
- 7 Brake servo
- 8 Non-return valve



9 To vacuum reservoir

- ◆ In wheel housing

10 Non-return valve

- ◆ White connection to charge pressure control solenoid valve -item **2** - and to vacuum reservoir

1.6 - Removing and installing turbocharger

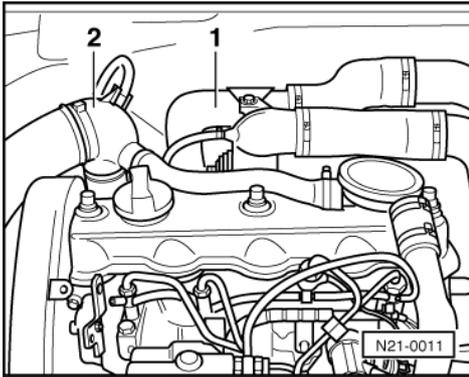
Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Jointed spanner 3205 (Engine code AAZ)
- ◆ V.A.G 1331 Torque wrench (5...50 Nm)
- ◆ Grease G 000 500

Engine codes 1Z, AHU, ALE

Engine codes AFN, AVG => Page **137**

Engine code AAZ => Page **137**



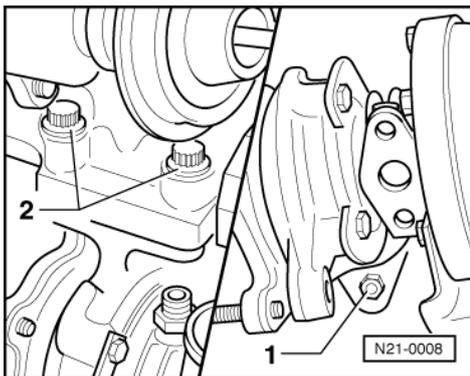
Removing

- With ignition switched off disconnect battery earth strap.

Note:

If necessary the anti-theft coding for the radio must be obtained first.

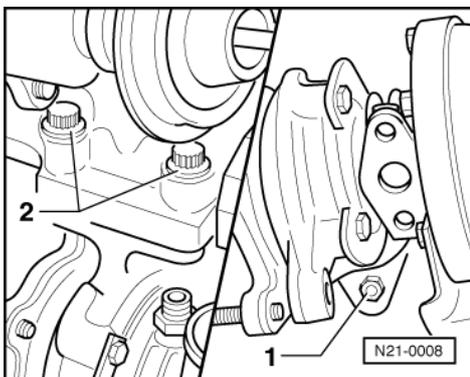
- -> Remove hoses between intake manifold/turbocharger -1- and turbocharger/air cleaner -2-.
- Pull off red hose (or remove banjo bolt) for charge pressure control solenoid valve (N75) on turbocharger.
- Disconnect exhaust pipe from turbocharger.
- Disconnect oil supply pipe from turbocharger and securing clip from intake manifold.
- Remove turbocharger/cylinder block support.
- Disconnect oil return pipe on turbocharger.



- -> Remove securing nut -1- from below and securing bolts -2- from above.
- Lift turbocharger out, upwards.
- Pull blue hose for charge pressure valve off pressure unit.

Installing

- Install blue hose for charge pressure valve on pressure unit and secure with a clamp.
- Grease securing bolts -2- threads and head contact surfaces with G 000 500 grease.
- Fit turbocharger on exhaust manifold and tighten securing bolts -2- handtight.
- Install securing nut -1- and tighten to 20 Nm.





- -> Tighten securing bolts -2- to 35 Nm.
- Install turbocharger/cylinder head support and tighten to 25 Nm.
- Install oil return pipe with new seal and tighten to 20 Nm.
- Install front exhaust pipe with new gasket onto flange and tighten to 25 Nm.
- Fill the turbocharger with engine oil via the oil supply connection.
- Install oil supply pipe and tighten to 25 Nm.
- Tighten oil supply pipe support to 10 Nm.

- Install red hose for charge pressure control solenoid valve (N75) on turbocharger and secure with clamp (or banjo bolt with new seal and tighten to 15 Nm.
- Insert O-ring into intake pipe, then install intake pipe on turbocharger and tighten to 10 Nm.
- Install pressure pipe.
- After installing the turbocharger, run engine for approx. 1 minute at idling speed, do not rev. up immediately. This ensures the turbocharger is properly lubricated.

Engine codes AFN, AVG

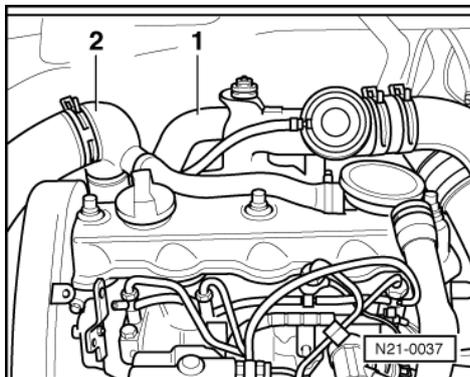
Removing

- With ignition switched off disconnect battery earth strap.

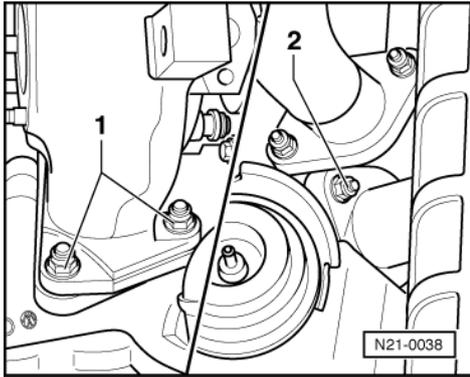
Note:

If necessary the anti-theft coding for the radio must be obtained first.

- Remove engine cover.



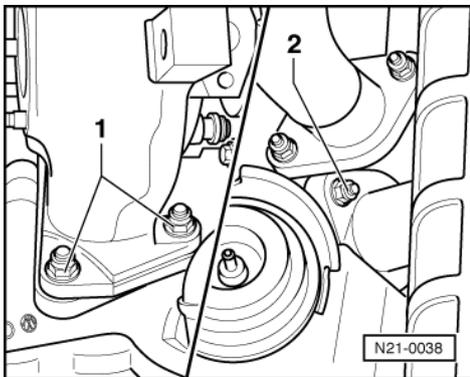
- -> Remove pressure pipe turbocharger/charge air cooling -1- and intake pipe turbocharger/air cleaner -2-.
- Pull charge pressure control vacuum pipe off pressure unit.
- Disconnect oil supply pipe from turbocharger and securing clip from intake manifold.
- Disconnect exhaust pipe from turbocharger.
- Remove turbocharger/cylinder block support.
- Disconnect oil return pipe on turbocharger.



- -> Remove securing nuts -1- from below and securing nut -2- from above.
- Lift turbocharger out, upwards.

Installing

- -> Grease threads of studs on exhaust manifold and turbocharger with G 000 500 grease.



- -> Fit turbocharger on exhaust manifold and tighten securing bolts -2- handtight.
- Install securing nuts -1- and tighten to 25 Nm.
- Install oil return pipe with new seal and tighten to 20 Nm.
- Install bracket turbocharger/cylinder head and tighten to
M8: 25 Nm
M10: 30 Nm
- Tighten securing nut -2- to 25 Nm.
- Install front exhaust pipe with new gasket onto flange and tighten to 25 Nm.
- Fill the turbocharger with engine oil via the oil supply connection.
- Install oil supply pipe and tighten to 25 Nm.
- Tighten oil supply pipe support to 10 Nm.
- Insert O-ring into intake pipe and tighten intake pipe to 10 Nm on turbocharger and intake manifold.
- Connect vacuum hose to charge pressure control pressure unit.
- Install turbocharger/charge air cooling pressure pipe and turbocharger/air cleaner intake pipe.
- After installing the turbocharger, run engine for approx. 1 minute at idling speed, do not rev. up immediately. This ensures the turbocharger is properly lubricated.

Engine code AAZ

Removing

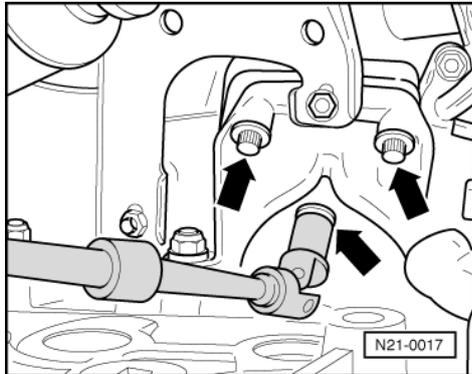
- With ignition switched off disconnect battery earth strap.



Note:

If necessary the anti-theft coding for the radio must be obtained first.

- Remove hoses between intake manifold/turbocharger and turbocharger/air cleaner.
- Disconnect oil supply pipe from turbocharger and securing clip from intake manifold.
- Disconnect oil return pipe on turbocharger.
- Disconnect exhaust pipe from turbocharger and exhaust manifold support.



- -> Remove securing bolts -arrows- between turbocharger and exhaust manifold (with ring spanner or jointed spanner 3205).

Installing

When installing observe the following:

- Fit turbocharger and tighten exhaust pipe securing nuts so that the turbocharger can still be moved slightly.
- Fit the turbocharger/exhaust manifold securing bolts and tighten fully. Then tighten the nuts on exhaust pipe.
- Before attaching the oil supply pipe, fill the connections on the turbocharger with engine oil.
- After installing the turbocharger, run engine for approx. 1 minute at idling speed, do not rev. up immediately. This ensures the turbocharger is properly lubricated.

1.7 - Checking turbocharger

Engine code AAZ =>Page 141

Engine codes AFN, AVG

=> Repair group 23; Checking components and function; Checking charge pressure control Checking components and function Checking charge pressure control

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Turbocharger tester V.A.G 1397 A

Engine codes 1Z, AHU, ALE

Check conditions

- No fault stored in fault memory

=> Repair group 01; Fault memory; Interrogating fault memory Fault memory Interrogating fault memory

- Carry out final control diagnosis



=> Repair group 01; Final control diagnosis; Performing final control diagnosis Final control diagnosis Performing final control diagnosis

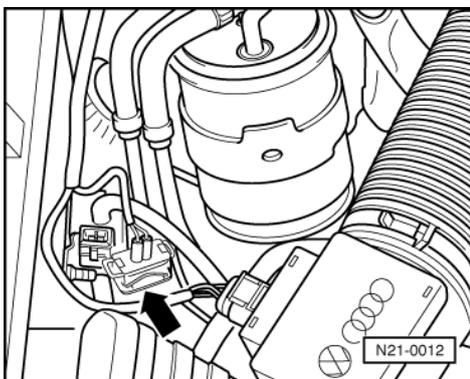
- No leaks on intake and exhaust systems.
- Control pipe to charge pressure regulating valve is not blocked, loose or leaking.
- No faults in engine and fuel injection system, e.g. commencement of injection, injectors and compression pressure.
- Engine oil temperature min. 80 °C

Test sequence

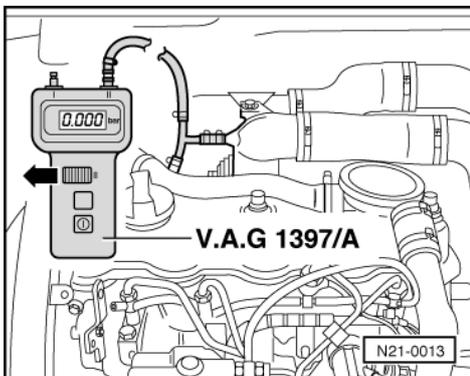
Observe following if test and measuring instruments are required during a test drive:

- ♦ Test and measuring instruments must be secured to rear seat and operated by a 2nd person from this location.

If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.



- The charge pressure is measured under full load, whilst driving or on a rolling road. Test duration per measurement max. 10 seconds.
- -> Pull connector -arrow- off charge pressure control solenoid valve (N75).



- -> Pull off connecting hose running between intake manifold and diesel direct injection system control unit (J248) and using T-piece connect in turbocharger tester V.A.G 1397 A.
- Select measuring range II.

Notes:

- ♦ To operate turbocharger tester see operating instructions.
 - ♦ The hoses must be connected so that there is no possibility of leaks.
 - ♦ Ensure that the pressure hose is not trapped between the bonnet and the body.
- Measure charge pressure at full throttle:
 - On a rolling road:
 - In 3rd gear or selector lever position 2 at 3500...4000 rpm.
 - Whilst driving:



In 2nd gear or selector lever position 1
at full throttle acceleration whilst observing
rev counter.

Note:

The brake pedal must not be operated whilst taking measurements. The control unit thus reduces the fuel quantity which leads to incorrect measurements.

- Press the memory button "M" on turbocharger tester at 3500...4000 rpm and read off values.
Specification: (Relative pressure)
0.50...0.65 bar

If the charge pressure is not attained:

- Check charge pressure control valve pressure unit and renew if necessary.
- Repeat charge pressure check.

If the charge pressure has still not been attained:

- Replace turbocharger.

If the charge pressure is exceeded:

- Test charge pressure control solenoid valve (N75). (Through-flow in hose from turbocharger via valve to pressure unit when connector is pulled off).
- Check pressure unit for charge pressure regulating valve is securely mounted on turbocharger.
- Check charge pressure control valve pressure unit as well as the operating rod and renew if necessary.
- Check shaft mounting for charge pressure regulating valve in turbocharger for ease of movement. When corroded together, renew turbocharger.

Engine code AAZ

Turbocharger and wastegate constitute one unit. A defective turbocharger becomes an item for exchange, as repairs with workshop equipment are not possible.

Prerequisites for the perfect functioning of the turbocharger and attainment of prescribed boost pressure are:

- No leaks on intake and exhaust systems.
- Control pipe to charge pressure regulating valve is not blocked, loose or leaking.
- No faults in engine and fuel injection system, e.g. commencement of injection, maximum speed, injectors and compression pressure.

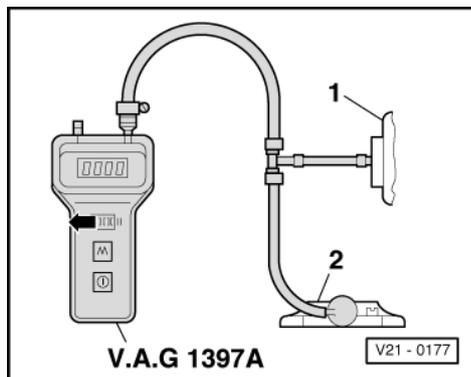
Test sequence

Observe following if test and measuring instruments are required during a test drive:

- ◆ Test and measuring instruments must be secured to rear seat and operated by a 2nd person from this location.

If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

- The charge pressure is measured under full load, whilst driving or on a rolling road. Test duration per measurement max. 10 seconds.



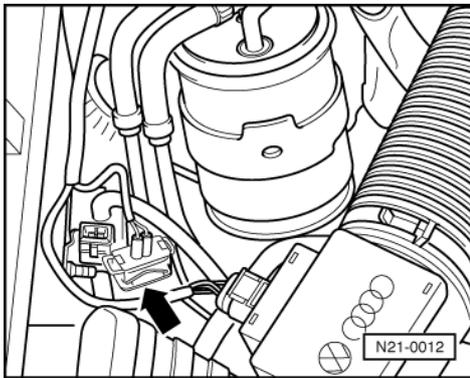


- -> Pull hose, running between intake manifold -1- and injection pump -2-, off at one end and using T-piece connect turbocharger tester in.

Notes:

- ♦ To operate turbocharger tester see operating instructions.
- ♦ Ensure that the pressure hose is not trapped between the bonnet and the body.
- boost pressure measured at full throttle:
 - On a rolling road:
 - In 3rd gear or selector lever position 2 at 4000 rpm.
 - Whilst driving:
 - In 2nd gear or selector lever position 1 whilst simultaneously braking the vehicle to approx. 60 km/h.
- Specification: (Relative pressure) 0,60 ... 0,83 bar
- If the specifications are not achieved, renew turbocharger.
- If the boost pressure is too high and if the control pipe to wastegate is not blocked, loose or leaking, then also replace turbocharger as the boost pressure regulator is defective.

1.8 - Checking pressure unit for charge pressure regulating valve



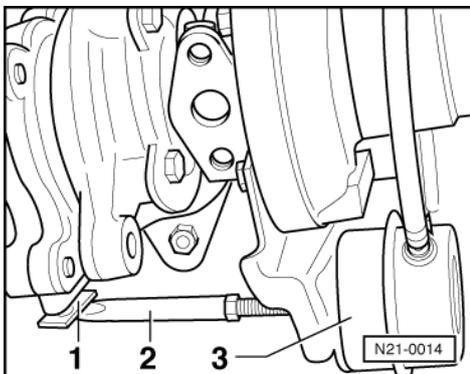
Engine codes 1Z, AHU, ALE

Check conditions

- Engine oil temperature min. 80 °C

Test sequence

- -> Pull connector -arrow- off charge pressure limitation solenoid valve (N75).



- -> Start engine and raise to maximum speed briefly by operating throttle. The operating rod -2- for charge pressure regulating valve must



move.

If the operating rod does not move:

- Check charge pressure regulating valve lever -1- for ease of movement. When corroded together, renew turbocharger.

If the operating rod does not move, even though the lever is free to move:

- Renew pressure unit for charge pressure regulating valve -3-.

1.9 - Removing and installing pressure unit for charge pressure regulating valve

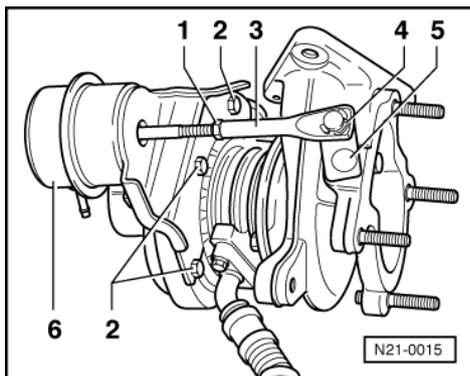
Engine codes 1Z, AHU, ALE

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ♦ V.A.G 1331 Torque wrench (5...50 Nm)

Removing

- Remove turbocharger => Page 135 .



- -> Unclip securing clip -4-.
- Remove securing bolts -2-.
- Take pressure unit -6- off.

Installing

- Install pressure unit -6- on turbocharger and tighten to 10 Nm.
Install securing bolts -2- with D 6.
- Loosen operating rod -3- lock nut -1-.
- Swing charge pressure regulating valve lever -5- in towards pressure unit onto stop and hold.
- Adjust rod length -3- so that the rod eye will fit easily on lever pin -5-. (Lever lies against stop with no play).
- From this position, turn operating rod in 8 full turns
(Rod shortens).
- Tighten lock nut -1-.
- Fit operating rod on to lever and install securing clip -4-.
- Install turbocharger => Page 135 .



26 - Exhaust system

1 - Removing and installing parts of exhaust system, front wheel drive

1.1 - Removing and installing parts of exhaust system, front wheel drive

Exhaust system engine codes:

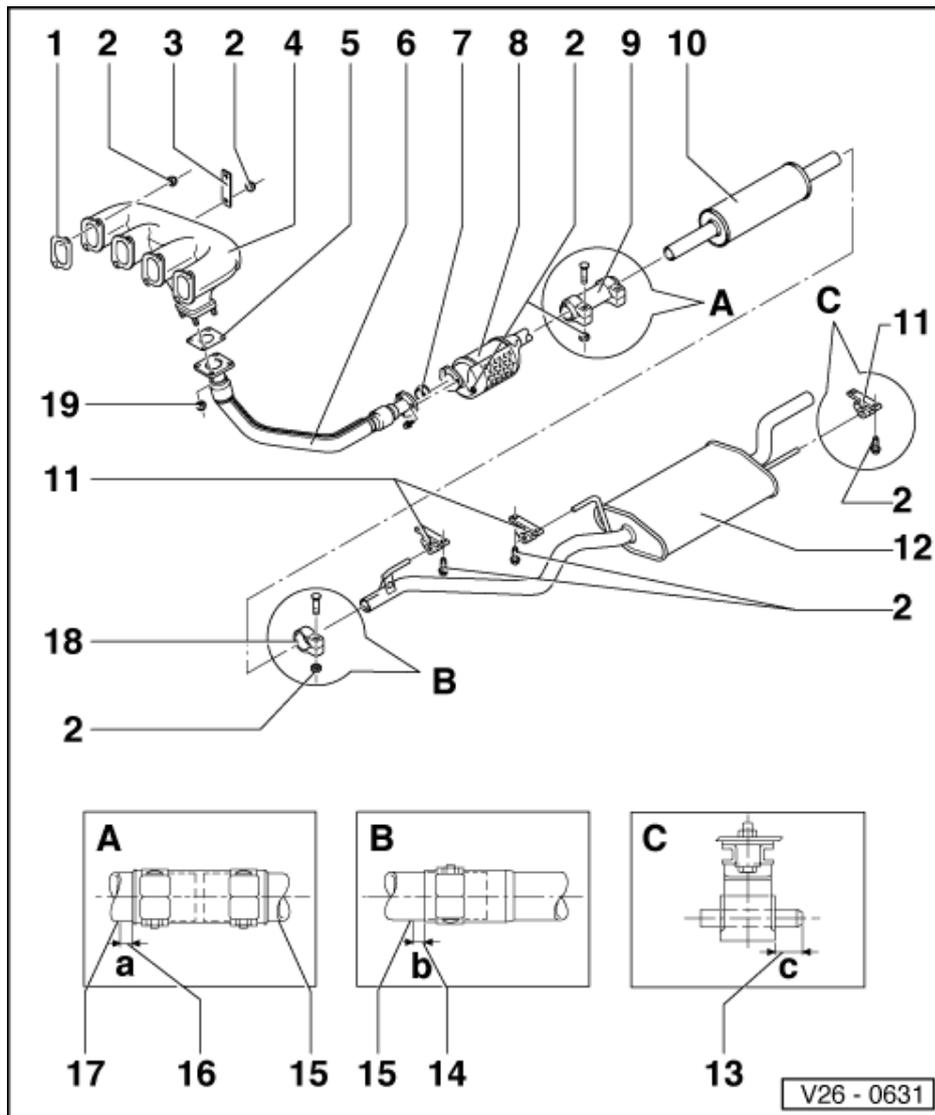
- ◆ 1Y => Page 145
- ◆ 1Z, AHU, AEY, AFN, AVG, ALE => Page 147
- ◆ AAZ => Page 153

Notes:

- ◆ Removing and installing exhaust manifold for engine codes 1Z, AHU, AAZ, AFN, AVG, ALE =>Page 120 , removing and installing turbocharger with attachments.
- ◆ After working on the exhaust system ensure that the system is not under stress, and that it has sufficient clearance from the bodywork. If necessary, loosen double and single clamps and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.
- ◆ Renew self-locking nuts.



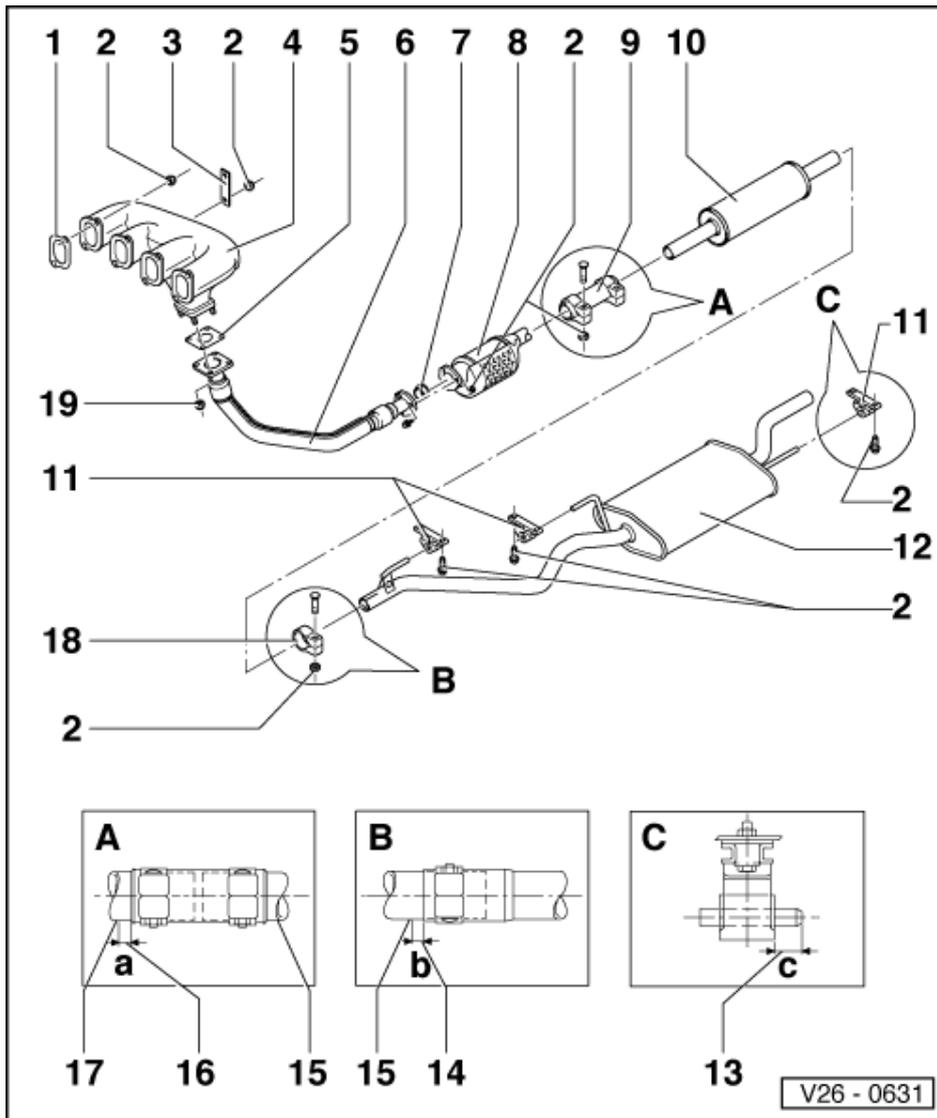
1.2 - Engine code 1Y



Note:

The exhaust system is to be aligned longitudinally so that the dimensions -13-, -14- and -16- are adhered to.

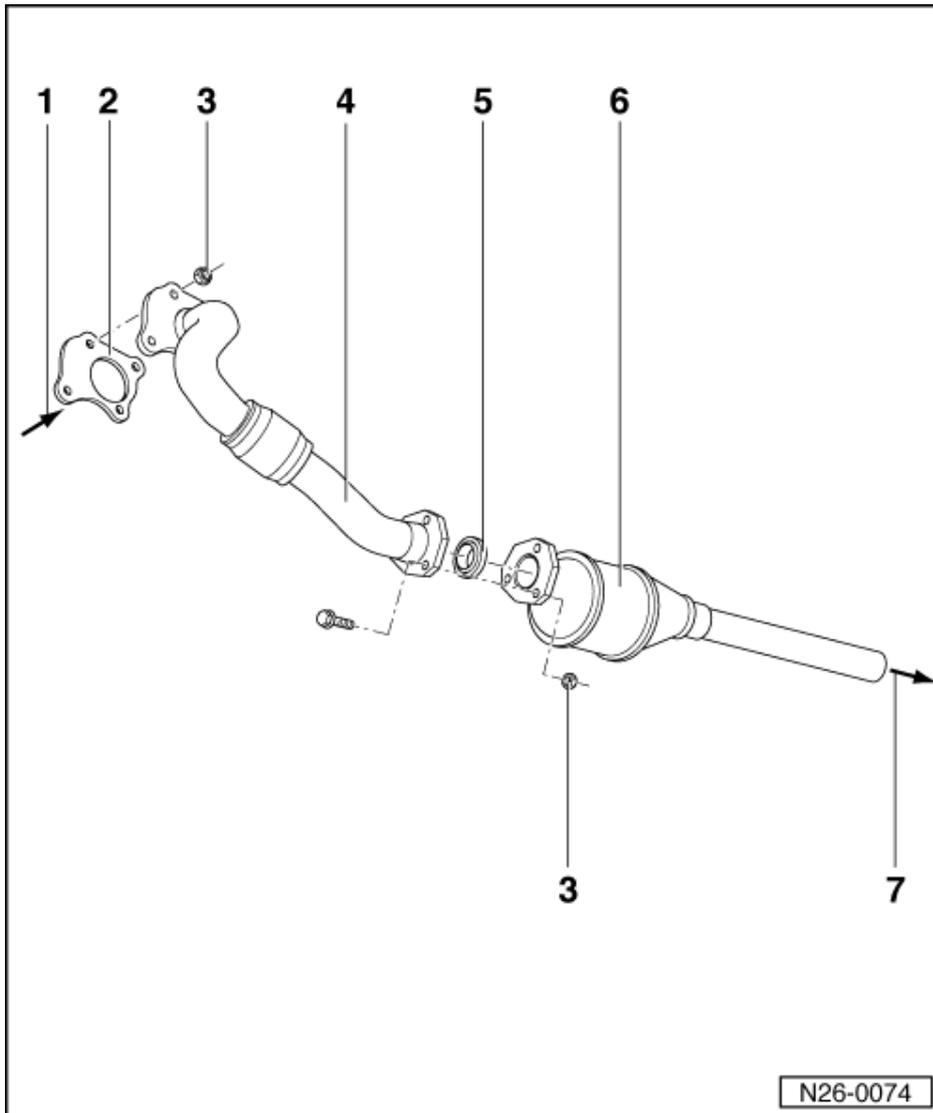
- 1 Gasket
 - ◆ Renew
- 2 25 Nm
- 3 Bracket
- 4 Exhaust manifold
- 5 Gasket
 - ◆ Renew
- 6 Front exhaust pipe
- 7 Sealing ring
 - ◆ Renew if damaged



- 8 Catalyst
- 9 Double clamp
- 10 Front silencer
- 11 Mounting
- 12 Rear silencer
- 13 Dimension -c- = at least 10 mm
- 14 Dimension -b- = approx. 5 mm
- 15 Marking
- 16 Dimension-a- = ca. 5 mm
- 17 Marking
 - ◆ S = Manual gearbox
- 18 Clamp
- 19 40 Nm



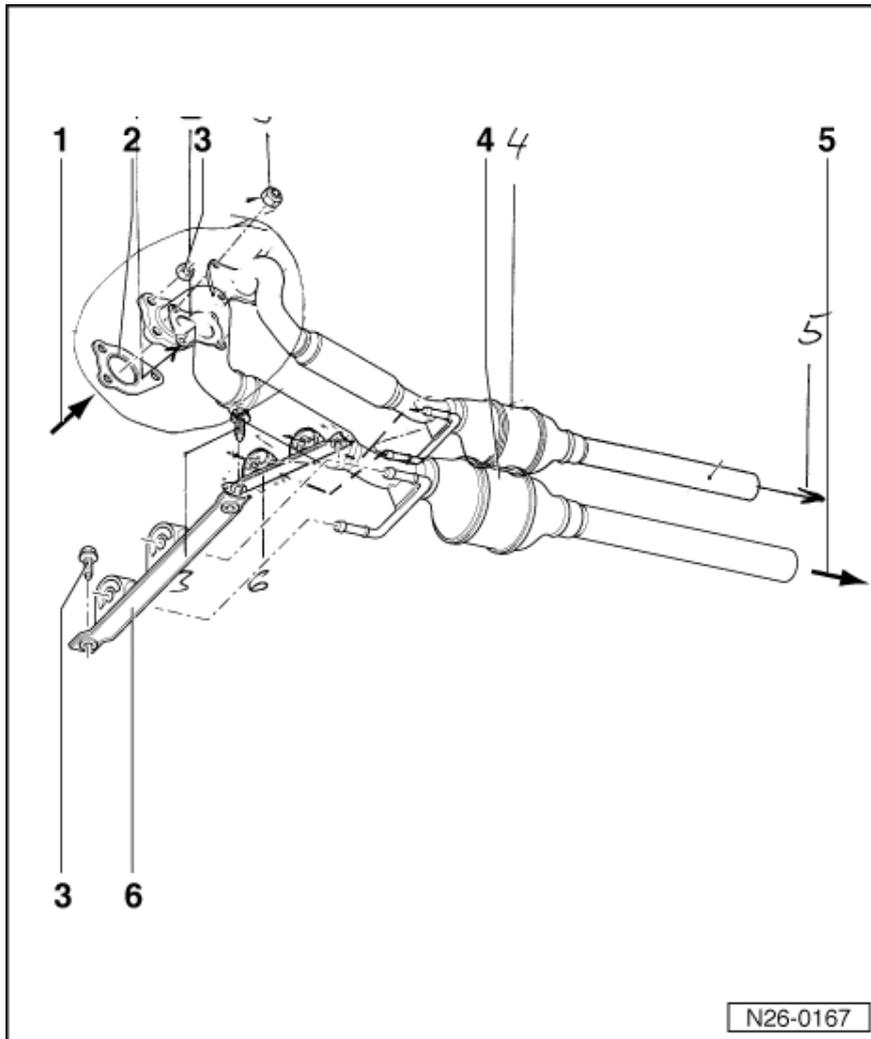
1.3 - Front exhaust pipe and catalyst with attachments, engine codes 1Z, AHU, ALE



- 1 From turbocharger
- 2 Gasket
 - ◆ Renew
- 3 25 Nm
- 4 Front exhaust pipe
- 5 Sealing ring
 - ◆ Renew if damaged
- 6 Catalyst
- 7 To intermediate pipe
 - ◆ => Page 150 , Item 2



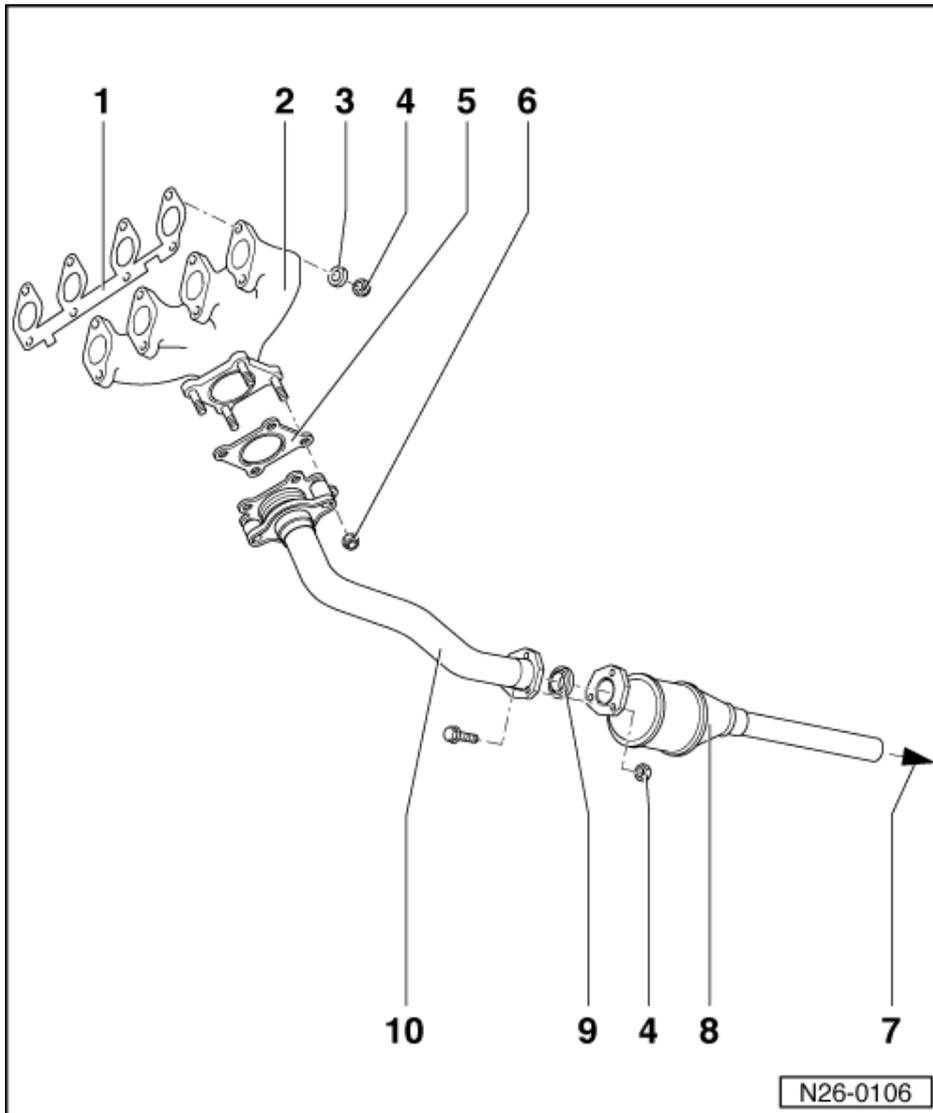
1.4 - Front exhaust pipe and catalyst with attachments, engine codes AFN, AVG



- 1 From turbocharger
- 2 Gasket
 - ◆ Renew
- 3 25 Nm
- 4 Catalyst
- 5 To intermediate pipe
 - ◆ => Page 150 , Item 2
- 6 Mounting



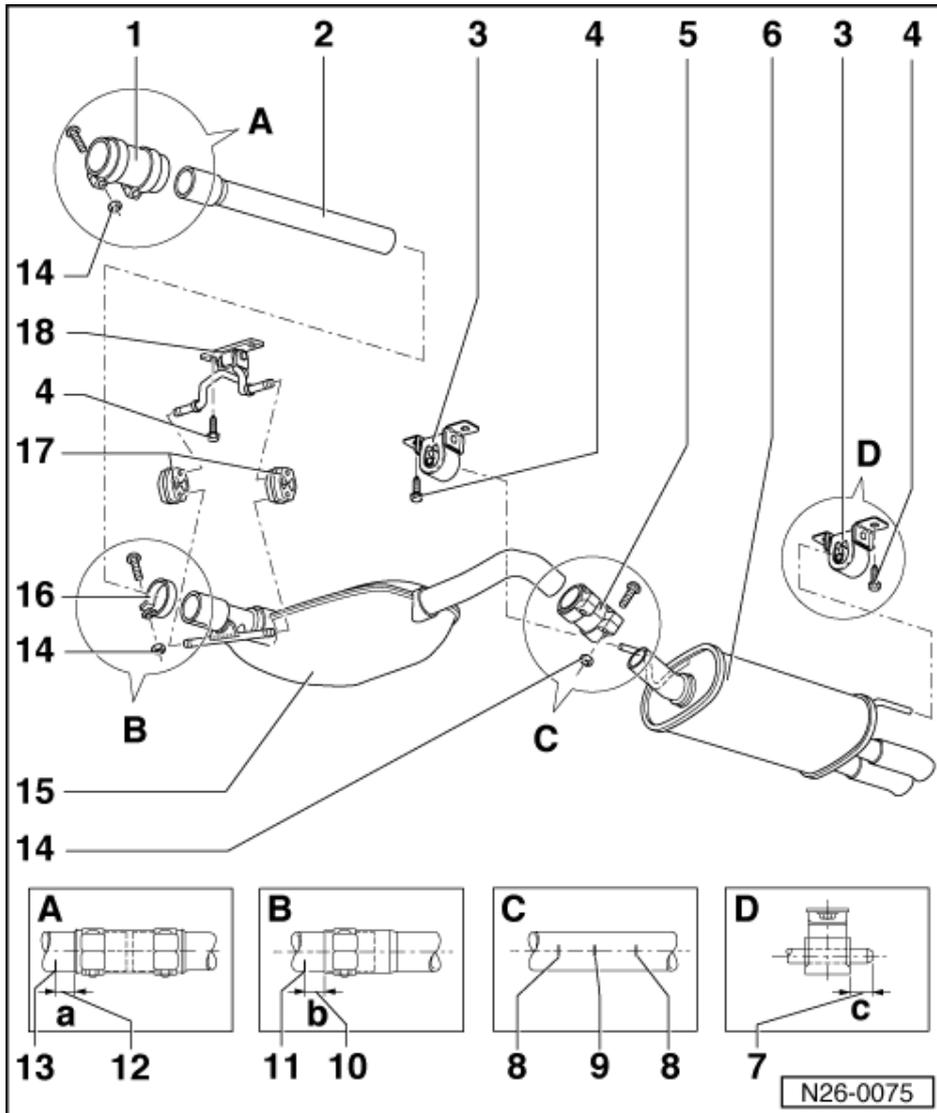
1.5 - Exhaust manifold, front exhaust pipe and catalyst with attachments, engine code AEY



- 1 Gasket
 - ◆ Renew
- 2 Exhaust manifold
- 3 Washer
- 4 25 Nm
- 5 Gasket
 - ◆ Renew
- 6 40 Nm
- 7 To intermediate pipe
 - ◆ => Page 150 , Item 2
- 8 Catalyst
- 9 Sealing ring
 - ◆ Renew if damaged
- 10 Front exhaust pipe

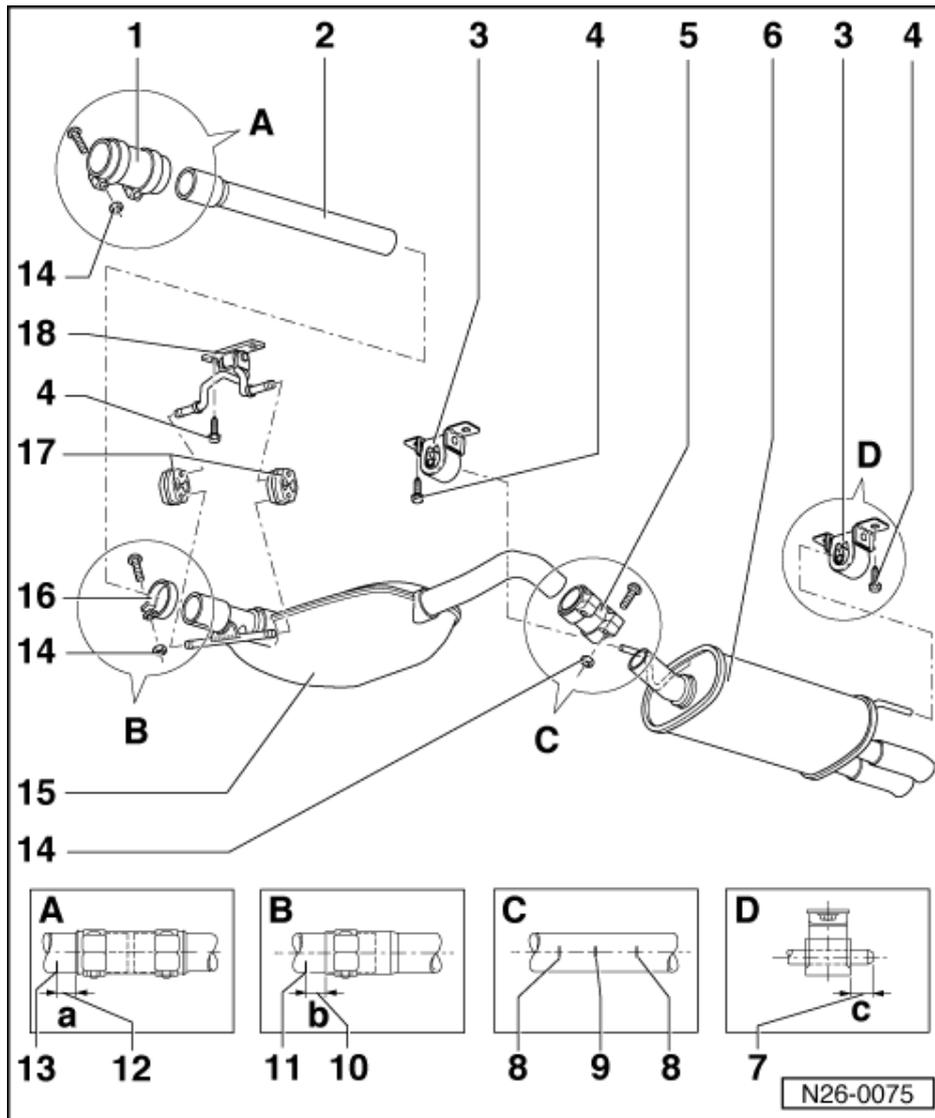


1.6 - Silencer with mountings, engine codes 1Z, AEY, AFN, AVG, AHU, ALE



- 1 Double clamp
- 2 Intermediate pipe
- 3 Mounting
- 4 25 Nm
- 5 Double clamp
- 6 Rear silencer
- 7 Dimension -c- = approx. 10 mm
- 8 Marking
 - ◆ For clamp
 - ◆ Three times on circumference

Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>



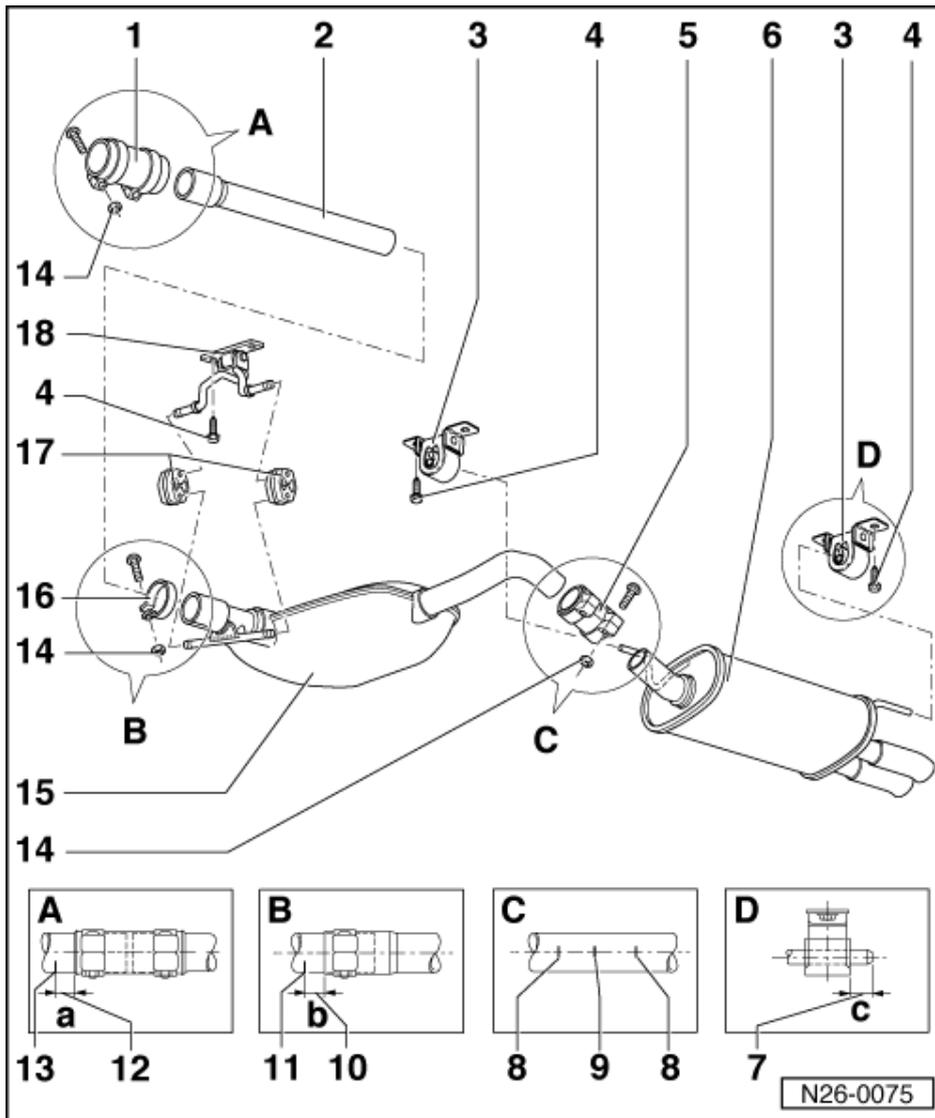
9 Separating point

- ◆ For repair cases
- ◆ When replacing central silencer
- ◆ Marked by three impressions on circumference of connecting pipe
- ◆ As standard central and rear silencers are installed as a single component. In repair cases the central and rear silencer are supplied individually and a double clamp -5- supplied as joint. Slide double clamp on to align with markings - 8 -
- ◆ Cut through connecting pipe with body saw e.g. V.A.G 1523 at right angles at the separating point.

10 Dimension-b- = ca. 5 mm

11 Marking

- ◆ Three times on circumference



12 Dimension-a- = ca. 5 mm

13 Marking

- ◆ S = Manual gearbox
- ◆ A = Automatic gearbox

14 40 Nm

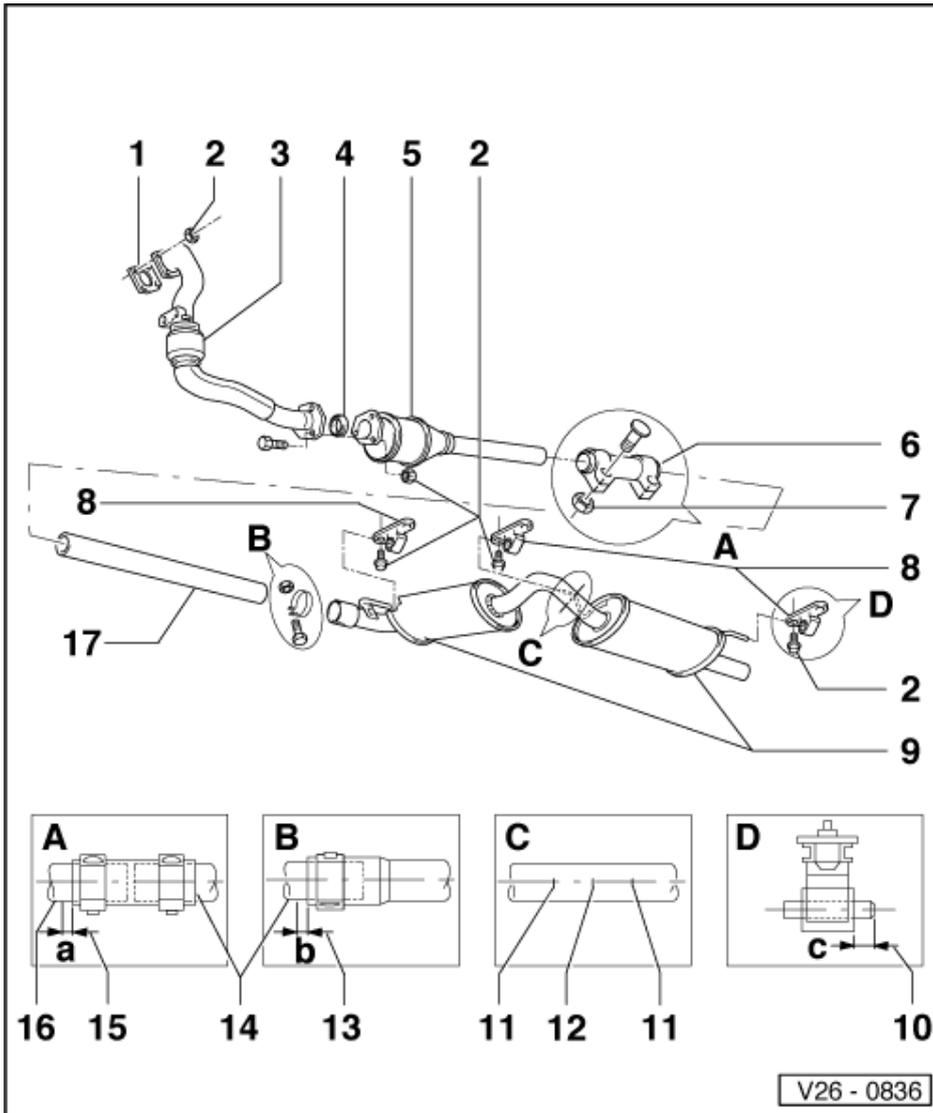
15 Centre silencer

16 Clamp

17 Support ring

18 Mounting

- ◆ Note fitting position



9 Centre and rear silencer

- ◆ In cases of repair renew individually, to do this cut through connecting pipe with a body saw e.g. V.A.G 1523 at right angles at the separating point - 12 -. Join centre and rear silencer with a repair double clamp, to do this push double camp on flush with the marking - 11 - .

10 Dimension -c- = at least 10 mm

11 Marking

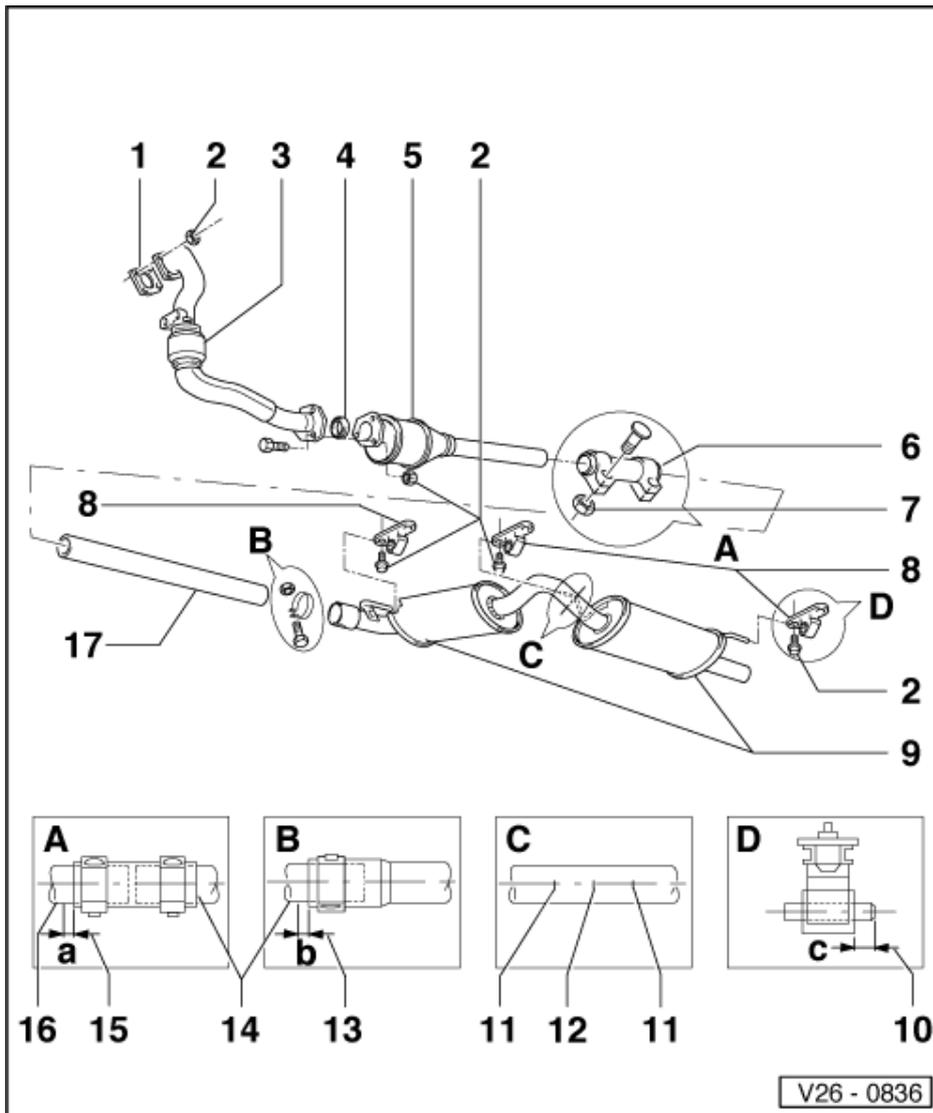
- ◆ For repair double clamp
- ◆ Three times on circumference

12 Separating point

13 Dimension -b- = approx. 5 mm

14 Marking

- ◆ Three times on circumference



15 Dimension-a- = ca. 5 mm

16 Marking

- ◆ S = Manual gearbox
- ◆ A = Automatic gearbox

17 Intermediate pipe

2 - Removing and installing parts of exhaust system, four wheel drive

2.1 - Removing and installing parts of exhaust system, four wheel drive

(Engine codes 1Z, AHU, ALE)

Front exhaust pipe and catalyst with attachments =>Page 156 .

Silencer with mountings =>Page 158 .

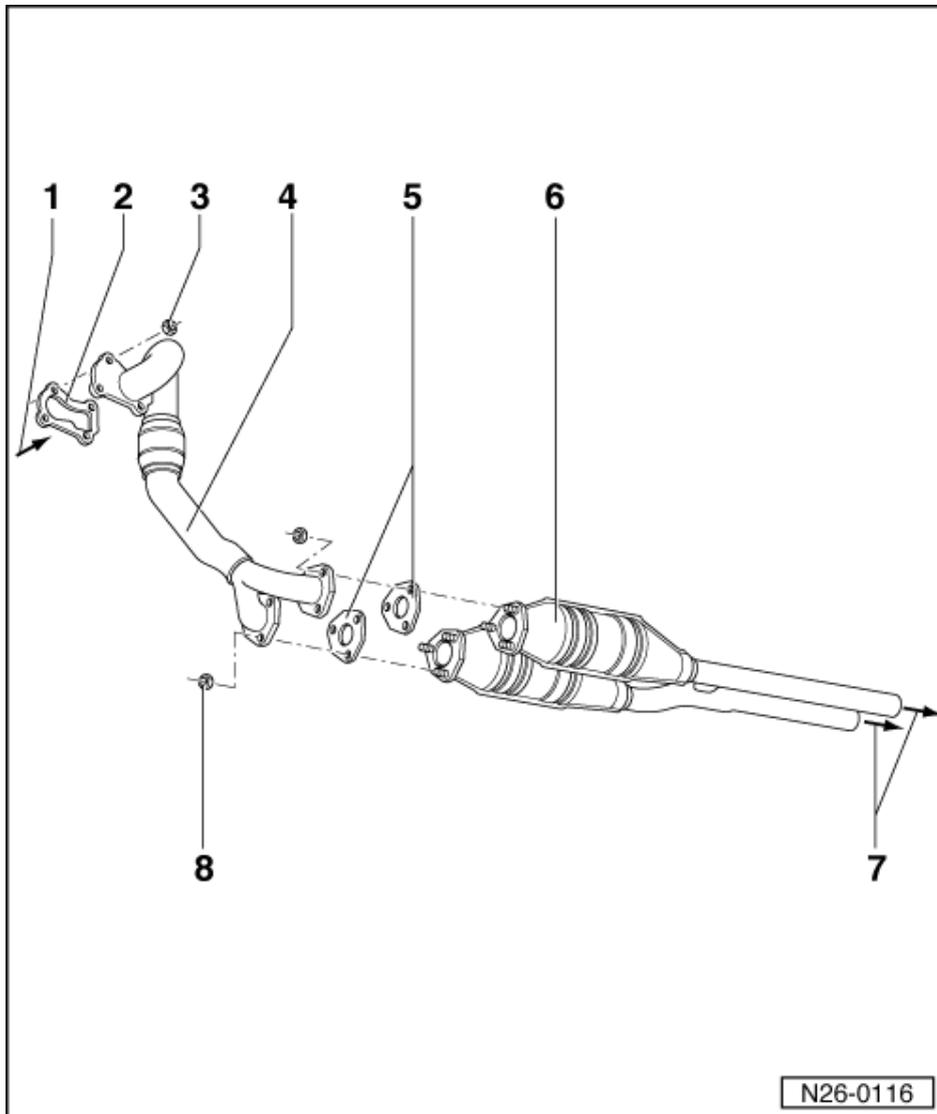
Notes:

- ◆ Removing and installing exhaust manifold =>Page 120 , removing and installing turbocharger with attachments.

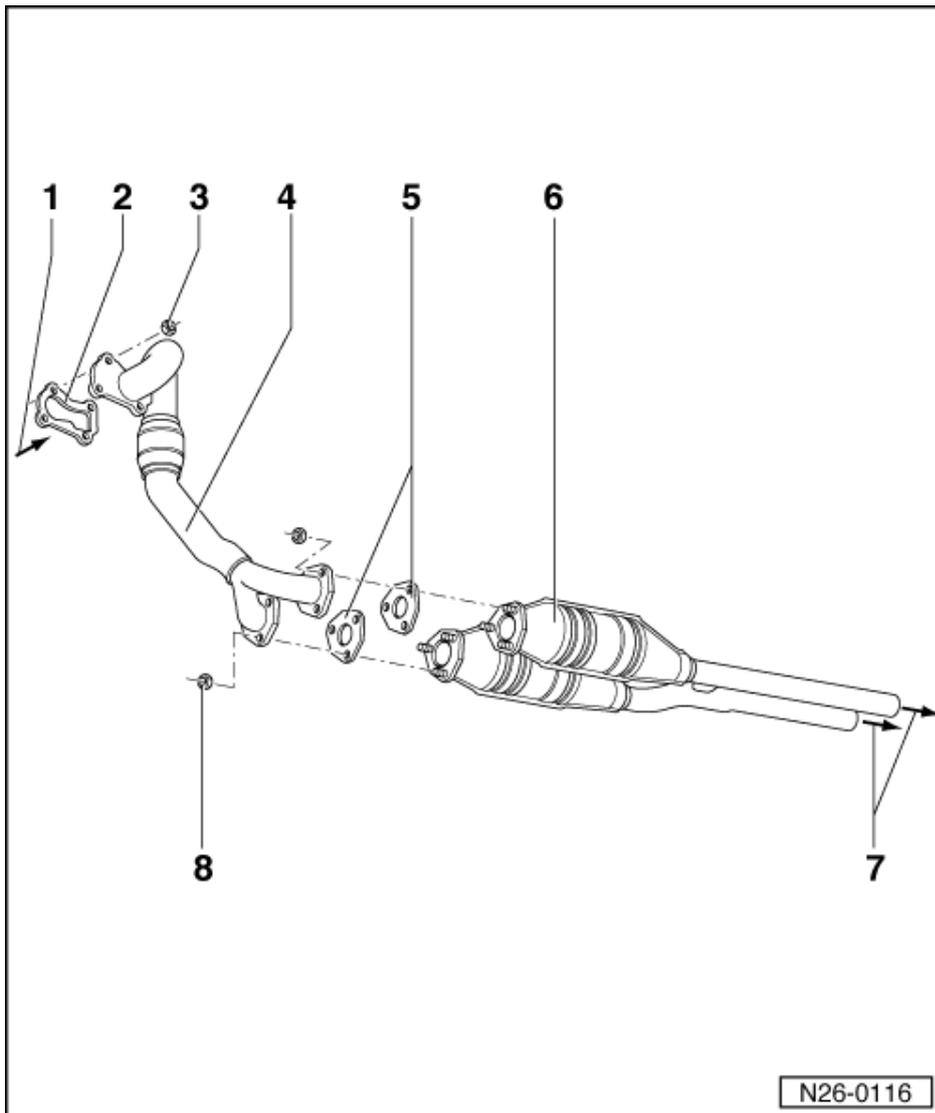


- ◆ After working on the exhaust system ensure that the system is not under stress, and that it has sufficient clearance to the bodywork. If necessary, loosen double clamps and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.
- ◆ Renew self-locking nuts.

2.2 - Front exhaust pipe and catalyst with attachments



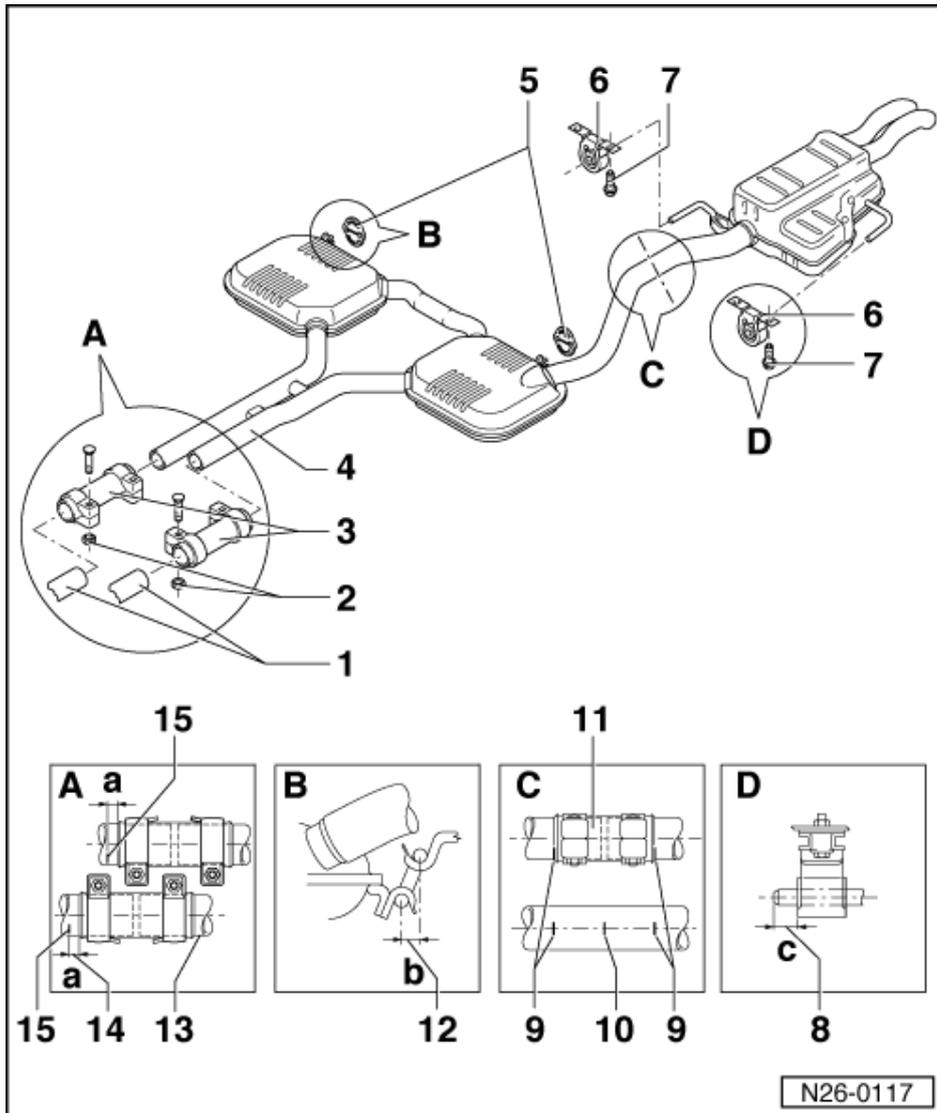
- 1 From turbocharger
- 2 Gasket
 - ◆ Renew
- 3 40 Nm
- 4 Front exhaust pipe
 - ◆ To remove:
 - Remove charge air cooling connecting pipe, remove exhaust gas recirculation valve with connecting pipe and remove oil supply pipe for turbocharger
 - Unbolt exhaust pipe at double catalyst and turbocharger and guide out upwards
- 5 Gasket
 - ◆ Renew
- 6 Catalyst



- 7 To centre and rear silencer
♦ => Page 158 , Item 4
- 8 25 Nm



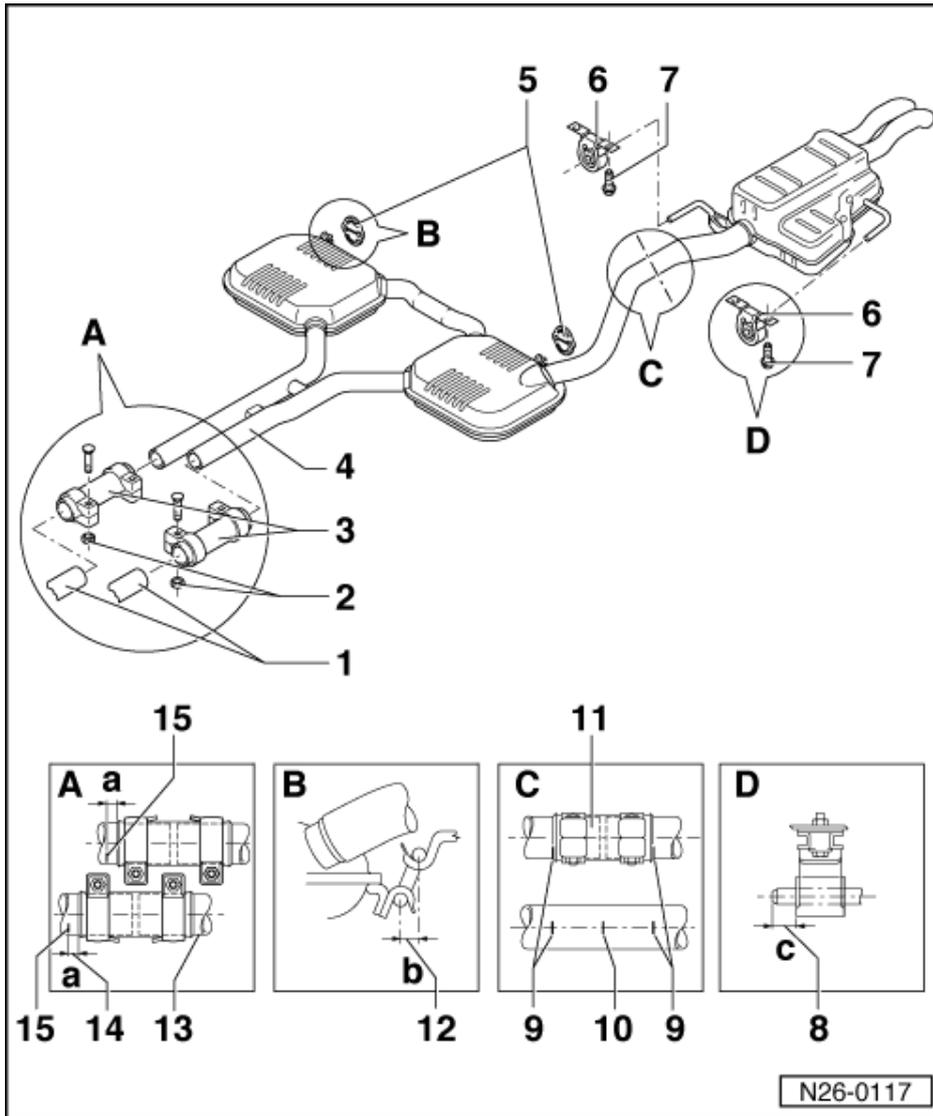
2.3 - Silencer with mountings



Note:

Align the exhaust system longitudinally so that the dimensions -a-, -b- and -c- are maintained.

- 1 From catalyst
- 2 25 Nm
- 3 Double clamp
- 4 Centre and rear silencer
 - ◆ In cases of repair renew individually
 - ◆ Removing and installing:
 - Cut through connecting pipe with body saw e.g. V.A.G 1523 at right angles at the separating point, Item 10.
 - Join front and rear silencer with a repair double clamp, Item 11 .



- 5 Support ring
- 6 Mounting
- 7 25 Nm
- 8 Dimension -c- = at least 10 mm
- 9 Marking
 - ♦ For repair double clamp
 - ♦ Three times on circumference
- 10 Separating point
- 11 Repair double clamp
- 12 Dimension -b- = approx. 10 mm
 - ♦ Pre-loading the support rings on centre silencer
- 13 To centre and rear silencer
- 14 Dimension-a- = approx. 5 mm
- 15 Marking
 - ♦ Two times on circumference of catalyst pipe



3 - Exhaust gas recirculation system, engine codes 1Y, AEY

3.1 - Exhaust gas recirculation system, engine codes 1Y, AEY

Engine code 1Y

Notes:

- ◆ The activation of the exhaust gas recirculation system is undertaken by automatic glow period control unit (J179) via exhaust gas recirculation 2-way valve (N161 or N18) to exhaust gas recirculation valve.
- ◆ The exhaust gas recirculation is switched off above approx. 1000 m by the altitude correction switch in the automatic glow period control unit.
- ◆ The engine speed cut-out is via the automatic glow period automatic control unit (J179). The exhaust gas recirculation is switched on at engine speeds over 800 rpm and is switched off at engine speeds over 3200 rpm.
- ◆ During acceleration the exhaust gas recirculation is switched off for 2 seconds.
- ◆ Renew self-locking nuts.

Engine code AEY

Notes:

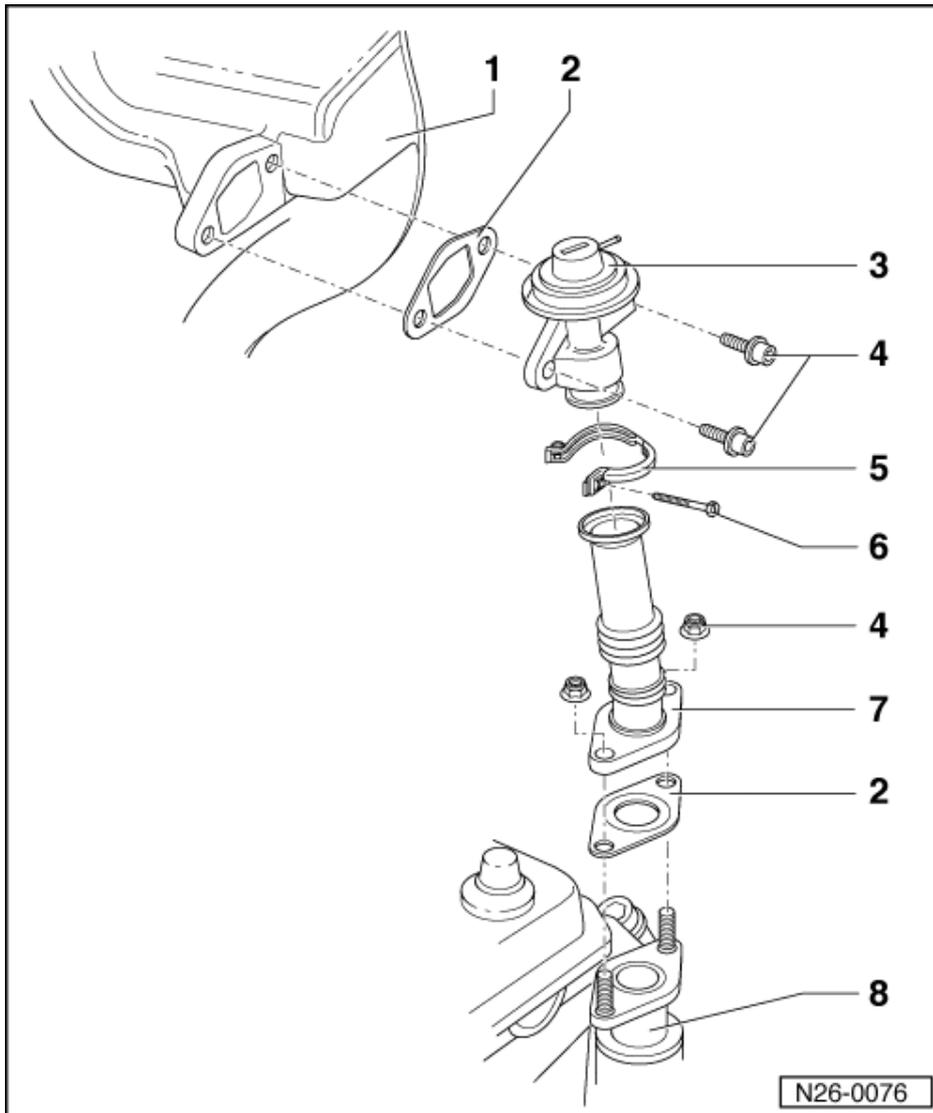
- ◆ The control of the exhaust gas recirculation system is undertaken by diesel direct injection system control unit (J248) via EGR valve (N18) (electric) to exhaust gas recirculation valve (mechanical).
- ◆ Checking exhaust gas recirculation valve (N18).

=> Repair group 01; Final control diagnosis; Performing final control diagnosis Final control diagnosis Performing final control diagnosis

- ◆ The cone-shaped plunger in the mechanical exhaust gas recirculation valve ensures that various cross sectional openings are possible at different plunger lifts.
- ◆ Pulsed control makes every conceivable valve position possible.
- ◆ Renew self-locking nuts.



3.2 - Removing and installing parts of exhaust gas recirculation system



- 1 Intake manifold
- 2 Gasket
 - ◆ Renew
- 3 Exhaust gas recirculation valve (mechanical)
 - ◆ Checking => Page 163
 - ◆ Checking activation

=> Repair group 01; Final control diagnosis; Performing final control diagnosis Final control diagnosis Performing final control diagnosis

- 4 25 Nm
- 5 Clamp
- 6 10 Nm
- 7 Connecting pipe
- 8 Exhaust manifold



3.3 - Checking exhaust gas recirculation

(Engine code 1Y)

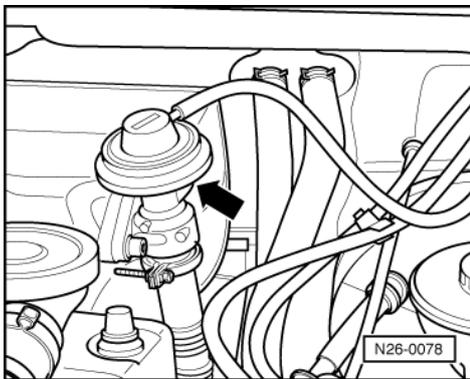
Check exhaust gas recirculation engine code AEY:

=> Repair group 23; Checking components and function; Checking exhaust gas recirculation and air mass meter function Checking components and function Checking exhaust gas recirculation and air mass meter function

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ♦ Diode test lamp V.A.G 1527
- ♦ Adapter set V.A.G 1594
- ♦ Current flow diagram

Functional check

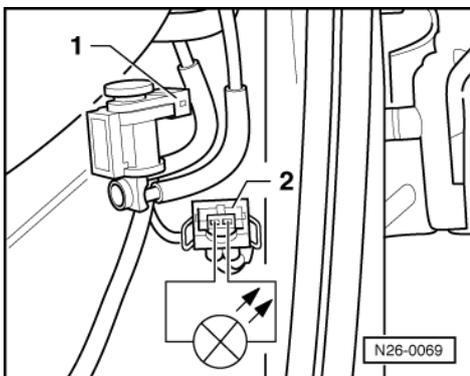


- Start engine and run at idling speed.
- -> Exhaust gas recirculation valve membrane is pulled towards vacuum hose connector (establish by feeling from below -arrow-). Exhaust gas is supplied.
- Increase engine speed to above 3200 rpm, the exhaust gas recirculation is switched off when exceeding 3200 rpm (membrane moves towards exhaust gas manifold).

If exhaust gas recirculation does not work as described:

Check exhaust gas recirculation two-way valve control as follows:

- Switch off ignition



- -> Pull 2 pin connector -2- off exhaust gas recirculation two-way valve (N161 or N18) -1-.
- Connect diode test lamp V.A.G 1527 using aux. cables from V.A.G 1594 to connector contacts.
- Start engine and run at idling speed.
LED must light up
- Increase speed to over 3200 rpm.



LED must go out

LED does not light up or go out as described:

- Check wiring according to current flow diagram, or renew automatic glow period control unit (J179) as necessary.

LED lights up and goes out as described:

- Check two-way valve => Page 163 .
- Check exhaust gas recirculation valve => Page 163 .

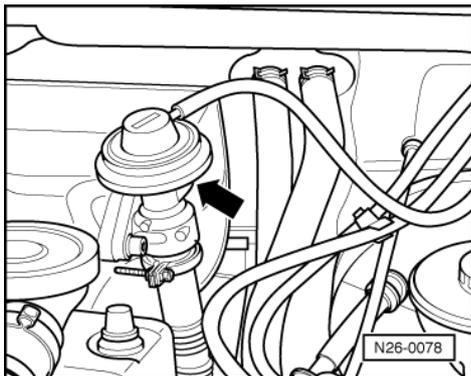
3.4 - Checking exhaust gas recirculation valve

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Hand vacuum pump V.A.G 1390

Test sequence

- Pull vacuum hose off (mechanical) exhaust gas recirculation valve.
- Connect hand vacuum pump V.A.G 1390 to valve.



- -> Operate pump.
Membrane must move in direction of vacuum connection (establish by feeling from below -arrow-).
- Pull hand vacuum pump hose off (mechanical) exhaust gas recirculation valve.
The valve must clearly be heard to close (membrane moves in direction of exhaust manifold).

3.5 - Checking two-way valve

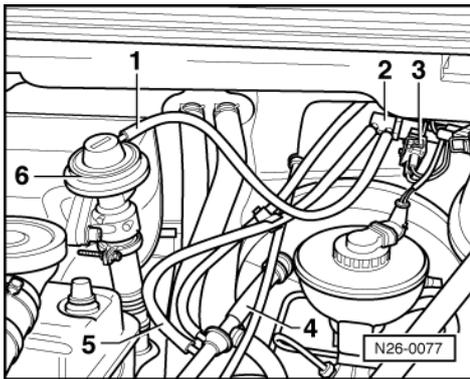
(Engine code 1Y)

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Hand vacuum pump V.A.G 1390



Test sequence



- -> Pull vacuum hose -5- off vacuum line -4- and connect hand vacuum pump V.A.G 1390 to vacuum hose.
- Pull vacuum hose -1- off (mechanical) exhaust gas recirculation valve.
- Pull 2 pin connector -3- off exhaust gas recirculation two-way valve (N161 or N18) -2-.
- Start engine and run at idling speed.
- Operate hand vacuum pump.
A vacuum must build up.
- Fit 2 pin connector -3- on exhaust gas recirculation two-way valve -2-. Vacuum at hand vacuum pump must release rapidly.

4 - Exhaust gas recirculation system, engine codes AFN, AVG, AHU, ALE, 1Z

4.1 - Exhaust gas recirculation system, engine codes AFN, AVG, AHU, ALE, 1Z

Notes:

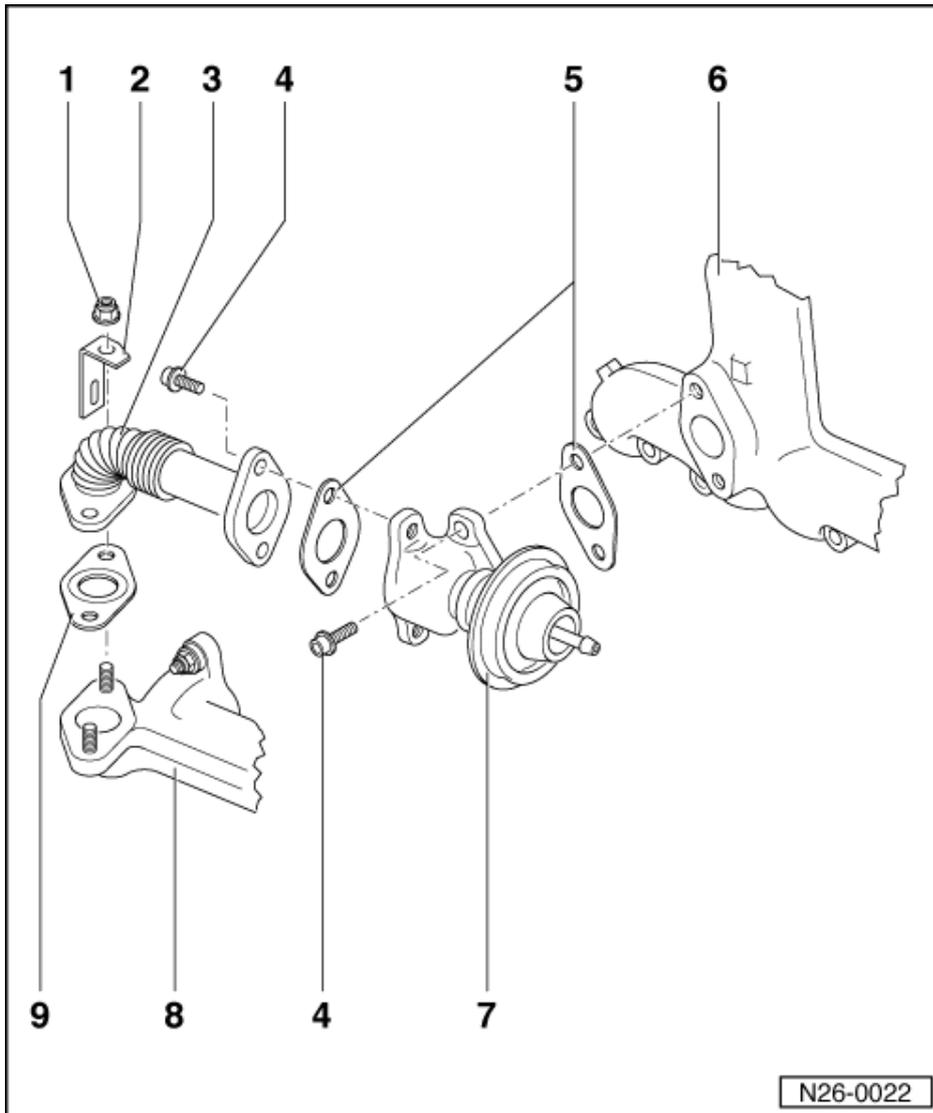
- ♦ The control of the exhaust gas recirculation system is undertaken by diesel direct injection system control unit (J248) via EGR valve (N18) (electric) to exhaust gas recirculation valve (mechanical).
- ♦ Checking exhaust gas recirculation valve (N18).

=> Repair group 01; Final control diagnosis; Performing final control diagnosis Final control diagnosis Performing final control diagnosis

- ♦ The cone-shaped plunger in the mechanical exhaust gas recirculation valve ensures that various cross sectional openings are possible at different plunger lifts.
- ♦ Pulsed control makes every conceivable valve position possible.
- ♦ Renew self-locking nuts.

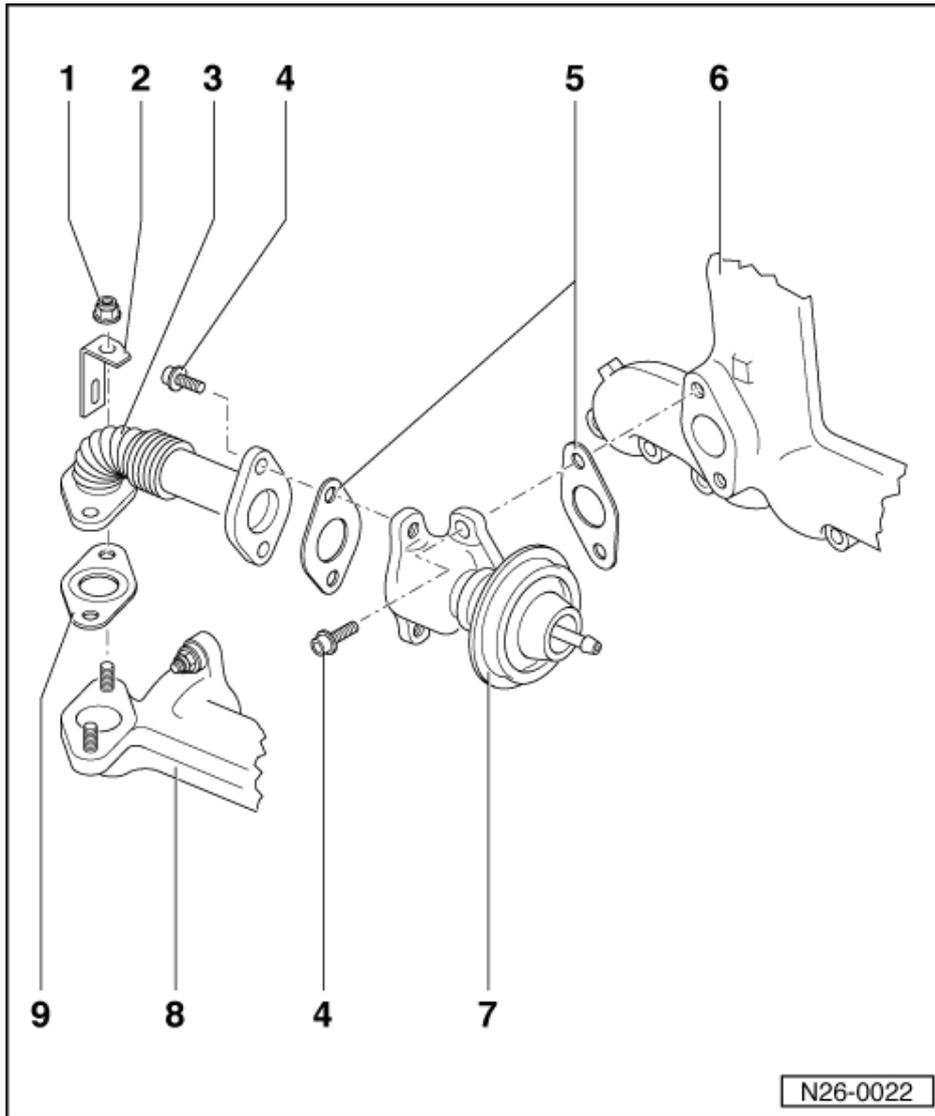


4.2 - Removing and installing parts of exhaust gas recirculation system



Engine codes AHU, 1Z

- 1 25 Nm
- 2 **Bracket**
 - ◆ For turbocharger oil supply pipe
- 3 **Connecting pipe**
 - ◆ When installing, just nip all bolts (parts must be just free to move), then tighten stress free
- 4 25 Nm
- 5 **Gasket**
 - ◆ Renew
- 6 **Intake manifold**



7 Exhaust gas recirculation valve (mechanical)

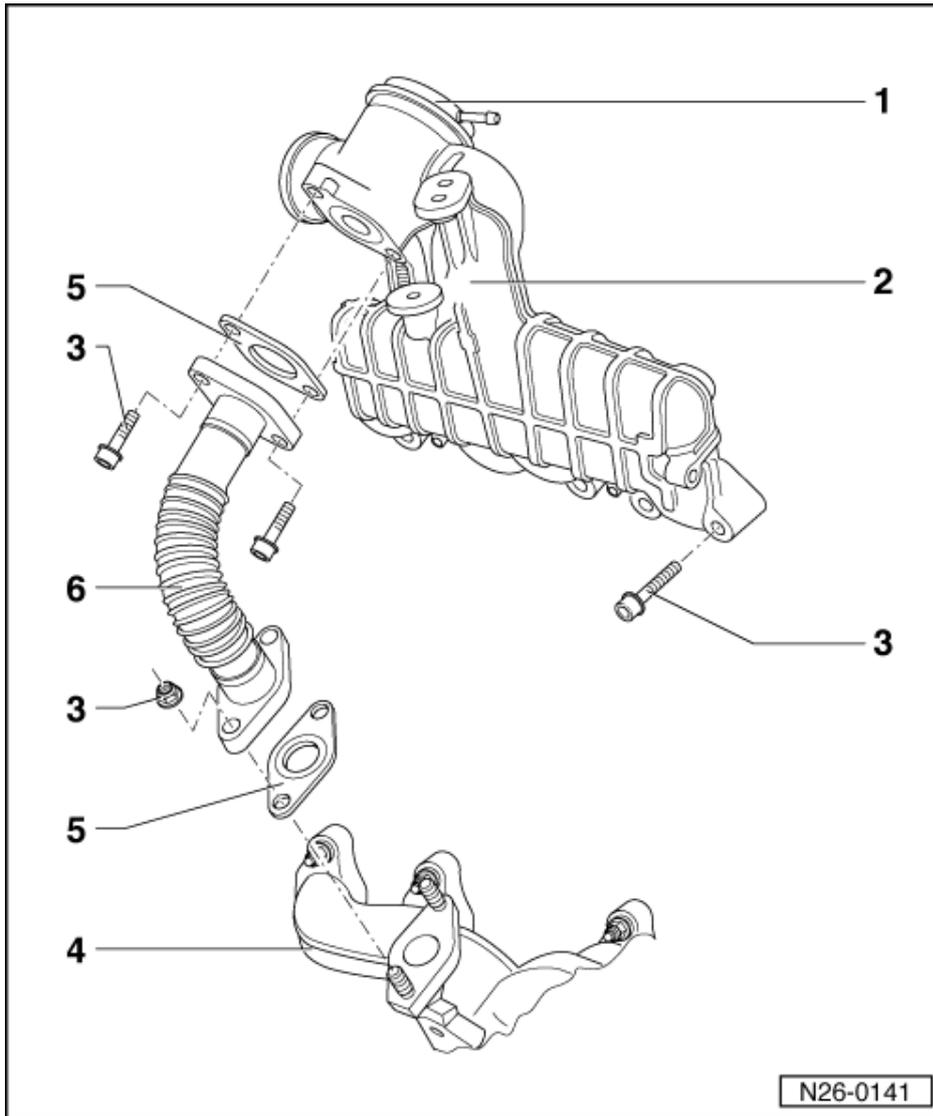
- ◆ Checking => Page 170
- ◆ Checking activation

=> Repair group 01; Final control diagnosis; Performing final control diagnosis Final control diagnosis Performing final control diagnosis

8 Exhaust manifold

9 Gasket

- ◆ Renew



Engine codes AFN, AVG, ALE

1 Exhaust gas recirculation valve

- ◆ Integral part of intake manifold cannot be replaced
- ◆ Checking => Page 170
- ◆ Checking activation

=> Repair group 01; Final control diagnosis; Performing final control diagnosis Final control diagnosis Performing final control diagnosis

2 Intake manifold

- ◆ With exhaust gas recirculation valve

3 25 Nm

4 Exhaust manifold

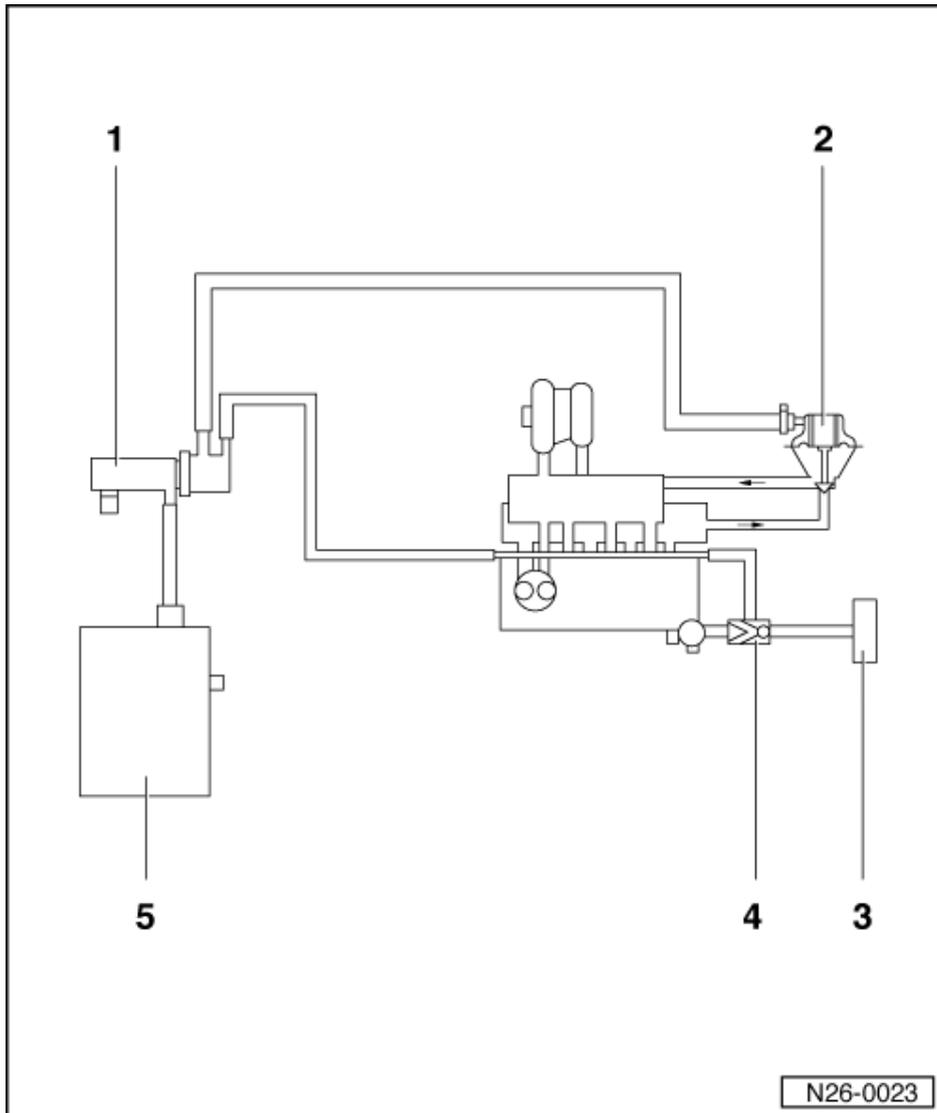
5 Gasket

- ◆ Renew

6 Connecting pipe

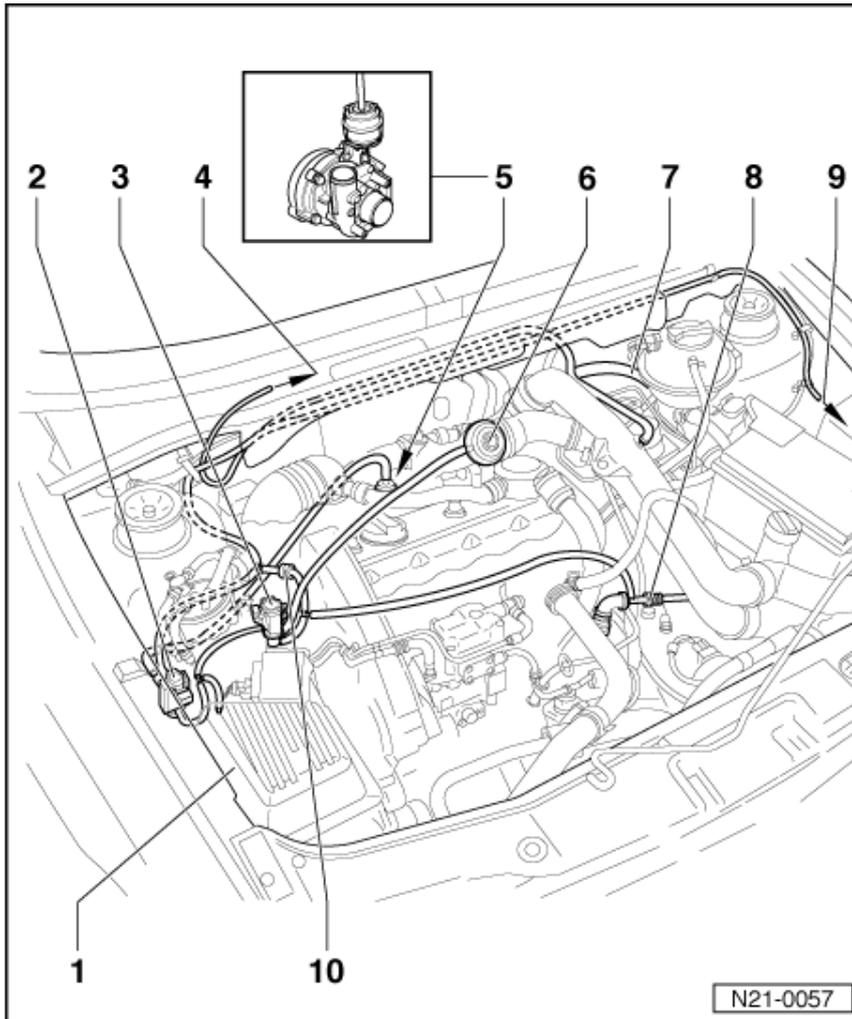


4.3 - Vacuum hose connection diagram



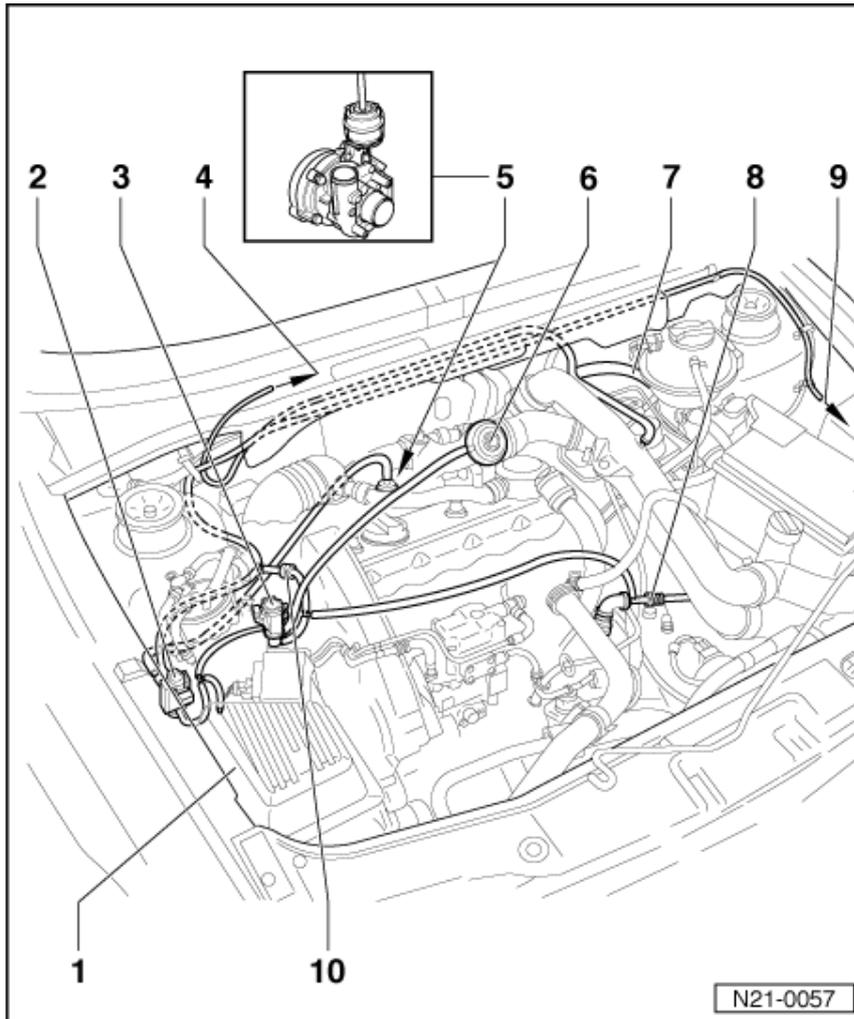
Engine codes AHU, ALE, 1Z

- 1 Exhaust gas recirculation valve (N18)
- 2 Exhaust gas recirculation valve (mechanical)
- 3 Brake servo
- 4 Non-return valve
- 5 Air cleaner



Engine codes AFN, AVG

- 1 Air cleaner
- 2 Solenoid valve for charge pressure control (N75)
- 3 Exhaust gas recirculation valve (N18)
- 4 To Diesel direct injection system control unit (J248)
- 5 Pressure unit
 - ◆ For charge pressure control
- 6 Exhaust gas recirculation valve (mechanical)
- 7 Brake servo
- 8 Non-return valve



9 To vacuum reservoir

- ◆ In wheel housing

10 Non-return valve

- ◆ White connection to charge pressure control solenoid valve -item **2** - and to vacuum reservoir

4.4 - Checking exhaust gas recirculation valve (mechanical)

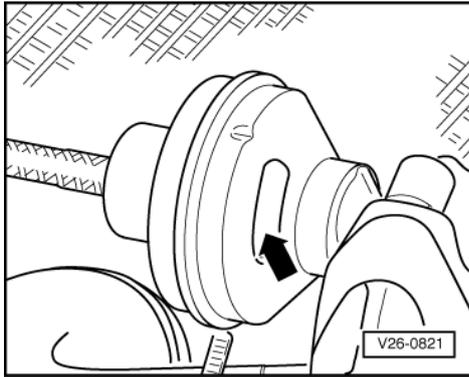
Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Hand vacuum pump V.A.G 1390

Engine codes AHU, 1Z

Test sequence

- Pull vacuum hose off (mechanical) exhaust gas recirculation valve.
- Connect hand vacuum pump V.A.G 1390 to valve.

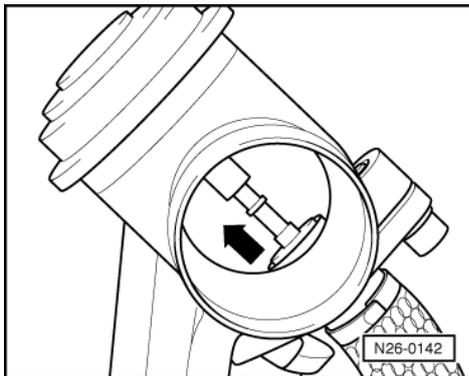


- -> Operate pump.
The membrane rod must move towards vacuum connection (observe membrane rod via opening -arrow-).
- Pull hand vacuum pump hose of exhaust gas recirculation valve.
The valve must clearly heard to close (membrane rod moves towards intake manifold).

Engine codes AFN, AVG, ALE

Test sequence

- Remove charge air cooler/intake manifold pressure pipe.
- Pull vacuum hose off (mechanical) exhaust gas recirculation valve.
- Connect hand vacuum pump V.A.G 1390 to valve.



- -> Operate pump and observe membrane rod.
The membrane rod must move in direction of arrow.
- Pull hand vacuum pump hose off exhaust gas recirculation valve.
The membrane rod must move back against the direction of arrow to its original position.

5 - Exhaust gas recirculation system, engine code AAZ

5.1 - Exhaust gas recirculation system, engine code AAZ

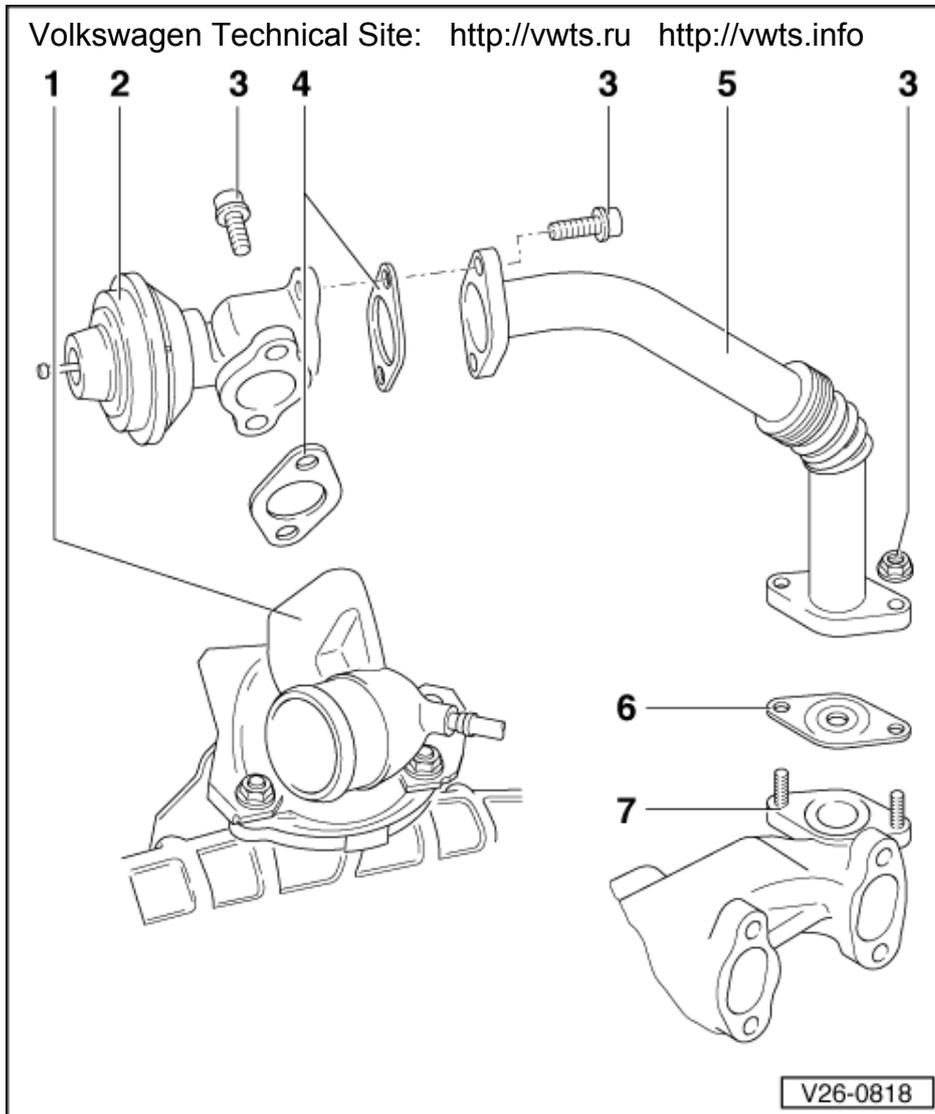
Notes:

- ◆ The activation of the exhaust gas recirculation system is undertaken by automatic glow period control unit (J179) via exhaust gas recirculation two-way valve (N161 or N18) to exhaust gas recirculation valve.
- ◆ The exhaust gas recirculation is switched off above approx. 1000 m by the altitude correction switch in the automatic glow period control unit.



- ◆ Depending on load the exhaust gas recirculation is switched off by automatic glow period control unit (J179) at engine speeds above 3200 rpm.
- ◆ During acceleration the exhaust gas recirculation is switched off for 2 seconds.
- ◆ Renew self-locking nuts.

5.2 - Removing and installing parts of exhaust gas recirculation system



- 1 Intake manifold
- 2 Exhaust gas recirculation valve (mechanical)
 - ◆ Checking => Page 173
- 3 25 Nm
- 4 Gasket
 - ◆ Renew
- 5 Connecting pipe
- 6 Gasket
 - ◆ Renew
 - ◆ Restriction hole 9 mm \varnothing
- 7 Exhaust manifold



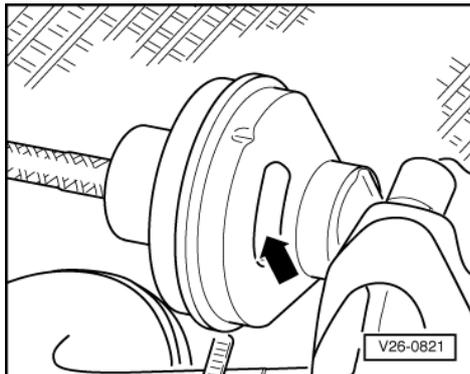
5.3 - Checking exhaust gas recirculation

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Diode test lamp V.A.G 1527
- ◆ Adapter set V.A.G 1594
- ◆ Current flow diagram

Functional check

- Start engine and run at idling speed.

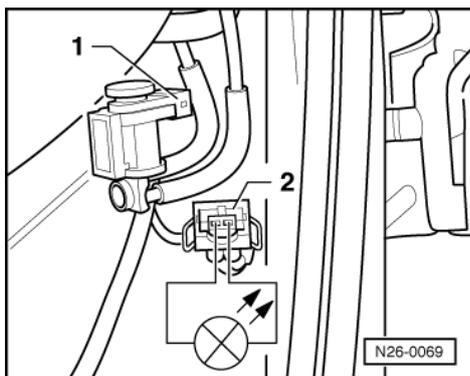


- -> Exhaust gas recirculation valve membrane rod is pulled towards vacuum hose connector (observe membrane rod through opening -arrow-). Exhaust gas is supplied.
- Increase engine speed to above 3200 rpm. The exhaust gas recirculation is switched off when 3200 rpm is exceeded (membrane moves towards exhaust gas manifold).

If exhaust gas recirculation does not work as described:

Check exhaust gas recirculation two-way valve control as follows:

- Switch off ignition



- -> Pull 2 pin connector -2- off exhaust gas recirculation two-way valve (N161 or N18) -1-.
- Connect diode test lamp V.A.G 1527 using aux. cables from V.A.G 1594 to connector contacts.
- Start engine and run at idling speed.
LED must light up
- Increase speed to over 3200 rpm.
LED must go out

LED does not light up or go out as described:

- Check wiring according to current flow diagram, or renew automatic glow period control unit (J179) as necessary.



LED lights up and goes out as described:

- Check two-way valve => Page 174 .
- Check exhaust gas recirculation valve => Page 174 .

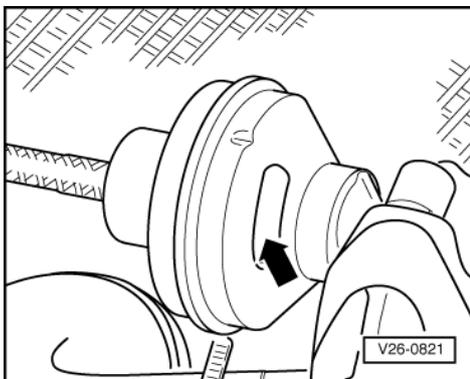
5.4 - Checking exhaust gas recirculation valve

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Hand vacuum pump V.A.G 1390

Test sequence

- Pull vacuum hose off (mechanical) exhaust gas recirculation valve.
- Connect hand vacuum pump V.A.G 1390 to valve.



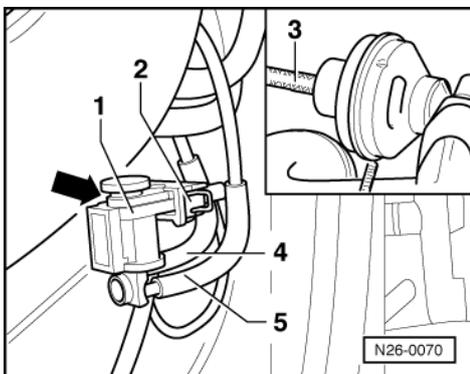
- -> Operate pump.
Membrane rod must move towards vacuum connection (observe membrane rod through opening -arrow-).
- Pull vacuum pump hose off exhaust gas recirculation valve.
The valve must clearly be heard to close (membrane rod moves towards intake manifold).

5.5 - Checking two-way valve

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ◆ Hand vacuum pump V.A.G 1390

Test sequence



- -> Pull vacuum hose -5- off vacuum pipe to vacuum pump and connect hand vacuum pump V.A.G 1390 to vacuum hose.



- Pull vacuum hose -3- off exhaust gas recirculation valve.
- Pull 2 pin connector -2- off exhaust gas recirculation two-way valve (N161) -1-.
- Start engine and run at idling speed.
- Operate hand vacuum pump.
A vacuum must build up.
- Fit 2 pin connector -2- on exhaust gas recirculation two-way valve -1-. Vacuum at hand vacuum pump must release rapidly.