Workshop Manual

Polo 2002 ➢

3-cylinder injection engine (1.2 l engine, 2V and 4V, EA 111)									
Engine ID	AWY	AZQ	BBM	BMD	BME	BZG			

Edition 07.2015

List of Workshop Manual Repair Groups

Repair 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.

P0050328920

Contents

00 – Technical data

1 Technical data

(VRL008301; Edition 07.2015)

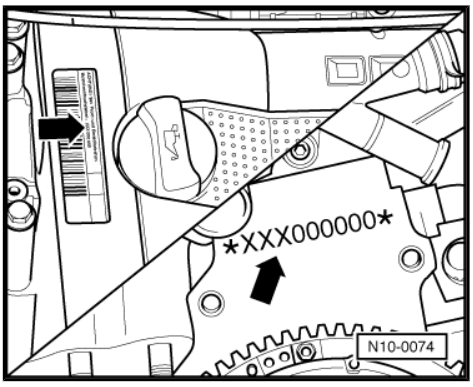
Engine number ⇒ page 1

1.1 Engine number

The engine number (“Code letters” and “Serial number”) can be found on the front of the cylinder block at the gearbox end below the thermostat housing.

The engine code is also on the vehicle data sticker and on the crankcase above the gearbox.

The engine number consists of up to nine characters (alphanumeric). The first part (maximum 3 characters) makes up the “engine code”, and the second part (6 characters), the “serial number”. If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter.



Engine codes		AWY	AZQ	BMD	BME
Manufactured		02.02 ➤	11.01 ➤	05.04 ➤	05.04 ➤
Emission standards		EU4	EU4	EU4	EU4
Capacity	cm^3	1198	1198	1198	1198
Output	kW at rpm	40/4750	47/5000	40/4750	47/5000
Torque	Nm at rpm	106/3000	112/3000	106/3000	112/3000
Bore	∅ mm	76.5	76.5	76.5	76.5
Stroke	mm	86.9	86.9	86.9	86.9
Compression ratio		10.8	10.4	10.8	10.4
Valves per cylinder		2	4	2	4
RON	min.	95 unleaded (in exceptional circumstances min. 91 RON, however with reduced performance)	95 unleaded (in exceptional circumstances min. 91 RON, however with reduced performance)	95 unleaded (in exceptional circumstances min. 91 RON, however with reduced performance)	95 unleaded (in exceptional circumstances min. 91 RON, however with reduced performance)
Injection, ignition system		Simos	Simos	Simos	Simos
Firing order		1-2-3	1-2-3	1-2-3	1-2-3
Exhaust gas recirculation		no	yes	no	no

Engine codes		BBM	BZG
Manufactured		05.07 ➤	05.07 ➤
Emission standards		EU4	EU4
Capacity	cm^3	1198	1198
Output	kW at rpm	44/5200	51/5400
Torque	Nm at rpm	108/3000	112/3000
Bore	∅ mm	76.5	76.5
Stroke	mm	86.9	86.9
Compression ratio		10.8	10.4
Valves per cylinder		2	4

Engine codes	BBM	BZG
RON min.	95 unleaded (in exceptional circumstances min. 91 RON, however with reduced performance)	95 unleaded (in exceptional circumstances min. 91 RON, however with reduced performance)
Injection, ignition system	Simos	Simos
Firing order	1-2-3	1-2-3
Exhaust gas recirculation	no	no

10 – Removing and installing engine

1 Removing and installing engine

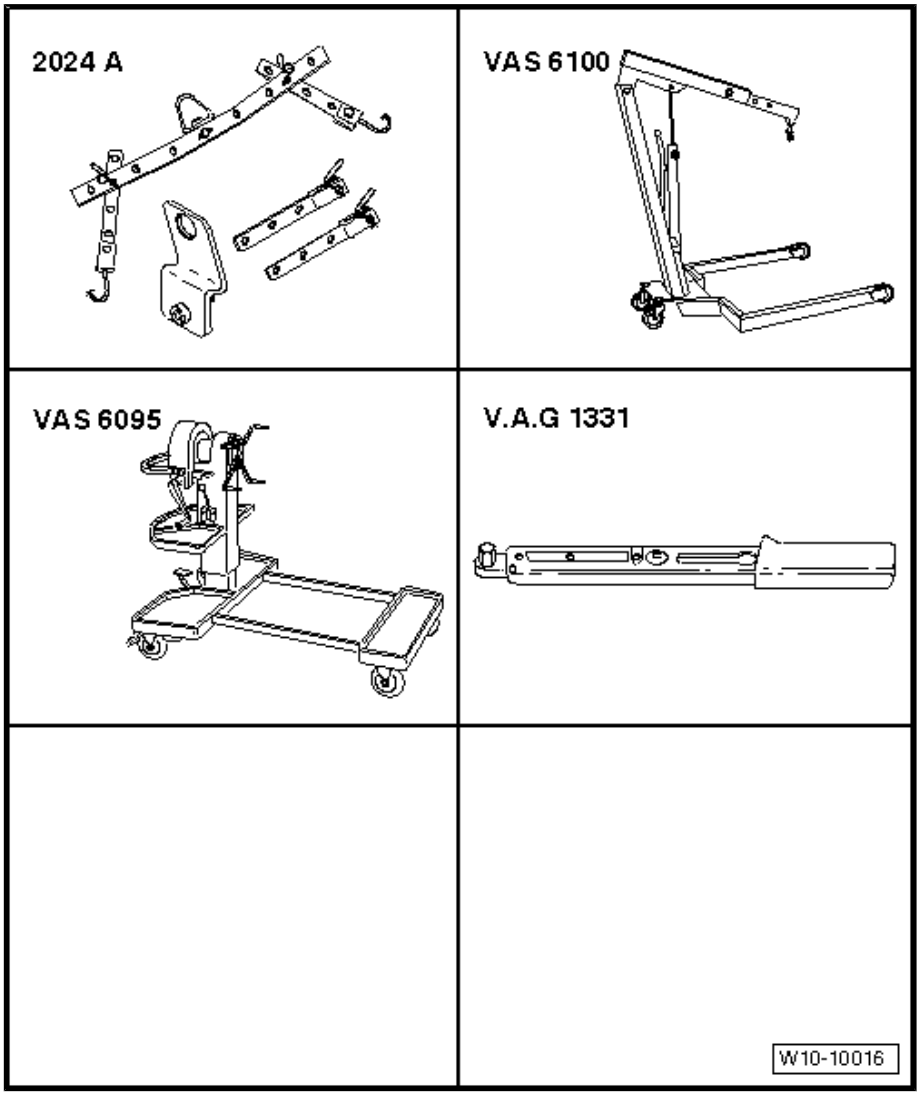
Removing ⇒ page 4 .

Installing ⇒ page 8 .

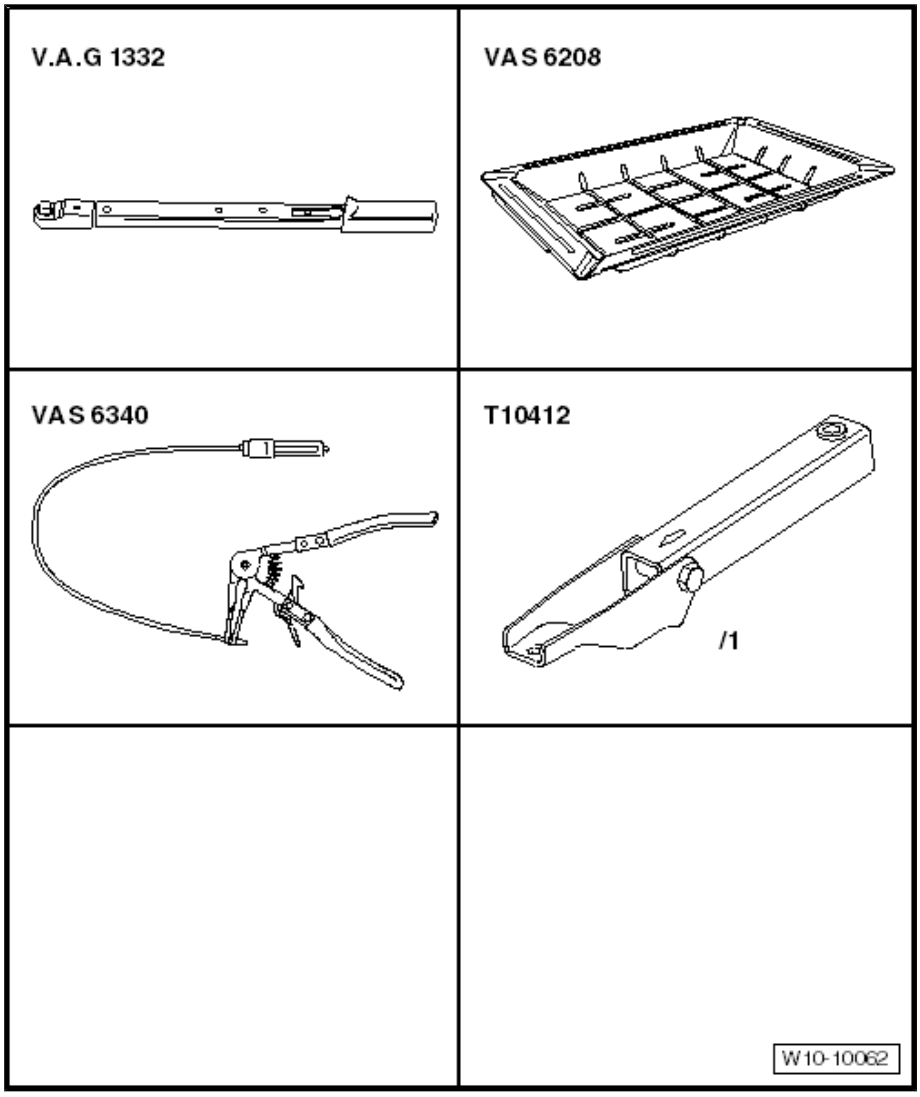
Specified torques ⇒ page 9 .

Special tools and workshop equipment required

- Lifting tackle - 2024 A-
- Workshop hoist - VAS 6100-
- Engine and gearbox support - VAS 6095-
- Torque wrench (5…50 Nm) - V.A.G 1331-



- Torque wrench (40…200 Nm) - V.A.G 1332-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6340-
- Gearbox support - T10412-
- Grease (vehicles with manual gearbox) - G 000 100-
- Cable ties



1.1 Removing

Note

The engine is removed upwards without gearbox.

– First check whether a coded radio is fitted. Obtain anti-theft coding beforehand if necessary.

– With ignition switched off, disconnect earth strap from battery.

– All cable ties that are opened or cut through when the engine is removed must be renewed/replaced in the same position when the engine is installed.

– Remove air filter.

Engine codes AWY, AZQ, BME ⇒ page 123

Engine codes BMD, BBM, BZG ⇒ page 125

– Remove battery and battery retainer.

– Release connector -1- from engine control unit and pull it off.

Vehicles with anti-theft secured engine control unit

– Remove engine control unit ⇒ page 140 .

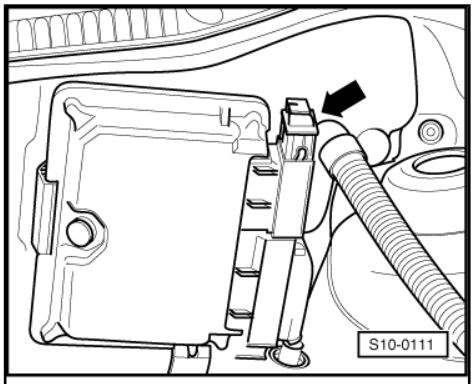
Continuation for all vehicles

– Secure wiring harness to engine.

– Open and close expansion tank cap to release pressure in cooling system.

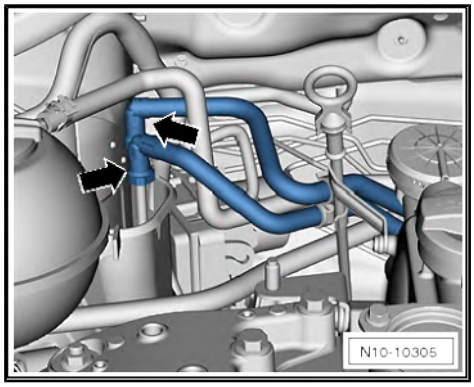
WARNING

Fuel supply lines are under pressure! Wear eye protection and gloves to avoid injuries and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.



—1

– Pull off fuel supply and breather lines -arrows-.
– Seal lines so that fuel system is not contaminated by dirt.
– Observe rules for cleanliness ⇒ page 98 .
– Remove Lambda probe and heat shield from exhaust manifold.
– Remove selector mechanism from gearbox ⇒ 5-speed manual gearbox 02T; Rep. gr. 34 ; Repairing selector mechanism .
– Drain coolant ⇒ page 88 .
– Unbolt thermostat housing from cylinder head.



Note

The coolant hoses remain connected to thermostat housing.

– Remove poly V-belt ⇒ page 17 .

Vehicles with air conditioner

Note

- *The air conditioning system lines must not be opened.*
- *Prevent damage to condenser and refrigerant lines and hoses.*
- *Do NOT stretch, kink or bend lines and hoses.*

– Remove air conditioner compressor ⇒ Heating, air conditioning system; Rep. gr. 87 .
– Secure air conditioner compressor to lock carrier.
– Ensure that lines are not kinked.

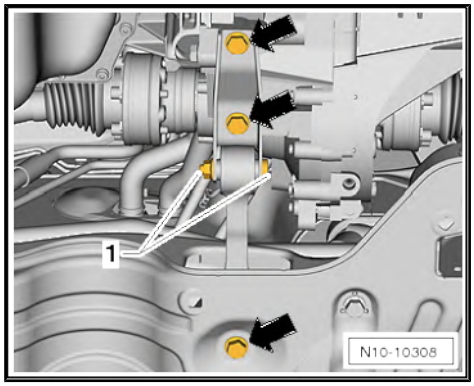
Continuation for all vehicles

– Remove engine splash protection.
– Remove front exhaust pipe ⇒ page 144 .
– Unscrew electrical line from alternator.

Caution

Bolt -1- must not be loosened.

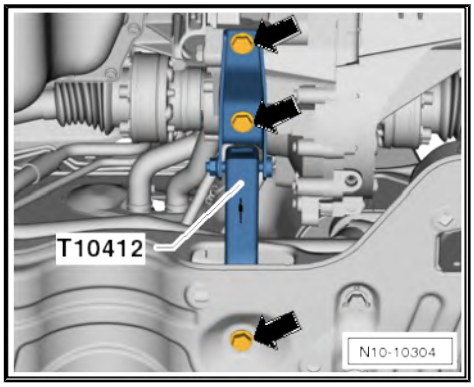
– Remove pendulum support securing bolts -arrows-.



– Install gearbox support - T10412- .

The -arrow- on gearbox support points forwards.

– Tighten securing bolts -arrows- hand-tight.



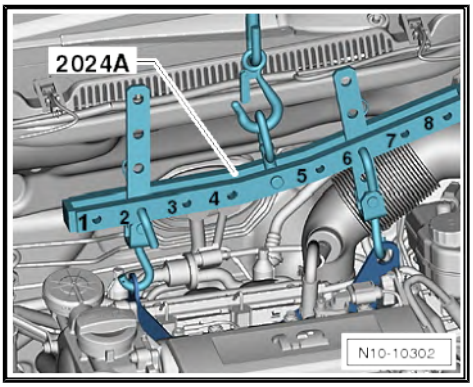
Note

- *The gearbox support - T10412- prevents lowering of the gearbox when the engine is removed and installed.*
- *The pendulum support must be reinstalled once engine is reinstalled.*

– Attach lifting tackle - 2024 A- as follows and lift slightly using workshop crane.

Belt pulley end: 1st hole in hook rail at position 2.

Flywheel end: 2nd hole in hook rail at position 6.



Caution

Use securing pins on hooks and locking pins to avoid damage to engine and vehicle.

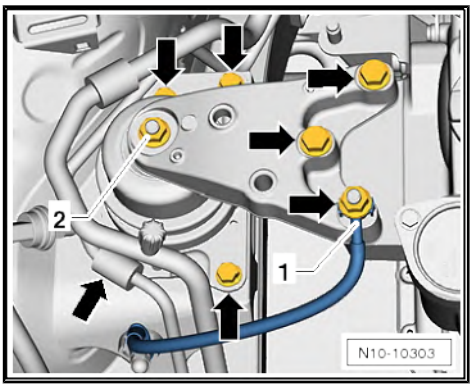
Note

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

Caution

Nut -2- must not be loosened.

– Unscrew securing bolts -arrows- for engine mounting.
– Remove complete engine mounting.
– Remove all gearbox flange securing bolts to engine.
– Secure starter against falling.
– Lift out assembly upwards. When doing this, turn assembly.



Note

- *Bonnet must be raised slightly when lifting out.*
- *When lifted out, the assembly must be carefully guided to prevent damage to the bodywork.*

Secure engine to engine and gearbox support - VAS 6095- to carry out repairs.

1.2 Installing

Installation is carried out in the reverse order. When installing, note the following:

- Check clutch release bearing for wear and renew if necessary.
- Lightly grease clutch release bearing, release bearing guide sleeve and splines on input shaft with G 000 100.
- Check whether dowel sleeves for centring engine and gearbox are in cylinder block and install if necessary.
- When swinging engine in, ensure that there is clearance between drive shafts.
- Bolt gearbox flange to cylinder block.

Specified torque for gearbox: ⇒ 5-speed manual gearbox 02T; Rep. gr. 34 ; Removing and installing gearbox .

Specified torque for starter: ⇒ Electrical system; Rep. gr. 27 .

- Rock engine to align engine mountings stress-free.

Note

Specified torques for assembly mountings ⇒ page 9 .

Vehicles with air conditioner

- Install air conditioner compressor ⇒ Heating, air conditioning system; Rep. gr. 87 .

Continuation for all vehicles

- Electrical connections and routing: ⇒ Electrical system; Rep. gr. 97 .
- Install poly V-belt ⇒ page 17 .
- Install thermostat housing. Specified torque for securing bolts: 10 Nm.
- Install gearbox selector mechanism: ⇒ 5-speed manual gearbox 02T; Rep. gr. 34 ; Repairing selector mechanism .
- Replenish coolant ⇒ page 88 .
- Install air filter.

Engine codes AWY, AZQ, BME ⇒ page 123

Engine codes BMD, BBM, BZG ⇒ page 125

- Connect Vehicle diagnosis, testing and information system - VAS 5052- .
- Erase learnt values and adapt engine control unit - J623- to throttle valve module ⇒ Vehicle diagnostic tester “Guided functions”.
- Carry out vehicle system test ⇒ Vehicle diagnostic tester “Guided fault finding”.
- Finish the vehicle system test so that any fault entries stored during assembly can be deleted automatically.

Observe applicable safety precautions during road test.

- Carry out a road test.
- Then carry out vehicle system test again and rectify any faults which may have occurred.

1.3 Specified torques

Threaded connection		Specified torque
Bolts, nuts	M6	10 Nm
	M8	20 Nm
	M10	45 Nm
	M12	60 Nm
Exhaust pipe to exhaust manifold		40 Nm

Assembly mountings

Note

Securing bolts for assembly mountings are stretch bolts and must be renewed.

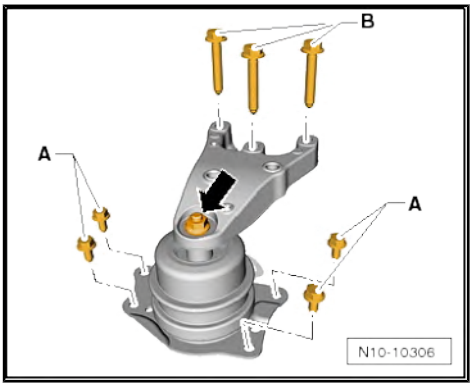
Caution

Nut -arrow- must not be loosened.

Engine assembly mountings

A = 20 Nm + 90° ($^1/_4$ turn) further

B = 30 Nm + 90° ($^1/_4$ turn) further



Gearbox assembly mounting

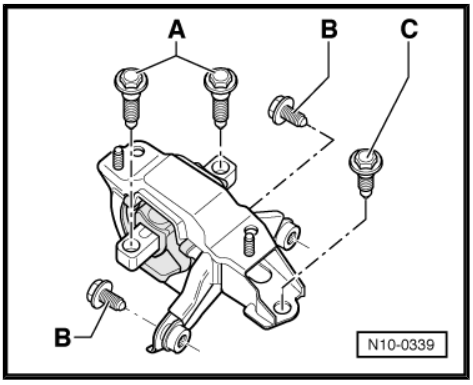
A = 40 Nm + 90° ($^1/_4$ turn) further

B = 50 Nm + 90° ($^1/_4$ turn) further

C = 50 Nm + 90° ($^1/_4$ turn) further

Caution

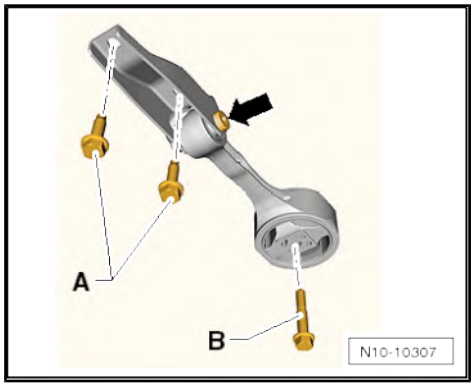
Bolt -arrow- must not be loosened.



Pendulum support

A = 30 Nm + 90° (1/4 turn) further

B = 40 Nm + 90° (1/4 turn) further



13 – Crankshaft group

1 Dismantling and assembling engine

Caution

The crankshaft must not be removed. Just loosening the main bearing caps will cause deformation of the cylinder block bearing pedestals. This deformation will cause a reduction of the bearing clearance. Even if the bearing shells are not renewed bearing damage could occur due to a different bearing clearance.

If the bearing cap bolts are loosened, the cylinder block must be renewed complete with the crankshaft.

Measuring the main bearing clearance is not possible with normal workshop equipment.

The pistons must not be removed.

Assembly overview - part I, belt drive ⇒ page 11 .

Assembly overview - part II, chain drive, engine codes AWY, BMD, BBM ⇒ page 12

Assembly overview - part II, chain drive, engine codes AZQ, BME, BZG ⇒ page 15

Removing and installing poly V-belt ⇒ page 17 .

Removing and installing control housing ⇒ page 19 .

1.1 Assembly overview - part I, belt drive

1 - 20 Nm

2 - Belt pulley

- ❑ For coolant pump.

3 - Cover

4 - Tensioning element

5 - 20 Nm + 1/4 turn (90°) further

- ❑ Renew.

6 - Alternator

7 - Idler roller

8 - Washer

9 - Belt pulley

- ❑ For crankshaft.
- ❑ Do not cant when installing.

10 - 90 Nm + 1/4 turn (90°) further

- ❑ Renew.

11 - Guide sleeve

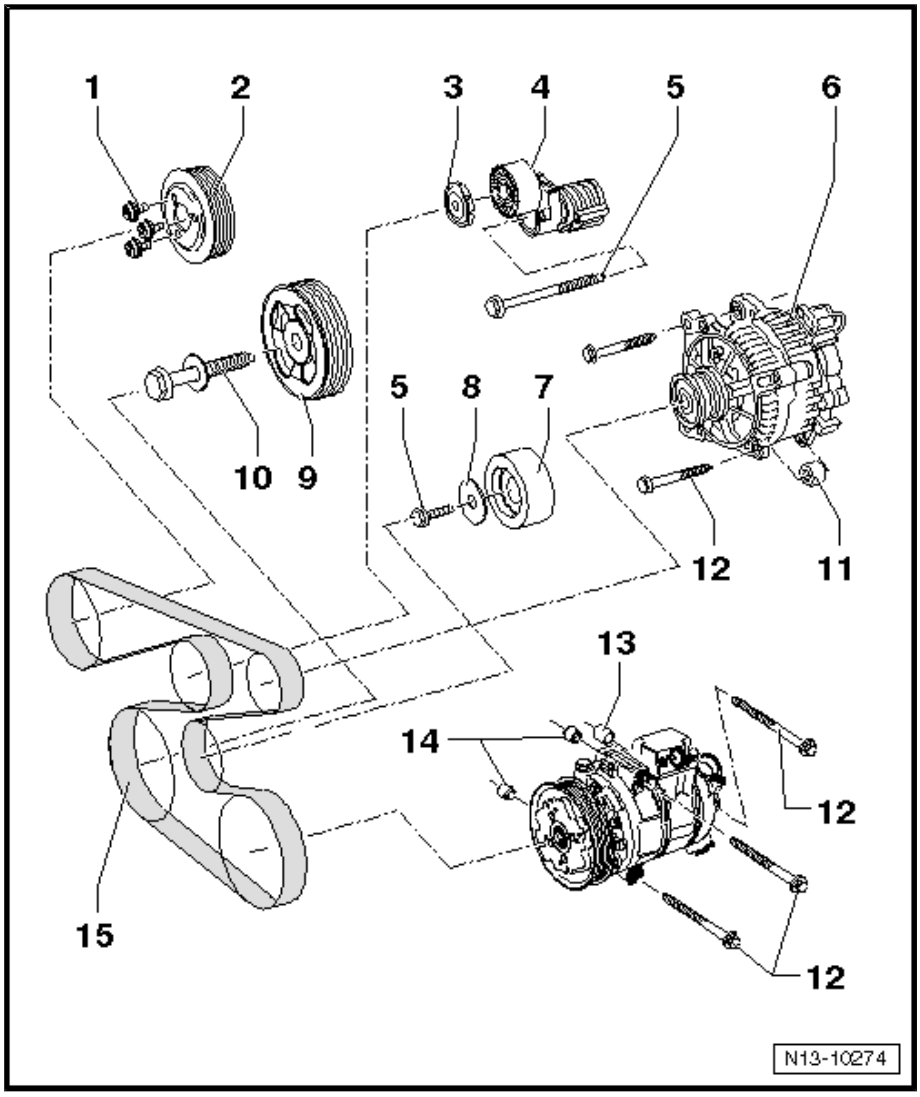
12 - 25 Nm

13 - Guide sleeve

14 - Spacer sleeve

15 - Poly V-belt

- ❑ Mark direction of rotation before removing.
- ❑ Removing and installing poly V-belt
⇒ page 17 .



1.2 Assembly overview - part II, chain drive, engine codes AWY, BMD, BBM

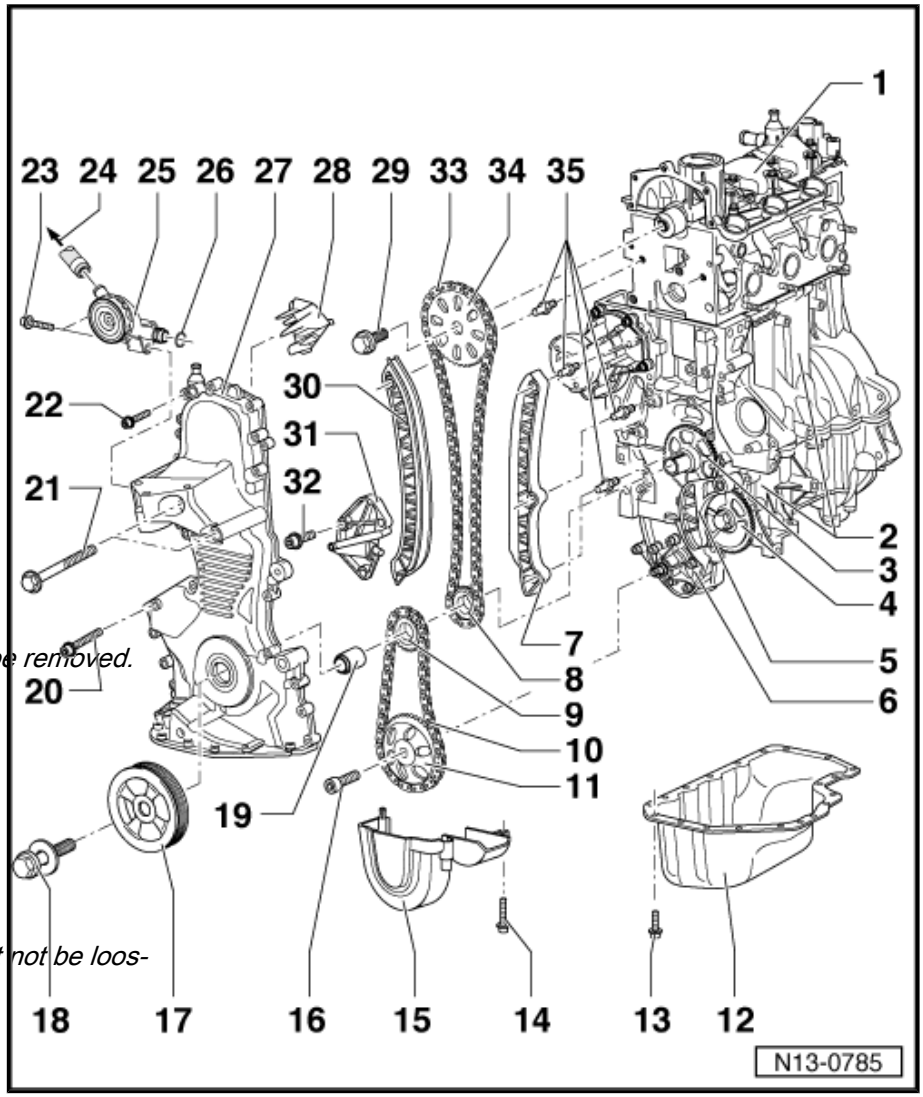
Caution

The crankshaft must not be removed. Just loosening the main bearing caps will cause deformation of the cylinder block bearing pedestals. This deformation will cause a reduction of the bearing clearance. Even if the bearing shells are not renewed bearing damage could occur due to a different bearing clearance.

If the bearing cap bolts are loosened, the cylinder block must be renewed complete with the crankshaft.

Measuring the main bearing clearance is not possible with normal workshop equipment.

The pistons must not be removed.



1 - Cylinder head cover

- ❑ Sealing surface must not be reworked.
- ❑ With integrated camshaft bearings.
- ❑ Remove sealant residue.
- ❑ Coat with D 154 103 A1 before fitting.
- ❑ When installing, lower vertically from above so that dowel pins fit into holes in cylinder head.

2 - Cylinder block

- ❑ 2 parts
- ❑ Bolts must not be loosened.

Note

The pistons must not be removed.

3 - Gear wheel

- ❑ For crankshaft.

4 - Gear wheel

- ❑ For balancer shaft.

Note

The securing bolt must not be loosened.

5 - Chain tensioner with tensioning plate

- ❑ For drive chain for oil pump ⇒ Item 10 (page 13) .

6 - Oil pump

- ❑ Renew complete only.

7 - Guide rail

- ❑ For timing chain ⇒ Item 33 (page 14)

8 - Chain sprocket

- ❑ For crankshaft.

9 - Chain sprocket

- ❑ For oil pump drive.

10 - Drive chain for oil pump

- ❑ Before removing, mark direction of rotation (installation position).

11 - Chain sprocket

- ❑ For oil pump.
- ❑ Installing ⇒ page 51 .

12 - Oil sump

- ❑ Remove and install on engines with liquid gasket ⇒ page 81 .
- ❑ Clean sealing surface before fitting.
- ❑ Install with silicone sealant D 176 404 A2 ⇒ page 81 .

13 - 15 Nm

14 - 8 Nm

15 - Cover

16 - 20 Nm + 1/4 turn (90°) further

- ❑ Renew.

17 - Belt pulley

- ❑ Do not cant when installing.
- ❑ Removing and installing poly V-belt ⇒ page 17 .

18 - 90 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Oil before installing.
- ❑ Lock with counterhold - 3415- .
- ❑ When tightening, lock crankshaft using locking pins - T10121- .
- ❑ The turning further angle can be measured with a commercial protractor.

19 - Bearing bush

- ❑ With O-ring.

Note

Always renew O-ring after removal.

20 - 25 Nm

21 - 45 Nm

22 - 10 Nm

23 - 10 Nm

24 - To intake manifold.

25 - Oil separator

- ❑ With vacuum valve.

26 - O-ring

- ❑ Renew if damaged.

27 - Valve timing housing

- ❑ Install with silicone sealant D 174 003 A2.
- ❑ When fitting, install two -M6x75- studs into cylinder head and cylinder block as a guide.
- ❑ To guide valve timing housing, secure oil sump in position with two bolts.

28 - Cover

29 - 20 Nm + 1/4 turn (90°) further

- ❑ Renew.

30 - Tensioning plate

31 - Chain tensioner

32 - 9 Nm

33 - Timing chain

34 - Chain sprocket

- ❑ For camshaft.
- ❑ Lock chain sprocket using counterhold - 3036- .

35 - Guide pins

- ❑ Specified torque: 20 Nm

1.3 Assembly overview - part II, chain drive, engine codes AZQ, BME, BZG

Caution

The crankshaft must not be removed. Just loosening the main bearing caps will cause deformation of the cylinder block bearing pedestals. This deformation will cause a reduction of the bearing clearance. Even if the bearing shells are not renewed bearing damage could occur due to a different bearing clearance.

If the bearing cap bolts are loosened, the cylinder block must be renewed complete with the crankshaft.

Measuring the main bearing clearance is not possible with normal workshop equipment.

The pistons must not be removed.

1 - Cylinder head with camshaft housing

- ❑ Sealing surface must not be reworked.
- ❑ With integrated camshaft bearings.
- ❑ Removing and installing ⇒ page 41
- ❑ Remove sealant residue.
- ❑ Coat with D 154 103 A1 before fitting.
- ❑ When installing, lower vertically from above so that dowel pins fit into holes in cylinder head.

2 - Cylinder block

- ❑ 2 parts
- ❑ Bolts must not be loosened.

Note

The pistons must not be removed

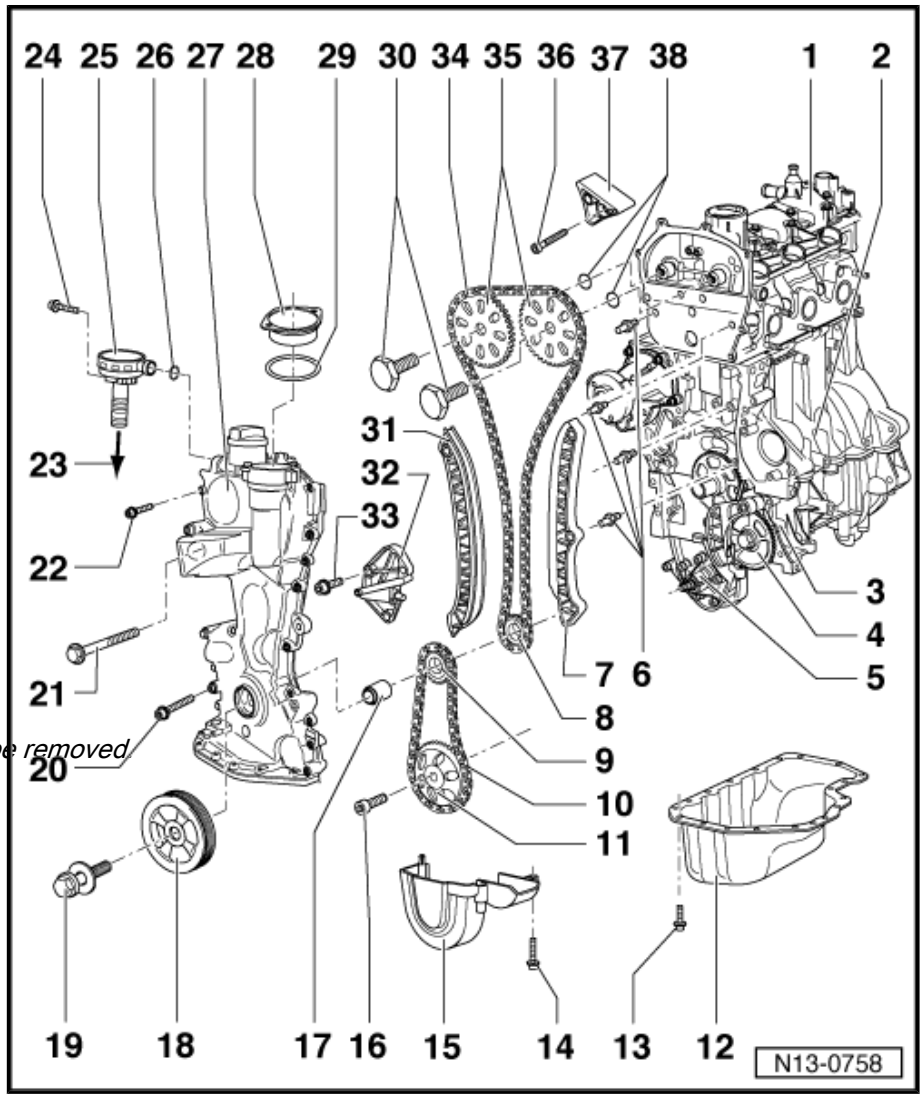
3 - Balancer shaft

4 - Gear wheel

- ❑ For balancer shaft.
- ❑ The securing bolt must not be loosened!!!

5 - Oil pump

- ❑ Renew complete only.



6 - Guide pins

- ❑ Specified torque: 20 Nm

7 - Guide rail

- ❑ For timing chain ⇒ Item 34 (page 17)

8 - Chain sprocket

- ❑ For crankshaft.

9 - Chain sprocket

- ❑ For oil pump drive.

10 - Drive chain for oil pump

- ❑ Before removing, mark direction of rotation (installation position).

11 - Chain sprocket

- ❑ For oil pump.
- ❑ Adjusting valve timing ⇒ page 58 .

12 - Oil sump

- ❑ Remove and install on engines with liquid gasket ⇒ page 81 .
- ❑ Clean sealing surface before fitting.
- ❑ Install with silicone sealant D 176 404 A2.

13 - 15 Nm

14 - 8 Nm

15 - Cover

16 - 20 Nm + 1/4 turn (90°) further

- ❑ Renew.

17 - Bearing bush

- ❑ With O-ring.

Note

Always renew O-ring after removal.

18 - Belt pulley

- ❑ Do not cant when installing.
- ❑ Removing and installing poly V-belt ⇒ page 17 .

19 - 90 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Oil before installing.
- ❑ Lock with counterhold - 3415- .
- ❑ When tightening, lock crankshaft using locking pins - T10121- .
- ❑ The turning further angle can be measured with a commercial protractor.

20 - 25 Nm

21 - 45 Nm

22 - 10 Nm

23 - To intake manifold.

24 - 10 Nm

25 - Oil separator

- ❑ With vacuum valve.

26 - O-ring

- ❑ Renew if damaged.

27 - Valve timing housing

- ❑ Install with silicone sealant D 174 003 A2.
- ❑ When fitting, install two -M6x75- studs into cylinder head and cylinder block as a guide.
- ❑ To guide valve timing housing, secure oil sump in position with two bolts.

28 - Cover

29 - O-ring

- ❑ Renew if damaged.

30 - 50 Nm + 1/4 turn (90°) further

- ❑ Renew.

31 - Tensioning plate

32 - Chain tensioner

33 - 9 Nm

34 - Timing chain

35 - Chain sprocket

- ❑ For camshaft.

36 - 15 Nm

- ❑ Was only fitted on engine code AZQ.

37 - Guide rail

- ❑ Was only fitted on engine code AZQ.

Note

- ♦ *The guide rail has been discontinued, also as replacement part.*
- ♦ *In case of repair the guide rail need not be installed.*

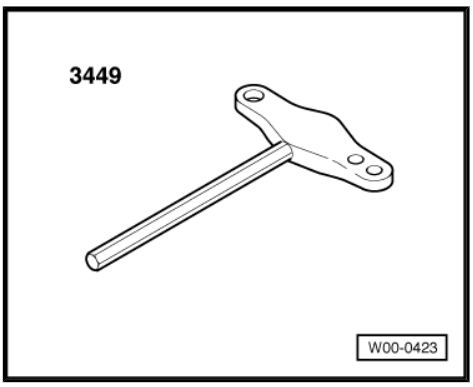
38 - Washer

- ❑ Was only fitted on engine code AZQ.

1.4 Removing and installing poly V-belt

Special tools and workshop equipment required

- ♦ Special wrench - 3449-



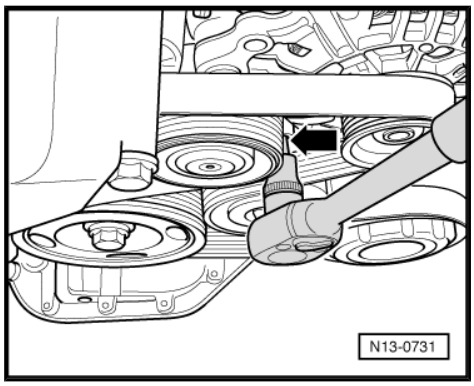
Procedure

Note

Gradual introduction of modified tensioning element. Note the different procedures.

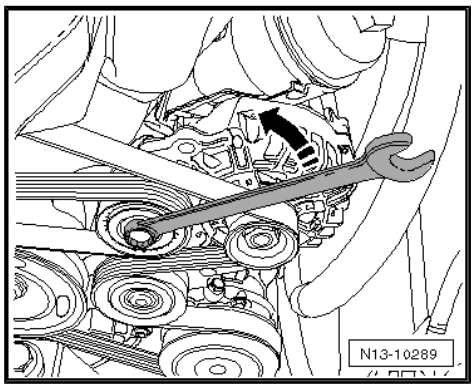
– Mark direction of rotation of poly V-belt.

– Swing tensioning element in -direction of arrow- until hole is visible. Lock tensioning element using hexagon key - 3449- .



– Swing tensioning element in -direction of arrow- using a spanner. Lock tensioning element using hexagon key - 3449- .

– Remove or fit poly V-belt.



Note

When installing poly V-belt, ensure that belt seats correctly in pulleys.

Poly V-belt routing

Belt drive without air conditioner compressor

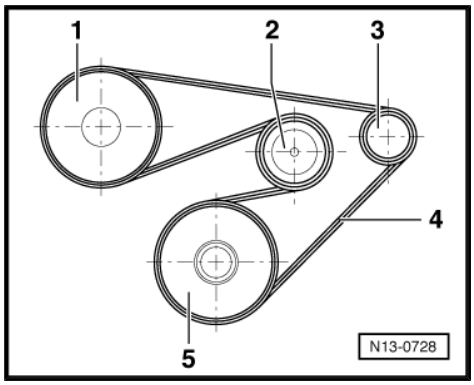
1 - Coolant pump pulley

2 - Tensioning roller

3 - Alternator pulley

4 - Poly V-belt

5 - Crankshaft pulley



Belt drive with air conditioner compressor

1 - Coolant pump pulley

2 - Tensioning roller

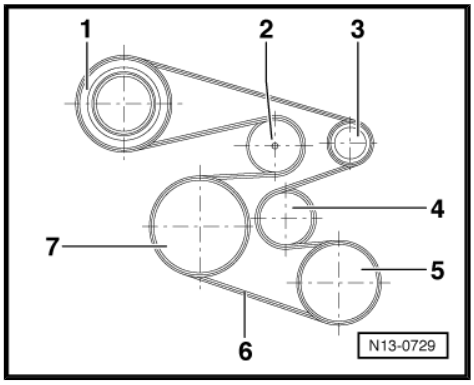
3 - Alternator pulley

4 - Idler roller

5 - Air conditioner compressor pulley

6 - Poly V-belt

7 - Crankshaft pulley

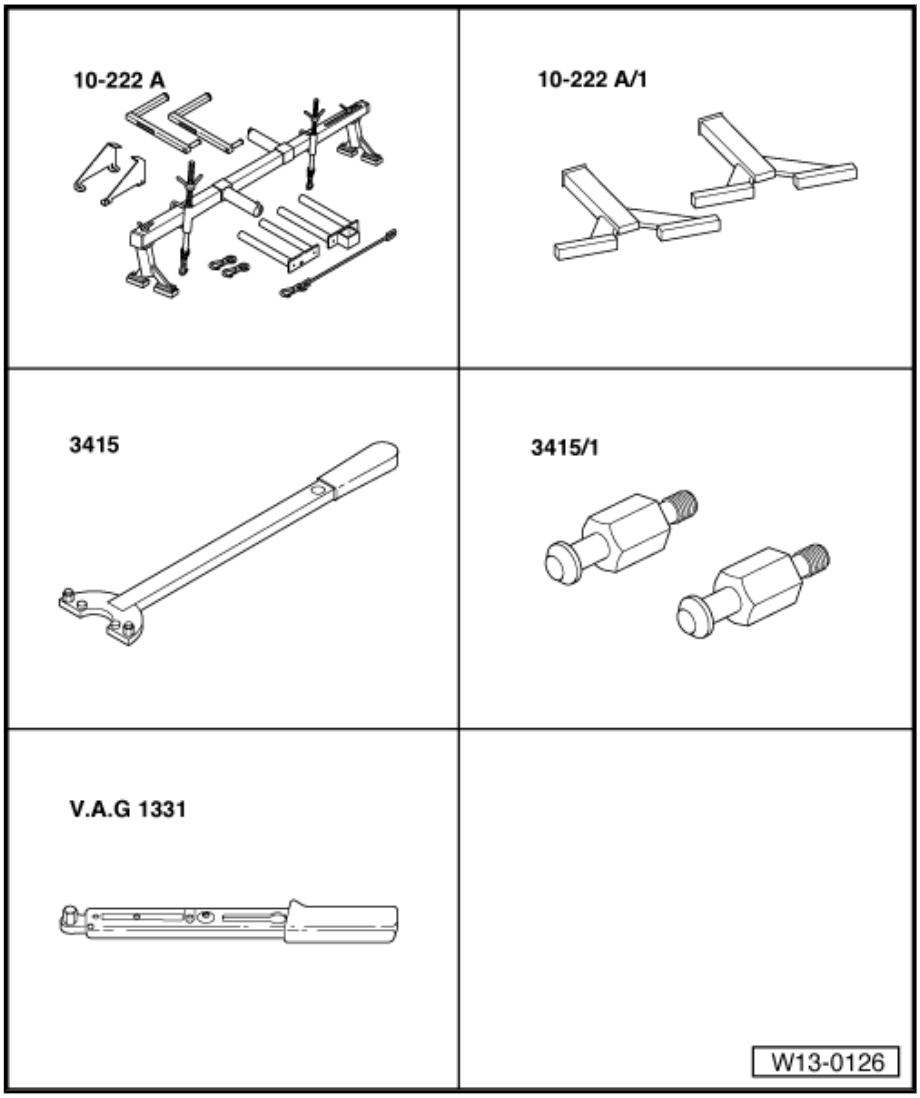


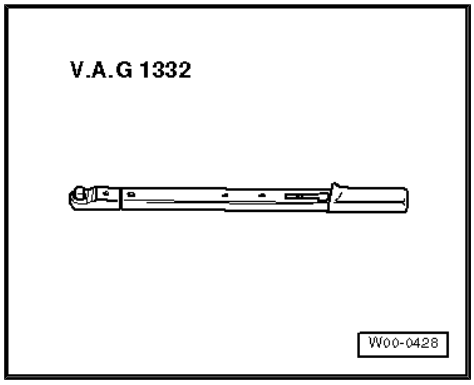
Further assembly is basically the reverse of the dismantling sequence.

1.5 Removing and installing valve timing housing

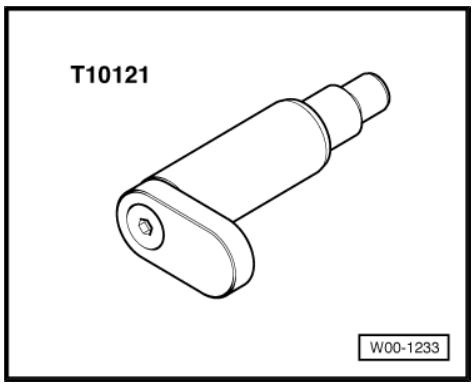
Special tools and workshop equipment required

- Support bracket - 10 - 222 A-
- Rack - 10 - 222 A /1-
- Counterhold tool - 3415-
- Pins - 3415/1-
- Torque wrench (5…50 Nm) - V.A.G 1331-





- Torque wrench (40…200 Nm) - V.A.G 1332-
- Locking pins - T10121-



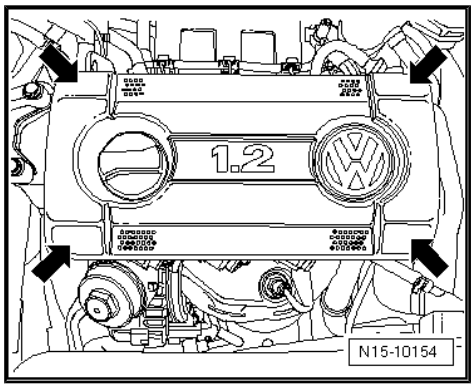
Removing

– Remove air filter.

Engine codes AWY, AZQ, BME ⇒ page 123

Engine codes BMD, BBM, BZG ⇒ page 125

– Remove engine cover by pulling at points indicated by -arrows- (only engine code BMD).

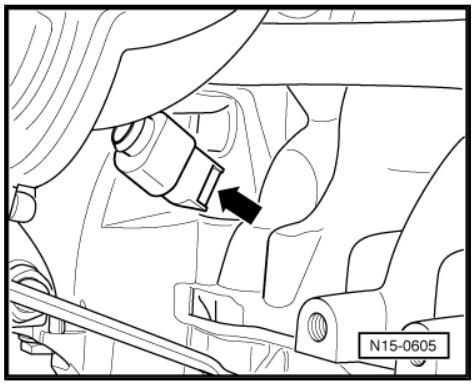


– Remove engine splash protection.

– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Removing and installing wheel housing liner .

– Mark the direction of rotation of the poly V-belt and remove belt ⇒ page 17 .

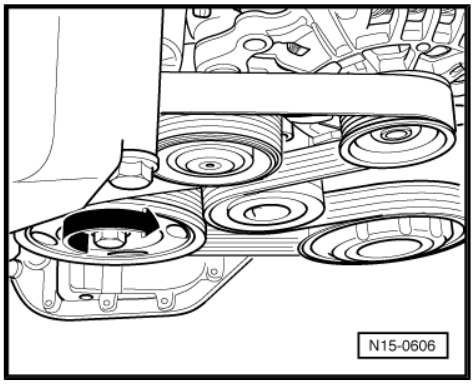
– Remove engine speed sender - G28- .



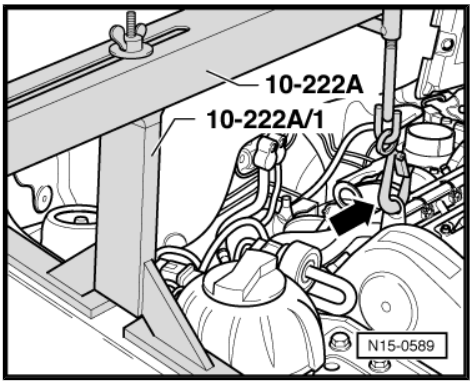
– Turn crankshaft, by pulley securing bolt, in direction of engine rotation -arrow- until locking pins - T10121- can be inserted in flywheel hole.

– Remove air conditioner compressor from bracket with refrigerant lines still connected ⇒ Heating, air conditioning; Rep. gr. 87 .

– Remove alternator.

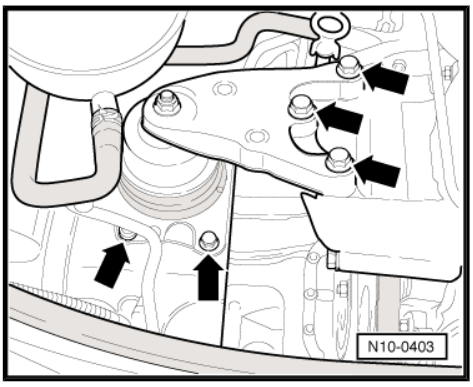


– Install support bracket - 10-222 A- with rack - 10 - 222 A /1- as shown and hook into lifting eye -arrow-.

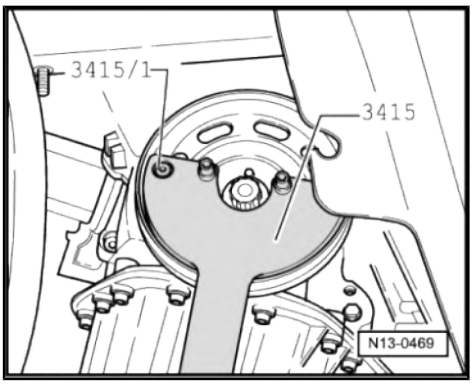


– Take up weight of engine and remove securing bolts -arrows-.

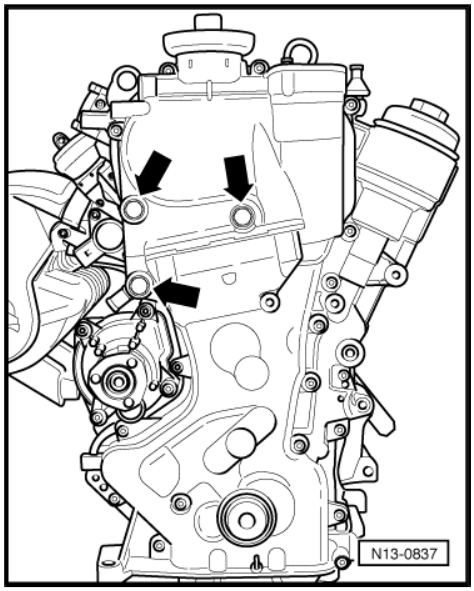
– Remove sump ⇒ page 81 .



– Now remove pulley securing bolt. Hold pulley with counterhold - 3415- and -3415/1- .



– Remove Allen head bolts for timing housing and hexagon bolts indicated by -arrows-.
– Remove valve timing housing.



Note

Note that crankshaft bearing bush remains in sealing flange.

Installing

– Clean sealing surfaces carefully. They must be free of oil and grease.
– When fitting, install two -M6x80- studs into cylinder head and cylinder block as a guide.
– Apply the sealant D 174 003 A2 thinly and evenly onto the clean sealing surface.
– Fit valve timing housing with crankshaft bearing bush simultaneously onto studs, dowel pins and crankshaft journal.
– Tighten valve timing housing securing bolts evenly and diagonally.

Ensure that camshaft housing is not canted.

Specified torque:

M6 bolt to 10 Nm.

M10 bolt to 50 Nm.

– Install the pulley with a new securing bolt.
– Screw pulley securing bolt in as far as it will go by hand.

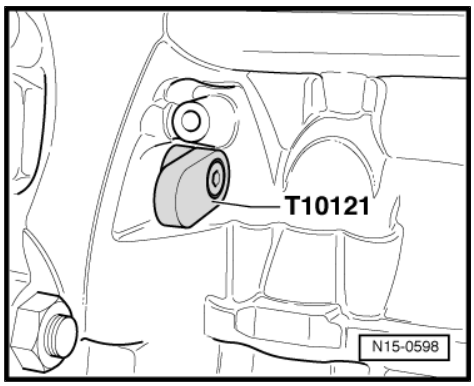
Note

Ensure that pulley is not tilted when assembling.

– Hold pulley with counterhold - 3415- and -3415/1- .

Specified torque: 90 Nm + $^1/_4$ turn (90°) further.

– Remove locking pin - T10121- from flywheel hole.



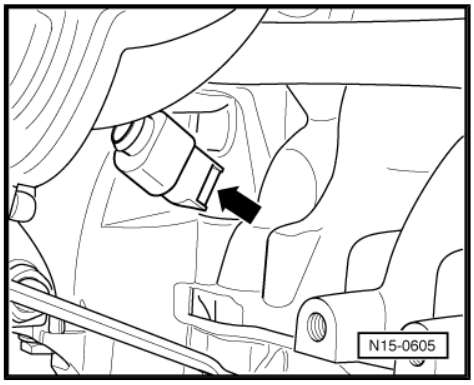
– Install engine speed sender - G28- .

Specified torque for securing bolt: 8 Nm.

– Install sump ⇒ page 81 .

– Install poly V-belt ⇒ page 17 .

Further assembly is basically the reverse of the dismantling sequence.



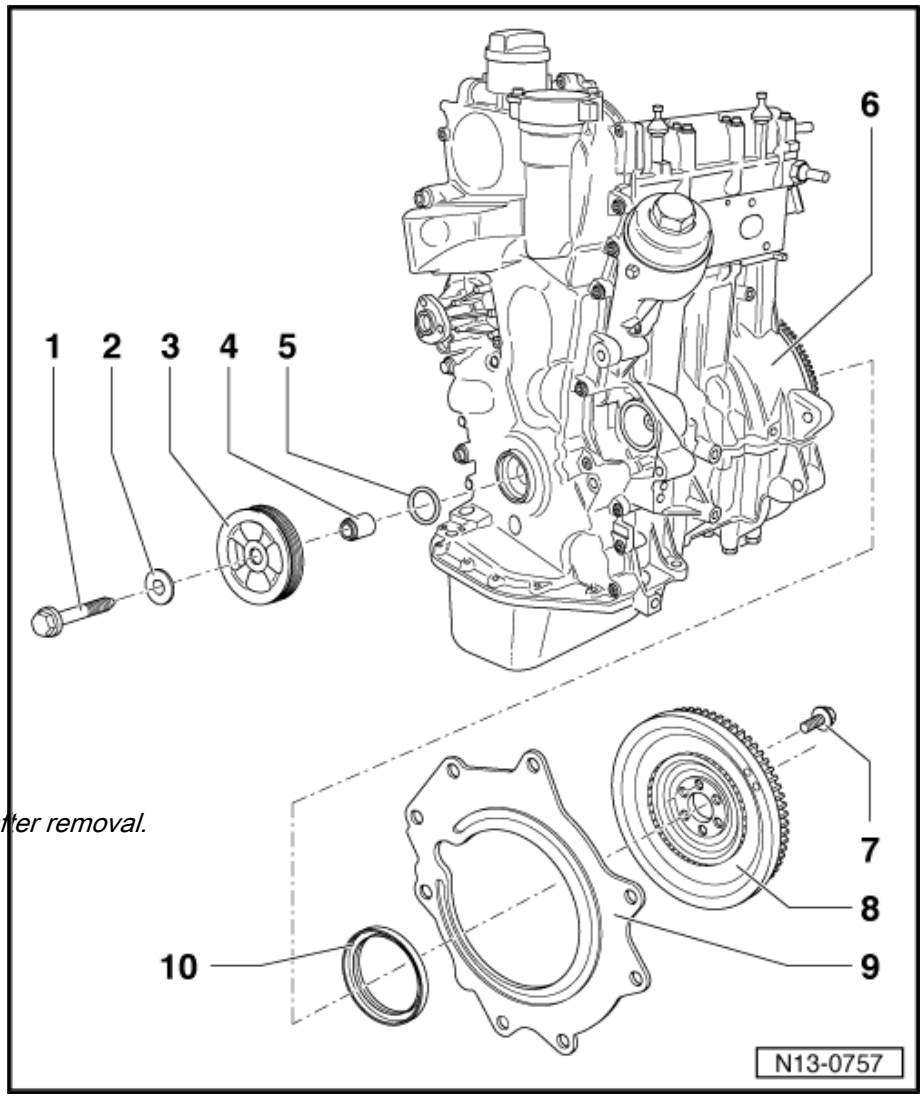
2 Cylinder block, seals

Assembly overview ⇒ page 24 .

Renewing crankshaft oil seal on belt pulley end ⇒ page 25 .

Renewing crankshaft oil seal - flywheel end ⇒ page 27

2.1 Assembly overview



1 - 90 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Oil before installing.
- ❑ Lock with counterhold - 3415- .
- ❑ When tightening, lock crankshaft using locking pins - T10121- .
- ❑ The turning further angle can be measured with a commercial protractor.

2 - Washer

3 - Belt pulley

- ❑ Do not cant when installing.
- ❑ Removing and installing poly V-belt ⇒ page 17 .

4 - Bearing bush

- ❑ With O-ring.

Note

Always renew O-ring after removal.

5 - Seal

- ❑ Renew. ⇒ page 25 .

6 - Cylinder block

7 - 60 Nm + 1/4 turn (90°) further

- ❑ Renew.

8 - Flywheel

9 - Intermediate plate

- ❑ Must seat on dowel sleeves.
- ❑ Do not damage or bend when assembling.

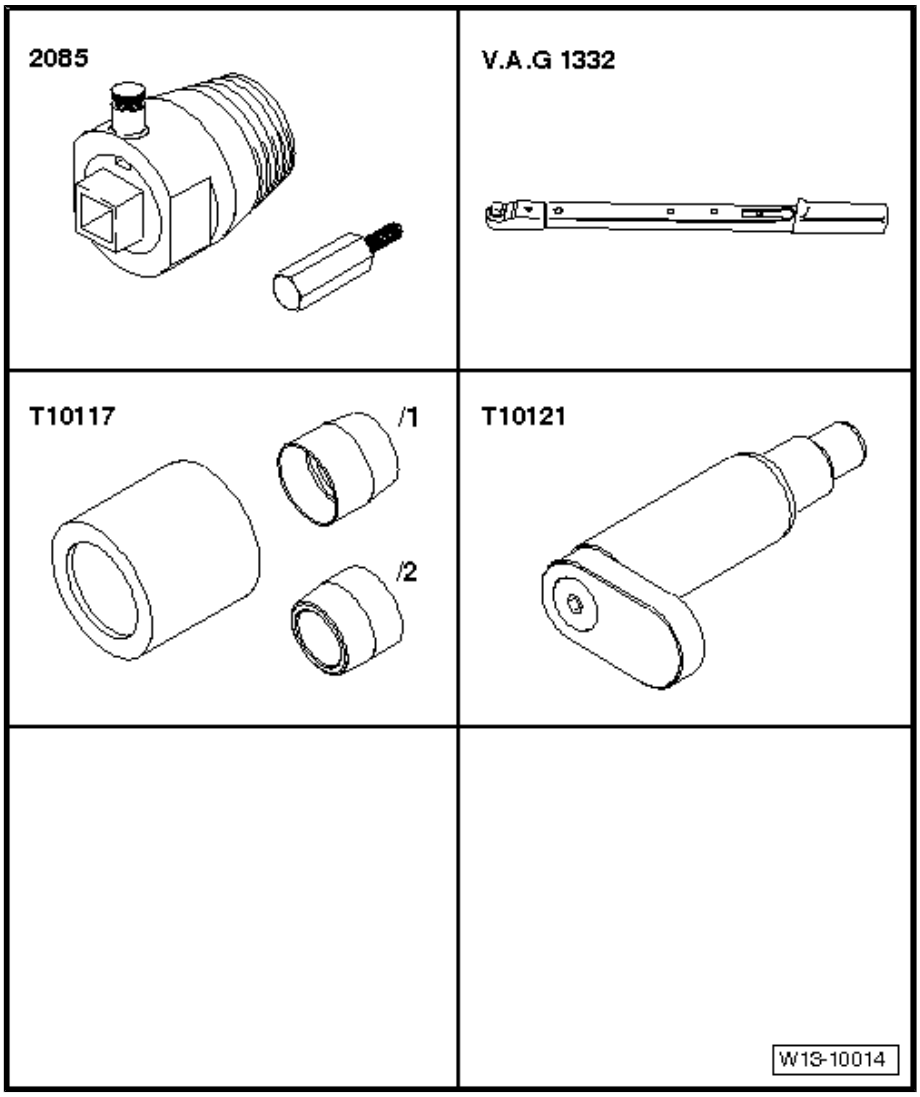
10 - Seal

- ❑ Renew. ⇒ page 27 .

2.2 Renewing crankshaft oil seal - belt pulley end

Special tools and workshop equipment required

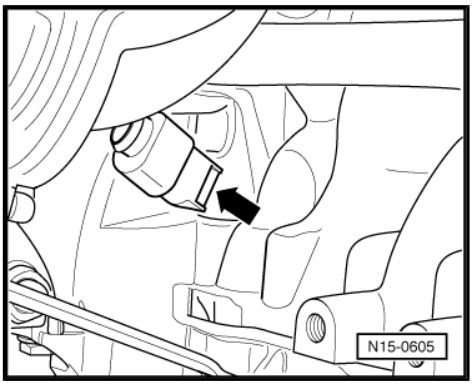
- Oil seal extractor - 2085-
- Torque wrench (40…200 Nm) - V.A.G 1332-
- Assembly tool - T10117-
- Locking pins - T10121-



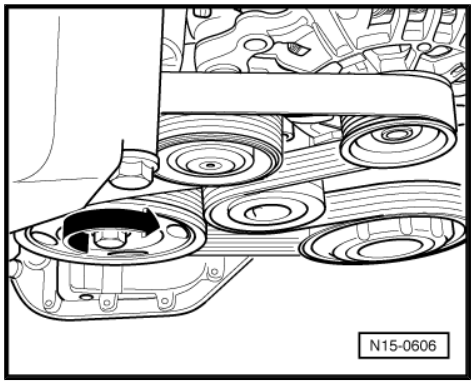
Removing

– Remove poly V-belt ⇒ page 17 .

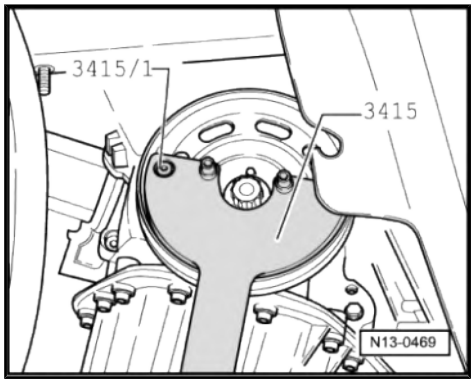
– Remove engine speed sender - G28- .



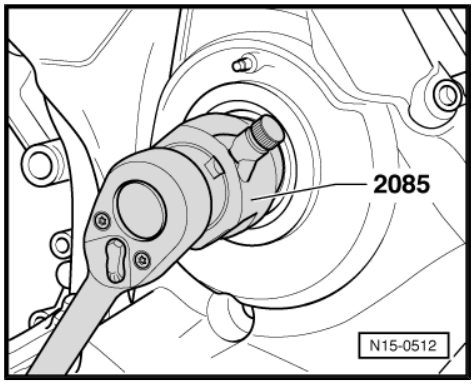
– Turn crankshaft, by pulley securing bolt, in direction of engine rotation -arrow- until locking pins - T10121- can be inserted in flywheel hole.



– Now remove pulley securing bolt. Hold pulley with counterhold - 3415- and 3415/1.
– Remove centre bolt and remove crankshaft pulley.
– Screw inner part of oil seal extractor - 2085- three turns (approx. 5 mm) out of outer part and lock using knurled screw.
– Pull bearing bush off crankshaft.



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



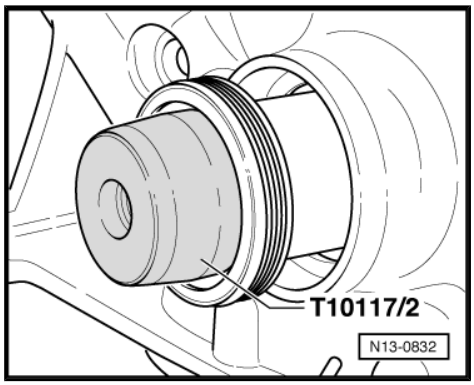
Installing

– Push bearing bush onto crankshaft journal as far as the stop.

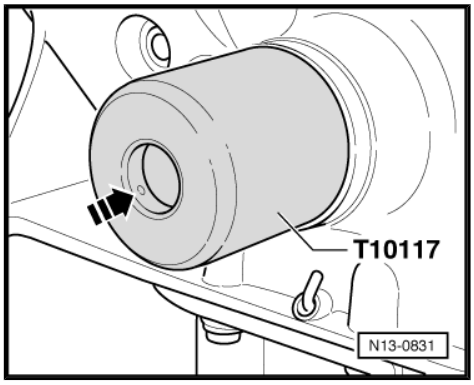
Note

The O-ring in the bearing bush must always be renewed.

– Fit sleeve -T10117/2- onto bush and slide oil seal onto bush.
– Remove sleeve -T10117/2- from bush.



– Drive oil seal into valve timing housing as far as to stop using assembly tool - T10117- and striking evenly with a hammer.
– Install the pulley with a new securing bolt.
– Screw pulley securing bolt in as far as it will go by hand.



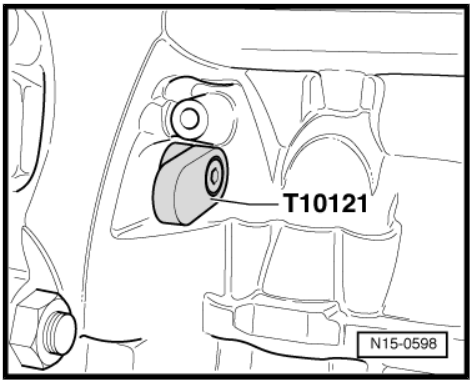
Note

Ensure that pulley is not tilted when assembling.

– Hold pulley with counterhold - 3415- and -3415/1- .

Specified torque: 90 Nm + $^{1}/_{4}$ turn (90°) further.

– Remove locking pin - T10121- from flywheel hole.

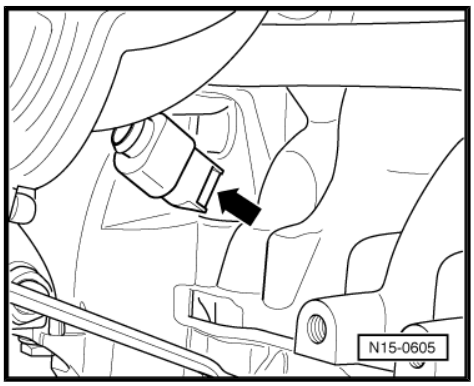


– Install engine speed sender - G28- .

Specified torque for securing bolt: 8 Nm.

– Install poly V-belt ⇒ page 17 .

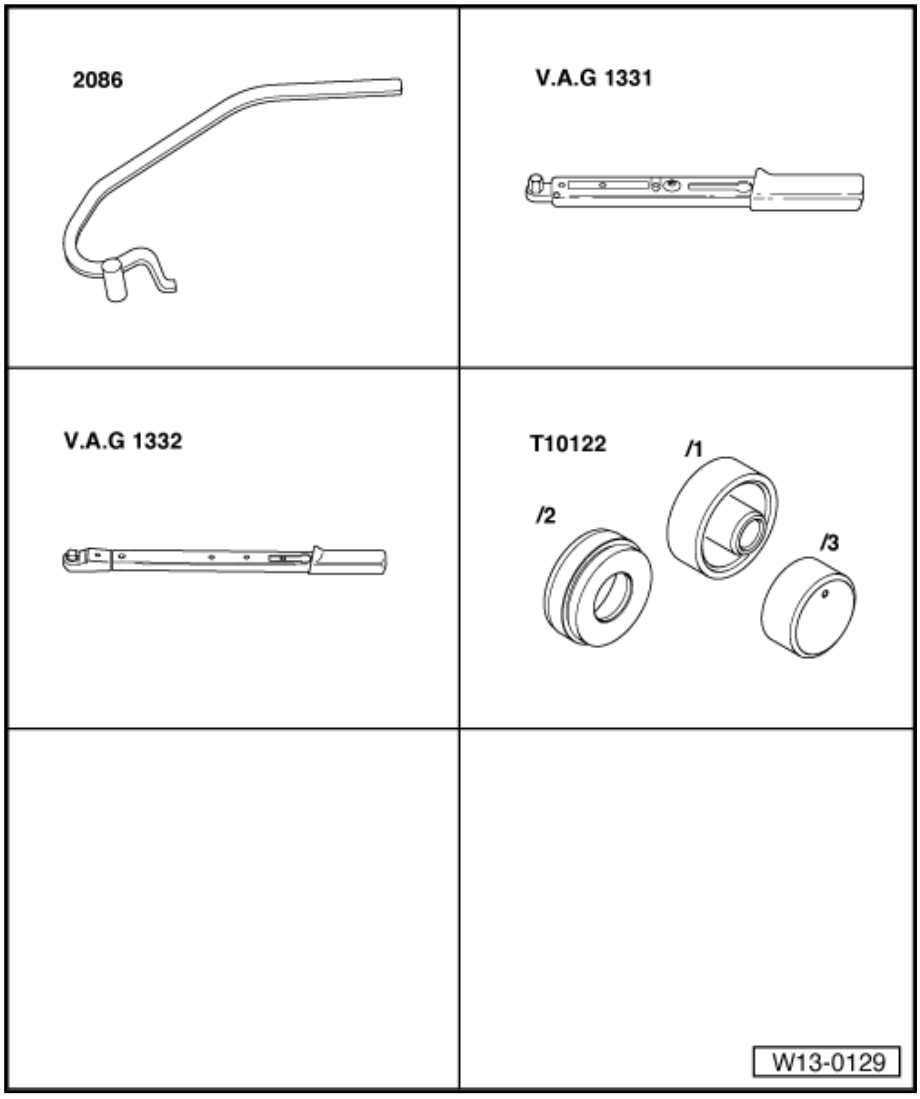
Further assembly is basically the reverse of the dismantling sequence.



2.3 Renewing crankshaft oil seal - flywheel end

Special tools and workshop equipment required

- Puller hooks - 2086-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Torque wrench (40…200 Nm) - V.A.G 1332-
- Fitting tool - T10122-



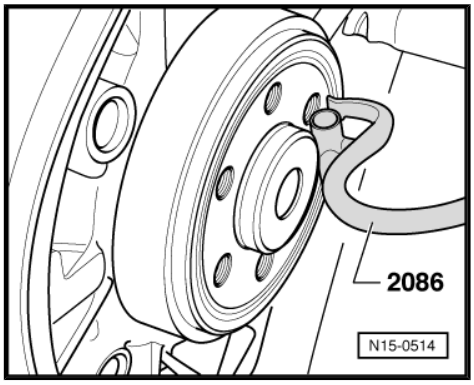
Note

- *For the sake of clarity, the work is performed with the engine removed.*
- *The procedure is identical whether the engine is installed or removed.*

Removing

– Remove flywheel or drive plate as applicable.

– Remove seal using extractor hook - 2086- .



Installing

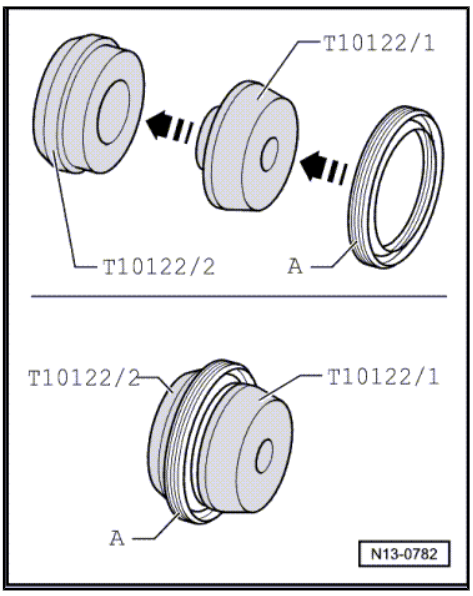
Note

Do not remove support ring from seal until immediately before installation.

– Assemble fitting tool sleeves -T10122/1- and -T10122/2- .

– Push seal -A- onto fitting tool sleeve -T10122/2- to stop.

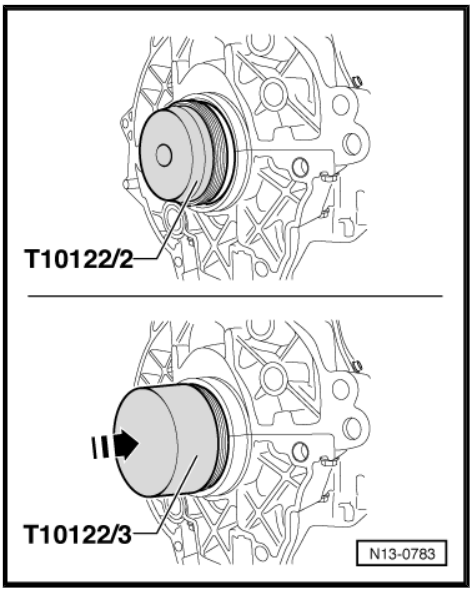
– Separate the two fitting sleeves.



– Fit assembly sleeve -T10122/2- together with oil seal on crankshaft flange.

– Press oil seal in to stop using fitting tool -T10122/3- .

Further assembly is basically the reverse of the dismantling sequence.



15 – Cylinder head, valve gear

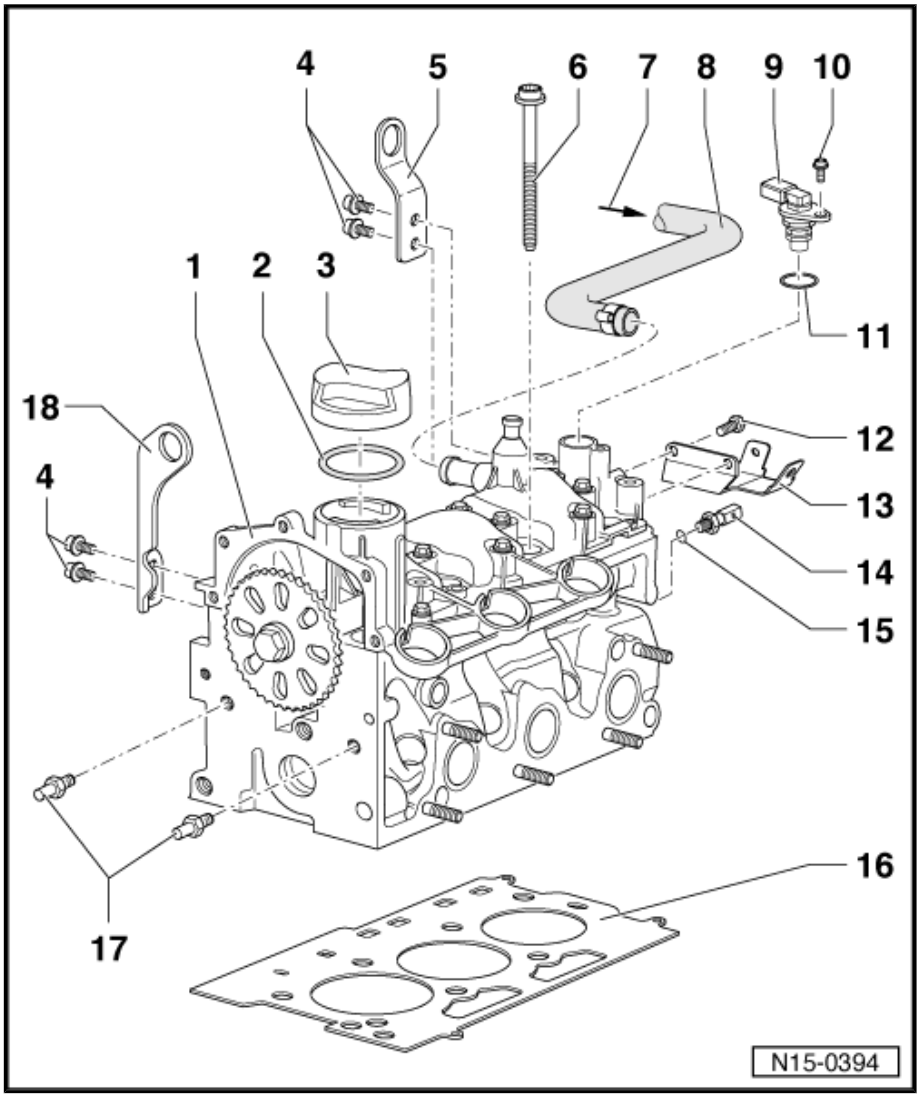
1 Cylinder head

Note

- *If an exchange cylinder head is installed, all the contact surfaces between the supporting elements, roller rocker fingers and the running surfaces of the camshaft must be oiled before the cylinder head cover is installed.*
- *The plastic protectors fitted to protect the open valves must be removed only immediately before the cylinder head is fitted.*
- *If the cylinder head is replaced, all the coolant in the system must also be renewed.*
- *Removing and installing intake manifold and injectors ⇒ page 121 .*

1.1 Assembly overview - engine codes AWY, BMD, BBM

Removing and installing cylinder head ⇒ page 32 .



1 - Cylinder head cover

- ❑ Sealing surface must not be reworked.
- ❑ With integrated camshaft bearings.
- ❑ Remove sealant residue.
- ❑ Coat with D 154 103 A1 before fitting.
- ❑ When installing, lower vertically from above so that dowel pins fit into holes in cylinder head.
- ❑ Reworking cylinder head sealing surface on cylinder head side ⇒ page 66 .

2 - Seal

- ❑ Renew if damaged.

3 - Cap

4 - 20 Nm

5 - Lifting eye

6 - Cylinder head bolt

- ❑ Renew.
- ❑ Follow installation instructions and sequence when loosening and tightening ⇒ page 32 .

7 - From air filter.

8 - Vacuum hose

9 - Hall sender - G40-

10 - 10 Nm

11 - O-ring

- ❑ Renew if damaged.

12 - 10 Nm

13 - Bracket

- ❑ For wiring harness.

14 - 0.3...0.7 bar oil pressure switch - F1- , 25 Nm

- ❑ Checking ⇒ page 82 .

15 - Seal

16 - Cylinder head gasket

- ❑ Metal gasket.
- ❑ Renew.
- ❑ After renewing, renew entire coolant.
- ❑ Reworking cylinder head sealing surface on cylinder head side ⇒ page 66 .
- ❑ Checking cylinder head for distortion ⇒ page 32

17 - Guide pins

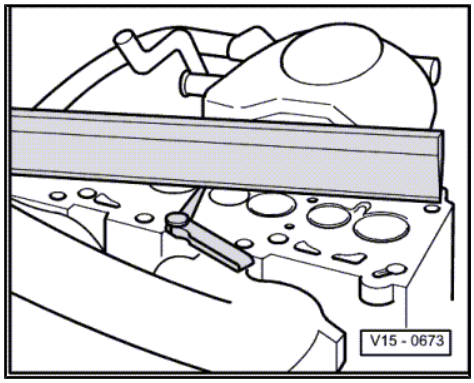
- ❑ Specified torque: 20 Nm

18 - Lifting eye

Checking cylinder head for distortion

Check with 500 mm straight edge - VAS 6075- and feeler gauge.

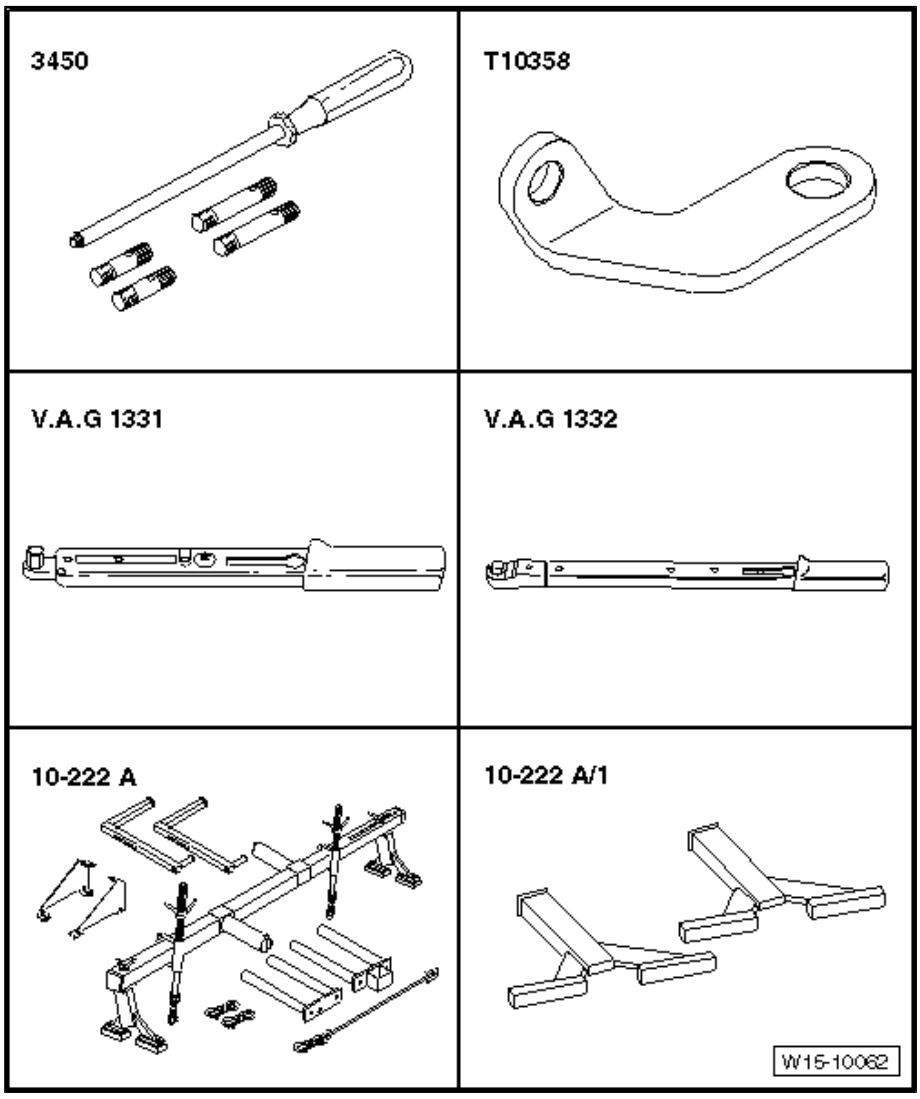
Max. permissible distortion: 0.05 mm.



1.2 Removing and installing cylinder head, engine codes AWY, BMD, BBM

Special tools and workshop equipment required

- Guide pins - 3450-
- Bracket - T10358-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Torque wrench (40…200 Nm) - V.A.G 1332-
- Support bracket - 10 - 222 A-
- Rack - 10 - 222 A /1-



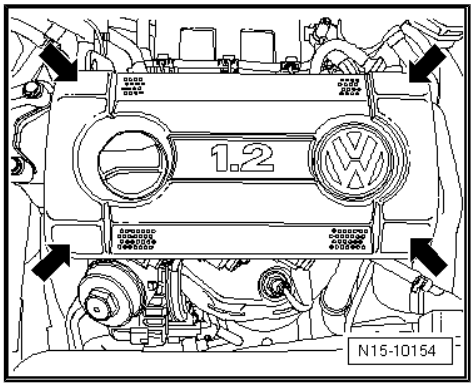
Prerequisites

- The engine must be no more than warm to touch.

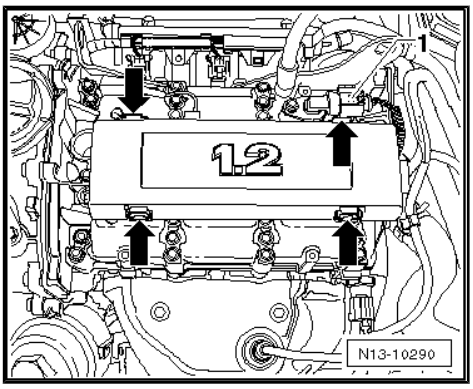
Removing

– Remove air filter (engine code AWY) ⇒ page 123 .

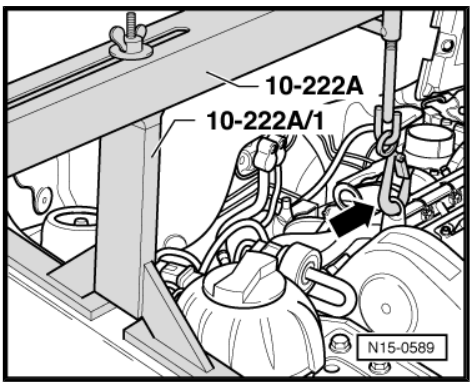
– Remove engine cover by pulling at points indicated by -arrows- (only engine code BMD).



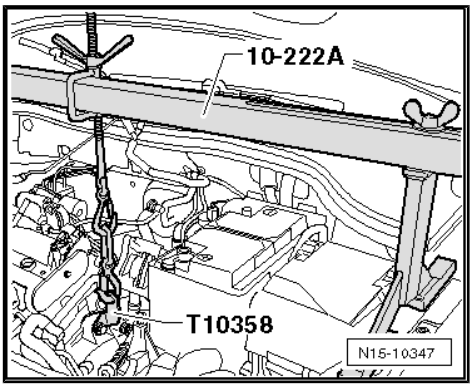
– Pull connector -1- off Hall sender - G40- (only engine code BZG).
– Unlock engine cover -arrows- and pull it upwards (only engine code BZG).



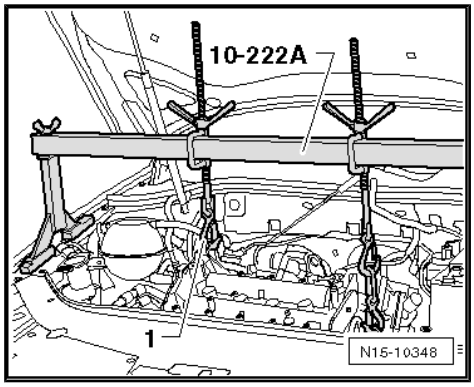
– Install support bracket - 10 - 222 A- with rack - 10 - 222 A /1- as shown and hook into lifting eye -arrow-.
– Remove valve timing housing ⇒ page 19 .
– Remove coolant pump pulley.



– Unscrew securing bolt for gearbox and attach bracket - T10358- as shown.
– Attach hooks of support bracket - 10 - 222 A- to bracket - T10358- as shown.
– Turn spindle until the hooks are lightly tensioned.



– Unhook hook -1- from left lifting eye and push spindle onto left side of support bracket - 10 - 222 A- .



♦

– Remove intake manifold ⇒ page 119 .

– Remove timing chain and drive chain for oil pump ⇒ page 49 .

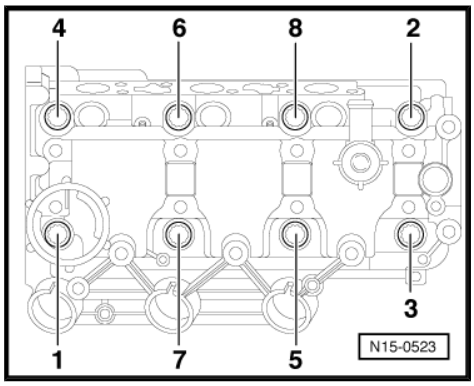
– Remove cylinder head cover.

– Remove fuel rail complete with all injectors from the cylinder head.

– Disconnect all connection, coolant, vacuum and intake hoses from cylinder head.

– Detach front exhaust pipe from exhaust manifold .

– Loosen cylinder head bolts in sequence given and then remove completely.



– Carefully remove cylinder head.

Installing

Note

♦ *Do not remove new cylinder head gasket from its packing until immediately before installing.*

♦ *Handle new gasket with extreme care. Damage will cause leakage.*

– Place clean cloths in cylinders so that no dirt or emery cloth particles can get in between cylinder wall and piston.

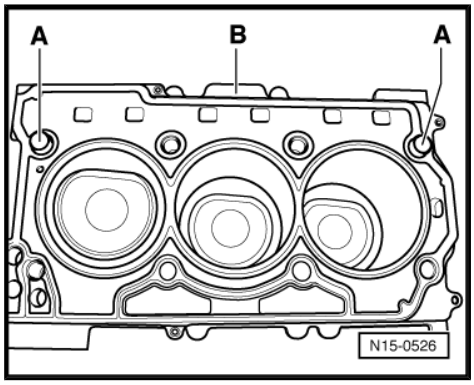
– Also prevent dirt and emery cloth particles from getting into coolant.

– Now carefully clean sealing surfaces of cylinder head and cylinder block. When doing this, ensure that surfaces are not scored or scratched (if abrasive paper is used, grade must not be less than 100).

– Carefully remove metal particles, emery residue and cloths.

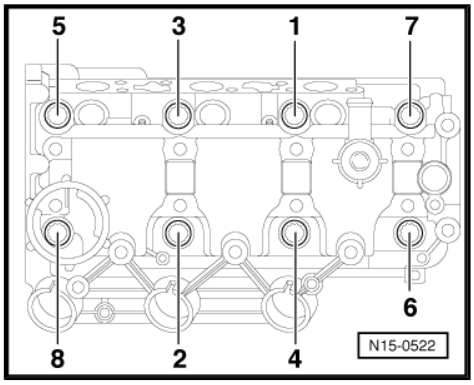
– Set No. 1 cylinder piston to top dead centre and then turn crankshaft back slightly.

– Fit new cylinder head gasket onto centring bushes -A-. Inscription (Part No.) -B- must be readable.



– Fit cylinder head, install the 8 cylinder head bolts and tighten by hand.

– Tighten cylinder head bolts in tightening sequence as follows:



– Tighten all bolts to 30 Nm.
– Then tighten all bolts $^{1}/_{4}$ turn (90°) further using a rigid wrench.
– Then tighten all bolts again $^{1}/_{4}$ turn (90°) further.
– Install timing chain and drive chain for oil pump ⇒ page 49 .

Note

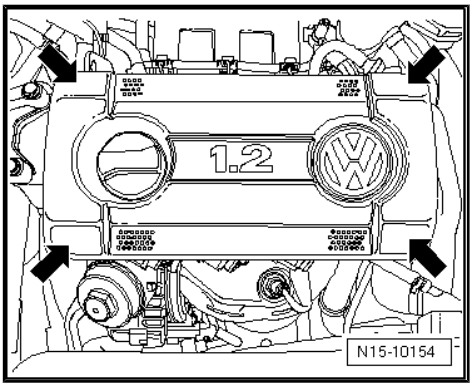
When camshaft is turned, crankshaft must not be at TDC. Danger of damage to valves and piston crowns.

– Adjust valve timing ⇒ page 51 .

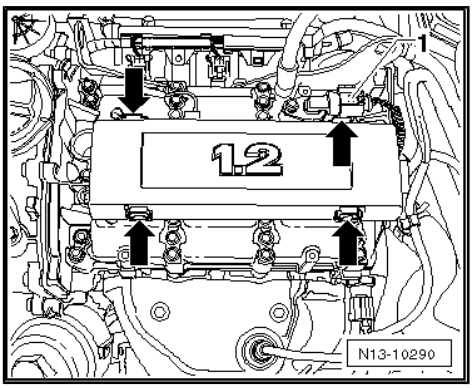
Further assembly is basically the reverse of the dismantling sequence.

Specified torques ⇒ page 64 .

– Replenish coolant ⇒ page 88 .
– Install air filter (engine code AWY) ⇒ page 123 .
– Install engine cover by pressing at points indicated by -arrows- (only engine code BMD).

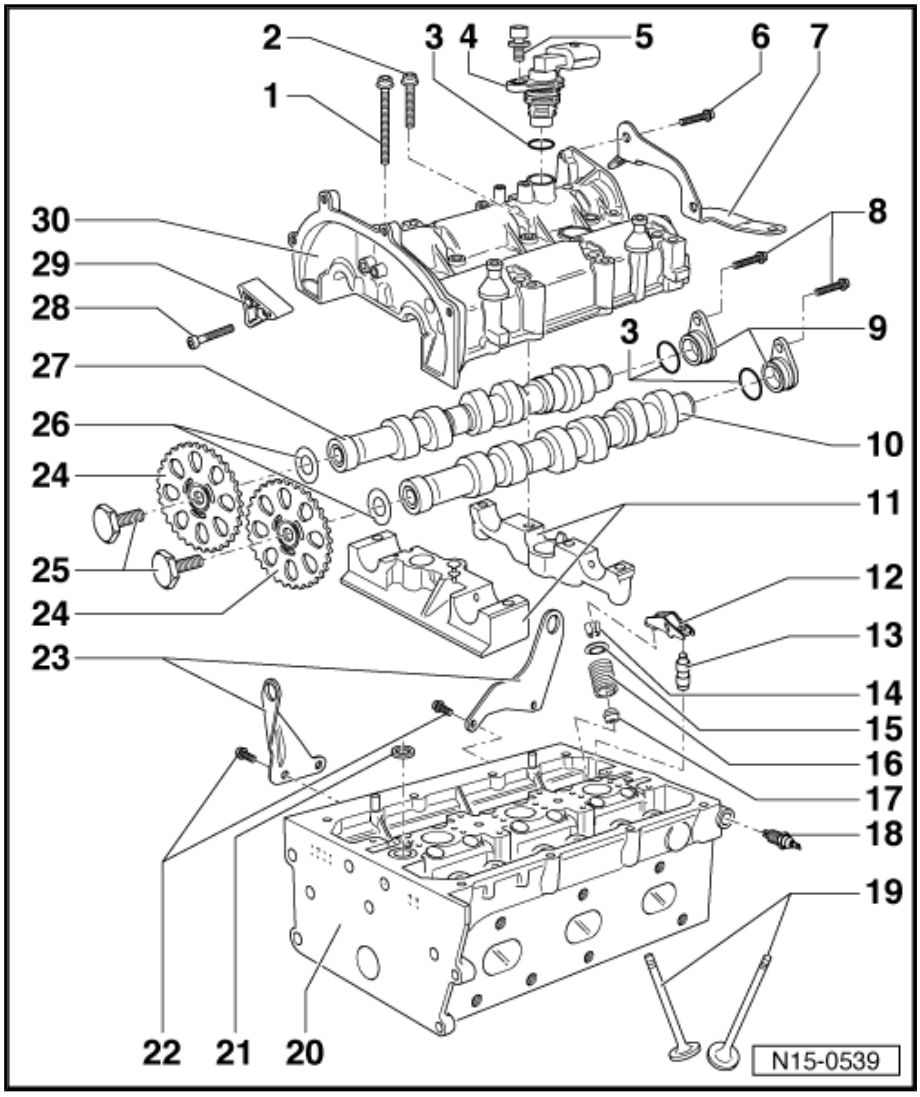


– Push engine cover on retainers -arrows- until they engage audibly (only engine code BZG).
– Push connector -1- on Hall sender - G40- (only engine code BZG).



1.3 Assembly overview - engine codes AZQ, BME, BZG

Removing and installing cylinder head ⇒ page 38 .



1 - 10 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Tighten from inside outwards.

2 - 10 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Tighten from inside outwards.

3 - O-ring

- ❑ Renew if damaged.

4 - Hall sender - G40-

5 - 10 Nm

6 - 10 Nm

7 - Bracket

- ❑ For wiring harness.

8 - 10 Nm

9 - Cap

10 - Exhaust camshaft

11 - Camshaft bearing caps

12 - Roller rocker finger

- ❑ Check roller bearing for ease of movement.
- ❑ Oil contact surface.
- ❑ When installing, secure to supporting element using securing clip.

13 - Support element

- ❑ Do not interchange.
- ❑ With hydraulic valve clearance compensation.
- ❑ Before installing, check camshaft axial clearance ⇒ page 69 .
- ❑ Oil contact surface.

14 - Cotters

15 - Valve spring plate

16 - Valve spring

- ❑ With cylinder head removed, use hold down tool for valve springs - 3362- .
- ❑ With cylinder head installed ⇒ page 73 .

17 - Valve stem seal

- ❑ Renew. ⇒ page 73 .

18 - 0.3...0.7 bar oil pressure switch - F1- , 25 Nm

- ❑ Checking ⇒ page 82 .

19 - Valves

- ❑ Do not rework, only lapping-in is permitted.
- ❑ Valve dimensions ⇒ page 69

20 - Cylinder head

Removing and installing ⇒ page 38

- ❑ Reworking valve seat ⇒ page 69 .
- ❑ Checking cylinder head for distortion ⇒ page 38
- ❑ Reworking sealing surface ⇒ page 68 .

21 - Seal

- ❑ Clean strainer if soiled.

22 - 20 Nm

23 - Lifting eye

24 - Chain sprocket

- ❑ For camshaft.
- ❑ Lock chain sprocket using counterhold - 3036- .

25 - 50 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Lock chain sprockets using counterhold - 3036- .

26 - Washer

- ❑ Was only fitted on engine code AZQ.

27 - Inlet camshaft

28 - 15 Nm

- ❑ Was only fitted on engine code AZQ.

29 - Guide rail

- ❑ Was only fitted on engine code AZQ.

Note

- ♦ *The guide rail has been discontinued, also as replacement part.*
- ♦ *In case of repair the guide rail need not be installed.*

30 - Camshaft housing

Caution

The studs (M6x80) must be screwed into cylinder head before installing camshaft housing.

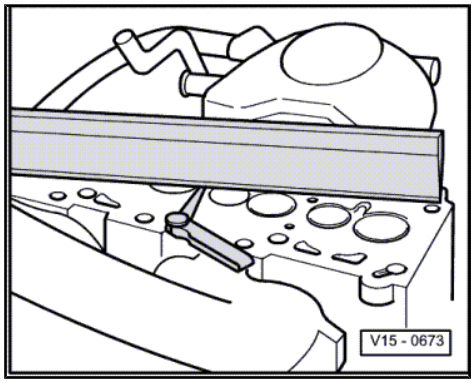
The camshaft housing is guided by the studs, so that the roller rocker fingers do not slip off the supporting elements.

- ❑ Removing and installing ⇒ page 41
- ❑ Remove sealant residue.
- ❑ Coat with D 154 103 A1 before fitting.
- ❑ When installing, fit vertically from above onto studs and dowel pins.

Checking cylinder head for distortion

Check with 500 mm straight edge - VAS 6075- and feeler gauge.

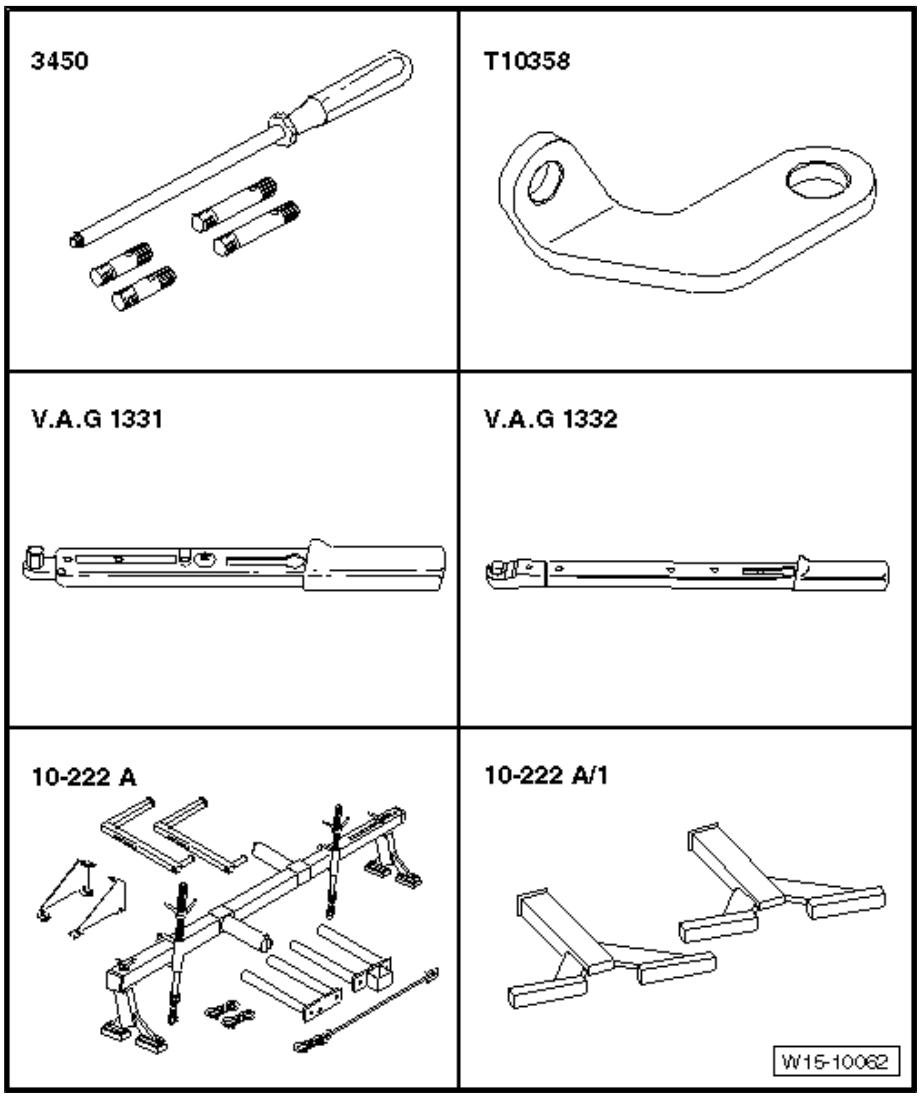
Max. permissible distortion: 0.05 mm.



1.4 Removing and installing cylinder head, engine codes AZQ, BME, BZG

Special tools and workshop equipment required

- Guide pins - 3450-
- Bracket - T10358-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Torque wrench (40…200 Nm) - V.A.G 1332-
- Support bracket - 10 - 222 A-
- Rack - 10 - 222 A /1-



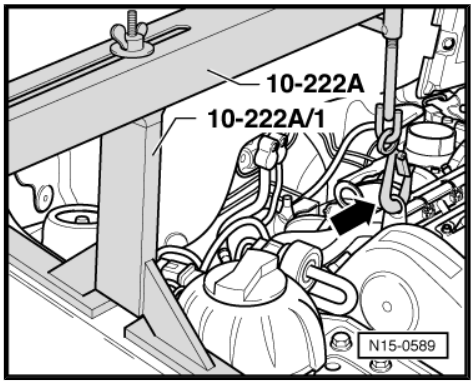
Prerequisites

- The engine must be no more than warm to touch.

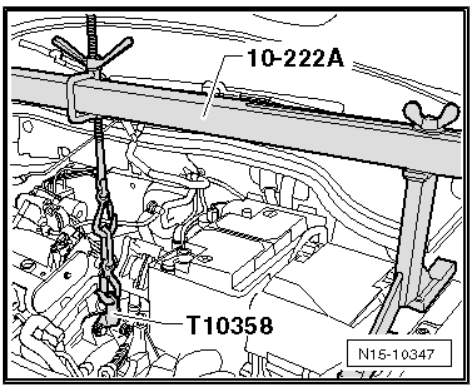
Removing

– Remove air filter (engine codes AZQ, BME) ⇒ page 123 .

– Install support bracket - 10 - 222 A- with rack - 10 - 222 A /1- as shown and hook into lifting eye -arrow-.
– Remove valve timing housing ⇒ page 19 .
– Remove coolant pump pulley.
– Remove exhaust gas recirculation valve - N18- ⇒ page 147 .



– Unscrew securing bolt for gearbox and attach bracket - T10358- as shown.
– Attach hooks of support bracket - 10 - 222 A- to bracket - T10358- as shown.
– Turn spindle until the hooks are lightly tensioned.

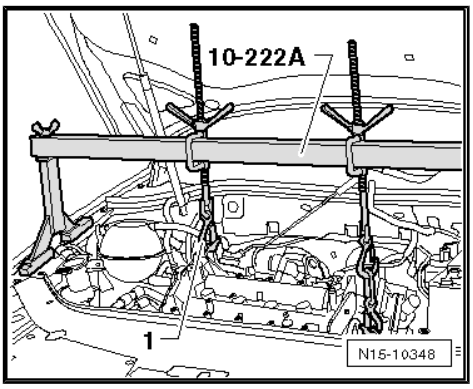


– Unhook hook -1- from left lifting eye and push spindle onto left side of support bracket - 10 - 222 A- .

Remove following components:

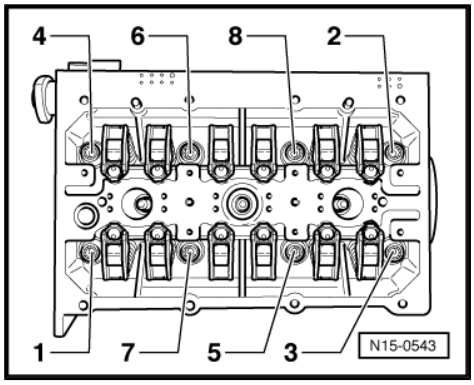
♦ Removing intake manifold ⇒ page 119 .
♦ Remove timing chain and drive chain for oil pump ⇒ page 54 .
♦ Remove camshaft housing ⇒ page 41
♦ Remove fuel rail complete with all injectors from the cylinder head.
♦ Unbolt exhaust manifold with catalytic converter.

– Disconnect all connection, coolant, vacuum and intake hoses from cylinder head.



– Loosen cylinder head bolts in sequence given and then remove completely.

– Carefully remove cylinder head.



Installing

Note

- *Do not remove new cylinder head gasket from its packing until immediately before installing.*
- *Handle new gasket with extreme care. Damage will cause leakage.*

– Place clean cloths in cylinders so that no dirt or emery cloth particles can get in between cylinder wall and piston.

– Also prevent dirt and emery cloth particles from getting into coolant.

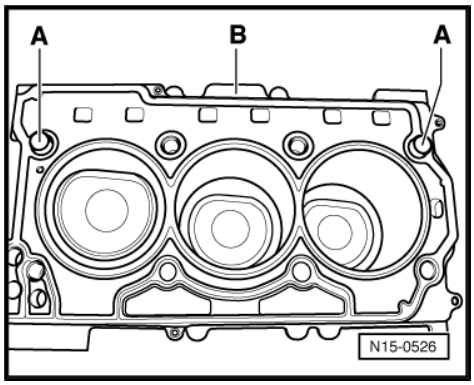
– Now carefully clean sealing surfaces of cylinder head and cylinder block. When doing this, ensure that surfaces are not scored or scratched (if abrasive paper is used, grade must not be less than 100).

– Carefully remove metal particles, emery residue and cloths.

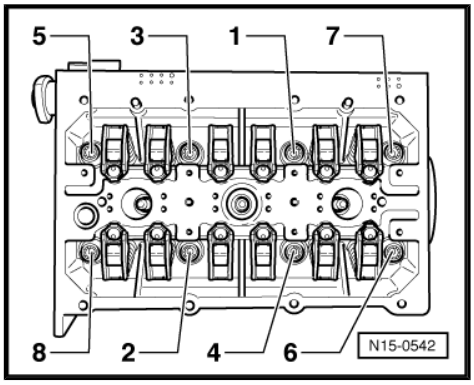
– Set No. 1 cylinder piston to top dead centre and then turn crankshaft back slightly.

– Fit new cylinder head gasket onto centring bushes -A-. Inscription (Part No.) -B- must be readable.

– Fit cylinder head, install the 8 cylinder head bolts and tighten by hand.



– Tighten cylinder head bolts in tightening sequence as follows:



– Tighten all bolts to 30 Nm.
– Then tighten all bolts $^{1}/_{4}$ turn (90°) further using a rigid wrench.
– Then tighten all bolts again $^{1}/_{4}$ turn (90°) further.

Note

When camshaft is turned, crankshaft must not be at TDC. Danger of damage to valves and piston crowns.

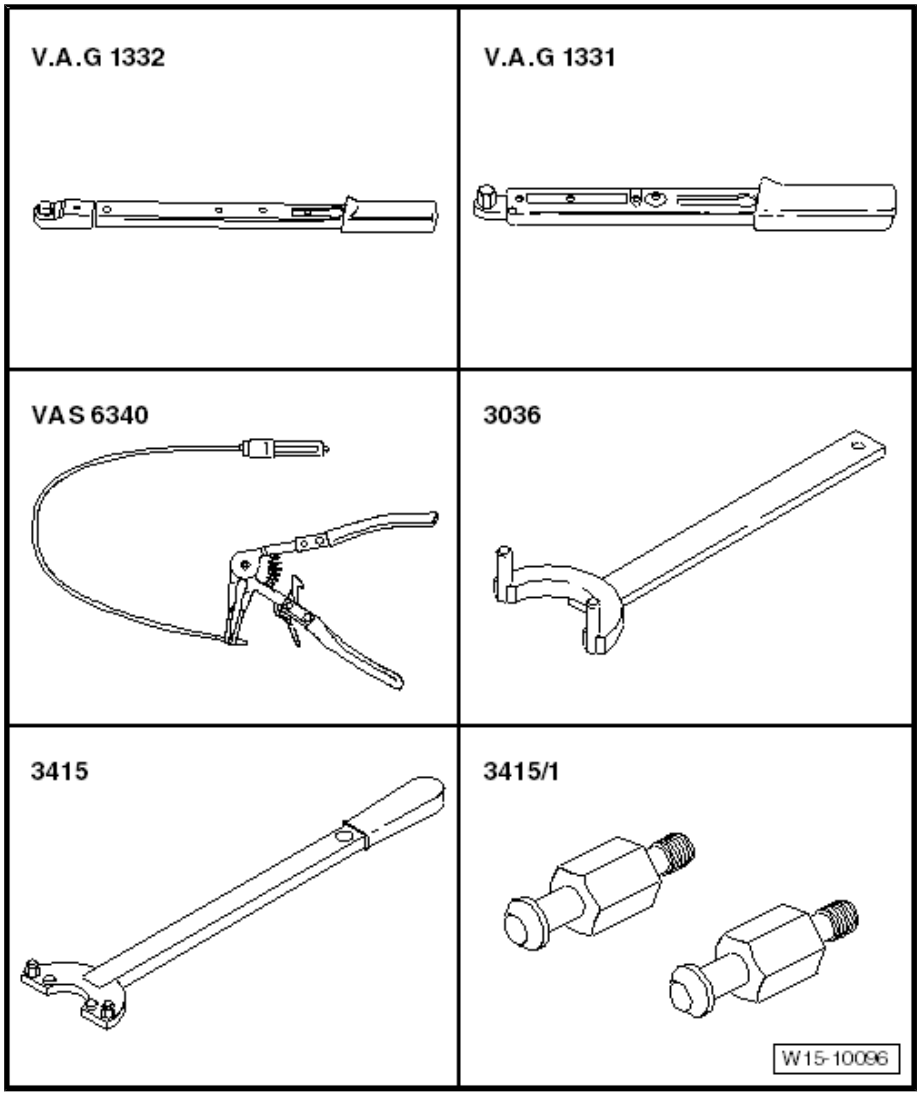
– Install camshaft housing ⇒ page 41 .
– Install timing chain and drive chain for oil pump ⇒ page 54 .
– Adjust valve timing ⇒ page 58 .
– Replenish coolant ⇒ page 88 .
– Install air filter (engine codes AZQ, BME) ⇒ page 123 .

Further assembly is basically the reverse of the dismantling sequence.

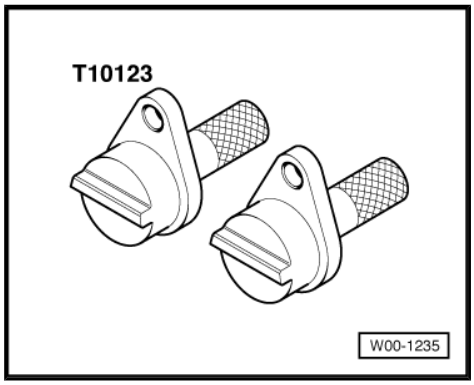
1.5 Removing and installing camshaft housing, engine codes AZQ, BME, BZG

Special tools and workshop equipment required

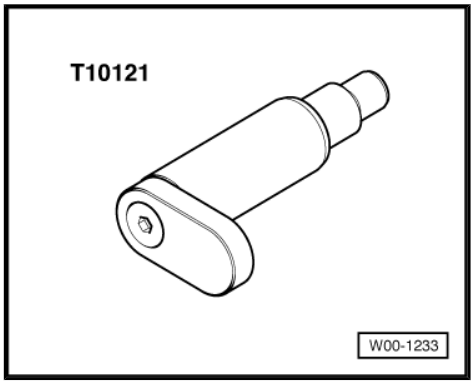
- Torque wrench (40…200 Nm) - V.A.G 1332-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Hose clip pliers - VAS 6340-
- Counterhold tool - 3036-
- Counterhold tool - 3415-
- Pins - 3415/1-



- Camshaft clamp - T10123-
- Sealant - D 154 103 A1-



- Locking pins - T10121-
- Two studs (M6x80)



1.5.1 Removing camshaft housing

Note

- *The camshafts are mounted in the camshaft housing on this engine. For this reason, the camshaft housing can only be removed if the valve timing housing has been removed first.*
- *The camshaft housing sealing surface must not be reworked.*

– First check whether a coded radio is fitted. If so, obtain anti-theft coding.

– Remove air filter.

Engine codes AZQ, BME ⇒ page 123

– With ignition switched off, disconnect battery earth strap.

– Pull 4-pin connectors off ignition coils.

– Remove ignition coils. Use puller - T10094 A- for this purpose.

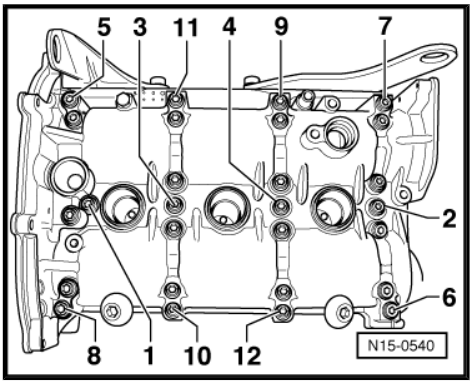
– Remove valve timing housing ⇒ page 19 .

– Remove timing chain ⇒ page 54 .

– Loosen camshaft housing bolts from outside to inside, alternately and diagonally and remove.

– Carefully lift camshaft housing off.

Removing camshafts



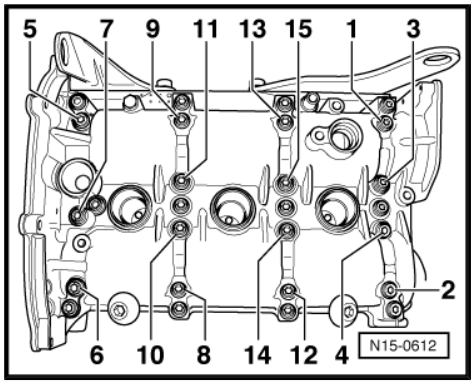
– Loosen camshaft bearing bolts in sequence given and then remove completely.

– Carefully lift camshaft housing off.

Installing camshafts

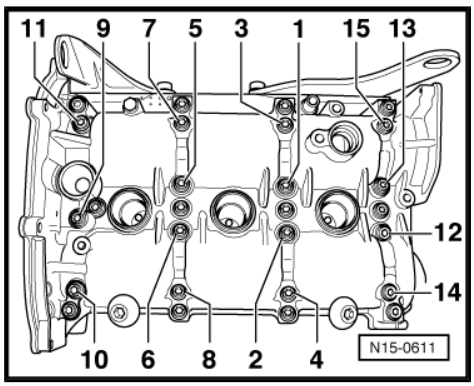
Note

Cast lug on inlet camshaft must be located above Hall sender hole.



– Tighten camshaft bearing bolts in the sequence given until finger-tight.

Ensure that camshaft bearing cap does not tilt. Specified torque: 10 Nm + $^{1}/_{4}$ turn (90°) further.



1.5.2 Installing camshaft housing

Caution

The studs (M6x80) must be screwed into cylinder head before installing camshaft housing.

The camshaft housing is guided by the studs, so that the roller rocker fingers do not slip off the supporting elements.

Prerequisite

- The pistons must not be positioned at TDC.

Note

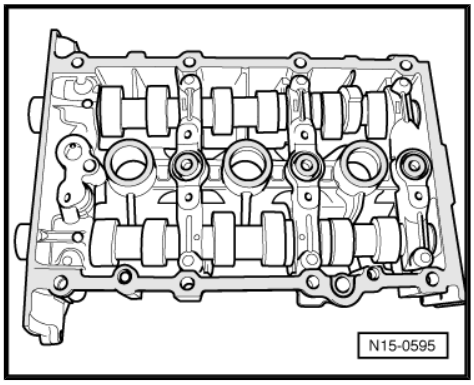
If a piston is at TDC, the valves could strike the piston when the camshafts turn.

– Remove sealant residue from cylinder head and camshaft housing with commercially available sealant remover.

– Also prevent dirt and residual sealant from entering cylinder head.

– Clean sealing surfaces. They must be free of oil and grease.

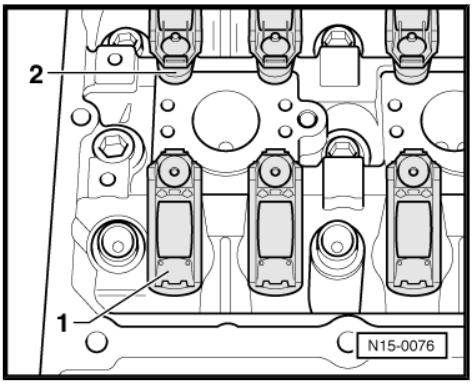
– Apply thin, even coat of sealant on clean camshaft housing sealing surface. See hatched area in illustration.



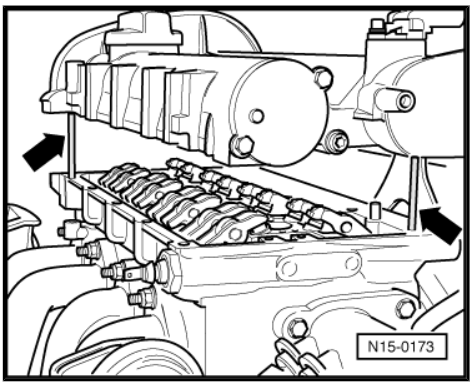
Note

Sealant must not be applied too thickly; otherwise excess sealant can enter oil channels and cause damage to engine.

– Ensure that all roller rocker fingers contact valve stem ends -1- correctly and that they are clipped into their respective support elements -2-.
– Before installing camshaft housing, screw two studs (M6 x 80) into cylinder head.

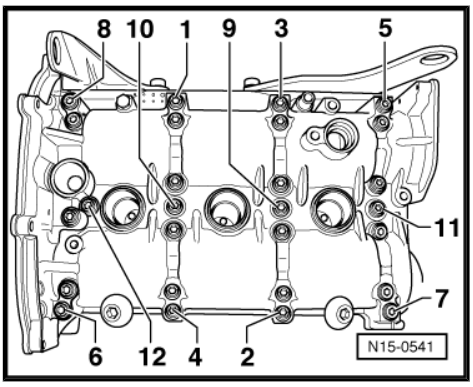


– Carefully fit camshaft housing vertically from above onto studs -arrows- and cylinder head dowel pins.



– Evenly tighten new camshaft housing securing bolts from inside to outside alternately and diagonally.

Ensure that camshaft housing is not canted. Specified torque: 10 Nm + $^1/_4$ turn (90°) further.



Note

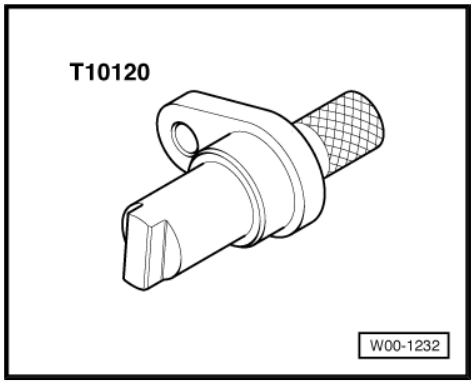
After installing the camshaft housing, wait about 30 minutes for the sealant to dry.

Further assembly is basically the reverse of the dismantling sequence.

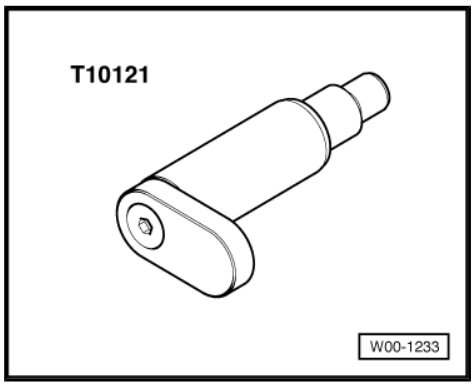
1.6 Checking valve timing, engine codes AWY, BMD, BBM

Special tools and workshop equipment required

♦ Locking pins - T10120-



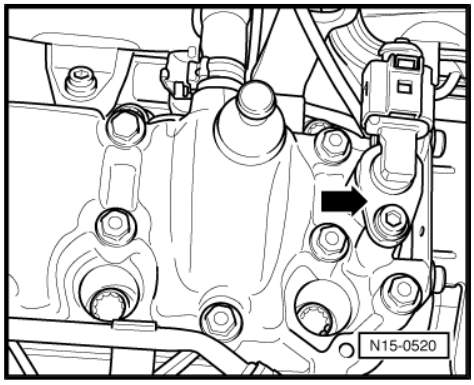
♦ Locking pins - T10121-



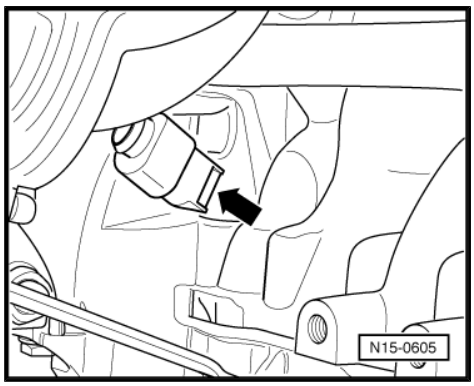
Test procedure

– Remove air filter (engine code AWY only) ⇒ page 123 .

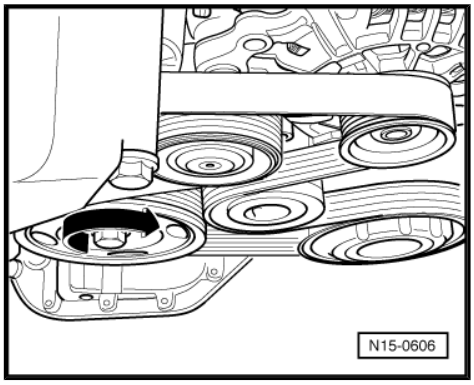
– Remove Hall sender - G40- -arrow-.



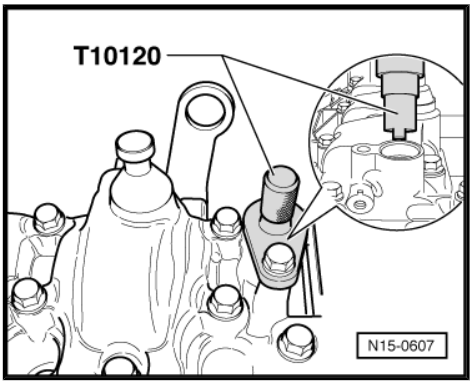
– Remove engine speed sender - G28- -arrow-.



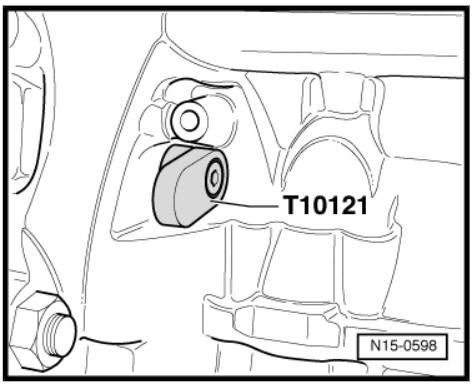
– Turn crankshaft by pulley securing bolt in engine direction of rotation until groove in camshaft appears in Hall sender hole.



– Locking pin -T10120- must be easily insertable into camshaft.



– Lock crankshaft by pressing locking pin -T10121- into flywheel hole.



Note

If locking pin -T10121- cannot be inserted, remove locking pin -T10120- from camshaft. Turn crankshaft in direction of engine rotation (360°) and repeat process.

If both locking pins cannot be inserted:

– Adjust valve timing ⇒ page 51 .

If both locking pins can be inserted:

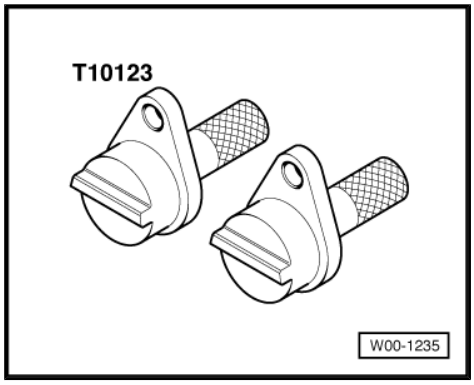
– Remove locking pins from holes and reinstall the two senders.

Further assembly is basically the reverse of the dismantling sequence.

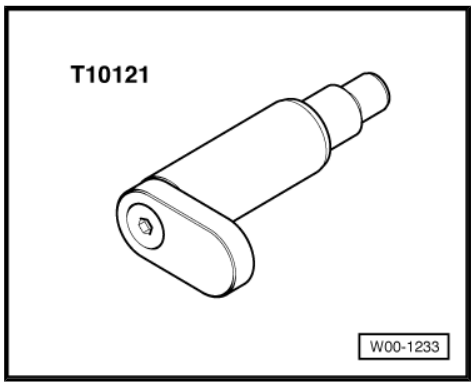
1.7 Checking valve timing, engine codes AZQ, BME, BZG

Special tools and workshop equipment required

♦ Camshaft clamp - T10123-



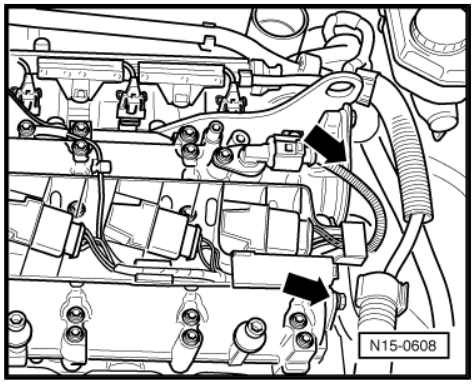
♦ Locking pins - T10121-



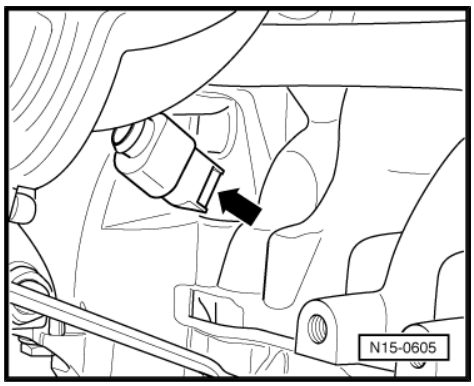
Test procedure

– Remove air filter ⇒ page 123 .

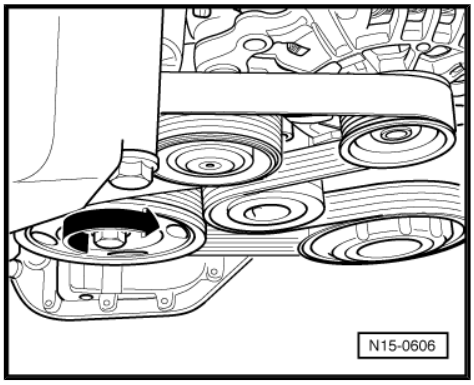
– Remove cover in camshaft housing -arrows-.



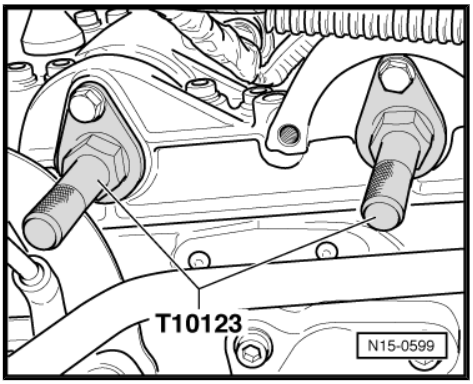
– Remove engine speed sender - G28- -arrow-.



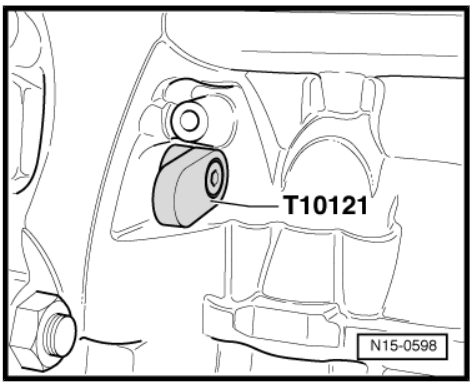
– Use securing bolt on pulley to turn crankshaft in direction of engine rotation until grooves are positioned horizontally in both camshafts.



– Camshaft clamps - T10123- must be easily insertable into camshafts.
– Attach both clamps hand-tight using -M6- hex bolts.



– Lock crankshaft by pressing locking pin -T10121- into flywheel hole.



Note

If locking pin -T10121- cannot be inserted, remove camshaft clamps - T10123- from camshafts. Turn crankshaft in direction of engine rotation (360°) and repeat process.

If both locating tools cannot be inserted:

– Adjust valve timing ⇒ page 58 .

If both locating tools can be inserted:

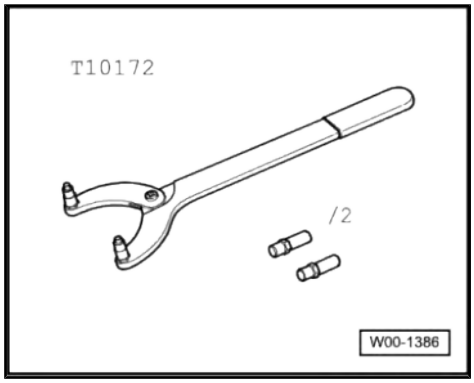
– Remove locating tools from holes and install senders and covers again.

Further assembly is basically the reverse of the dismantling sequence.

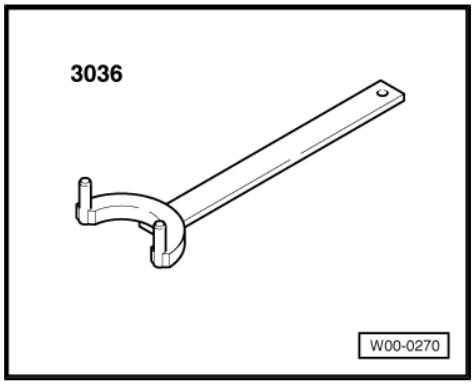
1.8 Removing and installing timing chain and drive chain for oil pump, engine codes AWY, BMD, BBM

Special tools and workshop equipment required

♦ Counterhold tool - T10172-

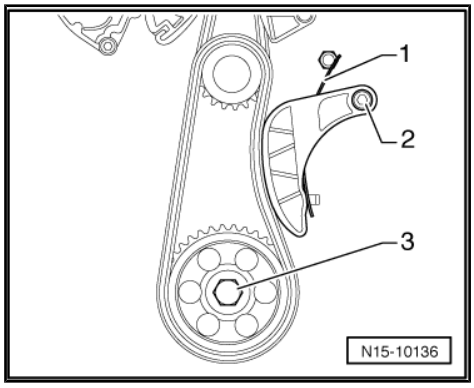


♦ Counterhold tool - 3036-

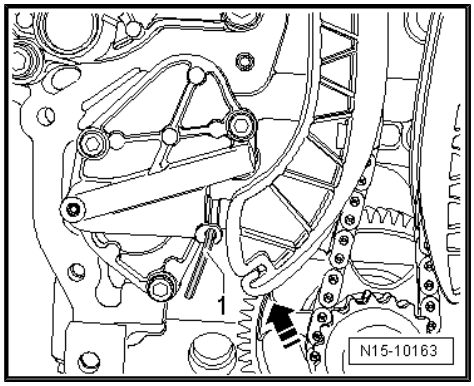


Removing

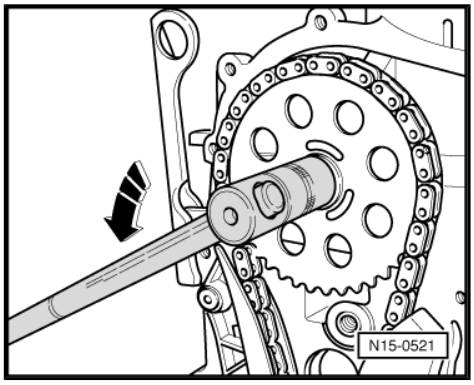
– Remove valve timing housing ⇒ page 19 .
– Lock camshaft and crankshaft ⇒ page 45 .
– Lever spring wire -1- out of stud using a screwdriver.
– Unscrew securing bolt -2- and remove chain tensioner.
– Remove securing bolt -3-. Counterhold the wheel using counterhold tool - T10172- .
– Remove chain sprocket for oil pump, drive chain and drive sprocket.



– Press tensioning plate by hand in -direction of arrow- and lock chain tensioner using 3 mm hexagon key -1-.



– Remove securing bolt. Use counterhold tool - 3036- for this.
– Pull tensioning plate and guide rail forwards off guide pins.
– Remove timing chain from chain sprockets.



Installing

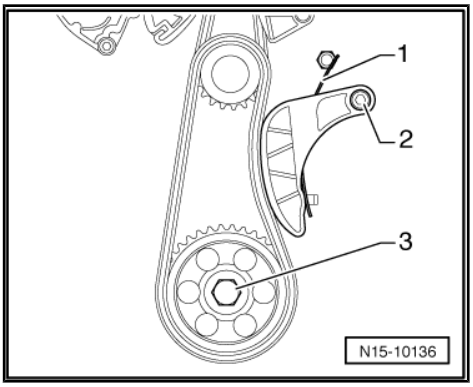
– Place timing chain on crankshaft chain sprocket and camshaft chain sprocket.
– Push tensioning plate and guide rail forwards onto guide pins from front.
– Install camshaft chain sprocket using new securing bolt.

Torque setting for sprocket securing bolt: 20 Nm + 1/4 turn (90°) further.

– Use counterhold tool - 3036- for this.
– Fit drive chain for oil pump on both chain sprockets.
– Fit new securing bolt to oil pump sprocket.

Torque setting for oil pump sprocket -3-: 20 Nm + 1/4 turn (90°) further.

– Install chain tensioner for the oil pump drive.



Torque setting for sprocket securing bolt -2-: 15 Nm

– Use counterhold tool - T10172- for this.
– Lever spring wire -1- onto stud using a screwdriver.
– Tension timing chain by removing 3 mm hexagon key from of chain tensioner.
– Check valve timing ⇒ page 45
– Install timing housing ⇒ page 19 .

1.9 Adjusting valve timing, engine codes AWY, BMD, BBM

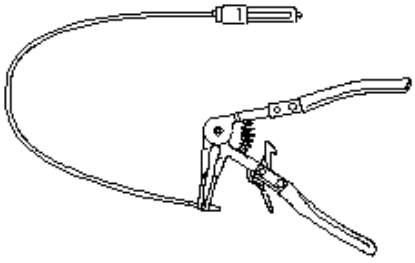
Special tools and workshop equipment required

- Torque wrench (40…200 Nm) - V.A.G 1332-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Hose clip pliers - VAS 6340-
- Counterhold tool - 3036-
- Counterhold tool - 3415-
- Pins - 3415/1-
- Locking pins - T10120-
- Locking pins - T10121-

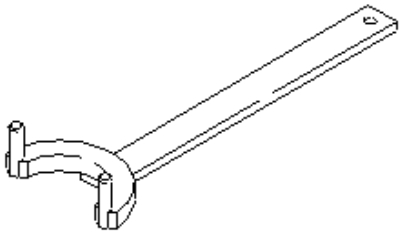
V.A.G 1332

V.A.G 1331

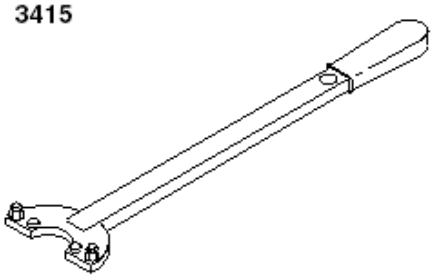
VAS 6340



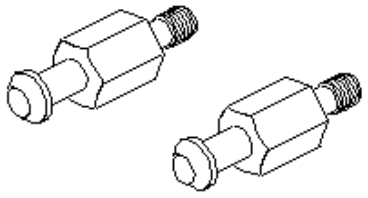
3036



3415

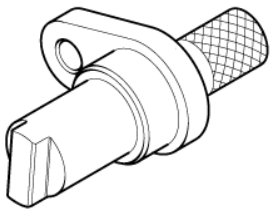


3415/1



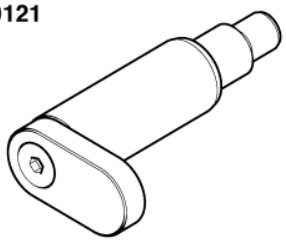
W15-10096

T10120



W00-1232

T10121

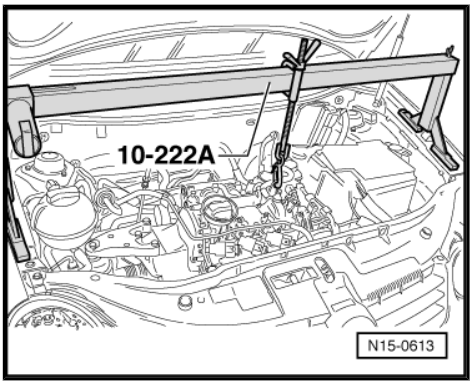


W00-1233

Procedure

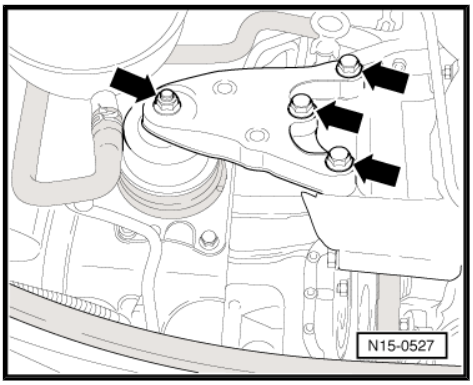
– Fit support bracket - 10 - 222 A- with rack - 10 - 222 A /1- as shown.

– Remove poly V-belt ⇒ page 17 .



– Loosen assembly bracket on engine by loosening the 3 securing bolts -arrows on right-.

– Securing nut on engine mounting -arrow on left- must not be loosened.

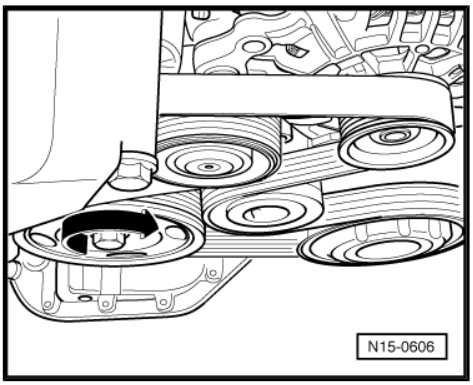


Loosen or separate the following components:

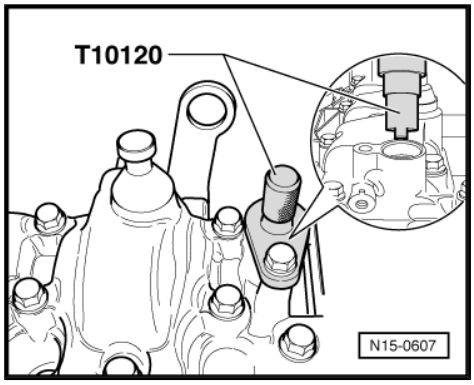
- Coolant pump pulley
- Tensioning element/belt drive
- Tensioning roller
- Alternator
- Air conditioner compressor
- Crankshaft pulley
- Oil level and oil temperature sender - G266-
- Oil dipstick
- Oil sump
- Control housing/chain drive

– Tighten crankshaft V-belt pulley securing bolt into crankshaft to stop.

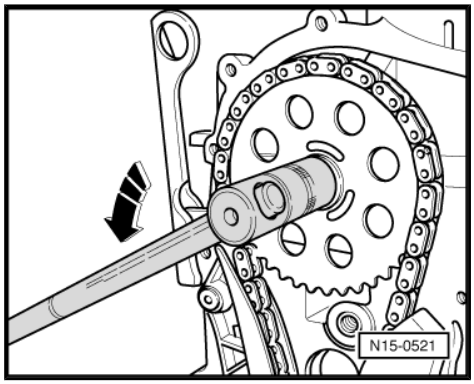
– Turn crankshaft by pulley securing bolt in engine direction of rotation until groove in camshaft appears in Hall sender hole.



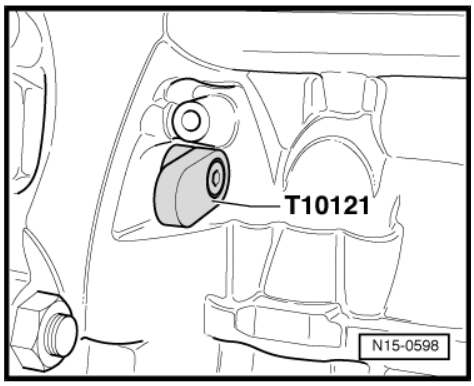
– Locking pin -T10120- must be easily insertable into camshaft.



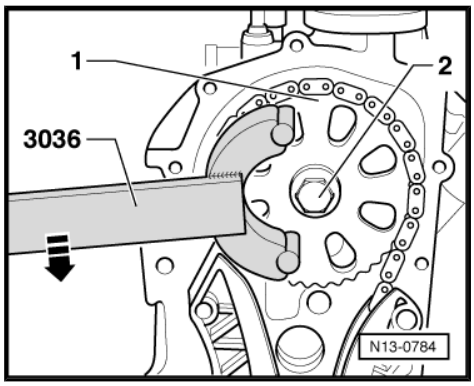
– Loosen securing bolt for camshaft toothed belt pulley (use counterhold - 3036-).



– Turn crankshaft by pulley securing bolt in direction of engine rotation until locking pin -T10121- can be inserted into flywheel.



– Tighten securing bolt -2- for camshaft sprocket -1- to 20 Nm (using counter-hold tool - 3036-).
– Then turn bolt $^{1}/_{4}$ turn (90°) further using a rigid wrench.
– Remove both locking pins from camshaft and flywheel.
– Turn crankshaft two full turns in direction of engine rotation and check valve timing again ⇒ page 45 .

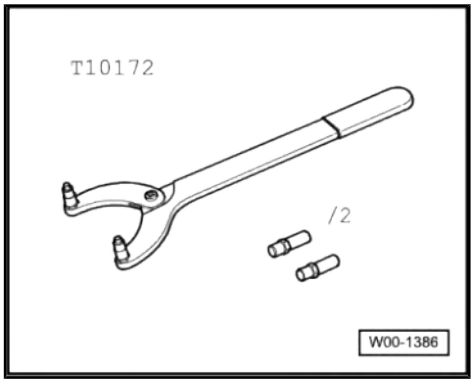


Further assembly is basically the reverse of the dismantling sequence.

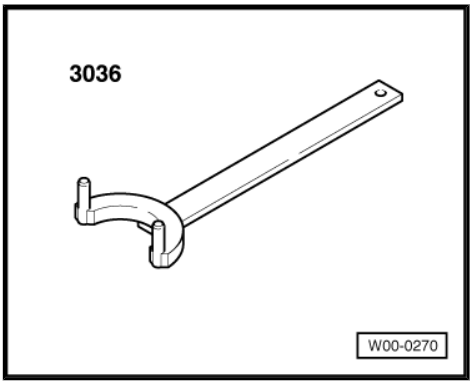
1.10 Removing and installing timing chain and drive chain for oil pump, engine codes AZQ, BME, BZG

Special tools and workshop equipment required

- Counterhold tool - T10172-

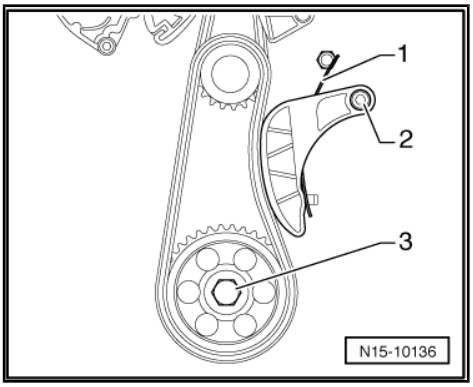


- Counterhold tool - 3036-



Removing

– Remove valve timing housing ⇒ page 19 .
– Lock camshafts and crankshaft ⇒ page 47 .
– Lever spring wire -1- out of stud using a screwdriver.
– Unscrew securing bolt -2- and remove chain tensioner.
– Remove securing bolt -3-. Counterhold the wheel using counterhold tool - T10172- .
– Take chain sprocket for oil pump, drive chain and drive sprocket off together.

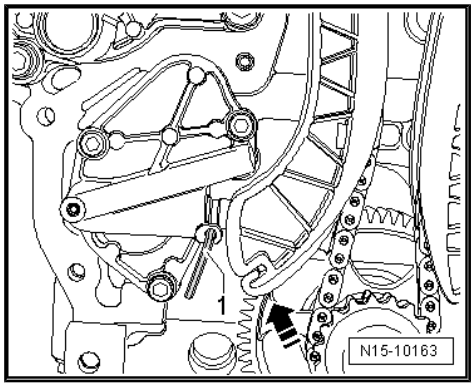


Note

- *The chain tensioner is fitted with the locking hole as standard.*
- *A modified chain tensioner has been implemented in order to reduce noise levels. This chain tensioner is fitted in the case of complaints and has no locking hole.*
- *Note the different repair procedures.*

Chain tensioner with locking hole

– Press tensioning plate by hand in -direction of arrow- and lock chain tensioner using 3 mm hexagon key -1-.



Chain tensioner without locking hole

Caution

Press and hold the chain tensioner piston until removal in order to prevent the components from falling apart.

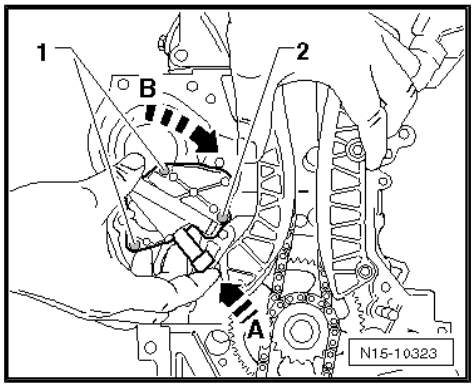
– Remove the securing bolts -1- and remove the bolt -2-.

– Press and hold the chain tensioner piston in direction -arrow A-.

– In doing so, turn the chain tensioner in -direction of arrow B- until the piston is located underneath the tensioning plate.

– Remove securing bolt -2- and remove chain tensioner.

– Remove guide rail -1-.



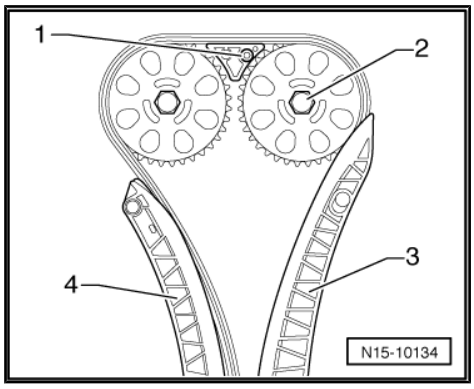
Note

- *The guide rail -1- was only installed on engines with engine code AZQ. It has been discontinued as replacement part.*
- *In case of repair the guide rail need not be installed.*

– Remove securing bolt -2-. Use counterhold tool - 3036- for this.

– Pull tensioning plate -4- and guide rail -3- forwards off guide pins.

– Remove timing chain from chain sprockets.



Installing

– Place timing chain on crankshaft chain sprocket and camshaft chain sprocket.

– Push tensioning plate -4- and guide rail -3- onto guide pins from front.

– Install second camshaft chain sprocket using new securing bolt -2-.

Note

- *The guide rail -1- was only installed on engines with engine code AZQ. It has been discontinued as replacement part.*
- *In case of repair the guide rail need not be installed.*

Chain tensioner with locking hole

– Tension timing chain by removing 3 mm hexagon key from of chain tensioner.

Chain tensioner without locking hole

– Put the chain tensioner together as follows and press and hold the piston.

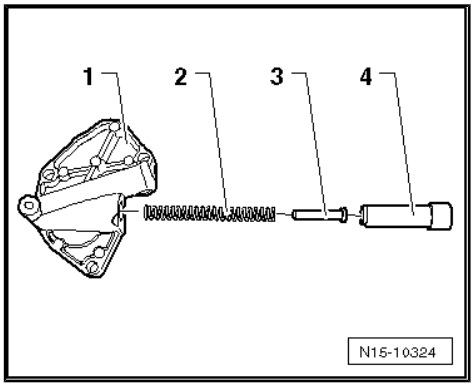
Assembly overview

1 - Chain tensioner housing

2 - Spring

3 - Pins

4 - Piston



Caution

Press and hold the chain tensioner piston until installation in order to prevent the components from falling apart.

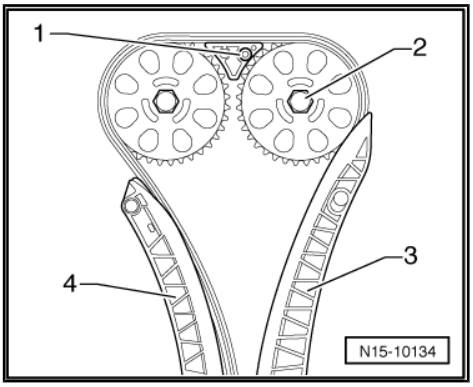
Specified torque for guide rail securing bolt: 15 Nm.

Specified torque for chain sprocket securing bolt: 50 Nm + 1/4 turn (90°) further.

– Use counterhold tool - 3036- for this.

– Fit drive chain for oil pump on both chain sprockets.

– Fit new securing bolt to oil pump sprocket.



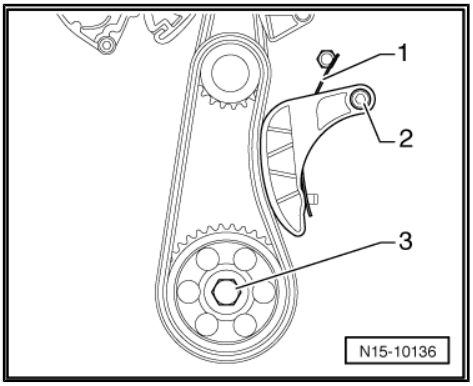
Specified torque for oil pump chain sprocket -3-: 20 Nm + 1/4 turn (90°) further.

– Install chain tensioner for the oil pump drive.

Torque setting for sprocket securing bolt -2-: 15 Nm

– Use counterhold tool - T10172- for this.

– Lever spring wire -1- onto stud using a screwdriver.



Note

- *The chain tensioner is fitted with the locking hole as standard.*
- *A modified chain tensioner has been implemented in order to reduce noise levels. This chain tensioner is fitted in the case of complaints and has no locking hole.*
- *Note the different repair procedures.*

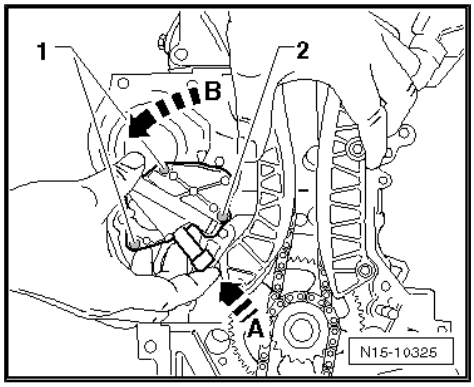
– Tighten securing bolt -2- hand-tight.

– Press the chain tensioner piston in direction -arrow A-.
– In doing so, turn the chain tensioner in -direction of arrow B- until the piston is on the tensioning plate.
– Secure the chain tensioner by tightening the securing bolts -1- hand-tight.
– Tighten securing bolts -1- and -2-.

Specified torque for securing bolts on chain tensioner: 9 Nm.

– Check valve timing ⇒ page 47
– Install timing housing ⇒ page 19 .

Further assembly is basically the reverse of the dismantling sequence.



1.11 Adjusting valve timing, engine codes AZQ, BME, BZG

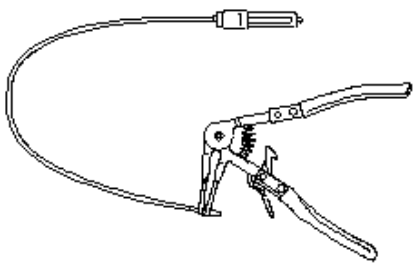
Special tools and workshop equipment required

- Torque wrench (40…200 Nm) - V.A.G 1332-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Hose clip pliers - VAS 6340-
- Counterhold tool - 3036-
- Counterhold tool - 3415-
- Pins - 3415/1-
- Camshaft clamp - T10123-
- Locking pins - T10121-

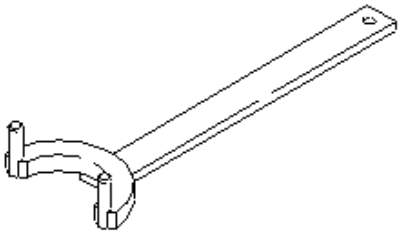
V.A.G 1332

V.A.G 1331

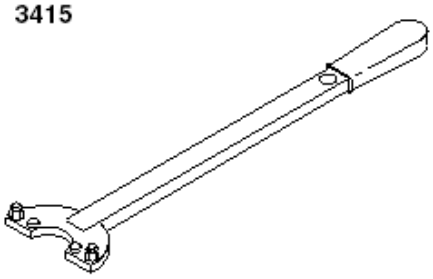
VAS 6340



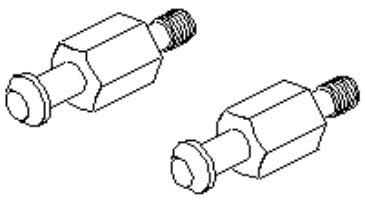
3036



3415

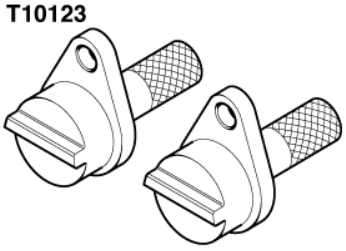


3415/1



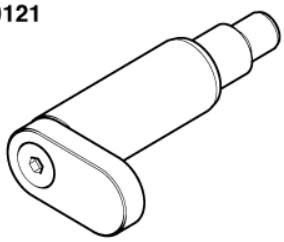
W15-10096

T10123



W00-1235

T10121

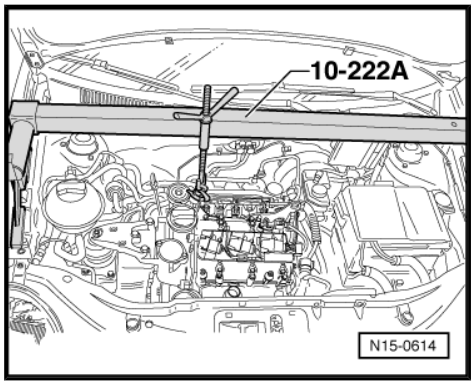


W00-1233

Procedure

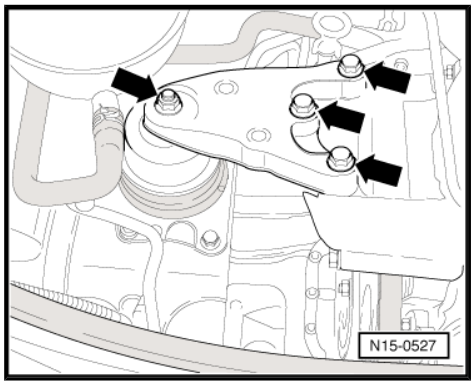
– Fit support bracket - 10 - 222 A- with rack - 10 - 222 A /1- as shown.

– Remove poly V-belt ⇒ page 17 .



– Loosen assembly bracket on engine by loosening the 3 securing bolts -arrows on right-.

– Securing nut on engine mounting -arrow on left- must not be loosened.

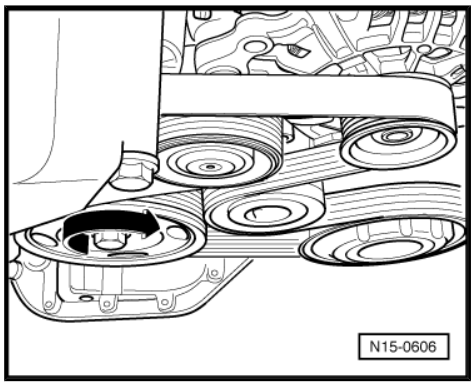


Loosen or separate the following components:

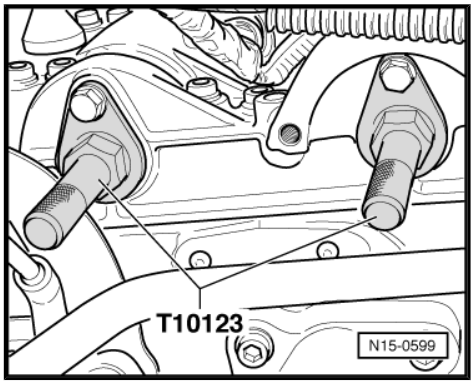
- Coolant pump pulley
- Tensioning element/belt drive
- Tensioning roller
- Alternator
- Air conditioner compressor
- Crankshaft pulley
- Oil level and oil temperature sender - G266-
- Oil dipstick
- Oil sump
- Control housing/chain drive

– Tighten crankshaft V-belt pulley securing bolt into crankshaft to stop.

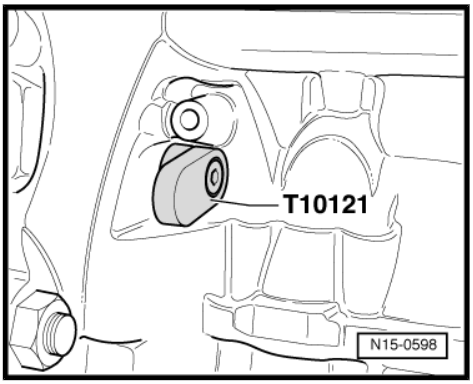
– Use securing bolt on pulley to turn crankshaft in direction of engine rotation until grooves are positioned horizontally in both camshafts.



– Camshaft clamps - T10123- must be easily insertable into camshafts.
– Attach both clamps hand-tight using -M6- hex bolts.
– Loosen both securing bolts for the camshaft pulleys (use counterhold tool - 3036-).

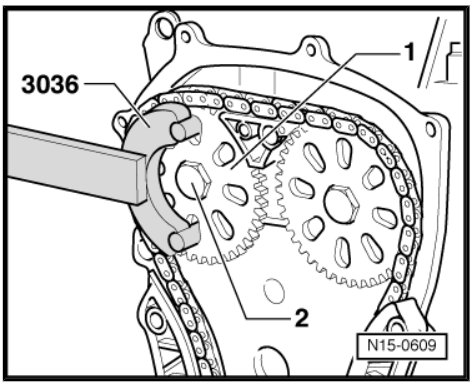


– Turn crankshaft by pulley securing bolt in direction of engine rotation until locking pin - T10121- can be inserted into flywheel.



– Tighten securing bolts -2- for camshaft pulleys -1- to 50 Nm (using counterhold tool - 3036-).
– Then tighten all bolts $^{1}/_{4}$ turn (90°) further using a rigid wrench.
– Remove both locating tools from camshaft and flywheel.
– Turn crankshaft two full turns in direction of engine rotation and check valve timing again ⇒ page 47

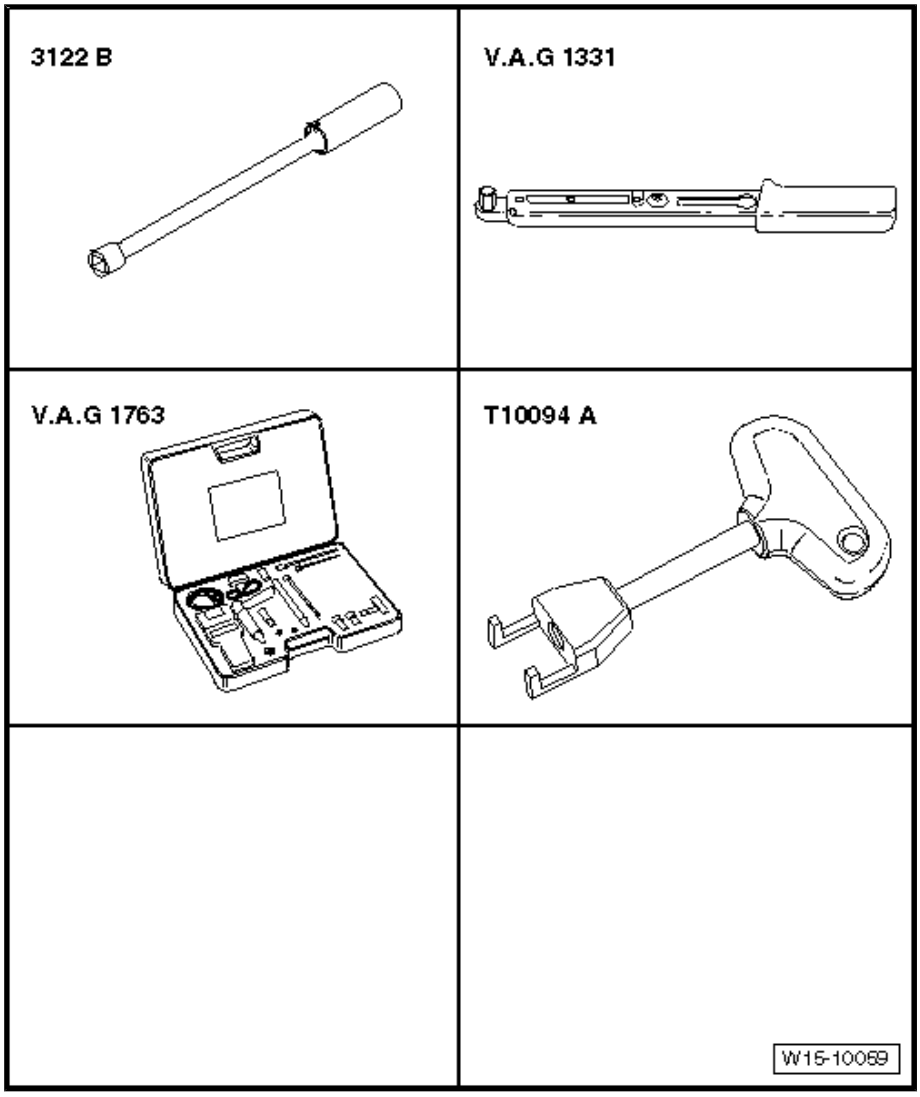
Further assembly is basically the reverse of the dismantling sequence.



1.12 Checking compression

Special tools and workshop equipment required

- Spark plug socket and extension - 3122 B-
- Torque wrench (5…50 Nm) - V.A.G 1331-
- Compression tester - V.A.G 1763-
- Puller - T10094 A-



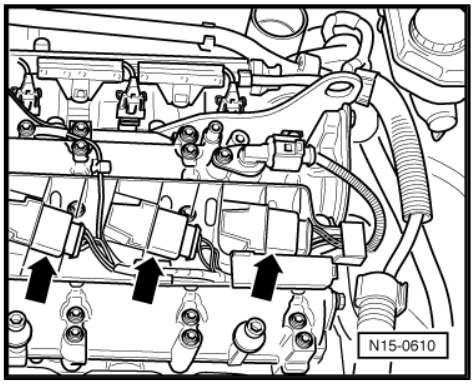
Test prerequisite

- Engine oil temperature must be at least 30°C.

Test procedure

– Remove air filter.

Engine codes AWY, AZQ, BME ⇒ page 123



– Pull 4-pin connectors off ignition coils -arrows-.
– Remove ignition coils off spark plugs using puller - T10094 A- .
– Remove spark plugs using spark plug socket and extension - 3122 B- .
– Remove fuse for injectors. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
– Check compression using compression tester - V.A.G 1763- .

Note

How to use the test unit is described in the respective operating instructions.

– Operate starter until tester shows no further pressure increase.

Compression pressures:

New: 10…15 bar.

Wear limit: 7 bar.

Maximum permissible difference between all cylinders: 3 bar

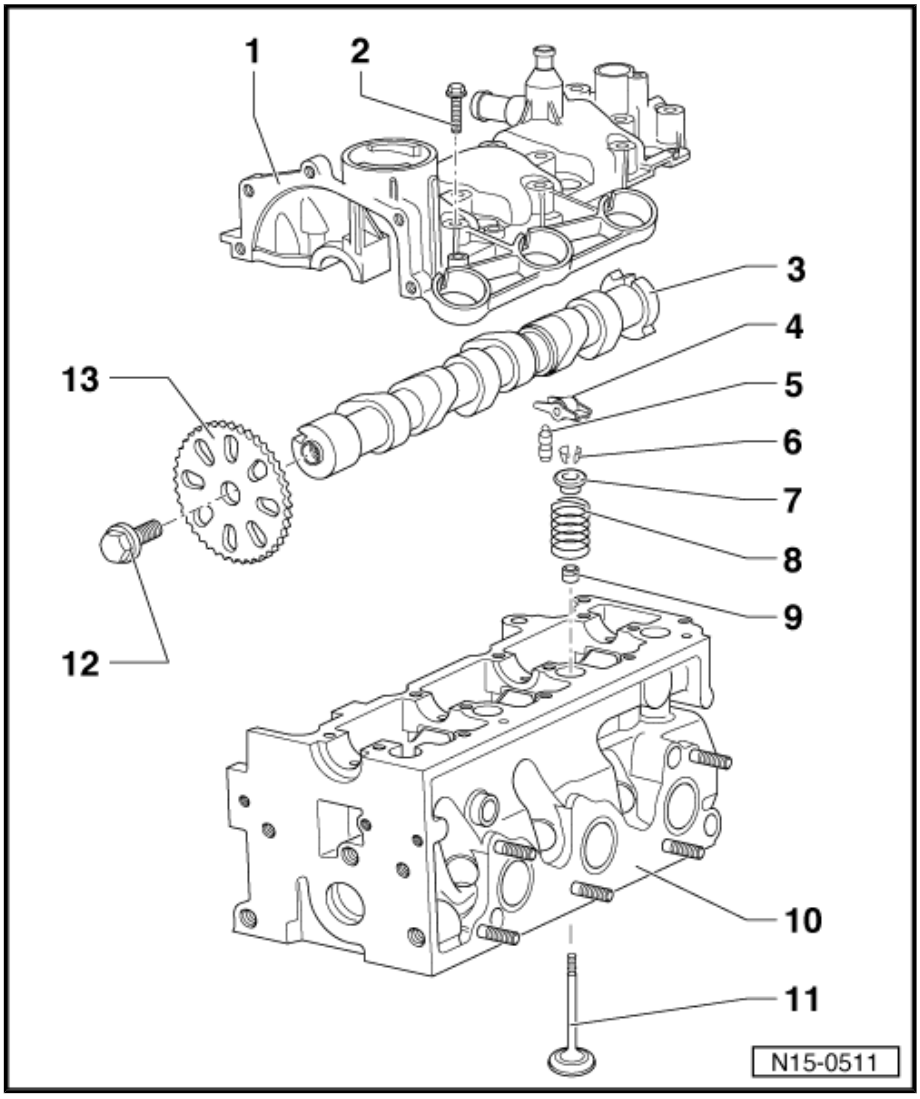
– Insert spark plugs using spark plug socket and extension - 3122 B- and tighten to 25 Nm.
– Read fault memory, rectify any faults and then erase fault memory ⇒ Vehicle diagnostic tester “Guided fault finding”.
– The readiness code must be generated if the fault memory has been erased.

2 Valve gear

2.1 Assembly overview - engine codes AWY, BMD, BBM

Note

Cylinder heads which have cracks between the valve seats or between a valve seat insert and the spark plug thread can be used further without reducing service life, provided the cracks do not exceed a maximum of 0.5 mm in width, or when only the first turns of the spark plug thread are cracked.



1 - Cylinder head cover

- ❑ Sealing surface must not be reworked.
- ❑ With integrated camshaft bearings.
- ❑ Remove sealant residue.
- ❑ Coat with D 154 103 A1 before fitting.
- ❑ When installing, lower vertically from above so that dowel pins fit into holes in cylinder head.

2 - 6 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Tighten from inside outwards.

3 - Camshaft

- ❑ Checking axial clearance ⇒ page 69 .
- ❑ Check radial clearance with Plastigage, wear limit: 0.1 mm.
- ❑ Runout: max. 0.05 mm.

4 - Roller rocker finger

- ❑ Check roller bearing for ease of movement.
- ❑ Oil contact surface.
- ❑ When installing, secure to supporting element using securing clip.

5 - Support element

- ❑ Do not interchange.
- ❑ With hydraulic valve clearance compensation.

6 - Cotters

7 - Valve spring plate

8 - Valve spring

- ❑ With cylinder head removed, use valve spring compressor - 2037- .
- ❑ With cylinder head installed ⇒ page 73 .

9 - Valve stem seal

- ❑ Renew. ⇒ page 73 .

10 - Cylinder head

- ❑ Removing and installing ⇒ page 32
- ❑ Reworking camshaft-side sealing surface is not permitted.
- ❑ Reworking valve seat ⇒ page 69 .
- ❑ Reworking sealing surface on cylinder head side ⇒ page 66 .

11 - Valves

- ❑ Do not rework, only lapping-in is permitted.
- ❑ Valve dimensions ⇒ page 69

12 - 20 Nm + 1/4 turn (90°) further

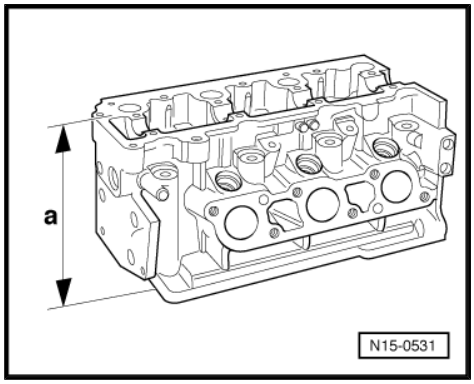
- ❑ Renew.

13 - Chain sprocket

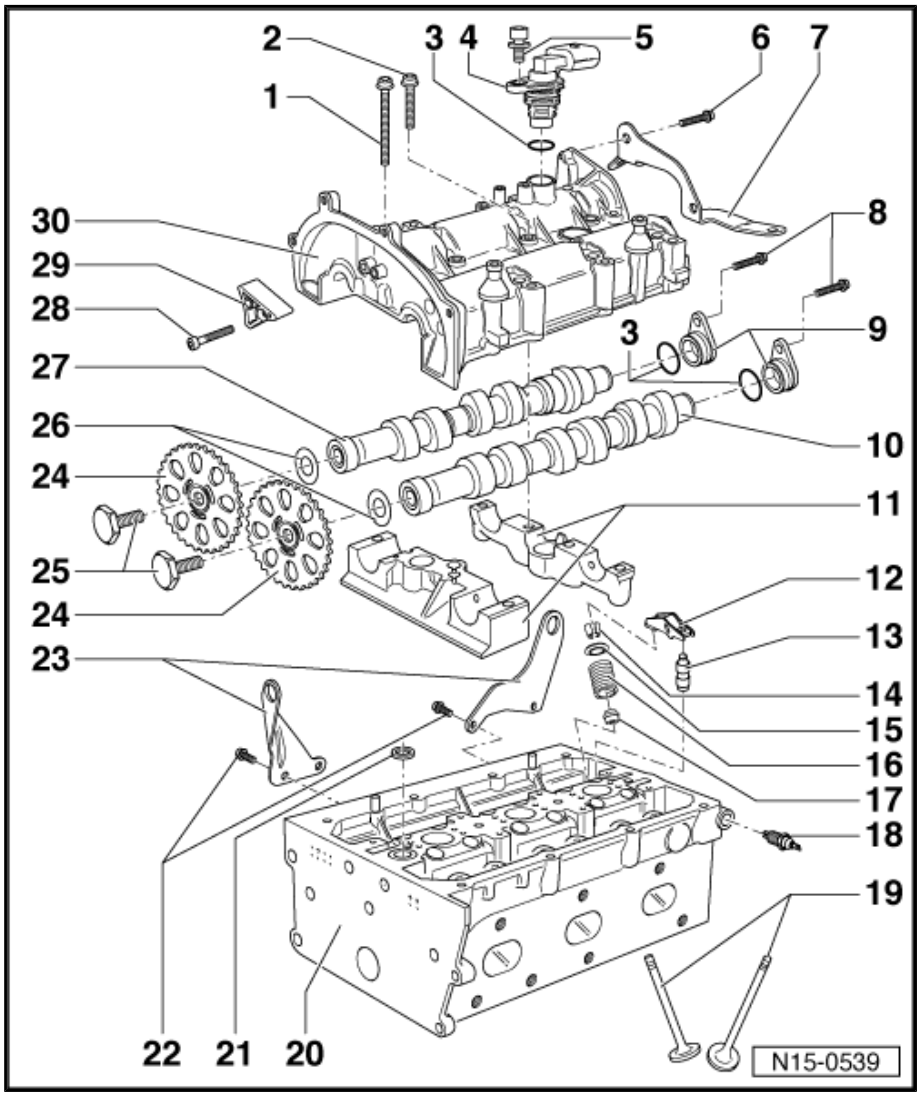
- ❑ For camshaft.
- ❑ Lock chain sprocket using counterhold - 3036- .

Rework cylinder head sealing surface on cylinder head side

Cylinder head reworking dimension: a = at least 136.15 mm.



2.2 Assembly overview - engine codes AZQ, BME, BZG



1 - 10 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Tighten from inside outwards.

2 - 10 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Tighten from inside outwards.

3 - O-ring

- ❑ Renew if damaged.

4 - Hall sender -G40-

5 - 10 Nm

6 - 10 Nm

7 - Bracket

- ❑ For wiring harness.

8 - 10 Nm

9 - Cap

10 - Exhaust camshaft

11 - Camshaft bearing caps

12 - Roller rocker finger

- ❑ Check roller bearing for ease of movement.
- ❑ Oil contact surface.
- ❑ When installing, secure to supporting element using securing clip.

13 - Support element

- ❑ Do not interchange.
- ❑ With hydraulic valve clearance compensation.

- ❑ Before installing, check camshaft axial clearance ⇒ page 69 .
- ❑ Oil contact surface.

14 - Cotters

15 - Valve spring plate

16 - Valve spring

- ❑ With cylinder head removed, use hold down tool for valve springs - 3362- .
- ❑ With cylinder head installed ⇒ page 73 .

17 - Valve stem seal

- ❑ Renew. ⇒ page 73 .

18 - 0.3…0.7 bar oil pressure switch - F1- , 25 Nm

- ❑ Checking ⇒ page 82 .

19 - Valves

- ❑ Do not rework, only lapping-in is permitted.
- ❑ Valve dimensions ⇒ page 69

20 - Cylinder head

- ❑ Removing and installing ⇒ page 66
- ❑ Reworking valve seat ⇒ page 69 .
- ❑ Reworking sealing surface ⇒ page 68 .

21 - Seal

- ❑ Clean strainer if soiled.

22 - 20 Nm

23 - Lifting eye

24 - Chain sprocket

- ❑ For camshaft.
- ❑ Lock chain sprocket using counterhold - 3036- .

25 - 50 Nm + $^{1}/_{4}$ turn (90°) further

- ❑ Renew.

26 - Washer

- ❑ Was only fitted on engine code AZQ.

27 - Inlet camshaft

28 - 15 Nm

- ❑ Was only fitted on engine code AZQ.

29 - Guide rail

- ❑ Was only fitted on engine code AZQ.

Note

- ♦ *The guide rail has been discontinued, also as replacement part.*
- ♦ *In case of repair the guide rail need not be installed.*

30 - Camshaft housing

Caution

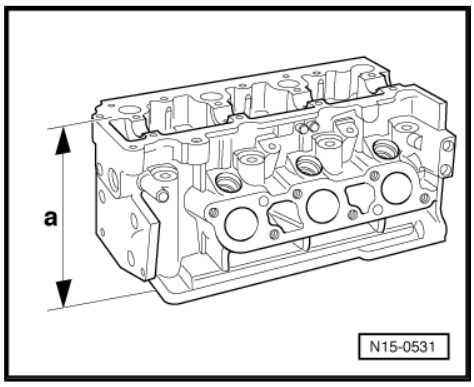
The studs (M6x80) must be screwed into cylinder head before installing camshaft housing.

The camshaft housing is guided by the studs, so that the roller rocker fingers do not slip off the supporting elements.

- ❑ Removing and installing ⇒ page 41
- ❑ Remove sealant residue.
- ❑ Coat with D 154 103 A1 before fitting.
- ❑ When installing, fit vertically from above onto studs and dowel pins.

Rework cylinder head sealing surface on cylinder head side

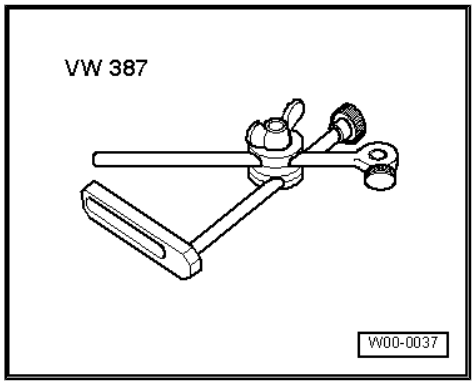
Cylinder head reworking dimension: a = at least 108.25 mm.

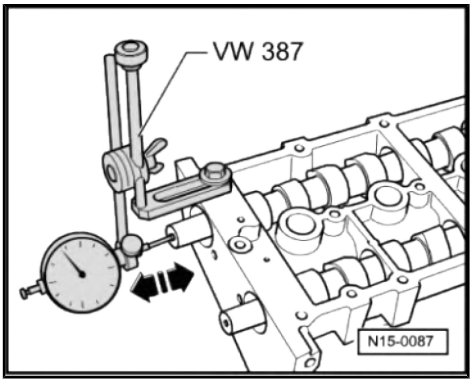


2.3 Checking camshaft axial clearance

Special tools and workshop equipment required

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





Checking camshaft axial clearance

Perform measurements with support elements and cylinder head cover removed.

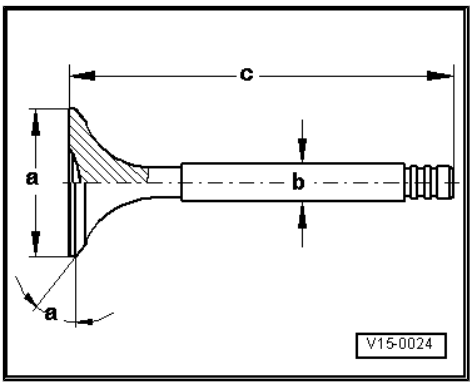
– Apply thumb pressure to centre camshaft bearing -arrow- and move camshaft back and forth to check axial play.

Wear limit: max. 0.20 mm

Valve dimensions

Note

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



Dimension		Inlet valve	Exhaust valve
∅ a	mm	29.5	26.0
∅ b	mm	5.973	5.953
c	mm	100.9	100.5
α	∠°	45	45

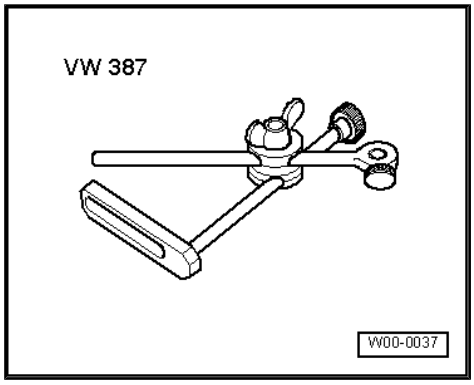
2.4 Reworking valve seats

⇒ “2.4.1 Two valves per cylinder, engine codes AWY, BMD, BBM”, page 70

⇒ “2.4.2 Four valves per cylinder, engine codes AZQ, BME, BZG”, page 71

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



- Dial gauge
- Depth gauge
- Vernier gauge
- Valve seat refacing tool

2.4.1 Two valves per cylinder, engine codes AWY, BMD, BBM

Note

- *When repairing engines with leaking valves, it is not sufficient to rework or renew valve seats and valves. Particularly on high mileage engines, it is necessary also to check valve guides for wear* *⇒ page 72* *.*
- *Valve seats are only to be reworked to the extent required to yield a proper surface appearance. Before beginning to rework valve seats, calculate the maximum permissible reworking dimensions. If the reworking dimension is exceeded, the hydraulic valve clearance compensation can no longer be guaranteed and the cylinder head must be renewed.*

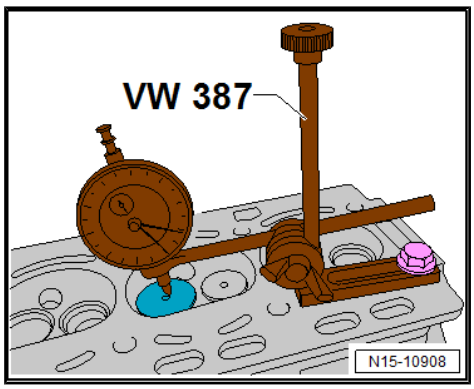
The max. permissible reworking dimension is calculated as follows:

– Insert valve and press firmly against seat.

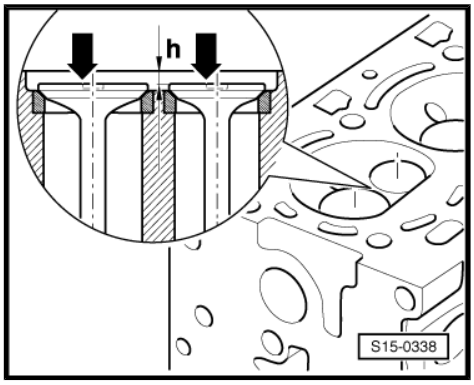
Note

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

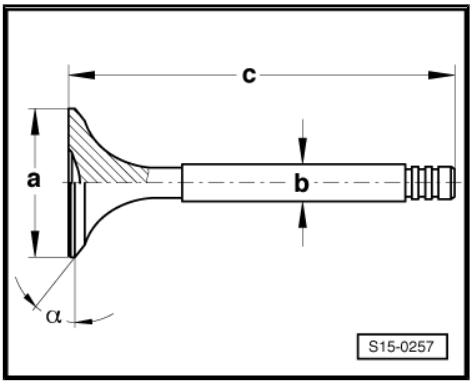
– Secure universal dial gauge bracket to cylinder head using bolt.



– Measure distance -h- from lower edge of cylinder head to lower edge of valve combustion face. Measure immediately next to the notch in the centre of the valve combustion face -arrows-.



– Measure length of valve -c-.



Note

Measure -c- immediately next to the notch in the centre of the valve combustion face.

– Calculate the maximum permissible reworking dimension from the measured distances -c, h- and the maximum dimension.

Maximum dimension for both valves: 103.7 mm

The maximum permissible reworking dimension = 103.7 - (c + h).

Example:

	Maximum dimension for both valves	103.7	mm
-	(Valve length -c- + measured distance -h-)	(99.2 + 4.35)	mm
=	= max. permissible reworking dimension [1]	0.15	mm

1) The max. permissible reworking dimension is shown as dimension “b” in the illustrations for reworking valve seats.

2.4.2 Four valves per cylinder, engine codes AZQ, BME, BZG

Note

- *When repairing engines with leaking valves, it is not sufficient to rework or renew valve seats and valves. Particularly on high mileage engines, it is necessary also to check valve guides for wear* ⇒ page 72 .
- *Valve seats are only to be reworked to the extent required to yield a proper surface appearance. Before beginning to rework valve seats, calculate the maximum permissible reworking dimensions. If the reworking dimension is exceeded, the hydraulic valve clearance compensation can no longer be guaranteed and the cylinder head must be renewed.*

The max. permissible reworking dimension is calculated as follows:

– Insert valve and press firmly against seat.

Note

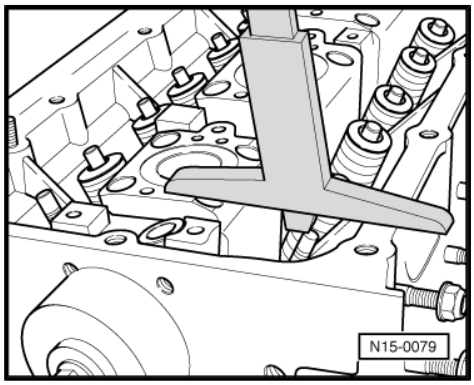
If the valve is to be renewed as part of a repair, use a new valve for the calculation.

– Measure distance -a- between end of valve stem and upper edge of cylinder head.

– Calculate maximum permissible reworking dimension from measured distance and minimum dimension.

Minimum dimension: inlet valve 7.6 mm, exhaust valve 7.6 mm

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

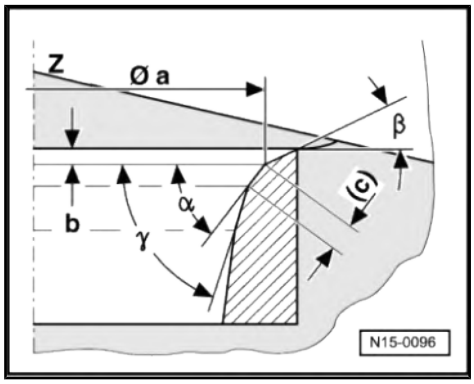


Example:

Measured distance	8.0 mm
– Minimum dimension	7.6 mm
Max. permissible reworking dimension	0.4 mm

1) The max. permissible reworking dimension is shown as dimension “b” in the illustrations for reworking valve seats.

Reworking inlet valve seat.



a = ∅ 28.7 mm
b = max. permissible reworking dimension[1]
c = 1.5…1.8 mm
Z = cylinder head lower edge
α = 45° valve seat angle
β = 30° upper correction angle
γ = 60° lower correction angle

2) Calculating max. permissible reworking dimension ⇒ page 69 .

Reworking exhaust valve seat.

a = ∅ 25.0 mm
b = max. permissible reworking dimension[1]
c = approx.1.8 mm
Z = Cylinder head lower edge
α = 45° valve seat angle
β = 30° upper correction angle
γ = 60° lower correction angle

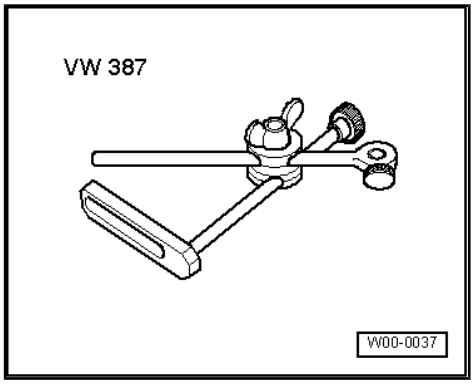
3) Calculating max. permissible reworking dimension ⇒ page 69 .

2.5 Checking valve guides

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-

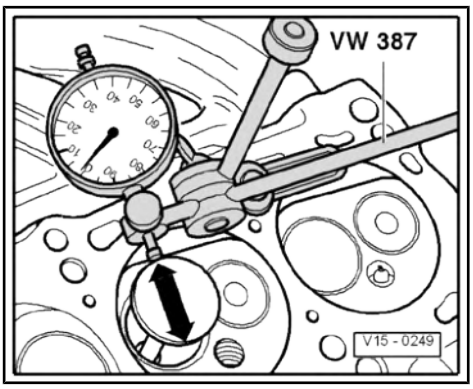
♦ Dial gauge



Test procedure

– Insert new valve into guide. The end of the valve stem must be flush with the guide. On account of differing stem diameters, only use inlet valve in inlet guide and exhaust valve in exhaust guide.

– Determine rock by moving valve in direction of -arrow-.



Wear limit: 0.8 mm

If wear limit is exceeded:

– Repeat measurement using a new valve.

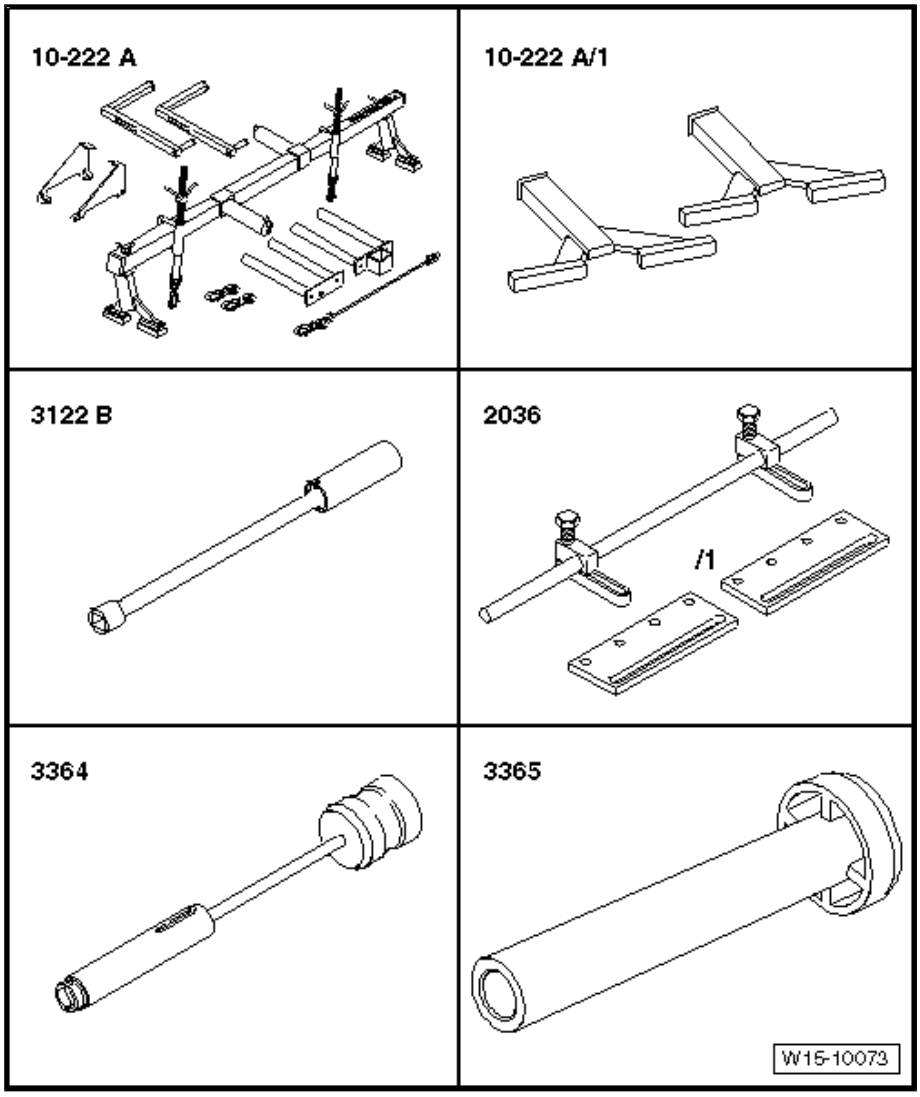
If wear limit is exceeded again:

– Renew cylinder head.

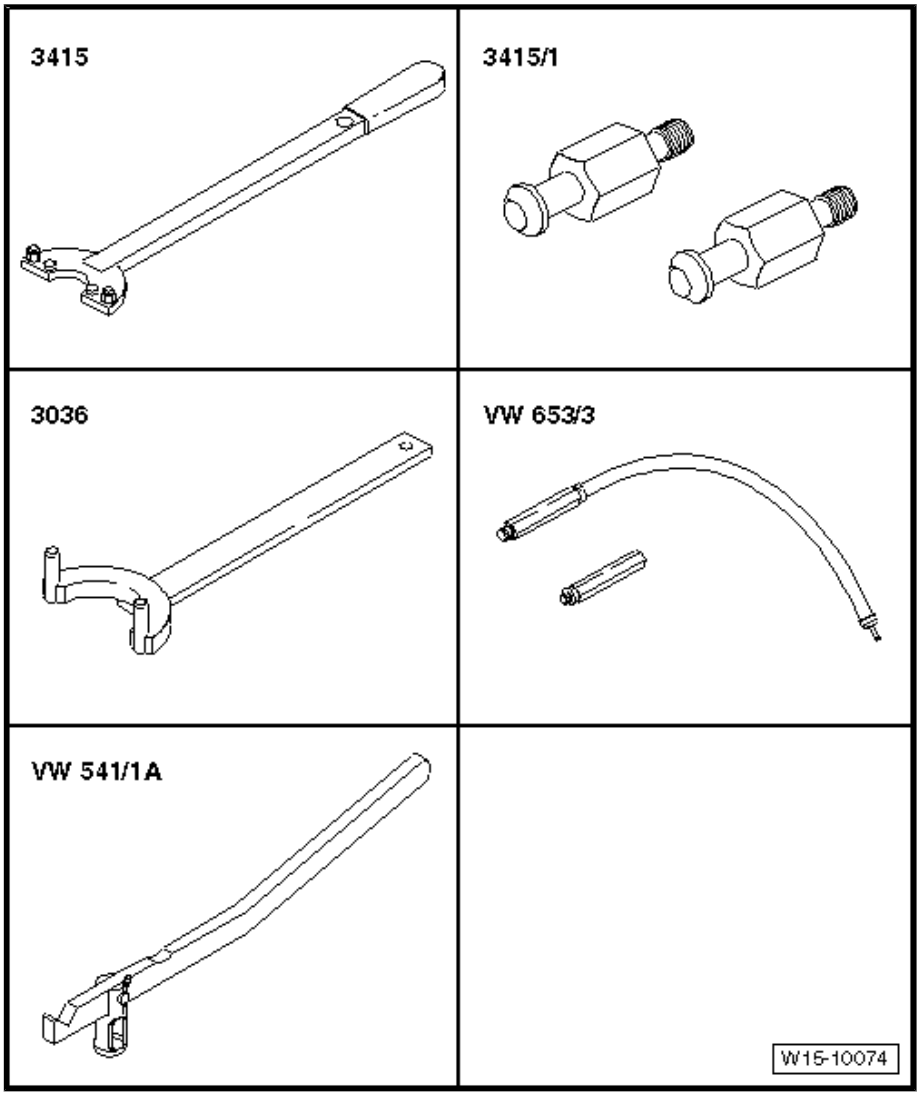
2.6 Renewing valve stem seals

Special tools and workshop equipment required

- Support bracket - 10-222A-
- Rack - 10 - 222 A /1-
- Spark plug socket and extension - 3122 B-
- Valve assembly device - 2036-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
-



- Counterhold tool - 3415-
- Pins - 3415/1-
- Counterhold tool - 3036-
- Pressure hose - VW 653/3-
- Valve lever - VW 541/1 A-



Removing

(With cylinder head installed)

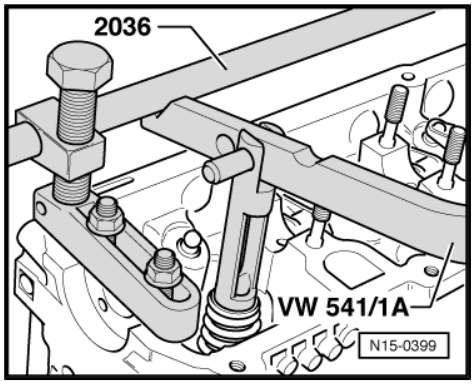
– Remove camshaft housing (engine codes AZQ, BME, BZG) ⇒ page 41 .

– Remove roller rocker fingers and place onto a clean surface. When doing this, ensure that the roller rocker fingers are not interchanged.

– Remove spark plugs using spark plug socket and extension - 3122 B- .

– Set piston of respective cylinder to “bottom dead centre”.

– Fit valve assembly tool - 2036- and adjust mountings to height of studs.
– Now screw pressure hose -VW 653/3- into spark plug hole.
– Connect pressure hose to compressed air system supplying at least 6 bar and remove valve springs.
– Remove valve springs using valve lever - VW 541/1 A- and press tool - VW 541/6- .



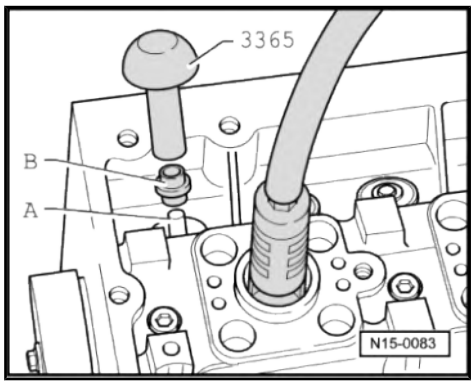
Note

Tight valve cotters can be loosened by tapping lightly on assembly lever.

– Pull off valve stem seals using valve stem seal puller - 3364- .

Installing

– Place plastic sleeve supplied on respective valve stem. This will prevent damage to new valve stem seal.
– Place new valve stem seal in valve stem seal fitting tool - 3365- .
– Oil valve stem seal sealing lip and press carefully onto the valve guide.
– Install camshaft housing ⇒ page 41 .



Further assembly is basically the reverse of the dismantling sequence.

17 – Lubrication

1 Parts of lubrication system

Note

The oil level must not be above the max. mark - danger of damage to catalytic converter! Markings ⇒ page 79 .

Engine oil (oil capacities, engine oil specification) ⇒ page 77

Assembly overview ⇒ page 77 .

Assembly overview - oil filter ⇒ page 80

Removing and installing oil filter element ⇒ page 80

Removing and installing sump ⇒ page 81 .

Checking oil pressure and oil pressure switch ⇒ page 82 .

1.1 Engine oil

Oil capacities

Engine codes: AWY, BMD, BBM

With oil filter, 2.8 l

Engine codes: AZQ, BME, BZG

With oil filter, 2.8 l

Engine oil specifications

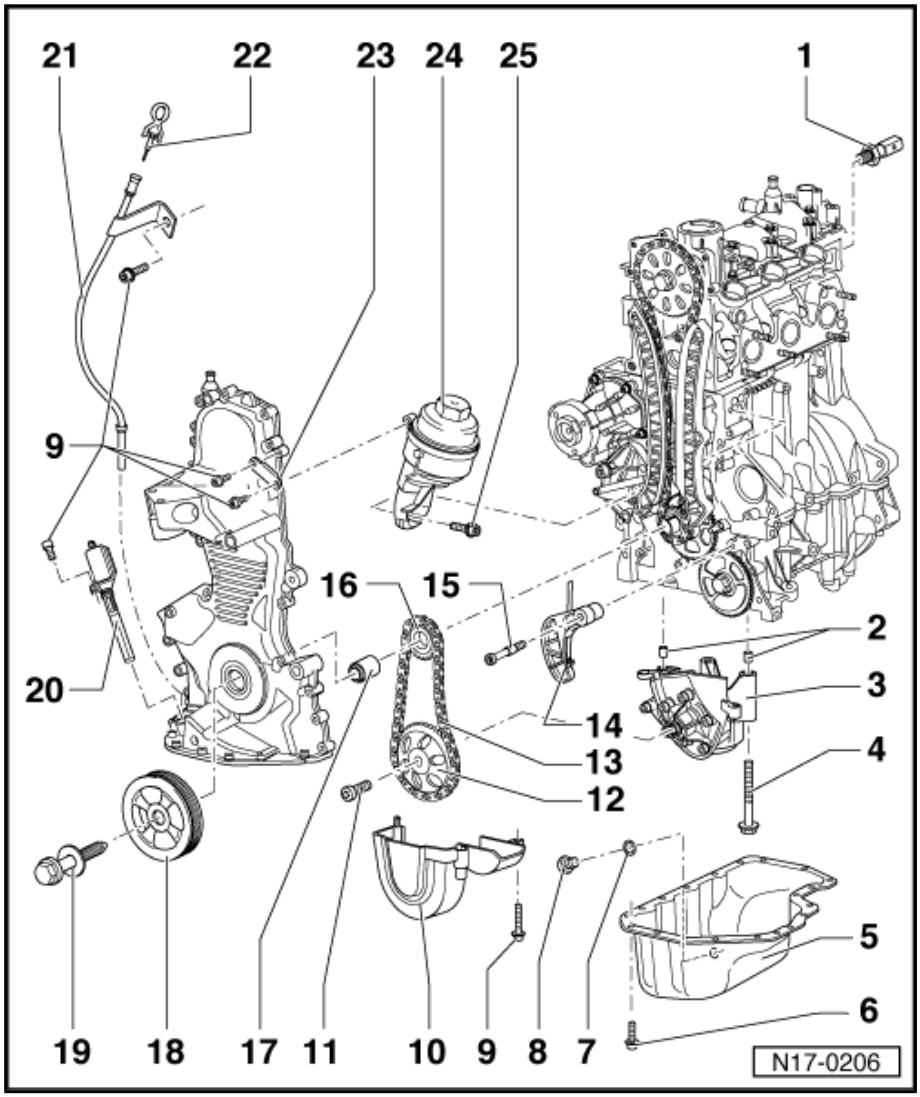
⇒ Maintenance ; Booklet 15.1

Changing engine oil: ⇒ Maintenance ; Booklet 15.1 “Engine oil: drain or extract”

1.2 Assembly overview

Note

The 2V engine is illustrated. Specified torques and assembly instructions are identical on 2V and 4V engines.



1 - 0.3...0.7 bar oil pressure switch - F1- , 25 Nm

2 - Guide sleeve

3 - Oil pump

- ❑ Renew complete only.
- ❑ Fill with engine oil before installing.

4 - 25 Nm

5 - Oil sump

- ❑ Remove and install on engines with liquid gasket ⇒ page 81 .
- ❑ Clean sealing surface before fitting.
- ❑ Install with silicone sealant D 176 600 A1 ⇒ page 81

6 - 15 Nm

7 - Seal

- ❑ Renew.

8 - Oil drain plug, 30 Nm

- ❑ With attached seal.
- ❑ Renew.

9 - 8 Nm

10 - Cover

11 - 20 Nm + 1/4 turn (90°) further

- ❑ Renew.

12 - Chain sprocket

- ❑ For drive chain for oil pump ⇒ Item 13 (page 78) .
- ❑ Adjust valve timing after installing ⇒ page 51 .

13 - Drive chain for oil pump

- ❑ Before removing, mark direction of rotation (installation position).
- ❑ Removing and installing (engine codes AWY, BMD, BBM) ⇒ page 49
- ❑ Removing and installing (engine codes AZQ, BME, BZG) ⇒ page 54 .

14 - Chain tensioner with tensioning plate

- ❑ For drive chain for oil pump ⇒ Item 13 (page 78) .

15 - 15 Nm

16 - Chain sprocket

- ❑ For drive chain for oil pump ⇒ Item 13 (page 78) .

17 - Bearing bush

- ❑ With O-ring.

Note

Always renew O-ring after removal.

18 - Belt pulley

- ❑ Do not cant when installing.
- ❑ Removing and installing poly V-belt ⇒ page 17 .

19 - 90 Nm + 1/4 turn (90°) further

- ❑ Renew.
- ❑ Oil before installing.
- ❑ Lock pulley with counterhold 3415.
- ❑ The turning further angle can be measured with a commercial protractor.

20 - Oil level and oil temperature sender - G266-

21 - Guide tube

22 - Oil dipstick

- ❑ The oil level must not be above the max. mark!
- ❑ Markings ⇒ page 79 .

23 - Bracket

24 - Oil filter

- ❑ Specified torque: 25 Nm
- ❑ Removing and installing ⇒ page 80

25 - 24 Nm

Markings on oil dipstick

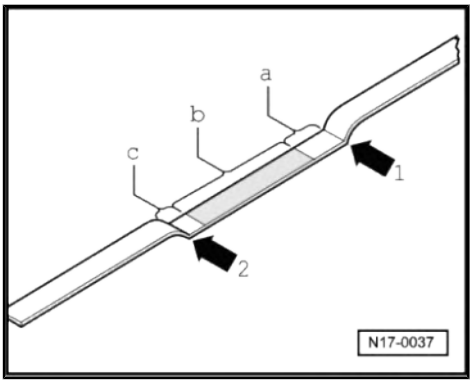
1 - Max. mark

2 - Min. mark

a - Area above hatched field up to max. mark: Do not top up with engine oil!

b - Oil level within hatched zone: can be topped up with engine oil

c - Area from min. mark up to hatched field: Must be topped up, max. 0.5 l of engine oil!



1.3 Assembly overview - oil filter

1 - Plug with oil filter element bracket, 25 Nm

2 - Seal

- ❑ Renew.
- ❑ Is supplied with oil filter element

3 - Oil filter element

4 - Gasket

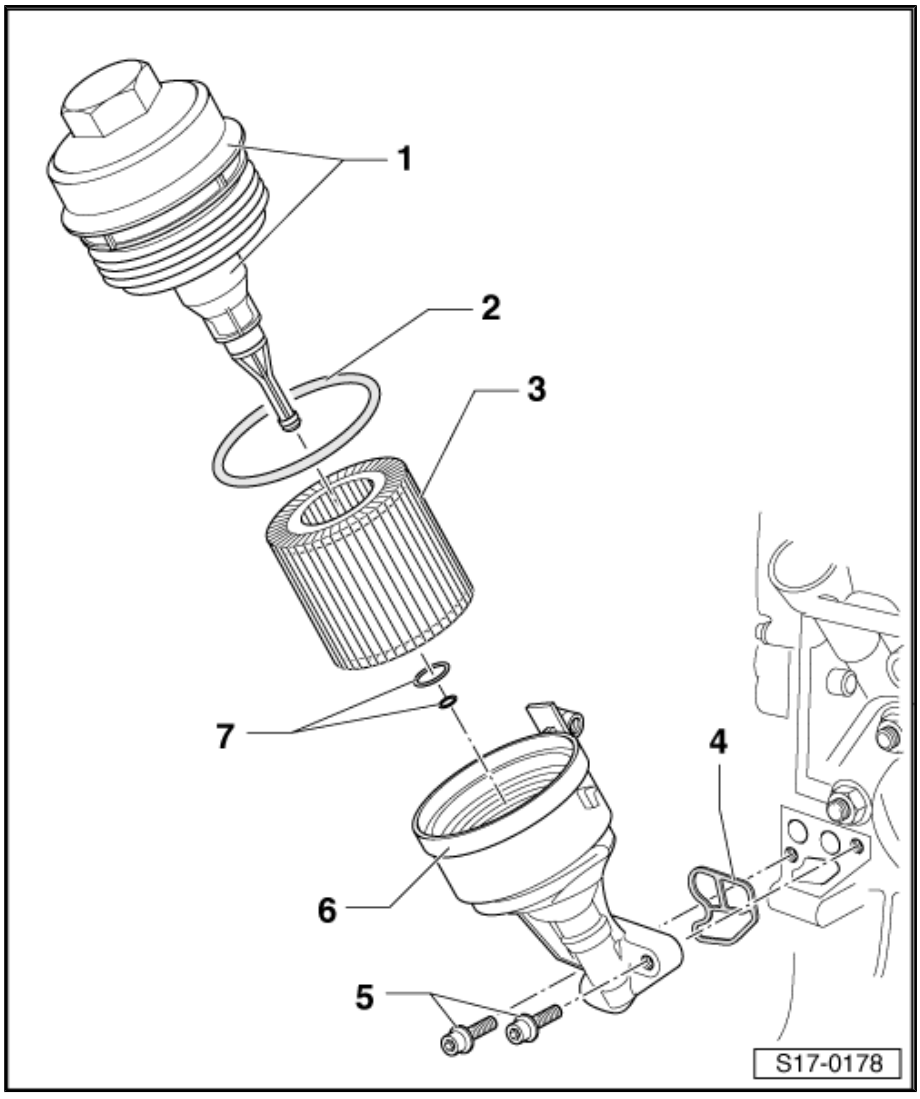
- ❑ Renew if damaged.

5 - 24 Nm

6 - Oil filter housing

7 - O-rings

- ❑ Renew if damaged.



1.4 Removing and installing oil filter element

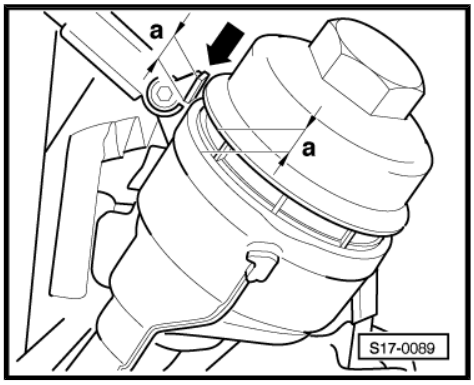
Removing

– Unscrew plug to edge of lug -arrow- or approx. 3 turns -a-.

Caution

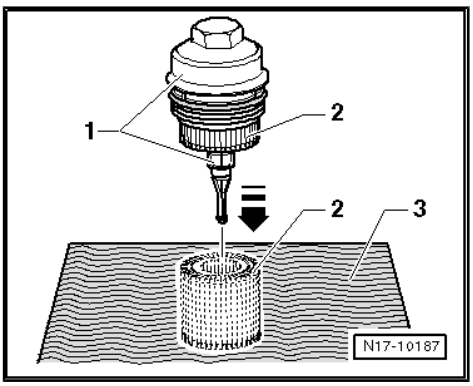
If the plug is removed without waiting time, leaking engine oil can cause damage to the alternator.

– Hold plug in this position for about 1 minute.
– Remove plug with oil filter element bracket.



– Place plug with oil filter element bracket -1- onto a hard surface -3-, lightly knock in -direction of arrow-.

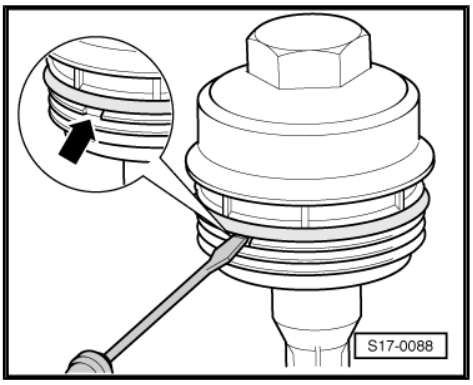
When doing this, the oil filter element -2- is being separated.



– Carefully lever seal out of groove -arrow- using a screwdriver.

Installing

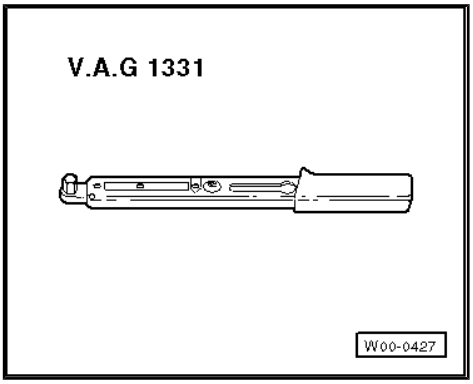
– Insert new seal into groove.
– Insert new oil filter element and tighten plug to 25 Nm.



1.5 Removing and installing oil sump

Special tools and workshop equipment required

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



♦ Hand drill with plastic brush
♦ Flat scraper
♦ Silicone sealant D 176 600 A1

Removing

– Drain engine oil.

– Detach front exhaust pipe from exhaust manifold .

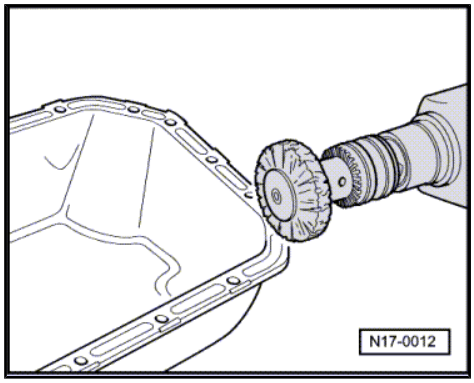
– Unbolt sump sealed with liquid gasket.

– Remove sump, it may be necessary to release sump by tapping lightly with a rubber head hammer.

– Remove sealant residue from cylinder block with a flat scraper.

– Remove sealant residue on sump with a rotating brush, e.g. an electric drill with plastic brush attachment (wear eye protection).

– Clean sealing surfaces. They must be free of oil and grease.



Installing

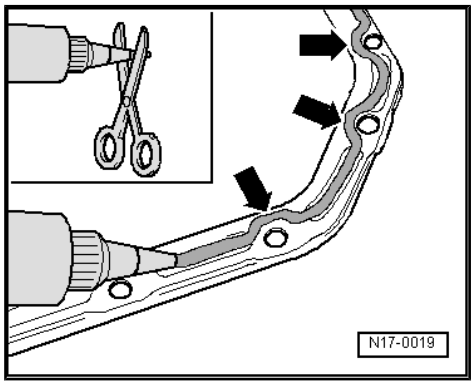
Note

- *Observe expiry date of sealing compound.*
- *The sump must be installed within 5 minutes of applying silicone sealing compound.*
- *Sump can be positioned more easily and with greater security if two M6 studs are inserted into the cylinder block flange as guides.*

– Cut off tube nozzle at front marking (∅ of nozzle approx. 3 mm).

– Apply silicone sealing compound, as shown, to clean sealing surface on sump. Sealant bead must be:

- 2…3 mm thick.
- Run bead along inner side of bolt holes -arrows-.



Note

The sealing compound bead must not be thicker, otherwise excessive sealing compound will enter the sump and may block the oil suction pipe strainer.

– Install sump immediately and tighten all sump bolts lightly.

– Tighten oil sump bolts to 15 Nm.

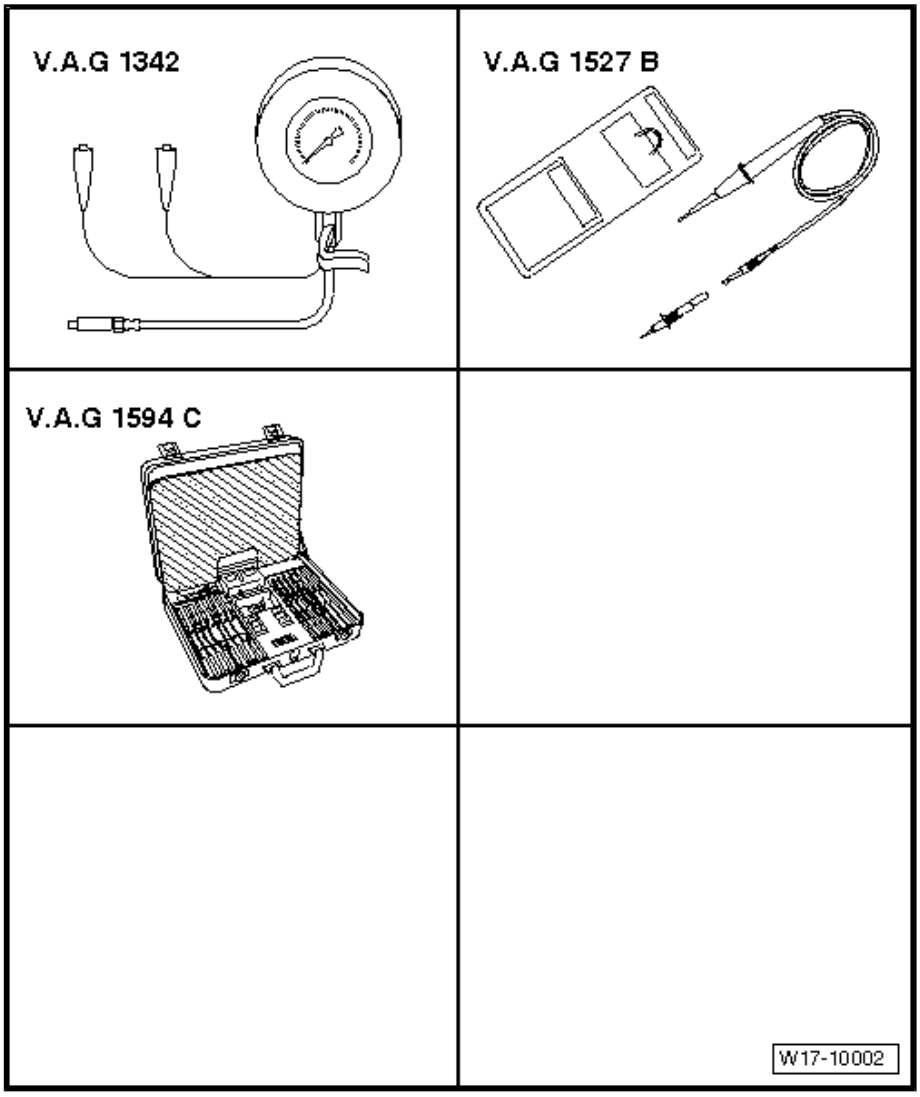
Note

Let sealing compound dry for approx. 30 minutes after installing oil sump. Only then fill with engine oil.

1.6 Checking oil pressure and oil pressure switch

Special tools and workshop equipment required

- Oil pressure tester - V.A.G 1342-
- Voltage tester - V.A.G 1527 B-
- Auxiliary measuring set - V.A.G 1594C-



Note

Functional check and repair of the optical and acoustic oil pressure warning: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

Test procedure

– Remove oil pressure switch - F1- and screw into tester.

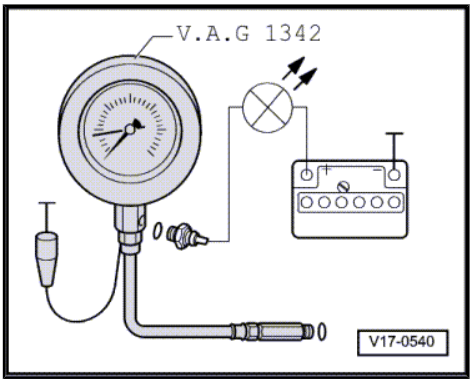
– Screw tester into cylinder head in place of oil pressure switch.

– Connect brown wire of tester to earth (-).

– Connect voltage tester - V.A.G 1527B- to battery positive (+) and oil pressure switch using cables from auxiliary measuring set - V.A.G 1594C- .

– Start engine and increase speed slowly. At 0.3…0.7 bar the LED must light up, otherwise renew oil pressure switch.

– Increase engine speed further. At 2,000 rpm and an oil temperature of 80°C the oil pressure should be at least 2.0 bar.



At higher engine speeds, the oil pressure must not exceed 7.0 bar.

19 – Cooling

1 Parts of cooling system

Caution

When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:

- ***Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant and refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.***
- ***To avoid damage to lines, ensure sufficient clearance to all moving or hot components.***

Note

- *When the engine is warm, the cooling system is under pressure. If necessary, release pressure before beginning repair work.*
- *Hoses are secured with spring-type clips. In case of repair, only use spring-type clips.*
- *Hose clip pliers - VAS 6340- are recommended to install spring-type clips.*
- *When installing coolant hoses, route stress-free so that they do not come into contact with other components (observe markings on coolant connection and hose).*

Test for leaks in cooling system using cooling system tester - V.A.G 1274 B- and adapters -V.A.G 1274/8- and -V.A.G 1274/9- .

Assembly overview - parts of cooling system, body side (radiator with two fans) ⇒ page 84 .

Assembly overview - parts of cooling system, body side (radiator with one fan) ⇒ page 86 .

Assembly overview - parts of cooling system, engine side ⇒ page 87 .

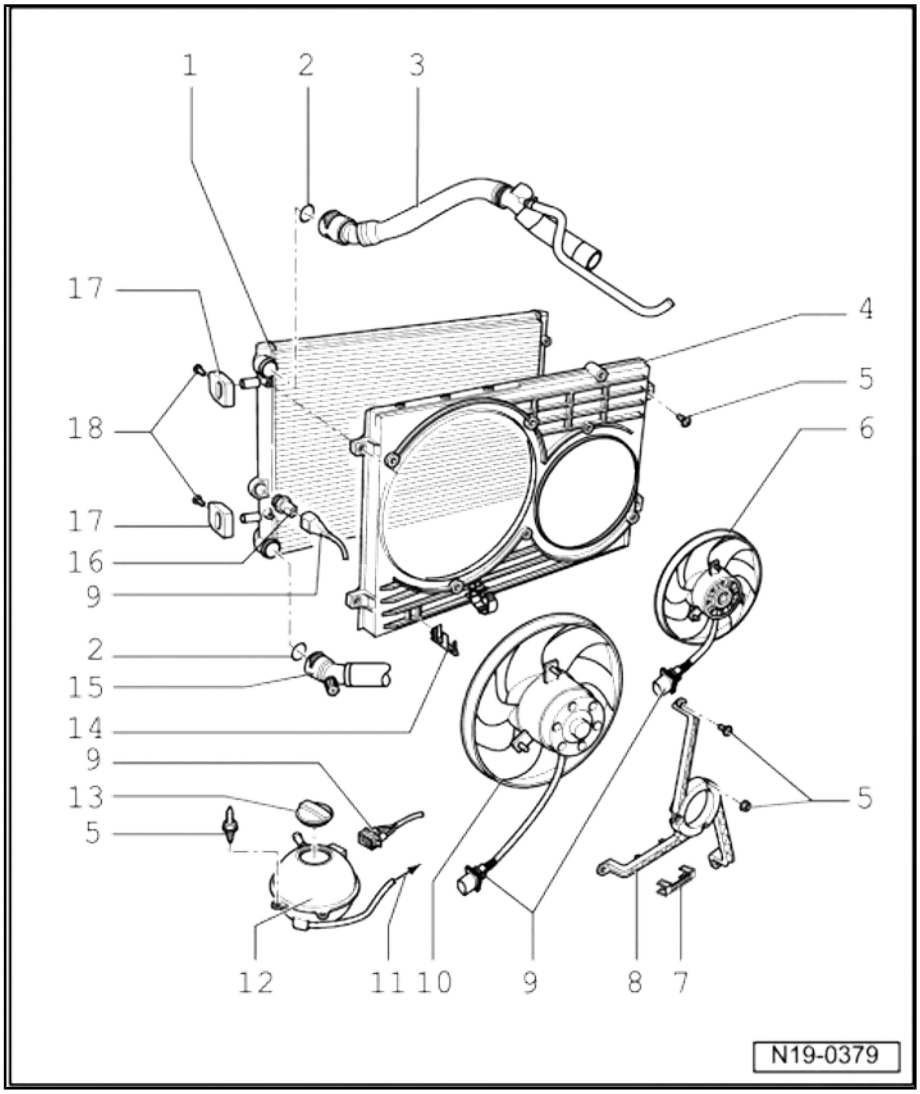
Draining and filling with coolant ⇒ page 88 .

Removing and installing radiator ⇒ page 90 .

Removing and installing coolant pump ⇒ page 92 .

Coolant mixture specifications ⇒ page 88 .

1.1 Assembly overview - parts of cooling system, body side (radiator with two fans)



1 - Radiator/cooler

- ❑ Removing and installing ⇒ page 90
- ❑ After renewing, renew entire coolant.

2 - O-ring

- ❑ Renew.

3 - Upper coolant hose

- ❑ Secured to radiator with retaining clip.
- ❑ Check for secure seating.

4 - Cowling

5 - 10 Nm

6 - Additional fan

- ❑ Vehicles with optional equipment only.

7 - Retaining clip

- ❑ Check for secure seating.

8 - Bracket

- ❑ For electric fan.

9 - Connector

10 - Radiator fan

11 - To thermostat housing.

12 - Expansion tank

- ❑ Test for leaks in cooling system using cooling system tester - V.A.G 1274 B- and adapter - V.A.G 1274/8- .

13 - Cap

- ❑ Check using cooling system tester - V.A.G 1274 B- and adapter -V.A.G 1274/9- .
- ❑ Test pressure 1.4…1.6 bar.

14 - Bracket

- ❑ For fan connector.

15 - Lower coolant hose

- ❑ Secured to radiator with retaining clip.
- ❑ Check for secure seating.

16 - Radiator fan thermal switch - F18- , 35 Nm

- ❑ For electric fan.

Switching temperatures

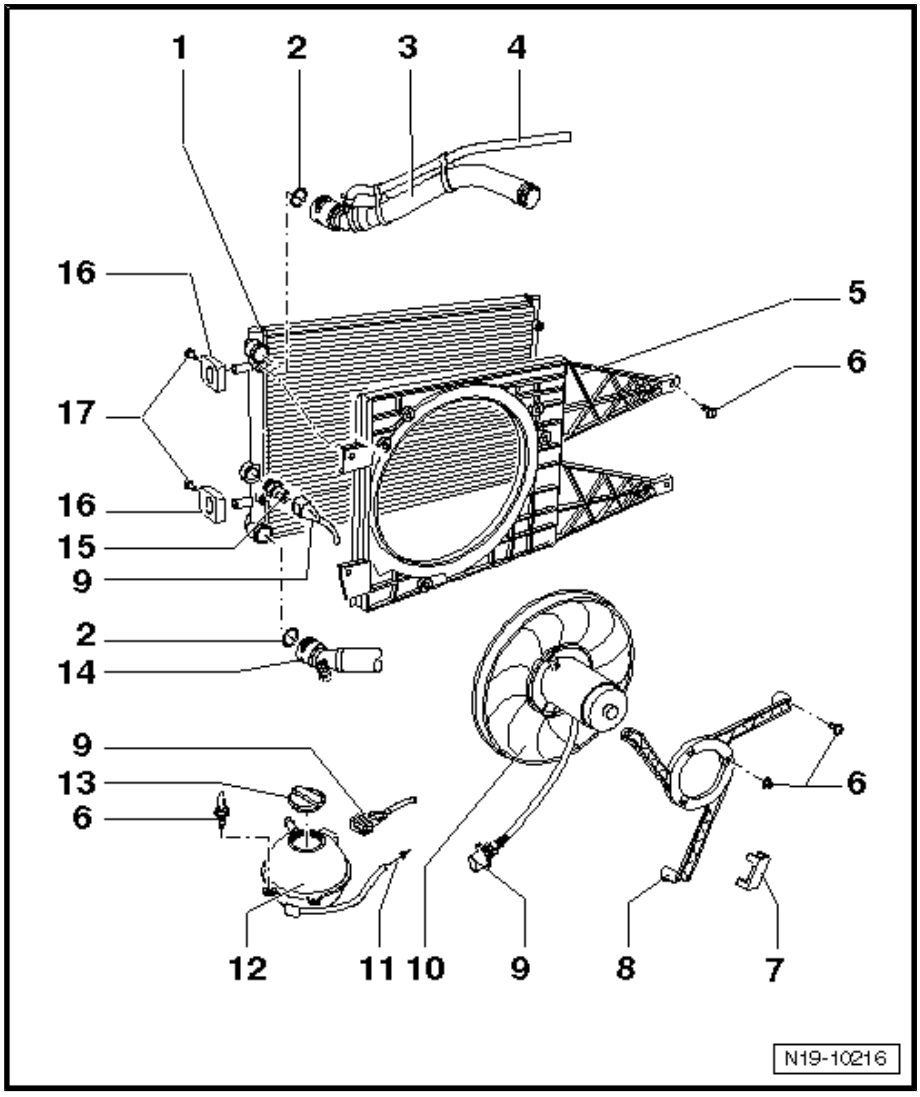
- ❑ 1st level on: 92…97 °C, off: 84…91 °C
- ❑ 2nd level on: 99…105 °C, off: 91…98 °C

17 - Bracket

- ❑ For radiator
- ❑ Note installation position.
- ❑ Note various versions.

18 - 10 Nm

1.2 Assembly overview - parts of cooling system, body side (radiator with one fan)



1 - Radiator/cooler

- ❑ Removing and installing ⇒ page 90
- ❑ After renewing, renew entire coolant ⇒ page 88

2 - O-ring

- ❑ Renew.

3 - Upper coolant hose

- ❑ Secured to radiator with retaining clip.
- ❑ Check for secure seating.

4 - Coolant hose

5 - Cowling

6 - 10 Nm

7 - Retaining clip

- ❑ Check for secure seating.

8 - Bracket

- ❑ For electric fan.

9 - Connector

10 - Radiator fan

11 - To coolant pipe

12 - Expansion tank

- ❑ Test cooling system for leaks using cooling system tester - V.A.G 1274 B- and adapter for cooling system tester - V.A.G 1274/8- .

13 - Cap

- ❑ Check using cooling system tester - V.A.G 1274 B- and adapter for cooling system tester - V.A.G 1274/9- .
- ❑ Test pressure 1.4…1.6 bar.

14 - Lower coolant hose

- ❑ Secured to radiator with retaining clip.
- ❑ Check for secure seating.

15 - Radiator fan thermal switch - F18- , 35 Nm

- ❑ For electric fan.

Switching temperatures

- ❑ 1st level on: 92…97 °C, off: 84…91 °C
- ❑ 2nd level on: 99…105 °C, off: 91…98 °C

16 - Bracket

- ❑ For radiator
- ❑ Note installation position.
- ❑ Note various versions.

17 - 10 Nm

1.3 Assembly overview - parts of cooling system, engine side

Thermostat side

1 - Connection

2 - Self-tapping bolt, 9 Nm

3 - O-ring

- ❑ Renew.

4 - Thermostat

- ❑ Check function: heat thermostat in water. The pin of the thermal element must move out.
- ❑ Temperature check: Opening starts (approx. 84 °C) and ends (approx. 98 °C) cannot be checked.

5 - To heat exchanger

6 - From expansion tank

7 - Thermostat housing

8 - From heat exchanger

9 - Coolant pipe

10 - Seal

- ❑ Renew.

11 - Coolant pump housing on cylinder block

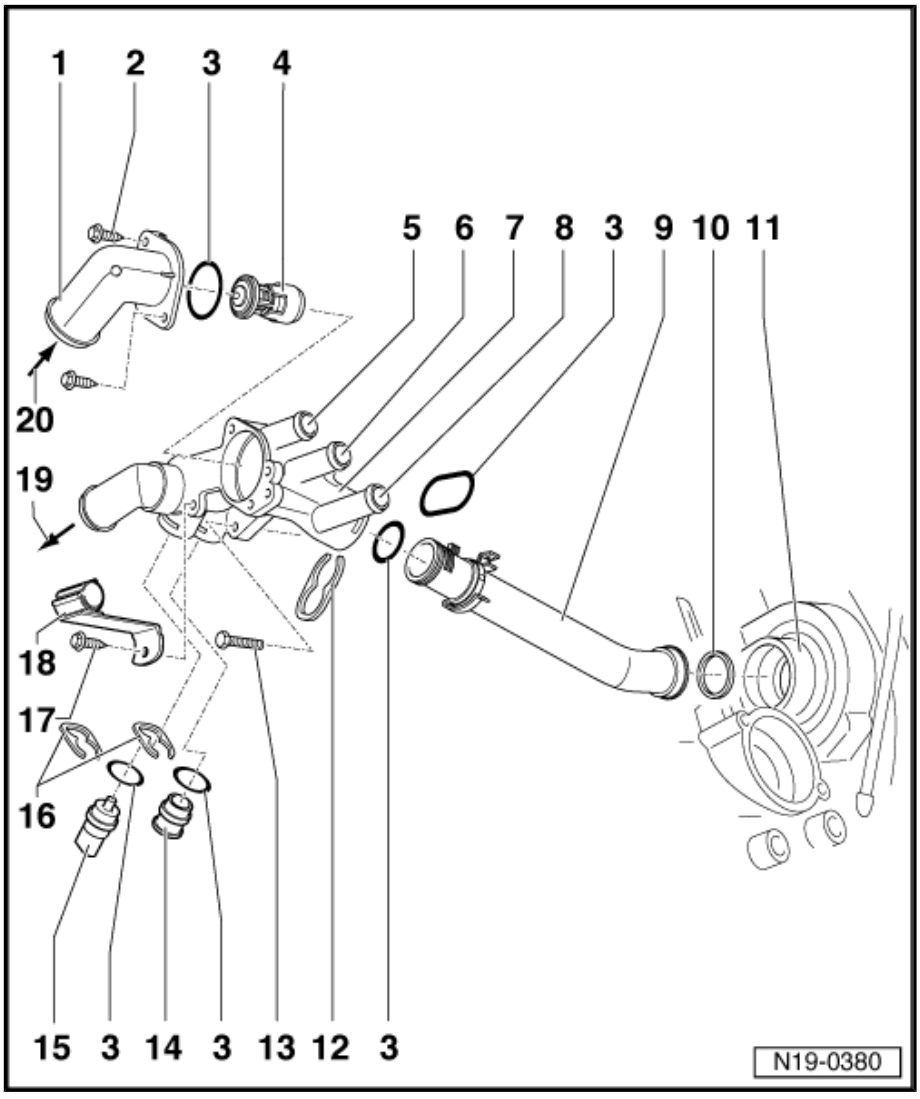
12 - Retaining clip

- ❑ Check for secure seating.

13 - 10 Nm

14 - Plug

- ❑ Check for secure seating.



15 - Coolant temperature sender - G62-

- ❑ Before removing, release pressure in cooling system if necessary.

16 - Retaining clip

- ❑ Check for secure seating.

17 - Self-tapping bolt, 6 Nm

18 - Bracket

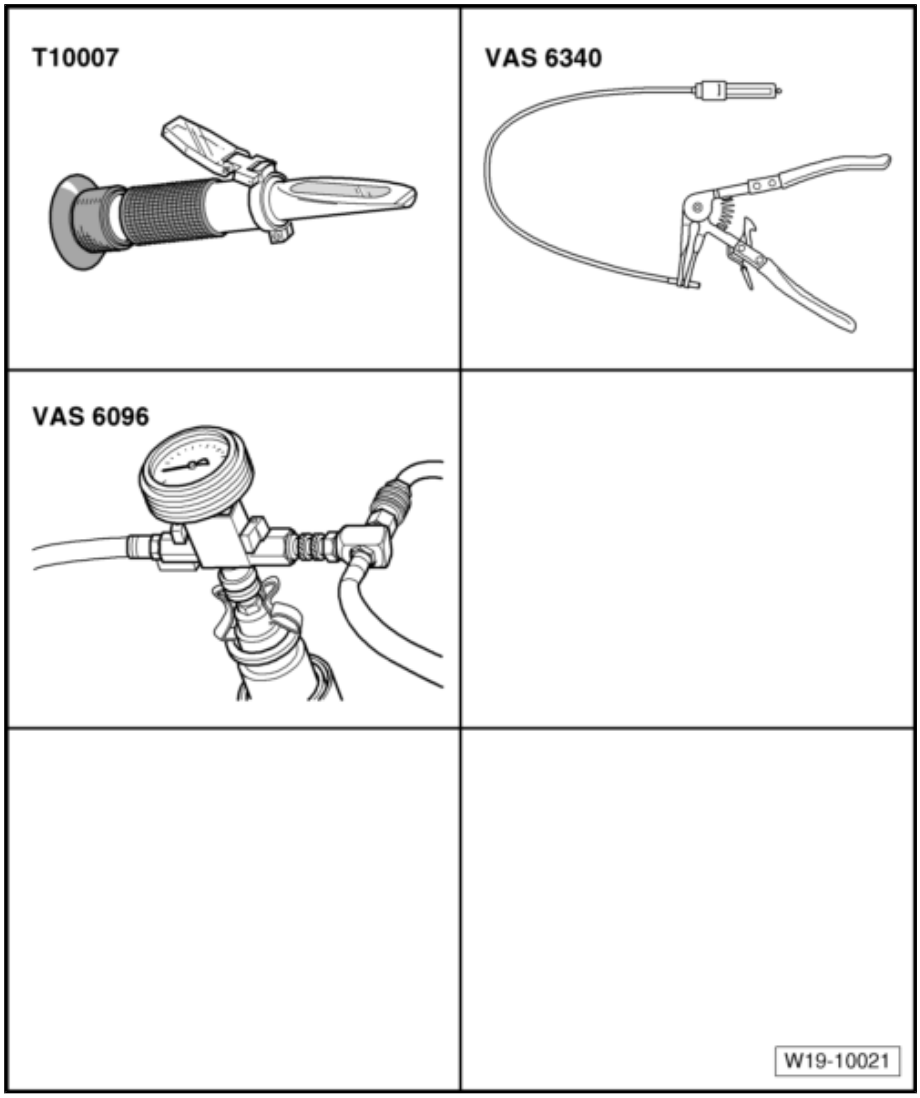
19 - From top of radiator

20 - To bottom of radiator

1.4 Draining and filling coolant

Special tools and workshop equipment required

- Refractometer - T10007-
- Hose clip pliers - VAS 6340-
- Cooling system charge unit - VAS 6096-



Draining

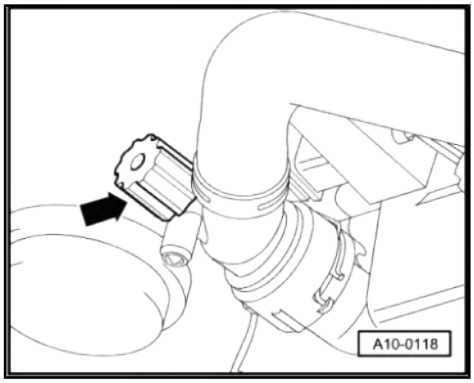
WARNING

Steam may escape when expansion tank is opened. Wear eye protection and protective clothing to avoid eye injuries and scalding. Cover cap with cloth and open carefully.

– Open filler cap on coolant expansion tank.

– Remove engine splash protection.

– To drain coolant from radiator, open drain plug -arrow-.



Note

Observe environmental regulations for disposal.

Filling

Caution

For mixing only tap water must be used. Well water does not have the required quality to ensure the coolant's function.

Note

- *Use only coolant additive G12 plus-plus in accordance with "TL VW 774 G".*
- *The coolant additive G 12 plus-plus must only be mixed with G 12 plus.*
- *Coolant additives marked conforming to "TL VW 774 G" or conforming to "TL VW 774 F" prevent frost and corrosion damage, scaling and also raise boiling point of coolant. Therefore, the cooling system must be filled all year round with coolant additive.*
- *Because of its higher boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *Frost protection is required down to about -25°C (in countries with arctic climates: down to about -35°C).*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive concentration must be at least 40%.*
- *If for climatic reasons greater frost protection is required, the amount of G 12 plus-plus can be increased, but only up to 60% (frost protection to about -40°C). Otherwise frost protection and cooling effectiveness are reduced again.*
- *If radiator, heat exchanger, cylinder head or cylinder head gasket is renewed, do not reuse old coolant.*

Recommended mixture ratios:

Frost protection to	Amount of anti-freeze	G 12 plus-plus[4)]	Tap water [4)]
-25 °C -35 °C	40 % 50 %	2.25 l 2.8 l	3.35 l 2.8 l

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

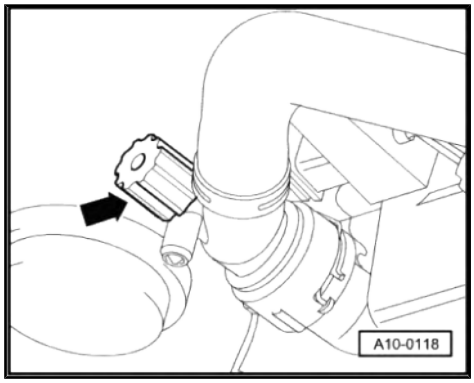
– Screw drain plug into radiator.

– Install engine splash protection.

With cooling system charge unit - VAS 6096-

– Fill coolant circuit using cooling system charge unit - VAS 6096- ⇒ Operating instructions for cooling system charge unit VAS 6096 .

Without cooling system charge unit - VAS 6096-



– Fill with coolant up to max. mark on expansion tank.

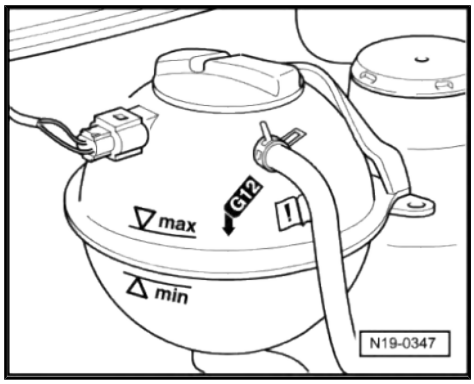
With or without cooling system charge unit - VAS 6096-

– Fit expansion tank cap.

– Turn off heater controls.

– Start engine and maintain an engine speed of about 2,000 rpm for about 3 minutes.

– Run engine until radiator fan cuts in.



WARNING

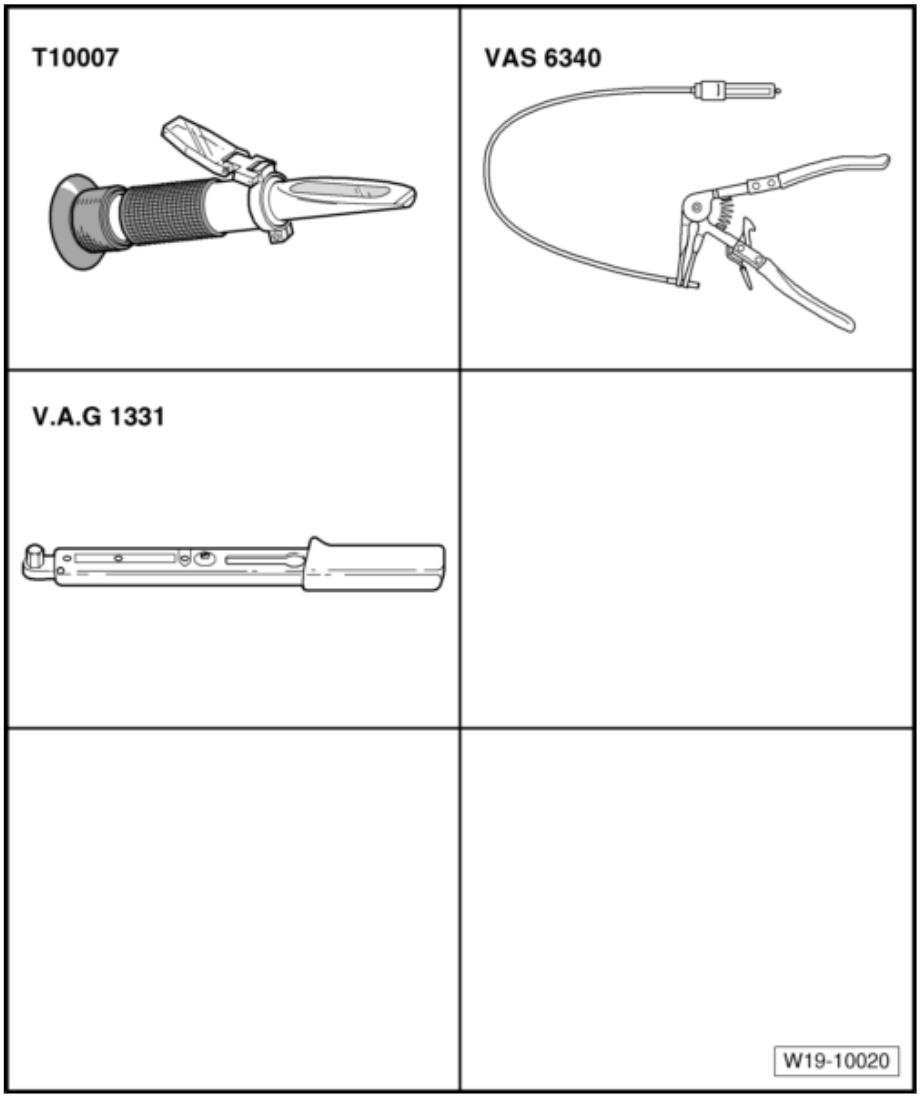
Steam may escape when expansion tank is opened. Wear eye protection and protective clothing to avoid eye injuries and scalding. Cover cap with cloth and open carefully.

– Check coolant level and top up if 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.

1.5 Removing and installing radiator

Special tools and workshop equipment required

- Refractometer - T10007-
- Hose clip pliers - VAS 6340-
- Torque wrench (5…50 Nm) - V.A.G 1331-



Removing

– Bring lock carrier into service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Lock carrier - service position .

– Drain coolant ⇒ page 88 .

– Pull coolant hoses off radiator.

– Pull connectors off thermal switch and radiator fan.

– Remove radiator securing bolts and remove radiator with fan downwards.

Additional information and assembly work for vehicles with air conditioner

Note

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

– Remove retaining clamp(s) for refrigerant lines.

– Unbolt condenser from radiator and secure to lock carrier.

Installing

Installation is carried out in the reverse order. When installing, note the following:

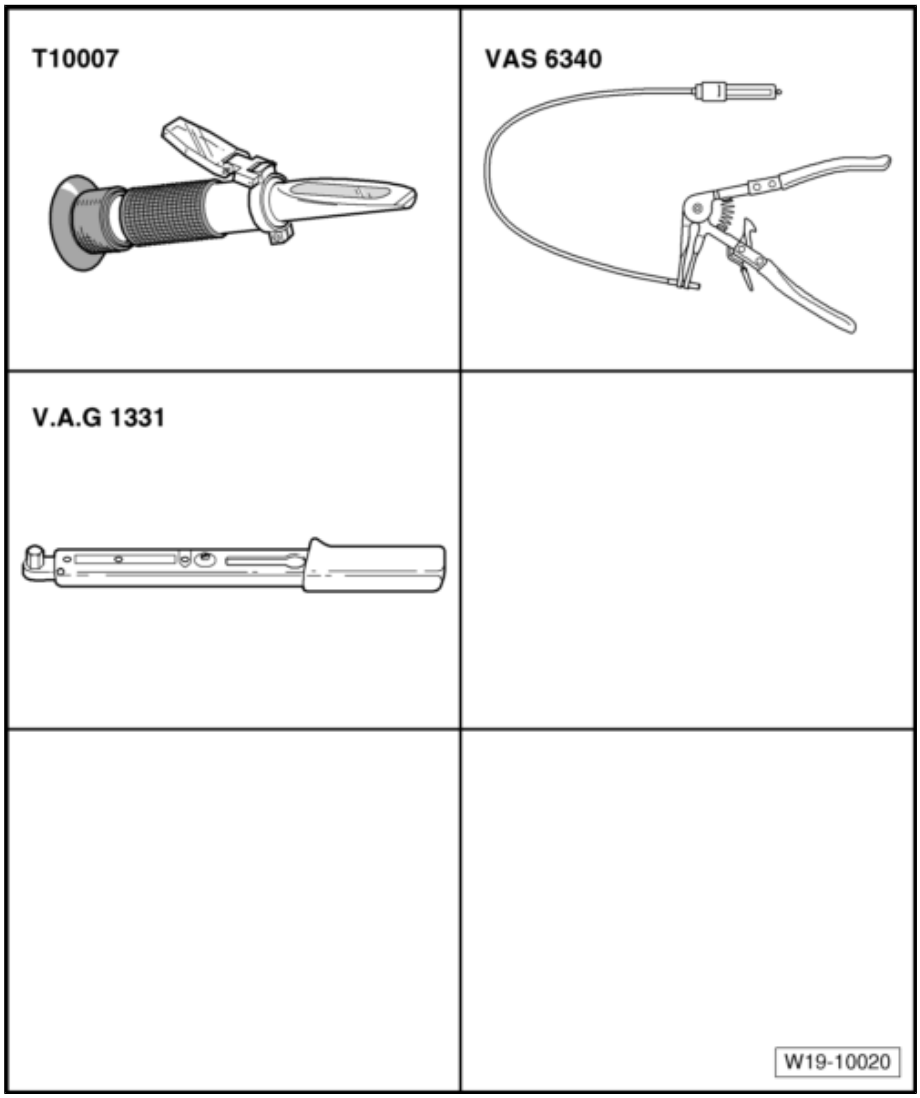
Filling with new coolant ⇒ page 88 .

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

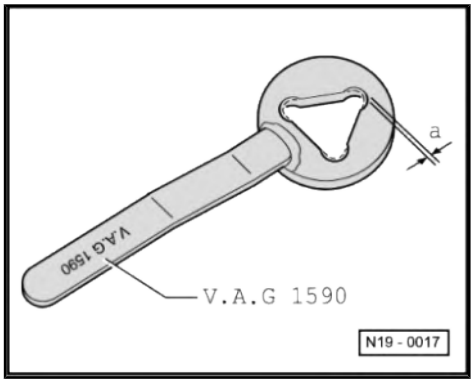
1.6 Removing and installing coolant pump

Special tools and workshop equipment required

- Refractometer - T10007-
- Hose clip pliers - VAS 6340-
- Torque wrench (5…50 Nm) - V.A.G 1331-



Water pump wrench - V.A.G 1590-



– Due to modification to securing bolts for coolant pump pulley, the three rounded corners must be filed out to minimum a = 1 mm.

Note

- *The integrated coolant pump seal must not be separated from the coolant pump.*
- *Damaged or leaking coolant pumps must be replaced complete with seal.*

Removing

– Drain coolant ⇒ page 88 .

– Remove poly V-belt ⇒ page 17 .

– Remove coolant pump pulley.

Installing

Installation is carried out in the reverse order. When installing, note the following:

– Install coolant pump in cylinder block.

– Tighten securing bolts to 25 Nm.

– Tighten coolant pump belt pulley to 20 Nm.

– Install poly V-belt ⇒ page 17 .

– Replenish coolant ⇒ page 88 .

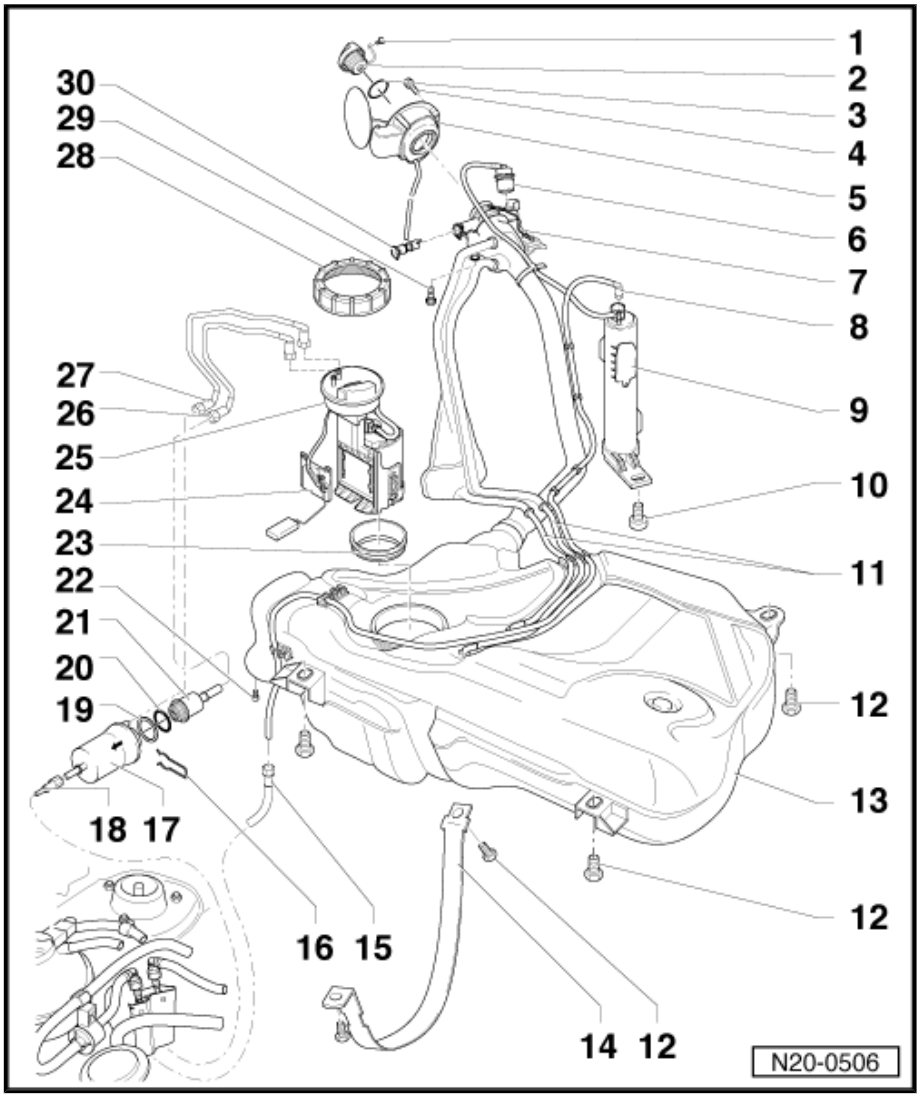
20 – Fuel supply system

1 Parts of fuel supply system

Note

- *Always replace clamp-type clips with screw or spring-type clips.*
- *Fuel hoses on engine must be secured with spring-type clips only. The use of clamp or screw-type clips is not permissible.*
- *Hose clip pliers - VAS 6340- are recommended to install spring-type clips.*

1.1 Assembly overview - fuel tank with attachments



1 - Retaining clip

2 - Cap

3 - Seal

- ❑ Renew if damaged.

4 - Securing bolt

5 - Tank flap unit

- ❑ With rubber cup.
- ❑ Removing and installing ⇒ General body repairs, exterior; Rep. gr. 55 ; Tank flap unit; Removing and installing fuel tank flap unit .

6 - Gravity valve

- ❑ To remove valve unclip upwards out of support.

Check valve for through-flow.

- ❑ Valve vertical: open.
- ❑ Valve tilted 45°: closed.

7 - Earth connection

- ❑ Check for secure seating.

8 - Breather line

- ❑ Check for secure seating.

9 - Activated charcoal filter

- ❑ Location: in rear right wheel housing.

10 - 10 Nm

11 - Breather line

- ❑ Clipped onto fuel tank.
- ❑ Check for secure seating.

12 - 25 Nm

13 - Fuel tank

- ❑ When removing, support using engine and gearbox jack - V.A.G 1383 A- .
- ❑ Removing and installing ⇒ page 100
- ❑ Fuel system must be bled if fuel tank is renewed ⇒ page 110 .

14 - Securing strap

15 - Breather line

- ❑ Check for secure seating.

16 - Retaining clip

- ❑ Check for secure seating.

17 - Fuel filter

- ❑ Installation position: arrow indicates direction of flow.
- ❑ Fuel system must be bled if fuel filter is renewed ⇒ page 110 .

18 - Supply line

- ❑ Black
- ❑ Check for secure seating.

- ❑ To fuel rail.

19 - Seal

- ❑ Renew if damaged.

20 - O-ring

- ❑ Renew.

21 - Fuel pressure regulator

- ❑ Observe pressure values on pressure regulator

Note

- ♦ *Note that pressure regulators with different control pressure may be installed. Pressure regulators with 3 and 4 bar control pressure have been installed.*
- ♦ *When renewing pressure regulator, ensure that pressure regulator type prescribed by car manufacturer is installed ⇒ ETKA (Electronic parts catalogue) .*

22 - 5 Nm

- ❑ For fuel filter clamp.

23 - Seal

- ❑ Renew if damaged.
- ❑ When installing, fit dry in fuel tank opening.
- ❑ Moisten with fuel only when installing flange.

24 - Fuel gauge sender - G-

- ❑ Removing and installing ⇒ page 100
- ❑ Adjust: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

25 - Fuel delivery unit

- ❑ Removing and installing ⇒ page 98
- ❑ Clean strainer if soiled.
- ❑ Checking fuel pump ⇒ page 102 .
- ❑ Note installation position on fuel tank ⇒ page 97 .

26 - Return line

- ❑ Blue
- ❑ Clipped onto side of fuel tank.
- ❑ Check for secure seating.

27 - Supply line

- ❑ Black
- ❑ Clipped onto side of fuel tank.
- ❑ Check for secure seating.

28 - Union nut, 80 Nm

29 - 10 Nm

30 - Breather valve

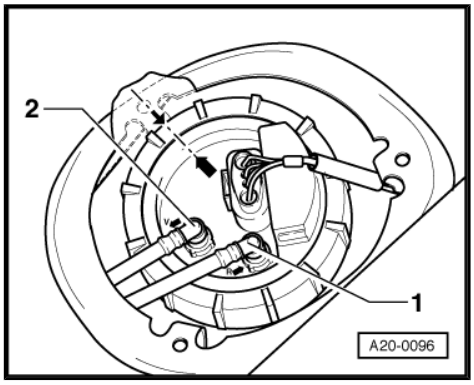
- ❑ Checking ⇒ page 97 .
- ❑ To remove press locking latch lightly -arrow- and pull valve out.

Installation position of fuel delivery unit

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

Return line -1- (blue or with blue marking) to connection marked -R-.

Black supply line -2- to connection marked -V-.



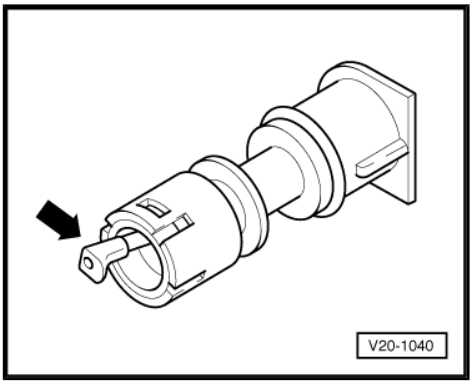
Note

After installing fuel delivery unit flange, check that supply, return and breather lines are still clipped onto fuel tank.

Checking breather valve

Lever in rest position: closed.

Lever pushed in direction of arrow: open.



Note

Before installing breather valve remove fuel tank cap.

1.2 Safety precautions when working on fuel supply system

WARNING

Fuel supply lines are under pressure! Wear eye protection and gloves to avoid injuries and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

Caution

When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:

- ***Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant and refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.***
- ***To avoid damage to lines, ensure sufficient clearance to all moving or hot components.***

When removing and installing fuel gauge sender or fuel pump (fuel delivery unit) from a full or partly full fuel tank, observe the following:

- Even before work commences, the extraction hose of an activated fume extraction system has to be placed in the vicinity of the assembly opening of the fuel tank to extract any escaping fumes. If no exhaust gas extraction system is available, a

radial fan with a displacement greater than 15 m^3/h can be used providing that motor is not in air flow.

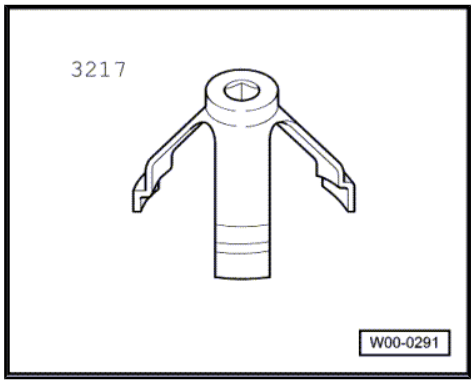
- Prevent skin contact with fuel! Wear fuel-resistant gloves!
- For safety reasons, the fuse for the fuel pump must be removed from the fuse holder before opening the fuel system. Otherwise, the fuel pump could be activated by the driver door contact switch. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

1.3 Rules for cleanliness

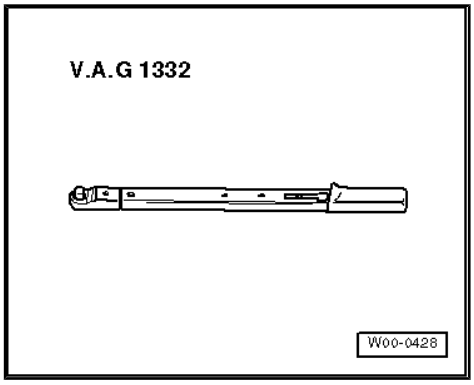
When working on the fuel supply and injection system, pay careful attention to the following “5 rules” for cleanliness:

- Thoroughly clean all unions and surrounding areas before disconnecting.
- Place removed parts on a clean surface and cover. Use only lint-free cloths.
- Carefully cover opened components or seal if repairs cannot be carried out immediately.
- Install clean components only. Do not remove replacement parts from packing until immediately before installing. Do not use parts that have not been stored in their packing (e.g. in tool boxes etc.).
- When system is open: do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.

1.4 Removing and installing fuel delivery unit



- Union nut tool - 3217-
- Torque wrench (40…200 Nm) - V.A.G 1332-



Removing

– Note safety precautions before beginning work ⇒ page 97 .

– Observe rules for cleanliness ⇒ page 98 .

– First check whether a coded radio is fitted. If so, obtain anti-theft coding.

– With the ignition switched off, disconnect battery earth strap.

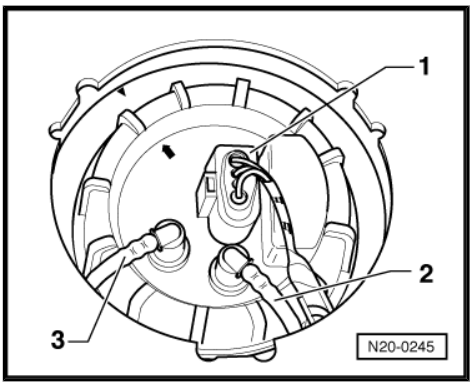
– Fold rear seat forwards.

– Remove cover from fuel delivery unit.

WARNING

Fuel supply lines are under pressure! Wear eye protection and gloves to avoid injuries and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

– Pull connector -1- and supply and return lines -2- and -3- off flange.

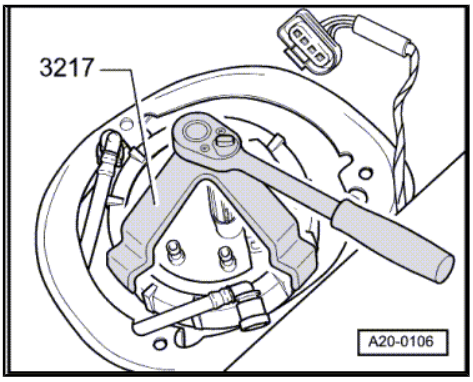


Note

Press in securing ring to release fuel lines.

– Unscrew union nut with union nut tool - 3217- .

– Pull fuel delivery unit and seal out of the opening in fuel tank.



Note

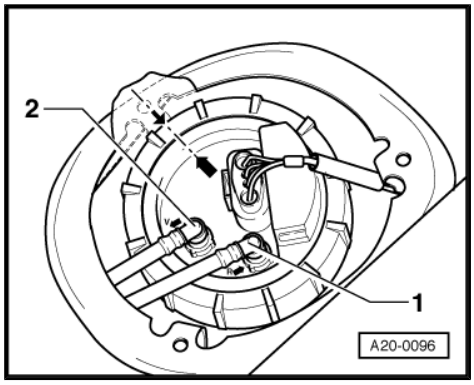
If delivery unit is to be renewed, drain old delivery unit before disposal.

Installing

– Installing the fuel delivery unit is carried out in reverse order of removal.

Note

- *When inserting fuel delivery unit, ensure that fuel gauge sender is not bent.*
- *Insert seal for fuel delivery unit dry into opening of fuel tank.*
- *Moisten seal with fuel only when installing fuel delivery unit.*
- *Note installation position of fuel delivery unit flange: mark on flange must align with mark on fuel tank -arrows-.*
- *Ensure that fuel hose connections are tight.*
- *Do not interchange supply and return lines.*
- *After installing fuel delivery unit, check that the supply, return and breather lines are still clipped onto the fuel tank.*
- *Fuel system must be bled if fuel delivery unit is renewed* ⇒ page 110 .



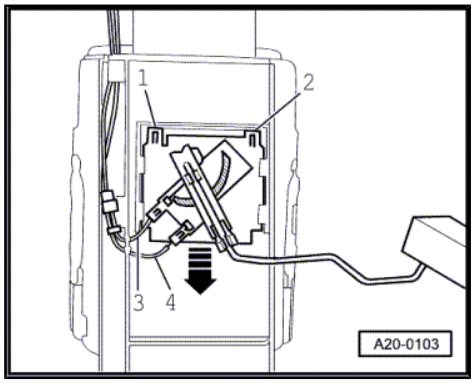
1.5 Removing and installing fuel gauge sender - G-

Removing

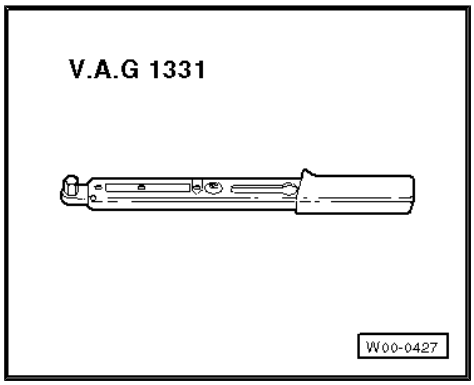
– Remove fuel delivery unit ⇒ page 98 .
– Release connector lugs on lines -3- and -4- and pull off.
– Raise retaining tabs -1- and -2- using a screwdriver and pull fuel gauge sender - G- off downwards -arrow-.

Installing

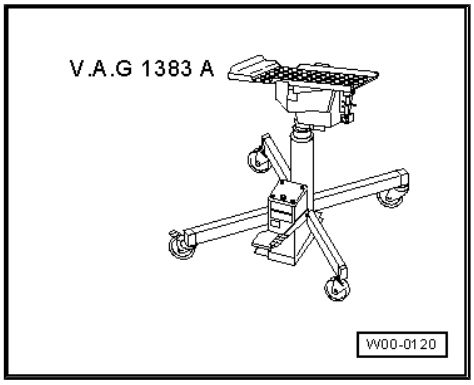
– Insert fuel gauge sender - G- into guides on fuel delivery unit and press upwards until it engages.



1.6 Removing and installing fuel tank



- Torque wrench (5…50 Nm) - V.A.G 1331-
- Engine and gearbox jack - V.A.G 1383 A-



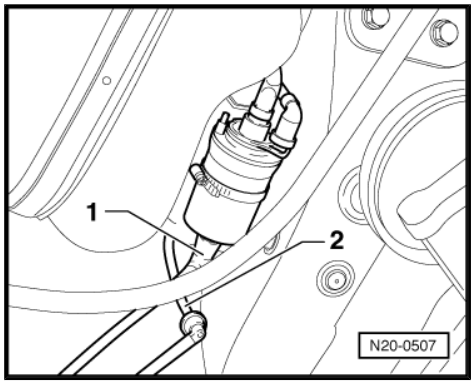
Removing

– Note safety precautions before beginning work ⇒ page 97 .
– First check whether a coded radio is fitted. If so, obtain anti-theft coding.
– With the ignition switched off, disconnect battery earth strap.
– Unscrew securing bolts and remove tank flap unit.
– Drain fuel tank and clean fuel filler neck and surrounding area.
– Fold rear bench seat forwards.
– Remove cover from fuel delivery unit.
– Pull 4-pin connector off flange.
– Remove rear right wheel.
– Remove rear right wheel housing liner: ⇒ General body repairs, exterior; Rep. gr. 66 ; Removing and installing wheel housing liner .
– Remove activated charcoal filter.
– Unbolt filler neck from body.
– Unscrew all rear exhaust system retainers from body. Then support lowered exhaust system on body with wire.
– Remove rear axle ⇒ Running gear, axles, steering; Rep. gr. 42 ; Removing and installing rear axle .

WARNING

Fuel supply lines are under pressure! Wear eye protection and gloves to avoid injuries and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

– Disconnect supply line -1- (black) and breather line -2- (white) at connecting point.
– Unscrew securing strap and securing bolts. When doing this, support fuel tank with engine and gearbox jack - V.A.G 1383 A- .
– Lower fuel tank.



Installing

Installation is performed in the reverse sequence. In the process, note the following:

- Install breather and fuel hoses free of kinks.
- Ensure that fuel hose connections are tight.
- Do not interchange supply line and return line (return line blue or with blue marking, supply line black).

Note

- *After installing fuel tank, check that the supply, return and breather lines are still clipped onto the fuel tank.*
- *Fuel system must be bled if fuel tank is renewed* ⇒ page 110 .

1.7 Crash fuel shut-off

Function

The crash fuel shut-off system reduces the risk of a vehicle burning in the event of a crash in that the fuel pump is switched off at the fuel pump relay. The system also improves the starting characteristics of the engine. When door is opened, the fuel pump is activated for 2 seconds to build up pressure in the fuel system.

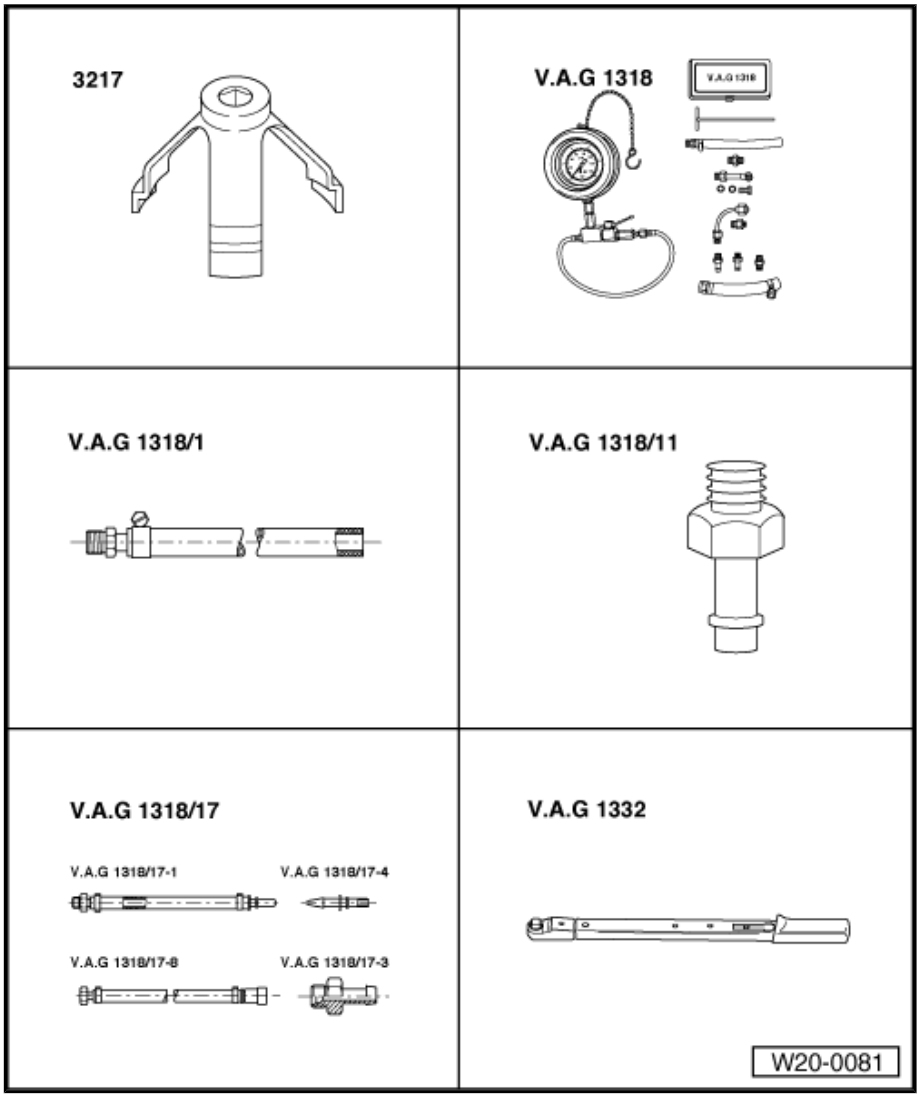
Observe safety precautions when fuel system is open ⇒ page 97 .

– Check fuel pump relay ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

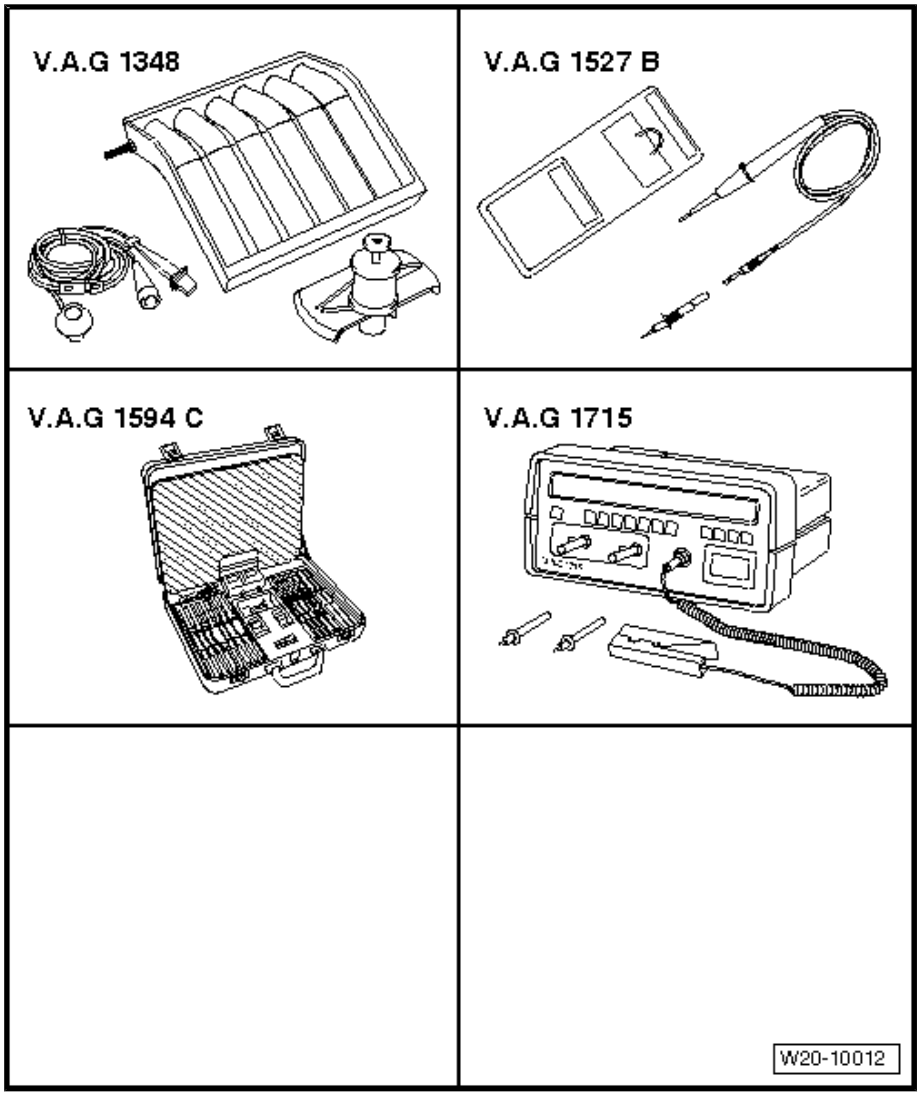
1.8 Checking fuel pump

Special tools and workshop equipment required

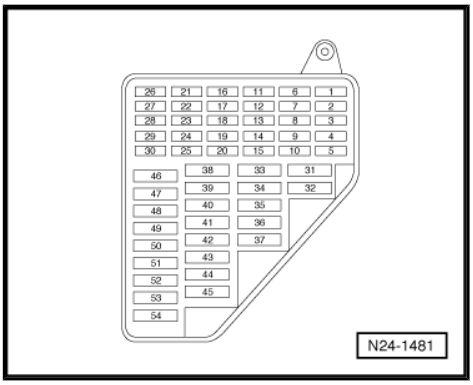
- Union nut tool - 3217-
- Pressure gauge - V.A.G 1318-
- Adapter - V.A.G 1318/1-
- Adapter - V.A.G 1318/11-
- Adapter set - V.A.G 1318/17-
- Torque wrench (40…200 Nm) - V.A.G 1332-



- Injection rate comparison meter - V.A.G 1348-
- Voltage tester - V.A.G 1527 B-
- Auxiliary measuring set - V.A.G 1594C-
- Multimeter - V.A.G 1715-
- Measuring glass



Test prerequisites



- Fuses must be OK. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- The battery voltage must be at least 11.5 V.
- All electrical consumers, e.g. lights and rear window heating, must be switched off.
- If the vehicle is equipped with an air conditioner, it must be switched off.

Note

Observe the functional description of the crash fuel shut-off *⇒ page 102* *.*

Checking function and voltage supply

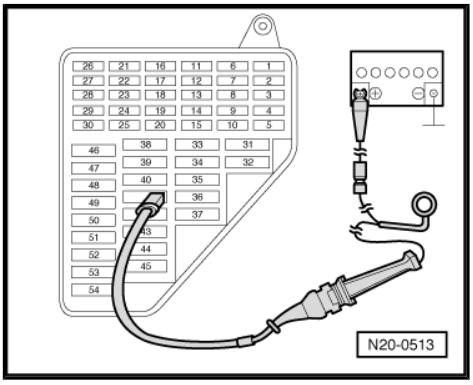
Note

Before carrying out further work, battery earth strap may have to be disconnected. Check whether a coded radio is fitted. Obtain anti-theft coding first if necessary.

– Fold rear seat forwards.
– Remove cover from fuel delivery unit.
– Switch on ignition. Fuel pump must be heard to run briefly (approx. 1 second).

If the fuel pump does not start:

– Switch off ignition.
– Remove fuse holder cover.



– Remove fuse for fuel pump from fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
– Connect remote control for V.A.G 1348 - V.A.G 1348/3A- with adapter cable -V.A.G 1348/3-2- to right contact of fuel pump and battery positive (+).
– Operate remote control.

If fuel pump runs:

– Check activation of fuel pump relay referring to current flow diagram: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

If fuel pump does not run:

– Pull 4-pin connector off fuel delivery unit flange.

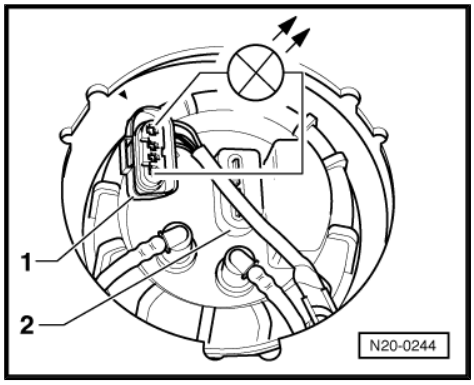
– Connect voltage tester - V.A.G 1527B- to outer contacts of connector using auxiliary cables from auxiliary measuring set - V.A.G 1594C- .

– Operate remote control. LED must light up.

If LED does not light up:

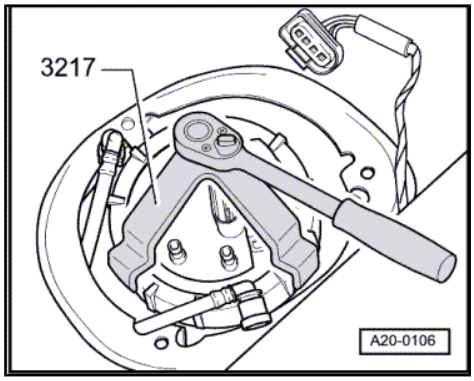
– Locate and eliminate open circuit referring to current flow diagram: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

If LED lights up (voltage supply OK):



– Unscrew union nut with union nut tool - 3217- .

– Check that electrical wires between flange and fuel pump are connected.



If no open circuit can be found:

– Renew fuel delivery unit.

Checking fuel delivery rate

Note

- *Note that pressure regulators with different control pressure may be installed. Pressure regulators with 3 and 4 bar control pressure have been installed.*
- *The fuel pressure regulator is located on the fuel filter.*
- *When renewing pressure regulator, ensure that pressure regulator type prescribed by car manufacturer is installed ⇒ ETKA (Electronic parts catalogue) .*

Test prerequisites

- Voltage supply OK.
- Remote control for V.A.G 1348 - V.A.G 1348/3A- is connected.
- Fuel pressure regulator and holding pressure OK, Checking fuel pressure regulator and holding pressure ⇒ page 134 .

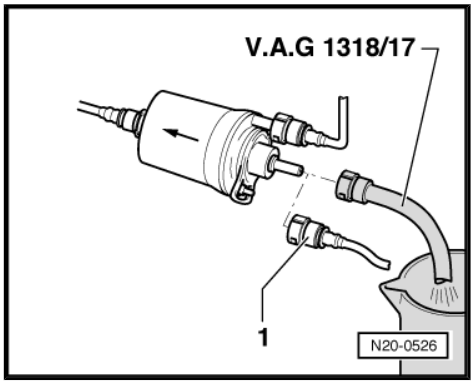
Test procedure

Note

- *Delivery rate of fuel pump must be measured at system pressure of fuel system. Therefore, test fuel pressure before measuring delivery rate.*
- *The 3-bar pressure regulator must build up a pressure of approx. 3 bar.*
- *The 4-bar pressure regulator must build up a pressure of approx. 4 bar.*

– Remove filler cap from fuel tank filler neck.

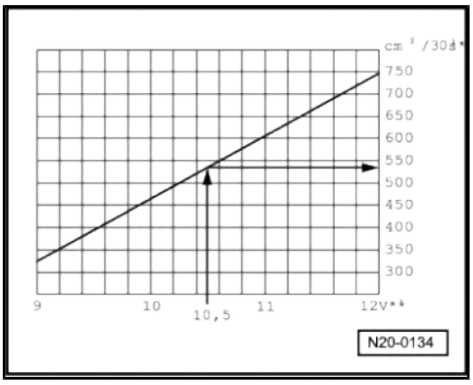
– Pull off return line -1- from fuel pressure regulator.



Note

Press in securing ring to release fuel line.

– Connect adapter set - V.A.G 1318/17- to fuel pressure regulator and hold end of adapter in measuring glass.
– Operate remote control -V.A.G 1348/3A- for approx. 5 seconds to fill fuel filter.
– Empty measuring glass.
– The fuel delivery rate of the fuel pump depends on the voltage, therefore connect multimeter to both outer contacts (connector remains connected) of fuel pump using adapter cables from auxiliary measuring set - V.A.G 1594C- .
– Operate remote control for 30 seconds while measuring battery voltage.
– Compare quantity of fuel delivered with specification.



5) Minimum delivery cm^3/30 seconds

6) Voltage at fuel pump with engine not running and pump running (approx. 2 volts less than battery voltage).

Example:

During the test a voltage of 10.5 volts is measured. At this pump voltage, the minimum delivery rate is 540 cm^3/30 s.

If minimum delivery rate is not attained:

– Check supply line to filter for possible restrictions (kinks) or blockages.

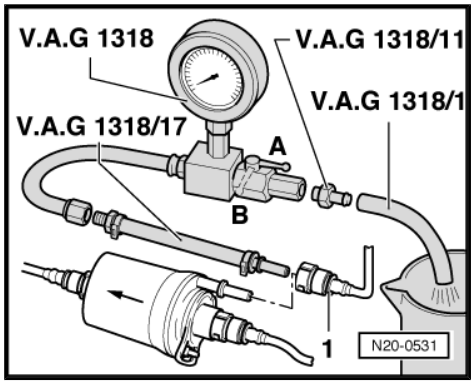
If fuel line is OK

– Check fuel delivery rate before fuel filter.

WARNING

Fuel supply lines are under pressure! Wear eye protection and gloves to avoid injuries and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

– Pull off supply line -1- from fuel filter inlet.



Note

Press in securing ring to release fuel line.

– Connect pressure tester - V.A.G 1318- using adapters - V.A.G 1318/17- as shown.
– Push adapter - V.A.G 1318/1- onto adapter - V.A.G 1318/11- of pressure tester and hold it in measuring glass.
– Open shut-off tap of pressure tester. The lever then points in direction of flow -A-.
– Operate remote control to V.A.G 1348 - V.A.G 1348/3A- for approx. 10 seconds to fill fuel filter and build-up system pressure.

The 3-bar pressure regulator must build up a pressure of approx. 3 bar.

The 4-bar pressure regulator must build up a pressure of approx. 4 bar.

– Empty measuring glass.
– Operate remote control again for 30 seconds. Compare delivery rate with the value determined in the first measurement.

If the minimum delivery rate is now attained:

– Renew fuel filter.

If the minimum delivery rate is again not attained

– Remove fuel delivery unit and check filter strainer for soiling.

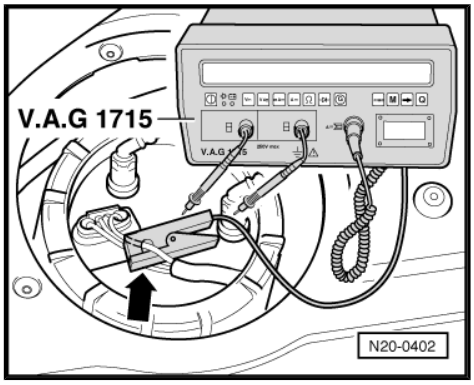
Only if still no fault has been detected:

– Renew fuel delivery unit.

If fuel delivery rate has been attained, but you nevertheless suspect a fuel supply system fault, e.g. intermittent failure of fuel supply system:

– Check current draw of fuel pump as follows:
– Reconnect all disconnected fuel lines.

– Connect multimeter - V.A.G 1715- to contact 1 -arrow- of 4-pin connector using pick-up clamp.
– Start engine and run at idling speed.
– Measure current draw of fuel pump. Specification: max. 8 amps.



Note

If the fuel system malfunction is intermittent, you can perform the check during a road test, but a 2nd person is necessary.

If the current draw is exceeded:

– Fuel pump defective, renew fuel pump unit .

Checking non-return valve for fuel pump

Test prerequisite

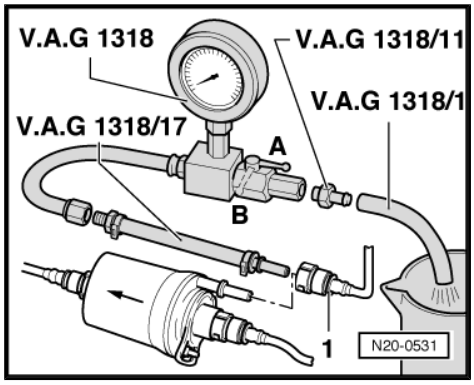
• Remote control for V.A.G 1348 - V.A.G 1348/3A- is connected.

Test procedure

WARNING

Fuel supply lines are under pressure! Wear eye protection and gloves to avoid injuries and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

– Pull supply hose -1- off fuel filter inlet.



Note

Press in securing ring to release fuel line.

– Connect pressure tester - V.A.G 1318- using adapters - V.A.G 1318/17- as shown.
– Push adapter - V.A.G 1318/1- onto adapter - V.A.G 1318/11- of pressure tester and hold it in measuring glass.
– Close pressure tester shut-off tap (lever at right angles to direction of flow, position -B-).
– Operate remote control to V.A.G 1348 - V.A.G 1348/3A- for approx. 10 seconds to fill fuel filter and build-up system pressure.

The 3-bar pressure regulator must build up a pressure of approx. 3 bar.

The 4-bar pressure regulator must build up a pressure of approx. 4 bar.

WARNING

Danger of spray when shut-off tap is opened. Wear eye protection and protective clothing to avoid injuries and skin contact. Hold container in front of open connection of pressure tester.

– If pressure builds up too high, relieve excess pressure by carefully opening shut-off tap.
– Watch pressure drop on pressure gauge. After 10 minutes, pressure must not drop by more than 0.5 bar.

If the pressure drops further:

– Check line connections for leaks.

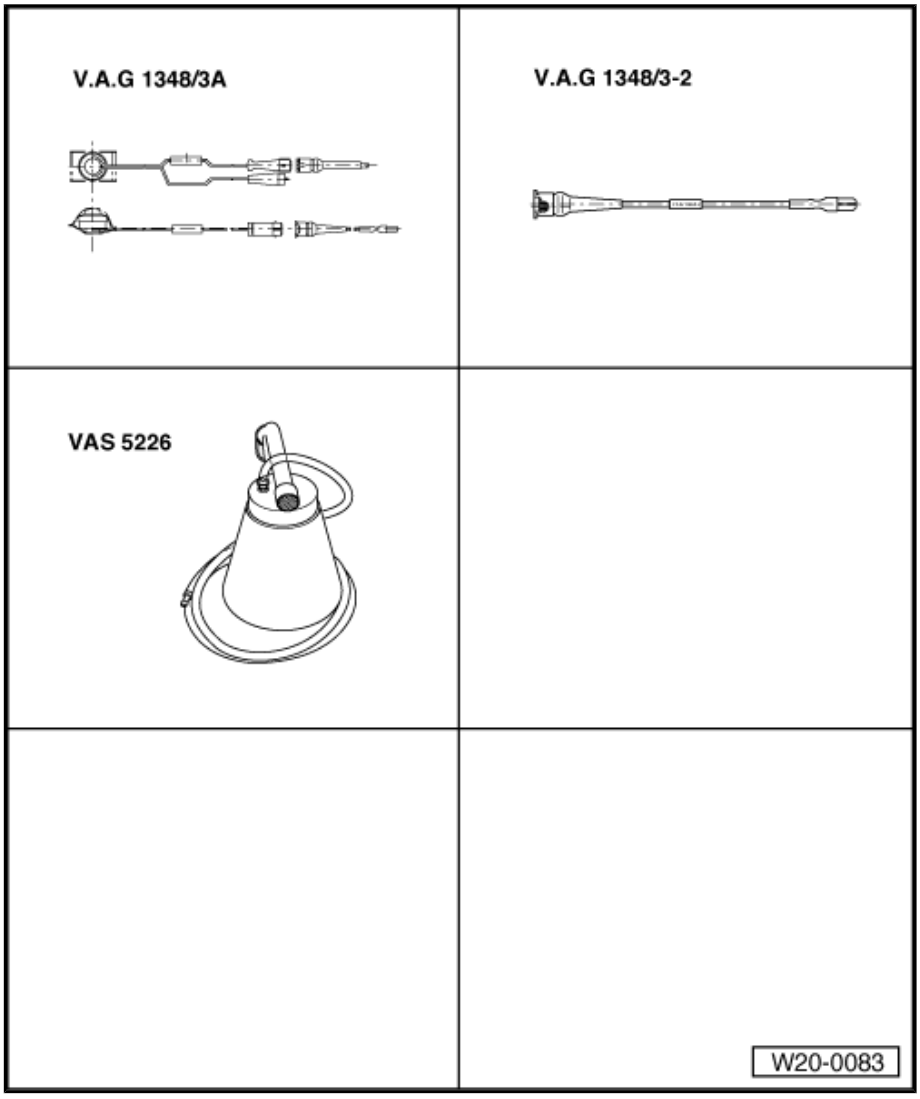
If no fault in lines is detected:

– Fuel pump defective, renew fuel pump unit .

1.9 Bleeding fuel system

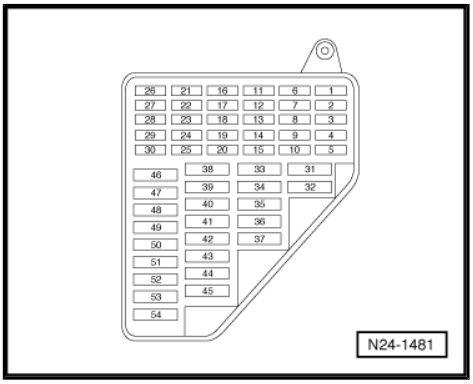
Special tools and workshop equipment required

- Remote control for V.A.G 1348 - V.A.G 1348/3 A-
- Adapter cable - V.A.G 1348/3-2-
- Diesel extractor - VAS 5226-
- Adapter - V.A.G 1318/20-
- Adapter - V.A.G 1318/20-1-



Prerequisites

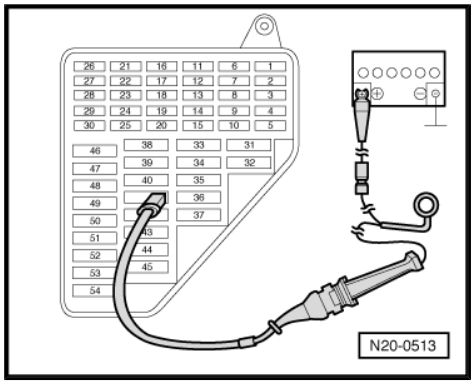
- Fuses must be OK. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- The battery voltage must be at least 11.5 V.
- Fuel pump relay must be OK.



Procedure

– Remove fuse holder cover.

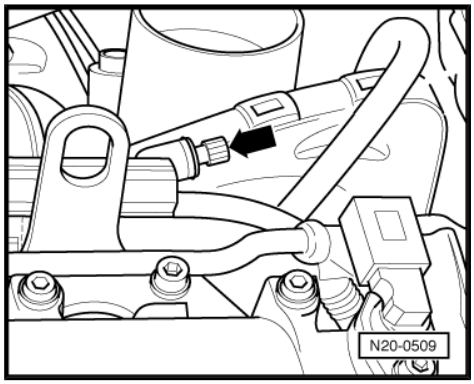
– Pull fuse for fuel pump out of fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
– Connect remote control for V.A.G 1348 - V.A.G 1348/3A- with adapter cable - V.A.G 1348/3-2- to right contact of fuel pump and battery positive (+).
– Remove air filter.



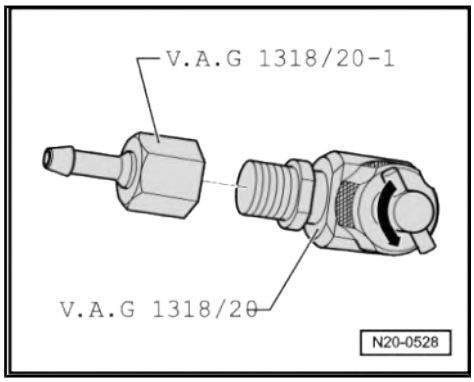
Engine codes AWY, AZQ, BME ⇒ page 123

Engine code BMD ⇒ page 125

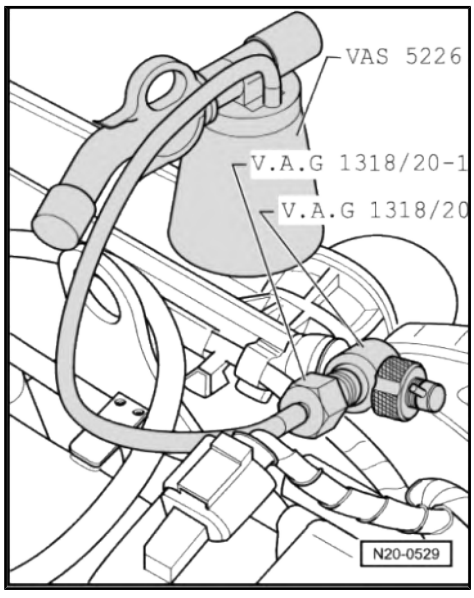
– Remove cover -arrow- from breather valve.



– Screw adapter -V.A.G 1318/20-1- onto adapter - V.A.G 1318/20- .
– Turn valve (on T-piece) anti-clockwise until it is entirely open.



– Screw adapter -V.A.G 1318/20- hand-tight onto bleeder valve.
– Connect hose of diesel extractor - VAS 5226- as illustrated.
– Turn valve on T-piece clockwise into bleed valve to stop.
– Check adapter and hose connections for leaks.
– Operate remote control for V.A.G 1348 - V.A.G 1348/3A- until fuel flows free of air bubbles from breather valve.
– Turn valve (on T-piece) anti-clockwise until it is entirely open again.
– Clamp off hose from diesel extractor - VAS 5226- (e.g. with hose clamps up to Ø 25 mm - 3094-) and pull it off adapter - V.A.G 1318/20-1- .
– Unscrew adapter -V.A.G 1318/20- from bleed valve.



2 Activated charcoal filter system

Function ⇒ page 113 .

Assembly overview ⇒ page 113 .

Checking fuel tank breather ⇒ page 114 .

2.1 Function

Fuel vapour forms above the surface of the fuel in the fuel tank; the quantity depends upon the air pressure and ambient temperature.

The activated charcoal filter system prevents these HC emissions escaping to the atmosphere.

In limited quantities, fuel vapours pass from the highest point in the tank through the gravity valve (which closes at an angle of 32°) and through a pressure retention valve into the activated charcoal filter.

The activated charcoal stores these vapours like a sponge.

When the car is being driven and the Lambda control is active (engine warm), the activated charcoal filter solenoid valve 1 - N80- , also known as regeneration valve, is activated (pulsed) by the engine control unit - J623- according to load and engine speed. The opening period depends on the input signals.

During the purging procedure (regeneration of the activated charcoal), the intake manifold vacuum draws in fresh air through the vent opening on the underside of the activated charcoal filter. The fuel vapours stored in the activated charcoal and fresh air are fed to combustion in metered quantities.

The pressure retention valve prevents fuel vapours from being drawn from the fuel tank when activated charcoal filter system solenoid valve 1 - N80- is open and intake manifold vacuum is present. It thus ensures that the purging of the activated charcoal filter has priority.

The activated charcoal filter system solenoid valve 1 - N80- is closed when it is not supplied with current (e.g. open circuit). The activated charcoal filter will not be purged.

Note

- *Hose connections are secured with either spring-type or clamp-type clips.*
- *Always renew clamp-type clips with spring-type clips.*
- *Hose clip pliers - VAS 6340- are recommended to install spring-type clips.*

Observe safety precautions ⇒ page 127 .

Observe rules for cleanliness ⇒ page 98 .

2.2 Assembly overview

1 - Breather line

- ❑ Check for secure seating.

2 - Pressure retention valve with connecting hose

- ❑ Check for secure seating.
- ❑ From gravity valve on fuel tank

3 - Breather connection

- ❑ Visible from below

4 - 10 Nm

5 - Throttle valve module - J338-

- ❑ With intake connection.

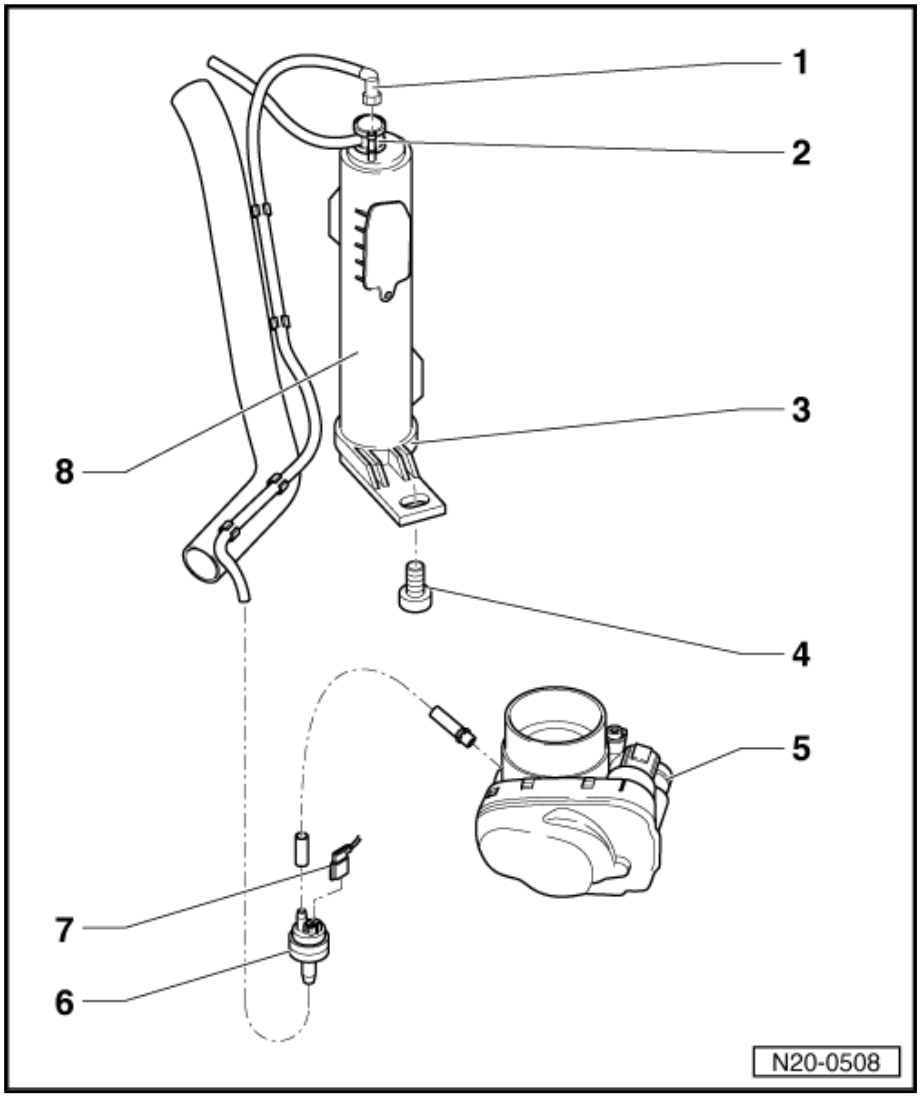
6 - Activated charcoal filter solenoid valve 1 - N80-

- ❑ Valve closed with ignition switched off.
- ❑ When engine is warm, valve is activated (pulsed) by engine control unit - J623- .

7 - Connector

8 - Activated charcoal filter

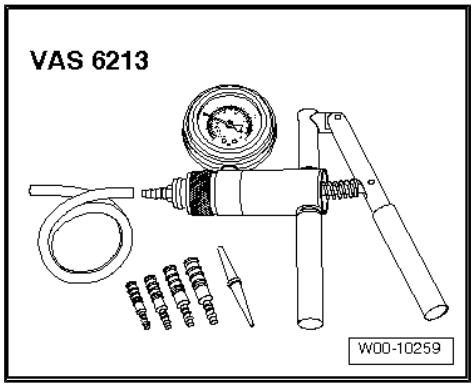
- ❑ Location: in rear right wheel housing.



2.3 Checking fuel tank breather

Special tools and workshop equipment required

♦ Hand vacuum pump - VAS 6213-



Test prerequisite

- Ignition must be switched off.

Test procedure

– First pull breather hose -1- from activated charcoal filter on activated charcoal filter system solenoid valve 1 - N80- -2-.

– Then connect hand vacuum pump -VAS 6213- to hose -1- as shown.

– Operate hand vacuum pump -VAS 6213- several times. Vacuum must not build up.

If vacuum builds up:

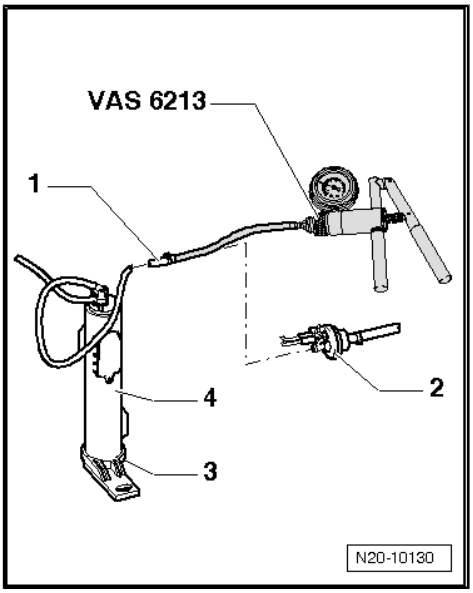
– Check breather opening -3- on lower activated charcoal filter -4- for soiling, clean if necessary.

If vacuum does not build up:

– Temporarily seal breather opening -3- and operate vacuum pump again several times. Vacuum must build up.

If vacuum does not build up:

– Renew activated charcoal filter.



3 Electronic power control (EPC)

Assembly overview ⇒ page 116 .

3.1 Assembly overview

1 - Bearing bracket

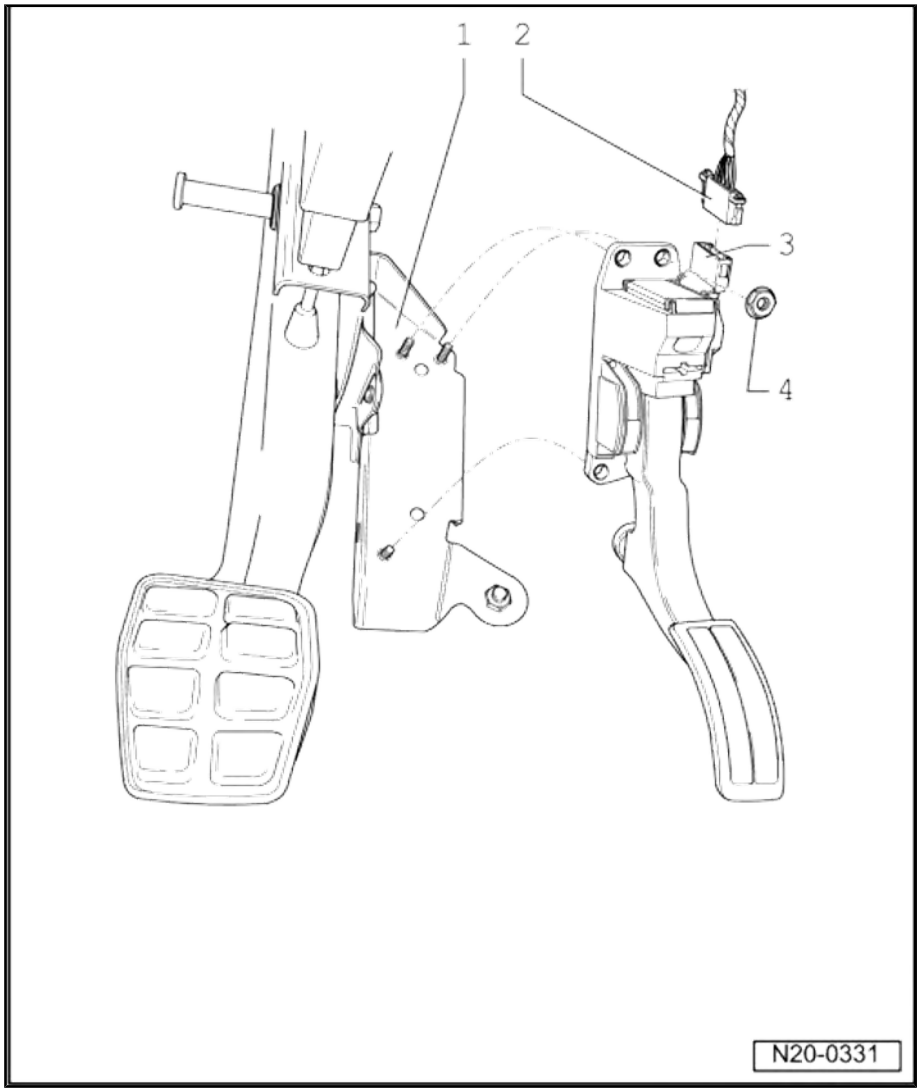
2 - Connector

- ❑ Black, 6-pin.

3 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ To remove, remove dash panel cover and pedal cluster cover.

4 - 10 Nm



24 – Mixture preparation - injection

1 Injection system

General notes on injection

- The engine control unit - J623- is equipped with self-diagnosis. Before carrying out repairs and fault finding, read fault memory. Also the vacuum hoses and connections must be checked (unmetered air).
- For trouble-free operation of electrical components, a voltage of at least 11.5 V is necessary.
- Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and damage the Lambda probe.
- Vehicles with an airbag are fitted with a crash fuel shut-off. It reduces the danger of a fire in a crash as the fuel pump is switched off via the fuel pump relay. The system also improves the starting characteristics of the engine. When door is opened, the fuel pump is activated for 2 seconds to build up pressure in the fuel system.

Assembly overview - parts of injection system ⇒ page 117

Assembly overview - intake manifold, engine codes AWY, BMD, BBM ⇒ page 119

Assembly overview - intake manifold, engine codes AZQ, BME, BZG ⇒ page 120

Assembly overview - fuel rail with injectors, engine code AWY ⇒ page 121

Assembly overview - fuel rail with injectors, engine codes AZQ, BMD, BME, BBM, BZG ⇒ page 122

Assembly overview - air filter, engine codes AWY, AZQ, BME ⇒ page 122

Removing and installing air filter, engine codes AWY, AZQ, BME ⇒ page 123

Assembly overview - air filter, engine codes BMD, BBM, BZG ⇒ page 124

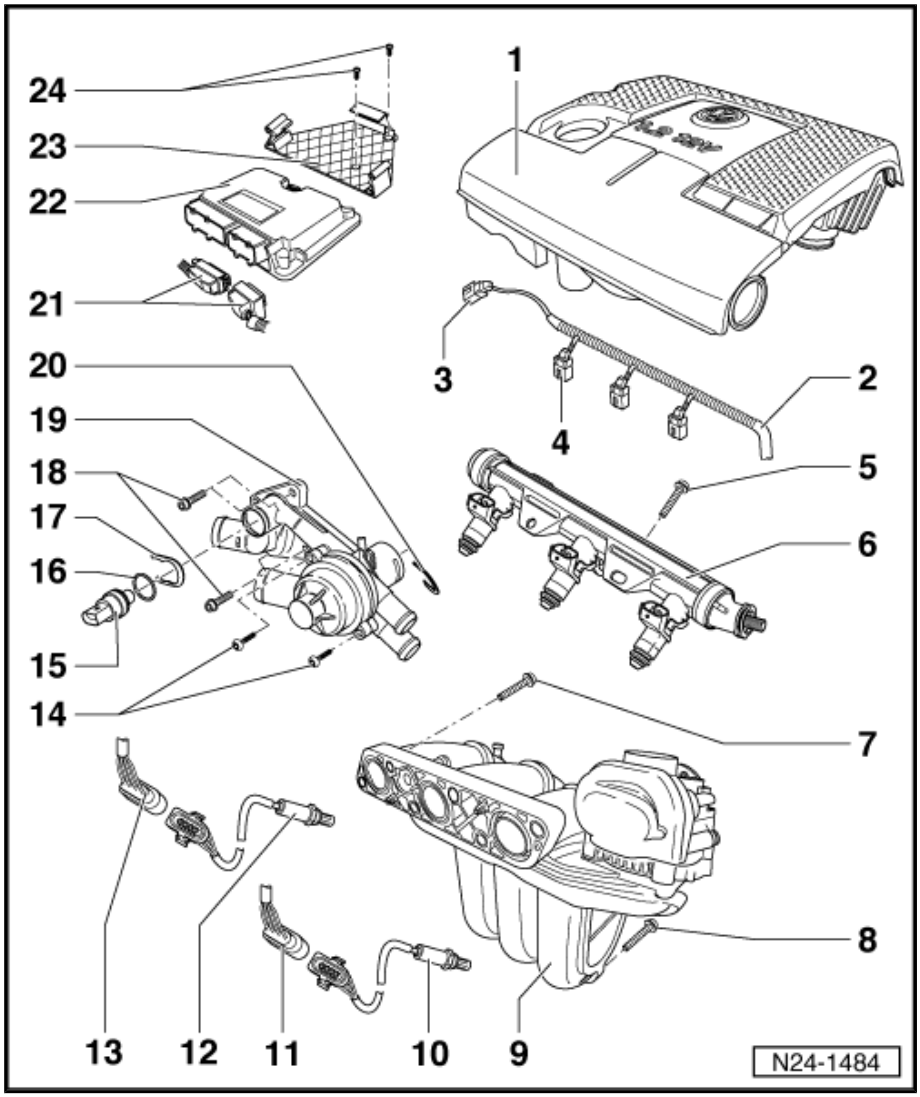
Removing and installing air filter, engine codes BMD, BBM, BZG ⇒ page 125

Safety precautions ⇒ page 127 .

Rules for cleanliness ⇒ page 98 .

Technical data ⇒ page 129 .

1.1 Assembly overview - parts of injection system



1 - Engine cover

- ❑ With integrated air filter.
- ❑ Engines with engine codes BMD, BBM, BZG are provided with separate air filter.

2 - Cable guide

3 - Connector

- ❑ Black, 2-pin.
- ❑ For engine speed sender - G28- .

4 - Connector

- ❑ Black, 2-pin.
- ❑ Injector, cylinder 1 - N30-
- ❑ Injector, cylinder 2 - N31-
- ❑ Injector, cylinder 3 - N32-

5 - 10 Nm

6 - Fuel rail with injectors

- ❑ Dismantling and assembling ⇒ page 121 .

7 - 20 Nm

8 - 20 Nm

9 - Intake manifold

10 - Lambda probe - G39- , 50 Nm

- ❑ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” must not get into the slots on the probe body.
- ❑ Remove and install with Lambda probe open ring spanner set - 3337- .

11 - 6-pin connector

- ❑ Black
- ❑ For Lambda probe - G39- .
- ❑ Contacts 3 and 4 on connector are gold-plated

12 - Lambda probe after catalytic converter - G130- , 50 Nm

- ❑ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” must not get into the slots on the probe body.
- ❑ Remove and install with Lambda probe open ring spanner set - 3337- .

13 - 4-pin connector

- ❑ Black
- ❑ For Lambda probe after catalytic converter - G130- .

14 - 10 Nm

15 - Coolant temperature sender - G62-

- ❑ Green
- ❑ Before removing, release pressure in cooling system if necessary.

16 - O-ring

- ❑ Renew if damaged.

17 - Retaining clip

- ❑ Check for secure seating.

18 - 10 Nm

19 - Thermostat housing

20 - Retaining clip

- ❑ Check for secure seating.

21 - Connector

- ❑ Only disconnect or connect connector with ignition switched off.

22 - Engine control unit - J623-

- ❑ If renewed, the engine control unit - J623- must be adapted to the electronic immobilizer ⇒ Vehicle diagnostic tester “Guided functions”.

23 - Retaining frame

24 - 5 Nm

1.2 Assembly overview - intake manifold, engine codes AWY, BMD, BBM

1 - 10 Nm

2 - Throttle valve module - J338-

- ❑ Clean ⇒ page 126 .
- ❑ 6-pin connector
- ❑ Gold-plated contacts.
- ❑ Heated by coolant.
- ❑ If renewed, adapt engine control unit - J623- to throttle valve module ⇒ Vehicle diagnostic tester “Guided functions”

3 - Gasket

- ❑ Renew.

4 - Connection

- ❑ from oil separator

5 - Connection

- ❑ From activated charcoal filter system solenoid valve 1 - N80-

6 - Seal

- ❑ Renew if damaged.

7 - 20 Nm

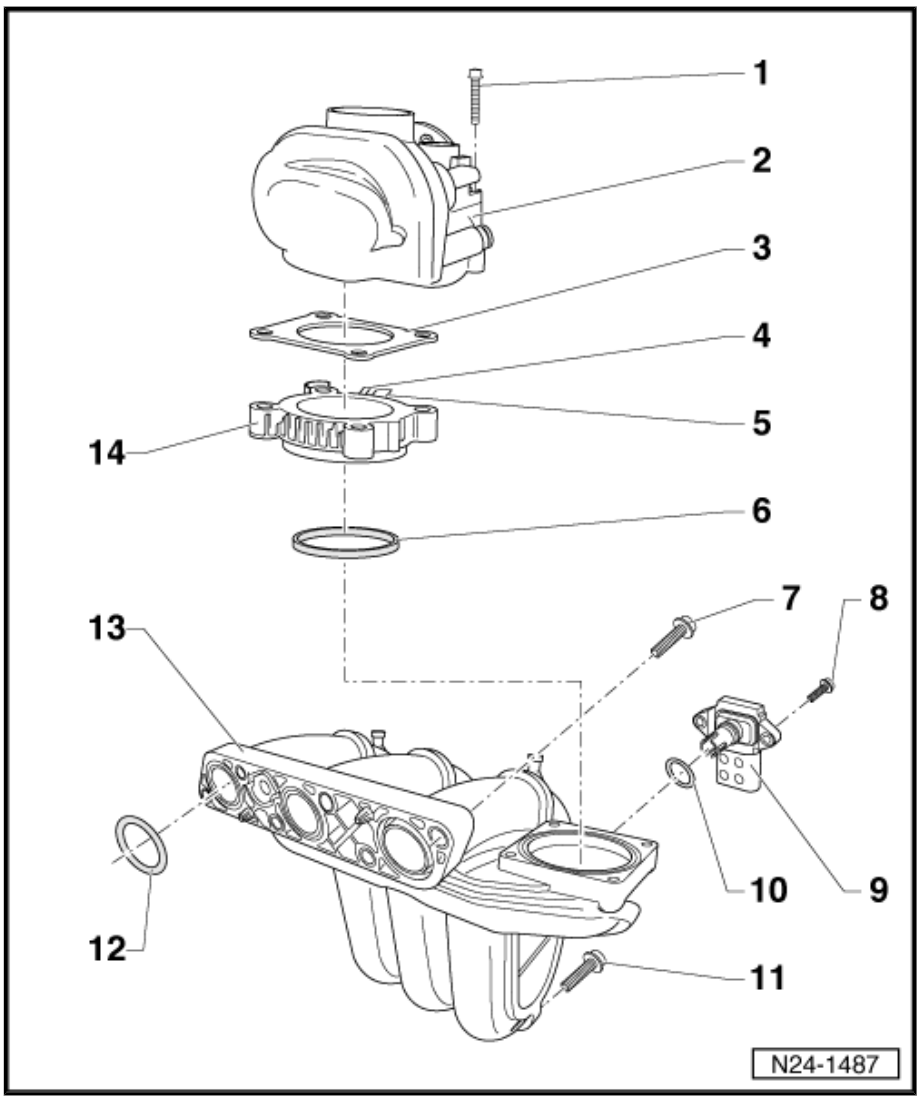
8 - 3 Nm

9 - Intake manifold pressure sender - G71- with intake air temperature sender - G42- .

- ❑ 4-pin connector
- ❑ Gold-plated contacts.

10 - O-ring

- ❑ Renew if damaged.



11 - 20 Nm

12 - O-ring

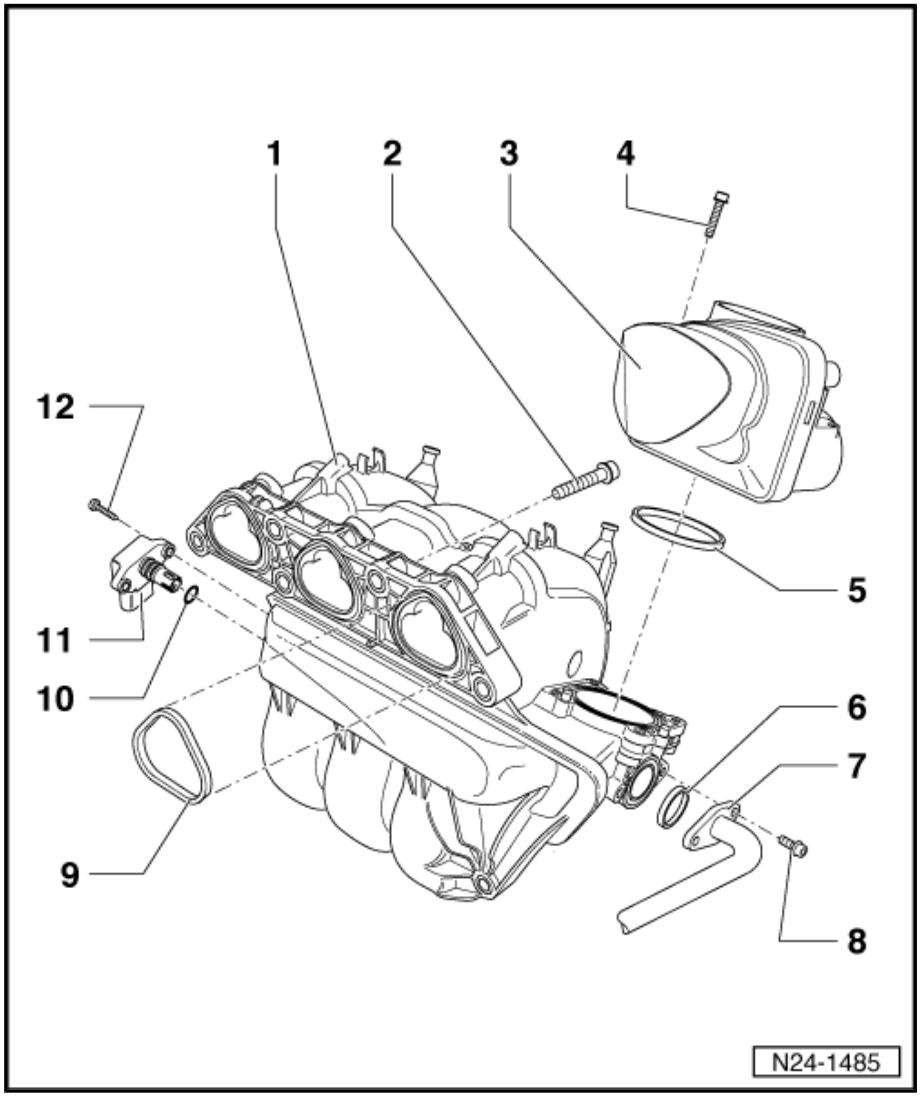
- ❑ Renew if damaged.

13 - Intake manifold

- ❑ Removing and installing ⇒ page 117

14 - Intake connecting pipe

1.3 Assembly overview - intake manifold, engine codes AZQ, BME, BZG



1 - Intake manifold

- ❑ Removing and installing ⇒ page 117

2 - 20 Nm

3 - Throttle valve module - J338-

- ❑ Clean ⇒ page 126 .
- ❑ 6-pin connector
- ❑ Gold-plated contacts.
- ❑ Heated by coolant.
- ❑ If renewed, adapt engine control unit - J623- to throttle valve module ⇒ Vehicle diagnostic tester “Guided functions”

4 - 10 Nm

5 - Seal

- ❑ Renew if damaged.

6 - Seal

- ❑ Renew if damaged.

7 - Connection

- ❑ For exhaust gas recirculation.

8 - 10 Nm

9 - Seal

- ❑ Renew if damaged.

10 - O-ring

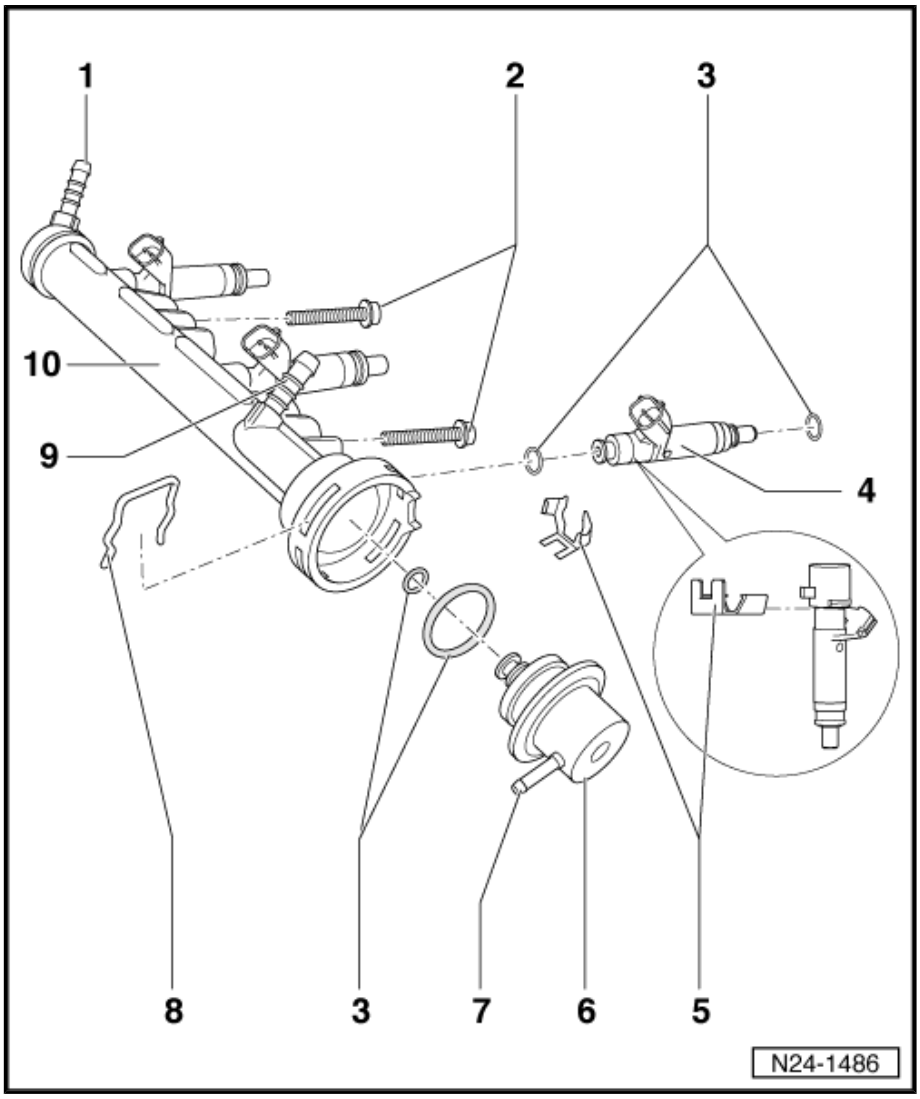
- ❑ Renew if damaged.

11 - Intake manifold pressure sender - G71- with intake air temperature sender - G42- .

- ❑ 4-pin connector
- ❑ Gold-plated contacts.

12 - 3 Nm

1.4 Assembly overview - fuel rail with injectors, engine code AWY



1 - Supply line

- ❑ Black with white marks.
- ❑ Secure with spring-type clips.
- ❑ Check for secure seating.
- ❑ From fuel filter.

2 - 10 Nm

3 - O-ring

- ❑ Renew.
- ❑ Before installing, moisten lightly with clean engine oil.

4 - Injector, cylinder 1 - N30-

- ❑ Injector, cylinder 2 - N31-
- ❑ Injector, cylinder 3 - N32-
- ❑ Checking injectors for leaks and quantity injected ⇒ page 130

5 - Retaining clip

- ❑ Ensure correct seating on injector and fuel rail.

6 - Fuel pressure regulator

- ❑ Observe pressure values on pressure regulator

7 - Vacuum hose

- ❑ To air filter.

8 - Retaining clip

- ❑ Check for secure seating.

9 - Return hose

- ❑ Blue or with blue marking.
- ❑ Secure with spring-type clips.
- ❑ Check for secure seating.
- ❑ To fuel delivery unit in fuel tank:

10 - Fuel rail with injectors

- ❑ Checking injectors for leaks and quantity injected ⇒ page 130

1.5 Assembly overview - fuel rail with injectors, engine codes AZQ, BMD, BME, BBM, BZG

1 - Breather connection

2 - Fuel rail with injectors

- ❑ Checking injectors for leaks and quantity injected ⇒ page 130

3 - O-ring

- ❑ Renew.
- ❑ Before installing, moisten lightly with clean engine oil.

4 - Injector, cylinder 1 - N30-

- ❑ Injector, cylinder 2 - N31-
- ❑ Injector, cylinder 3 - N32-
- ❑ Checking injectors for leaks and quantity injected ⇒ page 130

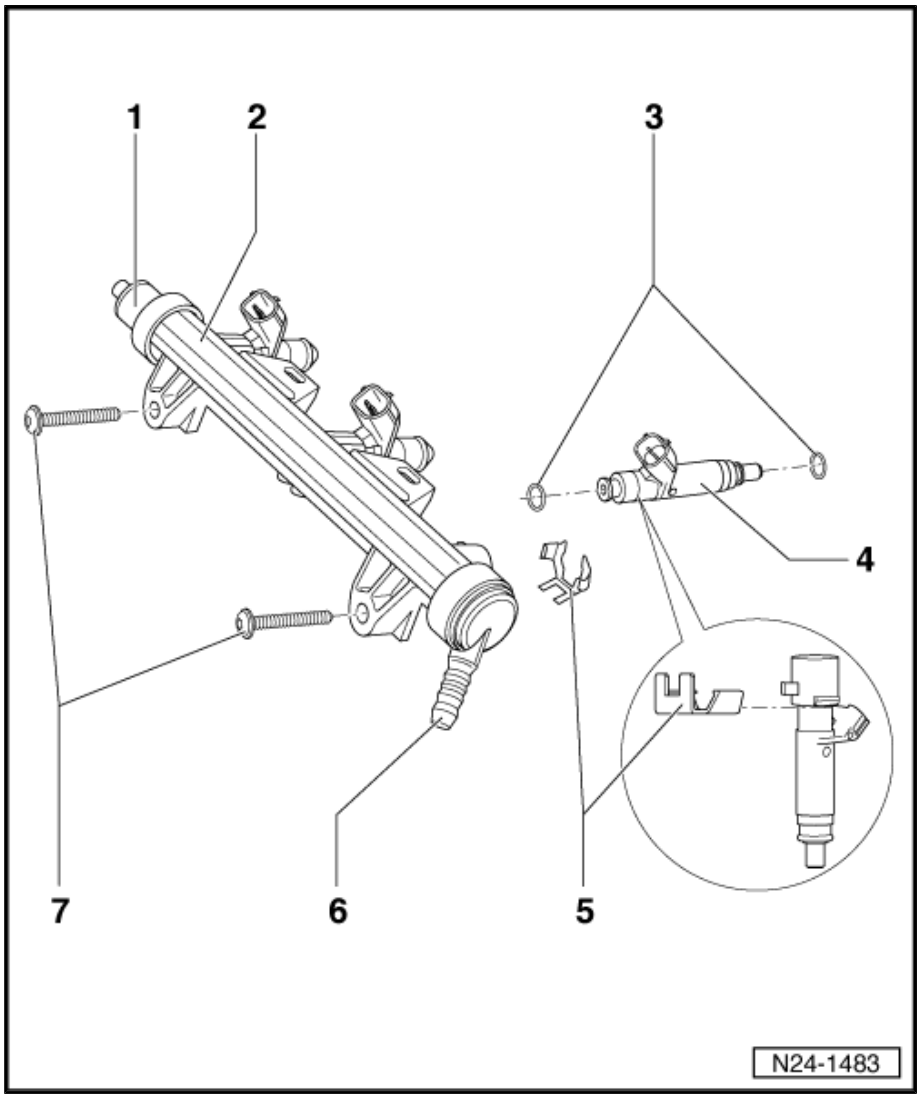
5 - Retaining clip

- ❑ Ensure correct seating on injector and fuel rail.

6 - Supply line

- ❑ Black with white marks.
- ❑ Secure with spring-type clips.
- ❑ Check for secure seating.
- ❑ From fuel filter.

7 - 10 Nm



1.6 Assembly overview - air filter, engine codes AWY, AZQ, BME

Note

- *Self-tapping screws are used as standard for securing upper part of air filter to lower part of air filter. When these screws are loosened or tightened using a power tool, the threads in the intake manifold or the lower part of air filter may be damaged.*
- *For this reason, the use of a power-operated screwdriver is only permitted if the screwdriver speed is max. 200 rpm and a max. tightening torque of 3 Nm is set.*
- *Ensure when installing that the union above the warm air collection does not lie against the plate.*

Removing and installing air filter ⇒ page 123 .

1 - Air filter housing

- ❑ Removing and installing ⇒ page 123

2 - Rubber bush

3 - Filter element

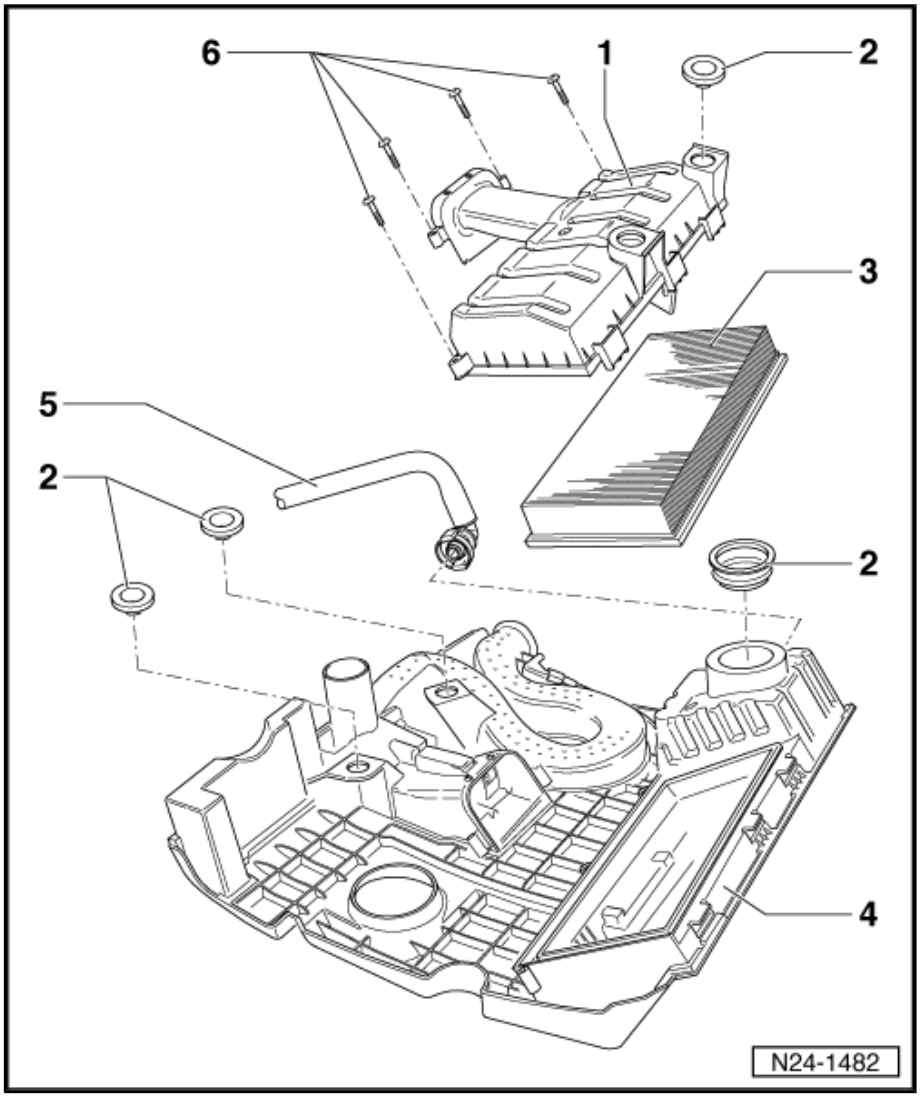
4 - Air filter upper part

5 - Vacuum hose

- ❑ From camshaft housing.

6 - 3 Nm

- ❑ Observe notes on installing ⇒ page 123 .



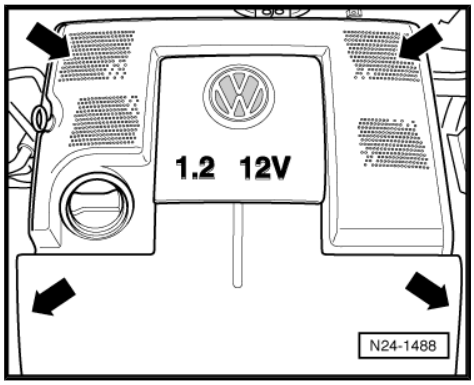
1.7 Removing and installing air filter, engine codes AWY, AZQ, BME

Note

- *The air filter is integrated into the engine cover.*
- *At ambient temperatures below -10 °C the engine compartment must be warmed up to a higher ambient temperature in order facilitate removal and to avoid damage to the air filter mountings.*

Removing

– Pull cover off at positions marked by -arrows-.

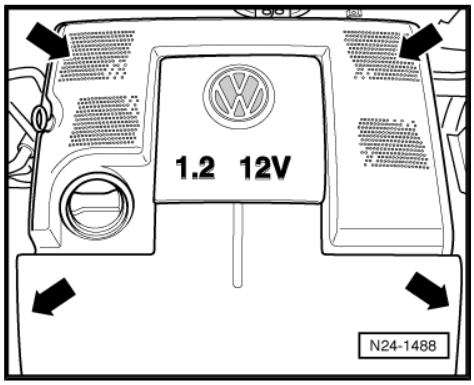


Installing

Install in reverse order. In the process, note the following:

– Fit rubber mountings of cover onto pins secured to engine.

– Press cover down at positions marked by -arrows-.



1.8 Assembly overview - air filter, engine codes BMD, BBM, BZG

Note

- *Self-tapping screws are used as standard for securing upper part of air filter to lower part of air filter. When these screws are loosened or tightened using a power tool, the threads in the intake manifold or the lower part of air filter may be damaged.*
- *For this reason, the use of a power-operated screwdriver is only permitted if the screwdriver speed is max. 200 rpm and a max. tightening torque of 3 Nm is set.*

1 - Air filter upper part

2 - Securing bolt, 1.6 Nm

3 - Filter element

4 - Air filter housing

5 - Securing bolt, 8 Nm

6 - Bonded rubber mounting

7 - Securing bolt

8 - Rubber bush

9 - Intake hose

10 - Rubber bush

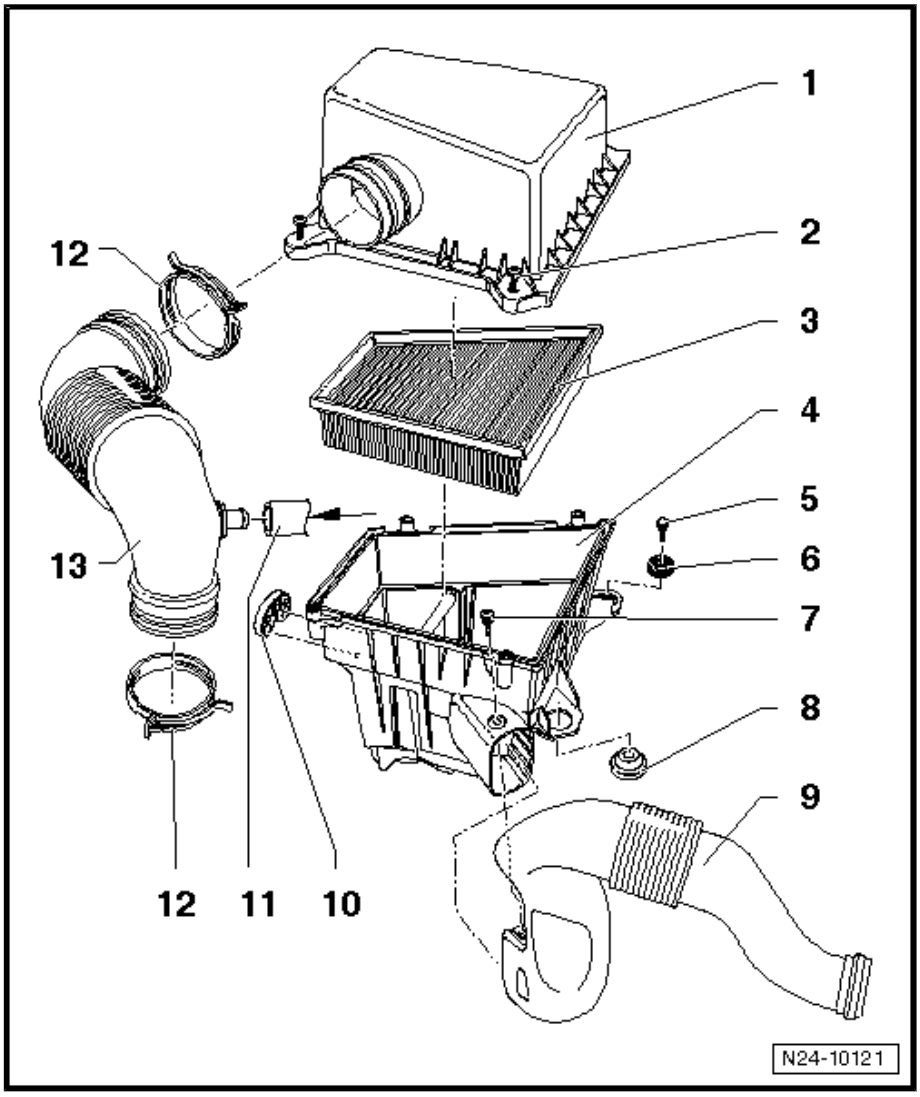
11 - Hose

- ❑ With non-return valve for crankcase breather, check ⇒ page 137
- ❑ From cylinder head cover.

12 - Spring-type clip

13 - Intake hose

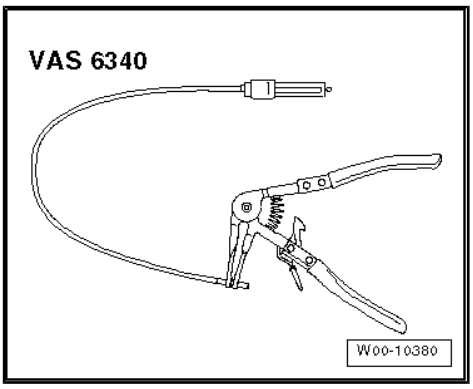
- ❑ To throttle valve module - J338- .



1.9 Removing and installing air filter, engine codes BMD, BBM, BZG

Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6340-

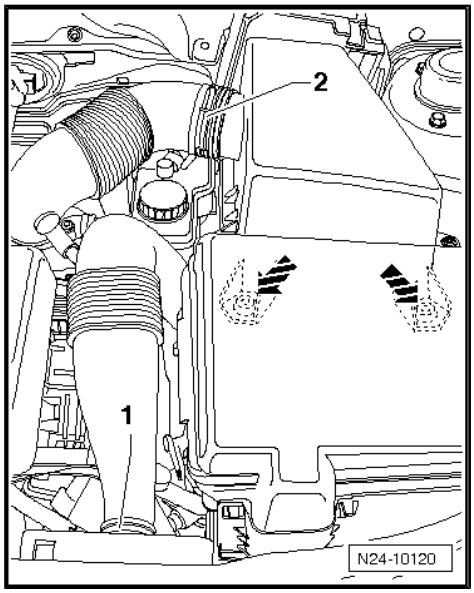


Removing

– Pull off intake hose -1-.

– Loosen spring-type clip -2- using spring-type clip pliers - VAS 6340- and pull intake hose off air filter housing.

– Remove securing bolt and pull air filter housing upwards off bonded rubber mounting -arrows-.



Installing

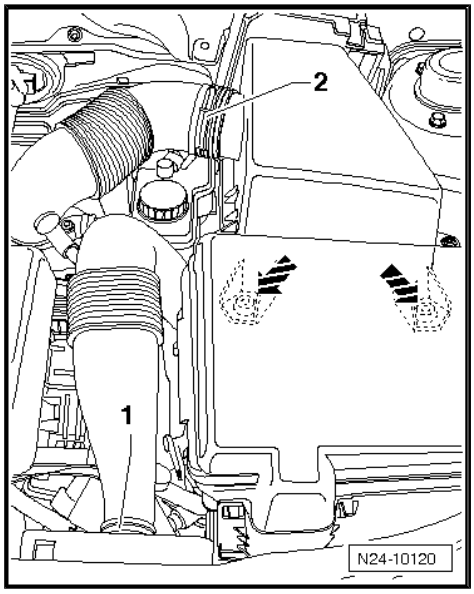
– Fit air filter housing with rubber mountings -arrows- onto pins.

– Press air filter housing downwards on pins.

– Tighten securing bolt to 8 Nm.

– Secure hose with spring-type clip -2- to air filter housing.

– Push intake hose -1- into intake connecting pipe.



1.10 Cleaning throttle valve module - J338-

Note

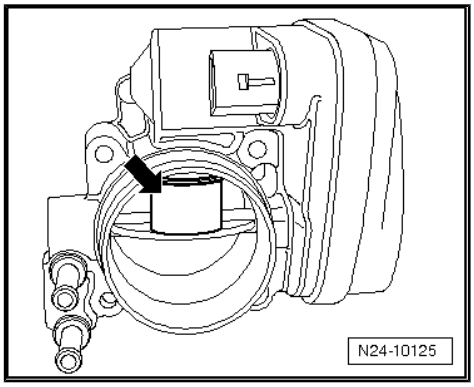
- *If a new engine control unit - J623- is installed the throttle valve module must be adapted. Adaptation must be performed only with a new or cleaned throttle valve module, because soiling or coking at the end stop of the throttle valve can lead to incorrect adaptation values.*
- *When cleaning the throttle valve housing it must not be scratched.*

– Remove air filter (engine codes AWY, AZQ, BME) ⇒ page 123 .

– Remove intake hose from throttle valve module (engine codes BMD, BBM, BZG).

– Remove throttle valve module.

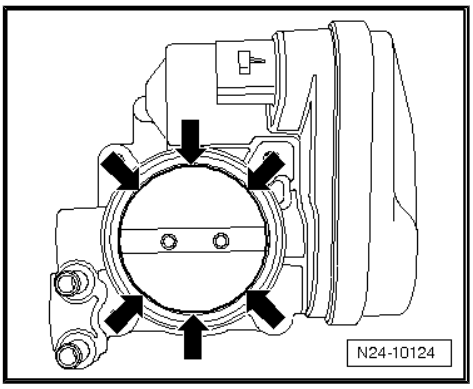
– Open throttle valve by hand and lock in open position using a suitable object (e.g. wood or plastic wedge) -arrow-.



WARNING

Acetone is highly inflammable. Please observe the accidental regulations and safety notes when handling with highly inflammable fluids. Do not use compressed air when cleaning the throttle valve. Wear eye protection and protective clothing to avoid possible injury and skin contact.

– Thoroughly clean throttle valve housing, especially around the closed throttle valve -arrows- using commercially available acetone according to DIN 53247 and a brush.



– Wipe off throttle valve housing using a lint-free cloth.

– Allow acetone to evaporate completely and re-install throttle valve module after cleaning.

– Adapt the engine control unit - J623- to throttle valve module ⇒ Vehicle diagnostic tester “Guided functions”.

1.11 Safety precautions

WARNING

Fuel system is under pressure! Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

To prevent injuries to persons and/or damage to the injection and ignition system, the following must be observed:

- For safety reasons, the fuse for the fuel pump must be removed from the fuse holder before opening the fuel system. Otherwise, the fuel pump could be activated by the driver door contact switch. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Do not touch or disconnect ignition cables when the engine is running or being turned at starter speed.
- Switch off ignition before connecting or disconnecting injection and ignition system wiring as well as test instrument cables.

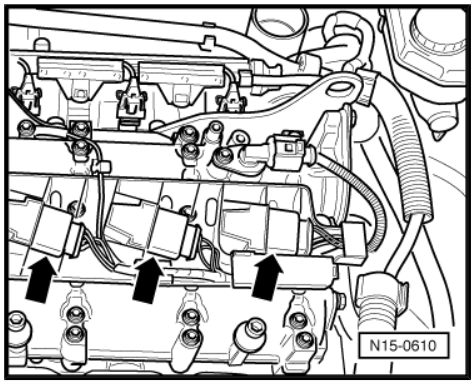
Note the following if testers and measuring instruments have to be used during a road test:

- Test and measuring instruments must always be secured to rear seat and operated by a second person from this location.

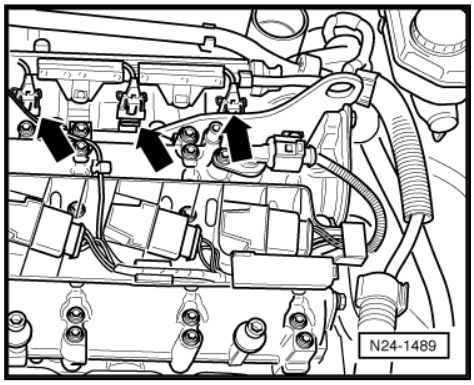
If test and measuring instruments are operated from front passenger seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

- If the engine is to be turned at starter speed without starting:

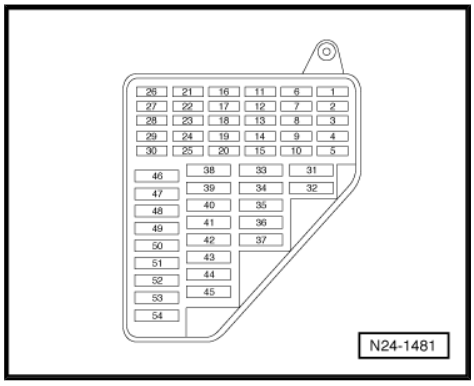
– Pull 4-pin connectors off ignition coils -arrows-.



– Pull connector -arrows- off all injectors.



– Remove fuse for injection valves from fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



1.12 Rules for cleanliness

When working on the fuel supply and injection system, pay careful attention to the following “5 rules” for cleanliness:

- Thoroughly clean all unions and surrounding areas before disconnecting.
- Place removed parts on a clean surface and cover. Use only lint-free cloths.
- Carefully cover opened components or seal if repairs cannot be carried out immediately.
- Install clean components only. Do not remove replacement parts from packing until immediately before installing. Do not use parts that have not been stored in their packing (e.g. in tool boxes etc.).
- When system is open: do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.

1.13 Technical data

Engine codes	AWY, BMD, BBM	AZQ, BME, BZG
Idling check Idling speed[8] rpm	650 … 870[7]	650 … 870[7]
Engine control unit - J623- System Part number	Simos 3PD, 3PG ⇒ Electronic parts catalogue	Simos 3PE, 3PG ⇒ Electronic parts catalogue
Governed speed rpm	from approx. 6,000	from approx. 6,000

7) Current values: ⇒ Exhaust emissions test

8) Not adjustable.

2 Checking components

Checking injectors ⇒ page 130 .

Checking fuel pressure regulator and holding pressure ⇒ page 134 .

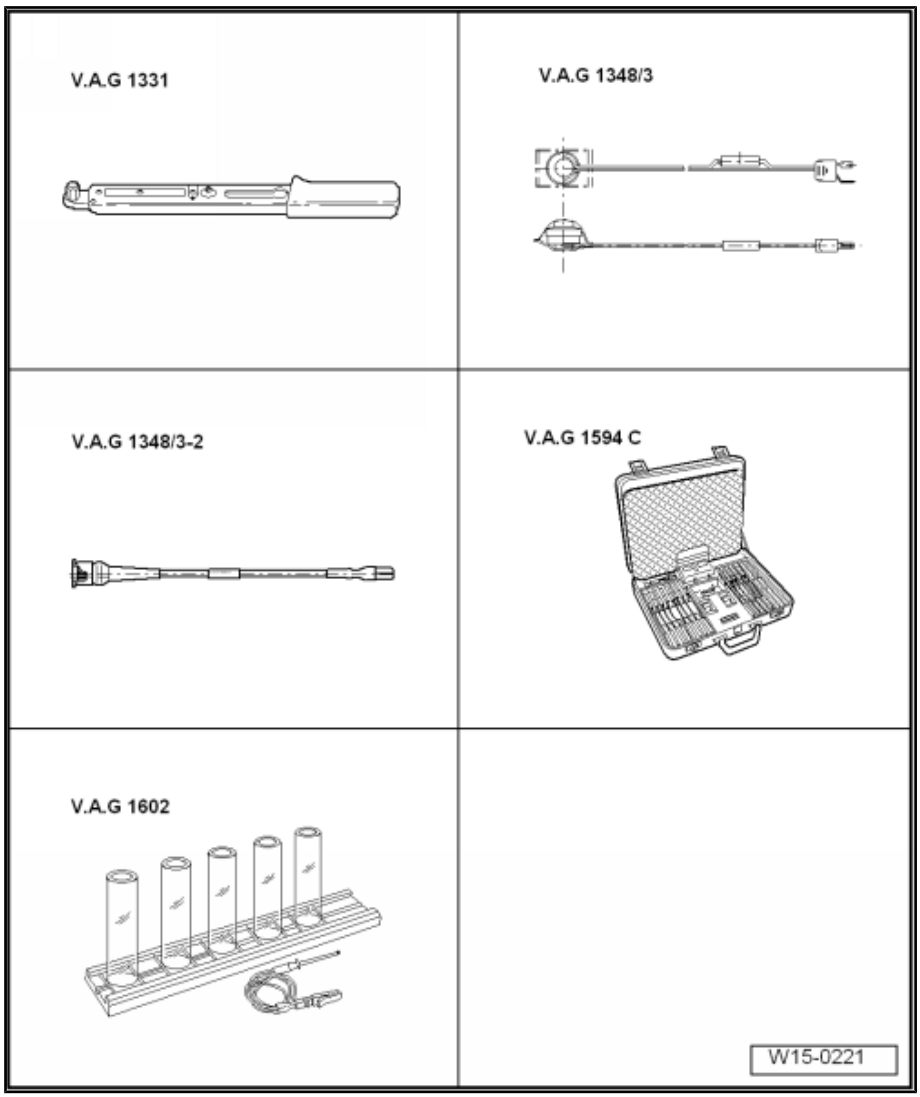
Checking intake air preheating ⇒ page 137 .

Check non-return valve for crankcase breather ⇒ page 137

2.1 Checking injectors

Special tools and workshop equipment required

- Torque wrench (5 … 50 Nm) - V.A.G 1331-
- Remote control for V.A.G 1348 - V.A.G 1348/3A-
- Adapter cable - V.A.G 1348/3-2-
- Auxiliary measuring set - V.A.G 1594 C-
- Injection rate tester - V.A.G 1602-



Check injection quantity and spray pattern of injectors.

Test prerequisite

- The fuel pressure must be OK ⇒ page 134 .
- Engine and fuel temperature: approx. 20 °C.

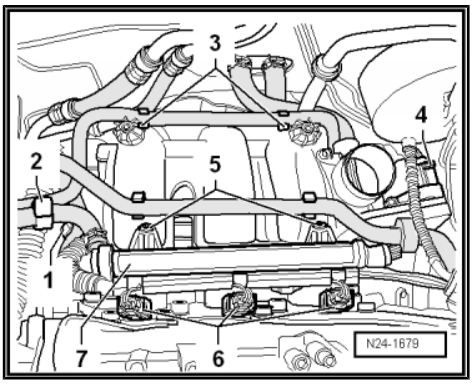
Test procedure

– Remove air filter.

Engine codes AWY, AZQ, BME ⇒ page 123

Engine codes BMD, BBM, BZG ⇒ page 125

– Disconnect hose from bracket -1-.
– Open bracket -2- and detach hoses.
– Detach hose from brackets -3-.
– Pull off connector -4-.
– Pull connector -6- off injectors.
– Remove bolts -5-.
– Pull fuel rail with injectors -7- out of the retainer in the intake manifold.

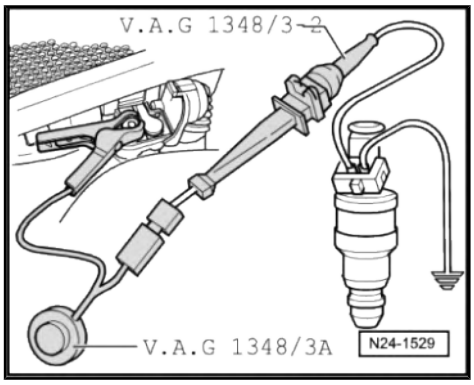


Note

Insert fuel rail loosely into intake manifold to prevent any dirt from entering the intake manifold when the test equipment is being connected.

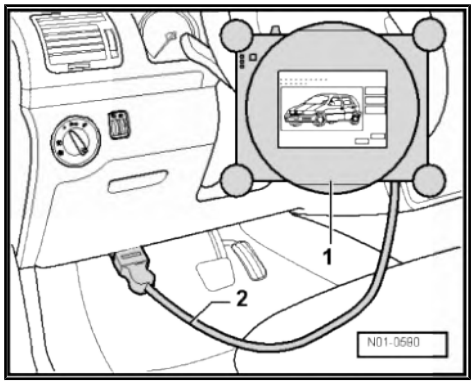
- Do not disconnect fuel hoses.
- Injectors are not to be removed from fuel rail.
- All connectors for the injectors must be disconnected.

– Connect one contact of injector to be checked to remote control - V.A.G 1348/3A- using test lead (adapter cable - V.A.G 1348/3-2-).
– Connect other contact of injector to be checked to engine earth using auxiliary measuring set - V.A.G 1594C- .
– Connect earth wire to measuring cables - V.A.G 1594/2- , measuring cables - V.A.G 1594/19- and pick-up clamp - V.A.G 1594/14- .
– Connect crocodile clip to positive battery pole in engine compartment.
– For injection rate measurement, remove 3 measuring glasses from injection rate tester - V.A.G 1602- .
– Use one measuring glass for each injector to be tested.



– Connect ⇒ Vehicle diagnostic tester as follows:

– Connect diagnosis cable connector -2- to diagnostic connection in driver footwell.



Note

- *During final control diagnosis, the relay for electronic fuel pump will be activated only for 30 seconds.*
- *The button on the remote control - V.A.G 1348/3A- must be pressed at the same moment as the final control diagnosis begins.*
- *The button of the remote control - V.A.G 1348/3A- must not be released as long as fuel still drips from the valve.*

– Switch ignition on.

– Press following buttons on display in succession:

- `Self-diagnosis`
- `01 - Engine electronics`
- `005 - Final control diagnosis`
- `Fuel pump relay`
- `Start`

Note

- *After checking an injector, switch the ignition off, on and off again before beginning the check of the next injector.*
- *If the ignition is not switched off, on and off again between checks, it might not be possible to perform the final control diagnosis repeatedly.*

– Repeat check on other injectors.

– After all injectors have been activated, place measuring beakers on a level surface and compare the quantity injected.

Note

- *When the final control diagnosis has been completed, there is still fuel in the lines and in the valve, which continues to flow after the final control diagnosis.*
- *This quantity is approx. 6 ml. The quantity which continued to flow must be subtracted from the total quantity.*
- *A sample calculation is provided in the table below.*

Total quantity in measuring glass after check	Continued flow (constant value)	Actual value
e.g.: 97 ml	- 6 ml	= 91 ml

Specification: 84…91 ml per injector

If the measured values of one or more injectors are above or below the prescribed specifications:

– Renew defective injector.

Checking for leaks

Test prerequisite

- Fuel pressure OK.
- Engine and fuel temperature: approx. 20 °C.
- Fuel rail is removed.
- Connectors of all injectors are disconnected.

– As a precaution, place a measuring glass - V.A.G 1602/1- under each injector.

Note

- *During the leakage test, pressure will build up in the fuel system.*
- *Valves will not be actuated.*
- *If fuel escapes from a valve, the valve is defective.*

– Connect ⇒ Vehicle diagnostic tester as follows:

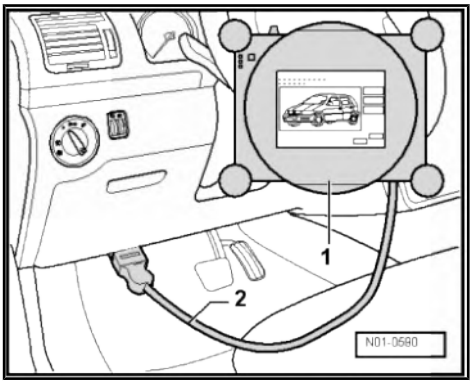
– Connect diagnosis cable connector -2- to diagnostic connection in driver footwell.

– Switch ignition on.

– Press following buttons on display in succession:

- `Self-diagnosis`
- `01 - Engine electronics`
- `005 - Final control diagnosis`
- `Fuel pump relay`
- `Start`

– Switch off ignition.



Specification: No more than 2 drops must escape during final control diagnosis.

If the fuel loss is greater:

– Renew defective injector
⇒ “1.1 Assembly overview - parts of injection system”, page 117 .

Install injectors in reverse order of removal. In the process, note the following:

– Renew O-rings on all injectors and lightly moisten with clean engine oil.

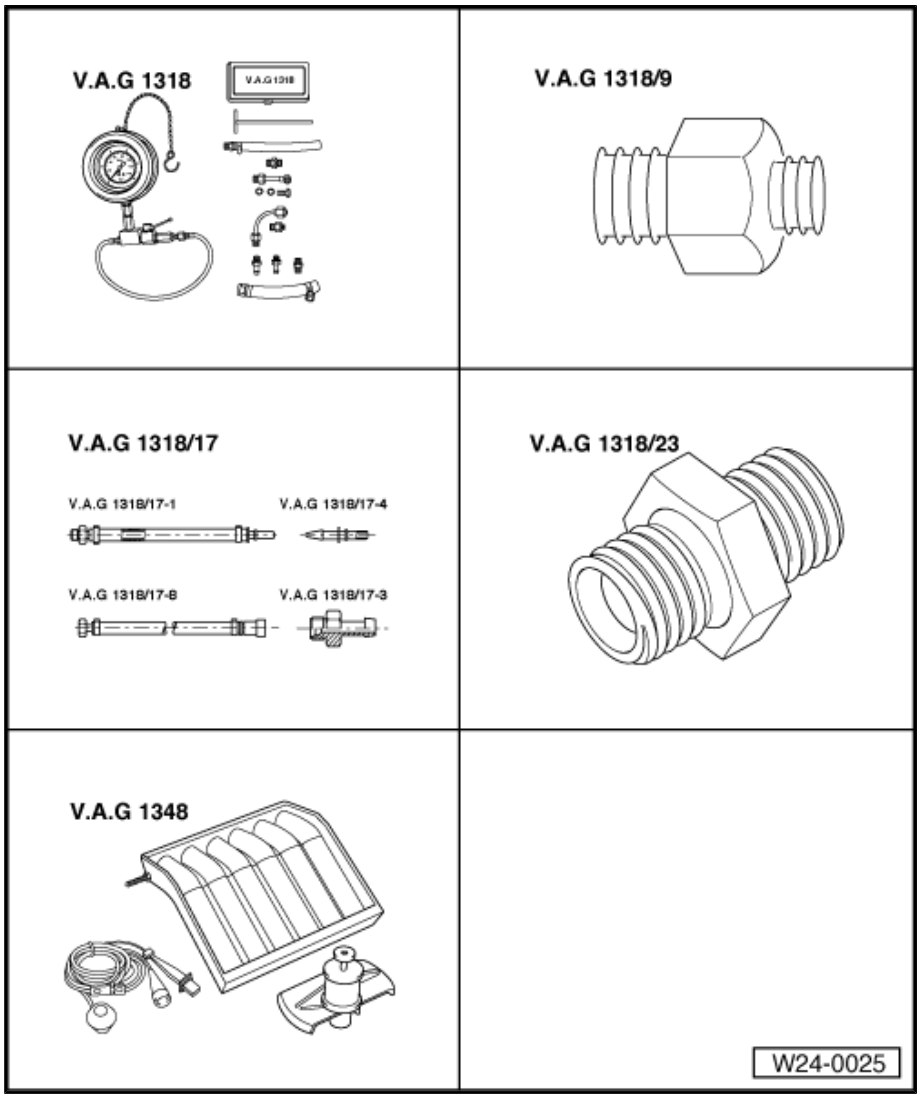
Specified torques:

- Fit fuel rail with secured injectors onto intake manifold and tighten evenly
⇒ “1.1 Assembly overview - parts of injection system”, page 117 .

2.2 Checking fuel pressure regulator and holding pressure

Special tools and workshop equipment required

- Pressure gauge - V.A.G 1318-
- Adapter - V.A.G 1318/9-
- Adapter set - V.A.G 1318/17-
- Connector - V.A.G 1318/23-
- Remote control for V.A.G 1348 - V.A.G 1348/3 A-
- Adapter cable - V.A.G 1348/3 - 2-



Checking holding pressure

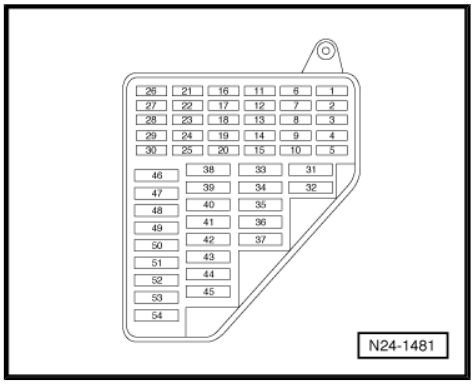
Note

- *Different types of pressure regulators are fitted. Note indicated pressure on pressure regulator.*
- *The fuel pressure regulator maintains the fuel pressure at 3 bar or 4 bar.*
- *The fuel pressure regulator is located on the fuel filter.*
- *The fuel regulator is on the fuel rail of engines with engine code AWY.*

Test procedure

– Remove fuse holder cover.

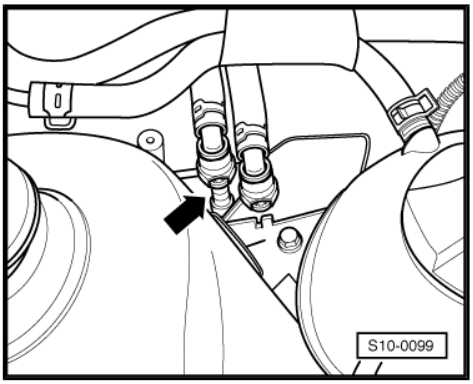
– Remove fuse for fuel pump from fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



WARNING

Fuel system is under pressure! Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

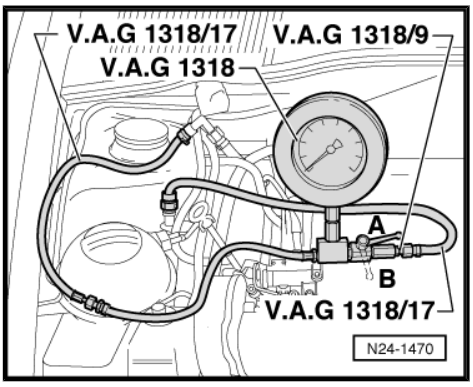
– Separate connection for fuel supply line -arrow- and catch escaping fuel with a cloth.



Note

Press in securing ring to release fuel line.

– Connect pressure tester - V.A.G 1318- using adapters - V.A.G 1318/9- and -1318/17- as shown.



– Open the pressure tester shut-off tap. The handle points in direction of flow.
– Refit fuse for fuel pump into fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
– Start engine and run at idling speed.
– Measure fuel pressure. Specification: 3.0 bar (3 bar pressure regulator). Specification: 4 bar (4 bar pressure regulator).

If the specification is not attained:

– Switch off ignition.
– Checking fuel pump non-return valve ⇒ page 102 .

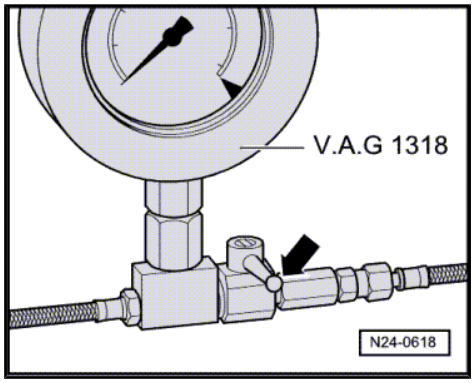
If specification is attained:

– Switch off ignition.
– Now check for leaks and holding pressure (entire system). Do this by observing pressure drop on gauge. After 10 minutes, there must be a residual pressure of at least 2.0 bar (3 bar pressure regulator) or 3.0 bar (4 bar pressure regulator).

If the holding pressure drops below these values:

– Start engine and run at idling speed.

– Switch ignition off after the pressure has built up. At the same time, close shut-off tap of pressure tester - V.A.G 1318- (lever at right angles to direction of flow -arrow-).
– Watch engine-side pressure drop on pressure gauge.



If the pressure drops again:

– Check line connections, O-rings on fuel rail and injectors for leaks.
– Check pressure tester for leaks.

Note

Before removing pressure tester, place a cloth around the connections to be loosened.

If the pressure does not drop:

– Check fuel pump non-return valve ⇒ page 102 .

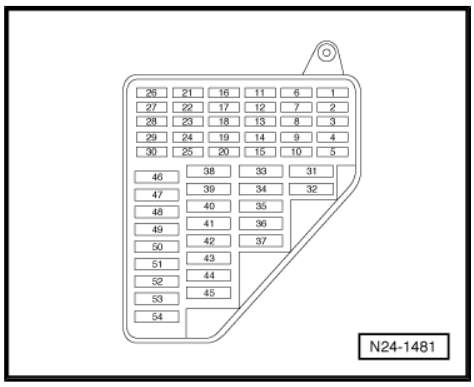
Checking fuel pressure regulator

Test prerequisite

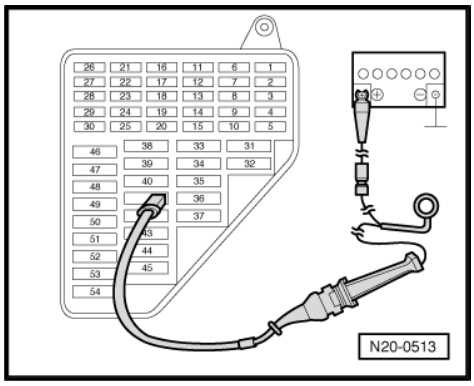
• Fuel pump non-return valve is OK., checking ⇒ page 102 .

Test procedure

– Remove fuel holder cover.
– Remove fuse for fuel pump from fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



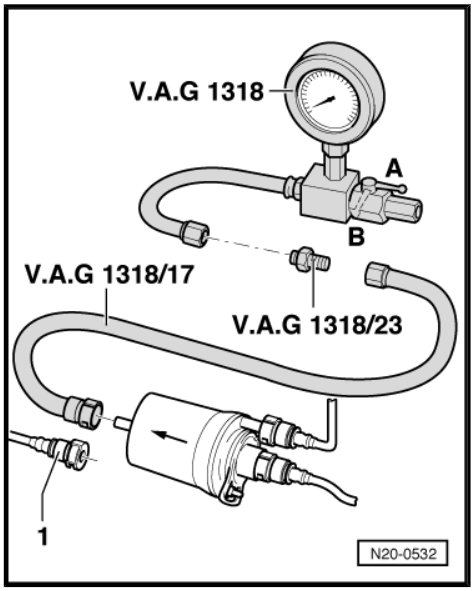
– Connect remote control for V.A.G 1348 - V.A.G 1348/3A- with adapter cable - V.A.G 1348/3-2- to right contact of fuel pump and battery positive (+).



WARNING

Fuel system is under pressure! Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.

– Pull supply line -1- off output side of fuel filter.



Note

Press in securing ring to release fuel line.

– Connect pressure tester - V.A.G 1318- using connector - V.A.G 1318/23- and adapter set - V.A.G 1318/17- as shown.
– Close pressure gauge shut-off tap (lever at right angles to through-flow direction, position -B-).
– Operate remote control for V.A.G. 1348 - V.A.G 1348/3A- for approx. 10 seconds to fill fuel filter and build up system pressure to 3.0 bar (3 bar pressure regulator) or 4 bar (4 bar pressure regulator).
– Watch pressure drop on pressure gauge. After 10 minutes the pressure must not drop below 2.5 bar (3 bar pressure regulator) or 3.5 bar (4 bar pressure regulator).

If the pressure drops further:

– Check line connections for leaks.

If no fault in lines is detected:

– Renew fuel pressure regulator.

2.3 Checking intake air preheating

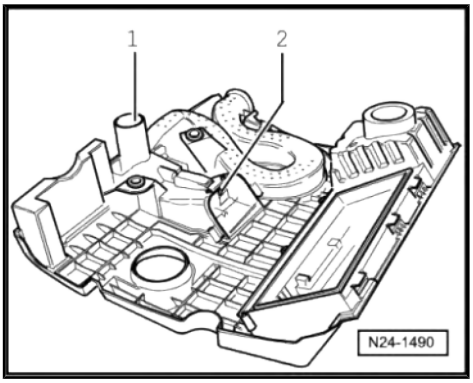
Special tools and workshop equipment required

♦ Chilling spray (commercially available)

Checking regulating flap

– Remove air filter.

Engine codes AWY, AZQ, BME ⇒ page 123



– Check regulating flap position -1-.
– Spray thermal element -2- with chilling spray.
♦ Above +23 °C, flap must close warm air connection.
♦ Below +10 °C, flap opens warm air connection.

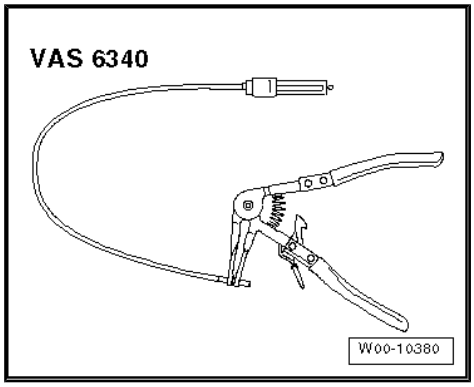
Note

The function of the thermal element can be checked simply by spraying with commercially available chilling spray. The lower part of air filter must be removed for this purpose ⇒ page 122 .

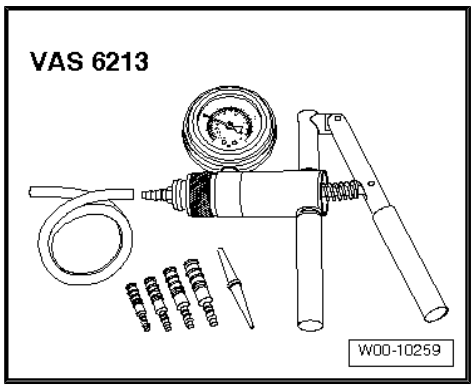
2.4 Check non-return valve for crankcase breather

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6340-



♦ Hand vacuum pump - VAS 6213-

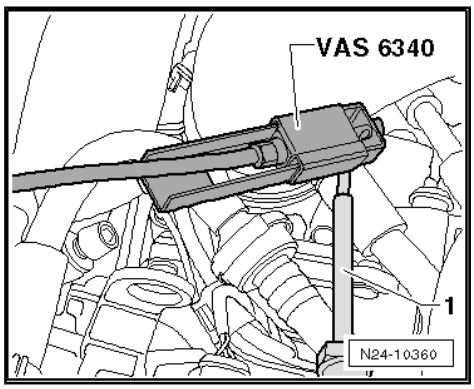


Test prerequisite

The arrows on the non-return valve -2- must point towards the engine.

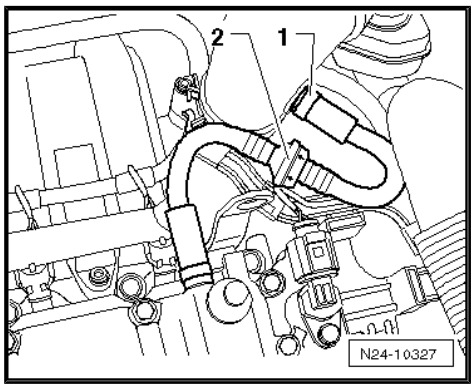
Test procedure

– Apply the hose clip pliers - VAS 6340- as shown to the hose clip and open the clip at the same time using a screwdriver -1-.



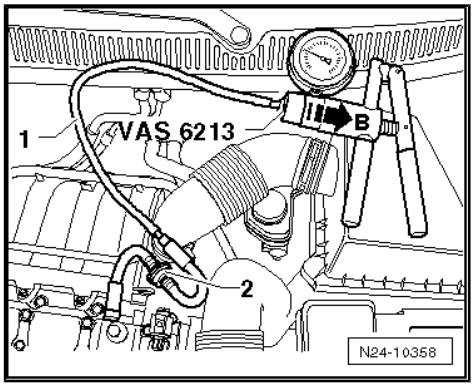
– To check the non-return valve -2-, remove the hose clip -1- and pull the breather hose off the intake hose connector.

– Connect hand vacuum pump - VAS 6213- to breather hose -1-.



– Push the hand vacuum pump - VAS 6213- switch ring in -the direction of arrow B-.
– Operate hand vacuum pump - VAS 6213- .

No pressure should build up, the non-return valve -2- is open.



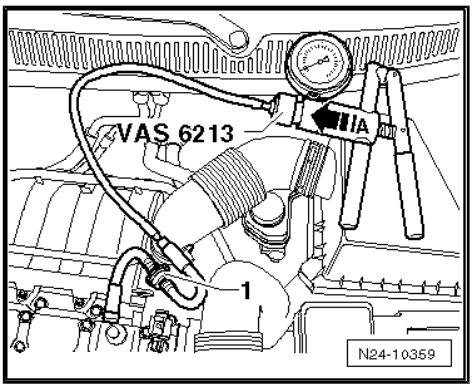
– Push the hand vacuum pump - VAS 6213- switch ring in -the direction of arrow A-.
– Operate hand vacuum pump - VAS 6213- until a pressure of 0.70 bar is attained on pressure gauge.

Note

The non-return valve will open at a pressure of 0.80 bar.

If a pressure of 0.70 bar cannot be created:

– Replace the non-return valve -1-.



3 Engine control unit - J623-

Removing and installing engine control unit - J623- ⇒ page 140

Removing and installing anti-theft-secured engine control unit - J623- (►model year 2007) ⇒ page 140

Removing and installing anti-theft-secured engine control unit - J623- (model year 2007►)

3.1 Removing and installing engine control unit - J623-

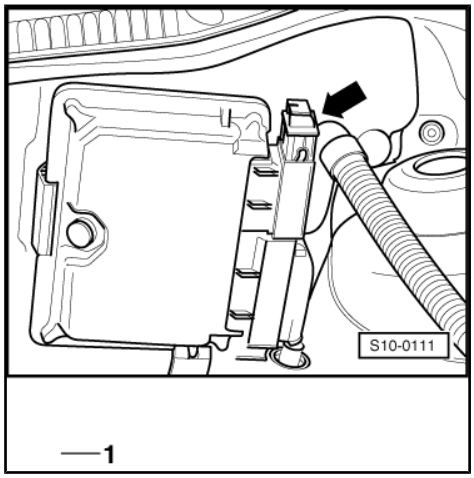
If you wish to renew the engine control unit, connect the ⇒ Vehicle diagnostic tester and carry out the guided function “Renew control unit”.

– Switch off ignition.

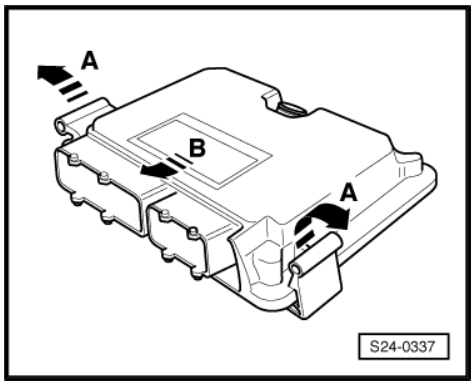
Removing

– Switch off ignition.

– Release connectors on engine control unit and pull off connector.



– Press clips -arrows A- outwards and pull engine control unit out to side -B-.



Installing

– Insert new engine control unit and press to the left.

– Fit connectors and lock in position.

– If engine control unit - J623- is renewed, erase learnt values and adapt engine control unit ⇒ Vehicle diagnostic tester “Guided functions”.

– Read fault memory, rectify any faults and then erase fault memory ⇒ Vehicle diagnostic tester “Guided fault finding”.

– The readiness code must be generated if the fault memory has been erased.

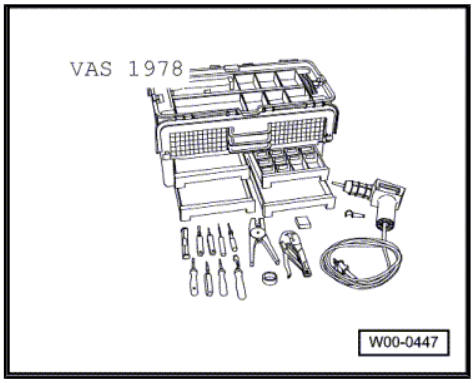
– Carry out a road test.

– Read control unit fault memory again.

3.2 Removing and installing anti-theft-secured engine control unit - J623- (►model year 2007)

Special tools and workshop equipment required

♦ Hot air blower from wiring harness repair set - VAS 1978-



♦ Nozzle from wiring harness repair set - VAS 1978-

If you wish to renew the engine control unit, connect the ⇒ Vehicle diagnostic tester and carry out the guided function “Renew control unit”.

Removing

– Remove windscreen wiper arms and cover for plenum chamber ⇒ Electrical system; Rep. gr. 92 ; Removing and installing windscreen wipe system .

– Remove air filter (engine code BMD) ⇒ page 125 .

Note

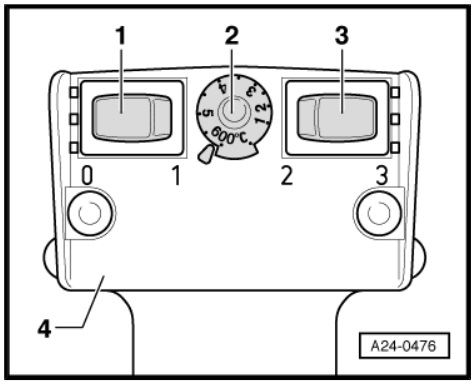
The shear-head bolt threads are coated with locking compound. Heating the shear-head bolt with a hot air blower releases the locking effect of the locking compound.

Caution

Cover brake hose and cable to brake fluid container in order to avoid damage.

Perform settings on hot air blower -4- as shown:

– Turn temperature setting potentiometer -2- to maximum heat output (600°C).
– Set two-stage switch for volume of air -3- to position 3.



WARNING

When shear-head bolts are heated up, parts of the protective housing will be subjected to a large amount of heat. Wear protective gloves to avoid possible injury.

– Place nozzle of hot air blower close to shear-head bolt.
– Switch on hot air blower and heat bolt for about 20 to 25 seconds.
– Unscrew shear-head bolt using mole grips on bolt head.

The procedure for the second shear-head bolt is identical.

– Push the clips of the protective housing in the plenum chamber together and unhook it from the plenum chamber bulkhead.
– Pull the protective housing off the engine control unit.
– Release connectors on engine control unit and pull off connector.

Installing

– Fit connectors and lock in position.
– Push the protective housing over the engine control unit.
– Install cover of protective housing using new shear-head bolts.
– Tighten shear-head bolts evenly until head shears off.
– Hook the protective housing into the plenum chamber bulkhead and push the clips into the openings.
– Install windscreen wiper arms and cover for plenum chamber: ⇒ Electrical system; Rep. gr. 92 ; Removing and installing windscreen wipe system .
– Install air filter (engine code BMD) ⇒ page 125 .
– If engine control unit - J623- is renewed, erase learnt values and adapt engine control unit ⇒ Vehicle diagnostic tester “Guided functions”.
– Read fault memory, rectify any faults and then erase fault memory ⇒ Vehicle diagnostic tester “Guided fault finding”.
– The readiness code must be generated if the fault memory has been erased.
– Carry out a road test.
– Read control unit fault memory again.

3.3 Vehicles with anti-theft secured engine control unit - J623- (model year 2007►)

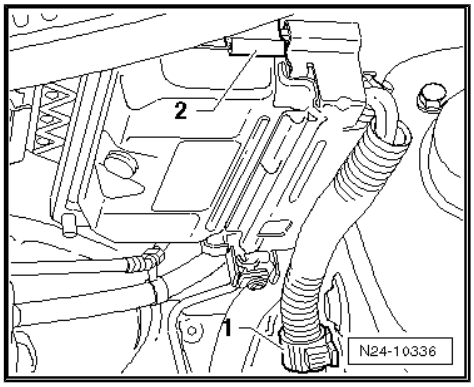
If you wish to renew the engine control unit, connect the ⇒ Vehicle diagnostic tester and carry out the guided function “Renew control unit”.

– Switch off ignition.

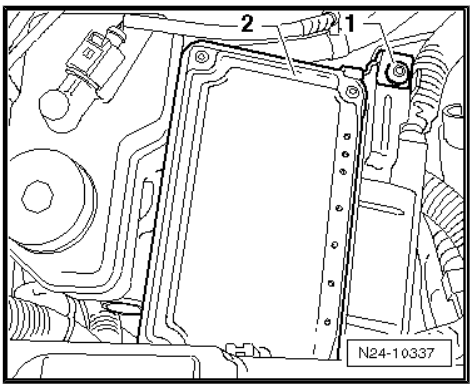
Removing

– Remove air filter (engine code BMD) ⇒ page 125 .

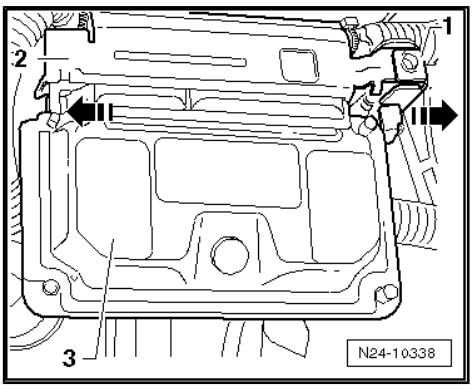
– Open wiring guide -1- and lift locking device -2-.
– Take engine control unit out of retainer.



– Unscrew shear-head bolt -1- using pliers.
– Turn engine control unit -2- over and unscrew second shear-head bolt using pliers.



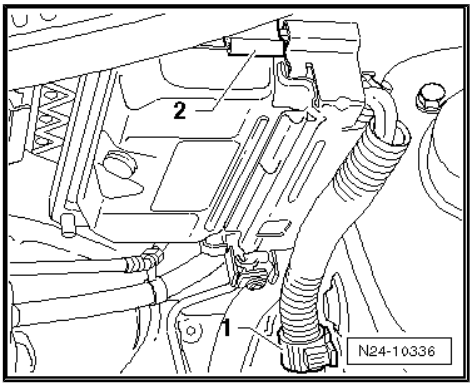
– Pull retainer -1- and protective housing -2- off engine control unit -3- in -direction of arrow-.
– Release connectors on engine control unit and pull off connector.



Installing

– Fit connectors and lock in position.
– Push the protective housing over the engine control unit.
– Install retainer for protective housing using new shear-head bolts.
– Tighten shear-head bolts evenly until head shears off.

– Insert engine control unit into control unit retainer on plenum chamber bulkhead until it engages in catches -1-.
– Insert wiring into wiring guide -1- and close guide.
– Install air filter (engine code BMD) ⇒ page 125 .
– If engine control unit - J623- is renewed, erase learnt values and adapt engine control unit ⇒ Vehicle diagnostic tester “Guided functions”.
– Read fault memory, rectify any faults and then erase fault memory ⇒ Vehicle diagnostic tester “Guided fault finding”.
– The readiness code must be generated if the fault memory has been erased.
– Carry out a road test.
– Read control unit fault memory again.



26 – Exhaust system

1 Parts of the exhaust system

Note

- *After working on the exhaust system, ensure that the system is not under stress and that there is 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.*

Assembly overview - front exhaust system with attachments ⇒ page 144 .

Assembly overview - silencers with mountings ⇒ page 145

1.1 Assembly overview - front exhaust system with attachments

1 - Warm air collector plate
- ❑ Install without preload.

2 - 10 Nm

3 - Exhaust manifold

4 - Lambda probe - G39- , 50 Nm
- ❑ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” must not get into the slots on the probe body.
- ❑ Remove and install with Lambda probe open ring spanner set - 3337- .
- ❑ If seal is leaking, nip open and renew.

5 - Gasket
- ❑ Renew.

6 - Heat shield

7 - Heat shield
- ❑ For alternator

8 - 20 Nm

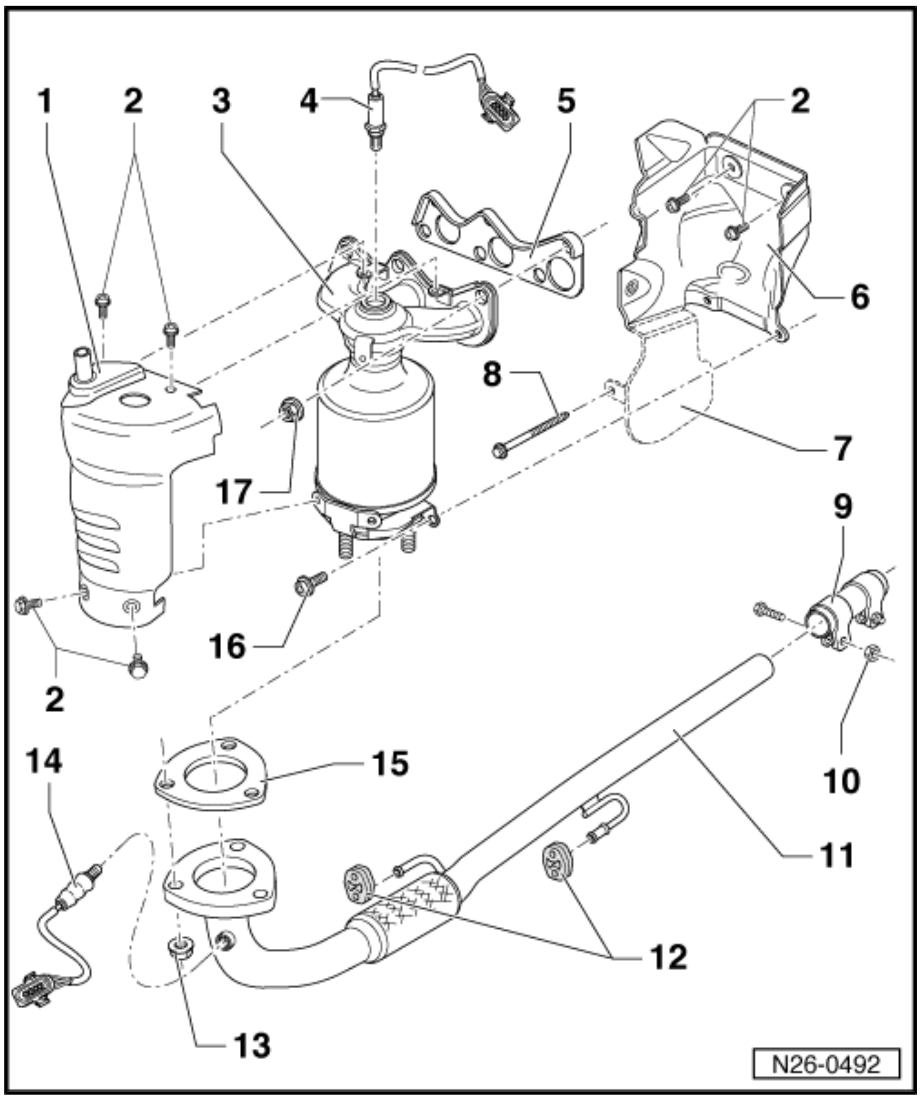
9 - Double clamp

10 - 25 Nm

11 - Front exhaust pipe

12 - Rubber mounting
- ❑ Renew if damaged.

13 - 40 Nm
- ❑ Renew.



14 - Lambda probe after catalytic converter - G130- , 50 Nm

- ❑ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” must not get into the slots on the probe body.
- ❑ With Lambda probe open ring spanner set - 3337-
- ❑ If seal is leaking, nip open and renew.

15 - Gasket

- ❑ Renew.

16 - 10 Nm

17 - Lock nut, 25 Nm

- ❑ Renew.

1.2 Assembly overview - silencers with mountings

1 - 25 Nm

2 - Mounting

- ❑ For front silencer
- ❑ Note installation position.

3 - Mounting

- ❑ For rear silencer
- ❑ Note installation position.

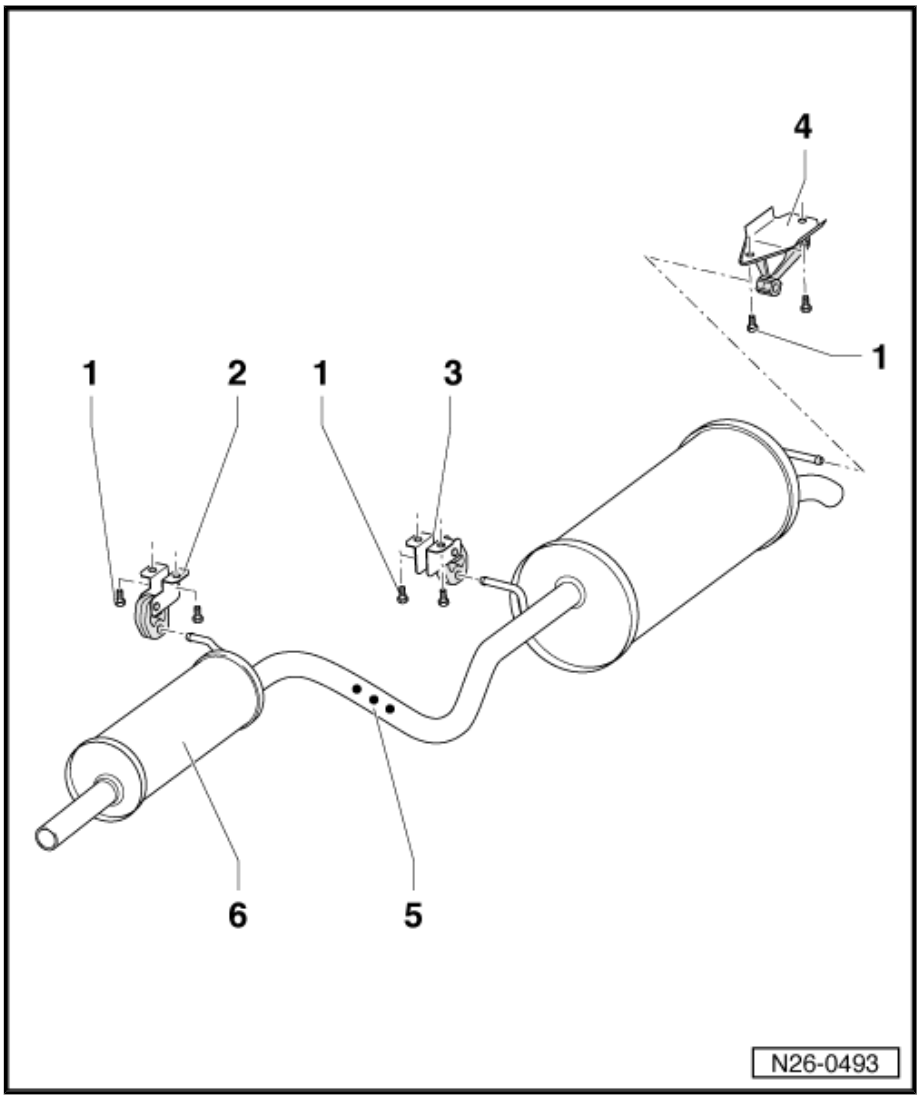
4 - Mounting

- ❑ For rear silencer
- ❑ Note installation position.

5 - Separating point

- ❑ Marked by impressions on connecting pipe.
- ❑ During production, front and rear silencers are installed as a single component. In case of repair, the front and rear silencers are supplied individually along with a double clamp.
- ❑ Cut through connecting pipe at right angles at separating point using pneumatic sabre saw - V.A.G 1523A- ⇒ page 146

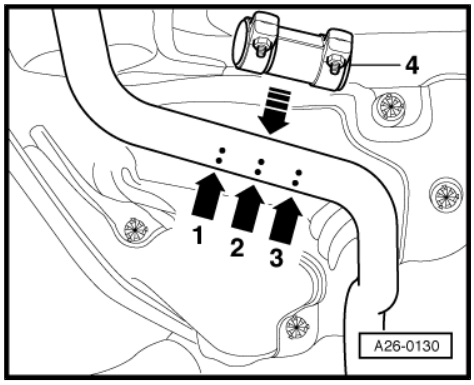
6 - Front silencer



Separating point on exhaust pipe

WARNING

To avoid injury from metal shavings, wear eye protection and protective clothing.



– Separate exhaust pipe at right angles at separating point -arrow 2-.
– Position repair double clamp -4- between side markings -arrows 1 and 3- when installing. Specified torque: 25 Nm.

2 Exhaust gas recirculation system

The exhaust gas recirculation system was only fitted on engines with engine codes AZQ, BME.

From 11/2005 on, the exhaust gas recirculation system was not fitted to engines with engine code BME anymore.

Note

- *The function and control of the exhaust gas recirculation system is checked by the engine control unit - J623- self-diagnosis.*
- *The exhaust gas recirculation valve - N18- with its cone shaped plunger ensures that various cross sectional openings are possible at different plunger lifts.*
- *Pulsed control enables every conceivable valve position.*

Assembly overview ⇒ page 147 .

2.1 Assembly overview

1 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

- ❑ If renewed, adapt engine control unit - J623- to exhaust gas recirculation valve - N18- ⇒ Vehicle diagnostic tester “Guided functions”.

2 - Gasket

- ❑ Renew.

3 - Adapter

4 - 20 Nm

5 - 10 Nm

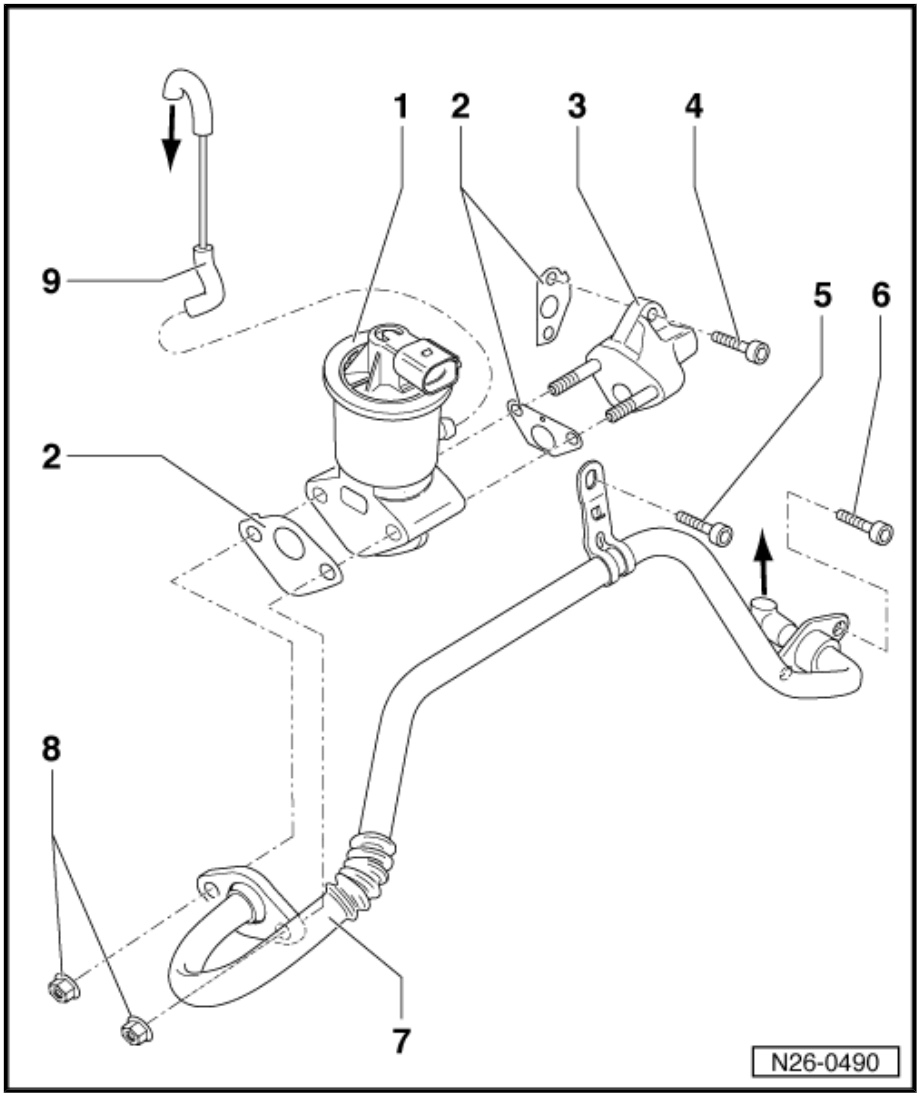
6 - 10 Nm

7 - Connecting pipe

8 - 20 Nm

9 - Vacuum hose

- ❑ To air filter.



28 – Ignition system

1 Ignition system

General notes on ignition system

- For trouble-free operation of electrical components, a voltage of at least 11.5 V is necessary.
- Certain tests may lead to a fault being detected by the control unit and stored. Therefore after completing all checks and repairs the fault memory must be read and if necessary cleared.

Assembly overview - parts of ignition system ⇒ page 148

Removing and installing ignition coils with output stage ⇒ page 149 .

Safety precautions ⇒ page 150 .

Spark plug test data ⇒ page 151 .

1.1 Assembly overview - parts of ignition system

1 - Ignition coil 1 with output stage - N70-

- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Remove and install with puller - T10094 A- ⇒ page 149 .

2 - Connector

- ❑ Black, 4-pin.

3 - Connector

- ❑ Black, 2-pin.
- ❑ For knock sensor 1 - G61- .
- ❑ Connector contacts are gold-plated.

4 - 20 Nm

- ❑ The specified torque influences the function of the knock sensor.

5 - Knock sensor 1 - G61-

- ❑ Connector contacts are gold-plated.

6 - 10 Nm

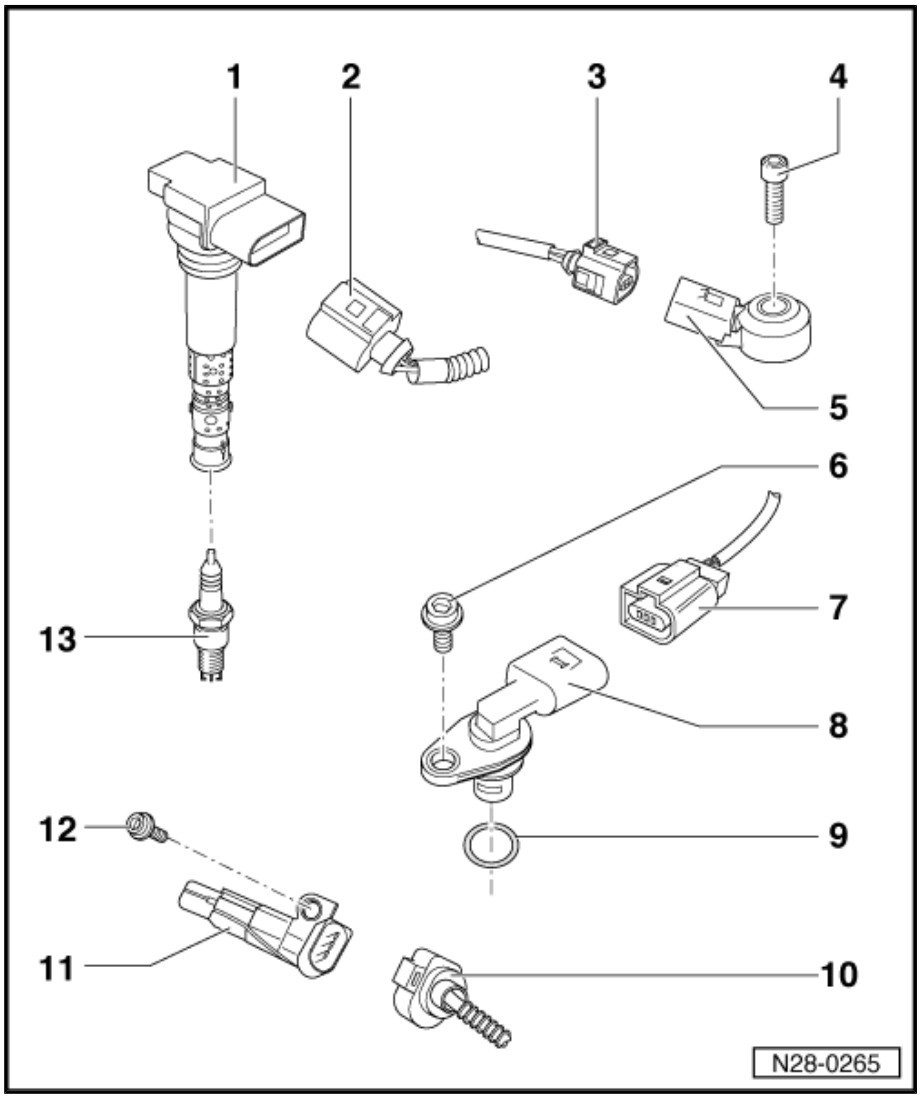
7 - Connector

- ❑ Black, 3-pin.
- ❑ For Hall sender - G40- .

8 - Hall sender - G40-

9 - O-ring

- ❑ Renew if damaged.



10 - Connector

- ❑ Black, 3-pin.
- ❑ For engine speed sender - G28- .

11 - Engine speed sender - G28-

12 - 8 Nm

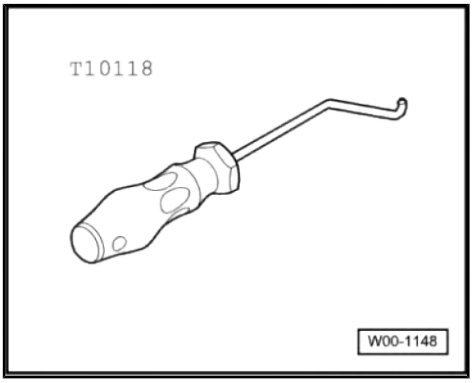
13 - Spark plug, 25 Nm

- ❑ Remove and install with spark plug socket and extension - 3122 B- .
- ❑ Type and electrode gap ⇒ page 151 .

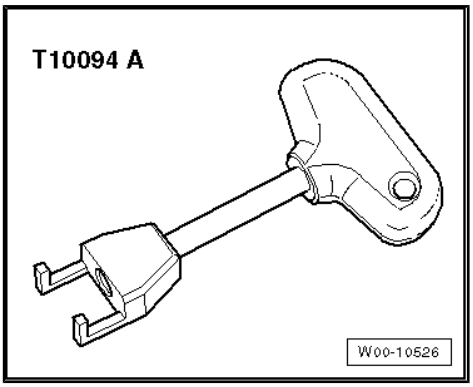
1.2 Removing and installing ignition coils with output stage

Special tools and workshop equipment required

- ♦ Assembly tool - T10118-



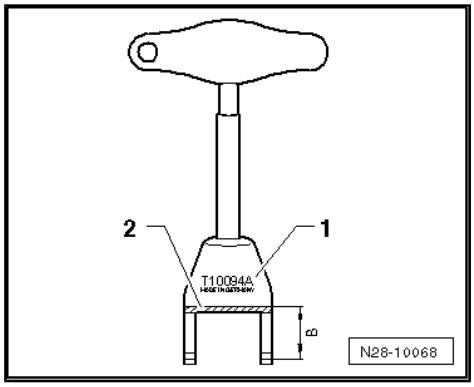
- ♦ Puller - T10094 A-



Note

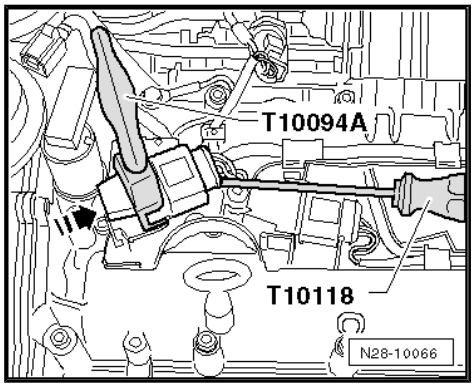
The housings for ignition coils with output stages have been modified. As a result, these ignition coils can only be installed or removed using puller - T10094 A- . The previous puller - T10094- can continue to be used if modified as described below.

– Remove marked area -2- using suitable workshop equipment to attain the new nominal dimension -B- of 18 mm.
– Additionally identify the tool designation with the letter A -1-.



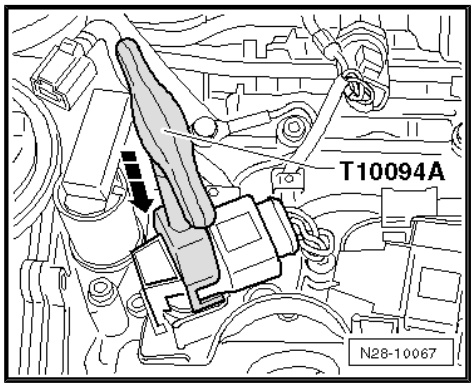
Removing

– Fit puller - T10094 A- on ignition coil with final output stage -arrow-.
– Pull ignition coil with final output stage out slightly.
– Fit assembly tool - T10118- as shown.
– Carefully release connector locking mechanism and pull off connector.



Installing

– Fit puller - T10094 A- on ignition coil with final output stage.
– Push connector onto ignition coil with final output stage until it audibly engages.
– Press ignition coil with output stage into cylinder head in direction of -arrow-.



1.3 Safety precautions

To prevent injuries to persons and/or damage to the injection and ignition system, the following must be observed:

- Do not touch or disconnect ignition cables when the engine is running or being turned at starter speed.
- Switch off ignition before connecting or disconnecting injection and ignition system wiring as well as test instrument cables.

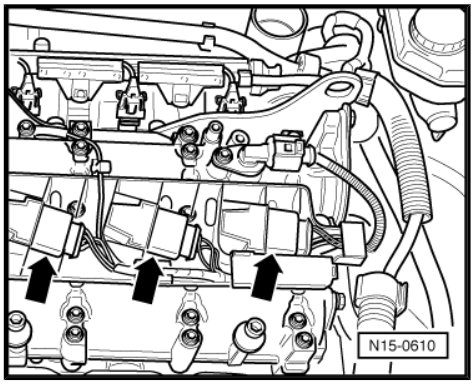
Note the following if testers and measuring instruments have to be used during a road test:

- Test and measuring instruments must always be secured to rear seat and operated by a second person from this location.

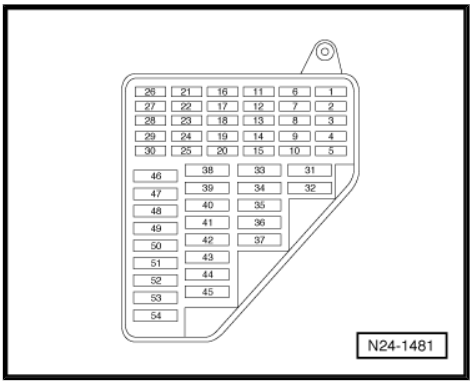
If test and measuring instruments are operated from front passenger seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

- If the engine is to be turned at starter speed without starting:

– Pull all 4-pin connectors -arrows- off ignition coils.



– Remove fuse for injection valves from fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



1.4 Test data, spark plugs

Engine codes	AWY, BMD, BBM	AZQ, BME, BZG
Firing order	1-2-3	1-2-3
Spark plugs		
VW part number	101 905 601 B	101 905 601 B
Electrode gap	0.8 …0.9 mm	0.8 …0.9 mm
Specified torque	25 Nm	25 Nm
Change interval	⇒ Maintenance ; Booklet ; Time or distance dependent additional work	
VW part number	101 905 617	---
Electrode gap	0.9 …1.1 mm	---
Specified torques	25 Nm	---
Change interval	⇒ Maintenance ; Booklet ; Time or distance dependent additional work	