



Workshop Manual Caddy 2004 ➤

4-cylinder diesel engine (1.9 l engine)

Engine ID	BJB	BLS	BSU						
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Edition 09.2014



Service

List of Workshop Manual Repair Groups

Repair Group

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

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

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00 – Technical data

1 Identification

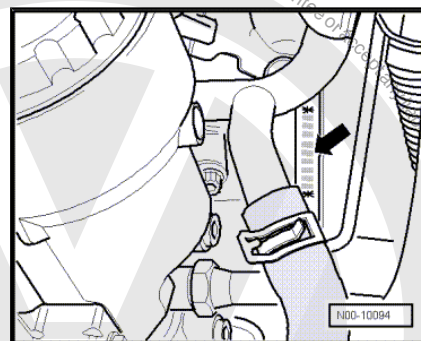
(VRL007032; Edition 09.2014)

⇒ **"1.1 Engine number, engine data", page 1**

1.1 Engine number, engine data

The engine number ("code letters" and "serial number") can be found at the joint between engine and gearbox.

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



Engine code	BJB	BLS	BSU
Manufactured	10.03 ▶	05.05 ▶	09.05 ▶
Emissions fulfil	EU3 standard	EU4 standard	EU4 standard
Capacity l	1.9	1.9	1.9
Output kW at rpm	77/ 4000	77/ 4000	55/ 4000
Torque Nm at rpm	250/ 1900	250/ 1900	210/ 1900
Bore Diameter, mm	79.5	79.5	79.5
Stroke mm	95.5	95.5	95.5
Valves per cylinder	2	2	2
Compression ratio	19.0	19.0	19.0
Fuel to	DIN EN 590	DIN EN 590	DIN EN 590
Firing order	1-3-4-2	1-3-4-2	1-3-4-2
Catalytic converter	yes	yes	yes
Exhaust gas recirculation	yes	yes	yes
Turbocharging/supercharging	yes	yes	yes
Charge air cooling	yes	yes	yes
Particulate filter	no	optional ¹⁾	optional ¹⁾

1) depending on vehicle equipment

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



2 Safety instructions

⇒ "2.1 Safety precautions when working on cooling system", page 2

⇒ "2.2 Safety precautions when working on fuel supply system", page 3

⇒ "2.3 Safety precautions when working on charge air system", page 4

⇒ "2.4 Safety precautions when working on injection system", page 4

⇒ "2.5 Safety precautions during road tests in which testing and measuring equipment is used", page 5

2.1 Safety precautions when working on cooling system



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.



Caution

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

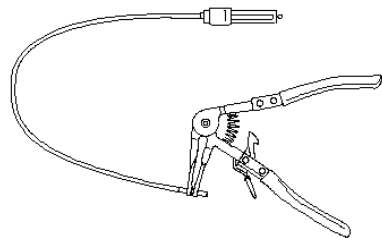
- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant and refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*



Note

- ◆ *Only demineralised / distilled water to standard VDE-0510 may be used for mixing. Tap water does not have the required quality to ensure the coolant's function.*
- ◆ *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.*
- ◆ *Spring-type clip pliers - VAS 6340- or spring-type clip pliers - VAS 5024A- are recommended for installation of 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).*
- ◆ *The arrows on the coolant pipes and on the ends of the hoses must be aligned with each other.*

VAS 6340



W00-10380



2.2 Safety precautions when working on fuel supply system



Note

- ◆ *Hose connections are secured with either spring-type or clamp-type clips.*
- ◆ *Always renew clamp-type clips with spring-type clips.*
- ◆ *Spring-type clip pliers - VAS 5024A- or hose clip pliers - V.A.G 1921- are recommended for installation of spring-type clips.*



WARNING

- ◆ *The fuel and the fuel lines in the fuel system can become very hot (danger of scalding)!*
- ◆ *The fuel system is also under pressure! Before opening the system, place cloths around the connections. Then carefully loosen connection to release the pressure!*
- ◆ *Wear eye and hand protection when performing any type of repair work on the fuel 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.*
- ◆ *Ensure that there is 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 m³/h can be used providing that motor is not in air flow.
- ◆ Prevent skin contact with fuel! Wear fuel-resistant gloves!



2.3 Safety precautions when working on charge air 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.***
- ◆ ***Ensure that there is sufficient clearance to all moving or hot components.***

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.



2.4 Safety precautions when working on injection 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.***
- ◆ ***Ensure that there is sufficient clearance to all moving or hot components.***

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.

To prevent injuries to persons and/or destruction of the injection and glow plug system, the following must be noted:

- ◆ The ignition must be switched off before connecting or disconnecting injection or glow plug system wiring or tester cables.
- ◆ If the engine is to be turned at starter speed, without starting, e.g. when checking compressions, disconnect unit injector connector on cylinder head.



- ◆ Before disconnecting battery, obtain radio code for radios with anti-theft coding.
- ◆ Disconnecting and connecting the battery must only be done with the ignition switched off, as otherwise the control unit for diesel direction injection system could become damaged.

2.5 Safety precautions during road tests in which testing and measuring equipment is used

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 the rear seat and operated by a second person from this location.
- ◆ Operating from the front passenger seat may result in an accident caused by releasing the front passenger air bag which can cause injuries to the person sitting there.



3 Repair instructions

⇒ ["3.1 Rules for cleanliness when working on fuel supply system/injection system", page 6](#)

⇒ ["3.2 Rules for cleanliness when working on charge air system", page 6](#)

⇒ ["3.3 General notes on the lubrication system", page 7](#)

3.1 Rules for cleanliness when working on fuel supply system/injection system

When working on the fuel supply and injection system, pay careful attention to the following "6 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.
- ◆ Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

3.2 Rules for cleanliness when working on charge air system

When working on the turbocharger, pay careful attention to the following 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.).
- ◆ Existing transport and protective packaging and sealing caps must only be removed immediately prior to installation.
- ◆ When making repairs, remove oil from connection and hose ends.
- ◆ When system is open: do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.



3.3 General notes on the lubrication system



Note

The oil level must not be above the max. mark - risk of damage to catalytic converter!



Caution

Finding metal shavings or a large quantity of small metal particles during engine repair could indicate that the crankshaft bearings or conrod bearings are damaged. To prevent this from causing further damage, perform the following repairs:

- ◆ *Thoroughly clean oil passages,*
- ◆ *Renew oil spray jets,*
- ◆ *Renew engine oil cooler,*
- ◆ *Renew oil filter element.*





10 – Removing and installing engine

1 Removing and installing engine

⇒ "1.1 Removing engine", page 8

⇒ "1.2 Removing engine - vehicles with four-wheel drive",
page 14

⇒ "1.3 Securing engine on engine and gearbox support VAS 6095",
page 21

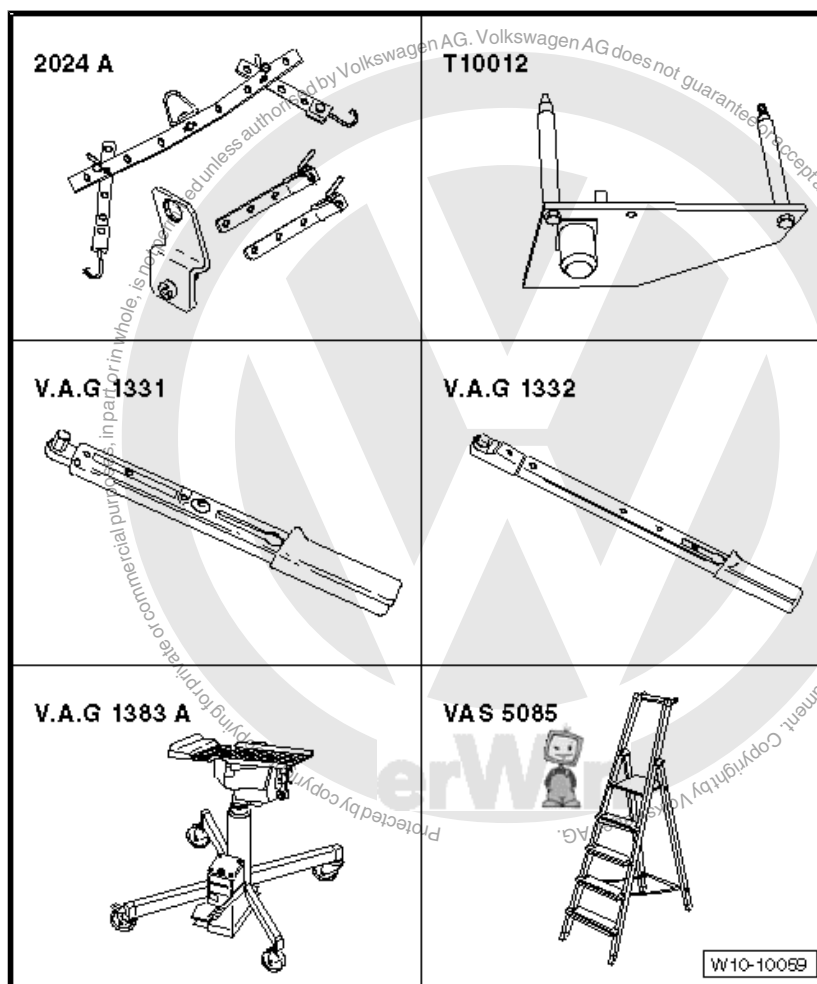
⇒ "1.4 Installing engine", page 22

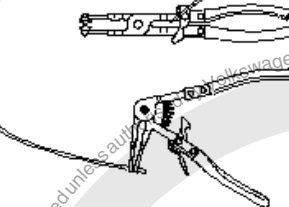
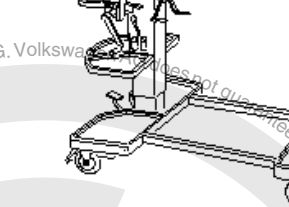
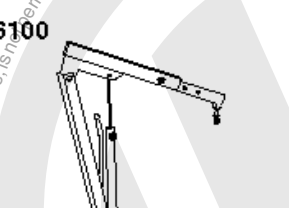
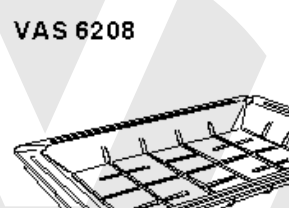
⇒ "1.5 Installing engine - vehicles with four-wheel drive",
page 23

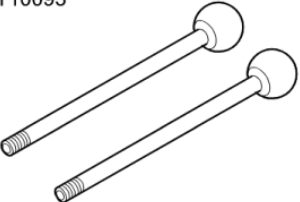
1.1 Removing engine

Special tools and workshop equipment required

- ◆ Lifting tackle - 2024 A-
- ◆ Engine bracket - T10012-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Stepladder - VAS 5085-

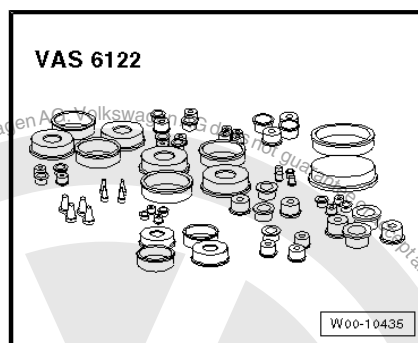


- | | |
|--|--|
| <p>VAS 5024 A</p>  | <p>VAS 6095</p>  |
| <p>VAS 6100</p>  | <p>VAS 6208</p>  |

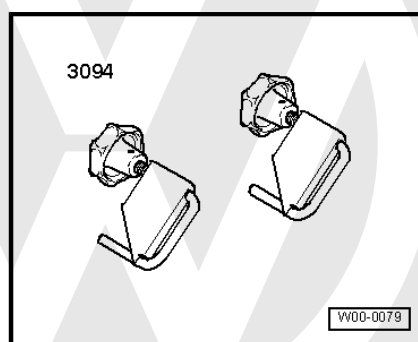
- T10093
- 
- W00-1117



- ◆ Engine bung set - VAS 6122-



- ◆ Hose clamps up to 25 mm - 3094-



Not illustrated:

- ◆ Container for removed parts - V.A.G 1698-
- ◆ Grease for clutch plate splines ⇒ Electronic Parts Catalogue (ETKA)
- ◆ Cable ties ⇒ Electronic Parts Catalogue (ETKA)



Note

- ◆ *Before carrying out further work, disconnect battery earth strap. Check whether a coded radio is fitted. Obtain anti-theft coding first if necessary.*
- ◆ *The engine is removed downwards together with the gearbox.*
- ◆ *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.*
- ◆ *To prevent damage to removed components, place them in the container for removed parts - V.A.G 1698-.*
- ◆ *Some of this vehicle's components cannot be removed, or can only be removed with difficulty, with the engine installed. Therefore, you should determine all defective components before removing engine and renew them while engine is removed.*

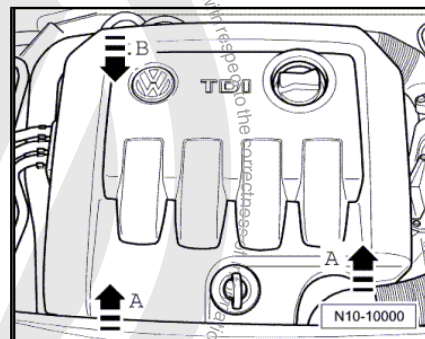
**Caution**

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

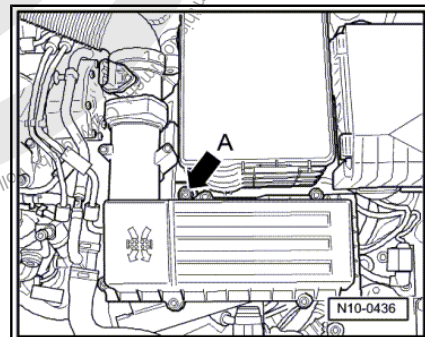
- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant and refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*

Procedure

- With ignition switched off, disconnect earth strap from battery.
- If fitted, remove engine cover panel. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.



- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.
- Remove air filter housing with air mass meter and connecting pipe.
- Remove battery and battery carrier.
- Remove plenum chamber bulkhead → General body repairs exterior; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead .



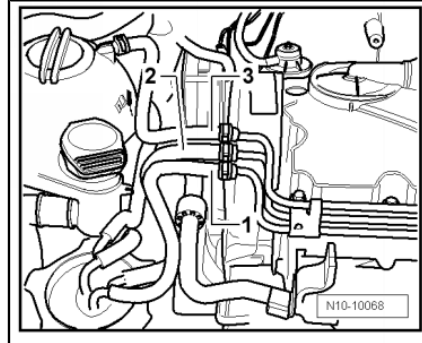


- Pull off fuel supply hose -2-, fuel return hose -1- and coolant hose -3-.



WARNING

- ◆ *In extreme cases, the fuel lines and the fuel can reach a temperature of 100 °C on vehicles with unit injector engine. Allow the fuel to cool down before disconnecting the lines - danger of scalding.*
- ◆ *Wear protective gloves.*
- ◆ *Wear eye protection.*



- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Move lock carrier to service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Lock carrier - service position .
- Drain coolant ⇒ [page 121](#)
- Remove poly V-belt ⇒ [page 30](#) .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

Vehicles with power-assisted steering

- Remove pulley from vane pump.
- Unscrew power-assisted steering vane pump from bracket and place to side. Do not disconnect hoses.

Vehicles with air conditioner



Note

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

To facilitate removing and installing engine without opening refrigerant circuit:

- Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Secure air conditioner compressor to lock carrier so that refrigerant lines are free of stress.

Vehicles with particulate filter

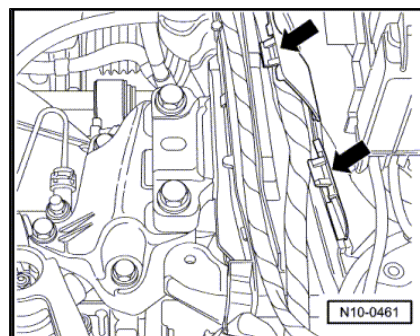
- Remove front exhaust pipe with particulate filter ⇒ [page 199](#) .

Continuation for all vehicles

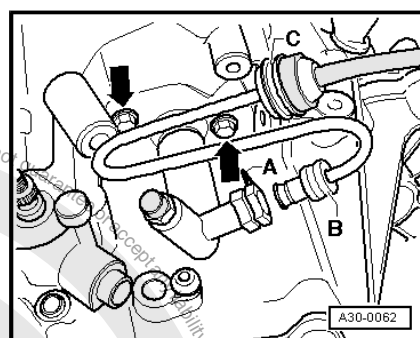
- Remove connecting pipes between charge air cooler and engine.
- Unbolt left and right drive shafts from gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Remove front exhaust pipe ⇒ [page 195](#) .
- Release and disconnect connector from engine control unit ⇒ [page 185](#) .



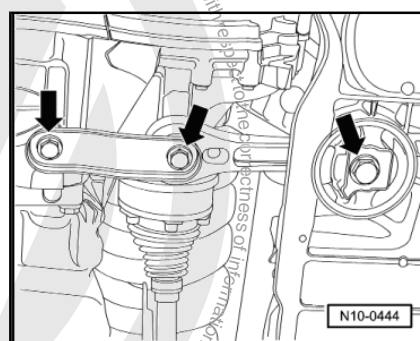
- Open all cable guide fasteners -arrows-.
- Remove engine wiring harness from cable duct on longitudinal member and place it on engine.
- Pull off or disconnect all other electrical connections as necessary from engine and gearbox and move to one side.
- Disconnect all connection, coolant, vacuum and intake hoses from engine.



- Unclip line -B- from slave cylinder of hydraulic clutch at connection (pull clip -A-).
- Pull out line-B- from the retainer-C-.
- Unbolt selector mechanism from gearbox ⇒ Manual gearbox: Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .



- Remove pendulum support -arrows-.



- Insert engine bracket - T10012- in engine and gearbox jack - V.A.G 1383 A- .

**Note**

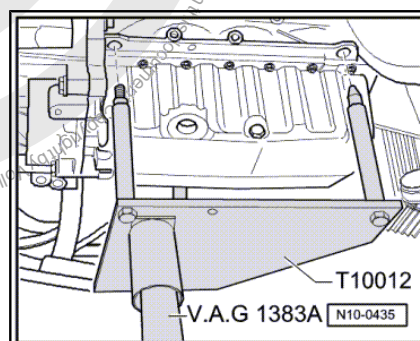
Support pins must be secured to engine bracket - T10012- as shown.

- Bolt engine bracket - T10012- to cylinder block with bolt M10 x 25 x 8.8.

Specified torque

Component	Specified torque
Engine bracket - T10012- to cylinder block	40 Nm

- Lift engine and gearbox slightly using engine and gearbox jack - V.A.G 1383 A- .



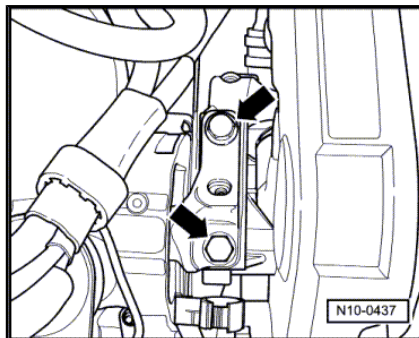


- Unbolt engine side of assembly mounting from engine bracket from above -arrows-.



Note

To remove securing bolts, use stepladder - VAS 5085- .

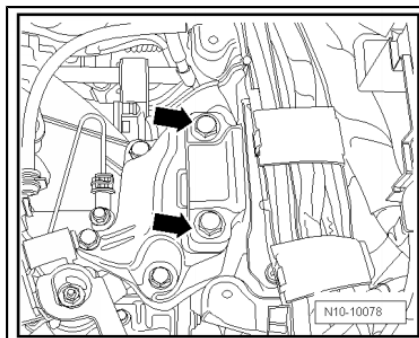


- Unbolt gearbox side of assembly mounting from gearbox bracket from above -arrows-.
- Carefully lower engine with gearbox.

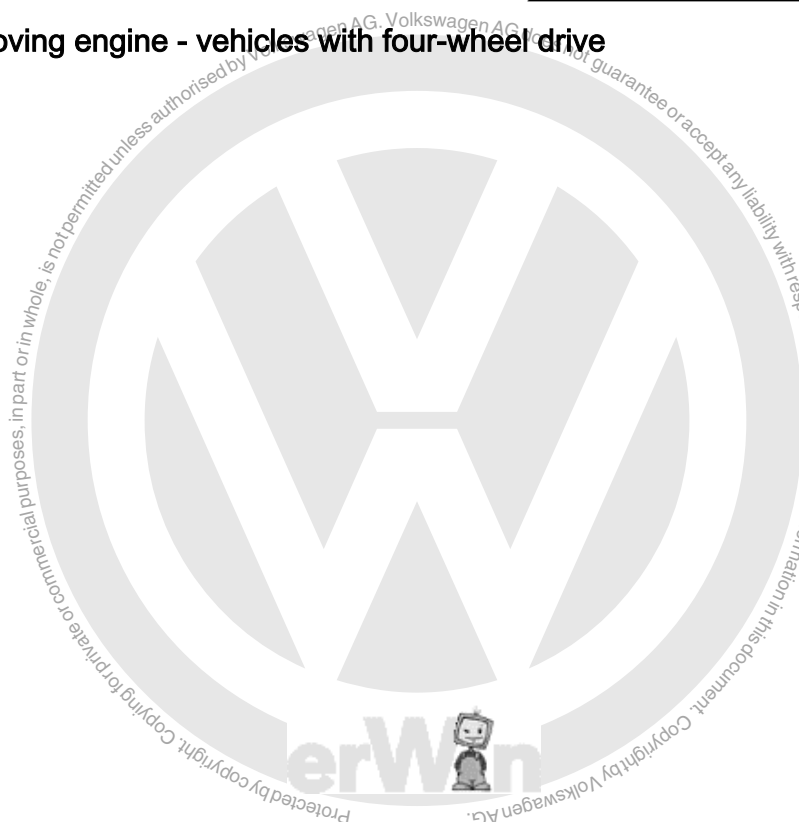


Note

Engine with gearbox must be guided carefully when lowering to prevent damage to bodywork.



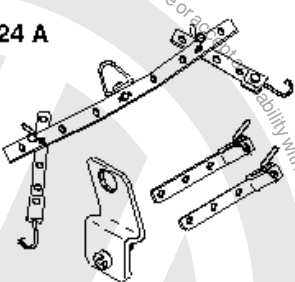
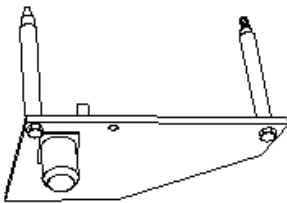
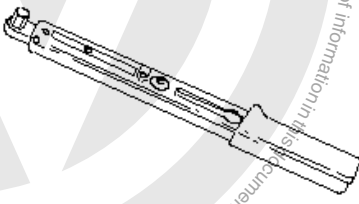
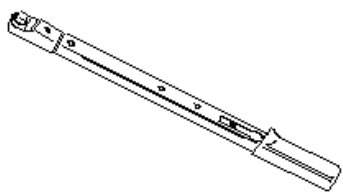
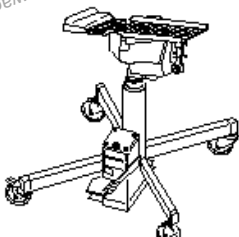
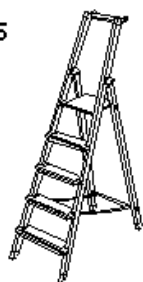
1.2 Removing engine - vehicles with four-wheel drive





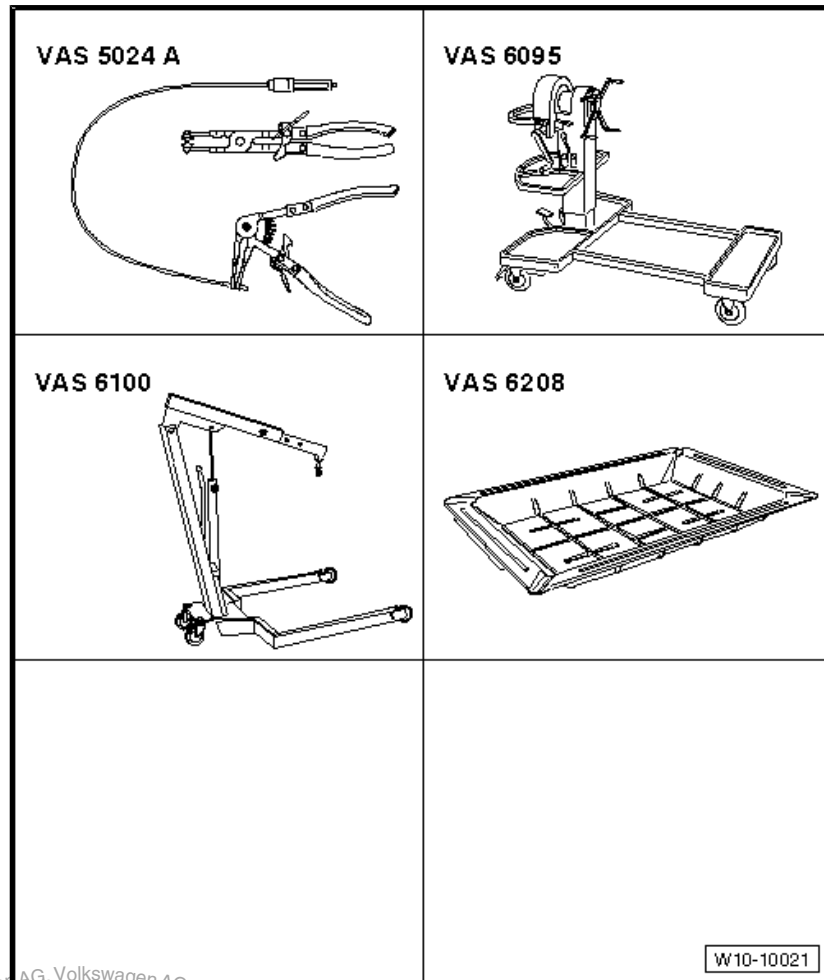
Special tools and workshop equipment required

- ◆ Lifting tackle - 2024 A-
- ◆ Engine bracket - T10012-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Stepladder - VAS 5085-

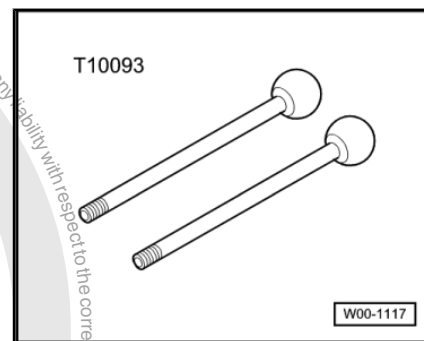
2024 A 	T10012 
V.A.G 1331 	V.A.G 1332 
V.A.G 1383 A 	VAS 5085  W10-10059



- ◆ Spring-type clip pliers - VAS 5024 A-
- ◆ Engine and gearbox support - VAS 6095- with engine bracket - 3269-
- ◆ Workshop hoist - VAS 6100-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-

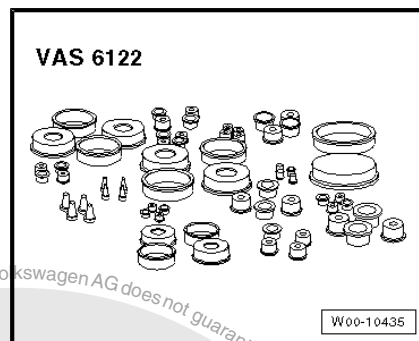


- ◆ Guide rods - T10093-

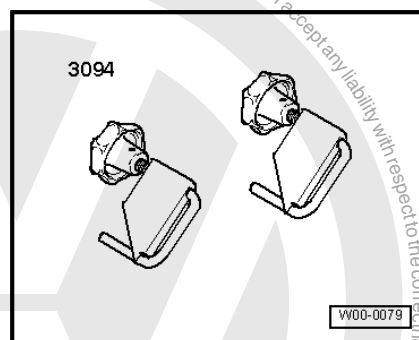




- ◆ Engine bung set - VAS 6122-



- ◆ Hose clamps up to 25 mm - 3094-



Not illustrated:

- ◆ Container for removed parts - V.A.G 1698-
- ◆ Grease for clutch plate splines ⇒ Electronic Parts Catalogue (ETKA)
- ◆ Cable ties ⇒ Electronic Parts Catalogue (ETKA)



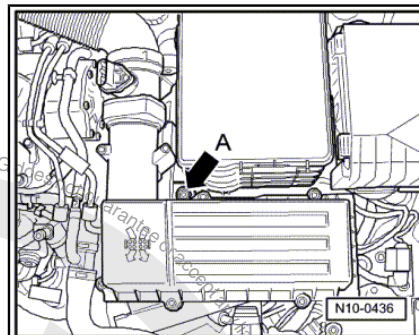
Note

- ◆ *Before carrying out further work, disconnect battery earth strap. Check whether a coded radio is fitted. Obtain anti-theft coding first if necessary.*
- ◆ *The engine is removed downwards together with the gearbox.*
- ◆ *Leave ignition key in ignition lock to prevent steering lock from engaging.*
- ◆ *It is advisable to remove the front wheels before beginning engine removal. The vehicle can then be lowered on hoist until the brake disc splash plates are just above the floor. This provides the most ergonomic working position regarding accessibility of engine compartment components.*
- ◆ *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.*
- ◆ *To prevent damage to removed components, place them in the container for removed parts - V.A.G 1698-.*
- ◆ *Some components cannot be removed, or removed only with difficulty, with the engine installed. Therefore, you should determine all defective components before removing engine and renew them while engine is removed.*

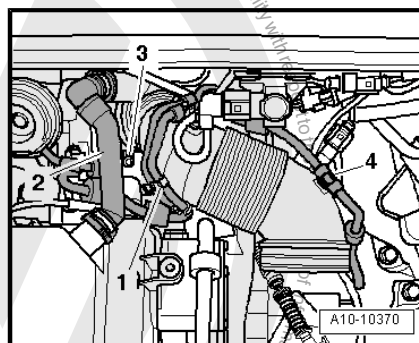


Procedure

- Before removing, read event memories of all control units
⇒ Vehicle diagnostic tester.
- Disconnect earth strap at battery with ignition switched off ⇒
Electrical system; Rep. gr. 27 ; Disconnecting and reconnect-
ing battery .
- Remove bolt -arrow A- and pull air filter housing upwards out
of mounting.
- Remove air filter housing together with air mass meter.



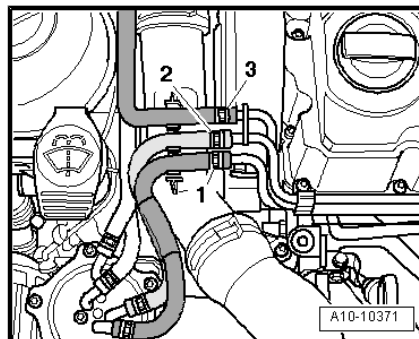
- Pull hose -2- off crankcase breather.
- Lay aside breather hose -4- and vacuum hoses -1- at air duct
hose.
- Remove bolt -3-.
- Swing air duct hose to rear and disconnect it from turbocharg-
er.
- Remove battery and battery carrier.
- Remove plenum chamber bulkhead ⇒ General body repairs,
exterior; Rep. gr. 50; Plenum chamber bulkhead .



WARNING

- ◆ *In extreme cases, the fuel lines and the fuel can reach a
temperature of 100 °C on vehicles with unit injector en-
gine. Allow the fuel to cool down before disconnecting the
lines - danger of scalding.*
- ◆ *Wear protective gloves.*
- ◆ *Wear eye protection.*

- Disconnect fuel supply hose -2- and fuel return hose -1- from
fuel lines.
- Disconnect coolant hose -3- from coolant line.





- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connection. To do this, raise retaining clips -arrows- slightly.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Move lock carrier to service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Lock carrier - service position .
- Drain coolant ⇒ [page 121](#) .
- Remove poly V-belt ⇒ [page 30](#) .
- Remove pulley from vane pump.
- Unscrew power-assisted steering vane pump from bracket and place to side. Do not disconnect hoses.

Vehicles with air conditioner



Note

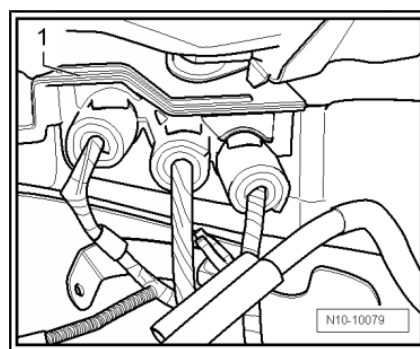
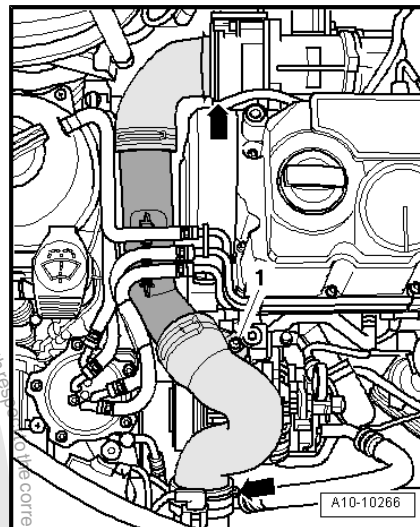
To prevent damage to condenser or to refrigerant lines and hoses, ensure that lines and hoses are not stretched, kinked or bent.

To facilitate removing and installing engine without opening refrigerant circuit:

- Unbolt air conditioner compressor from ancillary bracket ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Secure air conditioner compressor to lock carrier so that the refrigerant lines and hoses are not under tension.

Continuation for all vehicles

- Remove engine control unit ⇒ [page 185](#) .
- Release connector from engine control unit and pull off.
- Remove feed-through -1- for engine wiring harness.





- Open all cable guide fasteners -arrows-.
- Remove engine wiring harness from cable duct on longitudinal member and place it on engine.
- Pull off or disconnect all other electrical connections as necessary from engine and gearbox and move to one side.
- Disconnect all connection, coolant, vacuum and intake hoses from engine.
- Remove selector mechanism from gearbox ⇒ 6-speed manual gearbox 02Q; Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .
- Clamp off hose of pipe/hose assembly -A- to slave cylinder using hose clamps, up to 25 mm in diameter - 3094- .
- Release securing clip -arrow- using screwdriver and pull pipe/hose assembly off slave cylinder bleeder.



Caution

Do not depress clutch pedal.

- Remove front exhaust pipe with particulate filter
⇒ [page 202](#) .
- Unbolt left drive shaft from gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Insert engine bracket - T10012- in engine and gearbox jack - V.A.G 1383 A- .



Note

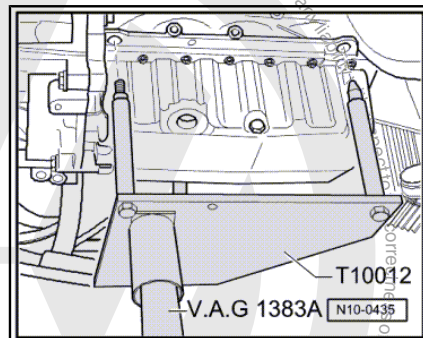
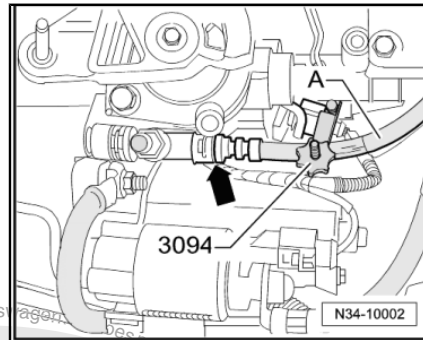
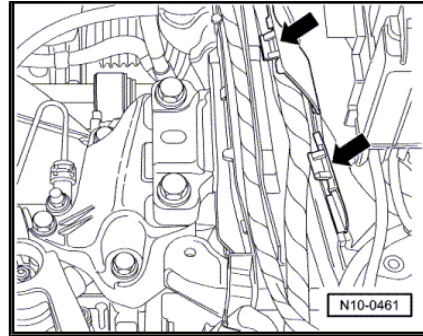
Support pins must be secured to engine bracket - T10012- as shown. The threaded support pin must be on the gearbox side.

- Bolt engine bracket - T10012- to cylinder block with bolt M10 x 25/8.8.

Specified torque

Component	Specified torque
Engine bracket - T10012- to cylinder block	40 Nm

- Lift engine and gearbox slightly using engine and gearbox jack - V.A.G 1383 A- .



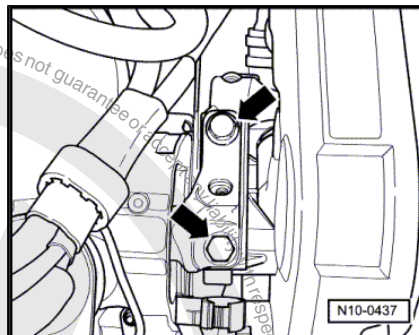


- Unbolt engine side of assembly mounting from engine bracket from above -arrows-.



Note

To remove securing bolts use a stepladder - VAS 5085- .

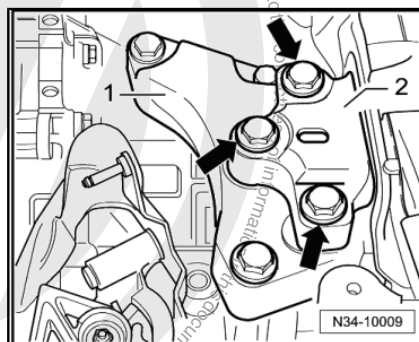


- Unscrew hexagon bolt -arrows- on left assembly mounting -2- from bracket -1-.
- Carefully lower engine with gearbox.



Caution

Engine with gearbox must be guided carefully when lowering to prevent damage to bodywork.



1.3 Securing engine on engine and gearbox support - VAS 6095-

Procedure

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

- Unbolt gearbox.
- Attach lifting tackle - 2024 A- as follows and lift engine from engine and gearbox jack - V.A.G 1202 A- using workshop hoist - V.A.G 1383 A- .

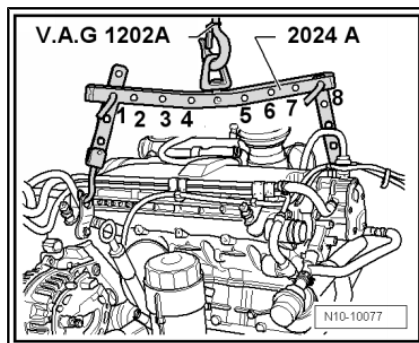
Belt pulley end: 3rd hole in hook rail at position 1

Flywheel end: 4th hole in hook rail at position 8



WARNING

Use locking pins at hooks and locating pins.



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.
- Secure engine on engine and gearbox support - VAS 6095- .



1.4 Installing engine



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.***
- ◆ ***Ensure that there is sufficient clearance to all moving or hot components.***

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

- Check clutch release bearing for wear and renew if necessary.
- Clean splines of input shaft and lightly grease them with grease for clutch plate splines ⇒ Electronic Parts Catalogue (ETKA) .
- Check whether dowel sleeves for centring engine/gearbox have been fitted in cylinder block, insert if necessary.
- Rock engine to align engine mountings stress-free. If necessary, also loosen engine mountings on body.
- Install pendulum support.
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Install front exhaust pipe ⇒ [page 195](#) .

Vehicles with particulate filter

- Install front exhaust pipe with particulate filter ⇒ [page 199](#) .

Vehicles with air conditioner

- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .

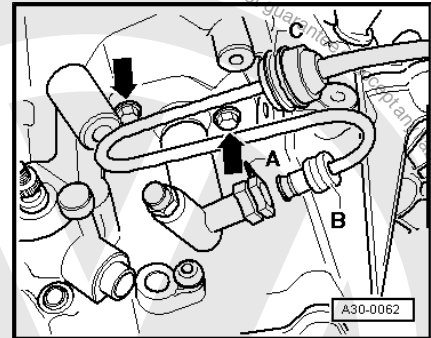
Vehicles with power-assisted steering

- Install vane pump for power-assisted steering ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power-assisted steering; Removing and installing vane pump .



Continuation for all vehicles

- Connect line -B- with plug-in connection to the slave cylinder of the hydraulic clutch by engaging retaining clip -A- securely.
- Bleed clutch control mechanism ⇒ Rep. gr. 30 ; Clutch control mechanism, Bleeding clutch control mechanism .
- Bolt selector mechanism to gearbox ⇒ Manual gearbox; Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .
- Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Install poly V-belt ⇒ [page 30](#) .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Install engine control unit ⇒ [page 185](#) .
- Install plenum chamber bulkhead ⇒ General body repairs; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead .
- Replenish coolant ⇒ [page 121](#) .
- Carry out road test and read event memory afterwards ⇒ Vehicle diagnostic tester.



Specified torques

- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 26](#)
- ◆ ⇒ ["1.2 Assembly overview - poly V-belt drive with vane pump", page 29](#)
- ◆ ⇒ ["2.1 Assembly overview - emission control with catalytic converter", page 195](#)
- ◆ ⇒ ["2.2 Assembly overview - emission control with diesel particulate filter, engine codes BLS, BSU", page 197](#)
- ◆ Drive shafts; Assembly overview - drive shafts ⇒ Rep. gr. 40 ; Assembly overview - drive shaft .
- ◆ Hydraulic power-assisted steering; Assembly overview - vane pump ⇒ Rep. gr. 48 ; Assembly overview - vane pump .
- ◆ Alternator; Assembly overview - alternator ⇒ Rep. gr. 27 ; Assembly overview - alternator .
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ Rep. gr. 50 ; Assembly overview - noise insulation

1.5 Installing engine - vehicles with four-wheel drive



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.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*



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

- Check clutch release bearing for wear and renew if necessary.
- Clean splines of input shaft and lightly grease them with grease for clutch plate splines ⇒ Electronic Parts Catalogue (ETKA) .
- Check whether dowel sleeves for centring engine/gearbox are fitted in cylinder block and install if necessary.
- Rock engine to align engine mountings stress-free. If necessary, also loosen engine mountings on body.
- Bolt left drive shaft to gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Install front exhaust pipe with particulate filter ⇒ [page 202](#) .

Vehicles with air conditioner

- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .

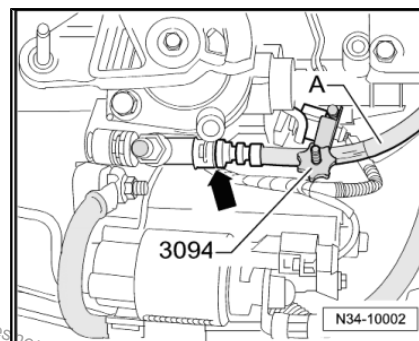
Continuation for all vehicles

- Install power-assisted steering vane pump.
- Install poly V-belt ⇒ [page 30](#) .





- Push pipe/hose assembly -A- to stop into slave cylinder bleeder.
- Push down clip -arrow-.
- Test line by tugging on it.
- Remove hose clamp, up to 25 mm in diameter - 3094- from pipe/hose assembly.
- Bleed clutch mechanism ⇒ Rep. gr. 30 .
- Install selector mechanism to gearbox ⇒ 6-speed manual gearbox 02Q; Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Install engine control unit ⇒ [page 185](#) .
- Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead .
- With ignition switched off, connect battery earth strap ⇒ Electrical system; Rep. gr. 27 ; Disconnecting and connecting battery .
- Replenish coolant ⇒ [page 121](#) .
- Carry out road test and read event memory afterwards ⇒ Vehicle diagnostic tester.



Specified torques

- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 26](#)
- ◆ ⇒ [“1.2 Assembly overview - poly V-belt drive with vane pump”, page 29](#)
- ◆ ⇒ [“2.1 Assembly overview – emission control with catalytic converter”, page 195](#)
- ◆ ⇒ [“2.2 Assembly overview – emission control with diesel particulate filter, engine codes BLS, BSU”, page 197](#)
- ◆ Drive shafts; Assembly overview - drive shafts ⇒ Rep. gr. 40 ; Assembly overview - drive shaft
- ◆ Hydraulic power-assisted steering; Assembly overview - vane pump ⇒ Rep. gr. 48 ; Assembly overview - vane pump .
- ◆ Alternator; Assembly overview - alternator ⇒ Rep. gr. 27 ; Assembly overview - alternator .
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ Rep. gr. 50 ; Assembly overview - noise insulation



2 Assembly mountings

⇒ "2.1 Assembly overview - assembly mountings", page 26

2.1 Assembly overview - assembly mountings



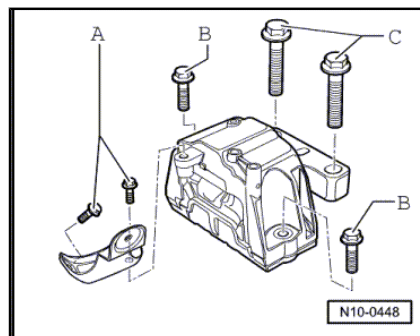
Note

Renew bolts after each removal.

Engine assembly mountings

Specified torque

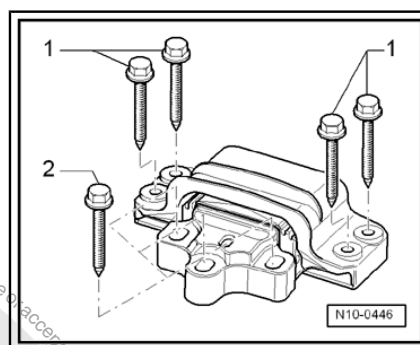
Component	Specified torque
Bolt A	20 Nm + 90°
Bolt B	40 Nm + 90°
Bolt C	60 Nm + 90°



Gearbox assembly mounting

Specified torque

Component	Specified torque
Bolt 1	40 Nm + 90°
Bolt 2	60 Nm + 90°





Pendulum support

Always note the size and strength rating of bolt. Different specified torques are valid.

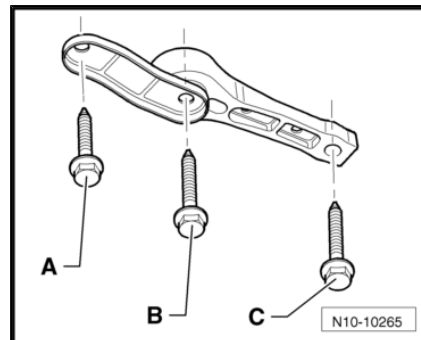


Caution

As of gearbox production date 28 05 7, Heli Coil inserts are installed in the threaded connections to pendulum support in manual gearboxes 02Q. Difference ⇒ Rep. gr. 34

For these and all other gearboxes bolts with strength rating 10.9 must be used.

If Heli Coil inserts are not fitted in manual gearboxes 02Q, use bolts with strength rating 8.8 and the specified torques.



Tighten only if pendulum support is bolted to gearbox.

Always renew after removing.

Specified torque

Component	Specified torque
Bolt A: M10 x 35, strength rating 8.8	40 Nm + 90°
Bolt A: M10 x 35, strength rating 10.9	50 Nm + 90°
Bolt B: M10 x 75, strength rating 8.8	40 Nm + 90°
Bolt B: M10 x 75, strength rating 10.9	50 Nm + 90°
Bolt C: M14 x 1.5 x 70	100 Nm + 90°



13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ "1.1 Assembly overview - cylinder block", page 28

⇒ "1.2 Assembly overview - poly V-belt drive with vane pump", page 29

⇒ "1.3 Assembly overview - poly V-belt drive with vane pump", page 30

⇒ "1.4 Removing and installing poly V-belt", page 30

⇒ "1.5 Renewing crankshaft oil seal on belt pulley end", page 33

⇒ "1.6 Removing and installing sealing flange on pulley end", page 35

1.1 Assembly overview - cylinder block

1 - Cylinder block

- ☐ Removing and installing sealing flange and fly-wheel ⇒ page 38 .
- ☐ Removing and installing crankshaft ⇒ page 50 .
- ☐ Dismantling and assembling pistons and con-rods ⇒ page 50

2 - Gasket

- ☐ Renew after removing.

3 - Oil filter bracket

- ☐ Dismantling and assembling ⇒ page 110 .

4 - Bolt

- ☐ Renew after removing.
- ☐ First fit upper left and lower right bolts and then tighten all 4 bolts in diagonal sequence.
- ☐ 15 Nm + 90°

5 - Bracket

6 - Bolt

- ☐ 20 Nm

7 - Connecting piece

8 - Bolt

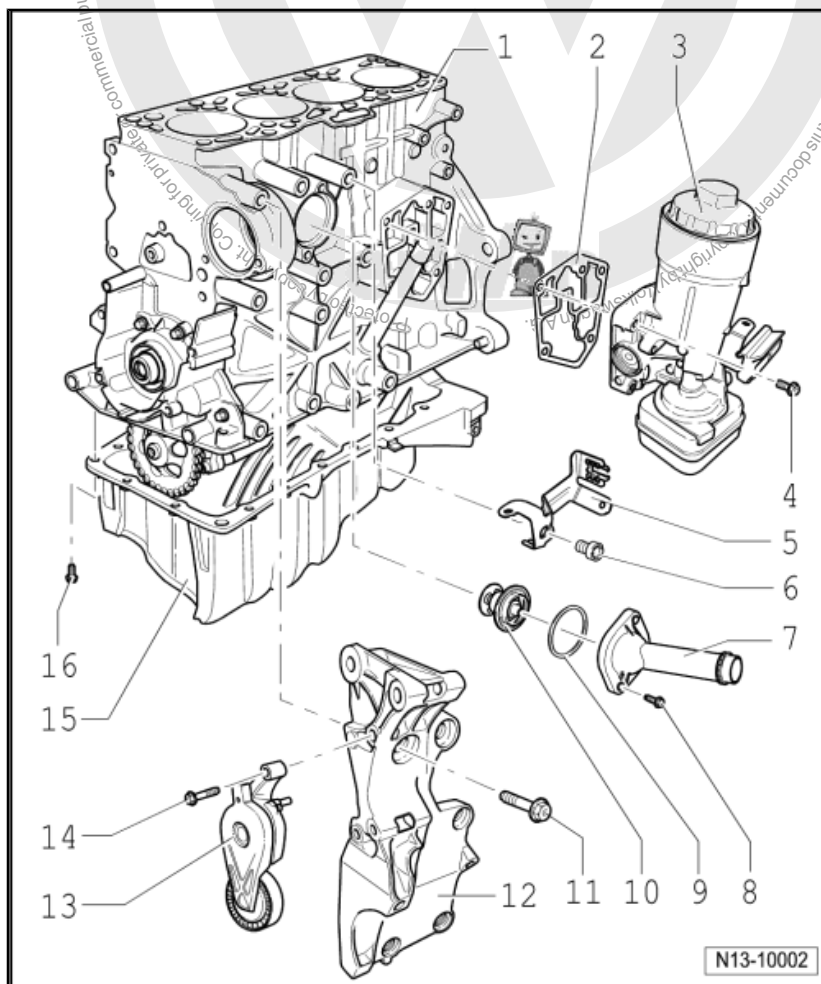
- ☐ 15 Nm

9 - O-ring

- ☐ Renew after removing.

10 - Thermostat

- ☐ Checking: heat thermostat in water.
- ☐ Opening begins at approx. 85 °C.





- ☐ Ends at approx. 105 °C.
- ☐ Opening lift at least 7 mm.
- ☐ Removing and installing ⇒ [page 133](#) .

11 - Hexagon bolt

- ☐ Tightening sequence and specified torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor .

12 - Bracket for ancillaries

13 - Tensioning element

14 - Bolt

- ☐ 20 Nm

15 - Sump

- ☐ Clean sealing surface before fitting.
- ☐ Insert with silicone sealant ⇒ Electronic Parts Catalogue (ETKA) .
- ☐ Removing and installing ⇒ [page 110](#) .

16 - Bolt

- ☐ 15 Nm

1.2 Assembly overview - poly V-belt drive with vane pump

1 - Poly V-belt

- ☐ Mark direction of rotation before removing.
- ☐ Check for wear.
- ☐ Do not kink.
- ☐ Removing and installing ⇒ [page 30](#) .

2 - Bolt

- ☐ 10 Nm + 90°

3 - Cover

4 - Belt pulley and vibration damper

- ☐ Can only be installed in one position, holes are offset.

5 - Bolt

- ☐ 25 Nm

6 - Poly V-belt tensioning element

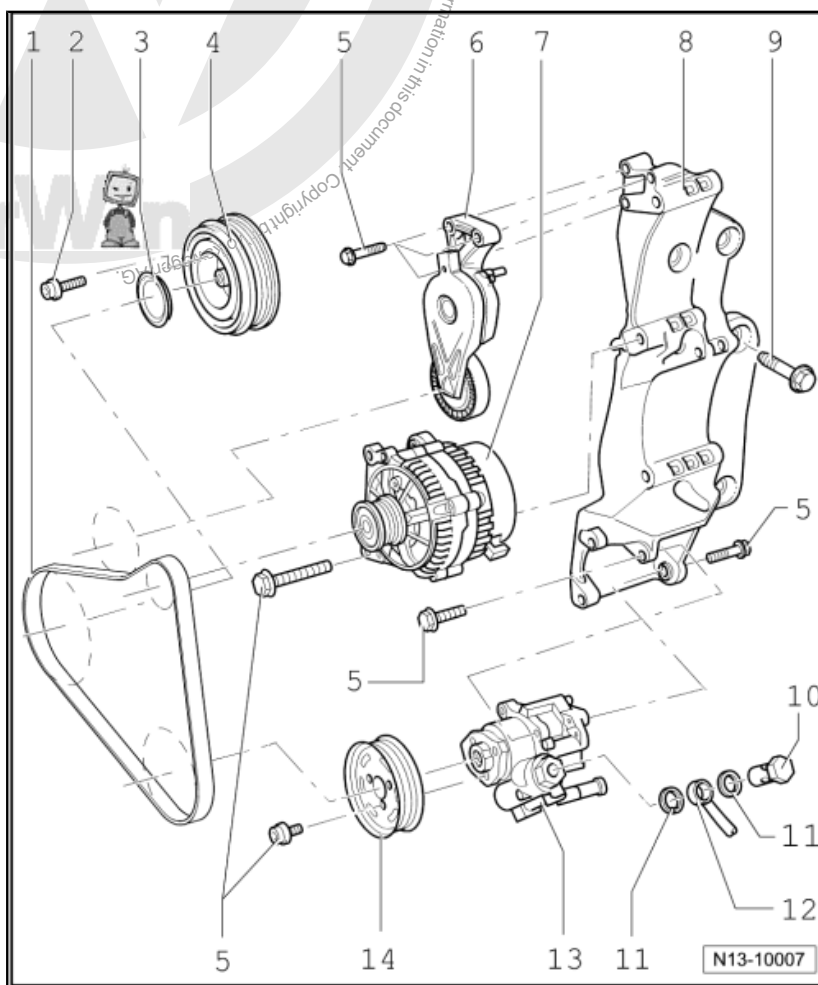
- ☐ Swing with open-end spanner to slacken poly V-belt.

7 - Alternator

8 - Bracket for ancillaries

9 - Hexagon bolt

- ☐ Tightening sequence and specified torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor .





10 - Banjo bolt

- ☐ 30 Nm

11 - Seal

- ☐ Renew after removing.

12 - Pressure line

13 - Vane pump

- ☐ Removing and installing ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power-assisted steering .

14 - Belt pulley

1.3 Assembly overview - poly V-belt drive with vane pump

1 - Belt pulley and vibration damper

- ☐ Can only be installed in one position. Holes are offset.

2 - Bolt

- ☐ 20 Nm

3 - Alternator

4 - Bracket for ancillaries

5 - Poly V-belt tensioning element

- ☐ Swing with ring spanner to slacken poly V-belt.

6 - Bolt

- ☐ 20 Nm

7 - Air conditioner compressor

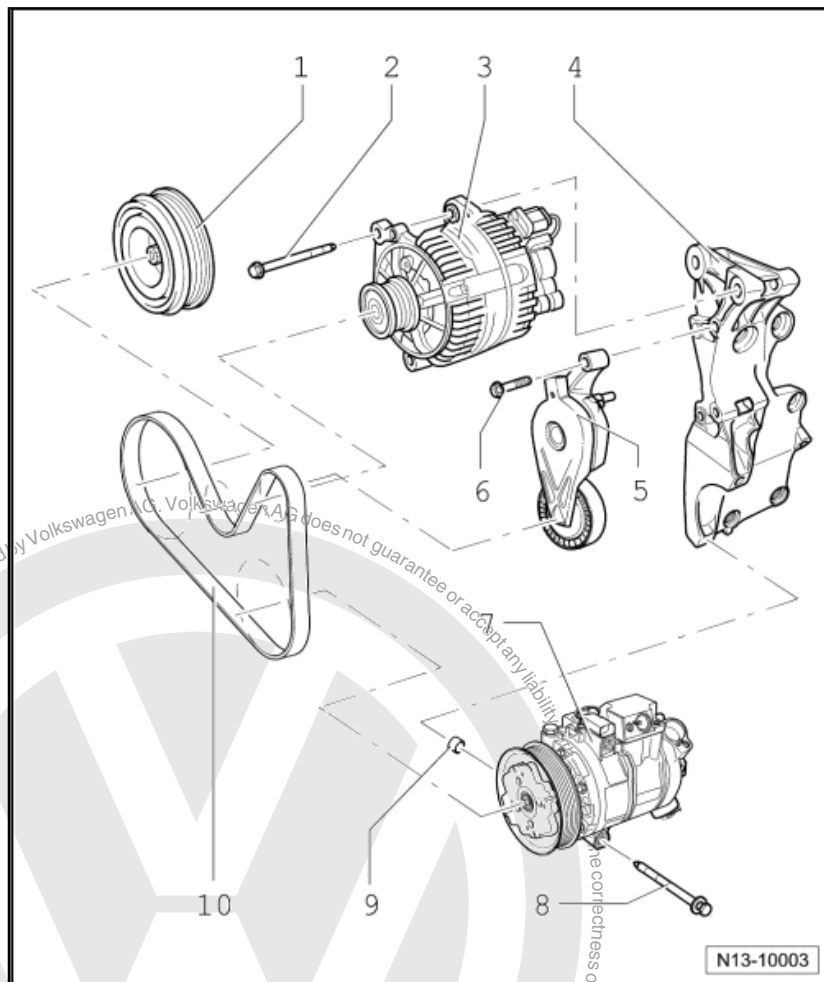
8 - Bolt

- ☐ 25 Nm

9 - Dowel sleeves

10 - Poly V-belt

- ☐ Mark direction of rotation before removing.
- ☐ Check for wear.
- ☐ Do not kink.
- ☐ Removing and installing ⇒ [page 30](#) .

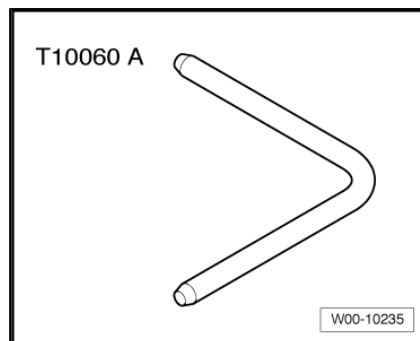


1.4 Removing and installing poly V-belt

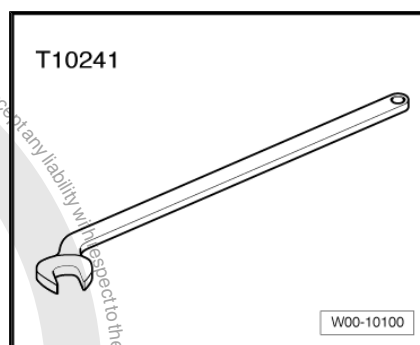
Special tools and workshop equipment required



- ◆ Locking pin - T10060 A-



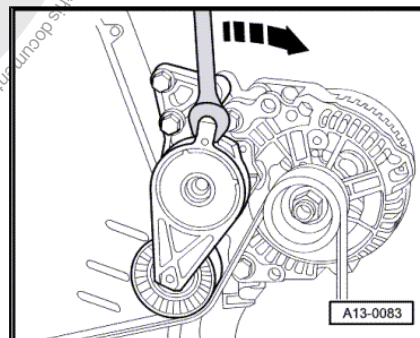
- ◆ 16 mm open-end spanner - T 10241-



Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Mark direction of rotation of poly V-belt.
- Swing tensioning device in direction of arrow to relieve tension on poly V-belt.

16 mm open-end spanner - T 10241- is particularly well suited to relieve tension.





- Lock tensioning element using locking pin - T10060 A- .
- Remove poly V-belt.

Installing

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



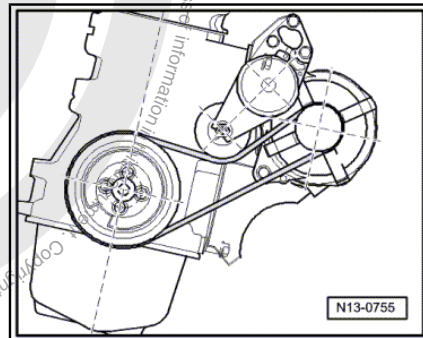
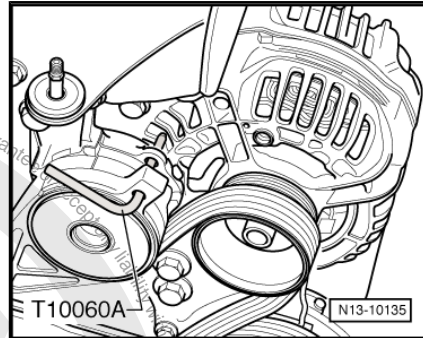
Note

- ◆ *Ensure, before installing poly V-belt, that all ancillaries (alternator, air conditioner compressor) are secured tightly.*
- ◆ *When installing poly V-belt, check direction of belt rotation and proper seating of belt in pulleys.*
- ◆ *Lastly, place poly V-belt over alternator.*

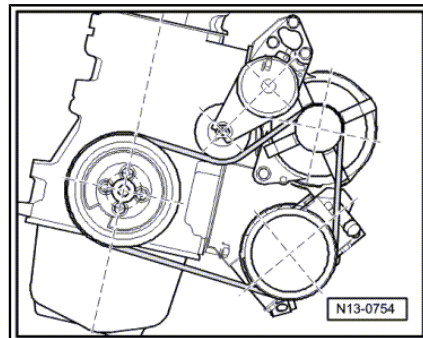
After completing repairs always:

- Start engine and check that belt runs properly.

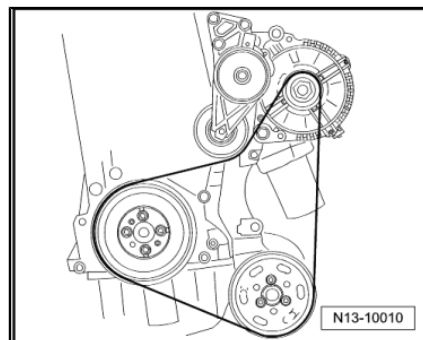
Belt drive without air conditioner compressor



Belt drive with air conditioner compressor



Belt drive without air conditioner compressor with power steering

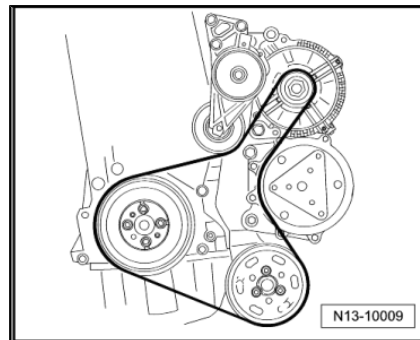




Belt drive with air conditioner compressor and power steering

Specified torques

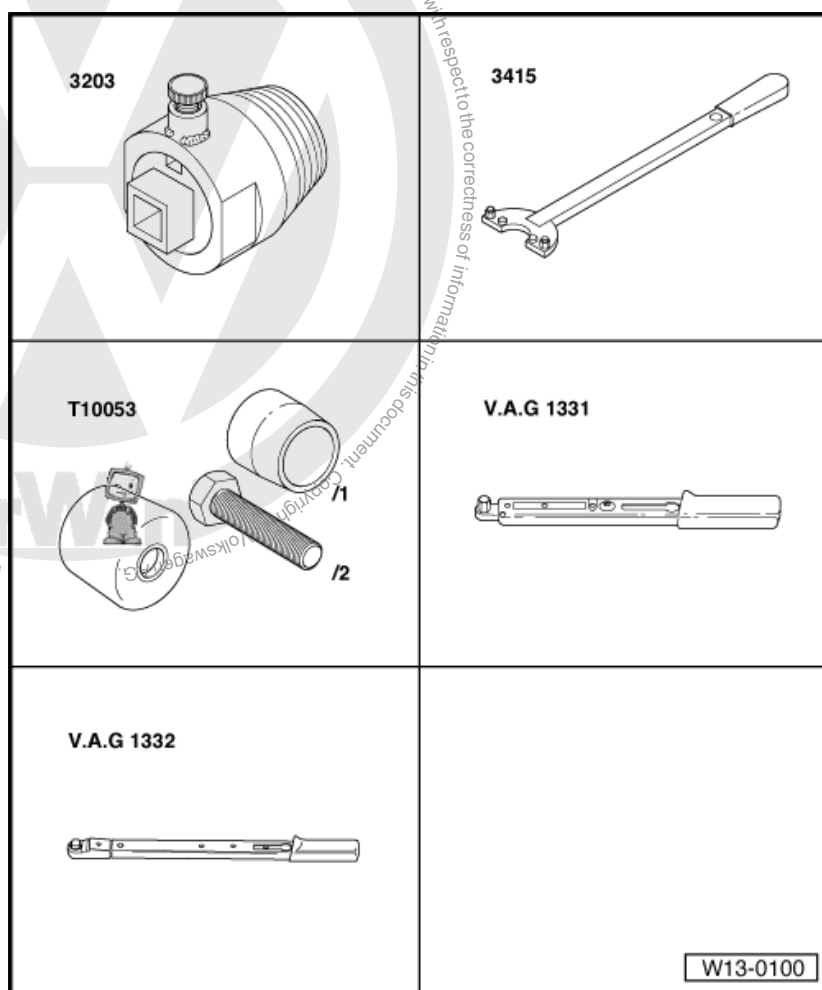
- ◆ Noise insulation; Assembly overview - noise insulation ➔ Noise insulation; Rep. gr. 50 ; Assembly overview - noise insulation



1.5 Renewing crankshaft oil seal on belt pulley end

Special tools and workshop equipment required

- ◆ Oil seal extractor - 3203-
- ◆ Counterhold tool - 3415-
- ◆ Assembly tool - T10053-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Torque wrench 40-200 Nm - V.A.G 1332-

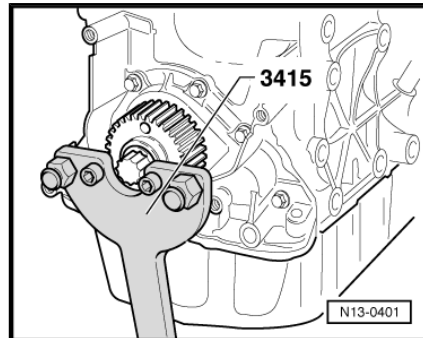


Removing

- Remove toothed belt ➔ [page 73](#) .



- Remove crankshaft pulley. To do this, lock toothed belt pulley using counter-hold tool - 3415- .
- To guide oil seal extractor - 3203- , screw centre bolt into crankshaft by hand to stop.
- Unscrew inner part of oil seal extractor - 3203- 2 turns (approx. 3 mm) from the outer part and lock in position with the knurled screw.
- Lubricate threaded head of oil seal extractor - 3203- .



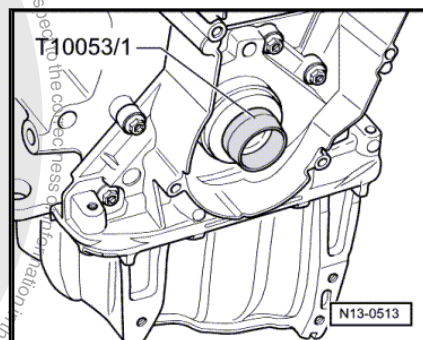
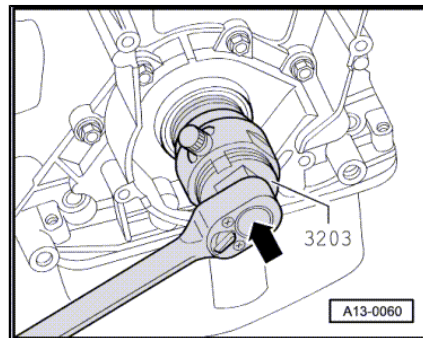
- Screw oil seal extractor - 3203- forcibly as far as possible into oil seal.
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.

Installing

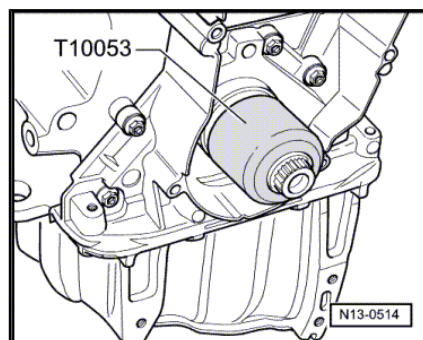


Note

- ◆ *The oil seal sealing lip must not be additionally oiled or greased.*
- ◆ *Thread and shoulder must be free of oil and grease.*
- Remove oil residues from crankshaft journal with a clean cloth.
- Fit guide sleeve - T10053/1- onto crankshaft journal.
- Slide seal over guide sleeve onto crankshaft journal.



- Press oil seal in as far as stop with press sleeve - T10053- and central bolt.

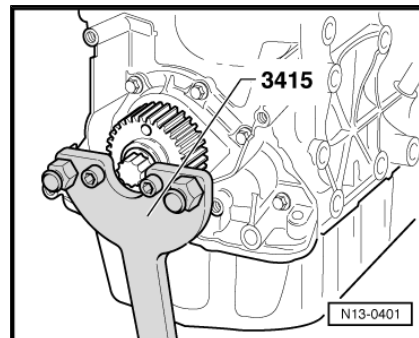




- Install crankshaft pulley. To do this, lock toothed belt pulley using counterhold - 3415- .
- Tighten new central bolt.
- Install toothed belt ⇒ [page 73](#) .

Specified torques

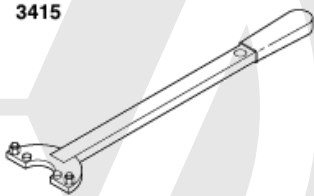
- ◆ ⇒ ["2.1 Assembly overview - toothed belt drive", page 72](#)
- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 26](#)



1.6 Removing and installing sealing flange on pulley end

Special tools and workshop equipment required

- ◆ Counterhold tool - 3415-
- ◆ Assembly tool - T10053-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Torque wrench 40-200 Nm - V.A.G 1332-

 3415	 T10053
 V.A.G 1331	 V.A.G 1332
	W13-0101

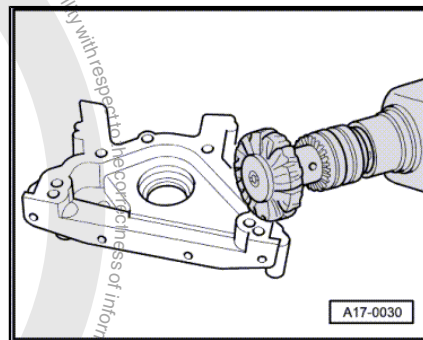
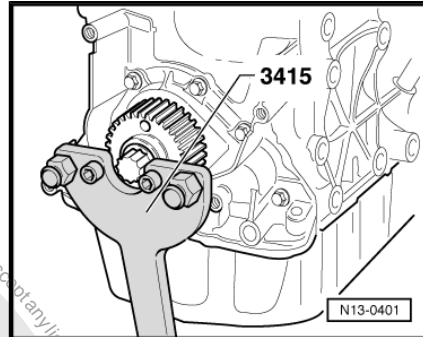
Not illustrated

- ◆ Silicone sealant ⇒ Electronic Parts Catalogue (ETKA)
- ◆ Hand drill with plastic brush attachment
- ◆ Flat scraper
- ◆ Eye protection



Removing

- Remove toothed belt ➔ [page 73](#) .
- Remove crankshaft pulley. To do this, lock toothed belt pulley using counter-hold tool - 3415- .
- Drain off engine oil.
- Remove sump ➔ [page 110](#) .
- Unbolt front sealing flange.
- Remove sealing flange; if necessary, loosen using light blows with a rubber headed hammer.
- Remove sealant residues from cylinder block with a flat scraper.
- Remove residual sealant on sealing flange using rotating plastic brush (wear eye protection).
- Clean sealing surfaces. These must be free of oil and grease.



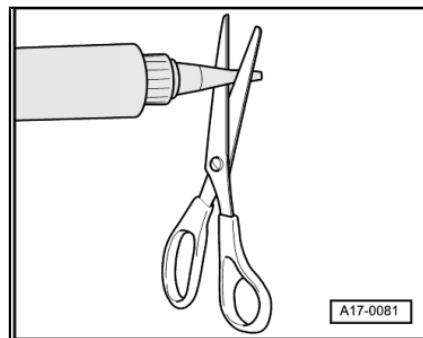
Installing

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



Note

- ◆ *Observe expiry date of sealing compound.*
- ◆ *The sealing flange must be installed within 5 minutes of applying the silicone sealant.*
- ◆ *The sealant bead must not be wider than 2...3 mm as otherwise excess sealant can enter the sump and block the strainer in the oil pump suction line and also drip onto the sealing surface of the crankshaft oil seal.*
- ◆ *Before applying sealant bead, cover sealing surface of oil seal with a clean cloth.*
- Cut off nozzle on tube at front marking (diameter of nozzle approx. 3 mm).





- Apply silicone sealant bead as shown to clean sealing surface of sealing flange.
- Fit sealing flange immediately and lightly tighten all bolts.

**Note**

- ◆ *When fitting sealing flange with oil seal installed use guide sleeve - T10053/1- .*
- ◆ *Sealing compound must dry for approx. 30 minutes after installation. Only then fill with engine oil.*
- ◆ *Thread and shoulder must be free of oil and grease.*
- Tighten sealing flange securing bolts diagonally and alternately.
- Install sump ⇒ [page 110](#) .

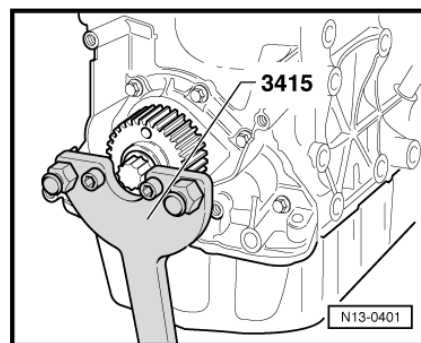
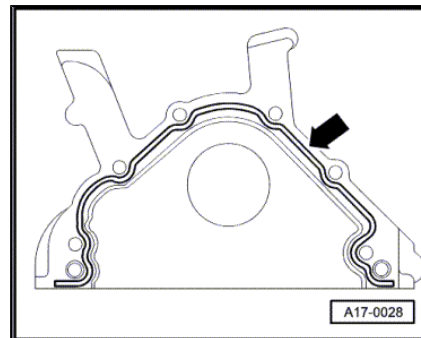
Install crankshaft pulley. To do this, lock toothed belt pulley using counterhold - 3415- .

Tighten new central bolt.

Install toothed belt ⇒ [page 73](#) .

Specified torques

- ◆ ⇒ [“2.1 Assembly overview - toothed belt drive”, page 72](#)
- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 26](#)
- ◆ ⇒ [“1.1 Assembly overview - sump and oil pump”, page 109](#)





2 Cylinder block, gearbox end

- ⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 38](#)
- ⇒ [“2.2 Removing and installing dual-mass flywheel”, page 39](#)
- ⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 41](#)
- ⇒ [“2.3.1 Pressing out sealing flange with sender wheel”, page 42](#)
- ⇒ [“2.3.2 Pressing in sealing flange with sender wheel”, page 43](#)
- ⇒ [“2.3.3 A - Securing seal with sender wheel on assembly tool T10134”, page 43](#)
- ⇒ [“2.3.4 B - Securing assembly tool T10134 with sealing flange on crankshaft flange”, page 45](#)
- ⇒ [“2.3.5 C - Bolting assembly tool T10134 onto crankshaft flange”, page 46](#)
- ⇒ [“2.3.6 D - Pressing sender wheel onto crankshaft flange using assembly tool T10134”, page 47](#)
- ⇒ [“2.3.7 Checking sender wheel installation position on crankshaft”, page 47](#)
- ⇒ [“2.3.8 F - Re-pressing sender wheel”, page 48](#)

2.1 Assembly overview - cylinder block, gearbox end



1 - Seal

- ☐ Do not additionally oil or grease the oil seal sealing lip.
- ☐ Before installing, remove oil residue from crankshaft journal using a clean cloth.
- ☐ Renewing crankshaft oil seal on belt pulley end ⇒ [page 33](#).

2 - Sealing flange

- ☐ Must seat on dowel sleeves.
- ☐ Insert with silicone sealant ⇒ Electronic Parts Catalogue (ETKA).
- ☐ Removing and installing ⇒ [page 41](#).

3 - Cylinder block

- ☐ Dismantling and assembling pistons and con-rods ⇒ [page 50](#)
- ☐ Removing and installing crankshaft ⇒ [page 50](#).

4 - Bolt

- ☐ Renew after removing.
- ☐ 60 Nm + 90°

5 - Flywheel

- ☐ Removing and installing dual-mass flywheel ⇒ [page 39](#).

6 - Intermediate plate

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

7 - Bolt

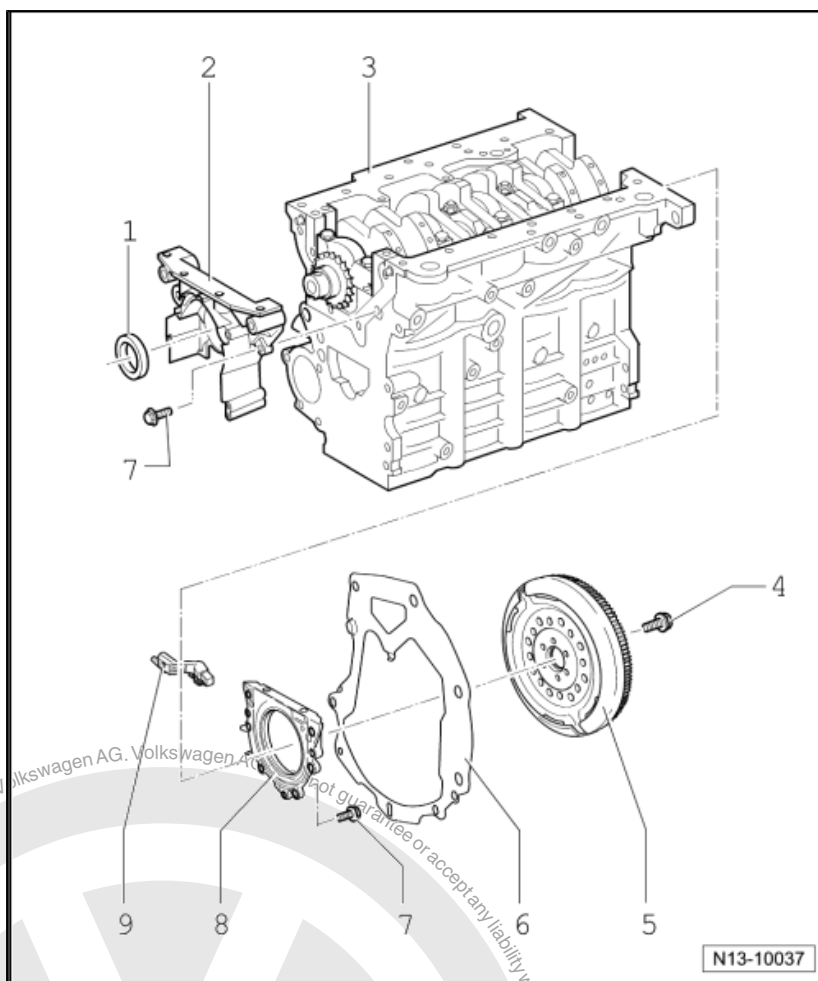
- ☐ Renew after removing.
- ☐ 15 Nm

8 - Sealing flange with oil seal

- ☐ Renew complete with oil seal and sender wheel only.
- ☐ Removing and installing ⇒ [page 41](#).

9 - Engine speed sender - G28-

- ☐ Loosen and tighten using commercially available ball-ended hexagon key socket
- ☐ Removing and installing ⇒ [page 215](#).
- ☐ 5 Nm

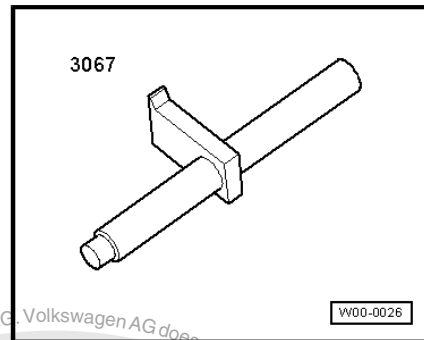


2.2 Removing and installing dual-mass fly-wheel

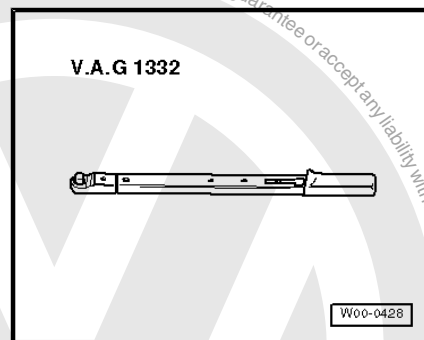
Special tools and workshop equipment required



- ◆ Counterhold tool - 3067-

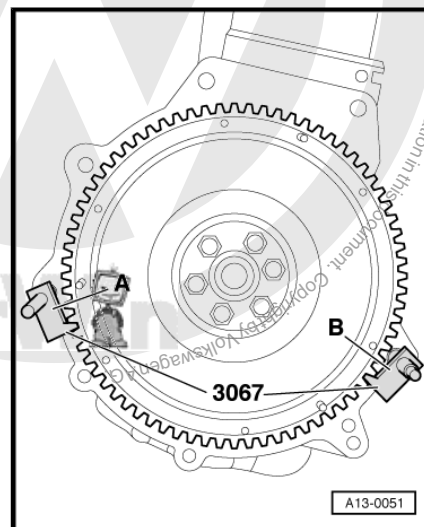


- ◆ Torque wrench 40-200 Nm - V.A.G 1332-



Removing

- Insert counterhold - 3067- in hole in cylinder head and screw onto dual mass flywheel.
- A - Position of counterhold for tightening
- B - Position of counterhold for loosening
- Mark position of dual-mass flywheel in relation to crankshaft.

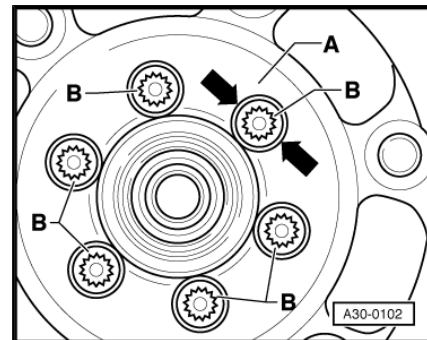




Note

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

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



Installing

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

- Use new bolts to secure.

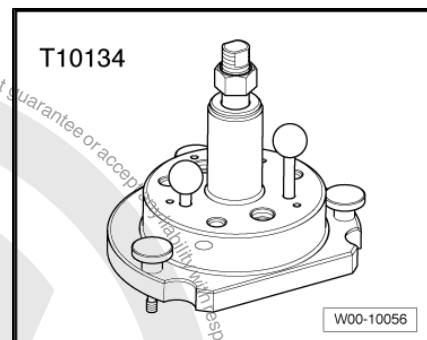
Specified torques

- ◆ ⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 38](#)

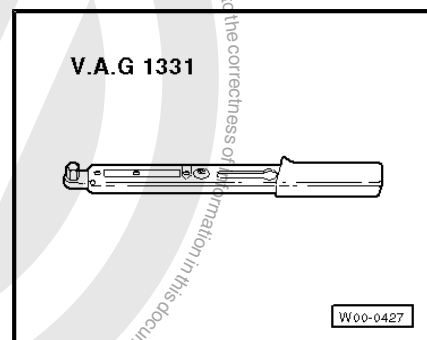
2.3 Removing and installing sealing flange on gearbox side

Special tools and workshop equipment required

- ◆ Assembly tool - T10134-



- ◆ Torque wrench 5-50 Nm - V.A.G 1331-



Not illustrated

- ◆ Commercially available socket, deep, 24mm
- ◆ Vernier gauge
- ◆ Hexagon bolts (Qty. 3) M6×35 mm
- ◆ Hexagon bolts (Qty. 2) M7×35 mm



2.3.1 Pressing out sealing flange with sender wheel



Note

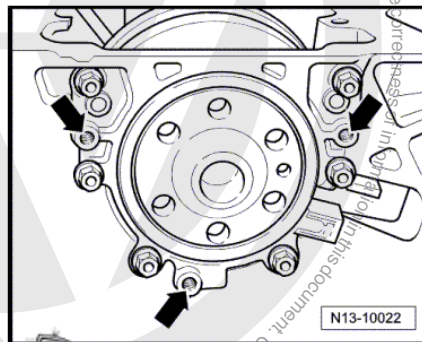
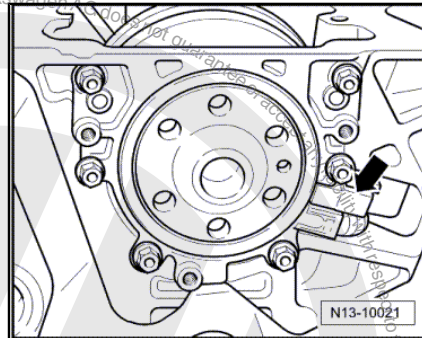
- ◆ For the sake of clarity, the work is performed with the engine removed.
- ◆ The procedure is identical whether the engine is installed or removed.
- Remove flywheel.
- Remove intermediate plate.
- Set engine to TDC for No. 1 cylinder ⇒ [page 73](#) .
- Remove sump ⇒ [page 110](#) .
- Remove engine speed sender - G28- -arrow- using a commercially available ball-ended hex key socket.
- Unscrew securing bolts of sealing flange.



Note

Sealing flange and sender wheel are pressed off the crankshaft together with three M6×35 mm bolts.

- Screw three M6x35 mm bolts into threaded holes of sealing flange -arrows-.
- Screw bolts alternately (max. $\frac{1}{2}$ turn (180°) for each bolt) into sealing flange and press sealing flange together with sender wheel off crankshaft.





2.3.2 Pressing in sealing flange with sender wheel

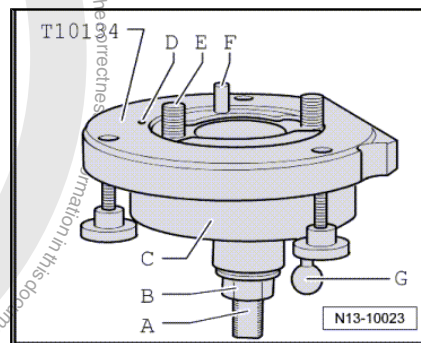


Note

- ◆ The sealing flange with a PTFE seal is equipped with a sealing lip support ring. This support ring serves as a fitting sleeve and must not be removed prior to installation.
- ◆ Sealing flange and sender wheel must not be separated or turned after removal from packaging.
- ◆ The sender wheel is held in its installation position on the assembly device - T10134- by a locating pin.
- ◆ Sealing flange and oil seal form one unit and must only be renewed together with the sender wheel.
- ◆ The assembly device - T10134- is held in its position relative to the crankshaft by a guide pin inserted into a hole in the crankshaft.

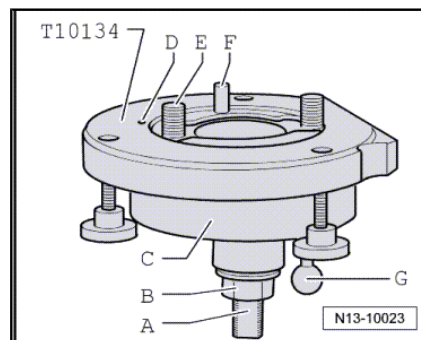
Assembly tool - T10134-

- A - Clamping surface
- B - Hexagon nut
- C - Assembly housing
- D - Locating pin
- E - Hexagon socket head bolt
- F - Guide pin for diesel engines (black knob)
- G - Guide pin for petrol engines (red knob)



2.3.3 A - Securing seal with sender wheel on assembly tool - T10134-

- Screw on hexagon nut -B- until just before it touches clamping surface -A- of threaded spindle.



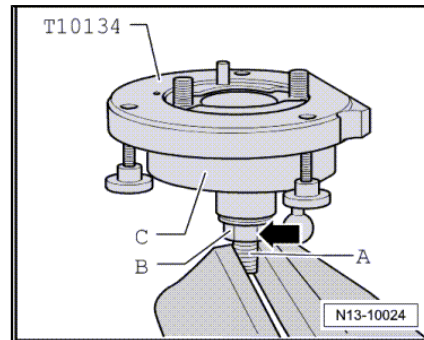


- Clamp assembly device - T10134- in a vice on clamping surface -A- of threaded spindle.
- Press the assembly housing -C- downwards until it lies on hexagon nut -B-, -arrow-.



Note

Inner part of assembly tool and assembly housing must be at same height.

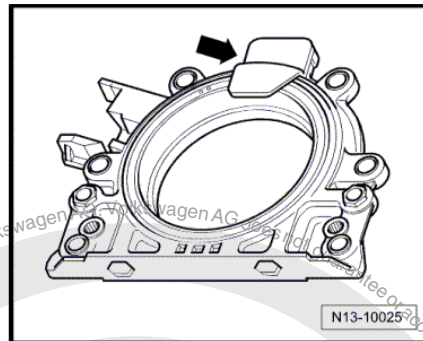


- Remove securing clip -arrow- from new sealing flange.

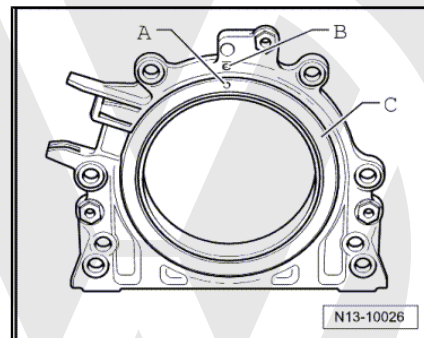


Note

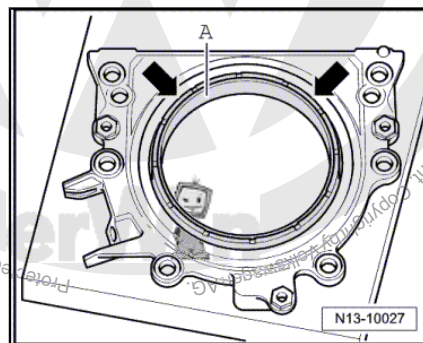
The sender wheel must not be taken out of the sealing flange or twisted.



- Locating hole -A- on sender wheel -C- must align with marking -B- on sealing flange.
- Place sealing flange with front side facing down on a clean level surface.

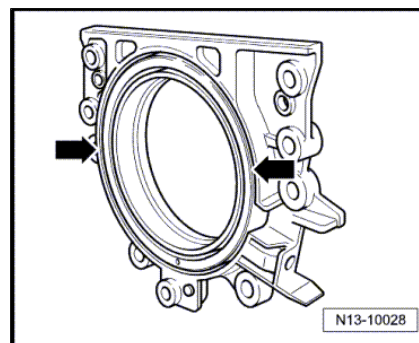


- Push sealing lip support ring -A- downwards in direction of arrow until it lies on flat surface.





- Upper edge of sender wheel and front edge of sealing flange must align -arrows-.

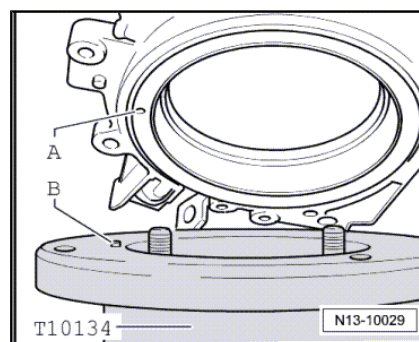


- Place sealing flange with front side facing downwards onto assembly tool - T10134- so that locating pin -B- can be inserted in sender wheel hole -A-.



Note

Ensure sealing flange lies flat on assembly tool.

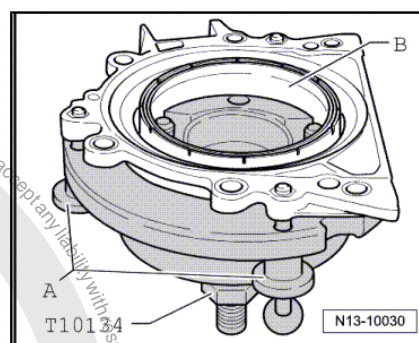


- Push sealing flange and support ring for sealing lip -B- against surface of assembly tool - T10134- whilst tightening the 3 knurled screws -A- so that locating pin cannot slide out of sender wheel hole.



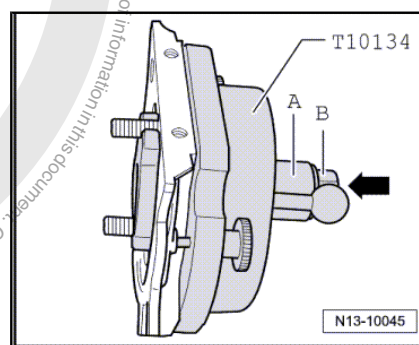
Note

When installing sealing flange, ensure that sender wheel remains fixed in assembly device.



2.3.4 B - Securing assembly tool - T10134- with sealing flange on crankshaft flange

- Crankshaft flange must be free of oil and grease.
- Engine positioned at TDC No. 1 cylinder.
- Screw hexagon nut -B- on until it reaches end of threaded spindle.
- Press threaded spindle of assembly tool - T10134- in direction of arrow, until hexagon nut -B- lies against assembly housing -A-.
- Align flat side of assembly housing to crankcase's sealing surface on the sump side.



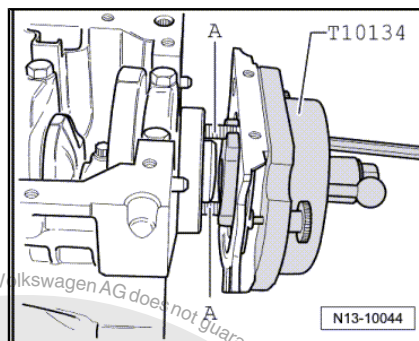


- Secure assembly tool - T10134- to crankshaft flange with hexagon socket head bolts -A-.

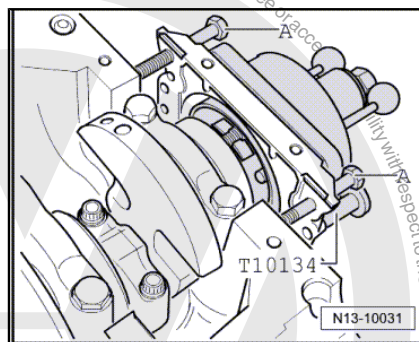


Note

Screw hexagon socket head bolts -A- into crankshaft flange (approx. 5 full turns).



- To guide sealing flange, screw two M7×35 mm bolts -A- into cylinder block.



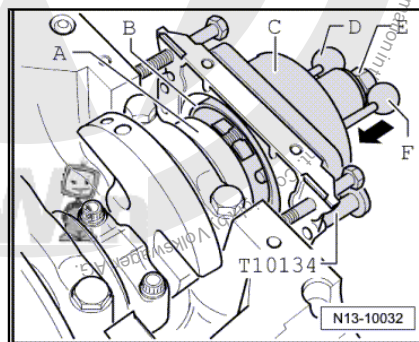
2.3.5 C - Bolting assembly tool - T10134- onto crankshaft flange

- Push assembly housing -C- by hand in direction of arrow until sealing lip support ring -B- touches crankshaft flange -A-.
- Push guide pin for diesel engines (black knob) -D- into hole in crankshaft. This ensures that the sender wheel reaches its final installation position.



Note

The guide pin for petrol engines (red knob) -F- must not be inserted in threaded hole of crankshaft.



- Tighten the two hexagon socket head bolts of the assembly tool hand-tight.
- Screw hexagon nut -E- onto threaded spindle by hand until it lies against assembly housing -C-.



2.3.6 D - Pressing sender wheel onto crankshaft flange using assembly tool - T10134-

- Tighten hexagon nut of assembly tool - T10134- using torque wrench 5-50 Nm - V.A.G 1331- and commercially available 24 mm deep socket -1-.

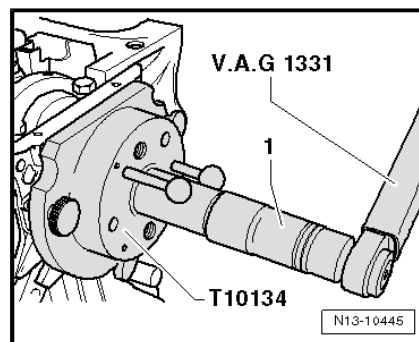
Specified torque

Component	Specified torque
Hexagon nut from assembly tool - T10134-	35 Nm



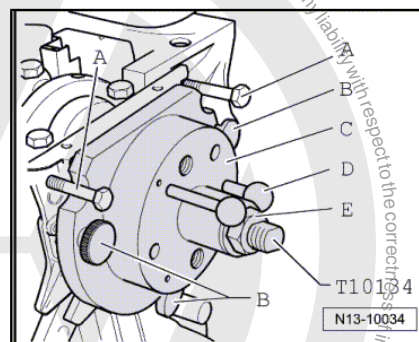
Note

After hexagon nut is tightened, a small air gap must still be present between cylinder block and sealing flange.

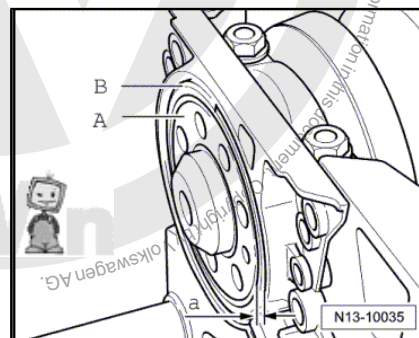


2.3.7 Checking sender wheel installation position on crankshaft

- Screw on the hexagon nut -E- until it reaches the end of the threaded spindle.
- Unscrew 2 bolts -A- from cylinder block.
- Unscrew the three knurled screws -B- out of sealing flange.
- Remove assembly tool - T10134- .
- Remove sealing lip support ring.



- The sender wheel is in the correct installation position on the crankshaft if a gap -a- = 0.5 mm exists between crankshaft flange -A- and sender wheel -B-.





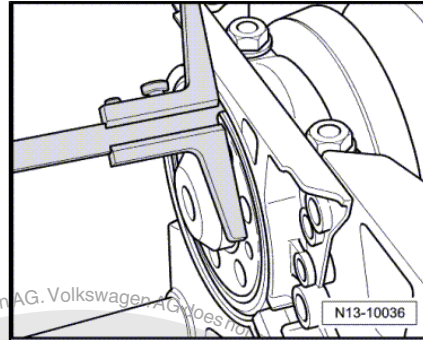
- Place caliper gauge on crankshaft flange.
- Measured distance -a- between crankshaft flange and sender wheel.

If dimension -a- is too small:

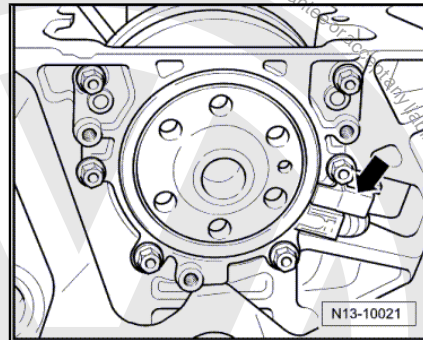
- Re-press sender wheel ⇒ [page 48](#) .

If dimension -a- is achieved:

- Tighten new sealing flange securing bolts diagonally and alternately.

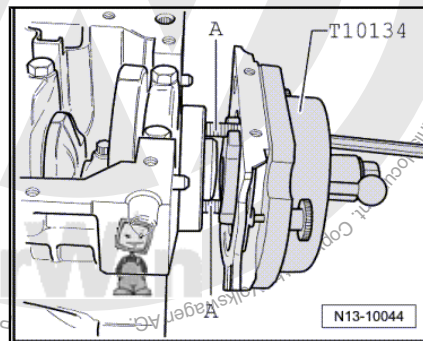


- Install engine speed sender - G28- -arrow- and tighten securing bolt.
- Install sump ⇒ [page 110](#) .
- Install intermediate plate.
- Install flywheel with new bolts.

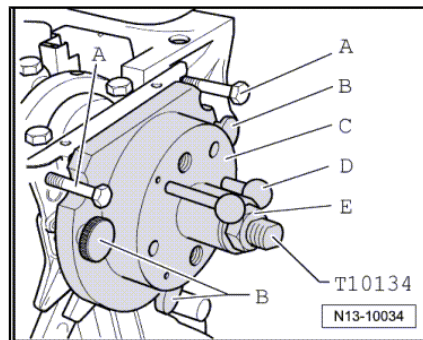


2.3.8 F - Re-pressing sender wheel

- Secure assembly tool - T10134- to crankshaft flange with hexagon socket head bolts -A-.
- Tighten the two hexagon socket head bolts hand-tight.
- Push the assembly tool - T10134- against the sealing flange by hand.



- Screw hexagon nut -E- onto threaded spindle by hand until it lies against assembly housing -C-.





- Tighten hexagon nut of assembly tool - T10134- using torque wrench 5-50 Nm - V.A.G 1331- and commercially available 24 mm deep socket -1-

Specified torque

Component	Specified torque
Hexagon nut from assembly tool - T10134-	40 Nm

- Check the sender wheel installation position on crankshaft again ➔ [page 47](#)

If dimension -a- is too small again:

- Tighten hexagon nut of assembly tool - T10134- as follows:

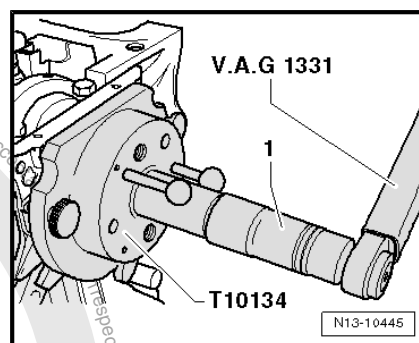
Specified torque

Component	Specified torque
Hexagon nut from assembly tool - T10134-	45 Nm

- Check the sender wheel installation position on crankshaft again ➔ [page 47](#)

Specified torques

- ◆ ➔ ["2.1 Assembly overview - cylinder block, gearbox end", page 38](#)
- ◆ ➔ ["1.1 Assembly overview - sump and oil pump", page 109](#)





3 Crankshaft

⇒ ["3.1 Assembly overview - crankshaft", page 50](#)

⇒ ["3.2 Renewing needle bearing in crankshaft", page 51](#)

⇒ ["3.3 Crankshaft dimensions", page 52](#)

3.1 Assembly overview - crankshaft

1 - Bearing shells 1, 2, 4 and 5

- ☐ For bearing cap without oil groove.
- ☐ For cylinder block with oil groove.
- ☐ Do not interchange used bearing shells (mark).

2 - Bolt

- ☐ Renew after removing.
- ☐ To measure radial clearance, tighten to 65 Nm but not further.
- ☐ 65 Nm + 90°

3 - Bearing cap

- ☐ Bearing cap 1: belt pulley end.
- ☐ Bearing cap 3 with recesses for thrust washers.
- ☐ Bearing shell retaining lugs in cylinder block and bearing caps must align.

4 - Thrust washer

- ☐ For bearing cap 3.
- ☐ Note fixing arrangement.

5 - Needle bearing

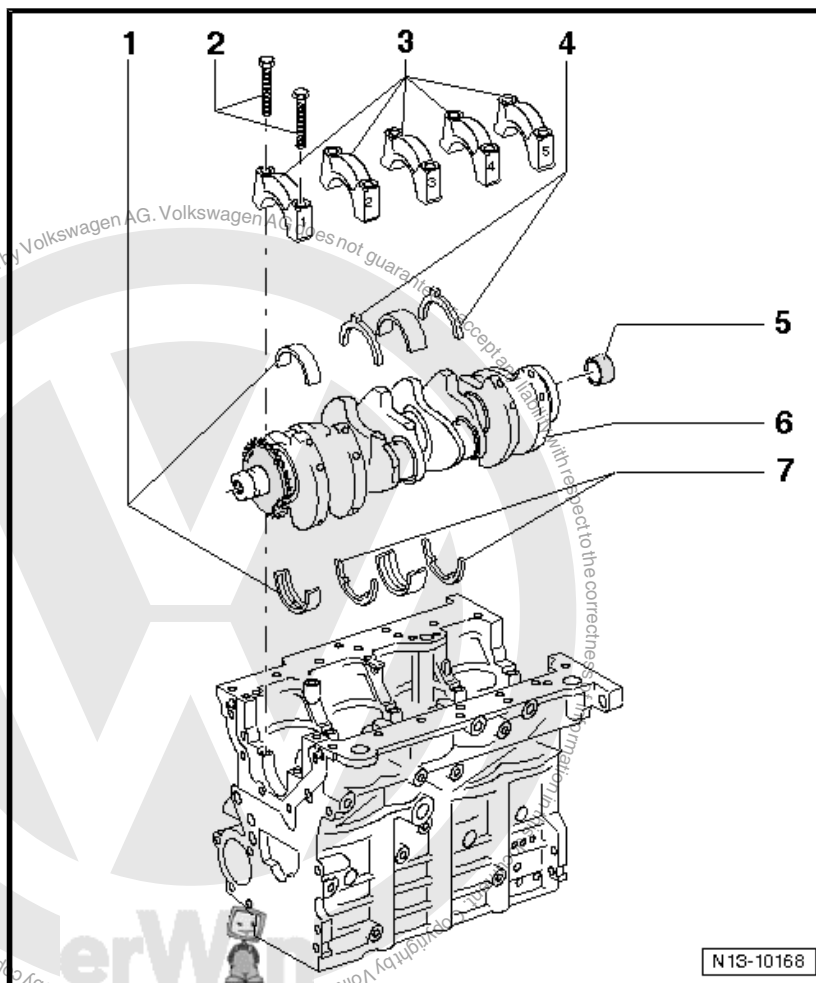
- ☐ Vehicles with dual clutch gearbox only.
- ☐ Removing and installing ⇒ [page 51](#).

6 - Crankshaft

- ☐ Axial clearance new: 0.07 ... 0.17 mm, wear limit: 0.37 mm.
- ☐ Measure radial clearance using Plastigage; new: 0.03 ... 0.08 mm; wear limit: 0.17 mm.
- ☐ Do not rotate crankshaft when checking radial clearance.
- ☐ Crankshaft dimensions ⇒ [page 52](#).

7 - Thrust washer

- ☐ For cylinder block, bearing 3



N13-10168

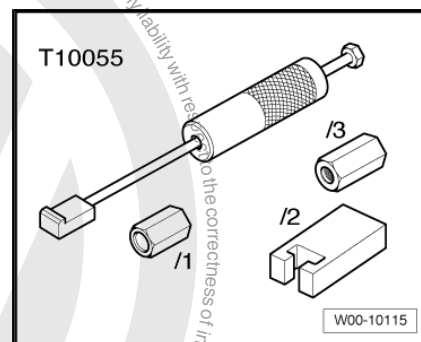


3.2 Renewing needle bearing in crankshaft

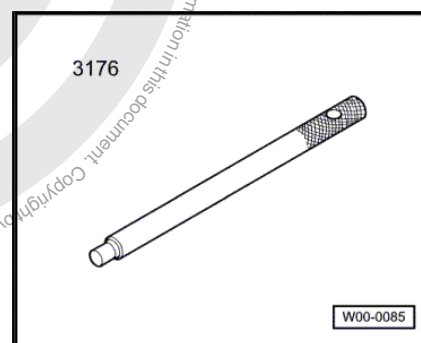
Vehicles with dual clutch gearbox

Special tools and workshop equipment required

- ◆ Puller - T10055- with adapter -T10055/3-



- ◆ Centring mandrel - 3176-



- ◆ or drift - VW 207 C-

- ◆ Puller, e.g. KUKKO - 21/2-

When engine or gearbox need to be removed during repair work, check needle bearing in crankshaft. If it is damaged or tarnished blue, it must be renewed.

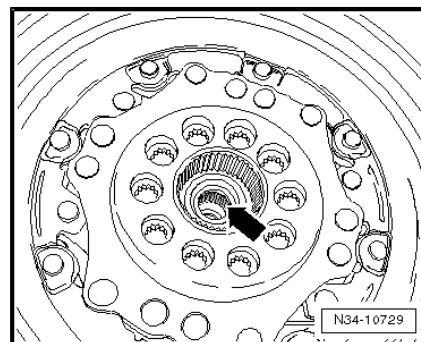
- If it is not damaged, lightly grease with high-temperature grease ⇒ Electronic Parts Catalogue (ETKA) .

Puller - T10055- with adapter -T10055/3-

Removing

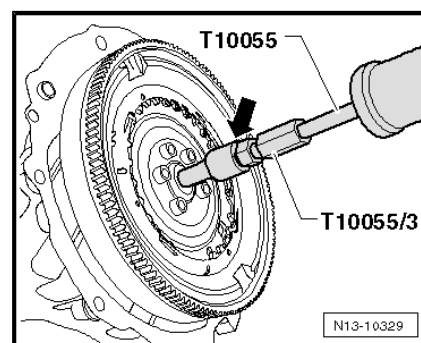
- Gearbox is separated from engine

Pulling needle bearing out:



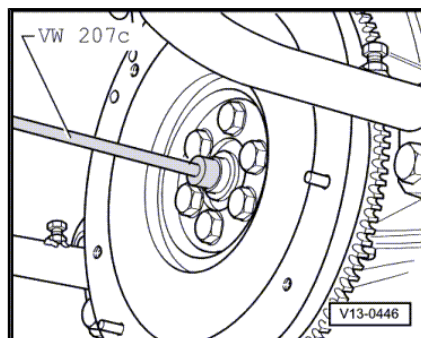
- Pull out using commercially available puller, e.g. KUKKO - 21/2- -arrow-, adapter - T10055/3- and puller - T10055- .

Installing

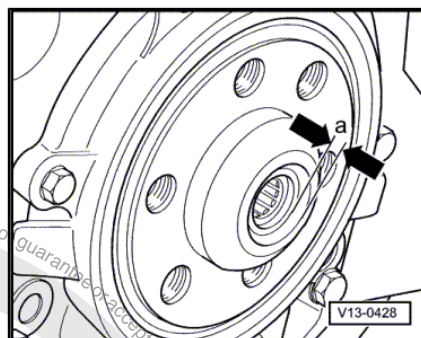




- Drive needle bearing in with drift - VW 207 C- or with centring mandrel - 3176- .
 - Drive needle bearing in carefully.
 - Constantly measure insertion depth when driving in.
- Renew bearing, if driving depth is too deep.



- Driving depth: Dimension -a- = 1.5...1.8 mm.



3.3 Crankshaft dimensions

(Dimensions in mm)

Honing dimension	Crankshaft main journal diameter		Conrod journal diameter	
Basic dimension	54.00	-0.022 -0.042	47.80	-0.022 -0.042



4 Pistons and conrods

⇒ "4.1 Assembly overview - pistons and conrods", page 53

⇒ "4.2 Checking piston and cylinder bore", page 54

⇒ "4.3 Separating new conrod", page 56

⇒ "4.4 Measuring piston projection at TDC", page 56

⇒ "4.5 Cylinder head gasket identification", page 58

⇒ "4.6 Piston and cylinder dimensions", page 58

4.1 Assembly overview - pistons and conrods

1 - Piston rings

- ☐ Offset gaps by 120°.
- ☐ Use piston ring pliers to remove and install.
- ☐ "TOP" faces towards piston crown.
- ☐ Check ring gap
⇒ page 54 .
- ☐ Check ring-to-groove clearance ⇒ page 55 .

2 - Piston

- ☐ With combustion chamber.
- ☐ Mark installation position and cylinder number.
- ☐ Arrow on piston crown points to belt pulley end.
- ☐ Install using piston ring clamp.
- ☐ If piston skirt is cracked, renew piston.
- ☐ Installation position and allocation of piston to cylinder ⇒ page 56 .
- ☐ Checking piston projection at TDC
⇒ page 56 .

3 - Piston pin

- ☐ If difficult to remove, heat piston to 60°C.
- ☐ Remove and install using drift - VW 222- .

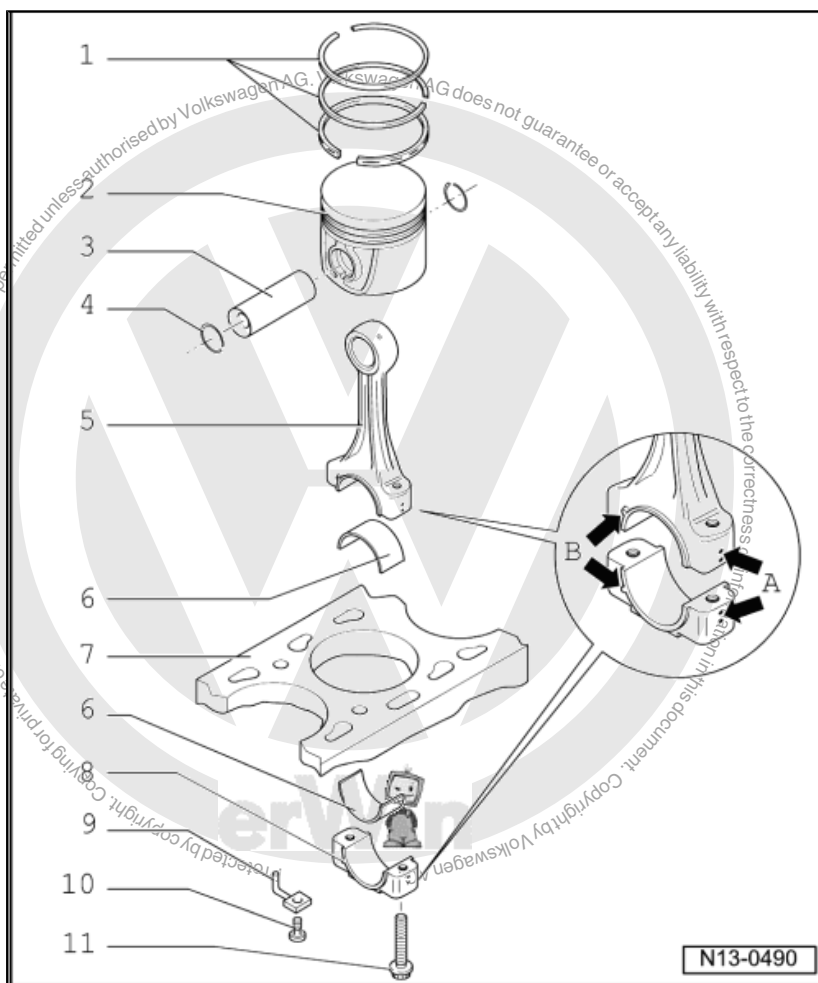
4 - Circlip

5 - Conrod

- ☐ Mark cylinder allocation -A- with coloured pen.
- ☐ Installation position: Marking -B- faces towards pulley end.
- ☐ With industrially cracked conrod cap.
- ☐ Separate new conrod ⇒ page 56 .

6 - Bearing shell

- ☐ Note installation position.





- ☐ Note version: Upper bearing shell (towards piston) is made of a more wear resistant material. Identification: Black line on bearing surface in area of joint.
- ☐ Do not interchange used bearing shells.
- ☐ Insert bearing shells centrally.
- ☐ Check for secure seating.
- ☐ Axial clearance, wear limit: 0.37 mm
- ☐ Measure radial clearance with Plastigage: Wear limit: 0.08 mm, do not rotate crankshaft when measuring radial clearance.

7 - Cylinder block

- ☐ Check cylinder bores ⇒ [page 55](#) .
- ☐ Piston and cylinder dimensions ⇒ [page 58](#) .

8 - Conrod bearing cap

- ☐ Note installation position.
- ☐ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod.
- ☐ Separate new conrod ⇒ [page 56](#) .

9 - Oil spray jet

- ☐ For piston cooling.

10 - Bolt

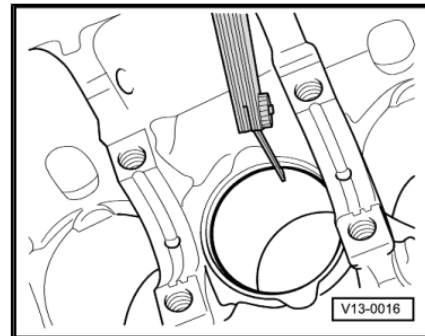
- ☐ Insert without sealant.
- ☐ 25 Nm

11 - Conrod bolt

- ☐ Renew after removing.
- ☐ Oil threads and contact surface.
- ☐ Use old bolt for measuring radial clearance.
- ☐ 30 Nm + 90°

4.2 Checking piston and cylinder bore

Checking piston ring gap



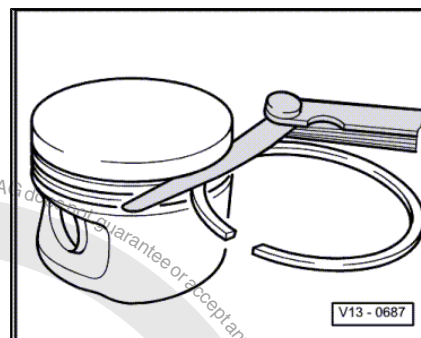
Special tools and workshop equipment required

- ◆ Feeler gauges
- Push piston ring at right angle from above down into lower cylinder bore to approx. 15 mm from bottom end of cylinder.

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



Checking ring-to-groove clearance

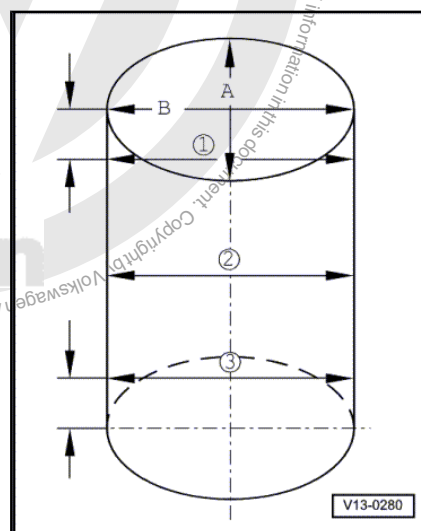


Special tools and workshop equipment required

- ◆ Feeler gauges
- Clean annular groove before check.

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

Checking cylinder bores



Special tools and workshop equipment required

- ◆ Cylinder gauge 50...100 mm
- Take measurements at 3 positions in both lateral direction -A- and longitudinal direction -B-. Difference between actual and nominal diameter max. 0.10 mm.



Note

The cylinder bores must not be measured when the cylinder block is mounted on assembly stand, as measurements may then be incorrect.

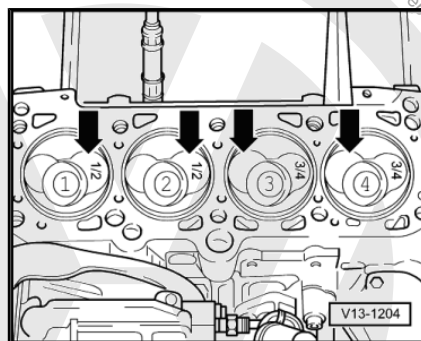
Piston installation position and allocation of piston to cylinder

Piston in cylinders 1 and 2:

Larger inlet valve recess towards flywheel -arrows-.

Piston in cylinders 3 and 4:

Larger inlet valve recess towards pulley end -arrows-.



Note

- ◆ *New piston allocation to cylinders is shown by a coloured marking on piston crown.*
- ◆ *Piston for cylinders 1 and 2: marked 1/2*
- ◆ *Piston for cylinders 3 and 4: marked 3/4*

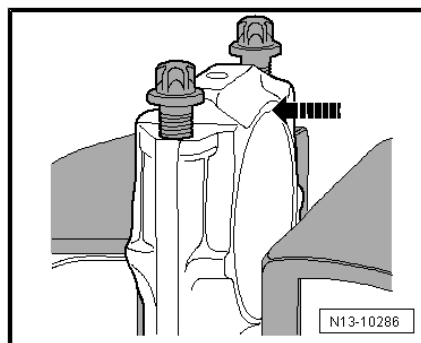
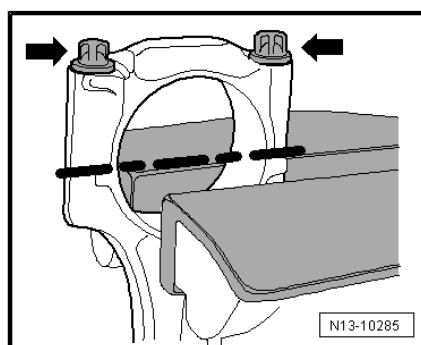
4.3 Separating new conrod

- Mark the cylinder to which the conrods belong
⇒ [Item 5 \(page 53\)](#) .
- Lightly clamp the conrod in a vice using aluminium vice clamps, as shown in the illustration.



Note

- ◆ *To prevent damage to the conrod, only clamp conrod in lightly.*
- ◆ *Clamp conrod in below the dashed line.*
- Unscrew both bolts -arrows- about 5 turns.
- Using a plastic hammer, carefully knock against conrod bearing cap -arrow- until it is loose.

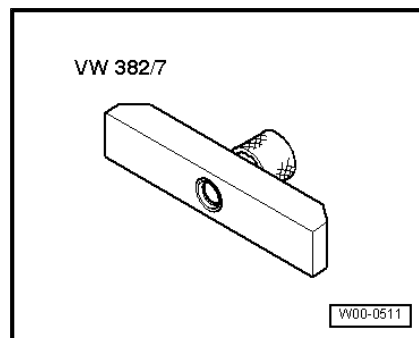


4.4 Measuring piston projection at TDC

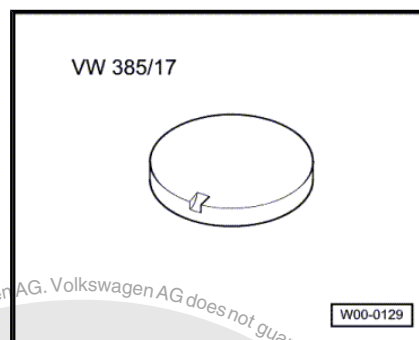
Special tools and workshop equipment required



◆ Measuring bridge - VW 382/7-



◆ End dimension plate - VW 385/17-



◆ Dial gauge

Test procedure

Note

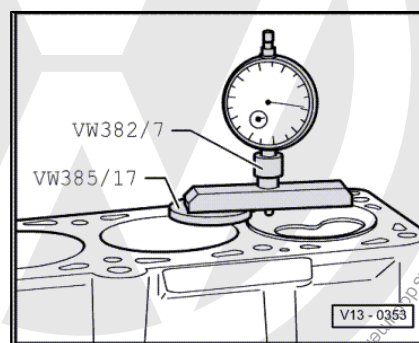
If different values are determined during the projection measurement, use the largest dimension for selecting the gasket.

Piston projection at TDC must be measured on all pistons when installing new pistons or a short engine. Install the appropriate cylinder head gasket depending upon piston projection, according to following table:

Note

Turn engine clockwise to measure piston projection at TDC.

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





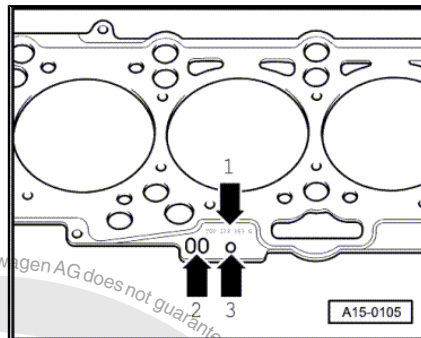
4.5 Cylinder head gasket identification

- ◆ Part No. = -arrow 1-
- ◆ Production control code = -arrow 2- (disregard)
- ◆ Holes = -arrow 3-



Note

If different values are determined during the projection measurement, use the largest dimension for selecting the gasket.



4.6 Piston and cylinder dimensions

Honing dimension		Piston diameter	Cylinder bore diameter
Basic dimension	mm	79.47	79.51
Stage I	mm	79.72	79.76
Stage II	mm	79.97	80.01



15 – Cylinder head, valve gear

1 Cylinder head

⇒ ["1.1 Assembly overview - cylinder head", page 59](#)

⇒ ["1.2 Removing and installing cylinder head", page 63](#)

⇒ ["1.3 Removing and installing cylinder head cover", page 67](#)

⇒ ["1.4 Checking compression", page 70](#)

1.1 Assembly overview - cylinder head



Note

- ◆ *When installing an exchange cylinder head with fitted cam-shaft, the contact surfaces between the bucket tappets and the cam must be oiled before installing the cylinder head cover.*
- ◆ *The plastic packing pieces for protecting the open valves must not be removed until immediately before fitting cylinder head.*
- ◆ *If the cylinder head is replaced, all the coolant in the system must also be renewed.*



1 - Toothed belt guard upper part

2 - Toothed belt

- ☐ Mark direction of rotation before removing.
- ☐ Check for wear.
- ☐ Do not kink.
- ☐ Removing and installing ➔ [page 73](#).

3 - Bolt

- ☐ Renew after removing.
- ☐ 10 Nm

4 - Bolt

- ☐ 25 Nm

5 - Bolt

- ☐ 100 Nm

6 - Camshaft pulley

7 - Hub

- ☐ With sender wheel
- ☐ Removing and installing ➔ [page 99](#).

8 - Toothed belt guard

- ☐ rear

9 - Sealing grommet

- ☐ Renew if damaged.

10 - Hall sender - G40-

- ☐ For camshaft position.
- ☐ To remove, unbutton sealing grommet ➔ [Item 9 \(page 60\)](#) from rear toothed belt guard.

11 - Cylinder head bolt

- ☐ Observe sequence when loosening and tightening ➔ [page 63](#).
- ☐ Before installing, insert washers into cylinder head ➔ [Item 4 \(page 97\)](#).

12 - Fuel return line

13 - Fuel supply line

14 - Coolant line

15 - Cylinder head cover

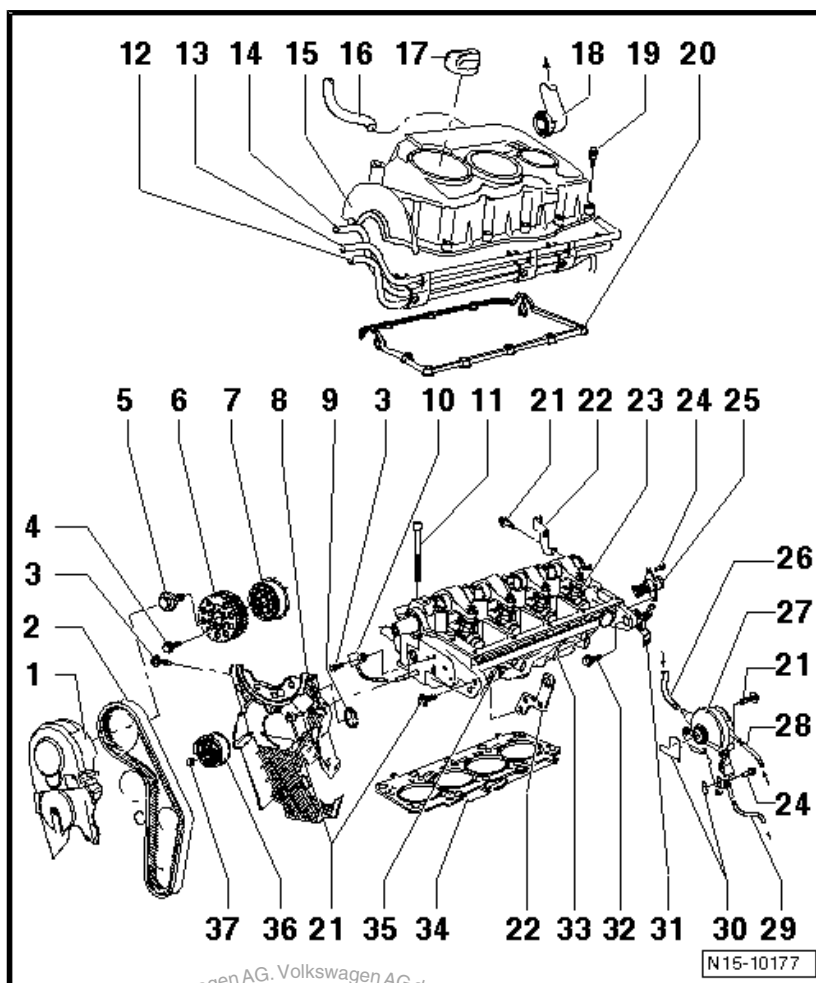
- ☐ With pressure regulating valve for crankcase breather and vacuum reservoir
- ☐ Thoroughly clean sealant groove and securing bolts before fitting a new gasket.
- ☐ Before fitting, thoroughly clean sealing surface of cylinder head with clean cloth.
- ☐ Removing and installing ➔ [page 67](#).

16 - Vacuum hose

- ☐ To connecting piece between tandem pump and brake booster
- ☐ Not with engine code BJB.

17 - Cap

- ☐ Renew seal if damaged.





18 - To intake hose for air filter/turbocharger

19 - Bolt

- ☐ Observe tightening sequence ⇒ [page 67](#) .
- ☐ 10 Nm

20 - Gasket for cylinder head cover

- ☐ Renew if damaged.
- ☐ Thoroughly clean sealant groove and securing bolts before fitting a new gasket.
- ☐ Before fitting gasket, seal transitions with sealant - AMV 174 004 01- .
- ☐ Removing and installing ⇒ [page 67](#) .

21 - Bolt

- ☐ 20 Nm

22 - Lifting eye

23 - Unit injector

- ☐ Removing and installing ⇒ [page 171](#) .

24 - Bolt

- ☐ 10 Nm

25 - Central connector

- ☐ For unit injector

26 - From brake booster

27 - Tandem pump

- ☐ For fuel and vacuum supply.
- ☐ Must not be dismantled.
- ☐ Checking ⇒ [page 189](#) .
- ☐ Removing and installing ⇒ [page 187](#) .

28 - Supply hose

- ☐ White or with white marking.
- ☐ Check for secure seating.
- ☐ Secure with spring-type clips.
- ☐ From fuel filter

29 - Return hose

- ☐ Blue or with blue marking.
- ☐ Check for secure seating.
- ☐ Secure with spring-type clips.
- ☐ To fuel filter

30 - Gasket

- ☐ Renew after removing.

31 - Bracket

32 - Bolt

- ☐ 25 Nm

33 - Cylinder head

- ☐ After renewing, renew entire coolant.
- ☐ Removing and installing ⇒ [page 63](#) .

34 - Cylinder head gasket

- ☐ Renew after removing.
- ☐ After renewing, renew entire coolant.
- ☐ Note marking ⇒ [page 58](#) .



35 - Glow plug

- ❑ With ceramic glow plugs, observe notes under all circumstances ⇒ [page 213](#).
- ❑ 15 Nm

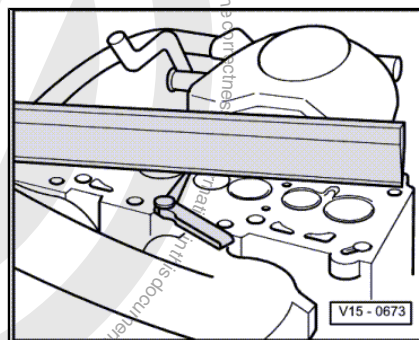
36 - Tensioning roller

- ❑ Both versions of engine support must be removed to change the tensioning roller ⇒ [page 73](#).

37 - Nut

- ❑ 20 Nm +45°

Checking cylinder head for distortion



Special tools and workshop equipment required

- ◆ Straight edge
- ◆ Feeler gauges

Max. permissible distortion: 0.1 mm.



Note

Reworking diesel cylinder heads is not permissible.

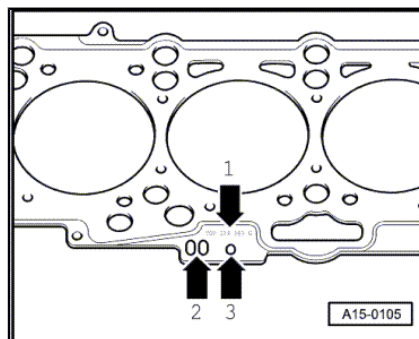
Cylinder head gasket identification

- ◆ Part No. = -arrow 1-
- ◆ Production control code = -arrow 2- (disregard)
- ◆ Holes = -arrow 3-



Note

- ◆ *Different thicknesses of cylinder head gasket are fitted depending on the piston projection. When renewing gasket, install new gasket with same identification.*
- ◆ *Piston projection at TDC must be determined when installing new pistons or a short engine ⇒ [page 56](#).*

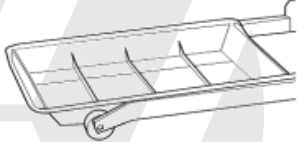
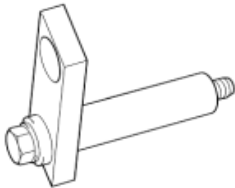




1.2 Removing and installing cylinder head

Special tools and workshop equipment required

- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Torque wrench 40-200 Nm - V.A.G 1332-
- ◆ Hand vacuum pump with accessories - V.A.G 1390- or hand vacuum pump - VAS 6213-
- ◆ Water drainage container - V.A.G 1390/1-
- ◆ Bracket - T10014-

V.A.G 1306 	V.A.G 1331 
V.A.G 1332 	V.A.G 1390 
V.A.G 1390/1 	T 10014  W15-0127



- ◆ Support bracket - 10-222A- with adapters - 10-222A/13-



Note

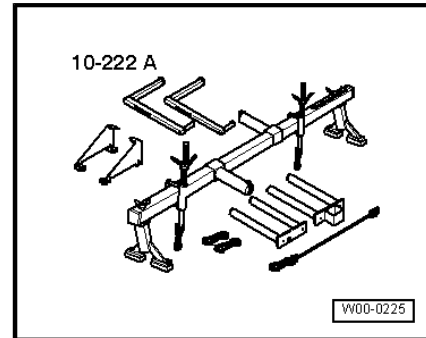
All cable ties which are opened or cut through when cylinder head is removed must be fastened in the same position when cylinder head is installed.



Caution

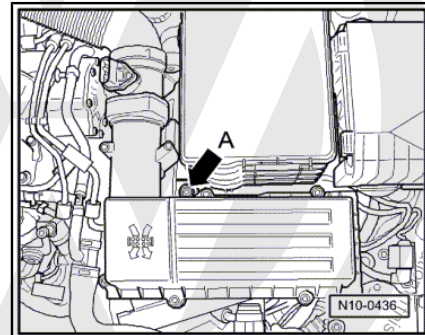
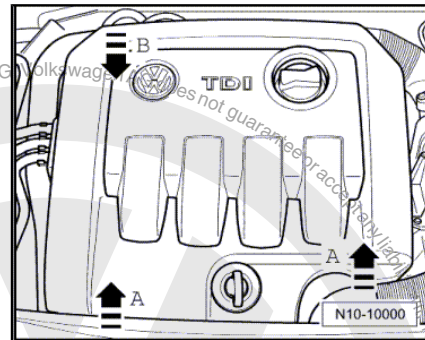
When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:

- ◆ **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.**
- ◆ **Ensure that there is sufficient clearance to all moving or hot components.**



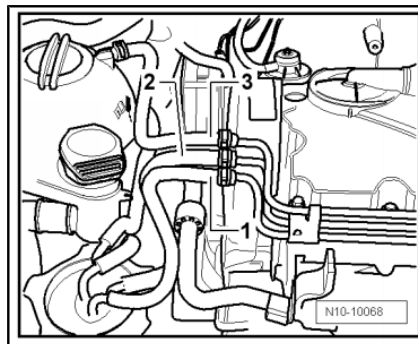
Removing

- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.
- Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead .
- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.
- Remove air filter housing with air mass meter and connecting pipe .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Drain coolant ⇒ [page 121](#) .
- Before removing cylinder head, extract fuel from tandem pump using hand vacuum pump with accessories - V.A.G 1390- and water drainage container - V.A.G 1390/1- .





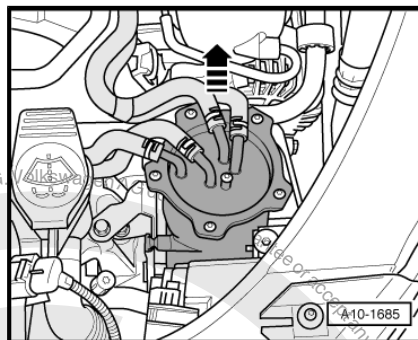
- Pull off fuel supply hose -2-, fuel return hose -1- and coolant hose -3-.



- Pull fuel filter out of its bracket or unscrew it and lay aside with hoses connected.
- If fitted, unscrew bracket for fuel filter.

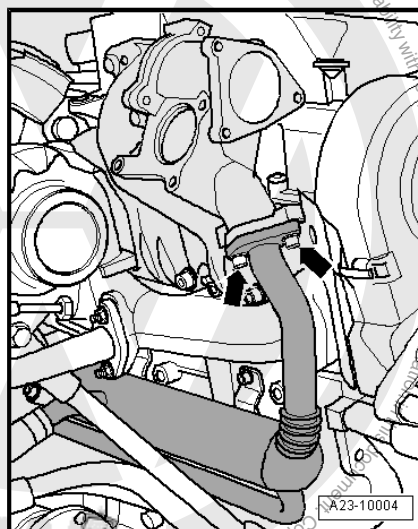
Engine code BJB

- Remove exhaust gas recirculation connecting pipe
⇒ [page 207](#) .
- Remove turbocharger support and oil return from turbocharger
⇒ [page 159](#) .



Engine codes BLS, BSU:

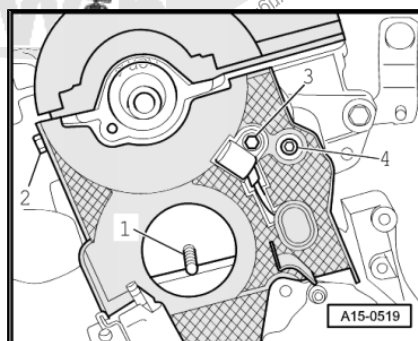
- Unscrew bolts -arrows- from connecting pipe to exhaust gas recirculation cooler.
- Remove turbocharger support with oil return pipe
⇒ [page 159](#) .



Continuation for all vehicles:

- Remove oil supply line and lay to side ⇒ [page 117](#) .
- Remove toothed belt ⇒ [page 73](#) .
- Remove toothed belt tensioning roller.
- Remove hub for camshaft pulley ⇒ [page 99](#) .

- Unscrew rear toothed belt guard securing bolts -2- and -4-.
- Unscrew Hall sender - G40- -3-.
- Pull off or disconnect all electrical connections from cylinder head as necessary and lay them to one side.
- Disconnect all connection, coolant, vacuum and intake hoses from cylinder head.



Note

Both lifting eyes for the support bracket are located on the cylinder head. This is the reason why an additional bracket must be attached to the cylinder head to support the engine.

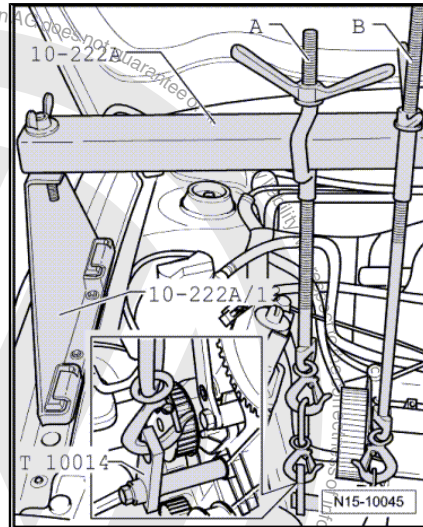


- Bolt retainer - T10014- to threaded hole above coolant pump.

Specified torque

Component	Specified torque
Retainer - T10014- to cylinder block	20 Nm

- Then, lift engine slightly using spindle -A- until spindle -B- is relieved.
- Detach spindle -B- und push to side.
- Remove cylinder head cover ⇒ [page 67](#) .



- Maintain sequence when loosening and tightening cylinder head bolts.
- Lift cylinder head slightly, guide it past toothed belt guard and remove it from engine (on vehicles 06.05 ►, toothed belt tensioning roller remains in the engine support).

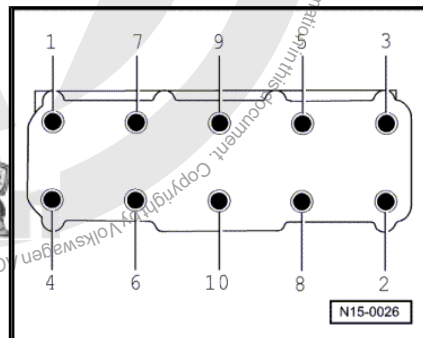
Installing

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



Note

- ◆ Always renew cylinder head bolts.
 - ◆ In cases of repair carefully remove gasket remains from cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces. When using abrasive paper do not use a grade less than 100.
 - ◆ Carefully remove remains of emery and abrasives.
 - ◆ Do not remove new cylinder head gasket from packaging until it is ready to be fitted.
 - ◆ Handle gasket very carefully. Damage to the silicone coating or the indented area will lead to leaks.
 - ◆ Note identification on cylinder head gasket ⇒ [page 62](#) .
 - ◆ On vehicles 06.05 ► cylinder head must be fitted so that tensioning roller stud is guided into tensioning roller in engine support. To do this, a second person is necessary.
- Turn crankshaft to TDC marking before fitting cylinder head.
 - Turn crankshaft against engine direction of rotation until all pistons are about the same distance below TDC.
 - Position cylinder head gasket.
 - Fit cylinder head and hand-tighten all cylinder head bolts.





- Tighten cylinder head in 4 stages in sequence shown as follows:

1 - Tighten initially with torque wrench:

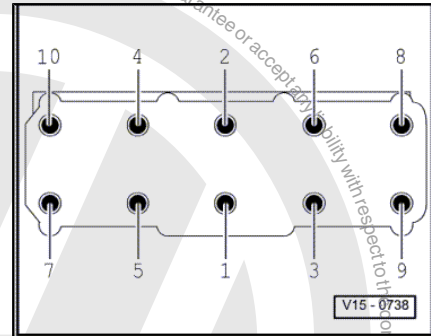
Stage I = 35 Nm

Stage II = 60 Nm

2 - Turn further with rigid spanner:

Stage III = $\frac{1}{4}$ turn (90°)

Stage IV = $\frac{1}{4}$ turn (90°)



- After tightening cylinder head, turn camshaft so that cams for No. 1 cylinder point equally upwards. Turn crankshaft, in engine direction of rotation, to TDC marking before fitting toothed belt ⇒ [page 73](#).

- Install hub for camshaft pulley ⇒ [page 99](#).

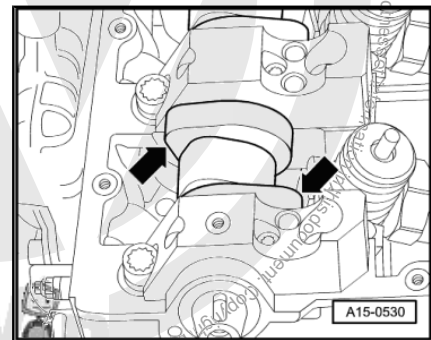
- Install toothed belt ⇒ [page 73](#)

- Install poly V-belt ⇒ [page 30](#).

Engine code BJB:

- Install turbocharger support and oil return for turbocharger ⇒ [page 159](#).

- Install exhaust gas recirculation connecting pipe ⇒ [page 207](#).



Engine codes BLS, BSU:

- Install turbocharger support with oil return pipe ⇒ [page 159](#).

- Install connection pipe to exhaust gas recirculation cooler ⇒ [page 208](#).

Continuation for all vehicles:

- Install oil supply line ⇒ [page 117](#).
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation.
- Install plenum chamber bulkhead ⇒ General body repairs; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead.
- Replenish coolant ⇒ [page 121](#).
- Carry out road test and read event memory afterwards ⇒ Vehicle diagnostic tester.

Specified torques

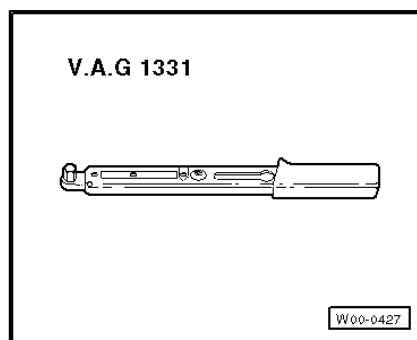
- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 59](#)
- ◆ ⇒ ["2.1 Assembly overview - toothed belt drive", page 72](#)
- ◆ ⇒ ["4.1 Assembly overview - exhaust gas recirculation system, engine code BJB", page 207](#)
- ◆ ⇒ ["4.2 Assembly overview - exhaust gas recirculation system, engine codes BLS, BSU", page 208](#)
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ Rep. gr. 50 ; Assembly overview - noise insulation

1.3 Removing and installing cylinder head cover

Special tools and workshop equipment required



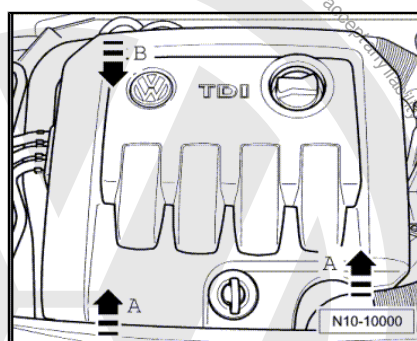
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-



- ◆ Sealant - AMV 174 004 01-

Removing

- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-
- Disconnect crankcase breather hose from connection on rear of charge air pipe.



- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe. To do this, raise retaining clips -arrows- slightly.
- Remove upper toothed belt guard.

Engine code BJB:

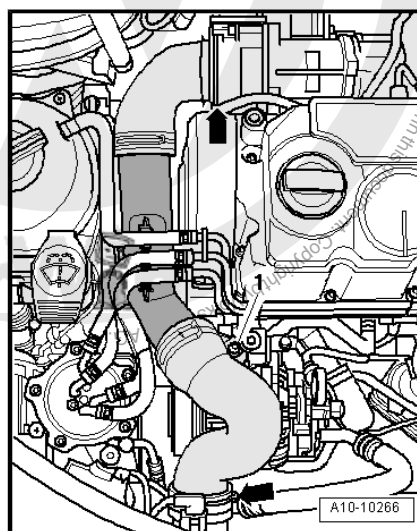
- Unbolt intake connecting pipe ➔ [page 182](#) .

Engine codes BLS, BSU:

- Pull vacuum hose off cylinder head cover.
- Disconnect connector on intake manifold flap motor - V157- and pull line off cylinder head cover.

Continuation for all vehicles:

- Unbolt cylinder head cover.



Installing

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

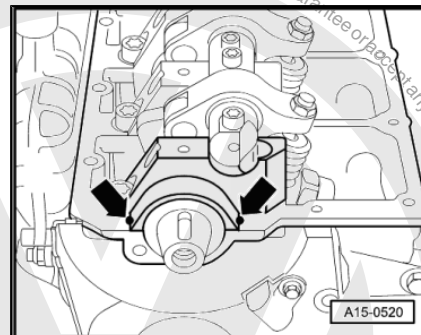


Note

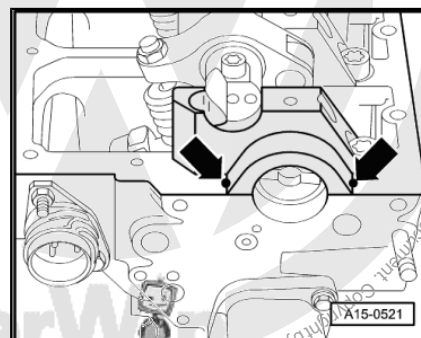
Renew cylinder head cover gasket and seal for bolts if damaged.



- Apply a drop of sealant - AMV 174 004 01- (diameter: approx. 5 mm) on edges of both sealing surfaces of bearing cap and cylinder head at front of engine -arrows-.



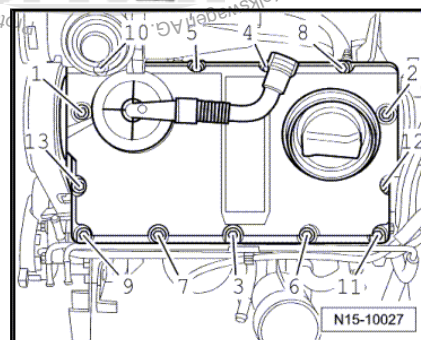
- Apply a drop of sealant - AMV 174 004 01- (diameter: approx. 5 mm) on edges of both sealing surfaces of bearing cap and cylinder head at rear of engine -arrows-.



Engine code BJB:

- Hand-tighten cylinder head cover in the sequence 1 ... 13.
- Tighten bolts in sequence 1 ... 13.

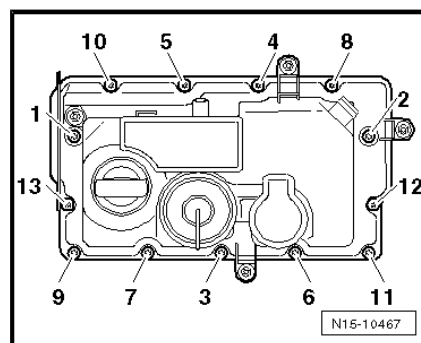
Engine codes BLS, BSU:



- Hand-tighten cylinder head cover in the sequence 1 ... 13.
- Tighten bolts in sequence 1 ... 13.

Specified torques

- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 59](#)





1.4 Checking compression

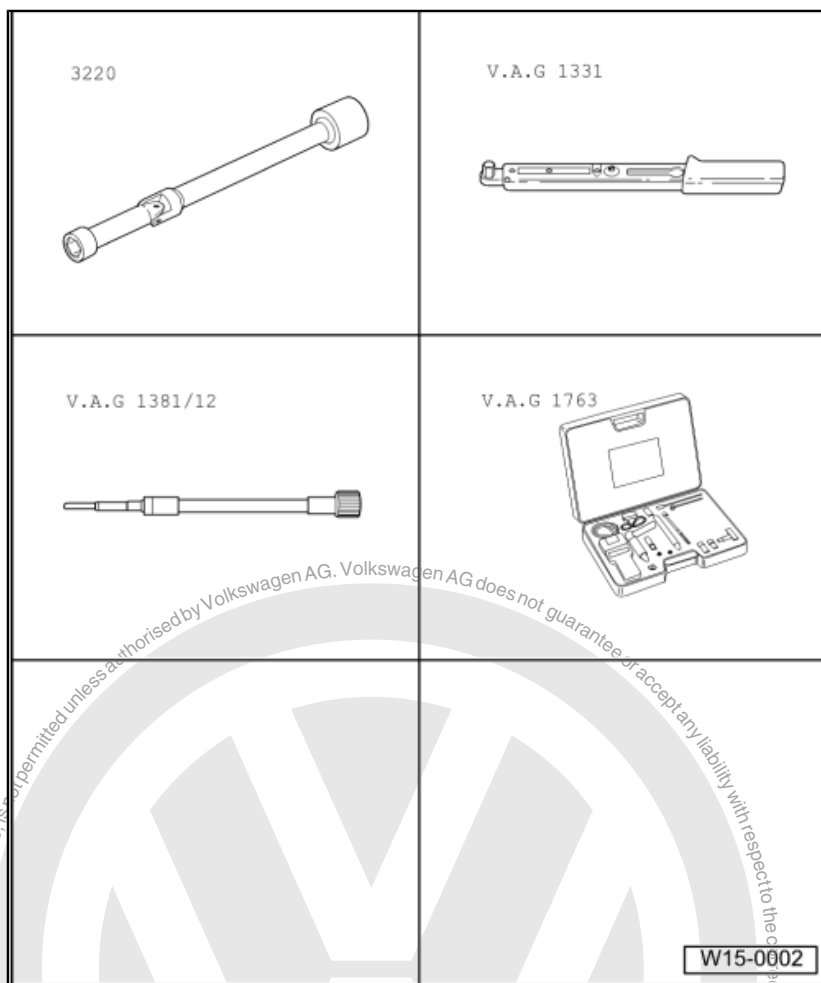


Note

If ceramic glow plugs are fitted, before removing check idling speed smooth running control using vehicle diagnosis, testing and information system ⇒ Vehicle diagnostic tester. The compression test is warranted only if one or more cylinders are conspicuous in this idling speed check.

Special tools and workshop equipment required

- ◆ U/J extension and socket, 10 mm - 3220-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Adapter - V.A.G 1381/12-
- ◆ Compression tester - V.A.G 1763-



Test prerequisite

- Engine oil temperature min. 30 °C.

Test procedure



Note

Observe characteristic features of ceramic glow plugs.

- Detach central connector from unit injectors.



- Remove all glow plugs using U/J extension and socket, 10 mm - 3220- .
- Screw in adapter - V.A.G 1381/12- in place of the glow plugs.
- Check compression using compression tester - V.A.G 1763- .



Note

Using compression tester ⇒ operating instructions .

- Operate starter until tester shows no further pressure increase.

Compression pressures:

New: 25 ... 31 bar.

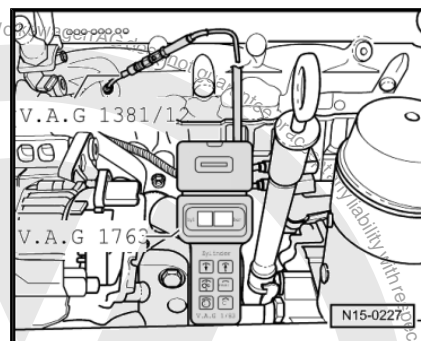
Wear limit: 19 bar.

Maximum permissible difference between all cylinders: 5 bar

- Install glow plugs using U/J extension and socket, 10 mm - 3220- .
- Read engine control unit event memory ⇒ Vehicle diagnostic tester.

Specified torques

- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 59](#)





2 Toothed belt drive

⇒ [“2.1 Assembly overview - toothed belt drive”, page 72](#)

⇒ [“2.2 Removing and installing toothed belt”, page 73](#)

⇒ [“2.2.1 Removing and installing toothed belt \(vehicles with engine support bolted close to engine\)”, page 74](#)

⇒ [“2.2.2 Removing and installing toothed belt \(vehicles with engine support bolted further away from engine\)”, page 83](#)

⇒ [“2.3 Loosening and securing toothed belt”, page 90](#)

2.1 Assembly overview - toothed belt drive

1 - Toothed belt guard upper part

2 - Bolt

- 100 Nm

3 - Bolt

- 25 Nm

4 - Camshaft pulley

5 - Hub

- With sender wheel
- Removing and installing
⇒ [page 99](#).

6 - Bolt

- Renew after removing.
- 10 Nm

7 - Stud

- 15 Nm

8 - Rear toothed belt guard

9 - Bolt

- 25 Nm

10 - Sealing grommet

- Renew if damaged.

11 - Nut

- 20 Nm +45°

12 - Tensioning roller

13 - Nut

- 20 Nm

14 - Guide roller

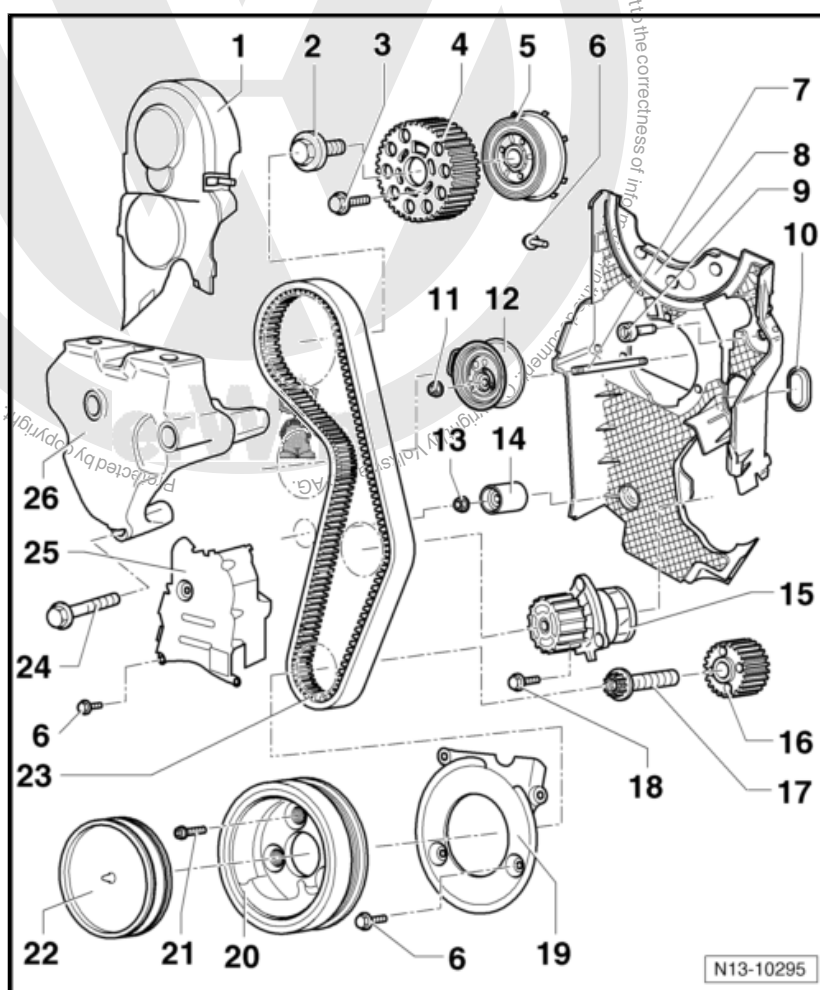
15 - Coolant pump

- Removing and installing ⇒ [page 132](#).

16 - Crankshaft pulley

17 - Bolt

- Renew after removing.
- Do not additionally oil or grease the threads and shoulder.
- Turning further can be done in several stages.
- 120 Nm + 90°





18 - Bolt

- ☐ 15 Nm

19 - Toothed belt guard lower part

20 - Belt pulley and vibration damper

- ☐ Can only be installed in one position. Holes are offset.

21 - Bolt

- ☐ 10 Nm + 90°

22 - Cover

23 - Toothed belt

- ☐ Mark direction of rotation before removing.
- ☐ Check for wear.
- ☐ Do not kink.
- ☐ Removing and installing ⇒ [page 73](#) .

24 - Bolt

- ☐ Renew after removing.
- ☐ 40 Nm +180°

25 - Toothed belt guard centre part

26 - Engine support

2.2 Removing and installing toothed belt



Note

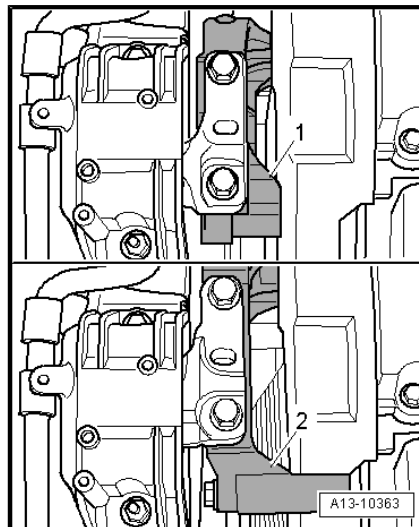
- ◆ *If the toothed belt is renewed during a repair measure, enter this in the service schedule of vehicle wallet.*
- ◆ *If the toothed belt is only loosened during a repair measure and only valve timing must be readjusted ⇒ [page 90](#) .*
- ◆ *A revised engine support has been introduced in the meantime and it is no longer necessary to remove the engine support and to support the engine for the procedure "removing, installing and tensioning toothed belt".*
- ◆ *Both versions of the engine support must be removed to change the tensioning roller.*

– Check which engine support is installed in the vehicle.

-1-: Engine support bolted close to engine (removal necessary)
⇒ [page 74](#) .



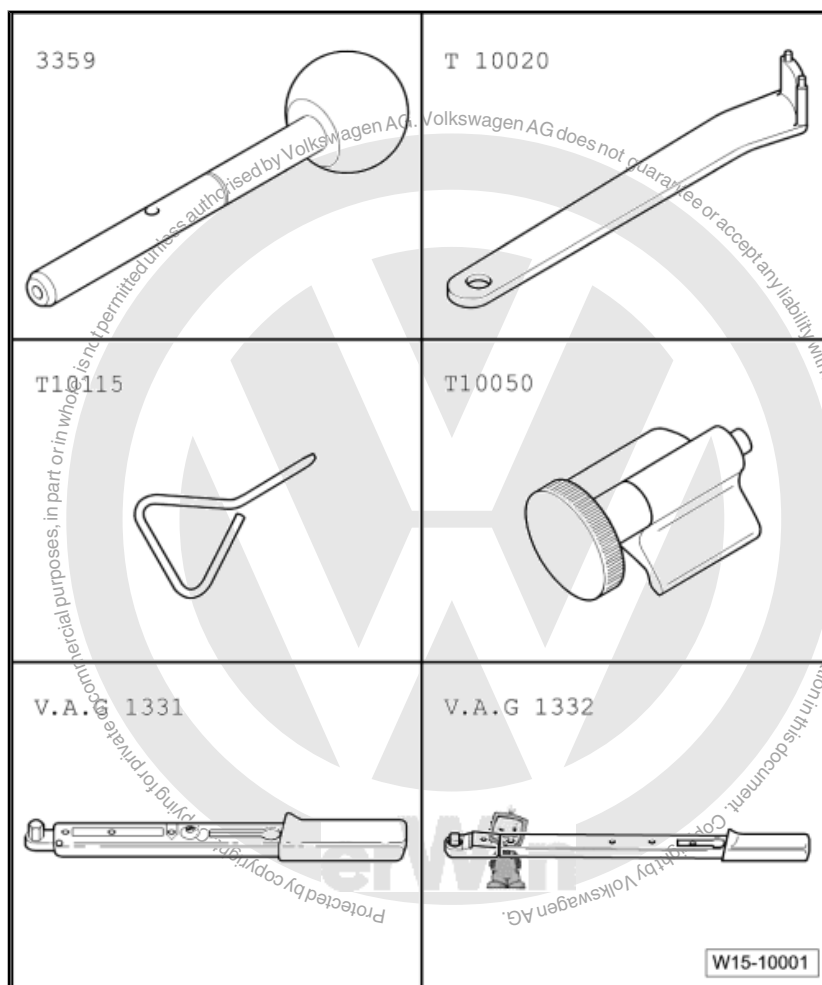
-2-: Engine support bolted further away from engine (removal not necessary) ⇒ [page 83](#) .



2.2.1 Removing and installing toothed belt (vehicles with engine support bolted close to engine)

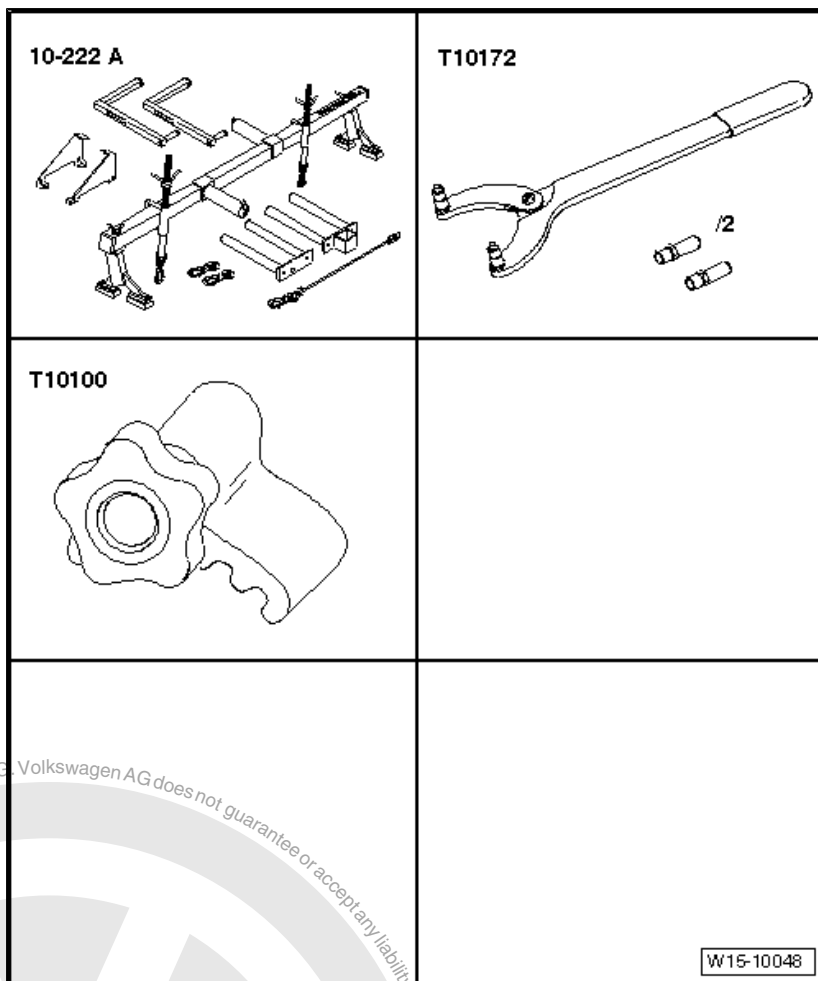
Special tools and workshop equipment required

- ◆ Locking pin - 3359-
- ◆ 2-hole pin wrench - T10020-
- ◆ Locking pin - T10115-
- ◆ Crankshaft stop - T10050-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Torque wrench 40-200 Nm - V.A.G 1332-





- ◆ Support bracket - 10 - 222 A- with adapter - 10 - 222 A /22- and adapter - 10 - 222 A /3-
- ◆ Counterhold tool - T10172- with pins - T10172/4-
- ◆ Crankshaft stop - T10100- (on vehicles with oval crankshaft belt pulley)



Note

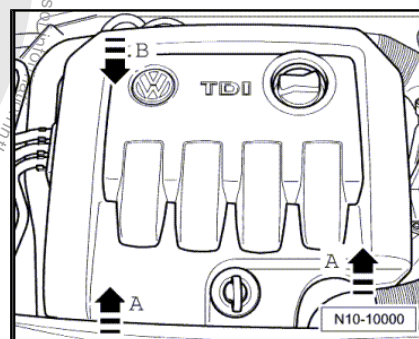
Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.

- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.

Engine code: BJB

- Remove connecting pipe between charge air cooler and intake connection.

Engine codes: BLS, BSU

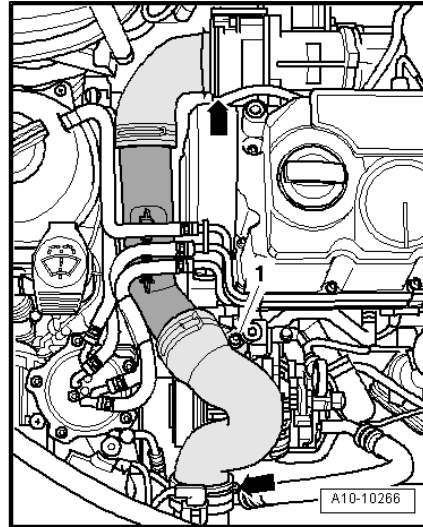




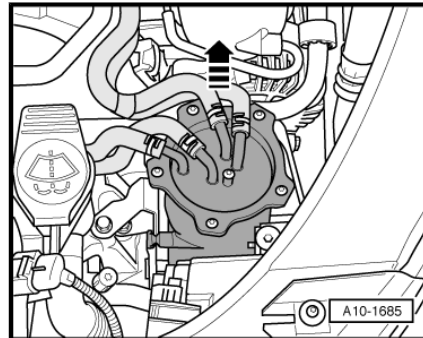
- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connection, raising retaining clips -arrows- slightly to do so.

Continuation for all engines:

- Remove upper toothed belt guard.

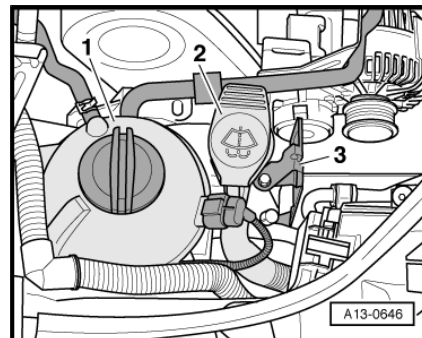


- Unscrew fuel filter, pull out of its bracket and lay aside together with connected hoses.





- Unscrew bolt at filler neck -2- for washer fluid reservoir.
- If fitted, unscrew bracket -3- for fuel filter.
- Disconnect electrical connector from coolant expansion tank -1-.
- Unscrew coolant expansion tank. Do not disconnect the hoses. Place expansion tank on engine.
- If fitted, remove power steering reservoir.
- Remove poly V-belt ⇒ [page 30](#) .
- Remove poly V-belt tensioning element.
- Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner .



Engine code: BJB

- Remove charge air pipe between charge air cooler and exhaust turbocharger ⇒ [page 162](#) .
- Remove flexible charge air pipe between exhaust turbocharger and air filter.



Note

Carefully seal the openings in the charge air routing, e.g. with a clean cloth, to prevent the ingress of particles of dirt.

Continuation for all engines:

- Remove vibration damper/belt pulley.
- Remove lower and centre toothed belt guards
- Fit engine support bracket - 10 - 222 A- with adapter - 10 - 222 A /22- and take up weight of engine in installation position.



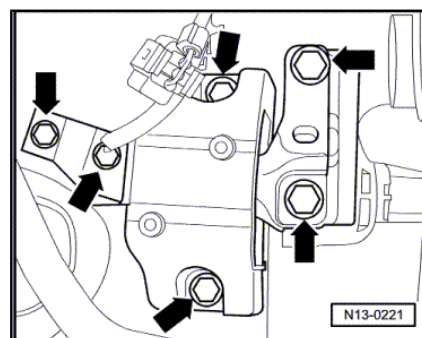
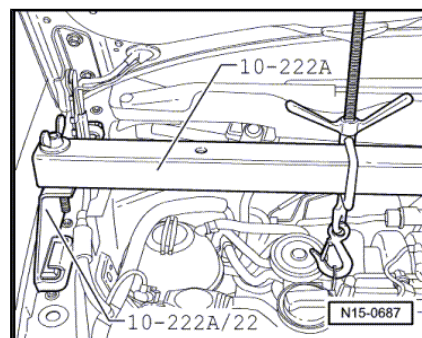
Note

♦ If toothed belt is to be removed in order to remove cylinder head, set up support bracket - 10-222A- with higher adapters - 10-222A/13- . This will provide the space necessary for removing the cylinder head.

♦ The assembly mounting may only be removed if the engine is supported with support bracket - 10-222A- !

♦ The engine bracket must be loosened only when the assembly mounting has been removed.

- Unscrew securing bolts from assembly mounting/engine support and assembly mounting/body -arrows-. After that, remove assembly mounting completely.





- Slightly lift up engine using engine support bracket - 10-222A- until both upper bolts of engine bracket can be loosened.
- Lower engine with support bracket - 10-222A- slightly in order to loosen lower bolt of engine bracket.
- Remove engine bracket downwards.



Note

Only oval crankshaft pulleys are installed at factory. When installing this toothed belt pulley, the crankshaft stop - T10100- must be installed to determine the TDC position.

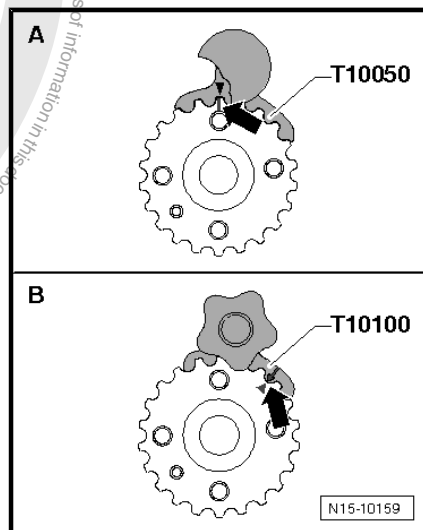
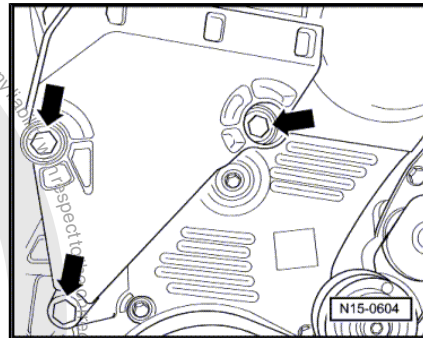
Characteristics of crankshaft pulley:

A = Round toothed belt pulley, lock using crankshaft stop - T10050- , TDC marking at 12 o'clock

B = Oval toothed belt pulley, lock using crankshaft stop - T10100- , TDC marking at 1 o'clock

Vehicles with round crankshaft pulley:

- Set engine to TDC No. 1 cylinder.



Note

Turn crankshaft until marking on crankshaft pulley and tooth segment of camshaft pulley is on top. The marking on the rear toothed belt guard must align with the marking on the camshaft sender wheel -arrow-.

- Lock hub with diesel injection pump locking pin - 3359- . Insert locking pin through free elongated hole on left into hole in cylinder head.
- Lock crankshaft pulley in position with crankshaft stop - T10050- . To do this, push crankshaft stop - T10050- into teeth of toothed belt pulley from latter's face side.



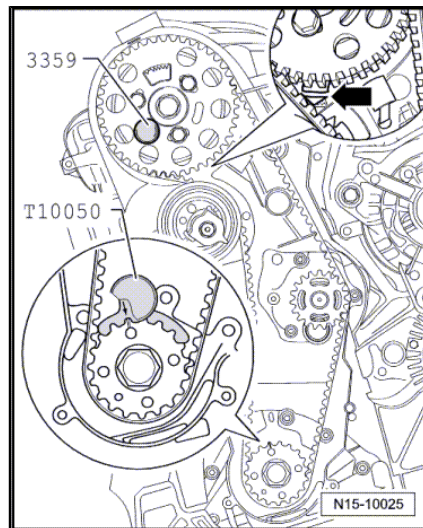
Note

The marks on the crankshaft pulley and the crankshaft stop - T10050- must be aligned. At the same time, the pin of the crankshaft stop - T10050- must engage in the drilling in the sealing flange.

- Mark direction of rotation of toothed belt.

Vehicles with oval crankshaft pulley:

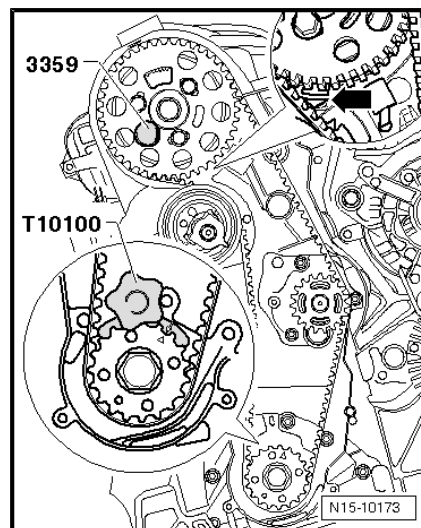
- Set engine to TDC No. 1 cylinder.



**Note**

Turn crankshaft until marking on crankshaft pulley and tooth segment of camshaft pulley is on top. The marking on the rear toothed belt guard must align with the marking on the camshaft sender wheel -arrow-.

- Lock hub with diesel injection pump locking pin - 3359- . To do this, insert locking pin through free elongated hole on left into hole in cylinder head.
- Lock crankshaft pulley in position with crankshaft stop - T10100- . To do this, push crankshaft stop - T10100- into teeth of toothed belt pulley from latter's face side.

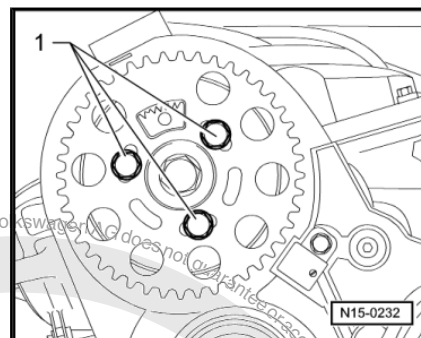
**Note**

The marks on the crankshaft pulley and the crankshaft stop - T10100- must be aligned. At the same time, the pin of the crankshaft stop - T10100- must engage in the drilling in the sealing flange.

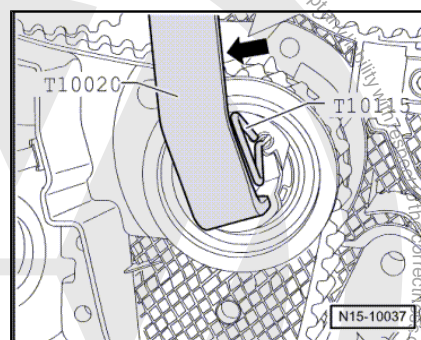
- Mark direction of rotation of toothed belt.

Continuation for all vehicles:

- Loosen securing bolts -1- of camshaft pulley until camshaft pulley can be moved within elongated holes.
- Loosen tensioning roller securing nut.



- Turn 2-hole pin wrench - T10020- anti-clockwise until toothed belt tensioning roller can be locked using locking pin - T10115- .





- Turn 2-hole pin wrench - T10020- clockwise as far as stop and hand-tighten securing nut -1-.
- Remove toothed belt first from coolant pump and then from remaining toothed pulleys.

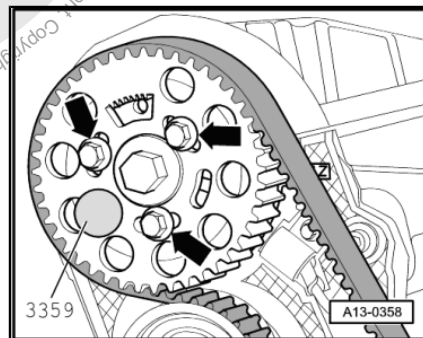
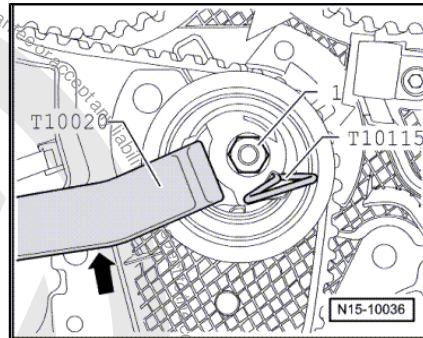
Installing

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



Note

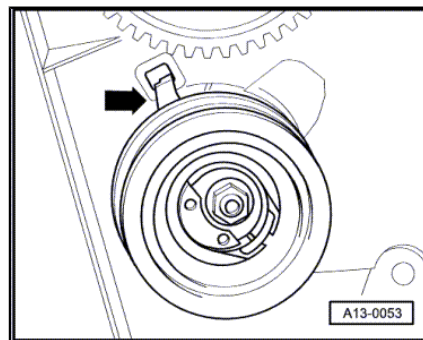
- ◆ *Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.*
- ◆ *Renew self-locking bolts and nuts => [page 72](#) .*
- Camshaft locked with locking pin - 3359- .
- The crankshaft is locked with crankshaft stop - T10050- or crankshaft stop - T10100- .
- Tensioning roller locked with locking pin - T10115- and secured to right stop.
- Turn camshaft pulley in its elongated holes to centre position -arrows-.
- Fit toothed belt to crankshaft pulley, tensioning roller, camshaft pulley and idler pulley.
- Finally, fit toothed belt on coolant pump toothed belt pulley.



Note

Ensure that tensioning roller seats correctly in rear toothed belt guard -arrow-.

- Undo securing nuts of tensioning roller and pull out locking pin - T10115- .

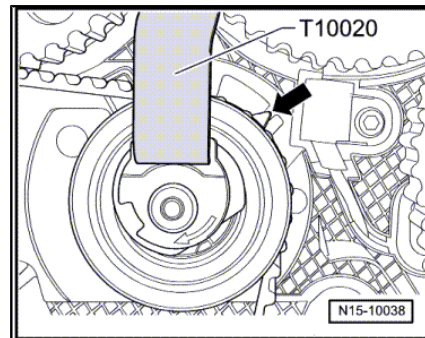




- Now carefully turn tensioning roller clockwise using 2-hole pin wrench - T10020- until indicator is in middle of gap in base plate -arrow-.

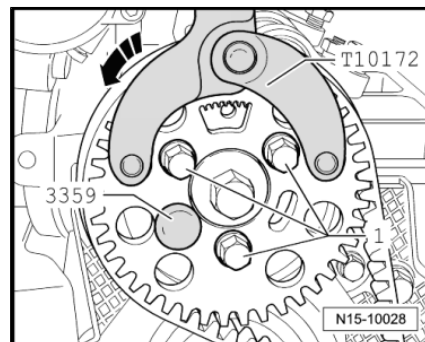
Ensure that securing nut does not turn as well.

- Hold tensioning roller in this position and tighten securing nut of tensioning roller.



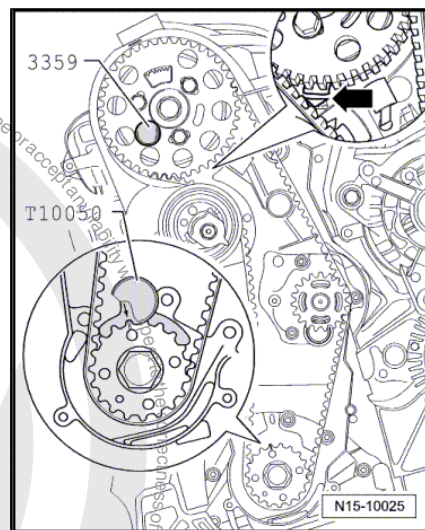
- Fit counterhold - T10172- with pin - T10172/4- as shown. Press counter-hold tool - T10172- in direction of arrow and keep camshaft sprocket in pretensioning position.
- In this position, tighten camshaft pulley securing bolts -1-.
- Remove locking pin - 3359- and crankshaft stop - T10050- .
- Turn crankshaft two revolutions in direction of engine rotation until crankshaft is just before TDC for No. 1 cylinder.

Vehicles with round crankshaft pulley:

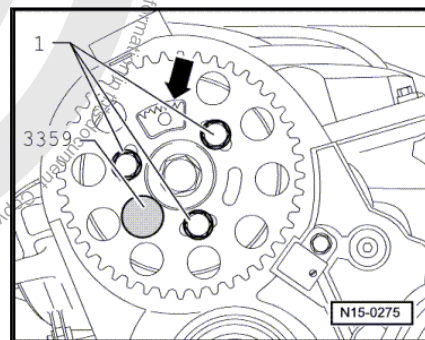


- Lock hub with locking pin - 3359- whilst turning engine in direction of rotation.
- Check whether crankshaft can be locked with crankshaft stop - T10050- .

If crankshaft cannot be locked:



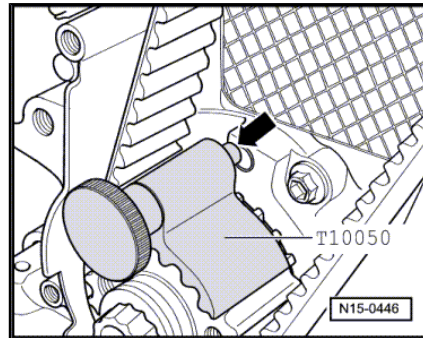
- Loosen securing bolts -1- of camshaft pulley.





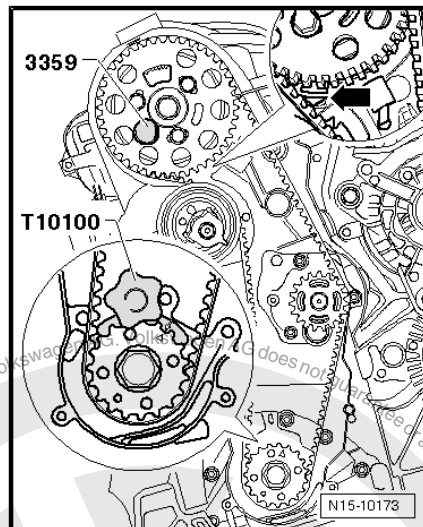
- Turn crankshaft slightly against direction of engine rotation until pin of crankshaft stop is positioned just before hole in sealing flange -arrow-.
- Turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange whilst turning.

Vehicles with oval crankshaft pulley:

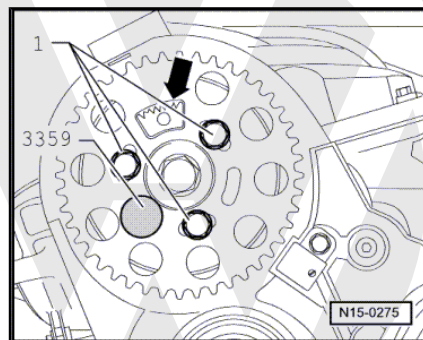


- Lock hub with locking pin - 3359- whilst turning engine in direction of rotation.
- Check whether crankshaft can be locked with crankshaft stop - T10100- .

If crankshaft cannot be locked:

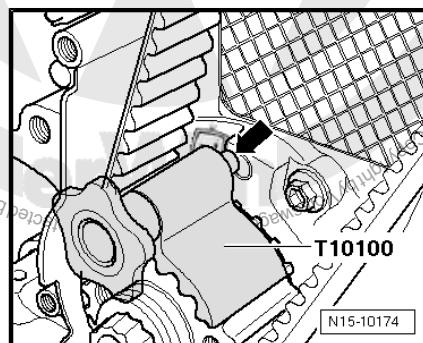


- Loosen securing bolts -1- of camshaft pulley.



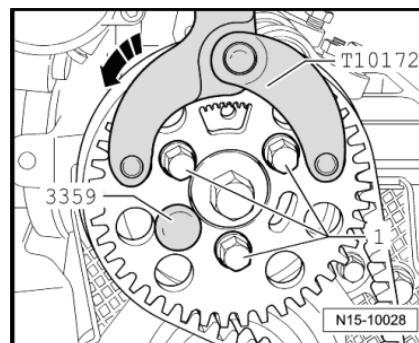
- Turn crankshaft slightly against direction of engine rotation until pin of crankshaft stop is positioned just before hole in sealing flange -arrow-.
- Now, turn crankshaft in direction of engine rotation until crankshaft stop pin engages in sealing flange whilst turning.

Continuation for all vehicles:





- Fit counterhold - T10172- with pin - T10172/4- as shown. Press counter-hold tool - T10172- in direction of arrow and keep camshaft sprocket in pretensioning position.
- In this position, tighten camshaft pulley securing bolts -1-.
- Remove locking pin - 3359- and crankshaft stop - T10050- or crankshaft stop - T10100- .
- Turn crankshaft two revolutions in direction of engine rotation until crankshaft is just before TDC for No. 1 cylinder.
- Repeat measurement.



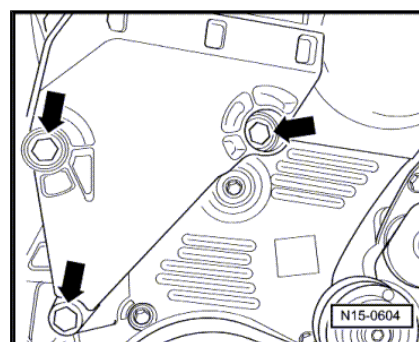
- Position engine bracket on cylinder block and tighten securing bolts.



Note

Before installing assembly mounting, tighten all engine bracket bolts to specified torque.

- Install engine to body assembly mounting(renew securing bolts).
- Bolt engine assembly mounting to engine bracket. Bring contact surfaces together using support bracket - 10-222A- .
- Remove middle and lower toothed belt guards.
- Install vibration damper/belt pulley.
- Install poly V-belt ⇒ [page 30](#) .
- Install upper toothed belt guard.
- Install charge air cooler / turbocharger and charge air cooler / intake connecting pipes ⇒ [page 162](#) .
- Install front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner .
- If available, install power steering reservoir.
- Install coolant expansion tank.
- Install fuel filter and, if fitted, fuel filter bracket.
- Bolt on filler neck for window wash system.



Specified torques

- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 26](#)
- ◆ ⇒ ["2.1 Assembly overview - toothed belt drive", page 72](#)
- ◆ ⇒ ["1.2 Assembly overview - poly V-belt drive with vane pump", page 29](#)

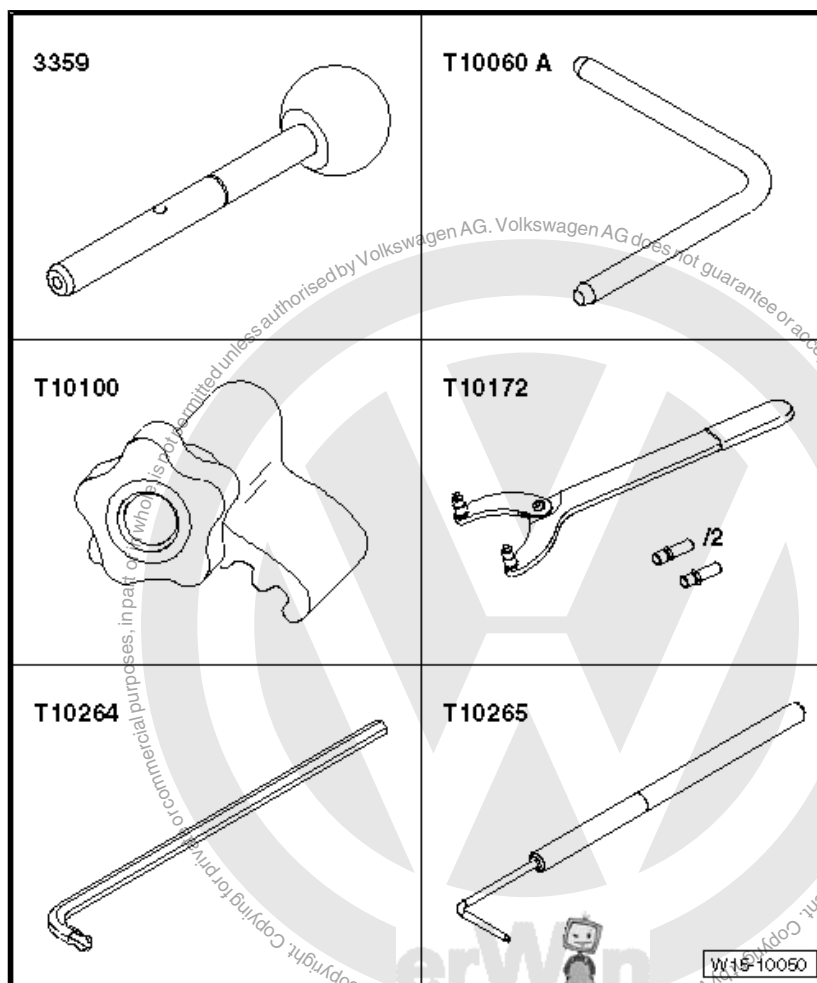
2.2.2 Removing and installing toothed belt (vehicles with engine support bolted further away from engine)





Special tools and workshop equipment required

- ◆ Diesel injection pump locking pin - 3359-
- ◆ Locking pin - T10060 A-
- ◆ Crankshaft stop - T10100-
- ◆ Counterhold tool - T10172-
- ◆ Special wrench, long reach - T10264-
- ◆ Locking tool - T10265-



Removing



WARNING

There is a danger of fuel running out.

The fuel system is under pressure.

Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

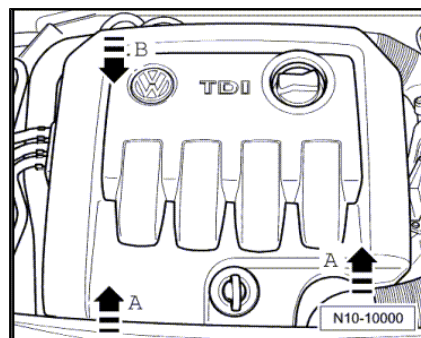


Note

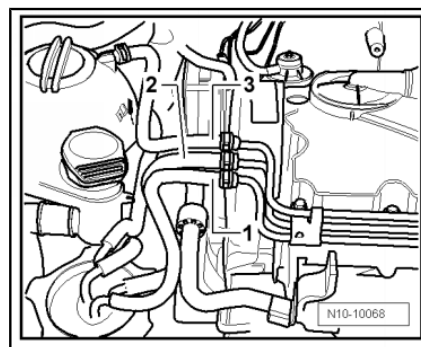
Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.



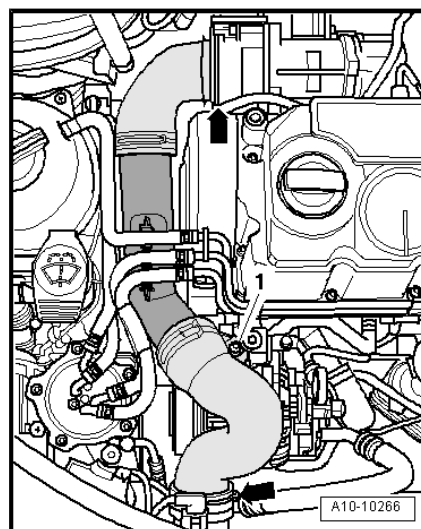
- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.



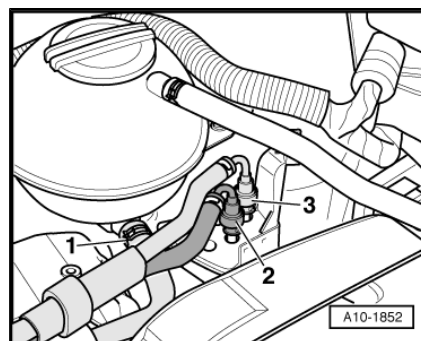
Pull off fuel supply hose -2-, fuel return hose -1- and coolant hose -3-.



- Remove connecting pipe between charge air cooler and intake connecting pipe. To do this, raise retaining clips -arrows- slightly.

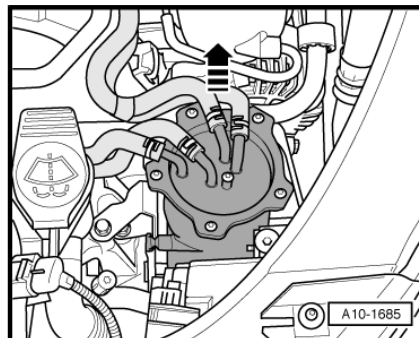


- Disconnect fuel supply line -3- and return line -2- by pulling release tabs.

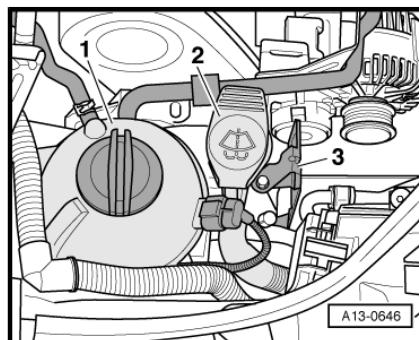




- Pull fuel filter out of its bracket or unscrew it and lay aside with hoses connected.
- Unscrew bolt at filler neck -2- for washer fluid reservoir.
- If fitted, unscrew bracket -3- for fuel filter.



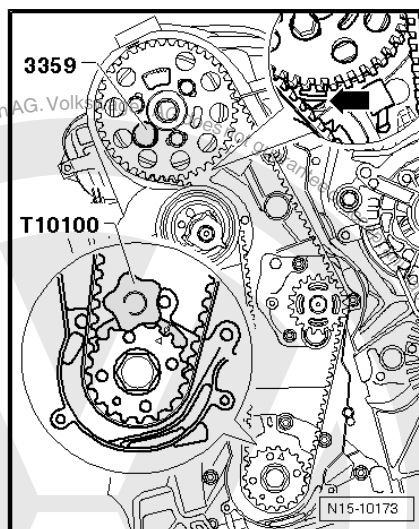
- Disconnect connector from coolant expansion tank -1-.
- Remove coolant expansion tank and place on engine. Do not disconnect hoses.
- Remove poly V-belt ⇒ [page 30](#) .
- Remove poly V-belt tensioning element.
- Remove upper toothed belt guard.
- Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner .
- Remove vibration damper/belt pulley.
- Remove lower and centre toothed belt guards
- Set engine to TDC No. 1 cylinder.



Note

Turn crankshaft until marking on crankshaft pulley and tooth segment of camshaft pulley is on top. The marking on the rear toothed belt guard must align with the marking on the camshaft sender wheel -arrow-.

- Lock hub with diesel injection pump locking pin - 3359- . To do this, insert locking pin through free elongated hole on left into hole in cylinder head.
- Lock crankshaft pulley in position with crankshaft stop - T10100- . To do this, push the crankshaft stop into the teeth of the toothed belt pulley from the latter's face side.



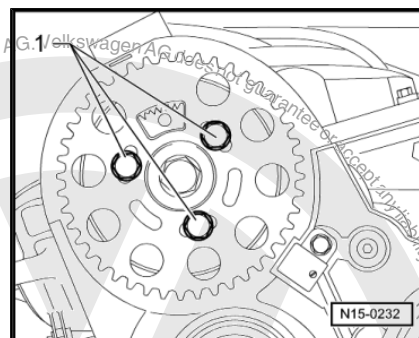
Note

The markings on the crankshaft pulley and the crankshaft stop must align. When doing this, the pin of the crankshaft stop must engage in the drilling of sealing flange.

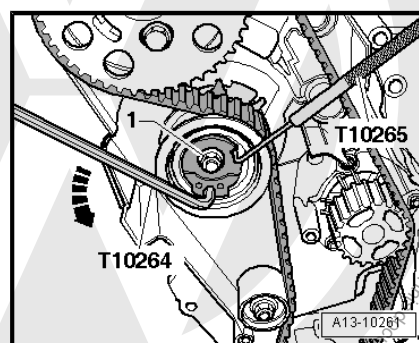
- Mark direction of rotation of toothed belt.



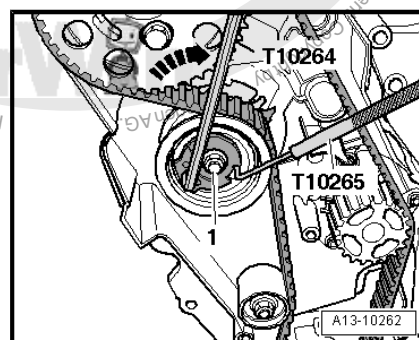
- Loosen securing bolts -1- of camshaft pulley until camshaft pulley can be moved within elongated holes.



- Loosen tensioning roller securing nut -1-.
- Turn eccentric of tensioning roller anti-clockwise -arrow- using angle screwdriver - T10264- , until the tensioning roller can be locked with locking tool - T10265-



- Now turn eccentric of tensioning roller clockwise -arrow- onto stop and tighten securing nut -1- hand-tight.
- Remove toothed belt first from coolant pump and then from remaining toothed belt pulleys.



Installing

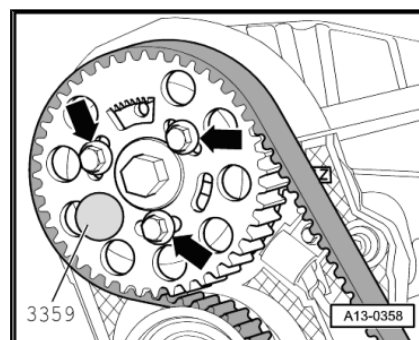
- Camshaft locked with locking pin - 3359- .
- Crankshaft locked in position with crankshaft stop - T10100- .
- Tensioning roller locked with locking pin - T10265- and secured to right stop with securing nut.



Note

Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.

- Turn camshaft pulley in its elongated holes to centre position -arrows-.
- Guide toothed belt through gap between engine support and engine.
- Fit toothed belt to crankshaft pulley, tensioning roller, camshaft pulley and idler pulley.
- Finally, fit toothed belt on coolant pump toothed belt pulley.





Note

Ensure that tensioning roller seats correctly in rear toothed belt guard -arrow-.

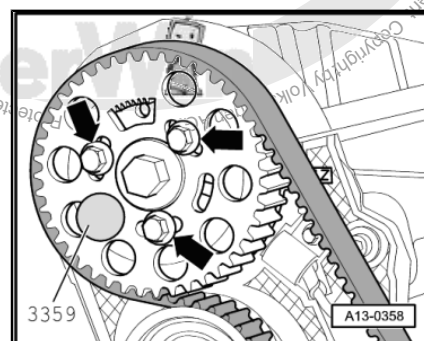
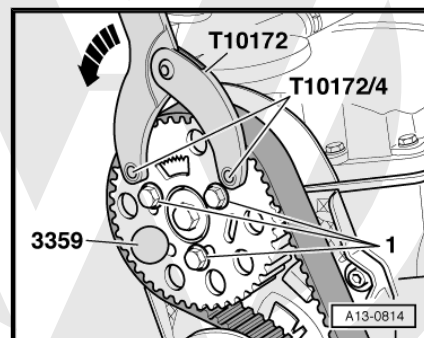
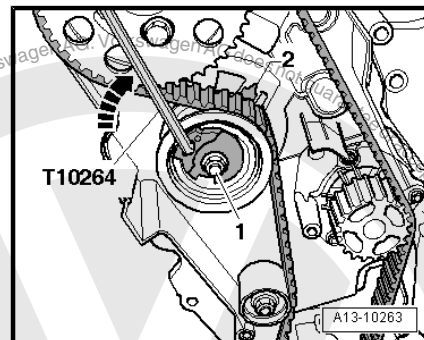
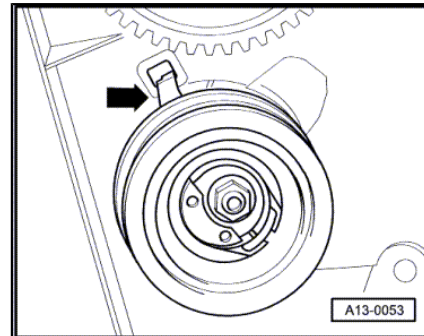
- Pull out the locking pin - T10265- from the tension roller.
- Loosen tensioning roller securing nut -1-.
- Carefully turn eccentric of tensioning roller clockwise -arrow- using angled screwdriver - T10264- until indicator -2- is in the middle of gap in base plate.



Note

Ensure that securing nut does not turn as well.

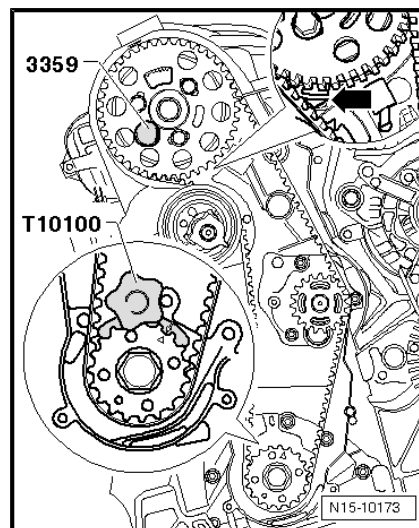
- Hold tensioning roller in this position and tighten nut of tensioning roller.
- Fit counterhold - T10172- with pin - T10172/4- as shown in illustration, and keep the toothed belt under tension on pulling side, by pressing in -direction of arrow-.
- Tighten bolts -1- of camshaft pulley.
- Remove locking pin - 3359- and crankshaft stop - T10100- .
- Turn crankshaft 2 rotations in direction of engine rotation until crankshaft is just before TDC again.
- Lock camshaft hub with diesel injection pump locking pin - 3359- whilst turning engine in direction of engine rotation.



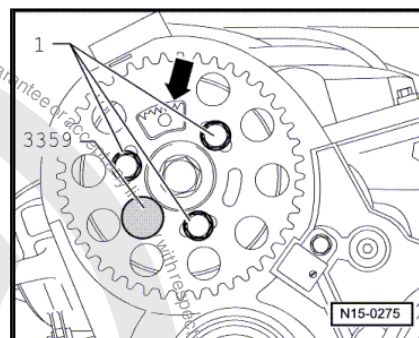


- Check whether crankshaft can be locked with crankshaft stop
- T10100-.

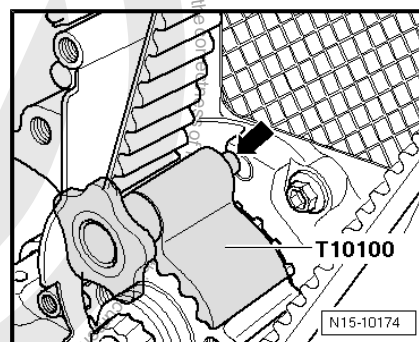
If crankshaft cannot be locked:



- Loosen securing bolts -1- of camshaft pulley.

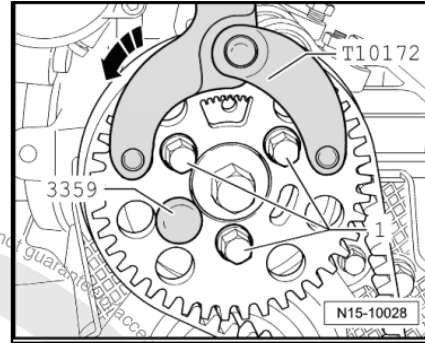


- Turn crankshaft slightly against direction of engine rotation until pin of crankshaft stop is positioned just before hole in sealing flange -arrow-.
- Turn crankshaft in engine direction of rotation until crankshaft stop pin arrow engages in sealing flange whilst turning.





- Fit counterhold - T10172- with pin - T10172/4- as shown. Press counter-hold tool - T10172- in direction of arrow and keep camshaft pulley in pretensioning position.
- In this position, tighten camshaft pulley securing bolts -1-.
- Remove locking pin - 3359- and crankshaft stop - T10100- .
- Turn crankshaft two revolutions in direction of engine rotation until crankshaft is just before TDC for No. 1 cylinder.
- Check and, if necessary, repeat adjustment.
- Remove middle and lower toothed belt guards.
- Install vibration damper/belt pulley.
- Install poly V-belt ⇒ [page 30](#) .
- Install upper toothed belt guard.
- Install front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner .
- Install coolant expansion tank.
- Install fuel filter.
- Bolt on filler neck for window wash system.
- Install engine cover panel.



Specified torques

- ◆ ⇒ ["2.1 Assembly overview - toothed belt drive", page 72](#)
- ◆ ⇒ ["1.2 Assembly overview - poly V-belt drive with vane pump", page 29](#)
- ◆

2.3 Loosening and securing toothed belt



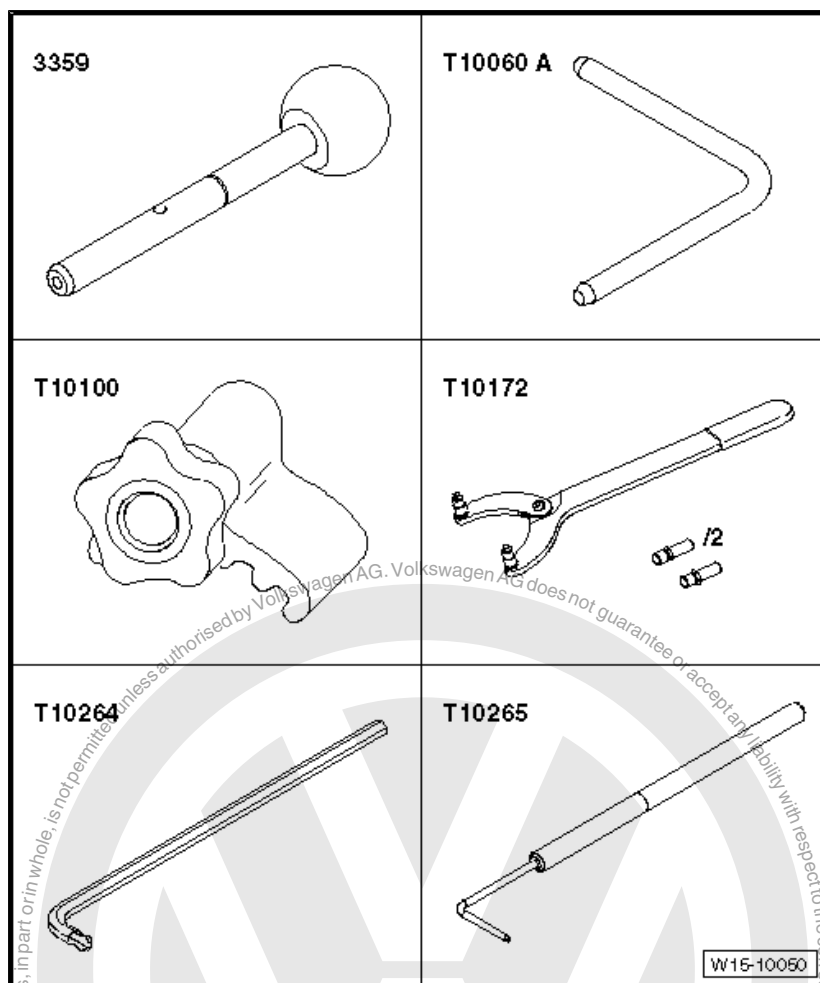
Note

If the toothed belt is only loosened during a repair measure, e.g. when camshaft is removed, it is not necessary to remove the complete toothed belt.



Special tools and workshop equipment required

- ◆ Diesel injection pump locking pin - 3359-
- ◆ Locking pin - T10060 A-
- ◆ Crankshaft stop - T10100-
- ◆ Counterhold tool - T10172-
- ◆ Special wrench, long reach - T10264-
- ◆ Locking tool - T10265-



- ◆ Crankshaft stop - T10050- (for round crankshaft pulley)

Removing



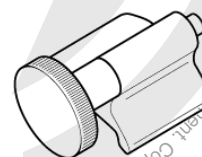
WARNING

There is a danger of fuel running out.

The fuel system is under pressure.

Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

T10050



W00-0991



Note

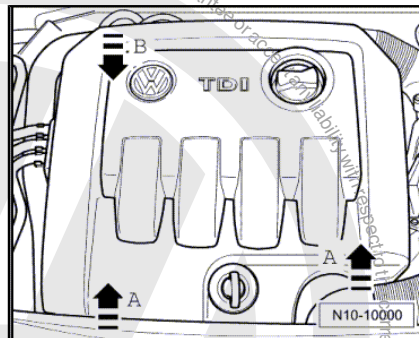
Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.



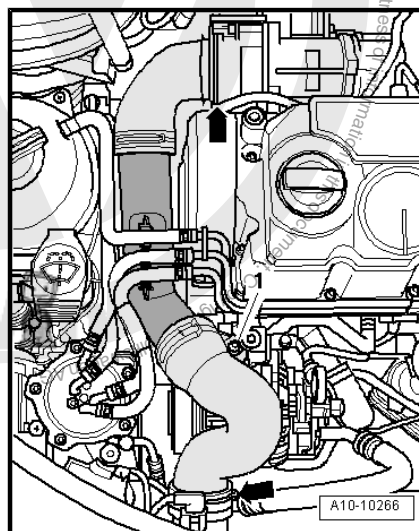
Caddy 2004 ➤

4-cylinder diesel engine (1.9 l engine) - Edition 09.2014

- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.



- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe. To do this, raise retaining clips -arrows- slightly.
- Remove poly V-belt ⇒ [page 30](#).
- Remove poly V-belt tensioning element.
- Remove upper toothed belt guard.
- Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner.
- Remove vibration damper/belt pulley.
- Set engine to TDC No. 1 cylinder.



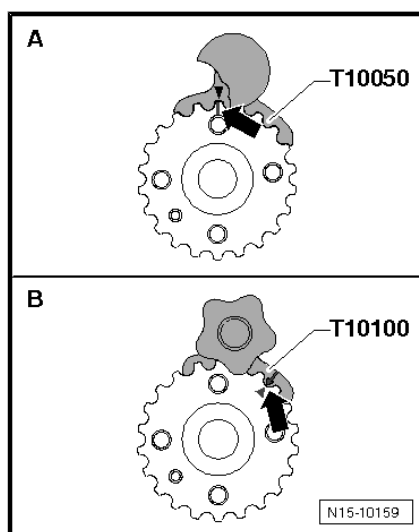
Note

Only oval crankshaft pulleys are installed at factory. When installing this toothed belt pulley, the crankshaft stop - T10100- must be installed to determine the TDC position.

Characteristics of crankshaft pulley:

A = Round toothed belt pulley, lock using crankshaft stop - T10050- , TDC marking at 12 o'clock

B = Oval toothed belt pulley, lock using crankshaft stop - T10100- , TDC marking at 1 o'clock

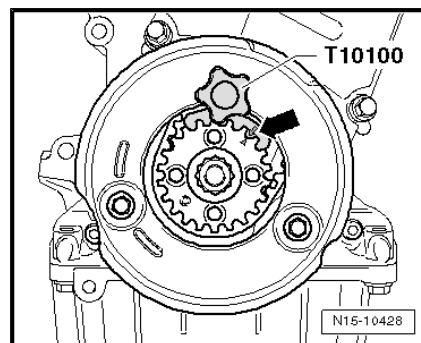




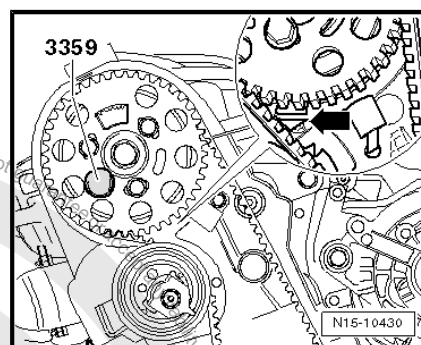
- Lock crankshaft pulley with crankshaft stop - T10050- or crankshaft stop - T10100- . To do this, push the crankshaft stop into the teeth of the toothed belt pulley from the latter's face side.

**Note**

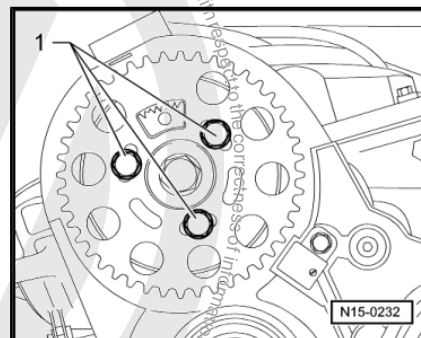
- ◆ *The marks on the crankshaft pulley and the crankshaft stop must align -arrow-. When doing this, the pin of the crankshaft stop must engage in the drilling of sealing flange.*
- ◆ *The marking on the rear toothed belt guard must align with the marking on the camshaft sender wheel -arrow-.*



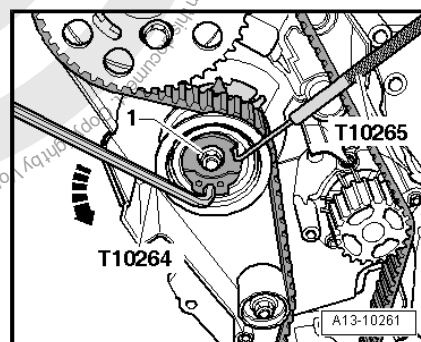
- Lock hub with diesel injection pump locking pin - 3359- . To do this, insert locking pin through free elongated hole on left into hole in cylinder head.
- Mark direction of rotation of toothed belt.



- Loosen securing bolts -1- of camshaft pulley until camshaft pulley can be moved within elongated holes.



- Loosen tensioning roller securing nut -1-.
- Turn eccentric of tensioning roller anti-clockwise -arrow- using socket - T10264- , until the tensioning roller can be locked with locking tool - T10265- .

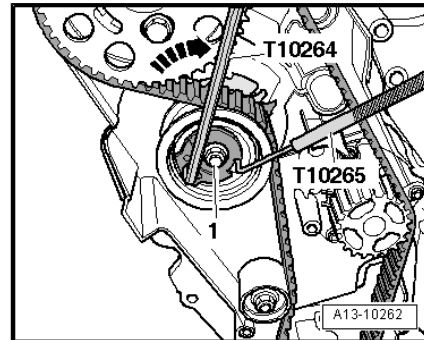




- Turn eccentric of tensioning roller clockwise -arrow- to stop and tighten securing nut -1- hand-tight.
- Remove toothed belt from camshaft pulley.

Installing

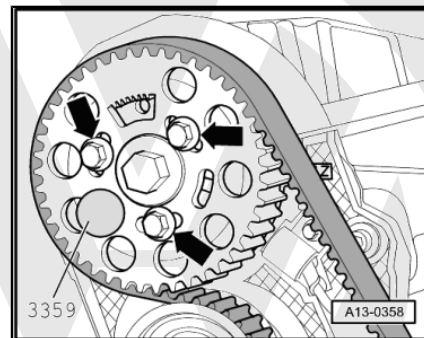
- Camshaft locked with locking pin - 3359- .
- Crankshaft locked with crankshaft stop - T10050- or crankshaft stop - T10100- .
- Tensioning roller locked with locking pin - T10265- and secured to right stop with securing nut.



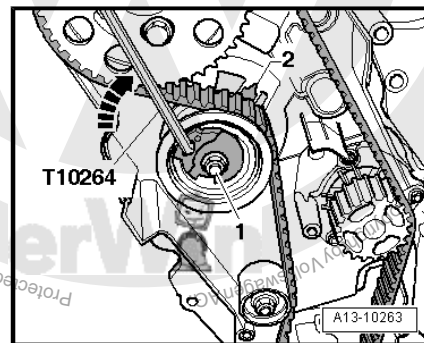
Note

Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.

- Turn camshaft pulley in its elongated holes to centre position -arrows-.
- Fit toothed belt onto camshaft pulley.
- Pull out the locking pin - T10265- from the tension roller.
- Loosen tensioning roller securing nut -1-.



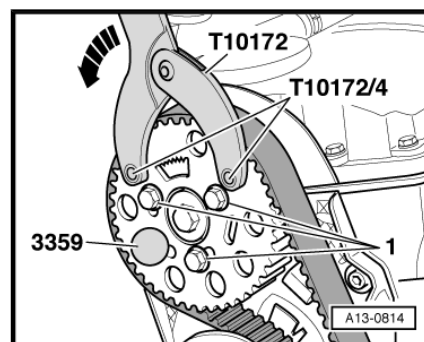
- Carefully turn eccentric of tensioning roller clockwise -arrow- using angled screwdriver - T10264- until indicator -2- is in the middle of gap in base plate.



Note

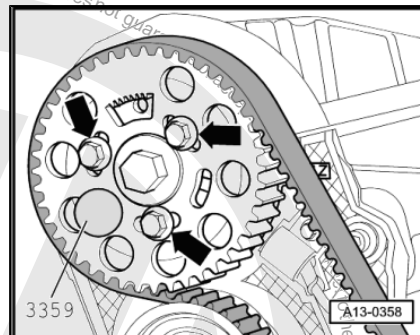
Ensure that securing nut does not turn as well.

- Hold tensioning roller in this position and tighten nut of tensioning roller.
- Fit counterhold - T10172- with pin - T10172/4- as shown in illustration, and keep the toothed belt under tension on pulling side, by pressing in -direction of arrow-.
- Tighten bolts -1- of camshaft pulley.
- Remove locking pin - 3359- and crankshaft stop - T10100- .
- Turn crankshaft 2 rotations in direction of engine rotation until crankshaft is just before TDC again.



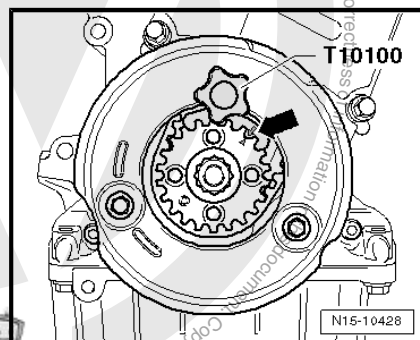


- Lock camshaft hub with diesel injection pump locking pin - 3359- whilst turning engine in direction of engine rotation.

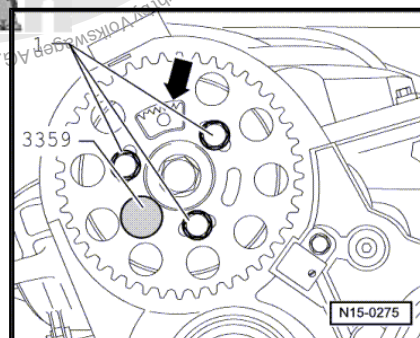


- Check whether crankshaft can be locked with crankshaft stop - T10050- or crankshaft stop - T10100- .

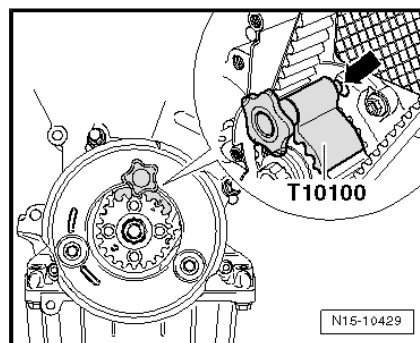
If crankshaft cannot be locked:



- Loosen securing bolts -1- of camshaft pulley.
- Remove crankshaft stop.



- Turn crankshaft slightly against direction of engine rotation until pin of crankshaft stop is positioned just before hole in sealing flange -arrow-.
- Turn crankshaft in engine direction of rotation until crankshaft stop pin arrow engages in sealing flange whilst turning.

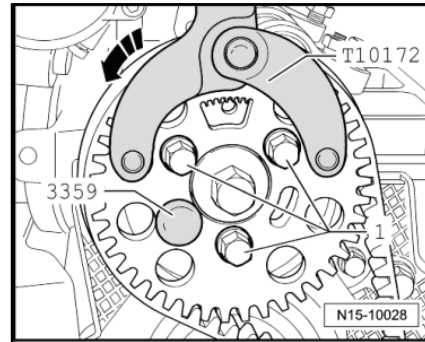


Note

Do not remove lower toothed belt guard. If installed, it restricts rotation of crankshaft when crankshaft stop is fitted.



- Fit counterhold - T10172- with pin - T10172/4- as shown. Press counter-hold tool - T10172- in direction of arrow and keep camshaft pulley in pretensioning position.
- In this position, tighten camshaft pulley securing bolts -1-.
- Remove locking pin - 3359- and crankshaft stop - T10100- .
- Turn crankshaft two revolutions in direction of engine rotation until crankshaft is just before TDC for No. 1 cylinder.
- Check and, if necessary, repeat adjustment.
- Install vibration damper/belt pulley.
- Install poly V-belt ⇒ [page 30](#) .
- Install upper toothed belt guard.
- Install front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner .
- If present, install engine cover panel.



Specified torques

- ◆ ⇒ [“2.1 Assembly overview - toothed belt drive”, page 72](#)
- ◆ ⇒ [“1.2 Assembly overview - poly V-belt drive with vane pump”, page 29](#)



3 Valve gear

⇒ "3.1 Assembly overview - valve gear", page 97

⇒ "3.2 Measuring axial play of camshaft", page 99

⇒ "3.3 Removing and installing camshaft", page 99

⇒ "3.4 Removing and installing camshaft oil seal", page 104

⇒ "3.5 Removing and installing valve stem seals", page 105

3.1 Assembly overview - valve gear



Note

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

1 - Bolt

- ☐ Renew after removing.
- ☐ Observe sequence when loosening and tightening ⇒ [page 99](#).
- ☐ 20 Nm + 90°

2 - Rocker arm shaft

- ☐ Do not interchange.
- ☐ Removing and installing ⇒ [page 99](#).

3 - Cylinder head bolt

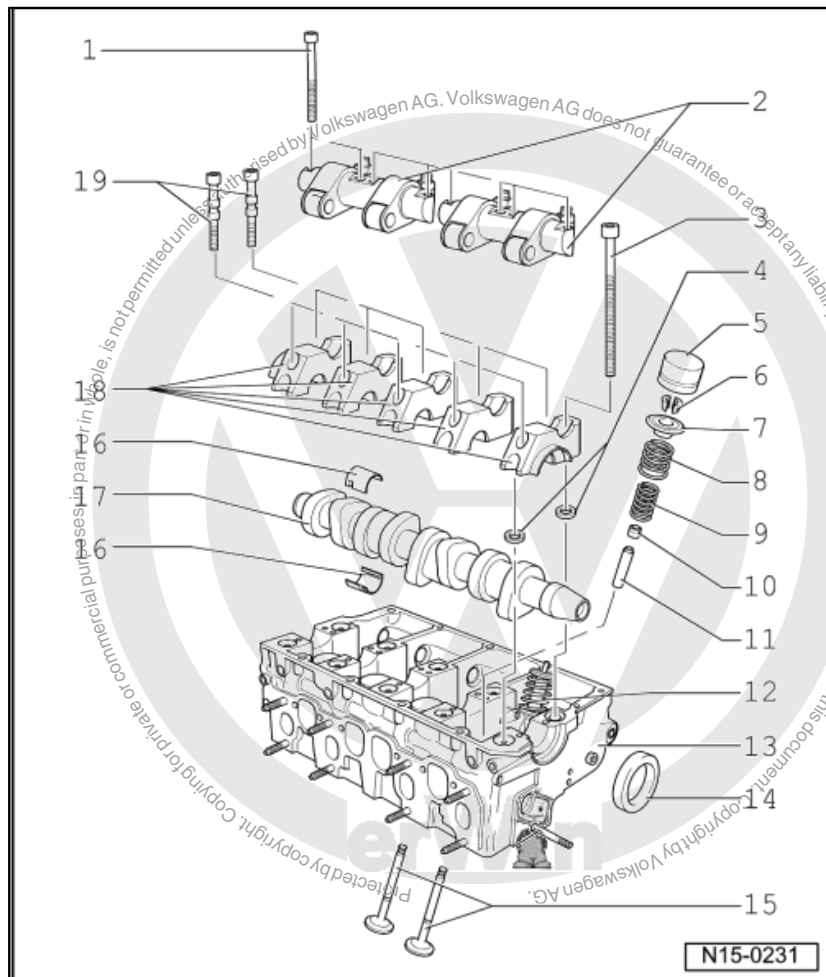
- ☐ Renew after removing.
- ☐ Observe specified torque and tightening sequence when loosening and tightening ⇒ [page 63](#).
- ☐ Before installing, insert washers ⇒ [Item 4 \(page 97\)](#) in cylinder head.

4 - Washer

- ☐ For cylinder head bolts.
- ☐ Insert in cylinder head before installing bearing caps

5 - Bucket tappet

- ☐ Do not interchange.
- ☐ With hydraulic valve clearance compensation.
- ☐ Set down with contact surface facing downwards.
- ☐ Oil contact surface.
- ☐ Before removing, remove camshaft bearing caps
- ☐ Before installing, check camshaft axial clearance ⇒ [page 99](#).





6 - Cotteners

7 - Valve spring plate

8 - Outer valve spring

- ☐ Removing and installing ⇒ [page 105](#) .

9 - Inner valve spring

- ☐ Removing and installing ⇒ [page 105](#) .

10 - Valve stem seal

- ☐ Renew. ⇒ [page 105](#) .

11 - Valve guide

- ☐ Checking ⇒ [page 108](#) .

12 - Unit injector

- ☐ Removing and installing ⇒ [page 171](#) .

13 - Cylinder head

- ☐ See note ⇒ [page 97](#) .

14 - Seal

- ☐ Do not additionally oil or grease the oil seal sealing lip.
- ☐ Before installing, remove residual oil from camshaft journal using a clean cloth.
- ☐ To install, tape over groove in taper of camshaft (e.g. using Sellotape).
- ☐ Removing and installing ⇒ [page 104](#) .

15 - Valves

- ☐ Valve dimensions ⇒ [page 108](#)

16 - Bearing shell

- ☐ Do not interchange used bearing shells (mark).
- ☐ Ensure that retaining lugs are correctly seated in bearing caps and cylinder head

17 - Camshaft

- ☐ Check radial clearance with Plastigage, wear limit: 0.11 mm.
- ☐ Runout: max. 0.01 mm.
- ☐ Checking axial clearance ⇒ [page 99](#) .
- ☐ Removing and installing ⇒ [page 99](#) .

18 - Bearing cap

- ☐ To install, seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01- ⇒ [page 99](#)
- ☐ Installation sequence ⇒ [page 99](#) .

19 - Bolt

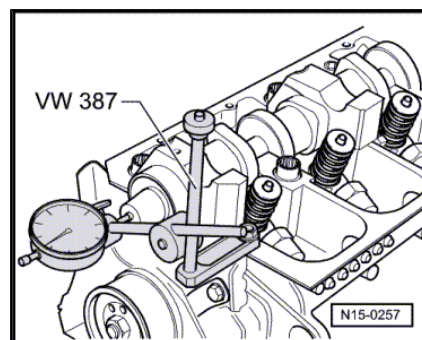
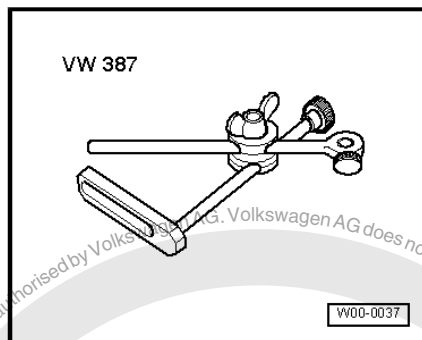
- ☐ Renew after removing.
- ☐ 8 Nm + 90°



3.2 Measuring axial play of camshaft

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-



- ◆ Dial gauge

Checking camshaft axial clearance:

Test procedure

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

Wear limit: max.
0.15 mm

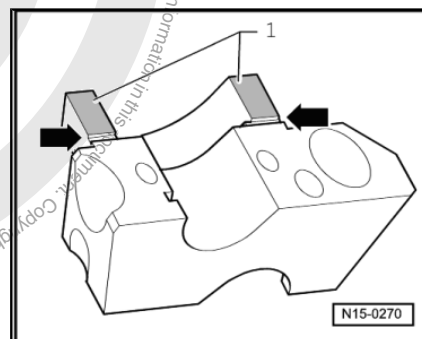
Seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01-

- Apply sealant - AMV 174 004 01- thinly and evenly on surfaces -1-.



Note

Be careful that no sealant gets into grooves -arrows-

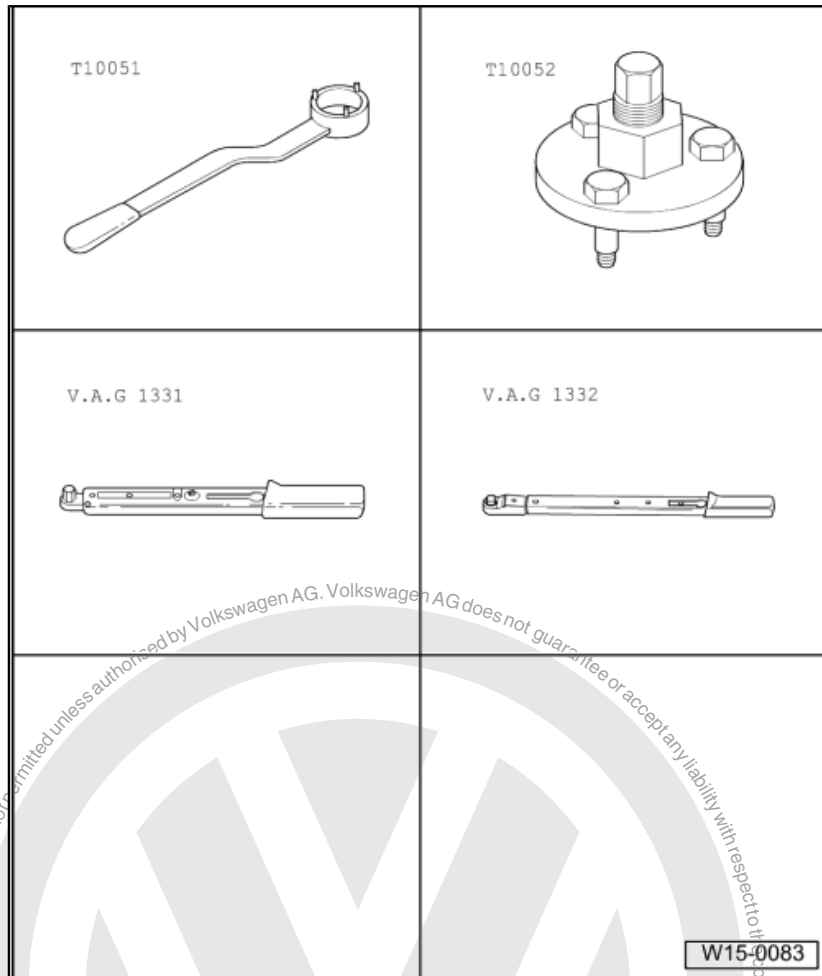


3.3 Removing and installing camshaft



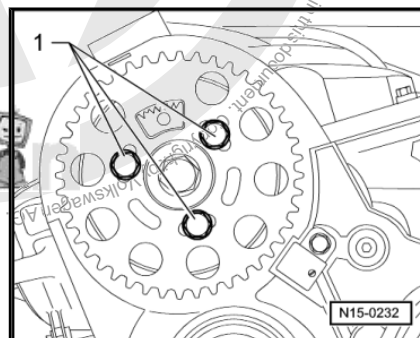
Special tools and workshop equipment required

- ◆ Counterhold tool - T10051-
- ◆ Puller - T10052-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Torque wrench 40-200 Nm - V.A.G 1332-
- ◆ Sealant - AMV 174 004 01-



Removing

- Remove toothed belt from camshaft toothed belt pulley
⇒ [page 90](#).
- Remove locking pin - 3359-.
- Unscrew securing bolts -1- of camshaft pulley.
- Pull camshaft pulley off hub.





- Loosen hub securing bolt -1-.
- Use counterhold tool - T10051- to do this.

**Note**

Turn hub clockwise if the counterhold cannot be fitted.

- Unscrew hub securing bolt approx. 2 turns.
- Fit puller - T10052- and screw securing bolts -1- into hub.
- Apply tension to hub by tightening puller until hub separates from taper of camshaft.

**Note**

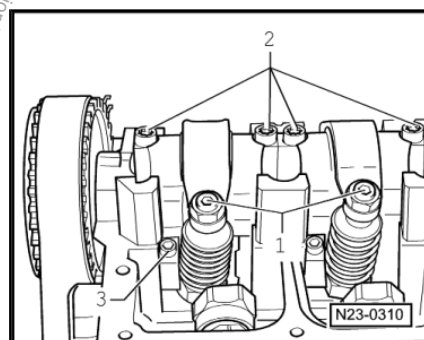
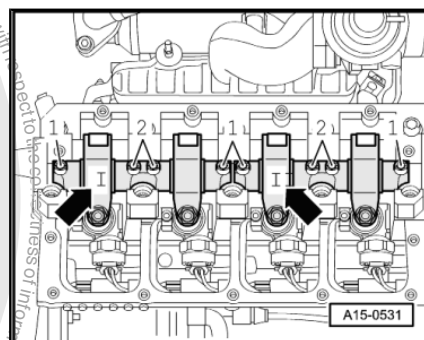
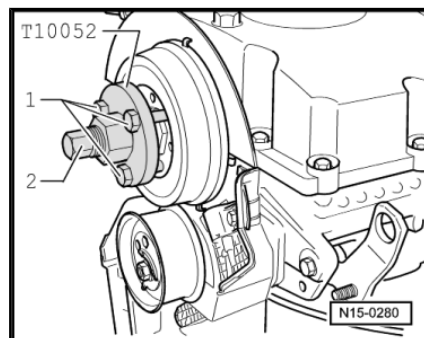
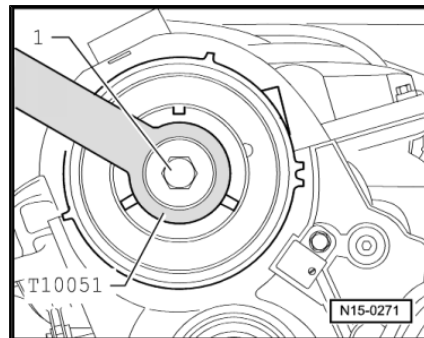
When doing this, hold puller with 30 mm spanner.

- Remove hub from taper of camshaft.
- Remove cylinder head cover ⇒ [page 67](#).

Mark rocker arm shafts using a permanent felt tip marker to prevent interchanging. This will prevent having to perform basic settings of unit injectors -arrows-.

Loosen lock nuts of adjustment screws -1- and remove adjustment screws.

- Loosen securing bolts -2- for rocker arm shaft working from outside to inside using Socket XZN 10 - 3410-. Remove rocker arm shaft.
- Remove tandem pump ⇒ [page 187](#)





- First, remove bearing caps -5-, -1- and -3-. Then loosen bearing caps -2- and -4- alternately and diagonally.
- Remove camshaft.

Installing



Note

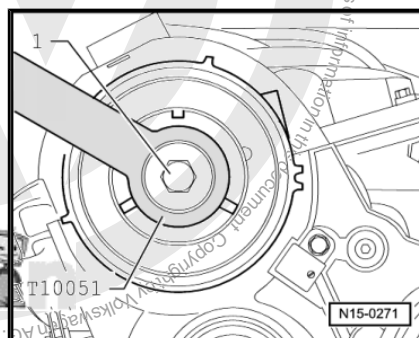
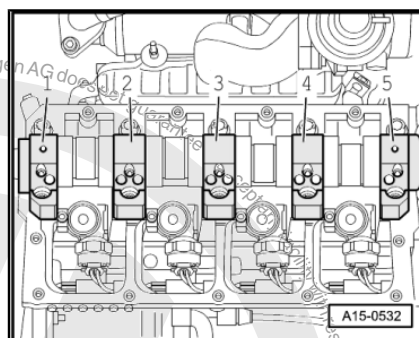
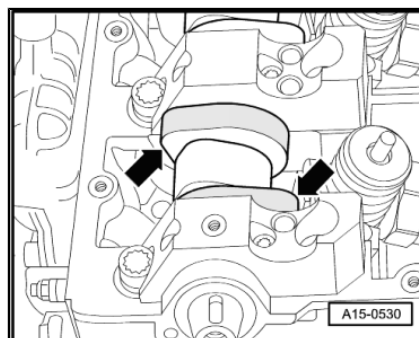
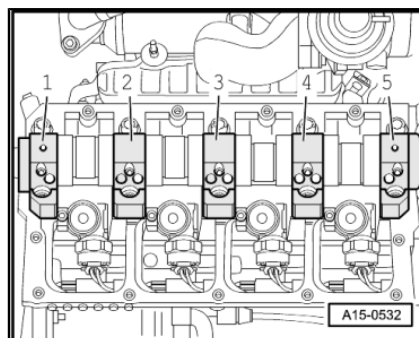
- ◆ When installing camshaft, No. 1 cylinder cams -arrows- must point upwards.
- ◆ Do not interchange used bearing shells (mark).
- ◆ When installing the camshaft, ensure proper seating of retaining lugs in bearing caps and cylinder head.
- ◆ Before installing bearing caps, ensure that cylinder head bolt washers are inserted in the cylinder head.

- Oil running surfaces of bearing shells.
- Install bearing caps -2- and -4- using new bolts.
- Tighten bearing caps 2 and 4 using alternate and diagonal sequence.
- Install bearing caps 5, 1 and 3 using new bolts.



Note

- ◆ Seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01- ➔ [page 99](#).
- ◆ Bearing cap 5 must be flush with outer edge of cylinder head, otherwise leaks can occur at the tandem pump.
- Tighten bearing caps 5, 1, and 3 also.
- Install camshaft seal ➔ [page 104](#).
- Fit hub on camshaft.
- Tighten securing bolt -1- of hub.
- Use counterhold tool - T10051- to do this.





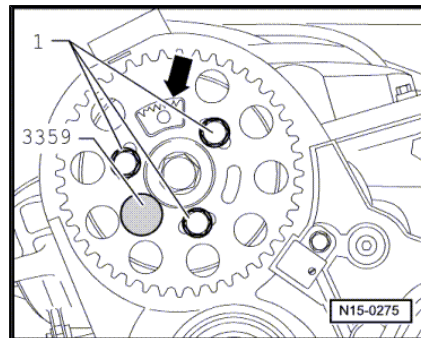
- Push camshaft pulley onto hub.



Note

The toothed segment -arrow- of the camshaft belt pulley must be on top.

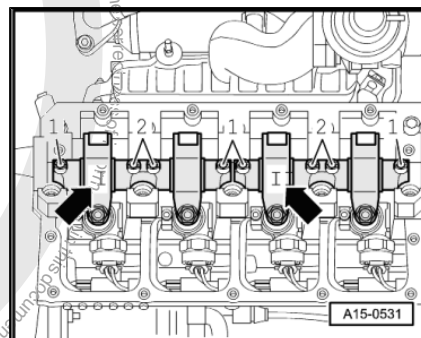
- Align camshaft pulley at centre of elongated holes.
- Insert securing bolts -1- by hand without play to camshaft sprocket.
- Lock hub with diesel injection pump locking pin - 3359- .
- Install toothed belt and adjust valve timing ⇒ [page 73](#) .
- Renew unit injector ball studs ⇒ [Item 5 \(page 169\)](#) .



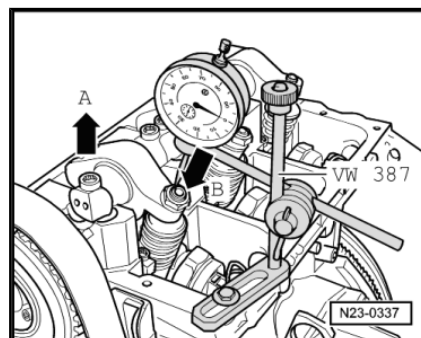
Note

Each time the rocker arm shaft is removed and each time work is performed which requires adjustment of the unit injector, the adjustment screws ⇒ [Item 4 \(page 169\)](#) and the ball pins ⇒ [Item 5 \(page 169\)](#) of the unit injectors must be renewed.

- Fit rocker arm shafts with new adjustment screws and tighten new securing bolts as follows:
- First, tighten inner bolts -2-, and then outer bolts -1- evenly and diagonally.



- Fit dial gauge onto adjustment screw of unit injector as shown
- Turn crankshaft in direction of engine rotation until roller of rocker arm is located at tip of drive cam. Roller side -arrow A- positioned at highest point. Dial gauge -arrow B- positioned at lowest point.
- Remove dial gauge.
- Now turn adjustment screw into rocker arm until significant resistance can be felt (unit injector is at limit stop).



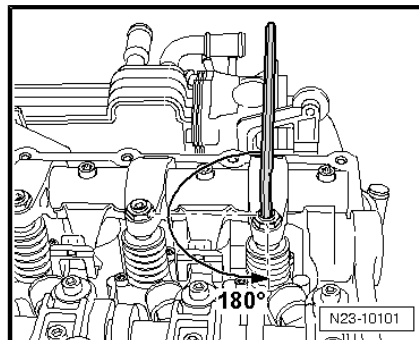


- Slacken adjustment screw of stop by 180°.
- Hold adjuster bolt in this position and tighten lock nut.
- Install cylinder head cover ➔ [page 67](#) .
- Install tandem pump ➔ [page 187](#) .



Note

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



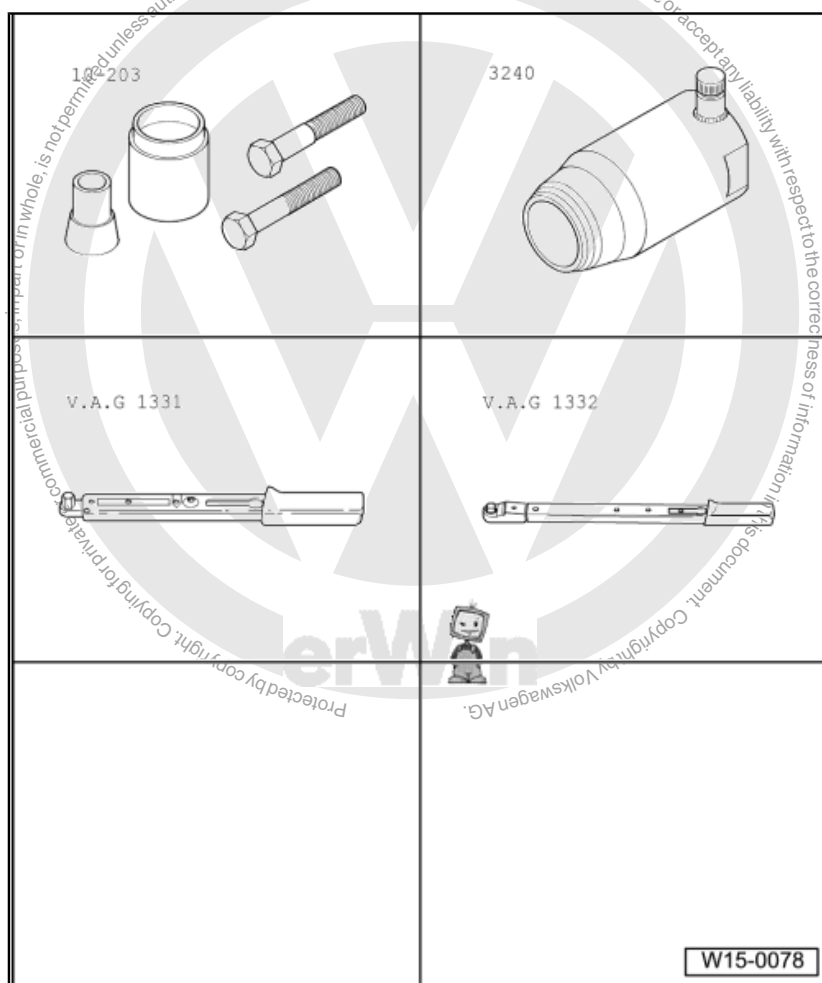
Specified torques

- ◆ ➔ ["2.1 Assembly overview - toothed belt drive", page 72](#)
- ◆ ➔ ["3.1 Assembly overview - valve gear", page 97](#)
- ◆ ➔ ["1.1 Assembly overview - unit injector", page 169](#)

3.4 Removing and installing camshaft oil seal

Special tools and workshop equipment required

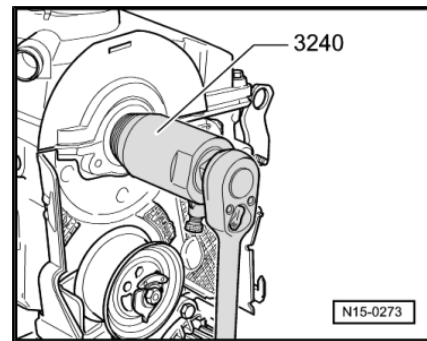
- ◆ Fitting tool - 10-203-
- ◆ Oil seal extractor - 3240-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Torque wrench 40-200 Nm - V.A.G 1332-
- ◆ Bolt M12 x 1.5 x 65





Removing

- Remove toothed belt from camshaft toothed belt pulley
⇒ [page 90](#) .
- Remove camshaft sprocket and hub ⇒ [page 99](#) .
- Unscrew inner part of oil seal extractor - 3240- 2 turns (approx. 3 mm) from the outer part and lock in position with the knurled screw.
- Lubricate threaded head of oil seal extractor - 3240- , 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 camshaft until oil seal is pulled out.



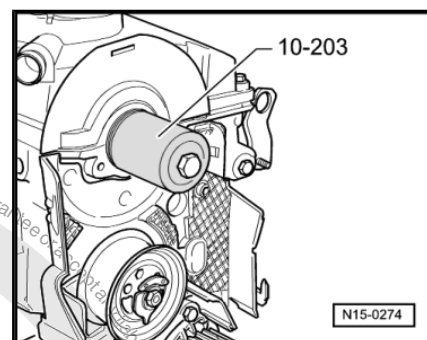
Installing



Note

The oil seal sealing lip must not be additionally oiled or greased.

- Remove oil residues from crankshaft journal with a clean cloth.
- Tape over groove in taper of camshaft (e.g. using Sellotape).
- Carefully place seal onto camshaft.
- Press in oil seal as far as stop with thrust piece of fitting tool - 10-203- and bolt M12 × 1.5 x 65.
- Install toothed belt ⇒ [page 73](#) .



Specified torques

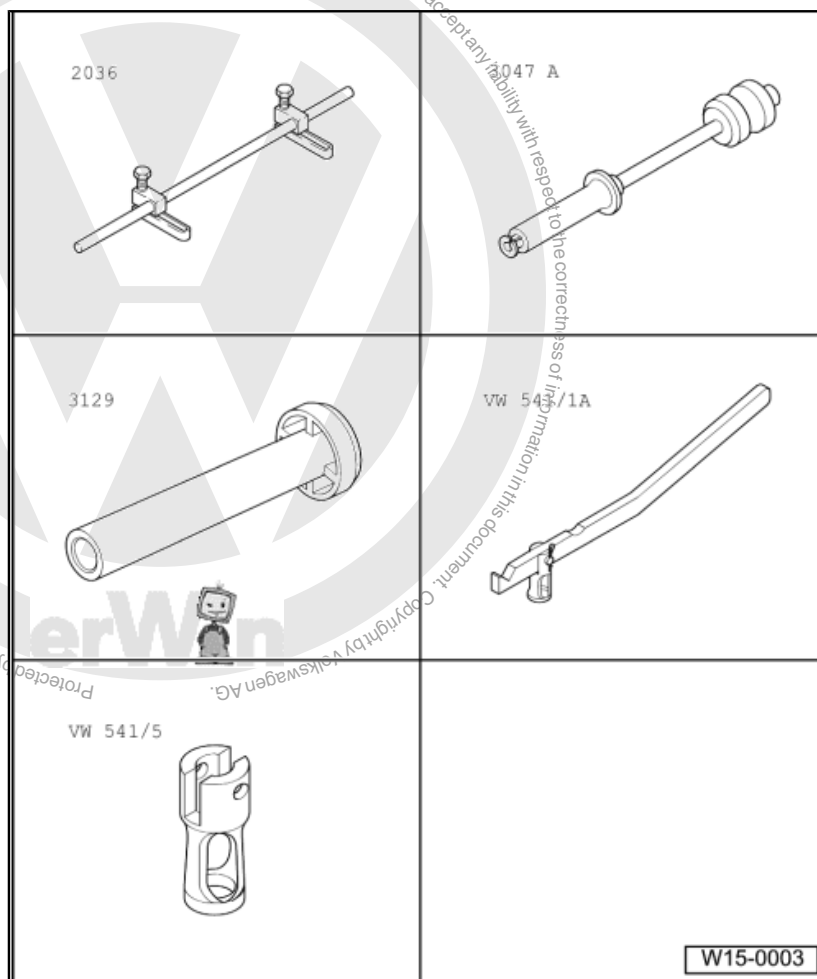
- ◆ ⇒ ["2.1 Assembly overview - toothed belt drive", page 72](#)

3.5 Removing and installing valve stem seals



Special tools and workshop equipment required

- ◆ Valve assembly device - 2036-
- ◆ Puller - 3047 A-
- ◆ Fitting tool - 3129-
- ◆ Valve lever - VW 541/1 A-
- ◆ Thrust piece for VW 541 / 1 A and 2037 - VW 541/5-



Removing

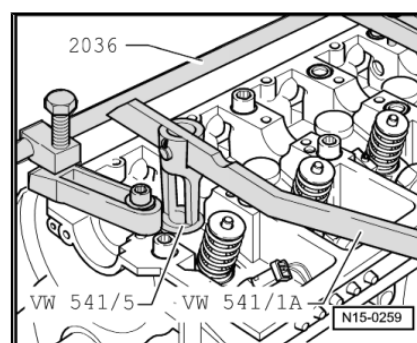
(With cylinder head installed):

- Remove camshaft ➔ [page 99](#) .
- Remove tappets and place to one side with face downwards. When doing this, ensure that tappets are not interchanged.
- Set piston of respective cylinder to top dead centre (TDC).
- Fit valve assembly tool - 2036- and adjust mountings to height of studs.
- Remove valve springs using valve lever - VW 541/1 A- and thrust piece for VW 541 / 1 A and 2037 - VW 541/5- .



Note

The valves are supported by the piston crown.





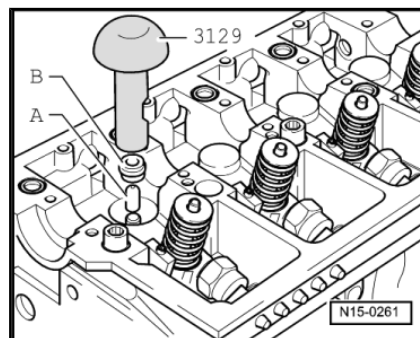
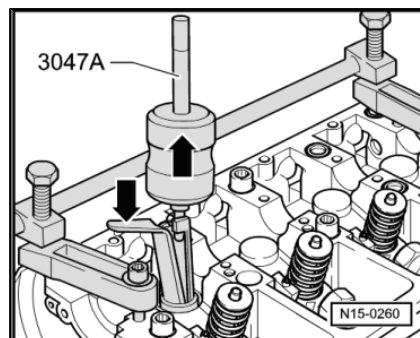
- Pull off valve stem seals using puller - 3047 A- .

Installing

- Place the plastic sleeve -A- supplied on the respective valve stem. This will prevent the new valve stem seal -B- being damaged.
- Insert new valve stem seal into fitting tool - 3129- .
- Lubricate sealing lip of valve stem seal and carefully slide on valve guide.

Specified torques

- ◆ ⇒ [“3.1 Assembly overview - valve gear”, page 97](#)
- ◆ ⇒ [“2.1 Assembly overview - toothed belt drive”, page 72](#)
- ◆ ⇒ [“1.1 Assembly overview - unit injector”, page 169](#)





4 Inlet and exhaust valves

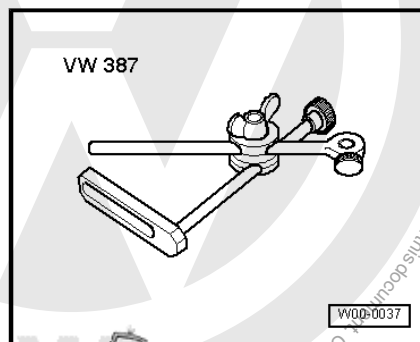
⇒ "4.1 Checking valve guides", page 108

⇒ "4.2 Valve dimensions", page 108

4.1 Checking valve guides

Special tools and workshop equipment required

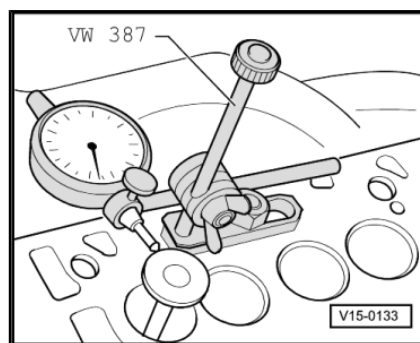
- ◆ Universal dial gauge bracket - VW 387-



- ◆ Dial gauge

Test procedure

- Insert new valve in 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. Wear limit: max. 1.3 mm
- Cylinder head must be renewed if rock exceeds wear limit.



4.2 Valve dimensions

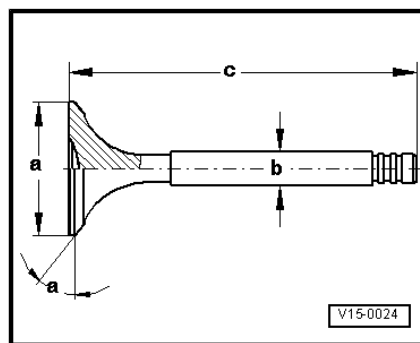
Valve dimensions



Note

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

Dimension		Inlet valve	Exhaust valve
Diameter a	mm	35,95	31.45
Diameter b	mm	6.980	6.956
c	mm	89.95	89.95
α	°	45	45





17 – Lubrication

1 Sump, oil pump

⇒ "1.1 Assembly overview - sump and oil pump", page 109

⇒ "1.2 Removing and installing sump", page 110

⇒ "1.3 Engine oil", page 112

⇒ "1.4 Oil consumption measurement", page 113

1.1 Assembly overview - sump and oil pump

Observe notes ⇒ page 7 .

1 - Bolt

- ☐ 15 Nm

2 - Sealing flange

- ☐ With seal
- ☐ Must seat on dowel sleeves
- ☐ Insert with silicone sealant ⇒ Electronic Parts Catalogue (ETKA) .
- ☐ Do not additionally oil or grease the oil seal sealing lip.
- ☐ Before installing, remove oil residue from crankshaft journal using a clean cloth.
- ☐ Renewing crankshaft oil seal on belt pulley end ⇒ page 33 .
- ☐ Removing and installing ⇒ page 41 .

3 - Chain tensioner with tensioning plate

- ☐ When installing, pretension spring and fit.
- ☐ 15 Nm

4 - Oil dipstick

- ☐ Lugs on dipstick and dipstick guide, if fitted, must align.
- ☐ The oil level must not be above the max. mark!
- ☐ Markings ⇒ page 112 .

5 - Piston fitting tool

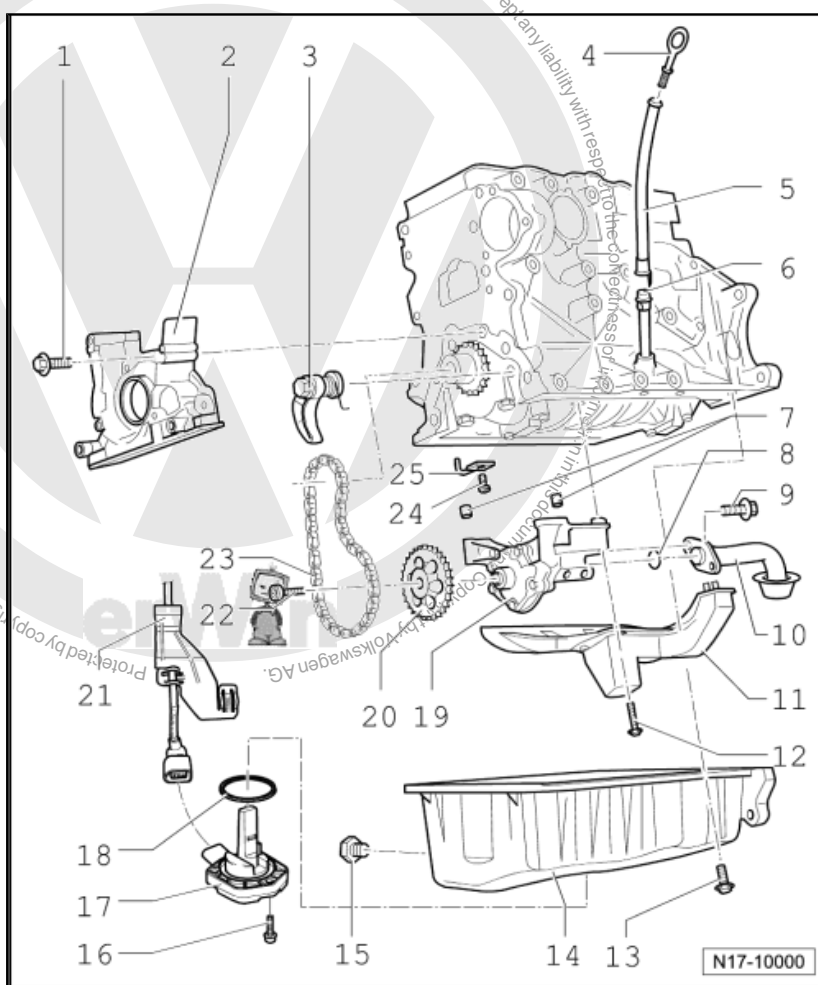
- ☐ Lugs on dipstick and dipstick guide, if fitted, must align.

6 - Guide tube

7 - Dowel sleeves

8 - O-ring

- ☐ Renew after removing.





9 - Bolt

- ☐ 15 Nm

10 - Suction hose

- ☐ Clean strainer if soiled.

11 - Baffle plate

12 - Bolt

- ☐ 15 Nm

13 - Bolt

- ☐ 15 Nm

14 - Sump

- ☐ Clean sealing surface before fitting.
- ☐ Insert with silicone sealant ⇒ Electronic Parts Catalogue (ETKA) .
- ☐ Removing and installing ⇒ [page 110](#) .

15 - Oil drain plug

- ☐ Renew after removing.
- ☐ 30 Nm

16 - Bolt

- ☐ 10 Nm

17 - Oil level and oil temperature sender - G266-

- ☐ Black 3-pin connector

18 - Seal

- ☐ Renew after removing.

19 - Oil pump

- ☐ With 12 bar pressure relief valve.
- ☐ Before installing, check that both dowel sleeves for centring oil pump on cylinder block are fitted.
- ☐ Renew if running surfaces and gears are scored.

20 - Chain sprocket for oil pump

21 - Bracket

- ☐ For oil level and oil temperature sender - G266- wiring harness.

22 - Bolt

- ☐ Renew after removing.
- ☒ 20 Nm + 90°

23 - Chain

24 - Bolt

- ☐ Insert without sealant.
- ☐ 25 Nm

25 - Oil spray jet

- ☒ For piston cooling.

1.2 Removing and installing sump

Special tools and workshop equipment required



- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

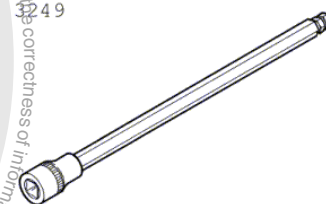
V.A.G 1331



W00-0427

- ◆ Hexagon key, extension 5 mm - 3249- or Allen key, long reach - T10058-

3249



W00-0328

- ◆ Hand drill with plastic brush attachment
- ◆ Silicone sealant ⇒ Electronic Parts Catalogue (ETKA)
- ◆ Hand drill with plastic brush attachment
- ◆ Eye protection
- ◆ Flat scraper

Removing

- Remove noise insulation ⇒ General body repairs, exterior;
Rep. gr. 50 ; Noise insulation .
- Drain off engine oil.



Note

Observe environmental regulations for disposal.

- Pull 3-pin connector off oil level and oil temperature sender - G266- .
- Unscrew sump.
- Loosen sump with light blows using a rubber headed hammer if necessary.
- Remove sealant residues from cylinder block with a flat scraper.



- Remove sealant residues 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

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



Note

- ◆ *Observe expiry date of sealing compound.*
- ◆ *The sump must be installed within 5 minutes of applying silicone sealing compound.*
- Cut off nozzle on tube at front marking (diameter of nozzle approx. 3 mm).
- Apply silicone sealant ⇒ Electronic Parts Catalogue (ETKA) to clean sealing surface of sump. Sealant bead must be:
 - ◆ 2...3 mm thick.
 - ◆ run along inner side of bolt holes -arrows-.



Note

The sealant bead must not be thicker, otherwise excess sealing compound will enter the sump and may block the oil pump suction line strainer.

- Apply silicone sealant ⇒ Electronic Parts Catalogue (ETKA) onto clean sealing surface of sump (illustration shows position of sealant bead on cylinder block).
- Immediately position sump and tighten all sump bolts slightly. Ensure that sump is flush against intermediate plate and gearbox flange.



Note

- ◆ *When installing sump with engine removed, ensure that sump is flush with cylinder block at flywheel end.*
- ◆ *Let sealing compound dry for approx. 30 minutes after installing sump. Only then fill with engine oil.*

Specified torques

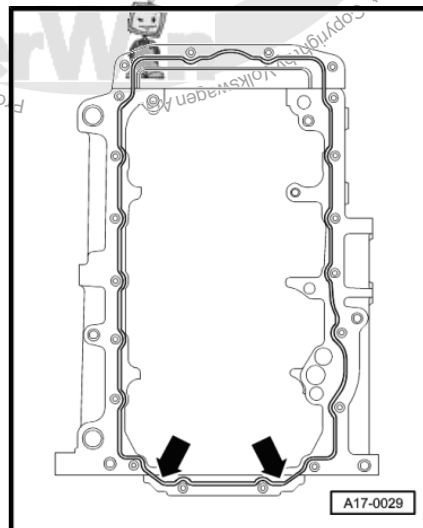
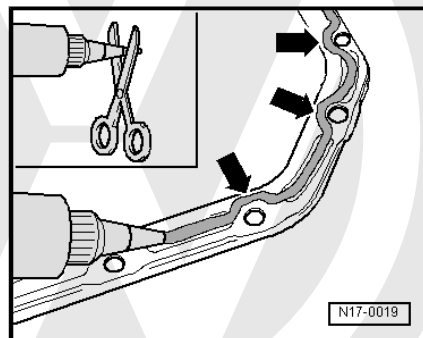
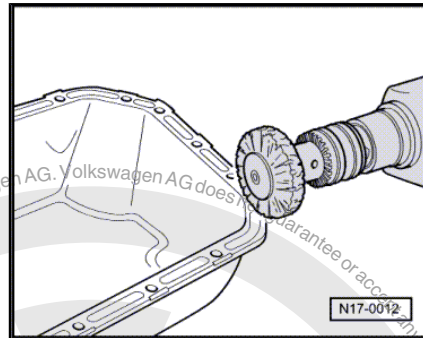
- ◆ ⇒ ["1.1 Assembly overview - sump and oil pump", page 109](#)

1.3 Engine oil



Note

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





Checking engine oil level:

Old version

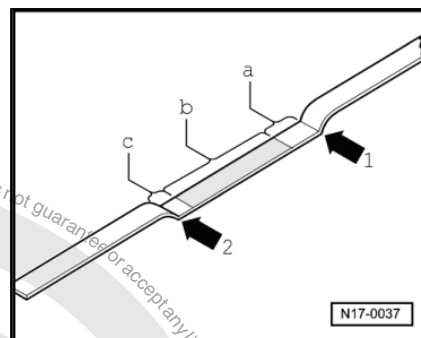
1 - Max. mark

2 - Min. mark

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

b - Oil level within hatched field: Can be topped up with engine oil.

c - Area from min. mark up to hatched field: top up with max. 0.5 l of engine oil!



New version

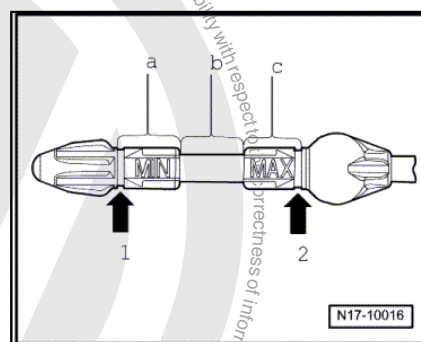
1 - Min. mark

2 - Max. mark

a - Area of min. mark: top-up with max. 0.5 l of engine oil!

b - Oil level in middle range: can be topped-up with engine oil.

c - Area of max. mark: do not add engine oil!



1.4 Oil consumption measurement

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester

Procedure

- Apply parking break.
- Manual gearbox: move selector lever to neutral position.
- Automatic gearbox: move selector lever to position "N".
- Connect ⇒ Vehicle diagnostic tester.
- Switch ignition on.
- Carry out program oil consumption measurement using
⇒ Vehicle diagnostic tester and follow instructions.



2 Oil filter, oil pressure switch

⇒ ["2.1 Assembly overview - oil filter housing, oil pressure switch", page 114](#)

⇒ ["2.2 Checking oil pressure and oil pressure switch", page 115](#)

2.1 Assembly overview - oil filter housing, oil pressure switch

1 - Oil filter bracket

2 - Bolt

- ☐ Renew after removing.
- ☐ First fit upper left and lower right bolts and then tighten all 4 bolts in diagonal sequence.
- ☐ 15 Nm + 90°

3 - Gasket

- ☐ Renew after removing.

4 - Seal

- ☐ Renew after removing.

5 - Connecting piece

- ☐ 35 Nm

6 - Oil supply line

- ☐ To turbocharger.
- ☐ 22 Nm
- ☐ Removing and installing
⇒ [page 117](#) .

7 - Cap

- ☐ Loosen and tighten with socket AF 36 mm - T10125- .
- ☐ 25 Nm

8 - Seal

- ☐ Renew after removing.

9 - Oil filter element

- ☐ Observe change intervals.
- ☐ Ensure "Top" is uppermost when fitting

10 - Plug

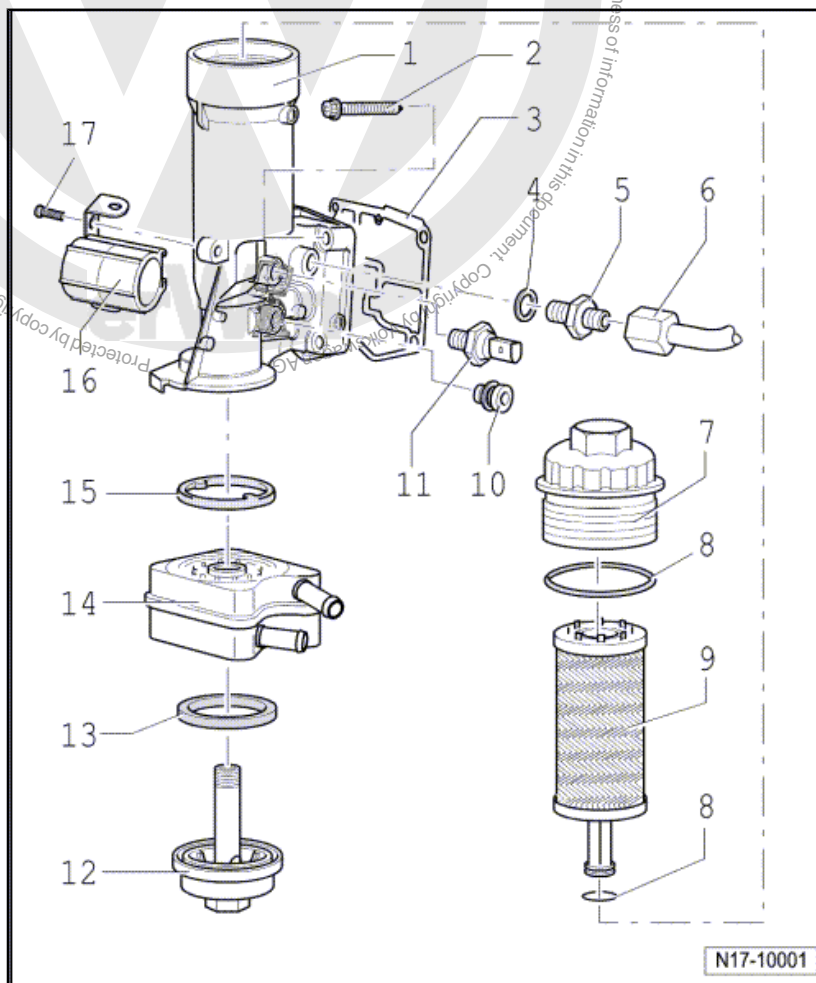
- ☐ If seal is leaking, nip open and renew.
- ☐ 10 Nm

11 - Oil pressure switch - F1-

- ☐ 0.7 bar switch: brown.
- ☐ If seal is leaking, nip open and renew.
- ☐ 20 Nm
- ☐ Checking ⇒ [page 115](#) .

12 - Plug

- ☐ 25 Nm





13 - Gasket

- ☐ Renew after removing.

14 - Engine oil cooler

- ☐ Ensure clearance to adjacent components.
- ☐ See note ⇒ [page 109](#).
- ☐ Checking engine oil cooler for leaks ⇒ [page 125](#)

15 - Gasket

- ☐ Renew after removing.

16 - Bracket

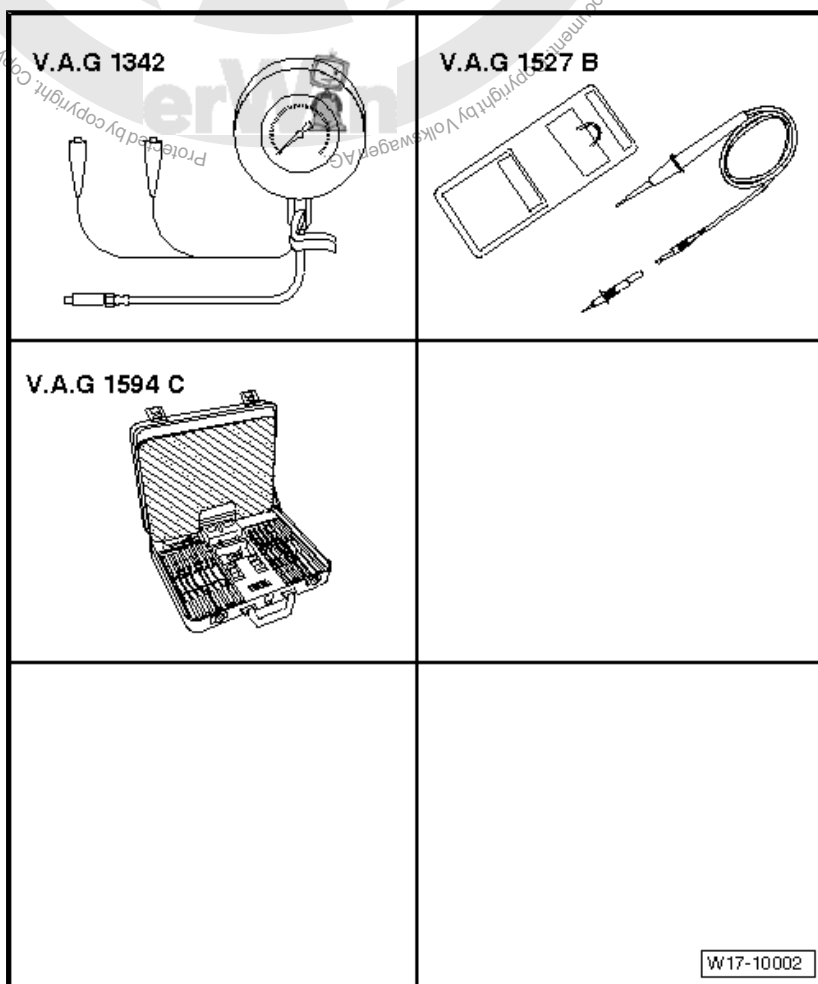
17 - Bolt

- ☐ 10 Nm

2.2 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-





Test procedure

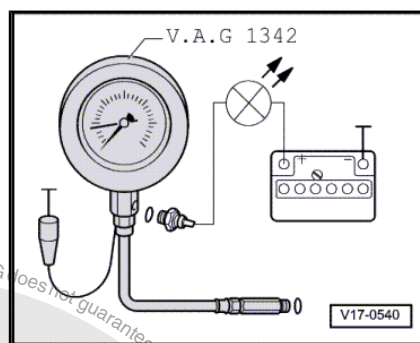


Note

Functional check and repair of the optical and acoustic oil pressure warning: ➔ Current flow diagrams, Electrical fault finding and Fitting locations or ➔ Vehicle diagnostic tester.

- Remove oil pressure switch - F1- and screw into tester.
- Screw tester into oil filter bracket in place of oil pressure switch.
- Connect brown wire of tester to earth (MINUS).
- Connect voltage tester - V.A.G 1527 B- to battery positive (+) and oil pressure switch using cables from auxiliary measuring set - V.A.G 1594C- . LED must not light up.
- Start engine and increase revolutions slowly.
- At 0.55...0.85 bar the LED must light up, otherwise renew oil pressure switch.
- Increase engine speed further. At 2000 rpm and an oil temperature of 80°C the oil pressure should be at least 2.0 bar.

At a higher engine speed the oil pressure must not exceed 7.0 bar. If necessary, renew oil filter bracket.





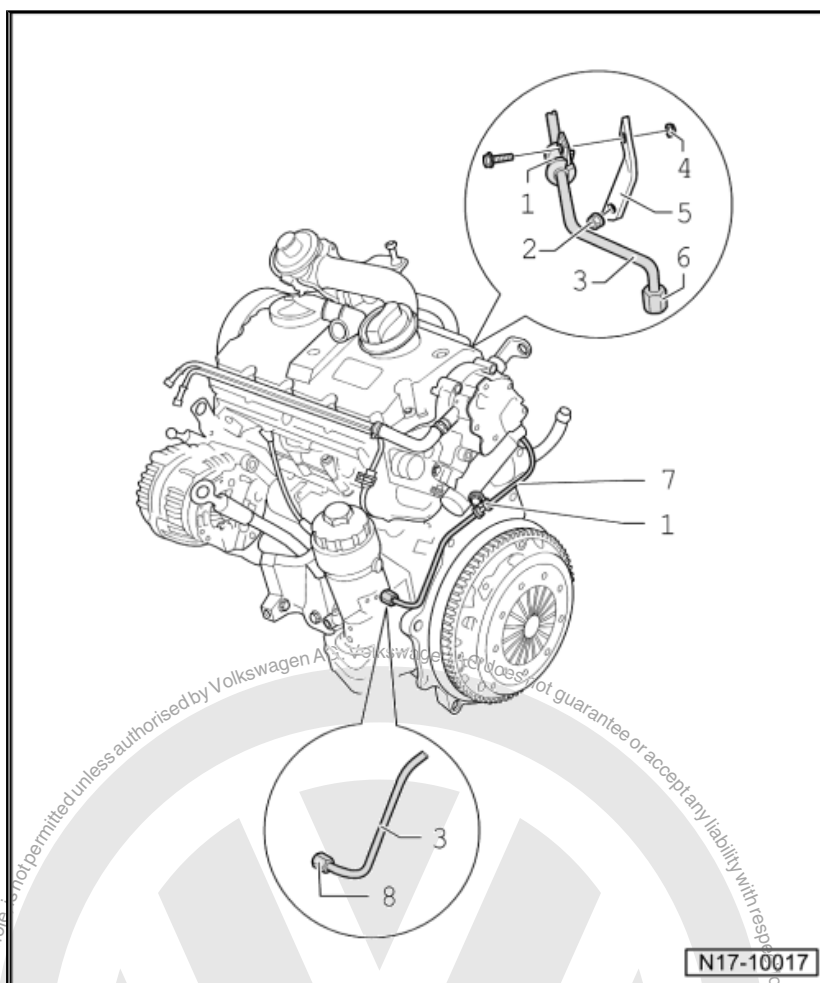
3 Oil circuit

⇒ ["3.1 Assembly overview - oil supply line", page 117](#)

⇒ ["3.2 Removing and installing oil supply line", page 117](#)

3.1 Assembly overview - oil supply line

- 1 - Retaining clamp
- 2 - Nut
 - 25 Nm
- 3 - Oil supply line
 - To turbocharger.
- 4 - Nut
 - 10 Nm
- 5 - Retainer
- 6 - Union nut
 - 22 Nm
- 7 - Line
- 8 - Union nut
 - 22 Nm

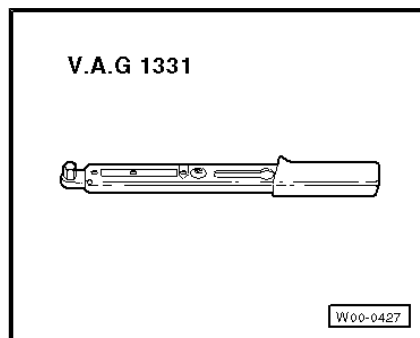


3.2 Removing and installing oil supply line

Special tools and workshop equipment required

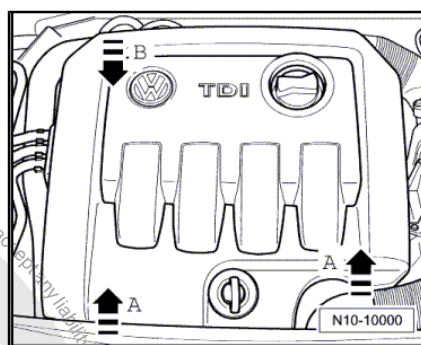


- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

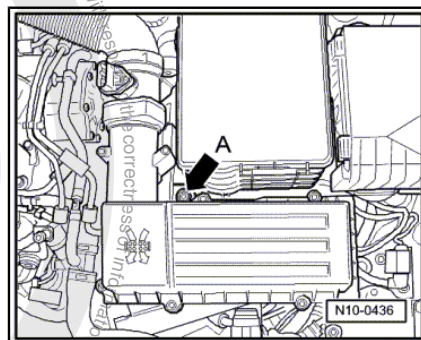


Removing

- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.
- Remove air filter housing with air mass meter and connecting pipe .



- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Remove charge air pipe ⇒ [Item 11 \(page 164\)](#) .
- Remove oil pressure switch - F1- .
- Unscrew retaining clip securing bolts.
- Unscrew union nuts of oil supply line on oil filter bracket and exhaust turbocharger.
- Remove oil supply line.



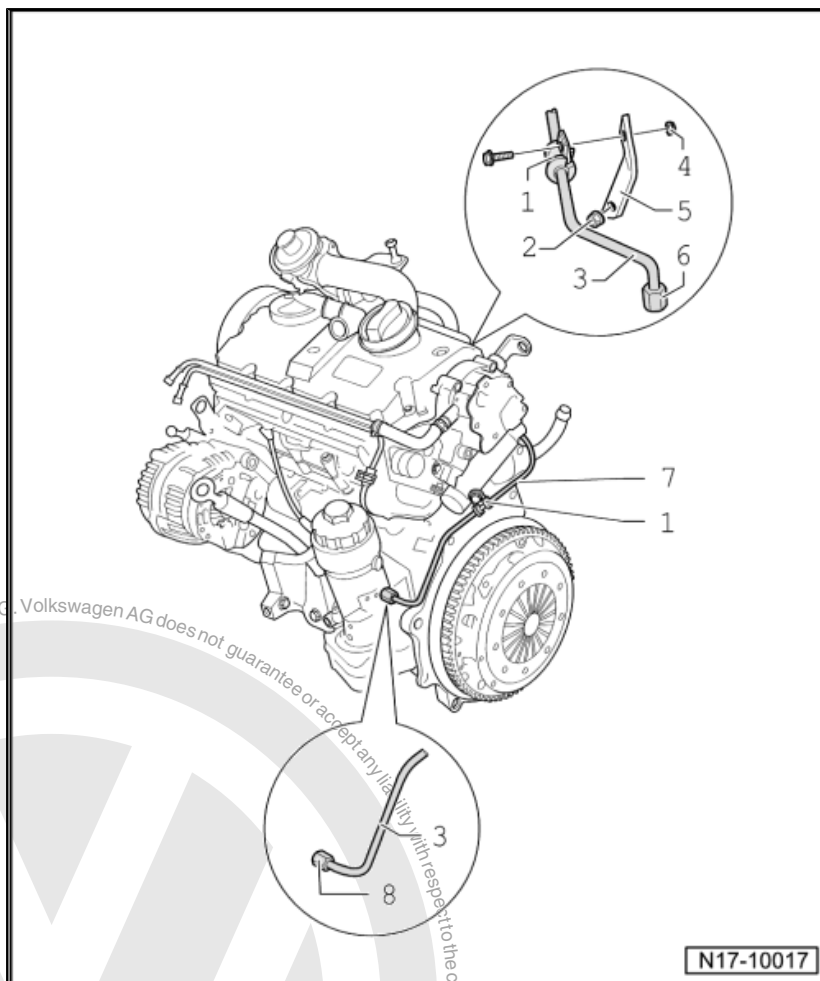
Installing

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



Note

The procedure must be adhered to in order to ensure that the oil supply line is installed tension-free.



N17-10017

- Loosen securing bolts -2- of bracket -5-.
- Locate union nuts of oil supply line on connections.
Hand-tighten union nut -8- on oil filter bracket.
- Hand-tighten union nut -6- on turbocharger.
- First tighten union nut -8- on oil filter bracket and then union nut -6- on turbocharger.
- Fit retaining clips -1- on brackets and tighten securing bolts.
- Tighten securing nut -2-.

Specified torques

- ◆ ⇒ ["3.1 Assembly overview - oil supply line", page 117](#)



19 – Cooling

1 Cooling system, coolant

⇒ “1.1 Coolant hose schematic diagram”, page 120

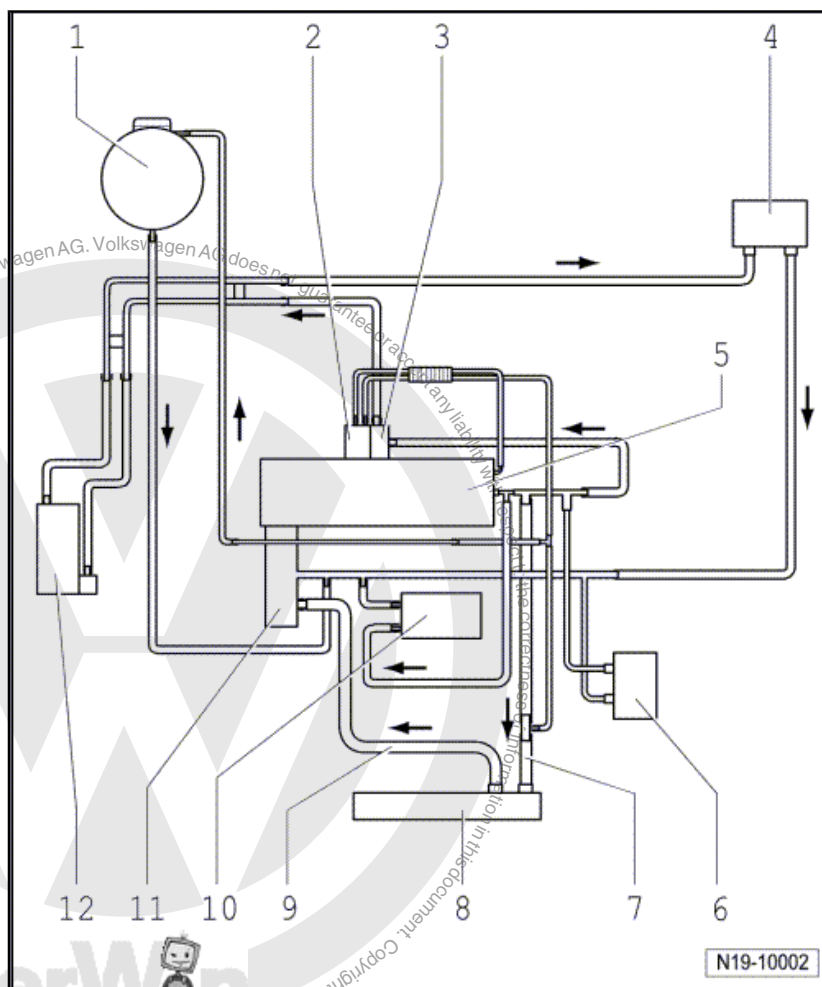
⇒ “1.2 Draining and filling coolant”, page 121

⇒ “1.3 Checking cooling system for leaks”, page 123

⇒ “1.4 Checking engine oil cooler for leaks”, page 125

1.1 Coolant hose schematic diagram

- 1 - Coolant expansion tank
- 2 - Bypass flap
- 3 - Exhaust gas recirculation cooler
- 4 - Heat exchanger for heater unit
- 5 - Cylinder head/cylinder block
- 6 - Gear oil cooler
 - ☐ For gear oil
 - ☐ Vehicles with automatic gearbox only
- 7 - Upper coolant hose
- 8 - Radiator
- 9 - Lower coolant hose
- 10 - Engine oil cooler
 - ☐ For engine oil.
- 11 - Coolant pump and thermostat
- 12 - Auxiliary heater

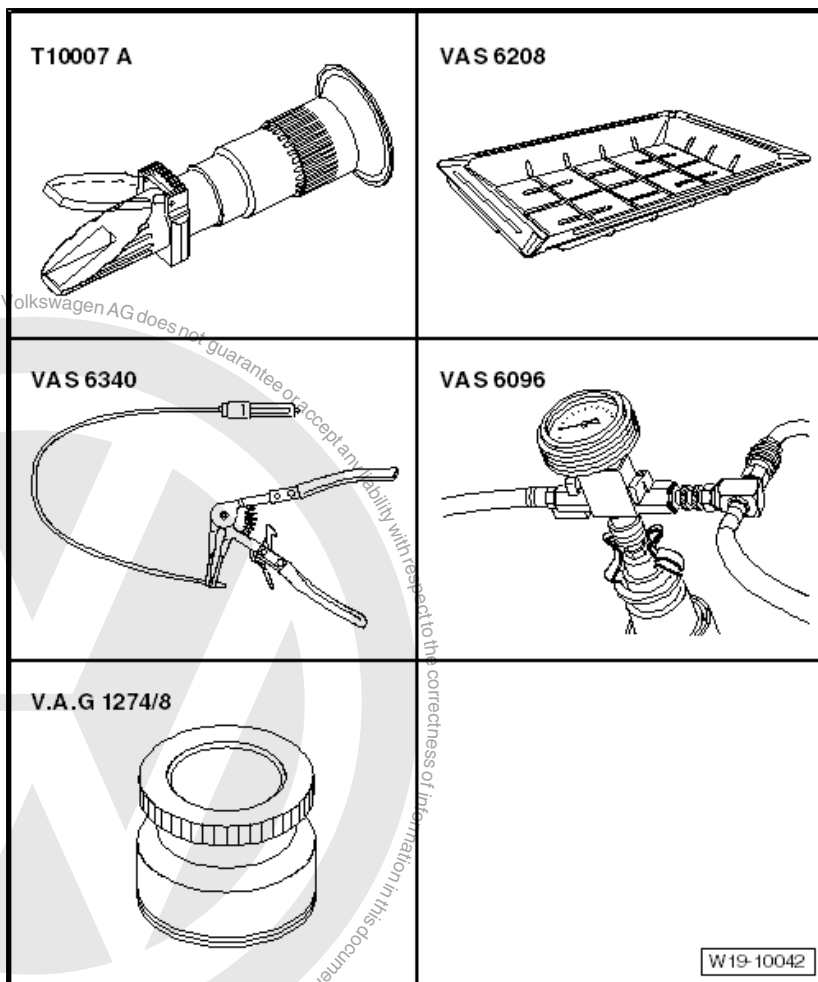




1.2 Draining and filling coolant

Special tools and workshop equipment required

- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clip pliers - VAS 6340-
- ◆ Cooling system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-



- Observe safety precautions ⇒ [page 2](#).

Draining coolant



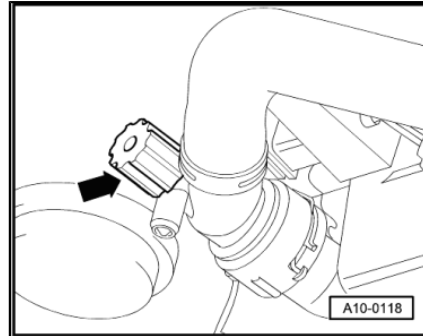
WARNING

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.

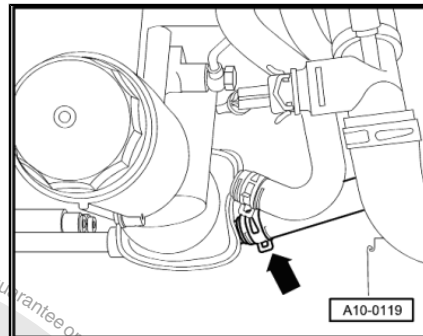
- Carefully open filler cap on coolant expansion tank.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .



- To drain coolant from radiator, unscrew drain plug -arrow-.



- In addition to draining coolant from engine, pull the coolant hose off the engine oil cooler -arrow-.



Note

Observe environmental regulations for disposal.

Filling with coolant



Note

The amount of water used in the coolant mixture has a great influence on its effectiveness. Because the water quality differs from country to country and even region to region, Volkswagen has decided to define the quality of the water to be used in the coolant system. Distilled water fulfils all requirements. It is therefore recommended that the coolant be mixed with distilled water whenever the coolant is replenished or replaced, even for older models.



Caution

Only distilled water may be used for mixing with coolant additives. The use of distilled water ensures optimum protection against corrosion.



Note

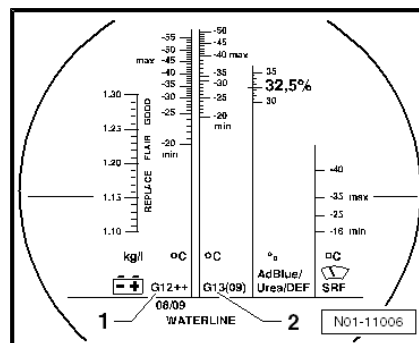
- ◆ Use only coolant additives which conform with the ⇒ *Electronic Parts Catalogue (ETKA)*. Other coolant additives may reduce corrosion protection substantially. The resulting damage could lead to loss of coolant and subsequent severe damage to the engine.
- ◆ The correct coolant solution ratio helps prevent damage from freezing and corrosion as well as scaling. Moreover, the boiling temperature is raised. 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 must be guaranteed down to about -25 °C (in countries with Arctic climates, down to about -36 °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 a stronger anti-freeze mixture is necessary due to harsher weather conditions, the coolant additive content can be increased. But only to 60 % otherwise, the antifreeze protection will be reduced again and the cooling effect will be impaired.
- ◆ ONLY refractometer - T10007 A- may be used for determining current anti-freeze density.
- ◆ Read anti-freeze figures from respective scale for type of anti-freeze added.
- ◆ Do not reuse old coolant.

Recommended mixture ratios:

Frost protection to	Coolant additive portion	Coolant additive ²⁾	Distilled water ²⁾
-25 °C	40 %	3.2 l	4.8 l
-36 °C	50 %	4.0 l	4.0 l

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

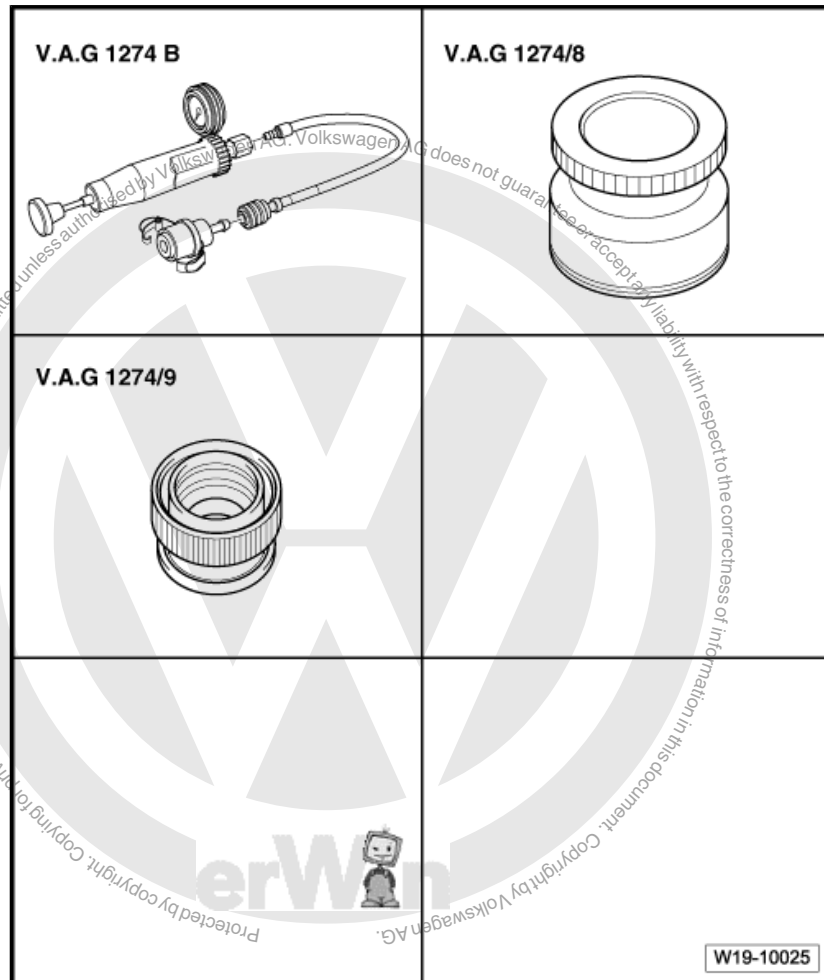
- Install coolant drain plug.
- Connect coolant hoses to engine, oil cooler.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Screw adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
- Fill coolant circuit using cooling system charge unit - VAS 6096- ⇒ Operating instructions for cooling system charge unit VAS 6096 .



1.3 Checking cooling system for leaks



- ◆ Cooling system tester - V.A.G 1274 B-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Adapter for cooling system tester - V.A.G 1274/9-



- Observe safety precautions ⇒ [page 2](#) .

Test prerequisite:

- Engine at operating temperature.

Test sequence:



WARNING

Risk of scalding.

The cooling system is pressurised. When the engine is warm, the coolant temperature may be above 100 °C.

Before carrying out repairs, release pressure and allow temperature to drop as necessary.

- Open filler cap on coolant expansion tank.
- Screw adapter for cooling system tester - V.A.G 1274/8- into coolant expansion tank.
- Clamp connector - V.A.G 1274 B/1- into adapter for cooling system tester - V.A.G 1274/8- .



- Join connection piece - V.A.G 1274 B/1- to cooling system tester - V.A.G 1274 B- using connecting hose supplied.
- Using hand pump on tester, build up a pressure of approx. 1.0 bar.

**DANGER!**

Risk of scalding! Before disconnecting cooling system tester - V.A.G 1274 B- from connecting hose or connector - V.A.G 1274 B/1- , relieve existing pressure under all circumstances. To do this, press pressure relief valve on cooling system tester - V.A.G 1274 B- until pressure gauge displays value of »0«.

If pressure drops:

- Find leaks and rectify.

Check pressure relief valve in cap.

- Screw cap into adapter for cooling system tester - V.A.G 1274/9- .
- Clamp connector - V.A.G 1274 B/1- into adapter for cooling system tester - V.A.G 1274/9- .
- Join connection piece - V.A.G 1274 B/1- to cooling system tester - V.A.G 1274 B- using connecting hose supplied.
- Using hand pump on cooling system tester, build up a pressure of approx. 1.6 bar.

The pressure relief valve must not open.

If the pressure relief valve opens prematurely:

- Renew cap.
- Increase pressure to over 1.6 bar.

The pressure relief valve must open.

If the pressure relief valve does not open:

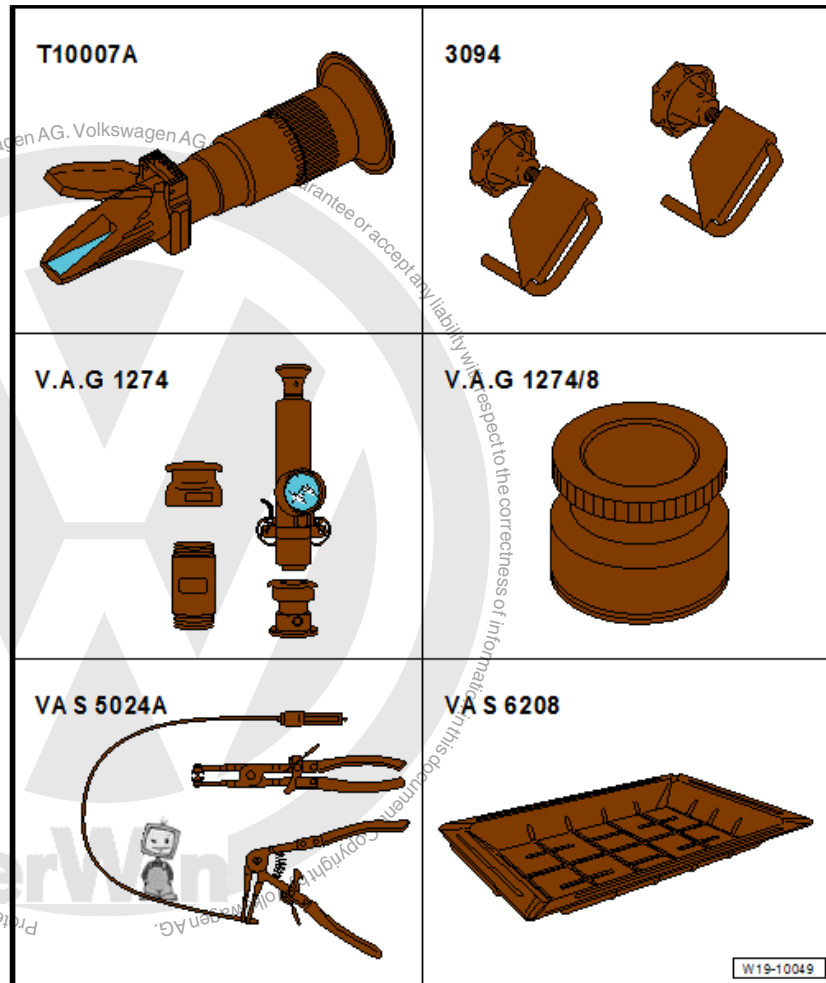
- Renew cap.

1.4 Checking engine oil cooler for leaks



Special tools and workshop equipment required

- ◆ Refractometer - T10007 A-
- ◆ Hose clamps up to 25 mm - 3094-
- ◆ Cooling system tester - V.A.G 1274-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Spring-type clip pliers - VAS 5024 A-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-



- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

Not illustrated

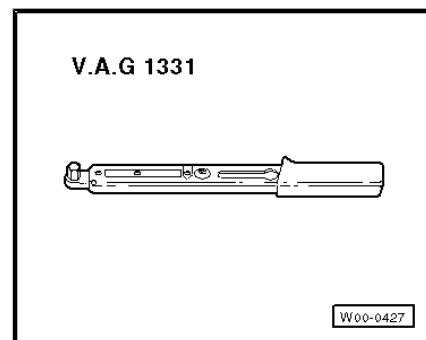
- ◆ Expansion tank
- ◆ Cap
- ◆ Commercially available plug
- ◆ Commercially available hose

Test prerequisite:

- Engine cold

Test sequence:

- Remove noise insulation ⇒ General body repairs, exterior;
Rep. gr. 50 ; Body - front; Noise insulation .





- Clamp off engine oil cooler supply and return lines using hose clamps, up to 25 mm in diameter - 3094- .
- Loosen hose clips -arrow- using spring-type clip pliers - VAS 5024- .

**Note**

Collect escaping coolant with drip tray - V.A.G 1306- or drip tray - VAS 6208- .

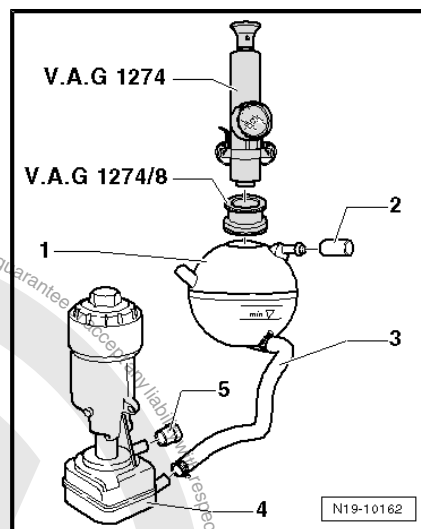
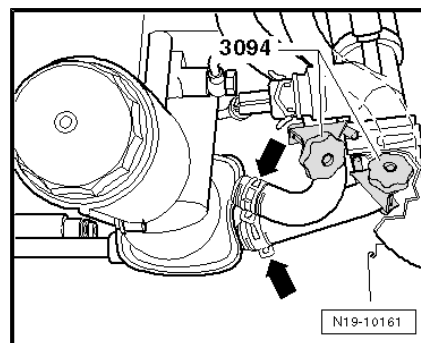
- Pull coolant hoses off engine oil cooler.
- Fit sealing cap -5- to rear connection of engine oil cooler -4-.
- Fit sealing plug -2- to breather connection of expansion tank -1-.
- Secure hose -3- on engine oil cooler and coolant expansion tank.
- Fill coolant expansion tank up to max. mark.
- Fit cooling system tester - V.A.G 1274- with adapter for cooling system tester - V.A.G 1274/8- to coolant expansion tank.
- Using hand pump on tester, build up a pressure of approx. 1.6 bar.
- Observe pressure drop on pressure gauge. A pressure drop within 10 minutes is not permitted.

If pressure drops:

- Renew engine oil cooler ⇒ [page 114](#) .

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

- Check coolant level and, if necessary, replenish ⇒ [page 121](#) .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .





2 Coolant pump, regulation of cooling system

⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 128](#)

⇒ ["2.2 Removing and installing coolant pump", page 132](#)

⇒ ["2.3 Removing and installing thermostat", page 133](#)

2.1 Assembly overview - coolant pump, thermostat

Engine code BJB

Engine codes BLS, BSU ⇒ [page 129](#)

1 - To upper coolant expansion tank

- ❑ Coolant hose schematic diagram ⇒ [page 120](#) .

2 - Upper coolant pipe

- ❑ Bolted to cylinder head cover

3 - To bypass flap

- ❑ Coolant hose schematic diagram ⇒ [page 120](#) .

4 - O-ring

- ❑ Renew after removing.

5 - Retaining clip

- ❑ Check for secure seating.

6 - Coolant temperature sender - G62-

- ❑ With coolant temperature display sender - G2-
- ❑ Before removing, release pressure in cooling system if necessary.

7 - To exhaust gas recirculation cooler.

- ❑ Coolant hose schematic diagram ⇒ [page 120](#) .

8 - Connection

9 - Bolt

- ❑ 10 Nm

10 - To heat exchanger

- ❑ Coolant hose schematic diagram ⇒ [page 120](#) .

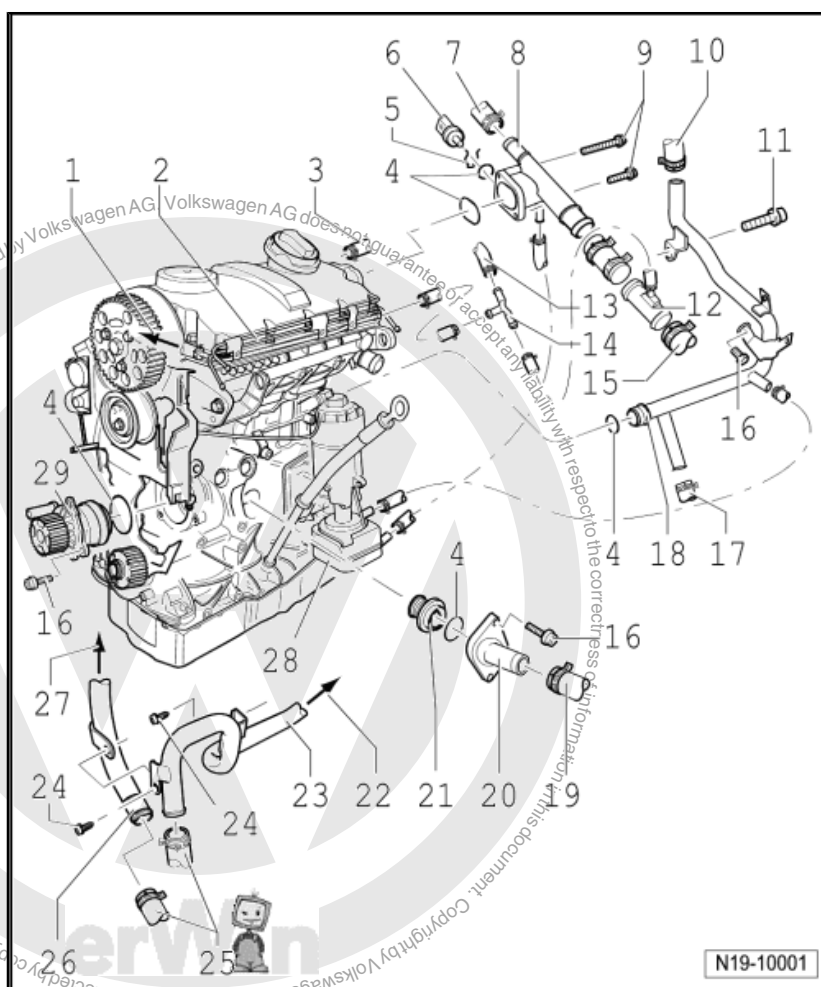
11 - Bolt

- ❑ 40 Nm

12 - T-piece

13 - To bypass flap

- ❑ Coolant hose schematic diagram ⇒ [page 120](#) .





14 - T-piece

15 - To top of radiator

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

16 - Bolt

- ☐ 15 Nm

17 - To lower coolant expansion tank

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

18 - Coolant pipe

19 - To bottom of radiator

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

20 - Connection

- ☐ For thermostat.

21 - Thermostat

- ☐ Checking: heat thermostat in water.
- ☐ Opening begins at approx. 85 °C.
- ☐ Ends at approx. 105 °C.
- ☐ Opening lift at least 7 mm.
- ☐ Note installation position ⇒ [page 133](#) .
- ☐ Removing and installing ⇒ [page 133](#) .

22 - To heat exchanger

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

23 - Rear coolant pipe

24 - Bolt

- ☐ 10 Nm

25 - To auxiliary heater

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

26 - Coolant pipe

27 - To exhaust gas recirculation cooler.

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

28 - Engine oil cooler

- ☐ Removing and installing ⇒ [page 114](#) .

29 - Coolant pump

- ☐ Check for ease of movement.
- ☐ Note installation position.
- ☐ Removing and installing ⇒ [page 132](#) .



Engine codes BLS, BSU



1 - To top of expansion tank

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

2 - Upper coolant pipe

- ☐ Bolted to cylinder head cover
- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

3 - O-ring

- ☐ Renew after removing.

4 - Retaining clip

- ☐ Check for secure seating.

5 - Coolant temperature sender - G62-

- ☐ If necessary, release pressure in cooling system before removing.

6 - To exhaust gas recirculation cooler.

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

7 - Connection

8 - Bolt

- ☐ 10 Nm

9 - To top of radiator

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

10 - From heat exchanger

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

11 - Bolt

- ☐ 40 Nm

12 - T-piece

13 - From upper coolant hose T-piece

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

14 - Bolt

- ☐ 15 Nm

15 - From bottom of expansion tank

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

16 - Front coolant pipe

- ☐ Coolant hose schematic diagram ➤ [page 120](#) .

17 - Seal

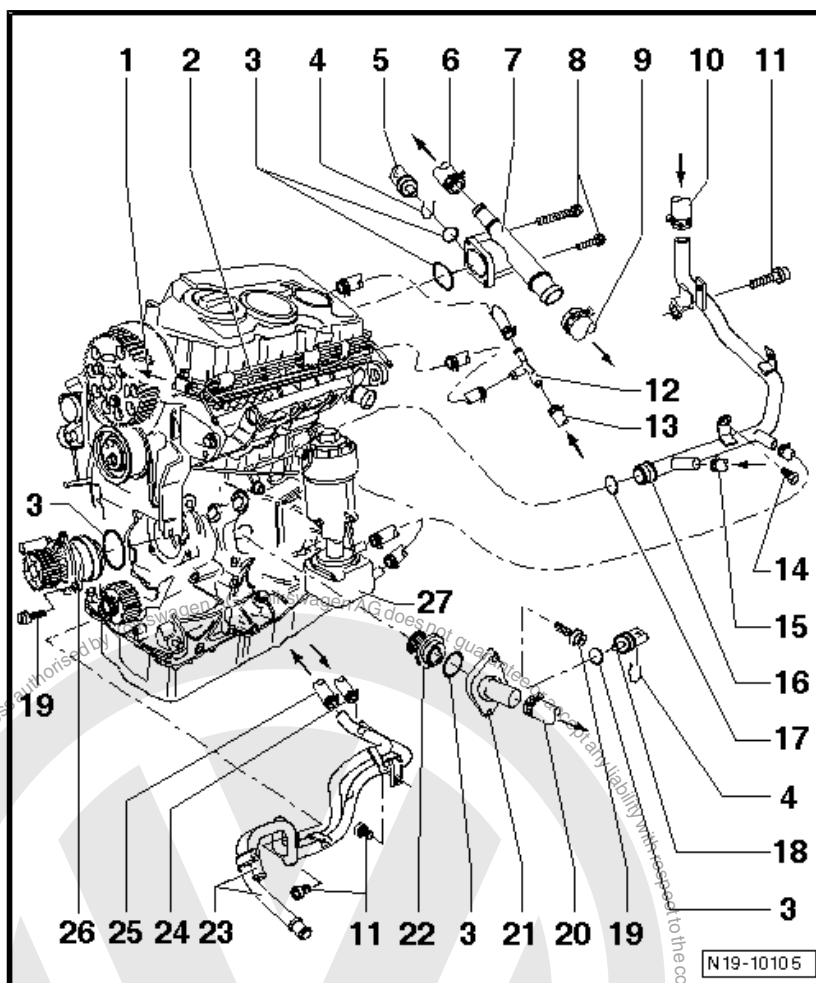
- ☐ Renew after removing.

18 - Radiator outlet coolant temperature sender - G83-

- ☐ If necessary, release pressure in cooling system before removing.

19 - Bolt

- ☐ 15 Nm





20 - To bottom of radiator

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

21 - Connection

- ☐ For thermostat.
- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

22 - Thermostat

- ☐ Checking: heat thermostat in water.
- ☐ Opening begins at approx. 85 °C.
- ☐ Ends at approx. 105 °C.
- ☐ Opening lift at least 7 mm.
- ☐ Note installation position ⇒ [page 133](#) .
- ☐ Removing and installing ⇒ [page 133](#) .

23 - Rear coolant pipe

- ☐ In vehicles with additional heater only.
- ☐ Removing and installing in vehicles with all-wheel drive ⇒ [page 136](#) .
- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

24 - From exhaust gas recirculation cooler

- ☐ To recirculating pump - V55- .
- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

25 - To heat exchanger

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

26 - Coolant pump

- ☐ Check for ease of movement.
- ☐ Note installation position.
- ☐ Removing and installing ⇒ [page 132](#) .

27 - Engine oil cooler

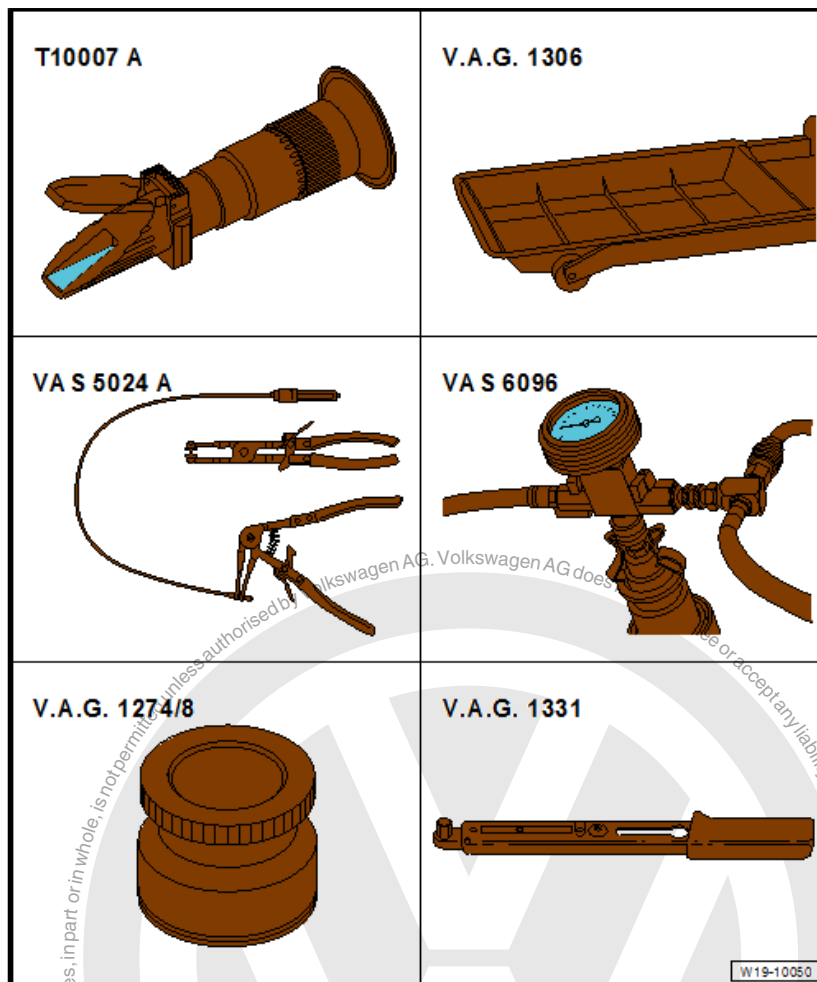
- ☐ For engine oil.
- ☐ Removing and installing ⇒ [page 114](#) .



2.2 Removing and installing coolant pump

Special tools and workshop equipment required

- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024A-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Cooling system charge unit - VAS 6096-



Removing

- Observe safety precautions ⇒ [page 2](#).



Note

Always renew seals and gaskets.

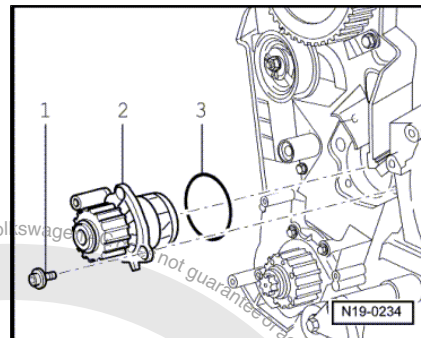
- Drain coolant ⇒ [page 121](#) .
- Remove poly V-belt ⇒ [page 30](#) .
- Remove toothed belt ⇒ [page 73](#) .



- Remove coolant pump securing bolts -1- and carefully remove coolant pump -2-.

Installing

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



- Moisten new O-ring -3- with coolant.
- Insert coolant pump -2- into cylinder block and tighten securing bolts -1-.



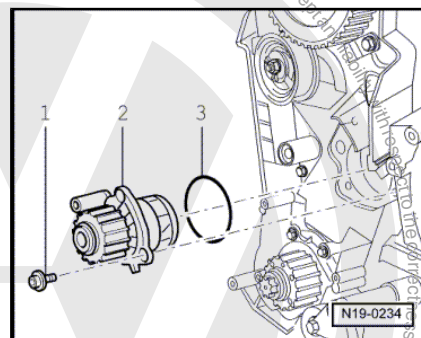
Note

The coolant pump plug faces downwards.

- Installing toothed belt ⇒ [page 73](#).
- Install poly V-belt ⇒ [page 30](#).
- Replenish coolant ⇒ [page 121](#).

Specified torques

- ♦ ⇒ [“2.1 Assembly overview - toothed belt drive”, page 72](#)
- ♦ ⇒ [“2.1 Assembly overview - assembly mountings”, page 26](#)

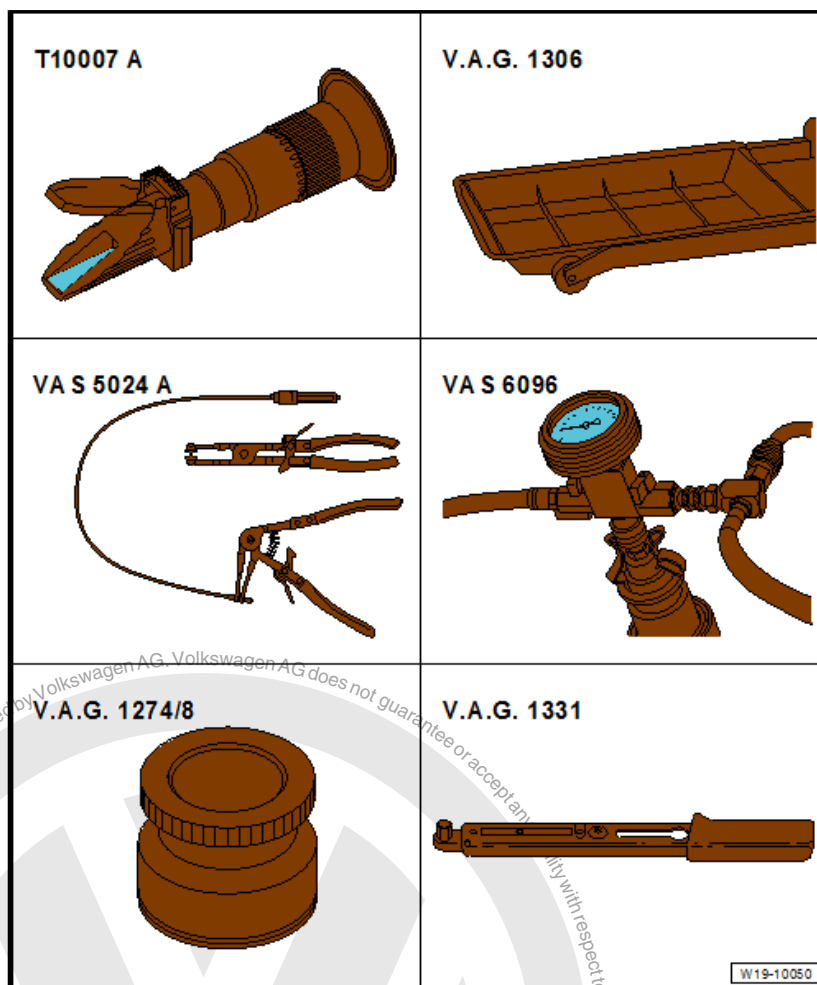


2.3 Removing and installing thermostat



Special tools and workshop equipment required

- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024A-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Cooling system charge unit - VAS 6096-



Removing

- Observe safety precautions ⇒ [page 2](#) .



Note

Always renew seals and gaskets.

- Drain coolant ⇒ [page 121](#) .

Vehicles with air conditioner

- Remove alternator ⇒ Electrical system; Rep. gr. 27; Alternator; Removing and installing alternator .

Vehicles with no air conditioner

- Release securing clip from wiring harness on alternator.

All vehicles:

- Pull coolant hose off connection.

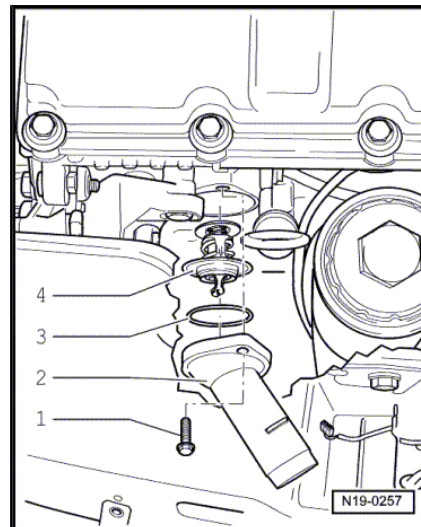


- Remove securing bolts -1- of connecting flange -2- and remove connecting flange -2- with thermostat -4-.
- Turn thermostat -4- 1/4 turn (90°) to left and remove from connecting flange -2-.

Installing

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

- Moisten new O-ring -3- with coolant.



- Insert thermostat -4- in union -2- and turn 1/4 turn (90°) to right.



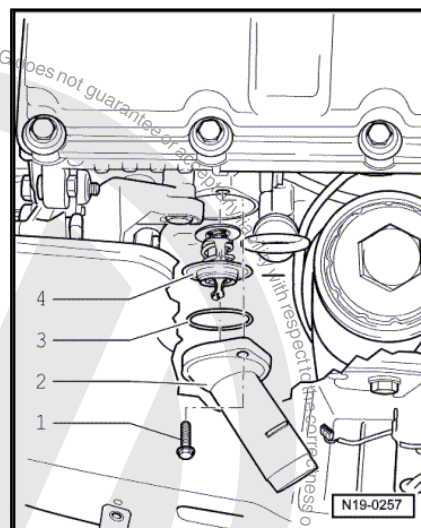
Note

The brace on the thermostat must be almost vertical.

- Fit connection -2- with thermostat -4- into cylinder block.
- Tighten securing bolts -1-.
- Replenish coolant ⇒ [page 121](#).

Specified torques

- ◆ ⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 128](#)





3 Coolant pipes

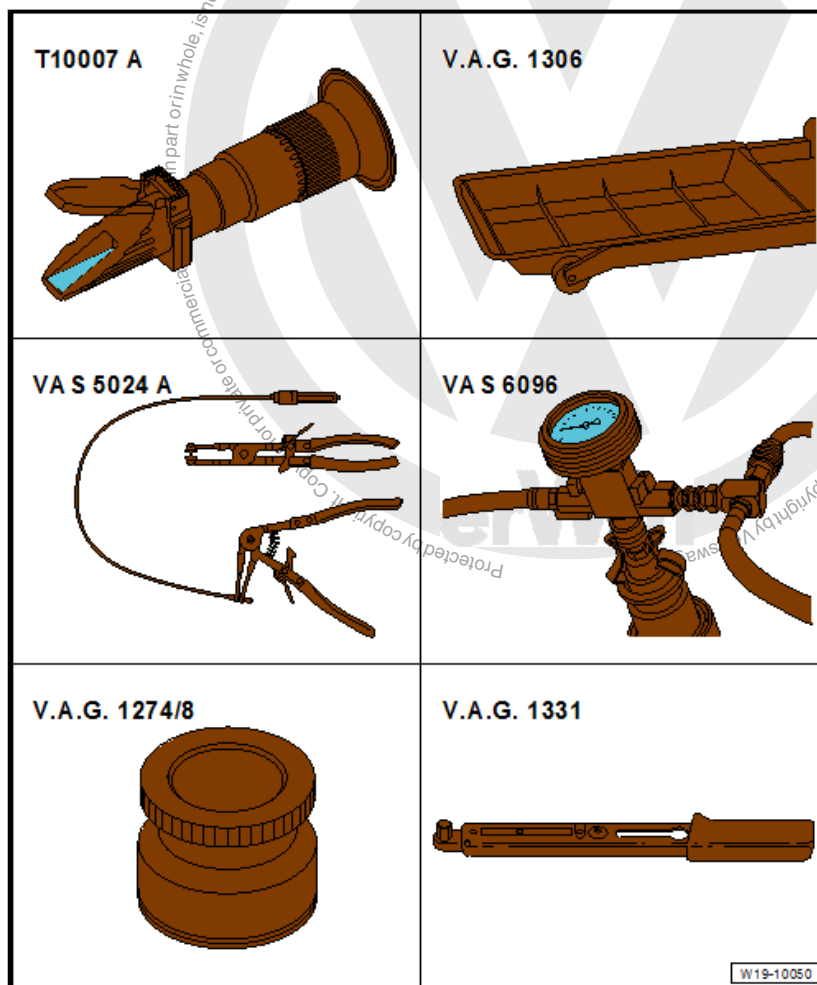
⇒ **"3.1 Removing and installing rear coolant pipe for additional heater", page 136**

3.1 Removing and installing rear coolant pipe for additional heater

Vehicles with four-wheel drive

Special tools and workshop equipment required

- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024A-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Cooling system charge unit - VAS 6096-

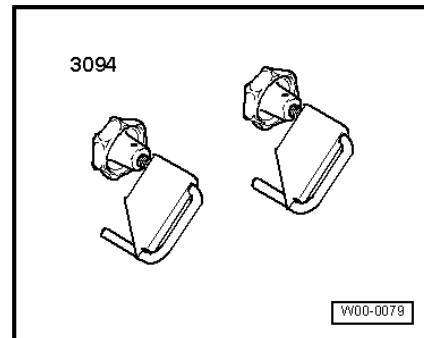




- ◆ Hose clamps up to 25 mm - 3094-

Removing

- Observe safety precautions ⇒ [page 2](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner .
- Remove propshaft ⇒ Rear axle and rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Remove right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Disconnect electrical connector from oil level and oil temperature sender - G266- and unclip wire from subframe.



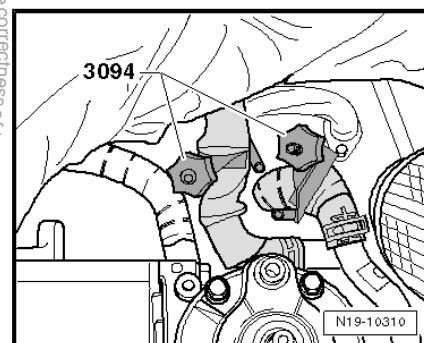
Caution

Risk of scalding.

When the engine is warm, the coolant temperature may be above 100 °C. The cooling system is pressurised.

Before carrying out repairs, release pressure and allow temperature to drop as necessary.

- Clamp off coolant hoses to rear coolant pipe using hose clamps, up to 25 mm in diameter - 3094- .
- Pull off coolant hoses.



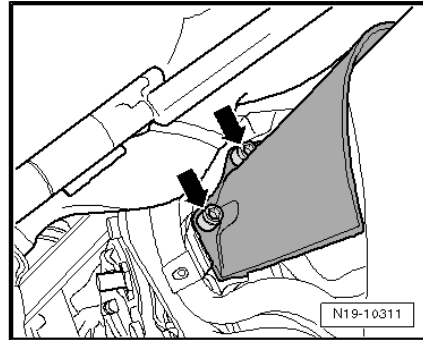


- Unbolt heat shield for right drive shaft from bevel box -arrows-.
- Pull off coolant hoses for auxiliary heater on coolant pipe.
- Unbolt and remove coolant pipe from sump.

Installing

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

- Install right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Install propshaft ⇒ Rear axle and rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Install front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Front wheel housing liner .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Replenish coolant ⇒ [page 121](#) .



Specified torques

- ◆ ⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 128](#)
- ◆ Drive shafts; Assembly overview - drive shafts ⇒ Rep. gr. 40 ; Assembly overview - drive shaft .
- ◆ Propshaft; Assembly overview - propshaft ⇒ Rep. gr. 39 ; Assembly overview - propshaft
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ Rep. gr. 50 ; Assembly overview - noise insulation





4 Radiator, radiator fan

⇒ "4.1 Assembly overview - radiator/radiator fan", page 139

⇒ "4.2 Removing and installing radiator", page 141

⇒ "4.3 Removing and installing fan support with fans", page 142

4.1 Assembly overview - radiator/radiator fan



Note

- ◆ Depending on vehicle equipment, vehicles are also fitted with one radiator fan only. Removing and installing is the same procedure as for the dual fan, described below.
- ◆ Coolant hose schematic diagram ⇒ page 120.

1 - Upper coolant hose

- ☐ Secured to radiator with retaining clip.
- ☐ Check for secure seating.
- ☐ Coolant hose schematic diagram ⇒ page 120.

2 - O-ring

- ☐ Renew after removing.

3 - Radiator

- ☐ After renewing, renew entire coolant.
- ☐ Removing and installing ⇒ page 141.

4 - Sealing strip

- ☐ Pushed onto top and bottom of radiator.

5 - 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

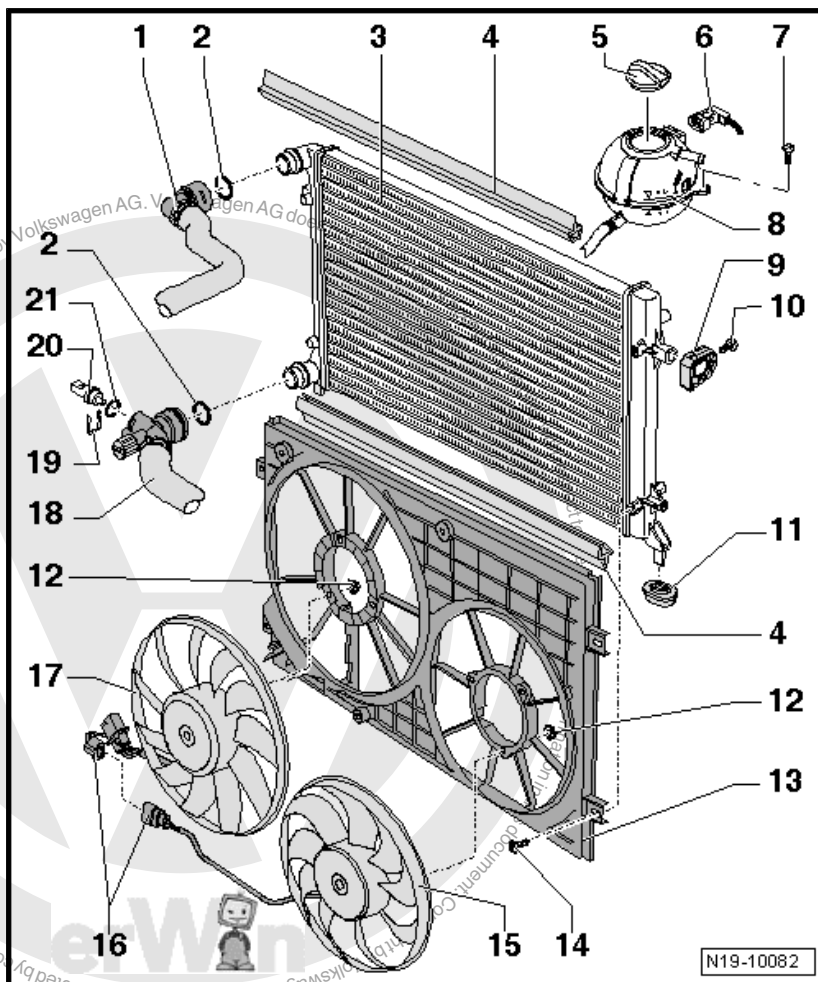
6 - Connector

7 - Bolt

- ☐ 5 Nm

8 - Expansion tank

- ☐ Check using cooling system tester - V.A.G 1274 B- and adapter for cooling system tester - V.A.G 1274/8-.





9 - Bracket

10 - Bolt

- ☐ 5 Nm

11 - Mounting

12 - Nut

- ☐ 10 Nm

13 - Fan support

- ☐ Removing and installing ⇒ [page 142](#) .

14 - Bolt

- ☐ 5 Nm

15 - Radiator fan 2 - V177-

- ☐ Removing and installing ⇒ [page 141](#) .

16 - Connector

17 - Radiator fan - V7-

- ☐ Removing and installing ⇒ [page 141](#) .

18 - Lower coolant hose

- ☐ Secured to radiator with retaining clip.
- ☐ Check for secure seating.
- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

19 - Retaining clip

- ☐ Check for secure seating.

20 - Radiator outlet coolant temperature sender - G83-

21 - O-ring

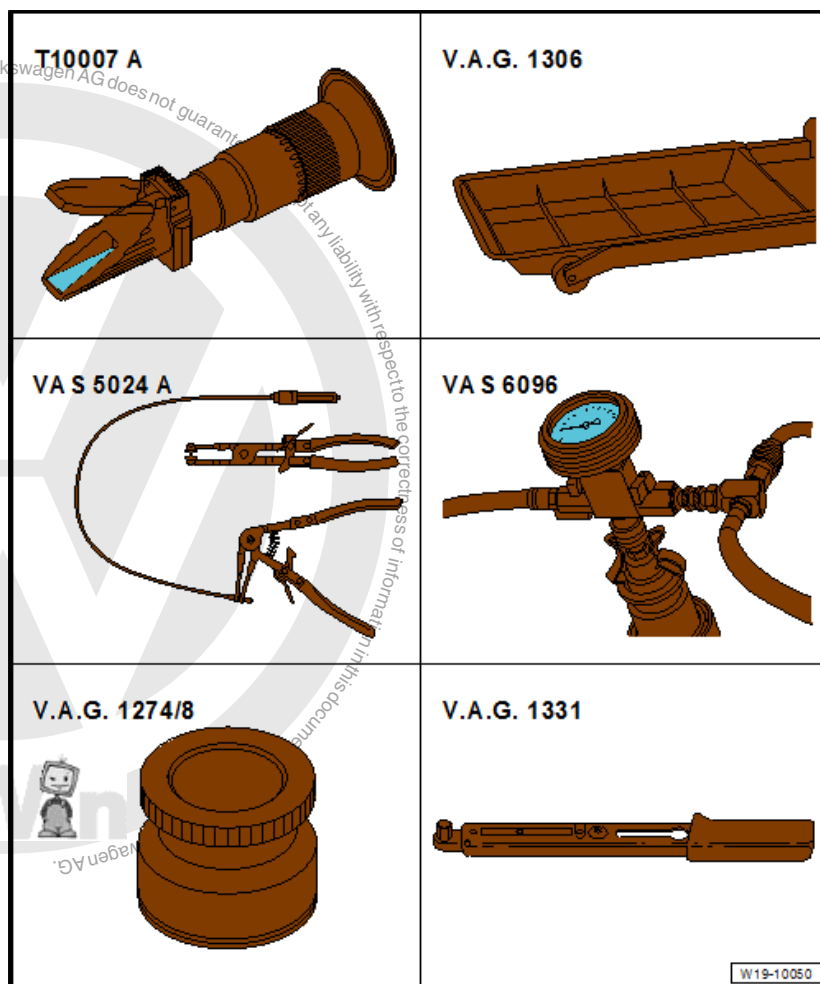
- ☐ Renew after removing.



4.2 Removing and installing radiator

Special tools and workshop equipment required

- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024A-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Cooling system charge unit - VAS 6096-



Removing

- Observe safety precautions ⇒ [page 2](#) .
- Drain coolant ⇒ [page 121](#) .
- Remove fan support with fans ⇒ [page 142](#) .
- Pull coolant hoses off radiator.
- Remove radiator securing bolts.
- Swing radiator backwards slightly and remove upwards.

Installing

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

- Replenish coolant ⇒ [page 121](#) .

Specified torques

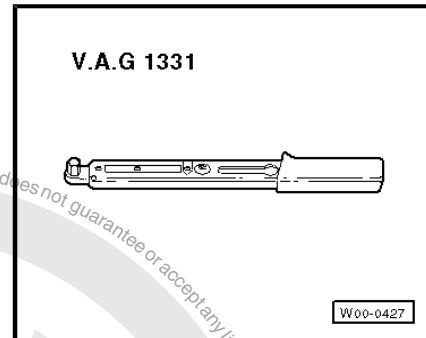
- ◆ ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 139](#)



4.3 Removing and installing fan support with fans

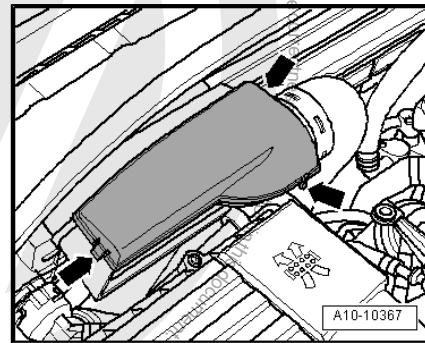
Special tools and workshop equipment required

- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

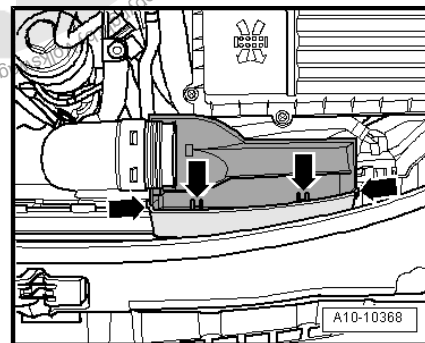


Removing

- Observe safety precautions ⇒ [page 2](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Pull cover off air duct by releasing retaining clips on sides -arrows-.

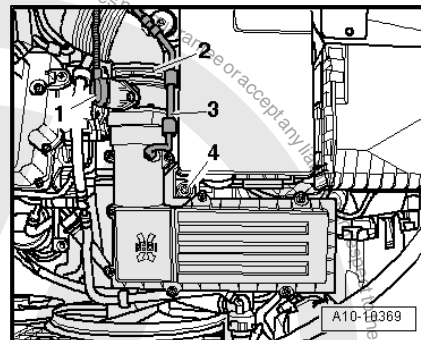


- Unclip air duct at bottom by releasing retaining clips -arrows-
- Detach air duct at bottom together with air hose.





- Disconnect electrical connector -1- from air mass meter - G70- .
- Pull off breather hose -3- and air duct hose -2-.
- Unscrew bolt -4- and remove air filter housing.

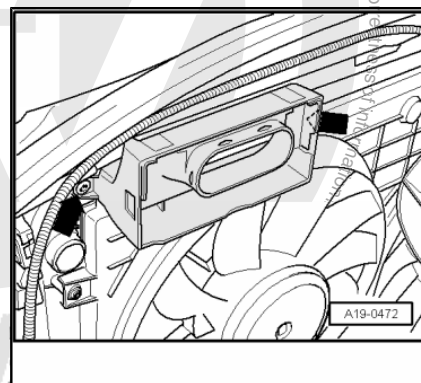


- Unscrew air duct on lock carrier -arrows-.

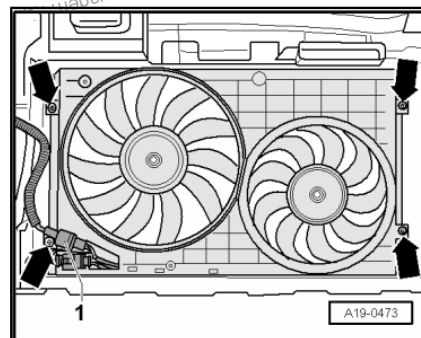
Engine code BJB

- On left-hand side, remove connecting pipe with connecting hose to charge air cooler.

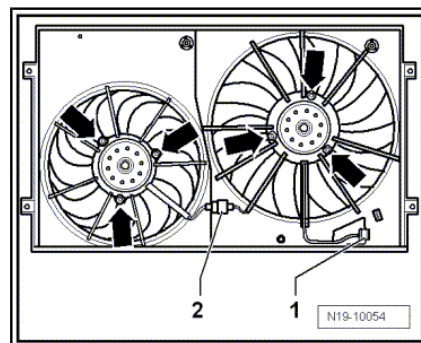
Continuation for all vehicles



- Disconnect connector -1- and unscrew securing bolts for fan support -arrows-.
- Remove fan support together with fans downwards.



- Disconnect connector -2-, and move clear electrical wiring.
- Unclip connector -1- from fan support, and lay lines to one side.
- Unscrew securing nuts -arrows- and remove fans.



Installing

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

Specified torques

- ♦ ⇒ ["4.1 Assembly overview - radiator/radiator fan", page 139](#)



21 – Turbocharging/supercharging

1 Turbocharger

⇒ [“1.1 Assembly overview - turbocharger, engine code BJB”, page 144](#)

⇒ [“1.2 Assembly overview - turbocharger, engine codes BLS, BSU”, page 146](#)

⇒ [“1.3 Changing and adjusting vacuum unit on turbocharger, only vehicles with engine codes BLS and BSU as of model year 2008”, page 148](#)

⇒ [“1.4 Removing and installing turbocharger”, page 154](#)

⇒ [“1.5 Removing and installing turbocharger support with oil return pipe”, page 159](#)

1.1 Assembly overview - turbocharger, engine code BJB



Note

- ◆ All hose connections are secured.
- ◆ Charge air system must be free of leaks.
- ◆ Renew self-locking nuts.
- ◆ Before screwing on oil supply line, fill turbocharger at connection with engine oil.
- ◆ After installing turbocharger, run engine for about 1 minute at idling speed to ensure that oil is supplied to turbocharger.

Observe rules for cleanliness ⇒ [page 6](#) .

Observe safety precautions ⇒ [page 4](#) .



1 - Bolt

- ☐ 10 Nm

2 - Union nut

- ☐ 22 Nm

3 - Oil supply line

- ☐ Before installing oil supply line, ensure that it is not blocked
- ☐ Before installing, fill turbocharger with engine oil through oil supply line connection
- ☐ Removing and installing
⇒ [page 117](#)

4 - Union nut

- ☐ 22 Nm

5 - Gasket

- ☐ Renew after removing.
- ☐ Note installation position.

6 - Washer

7 - Nut

- ☐ Renew after removing.
- ☐ 25 Nm

8 - Support

- ☐ Between turbocharger and cylinder block.

9 - Bolt

- ☐ First hand tighten all bolts
- ☐ 40 Nm

10 - Connecting pipe

- ☐ Air filter/turbocharger

11 - Connecting piece

12 - Gasket

- ☐ Renew after removing.

13 - Seal

- ☐ Renew after removing.

14 - Connecting piece

- ☐ 40 Nm

15 - Oil return line

- ☐ To cylinder block.
- ☐ 30 Nm

16 - Bolt

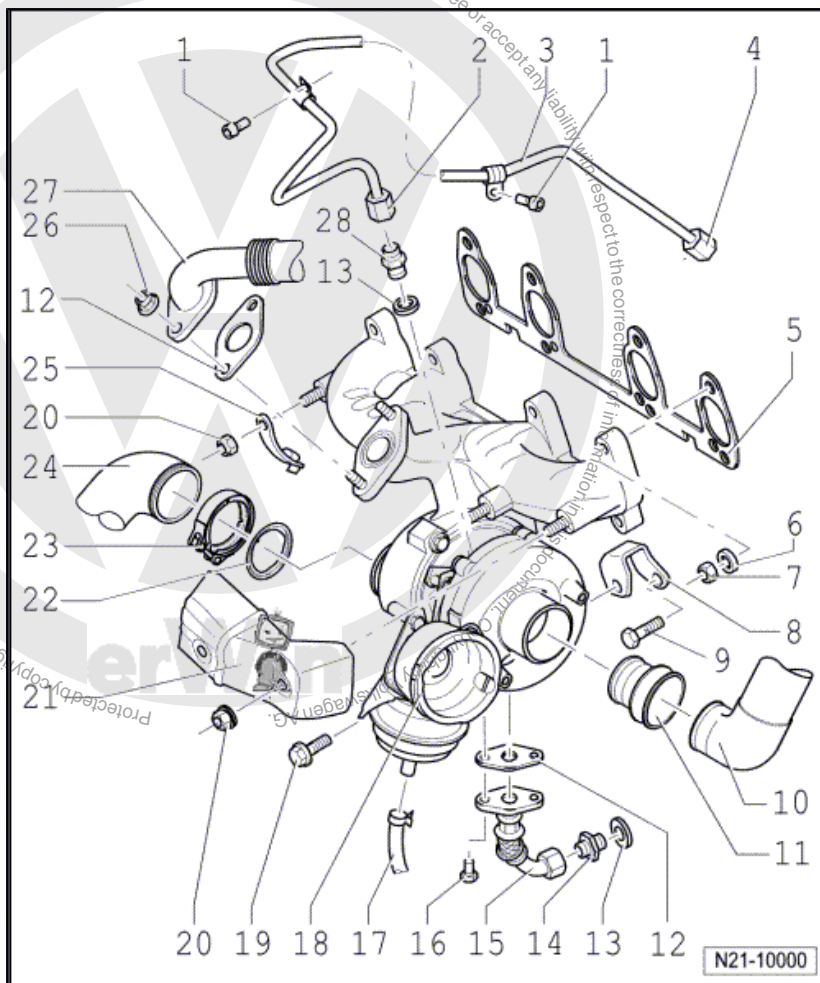
- ☐ 17 Nm

17 - Vacuum hose

- ☐ To solenoid valve block

18 - Turbocharger

- ☐ Can only be renewed with exhaust manifold.





- ☐ Removing and installing ⇒ [page 154](#) .

19 - Bolt

- ☐ First hand tighten all bolts
- ☐ 20 Nm

20 - Nut

- ☐ Renew after removing.
- ☐ 20 Nm

21 - Heat shield

22 - Gasket

- ☐ Renew after removing.
- ☐ Note installation position.

23 - Clamp

- ☐ 7 Nm

24 - Front exhaust pipe

25 - Bracket

- ☐ For oil supply line ⇒ [Item 3 \(page 145\)](#) .
- ☐ Before installing, secure oil supply line.

26 - Nut

- ☐ Renew after removing.
- ☐ 22 Nm

27 - Connecting pipe

- ☐ To bypass flap

28 - Connecting piece

- ☐ Renew after removing.
- ☐ 30 Nm

1.2 Assembly overview - turbocharger, engine codes BLS, BSU



Note

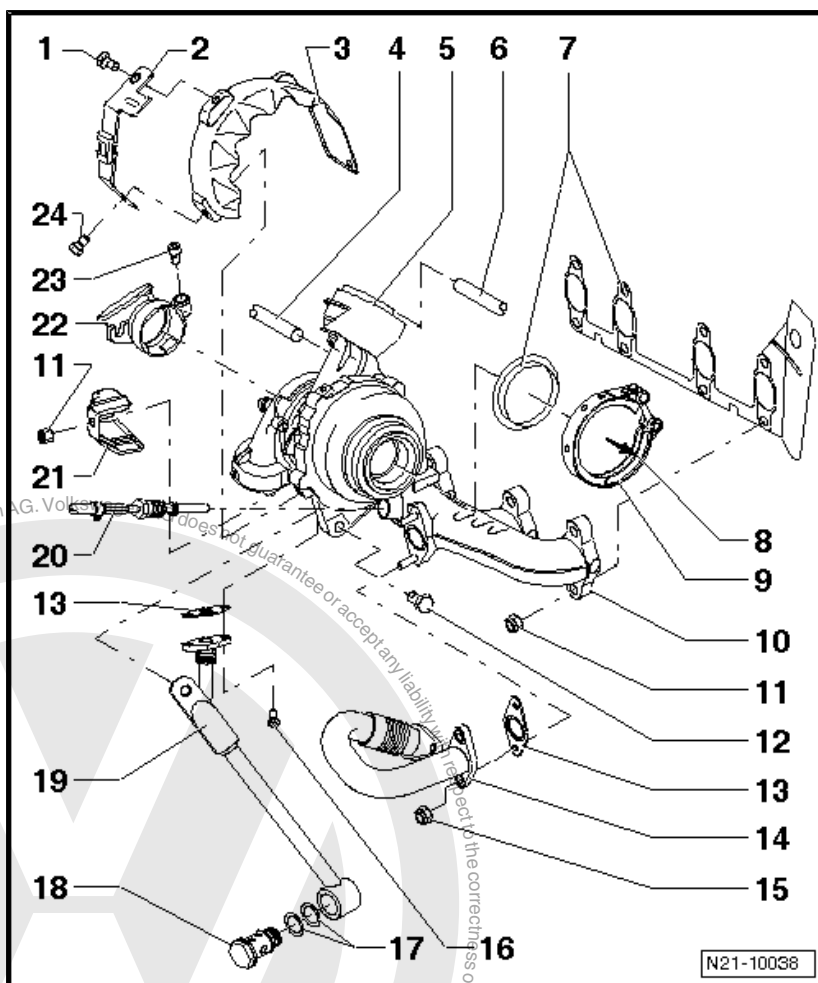
- ◆ *All hose connections are secured.*
- ◆ *Charge air system must be free of leaks.*
- ◆ *Renew self-locking nuts.*
- ◆ *Before screwing on oil supply line, fill turbocharger at connection with engine oil.*
- ◆ *After installing turbocharger, run engine for about 1 minute at idling speed to ensure that oil is supplied to turbocharger.*

Observe rules for cleanliness ⇒ [page 6](#) .

Observe safety precautions ⇒ [page 4](#) .



- 1 - Bolt**
 - ☐ 10 Nm
- 2 - Bracket**
- 3 - Heat shield**
- 4 - Oil supply hose**
 - ☐ To oil supply line connection on turbocharger
 - ☐ Before installing oil supply line, ensure that it is not blocked
 - ☐ Before installing, fill turbocharger via oil supply hose with engine oil.
- 5 - Turbocharger**
 - ☐ Can only be renewed with exhaust manifold.
 - ☐ Removing and installing ⇒ [page 154](#)
- 6 - Vacuum hose**
- 7 - Gasket**
 - ☐ Note installation position.
 - ☐ Renew after removing.
- 8 - To particulate filter**
- 9 - Clamp**
 - ☐ 7 Nm
- 10 - Exhaust manifold**
 - ☐ Can only be renewed with turbocharger
- 11 - Nut**
 - ☐ Renew after removing.
 - ☐ 25 Nm
- 12 - Bolt**
 - ☐ 25 Nm
- 13 - Gasket**
 - ☐ Renew after removing.
- 14 - Connecting pipe**
 - ☐ For exhaust gas recirculation.
 - ☐ Assembly overview - exhaust gas recirculation ⇒ [page 208](#)
- 15 - Nut**
 - ☐ Renew after removing.
 - ☐ 25 Nm
- 16 - Bolt**
 - ☐ 15 Nm
- 17 - O-ring**
 - ☐ Renew after removing.
- 18 - Banjo bolt**
 - ☐ 60 Nm





19 - Support

- ☐ With oil return line
- ☐ Removing and installing ⇒ [page 159](#) .

20 - Exhaust gas temperature sender 1 - G235-

- ☐ Grease thread of sender using high-temperature paste ⇒ Electronic Parts Catalogue (ETKA) .
- ☐ 45 Nm

21 - Heat shield

22 - Connecting piece

- ☐ Assembly overview - air filter ⇒ [page 181](#) .

23 - Bolt

- ☐ 9 Nm

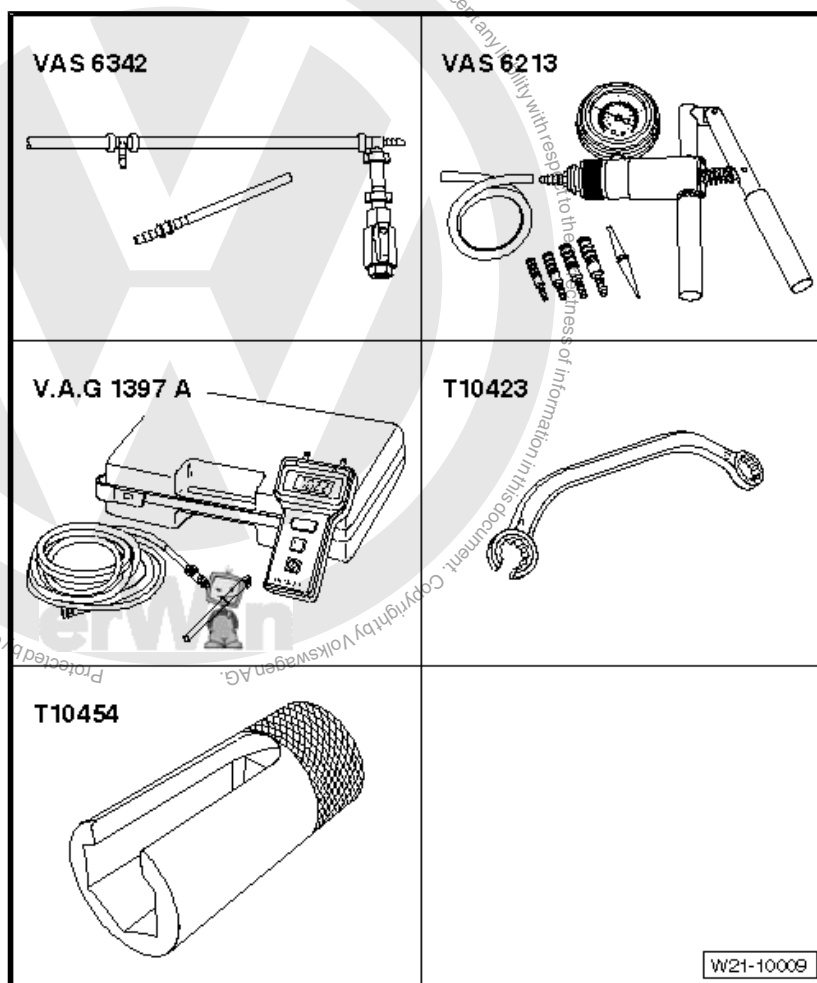
24 - Bolt

- ☐ 10 Nm

1.3 Changing and adjusting vacuum unit on turbocharger, only vehicles with engine codes BLS and BSU as of model year 2008

Special tools and workshop equipment required

- ◆ Pressure regulating valve - VAS 6342-
- ◆ Hand vacuum pump - VAS 6213-
- ◆ Turbocharger tester - V.A.G 1397A-
- ◆ Ring spanner - T10423-
- ◆ Socket 10 mm - T10454-





Caution

The special tools indicated, in particular Socket 10 mm - T10454-, are designed solely for use according to the following work instructions and must not be used for other threaded connections. There is a danger of deformation if high torques are applied.

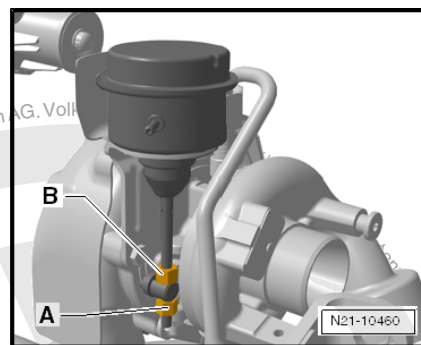


Note

A replacement parts kit is available when changing the vacuum unit ➔ *Electronic Parts Catalogue* .

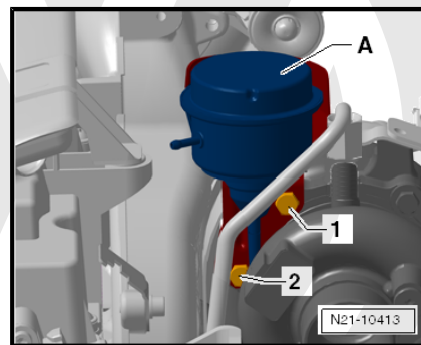
Removing

- To renew pressure unit, remove turbocharger ➔ [page 154](#) .
- Counterhold lock nut -B- with ring spanner 10x12 - T10423- and unscrew securing nut -A- from control rod using socket 10 mm - T10454- .



- Remove bolt -1-, then bolt -2- and remove vacuum unit -A-.

Installing





- Colour mark vacuum unit and control rods -as shown-.



Note

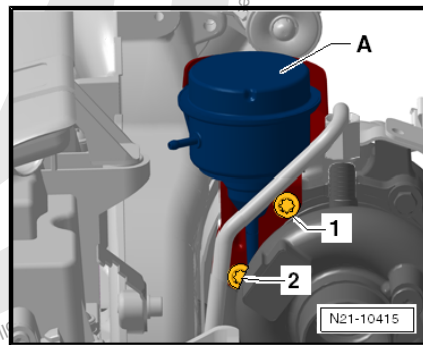
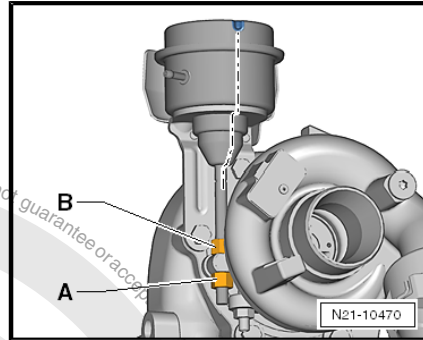
The colour marks show that the control rods are adjusted correctly, after tightening. Adjustments should then be made as necessary.



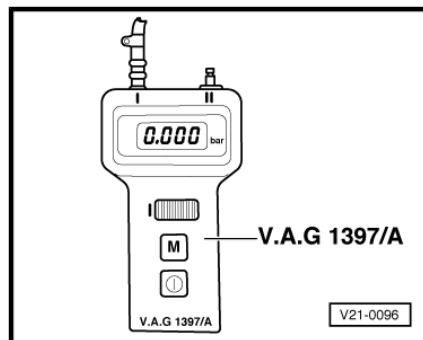
Caution

Only use new bolts and nuts from the spare-parts kit!

- If necessary, remove lower securing nut of the control rod from the new vacuum unit.
- Screw locknut by hand onto the control rod as far as possible in the direction of the vacuum unit.
- Push control rod through the adjusting lever on turbocharger, fit vacuum unit -A- and lock.
- Fit bolts -1- and -2- from repair kit.
- Tighten bolts -1- and -2-.

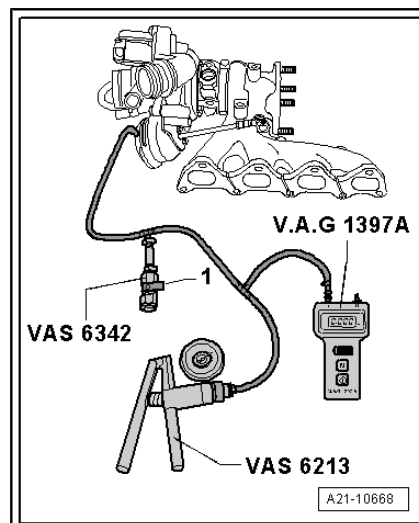


- Switch on turbocharger tester - V.A.G 1397A- and set sliding switch to position "I".
- Subtract 600 mbar from atmospheric pressure displayed and note value. (Value 1)
- Subtract 650 mbar from atmospheric pressure displayed and note value. (Value 2)





- Connect test and measuring instruments together as illustrated and connect to connection "I" -arrow- of turbocharger tester - V.A.G 1397A- and to turbocharger vacuum unit.
- Close lever -1- on pressure regulating valve - VAS 6342- .

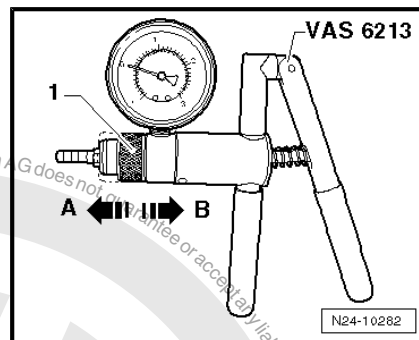


- Move slide ring -1- on hand vacuum pump - VAS 6213- to position -A- for "vacuum".

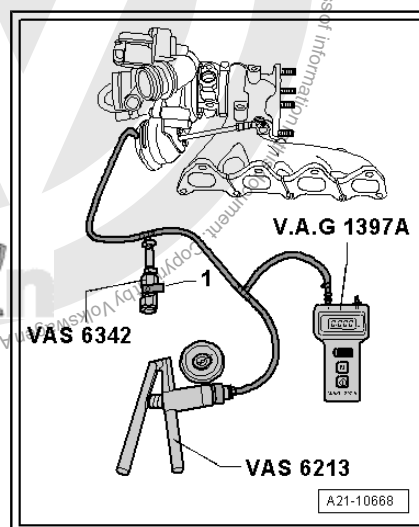
**Caution**

Excessive pressure may damage the vacuum unit.

The pressure must not fall below the read atmospheric pressure minus 800 mbar.

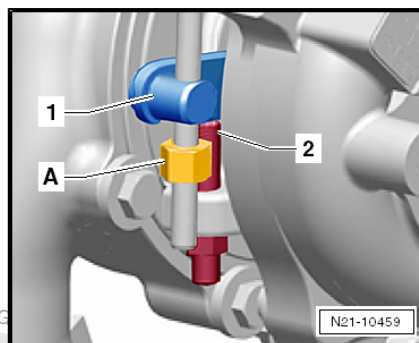
**Note**

- ♦ An accuracy of ± 20 mbar is adequate when setting Value 2.
- ♦ Make sure that the turbocharger adjusting lever moves easily on the control rod.
- Operate hand vacuum pump - VAS 6213- several times until noted value 2 is attained on turbocharger tester - V.A.G 1397A- .
- Open pressure regulating valve -1- until value 1 is set exactly.

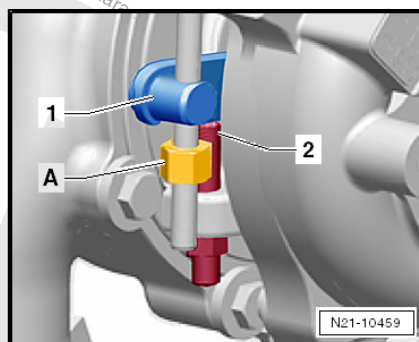




- Screw nut -A- up a couple of threads on control rod.

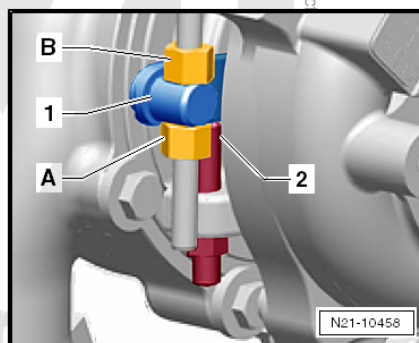


- Hold adjusting lever -1- on »stop« of adjustment screw -2- by hand.



Note

- ◆ During next procedure, ensure adjusting lever -1- remains against stop screw -2- and is not already contacting the securing nut -A-.
- ◆ Screw securing nut -A- back if this occurs.



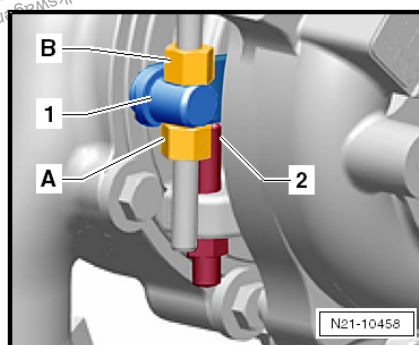
- Screw control rod lock nut -B- down slowly, by hand, until it contacts the adjusting lever -1-, do not turn further.
- Screw securing nut -A- up on control rod until it lies against adjusting lever.



Note

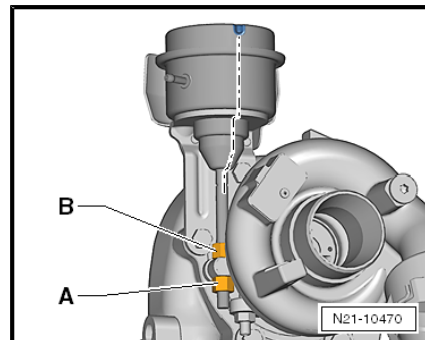
Ensure control rod does not move while tightening securing nut -A-.

- Counterhold lock nut -B- with ring spanner 10x12 - T10423- and tighten securing nut -A- using socket 10 mm - T10454- .





- Check colour marks on control rod, they must align -as shown-.

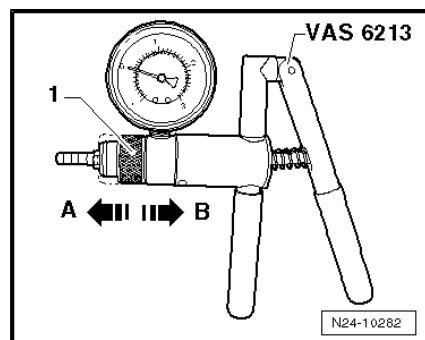


- Release vacuum, move slide ring -1- on hand vacuum pump to position -B- for this, then move slide ring back to position -A- again.



Note

There is very little space between cylinder head and turbocharger. Ensure you are aware of where the feeler gauge (0.05 mm) is positioned.



- Position feeler gauge (0.05 mm) between adjusting lever and adjustment screw, as shown in illustration.



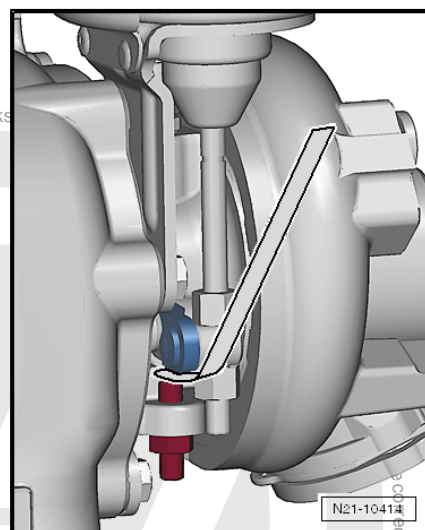
Note

The feeler gauge (0.05 mm) has a part number and must be ordered from the → Electronic Parts Catalogue.

- Operate the hand vacuum pump - VAS 6213- until the feeler gauge (0.05 mm) is pinched between adjusting lever and adjustment screw.

Now the »noted value 1« $\pm$ 20 mbar should appear on the turbocharger tester - V.A.G 1397A-.

Value OK.





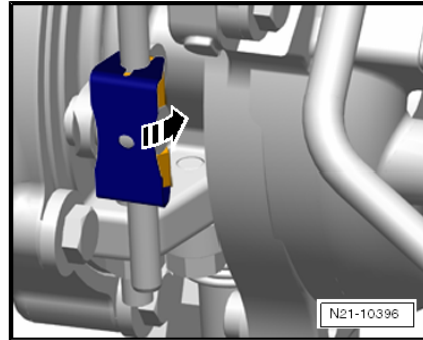
- Seal connection between control rod and securing nut with sealing paint from the spare-parts kit.
- Press locking plate by hand onto the control rod and turn 90° in the -direction of the arrow-.

Value not OK.

Repeat adjustment procedure again.

Continuation

- Install turbocharger ➔ [page 154](#) .
- Start motor and delete event memory ➔ Vehicle diagnostic tester.



Specified torques

- ◆ ➔ ["1.2 Assembly overview - turbocharger, engine codes BLS, BSU", page 146](#)

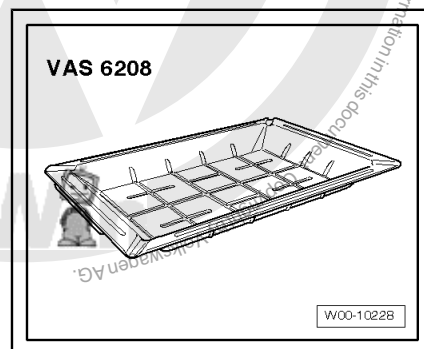
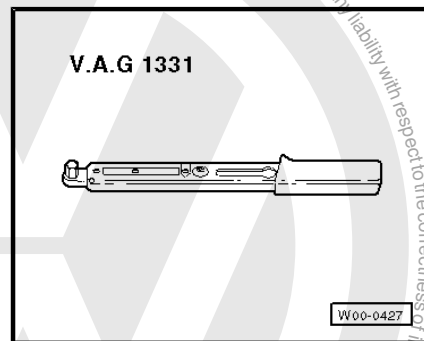
Specified torque

Component	Specified torque
Bolts for vacuum unit	8 Nm

1.4 Removing and installing turbocharger

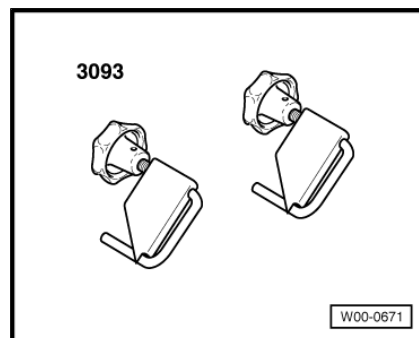
Special tools and workshop equipment required

- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Drip tray for workshop hoist - VAS 6208-





- ◆ Hose clamps up to 40 mm - 3093-



Observe rules for cleanliness ➔ [page 6](#) .

Observe safety precautions ➔ [page 4](#) .



Caution

When a mechanical fault is found on the turbocharger, e.g. a destroyed compressor impeller, it is not only sufficient to renew the turbocharger. To prevent this from causing further damage, perform the following repairs:

- ◆ ***Check air filter housing, air filter element and intake hoses for soiling.***
- ◆ ***Check complete charged air routing and charge air cooler for foreign objects.***

If foreign objects are found in the charge air system, the charged air routing must be cleaned and the charge air cooler must be renewed, if necessary.

Removing

- Remove noise insulation ➔ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .

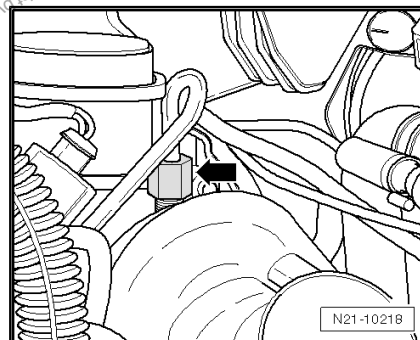
Engine codes BLS, BSU with particulate filter:

- Remove particulate filter ➔ [page 199](#) .

Continuation for all vehicles:

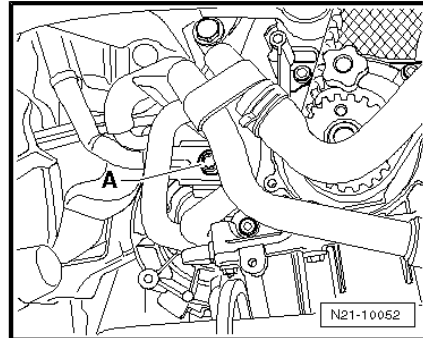
- Remove intake hose from air filter/turbocharger.
- Disconnect oil supply line -arrows- from turbocharger.
- Unbolt oil supply line from bracket ➔ [Item 5 \(page 117\)](#) .

Vehicles with front-wheel drive and additional heater





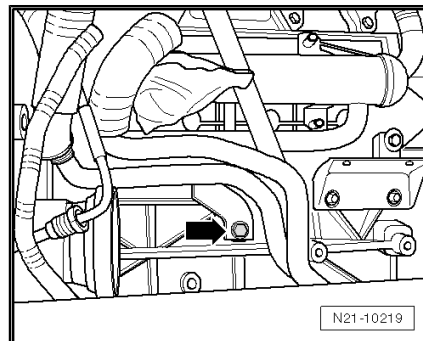
- Loosen retainer -A- for coolant pipes on front of engine.



- Loosen retainer of coolant pipes on cylinder block -arrow-.

Continuation for all vehicles:

- Place drip tray for workshop crane - VAS 6208- beneath engine.



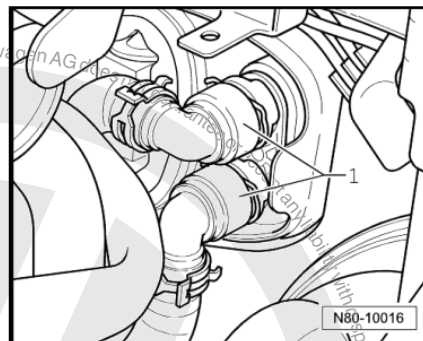
Caution

Risk of scalding.

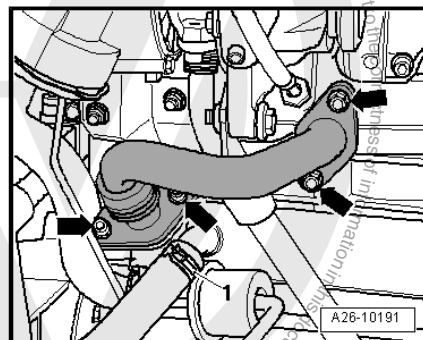
When the engine is warm, the coolant temperature may be above 100 °C. The cooling system is pressurised.

Before carrying out repairs, release pressure and allow temperature to drop as necessary.

- Clamp off coolant hoses -1- with hose clamps, up to 40 mm in diameter - 3093- and disconnect coolant hoses to heat exchanger.



- Unscrew bolts -arrows- and remove connection pipe to exhaust gas recirculation cooler.

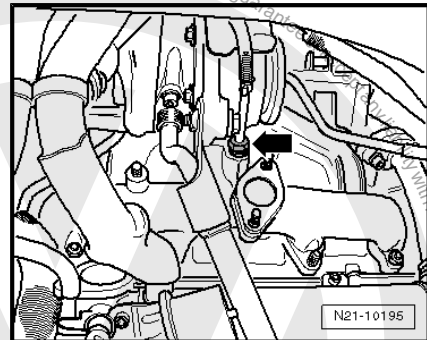




- Unscrew exhaust temperature sender 1 - G235- -arrow- from turbocharger.

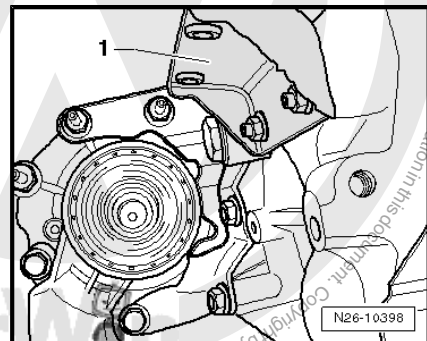
Vehicles with four-wheel drive

- Remove flange shaft from bevel box ⇒ 6-speed manual gear-box 02Q; Rep. gr. 39 .

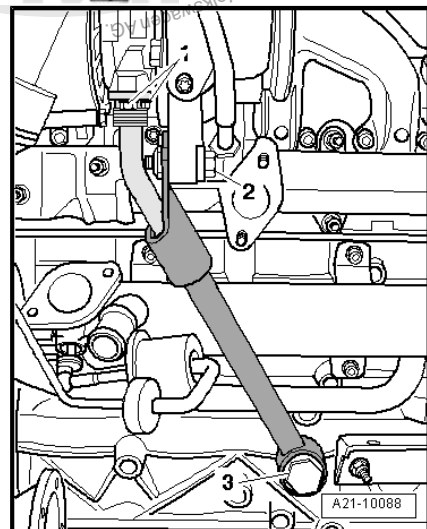


- Remove particulate filter bracket -1-.

Continuation for all vehicles:

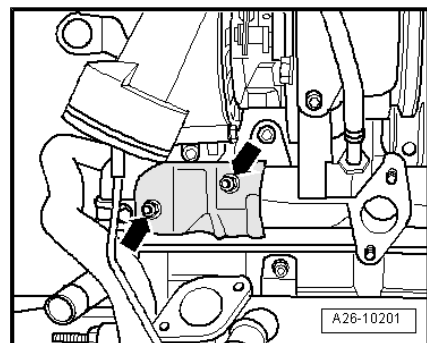


- Unscrew bolts -1- and -2-.
- Remove banjo bolt -3- and remove turbocharger support with oil return pipe.
- Pull vacuum hose off turbocharger.



- Remove heat shield from left of exhaust manifold -arrows-.

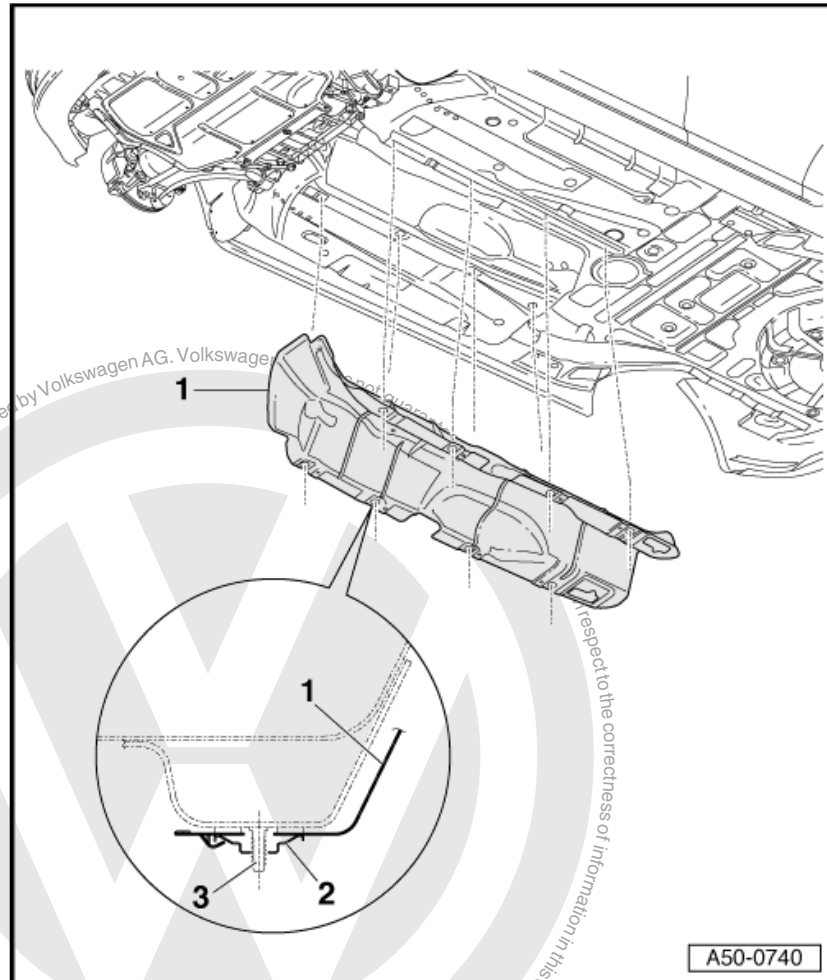
Front-wheel drive vehicles





Note

In order to be able to remove exhaust manifold downwards through tunnel in underbody, heat shield -1- must be removed first.



- Unscrew spring clip -2- from stud -3-.

Engine codes BLS, BSU:

- Remove securing bolts for exhaust gas recirculation cooler; coolant hoses remain connected ⇒ [page 208](#).
- Pull connecting hose to charge air cooler ⇒ [Item 14 \(page 164\)](#) off turbocharger.

**Continuation for all vehicles:**

- Remove exhaust manifold securing bolts -arrows-.
- Turn turbocharger with exhaust manifold, until it can be removed downwards through tunnel in underbody.

Installing

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

**Note**

Renew seals, gaskets and self-locking nuts.

- Install exhaust gas recirculation cooler ⇒ [page 208](#) .
- On vehicles with four-wheel drive, install flange shaft to bevel box ⇒ 6-speed manual gearbox 02Q; Rep. gr. 39 .
- On vehicles with particulate filter, install particulate filter ⇒ [page 199](#) .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Replenish coolant ⇒ [page 121](#) .

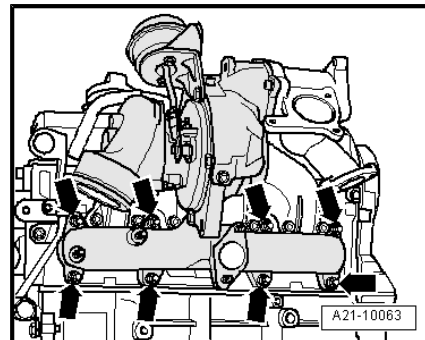
Specified torques

- ◆ ⇒ [“1.1 Assembly overview - turbocharger, engine code BJB”, page 144](#)
- ◆ ⇒ [“1.2 Assembly overview - turbocharger, engine codes BLS, BSU”, page 146](#)
- ◆ ⇒ [“4.1 Assembly overview - exhaust gas recirculation system, engine code BJB”, page 207](#)
- ◆ ⇒ [“4.2 Assembly overview - exhaust gas recirculation system, engine codes BLS, BSU”, page 208](#)
- ◆ ⇒ [“2.1 Assembly overview – emission control with catalytic converter”, page 195](#)
- ◆ ⇒ [“2.2 Assembly overview – emission control with diesel particulate filter, engine codes BLS, BSU”, page 197](#)
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ Rep. gr. 50 ; Assembly overview - noise insulation

1.5 Removing and installing turbocharger support with oil return pipe

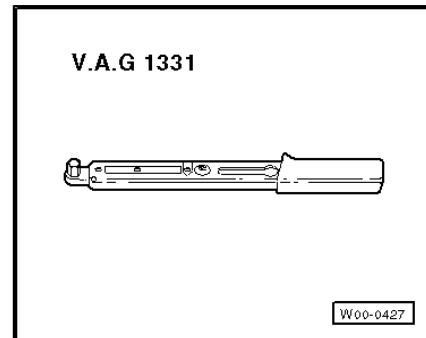
Engine codes BLS, BSU

Special tools and workshop equipment required





- ◆ Torque wrench 5-50 Nm - V.A.G 1331-



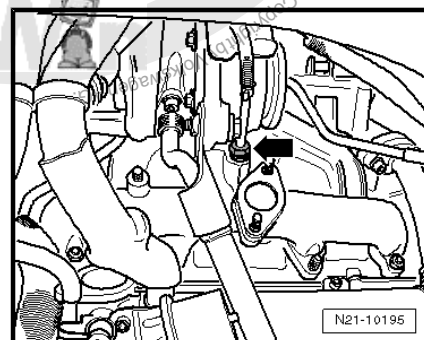
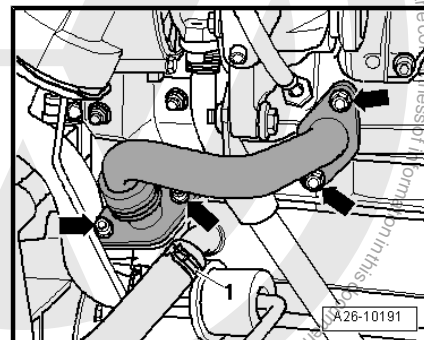
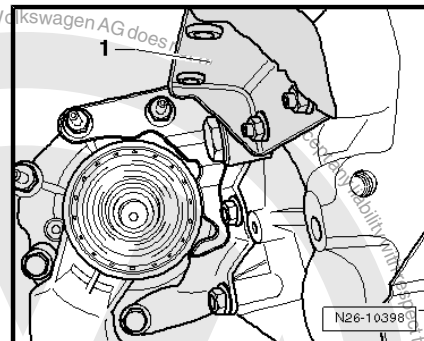
Removing

Vehicles with four-wheel drive:

- Remove particulate filter ⇒ [page 202](#) .
- Remove flange shaft from bevel box ⇒ 6-speed manual gear-box 02Q; Rep. gr. 39 .
- Remove particulate filter bracket -1-.

Continuation for all vehicles:

- Unscrew bolts -arrows- and remove connection pipe to exhaust gas recirculation cooler.
- Unscrew exhaust temperature sender 1 - G235- -arrow- from turbocharger.





- Unscrew bolts -1- and -2-.
- Remove banjo bolt -3- and remove turbocharger support with oil return pipe.

Installing

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

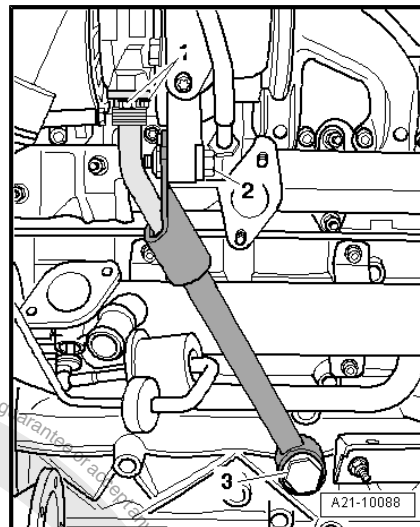


Note

- ◆ *Renew seals, gaskets and self-locking nuts.*
- ◆ *Specified torques for turbocharger support* ⇒ [page 146](#)
- Install connection pipe to exhaust gas recirculation cooler
⇒ [page 208](#).
- On vehicles with four-wheel drive, install flange shaft to bevel box ⇒ 6-speed manual gearbox 02Q; Rep. gr. 39.
- On four-wheel drive vehicles, install particulate filter
⇒ [page 202](#).

Specified torques

- ◆ ⇒ ["1.2 Assembly overview - turbocharger, engine codes BLS, BSU", page 146](#)
- ◆ ⇒ ["2.2 Assembly overview - emission control with diesel particulate filter, engine codes BLS, BSU", page 197](#)





2 Charge air system

⇒ ["2.1 Assembly overview - charge air system, engine code BJB", page 162](#)

⇒ ["2.2 Assembly overview - charge air system, engine codes BLS, BSU", page 164](#)

⇒ ["2.3 Fitting the charge-air system hose connections", page 165](#)

⇒ ["2.4 Checking charge air system for leaks", page 166](#)

2.1 Assembly overview - charge air system, engine code BJB



Note

- ◆ *Charge air system must be free of leaks.*
- ◆ *For assembly use lubricant (water without additive) if necessary. Do not use lubricants containing oil.*
- ◆ *When making repairs, remove oil from connection and hose ends.*
- ◆ *All hose connections of charge air system are secured by spring-type clips or by plug-in connectors.*
- ◆ *Check charge air system for leaks.*



1 - Bolt

- ☐ Fitting location
⇒ [page 165](#)
- ☐ 8 Nm

2 - Bracket

- ☐ Note installation position.

3 - Charge air cooler

4 - Connecting hose

5 - Bolt

- ☐ 8 Nm

6 - To turbocharger.

7 - Connecting pipe

8 - To intake connecting pipe.

9 - Vacuum reservoir

10 - Bolt

- ☐ 15 Nm

11 - Bolt

- ☐ 8 Nm

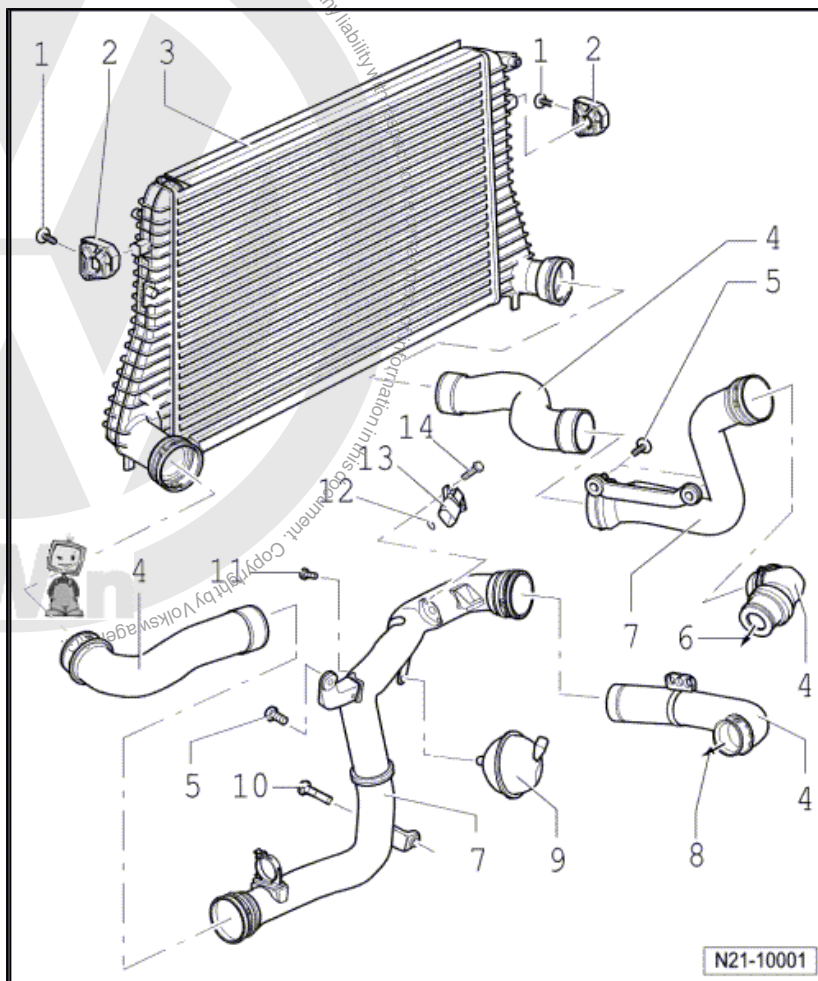
12 - O-ring

- ☐ Renew if damaged.

13 - Charge air pressure sender - G31- with intake air temperature sender - G42-

14 - Bolt

- ☐ 3 Nm





2.2 Assembly overview - charge air system, engine codes BLS, BSU

1 - Bolt

- ☐ Fitting location
⇒ [page 165](#)
- ☐ 8 Nm

2 - Bracket

- ☐ Note installation position.

3 - Charge air cooler

- ☐ To remove, move lock carrier to service position ⇒ General body repairs, exterior; Rep. gr. 50; Lock carrier; Moving lock carrier to service position.

4 - Sealing strip

- ☐ Pushed on top of charge air cooler

5 - Bolt

- ☐ 3 Nm

6 - Charge air pressure sender - G31- with intake air temperature sender - G42-

7 - O-ring

- ☐ Renew if damaged.

8 - Bracket

- ☐ Note installation position.

9 - Bolt

- ☐ 5 Nm

10 - Connecting hose

11 - Charge air pipe

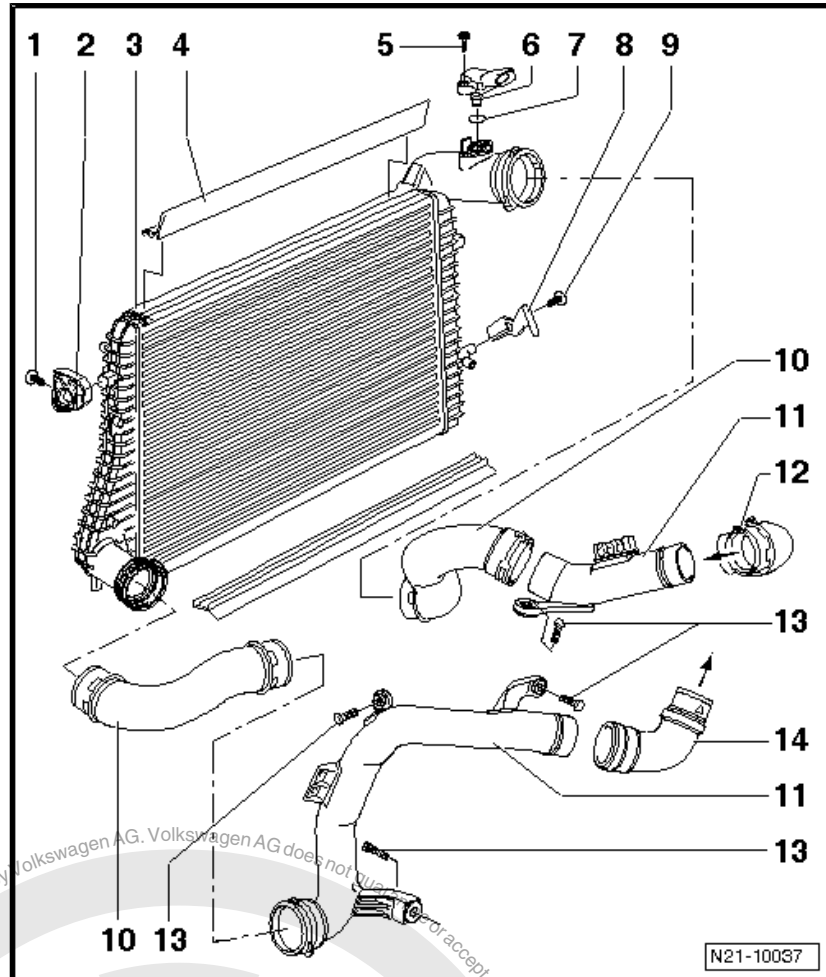
12 - Connecting hose

- ☐ To intake manifold flap motor - V157-

13 - Bolt

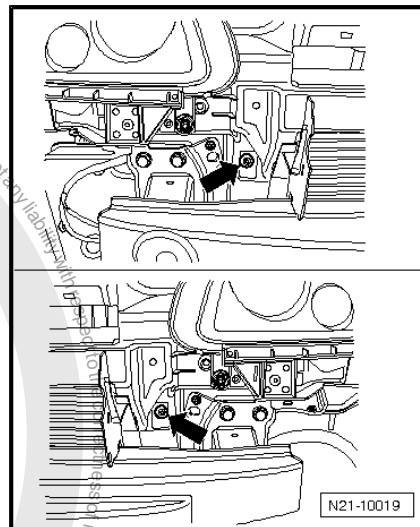
- ☐ 8 Nm

14 - Connecting hose to turbocharger





Securing bolts for charge air cooler -arrows-



2.3 Fitting the charge-air system hose connections



Caution

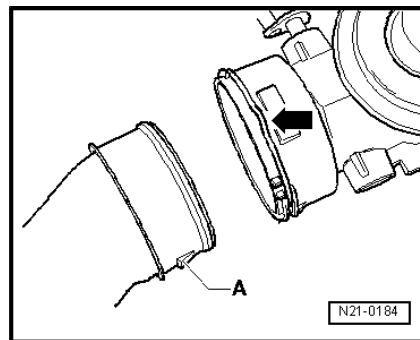
The seal in the plug-in connector can be damaged if the securing clip is in the locked position when fitting the connector. This can cause leakage. Observe installation instructions.

Removing

- Release plug-in connector by pulling out retaining clip -arrow-. Separate hose/pipe without tools.

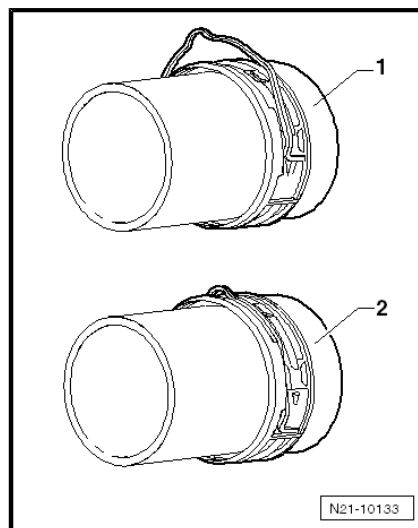
Installing

- When renewing seal, place seal in groove of charge air hose. Make sure seal is completely slotted into the groove all round.
- Coat sealing surface and oil seal with oil.
- Bring retaining clip to release position -1-.
- Push charge air hose into coupling as far as stop.





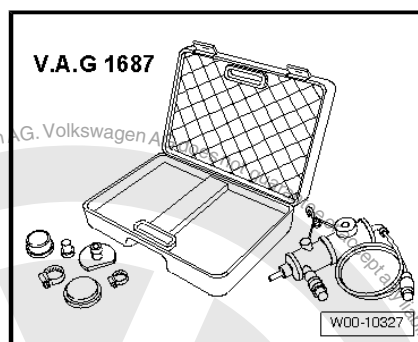
- Bring retaining clip to locking position -2- and then press charge air hose again.
- By pulling on hose, check whether plug-in connector seats correctly and is properly engaged.



2.4 Checking charge air system for leaks

Special tools and workshop equipment required

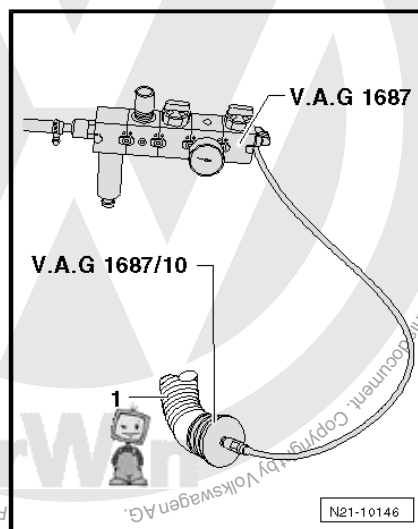
- ◆ Charge air system tester - V.A.G 1687-



- ◆ Adapter - V.A.G 1687/10-

- Remove intake hose -1- from air filter.
- Insert adapter - V.A.G 1687/10- into intake hose -1- and secure with a clip.

Prepare charge air system tester - V.A.G 1687- as follows:



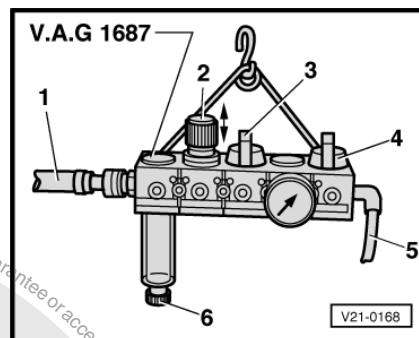


- Unscrew pressure control valve -2- completely and close valves -3- and -4-.

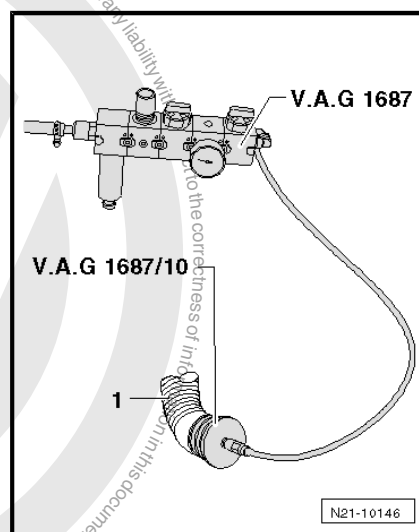


Note

To turn the pressure regulating valve -2- the knob must be pulled upwards.



- Connect charge air system tester - V.A.G 1687- to adapter - V.A.G 1687/10- as shown.





- Connect compressed air hose -1- (compressed air supply) to charge air system tester - V.A.G 1687- .



Note

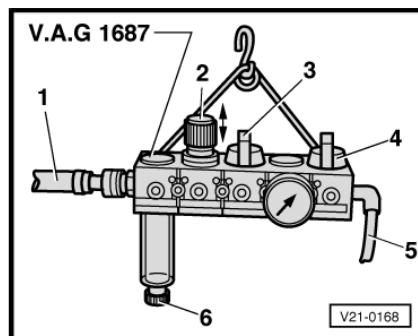
If there is water in the sight glass, drain at water drain screw -6-.

- Open valve -3-.
- Adjust pressure to 0.5 bar with pressure control valve -2-.



Caution

The pressure must not exceed 0.5 bar! If the pressure is too high this can cause damage to the engine.



- Open valve -4- and wait until test circuit is full. If necessary, regulate pressure to 0.5 bar.
- Check charge air system for leaks by listening, touching, with commercially available leak detector spray or using ultrasonic tester - V.A.G 1842- .



Note

- ◆ *How to use the ultrasonic tester - V.A.G 1842- ⇒ operating instructions*
- ◆ *If leaks occur, when doing any repair work observe notes for charge air system ⇒ [page 162](#) .*
- ◆ *Depressurise test circuit by detaching coupling from adapter - V.A.G 1687/10- before removing adapter.*





23 – Mixture preparation - injection

1 Injectors

⇒ "1.1 Assembly overview - unit injector", page 169

⇒ "1.2 Removing and installing O-rings for unit injector", page 170

⇒ "1.3 Removing and installing unit injector", page 171

⇒ "1.4 Removing and installing prewiring for unit injectors", page 174

1.1 Assembly overview - unit injector

- ◆ Observe rules for cleanliness ⇒ page 6 .
- ◆ Always renew seals and O-rings.

1 - Bolt

- ☐ Renew after removing.
- ☐ 20 Nm + 90°

2 - Rocker arm shaft

- ☐ With rocker arms
- ☐ Removing and installing
⇒ page 171 .

3 - Lock nut

- ☐ 30 Nm

4 - Adjuster screw

- ☐ Renew after removing.
- ☐ Observe notes on re-
newing ⇒ page 171

5 - Ball stud

- ☐ Renew after removing.
- ☐ Observe notes on re-
newing ⇒ page 171

6 - Unit injector

- ☐ Removing and installing
⇒ page 171 .

7 - O-ring

- ☐ Renewing ⇒ page 170 .

8 - O-ring

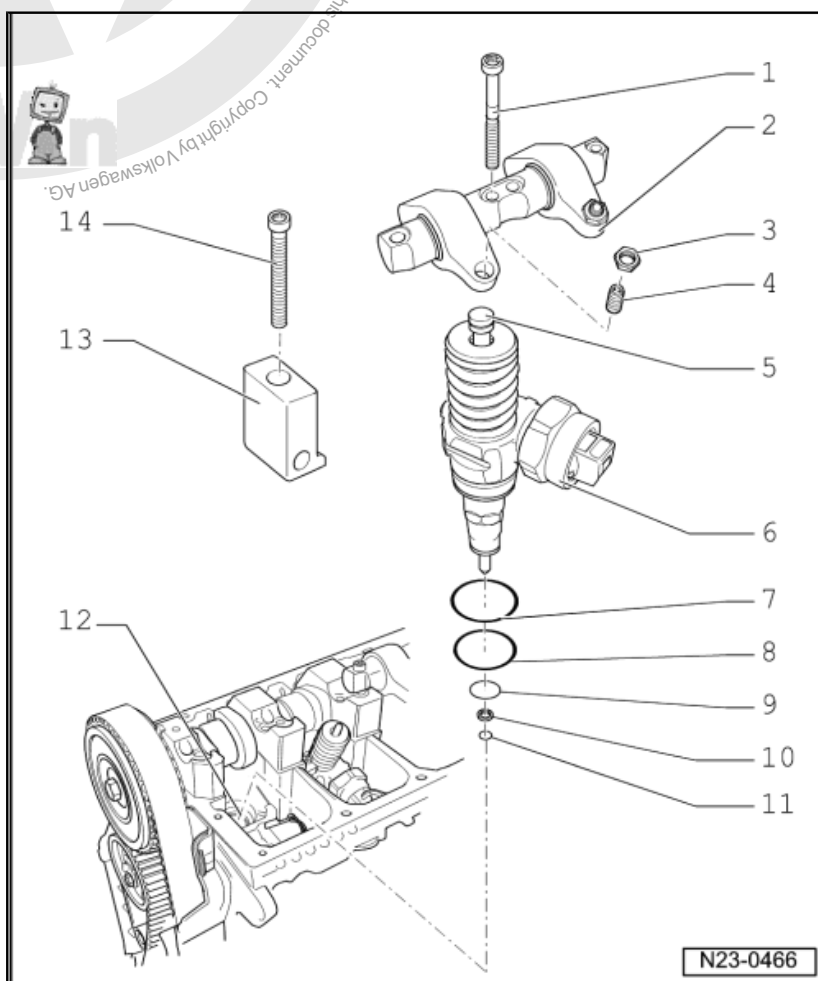
- ☐ Renewing ⇒ page 170 .

9 - O-ring

- ☐ Renewing ⇒ page 170 .

10 - Heat shield seal

- ☐ Renew after removing.





11 - Circlip

12 - Cylinder head

13 - Tensioning block

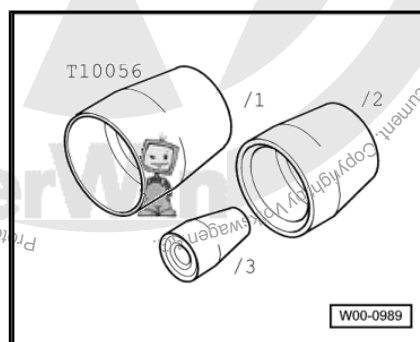
14 - Bolt

- ☐ Renew after removing.
- ☐ 12 Nm + 270° further

1.2 Removing and installing O-rings for unit injector

Special tools and workshop equipment required

- ◆ Assembly sleeves - T10056-



- Unit injector is removed.

Removing

- Lever old O-rings very carefully out of unit injector.
- Pay particular attention to ensure that seat of O-ring is not damaged by burrs.

Installing

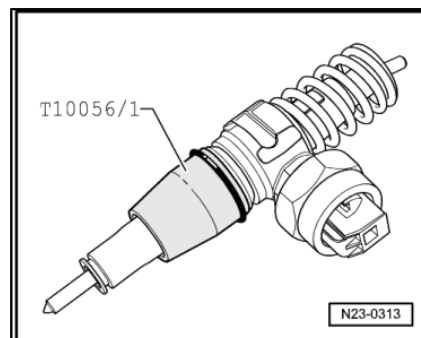


Note

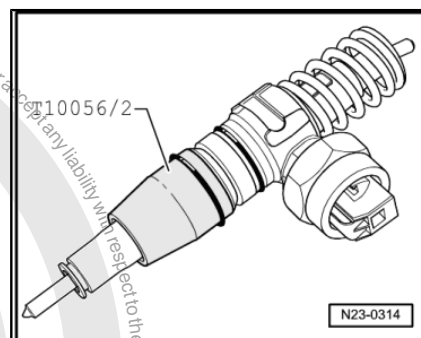
- ◆ *Always use the assembly sleeves to fit the O-rings. There is a danger of damaging the O-rings if the sleeves are not used.*
- ◆ *Gradual introduction of O-rings without different coloured markings. Note the correct allocation of O-rings to grooves: the thickness of the rings reduces towards injector nozzle.*
- ◆ *Prevent O-rings from rolling when sliding them on. The O-rings must not be twisted in their seats in unit injector.*
- Remove heat shield seal together with circlip.
- Clean seating surfaces for O-rings on unit injector very carefully.



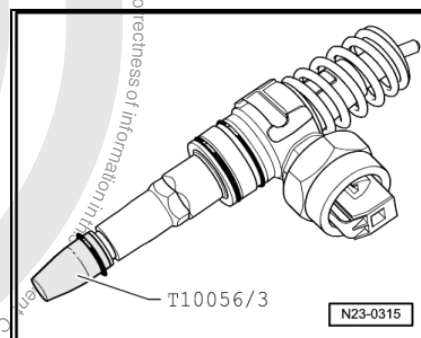
- Slide assembly sleeve - T10056/1- onto unit injector as far as stop.
- Push upper, thicker O-ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.



- Slide assembly sleeve T10056/2- onto unit injector as far as stop.
- Push middle, thinner O-ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.



- Slide assembly sleeve - T10056/3- onto unit injector as far as stop.
- Push lower O-ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.
- Slide new heat shield seal together with circlip into position.



Specified torques

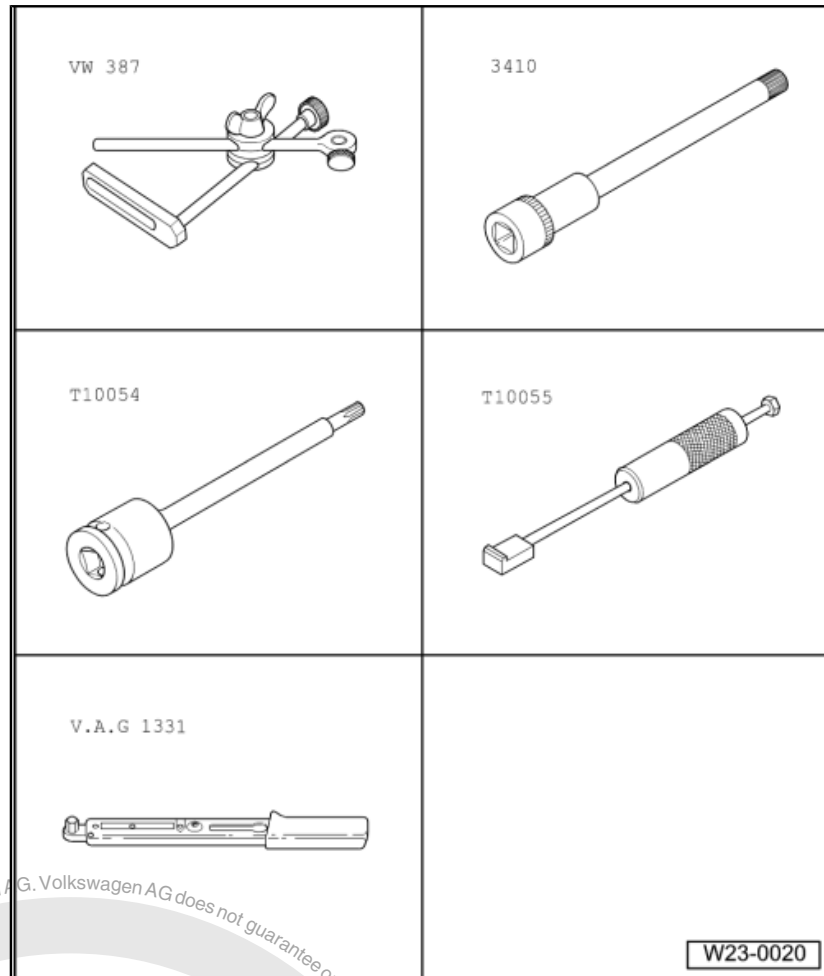
- ◆ ⇒ ["1.1 Assembly overview - unit injector", page 169](#)
- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 59](#)
- ◆ ⇒ ["3.1 Assembly overview - valve gear", page 97](#)

1.3 Removing and installing unit injector



Special tools and workshop equipment required

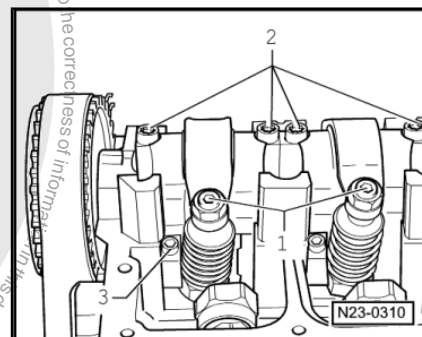
- ◆ Universal dial gauge bracket - VW 387-
- ◆ Socket XZN 10 - 3410-
- ◆ Special wrench, long reach XZN 6 - T10054-
- ◆ Puller - T10055-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-



Removing

- Remove upper toothed belt guard.
- Remove cylinder head cover ⇒ [page 67](#).
- Turn crankshaft until the cam pair of the respective unit injector to be removed evenly points upwards.
- Loosen lock nuts of adjustment screws -1- and remove adjustment screws.
- Loosen securing bolts -2- for rocker arm shaft working from outside to inside using Socket XZN 10 - 3410-. Remove rocker arm shaft.
- Loosen securing bolt -3- for clamping block using Special wrench, long reach XZN 6 - T10054- and remove clamping block.
- Prise off connector from unit injector using screwdriver. To avoid canting, support opposite side of connector with light finger pressure.

Observe cylinder allocation of unit injectors.





- Insert puller - T10055- in place of clamping block into slot on side of unit injector.
- Pull unit injector upwards out of cylinder head seat by means of gentle tapping.

Installing

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



Note

- ◆ Each time the rocker arm shaft is removed and each time work is performed which requires adjustment of the unit injector, the adjustment screw $\Rightarrow$ [Item 4 \(page 169\)](#) in rocker arm and the ball pin $\Rightarrow$ [Item 5 \(page 169\)](#) of the unit injector must be renewed.
- ◆ New unit injectors are supplied with O-ring and heat shield seal.
- ◆ The seals must not be twisted.

- Heat insulating seal and O-rings must be renewed if old unit injector is reused.
- Ensure that 3 O-rings, heat shield seal and circlip are seated correctly before installing unit injector.
- Lubricate oil seals and insert unit injector into cylinder head with great care.
- Apply even pressure to push unit injector into cylinder head seat as far as stop.
- Insert clamping block in slot on side of unit injector.



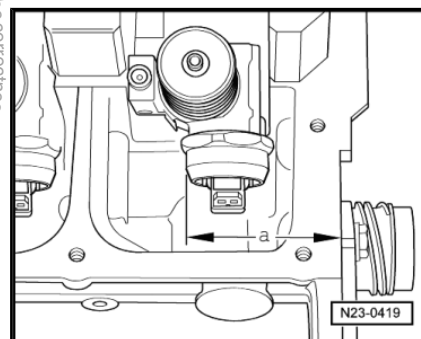
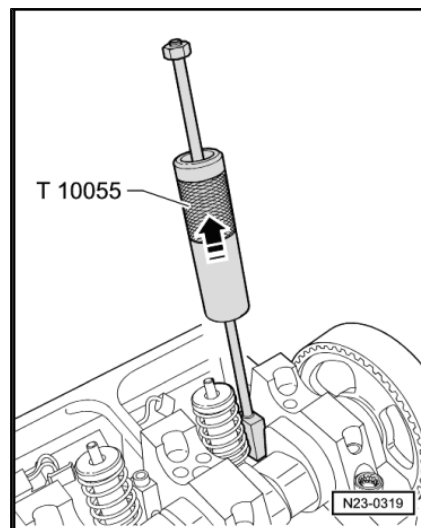
Note

If the unit injector is not at right angles to the tensioning block the securing bolt may loosen and this can damage the unit injector or the cylinder head.

- Thus, align unit injector as follows:
- Screw new securing bolt as far as possible into clamping block while still being able to turn unit injector easily).
- Align unit injector at right angles to camshaft bearing seats.
- Check dimension "a" from outer edge of cylinder head to rounded edge of unit injector with a vernier gauge (measuring range at least 400 mm).

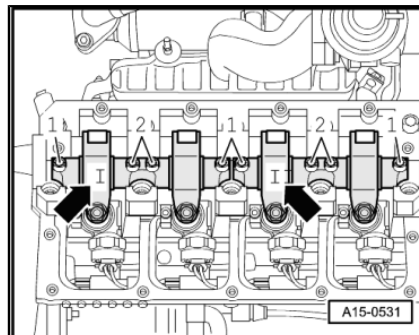
Cylinder	Dimension "a"
1	$333.0 \pm 0.8 \text{ mm}$
2	$245.0 \pm 0.8 \text{ mm}$
3	$153.6 \pm 0.8 \text{ mm}$
4	$65.6 \pm 0.8 \text{ mm}$

- Realign unit injector if necessary and tighten securing bolt.
- Renew unit injector ball studs $\Rightarrow$ [Item 5 \(page 169\)](#)

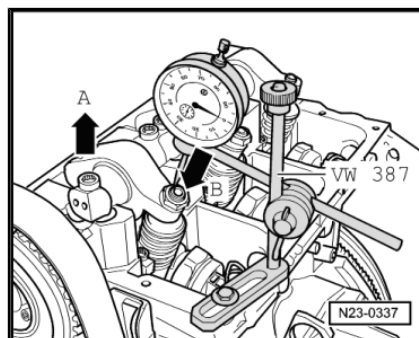




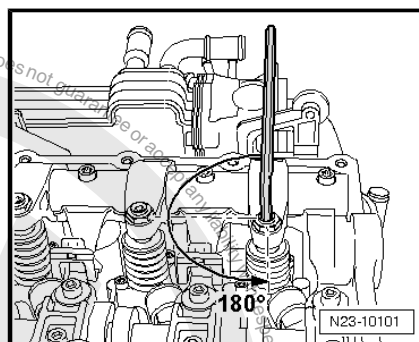
- Fit rocker arm shafts with new adjustment screws and tighten new securing bolts as follows:
- First, tighten inner bolts -2- followed by outer bolts -1- evenly, by hand. Tighten in same sequence to specified torque.



- Fit dial gauge onto adjustment screw of unit injector as shown.
- Turn crankshaft in direction of engine rotation until roller of rocker arm is located at tip of drive cam. Roller side -arrow A- positioned at highest point, dial gauge -arrow B- positioned at lowest point.
- Remove dial gauge.
- Now turn adjustment screw into rocker arm until significant resistance can be felt (unit injector is at limit stop).



- Slacken adjustment screw of stop by 180°.
- Hold adjuster bolt in this position and tighten lock nut.
- Connect unit injector connector.
- Install cylinder head cover ➤ [page 67](#).
- Install toothed belt guard.
- Read event memory = Vehicle diagnostic tester.



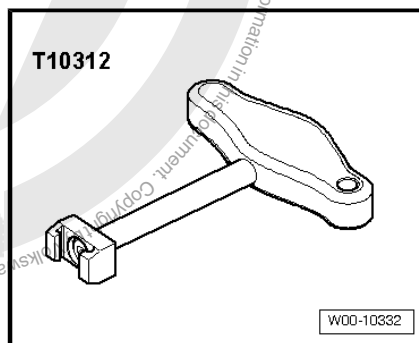
Specified torques

- ◆ ➤ ["1.1 Assembly overview - unit injector", page 169](#)
- ◆ ➤ ["1.1 Assembly overview - cylinder head", page 59](#)
- ◆ ➤ ["3.1 Assembly overview - valve gear", page 97](#)

1.4 Removing and installing prewiring for unit injectors

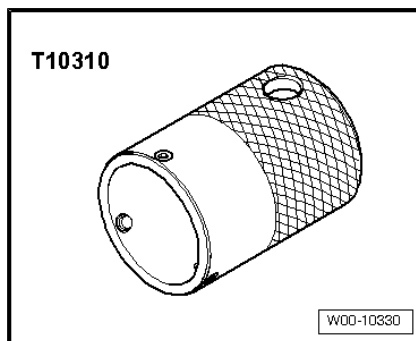
Special tools and workshop equipment required

- ◆ Puller - T10312-





◆ Wrench - T10310-



Removing



Caution

Removal and installation of the pre-wired wiring harness may only be undertaken by unscrewing the clips. Releasing the cable guide from the clips bends the clips which may break the cables due the excessive play. This also applies when changing the unit injectors and all work which does not require the central connector to be completely removed.



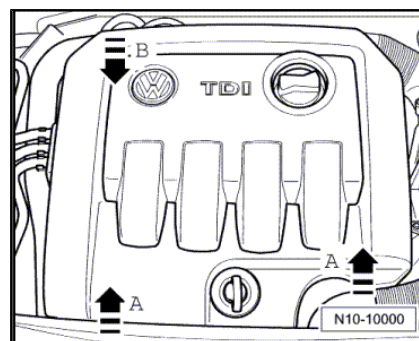
Note

Disconnecting connectors on piezo unit injectors may only be undertaken using special tool puller - T10312-

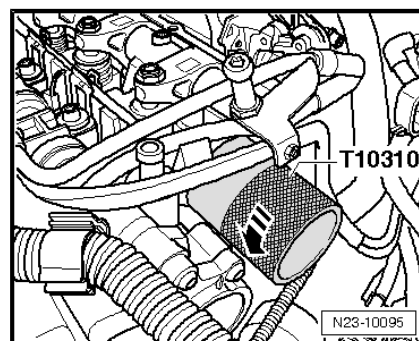
- Remove engine cover panel.

To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.

- Remove cylinder head cover ⇒ [page 67](#) .
- Disconnect central connector on cylinder head.

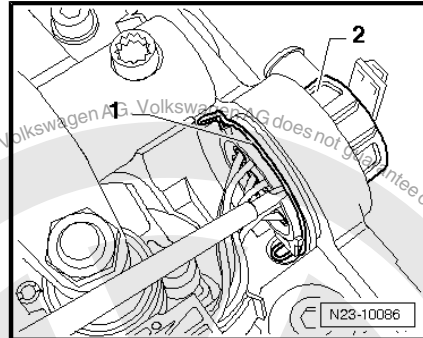


- Fit special wrench - T10310- on adapter ring and release it by turning key through 90° (1/4 turn) in -direction of arrow-.

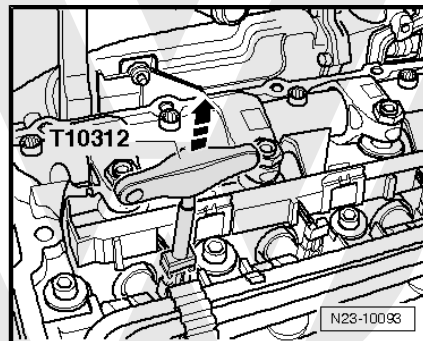




- Pull securing clip -1- slightly upwards with a screwdriver and press through central connector -2- inwards.



- Slide the puller - T10312- onto the unit injector connector from the side and pull it off in -direction of arrow-. Use long-nosed pliers for the older connector version.

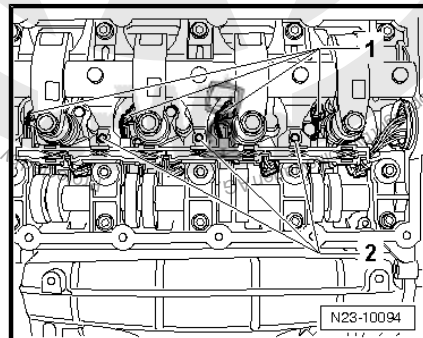


- Pull connectors off glow plugs -1-. Unscrew securing bolts -2- of steel clips and remove complete pre-wired wiring harness.

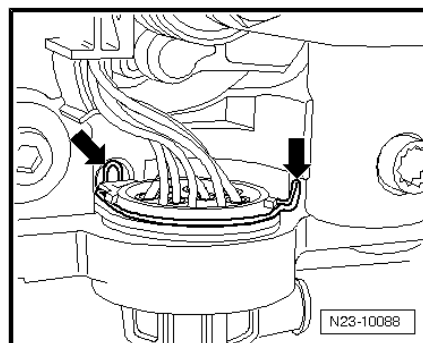
Installing

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

- Route pre-wired wiring harness and tighten securing bolts.

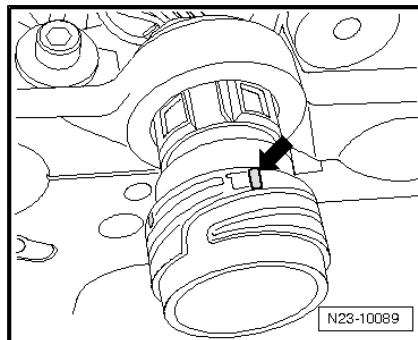


- Guide central connector through opening in retaining frame, ensure securing clips -arrows- are seated correctly when doing this.





- Fit adapter ring (colour marked "longer" stud -arrow- faces 12 o'clock)



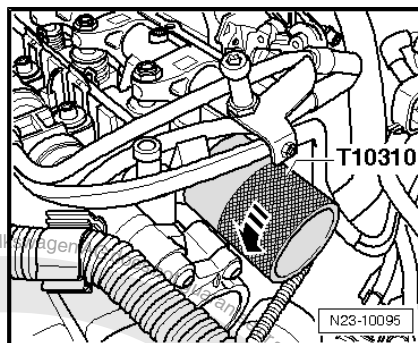
- Fit special wrench - T10310- on adapter ring and lock it by turning key through 90° (1/4 turn) in opposite -direction of arrow-.



Note

When adapter ring is installed correctly the colour marked "shorter" stud faces 12 o'clock.

- Fit central connector to cylinder head and lock in position.
- Install cylinder head cover ⇒ [page 67](#) .
- Fit engine cover panel.



Specified torques

- ♦ ⇒ ["1.1 Assembly overview - cylinder head", page 59](#)

Component	Specified torque
Threaded connections for wiring harness.	10 Nm



2 Vacuum system

⇒ [“2.1 Connection overview”, page 178](#)

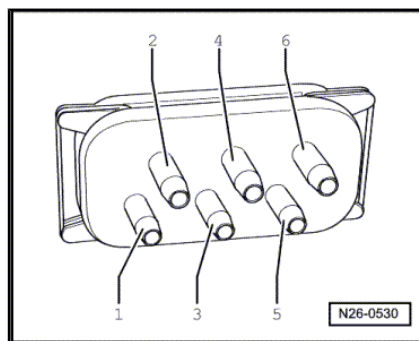
⇒ [“2.2 Schematic diagram - vacuum system, engine code BJB”, page 178](#)

⇒ [“2.3 Schematic diagram - vacuum system, engine codes BLS, BSU”, page 180](#)

2.1 Connection overview

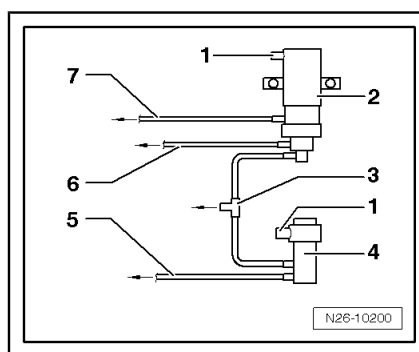
Pin assignment on solenoid valve block, engine code BJB

- 1 - Vacuum connection (on non-return valve for brake booster)
- 2 - Exhaust gas recirculation valve
- 3 - Intake manifold flap
- 4 - Air filter
- 5 - Vacuum reservoir
- 6 - Vacuum unit on turbocharger



Pin assignment on solenoid valves, engine codes BLS, BSU

- 1 - In connection
- 2 - Charge pressure control solenoid valve - N75-
- 3 - Vacuum distributor
- 4 - Exhaust gas recirculation cooler changeover valve - N345-
- 5 - To vacuum unit for bypass flap on exhaust gas recirculation cooler.
- 6 - To vacuum unit on turbocharger
- 7 - To air filter.

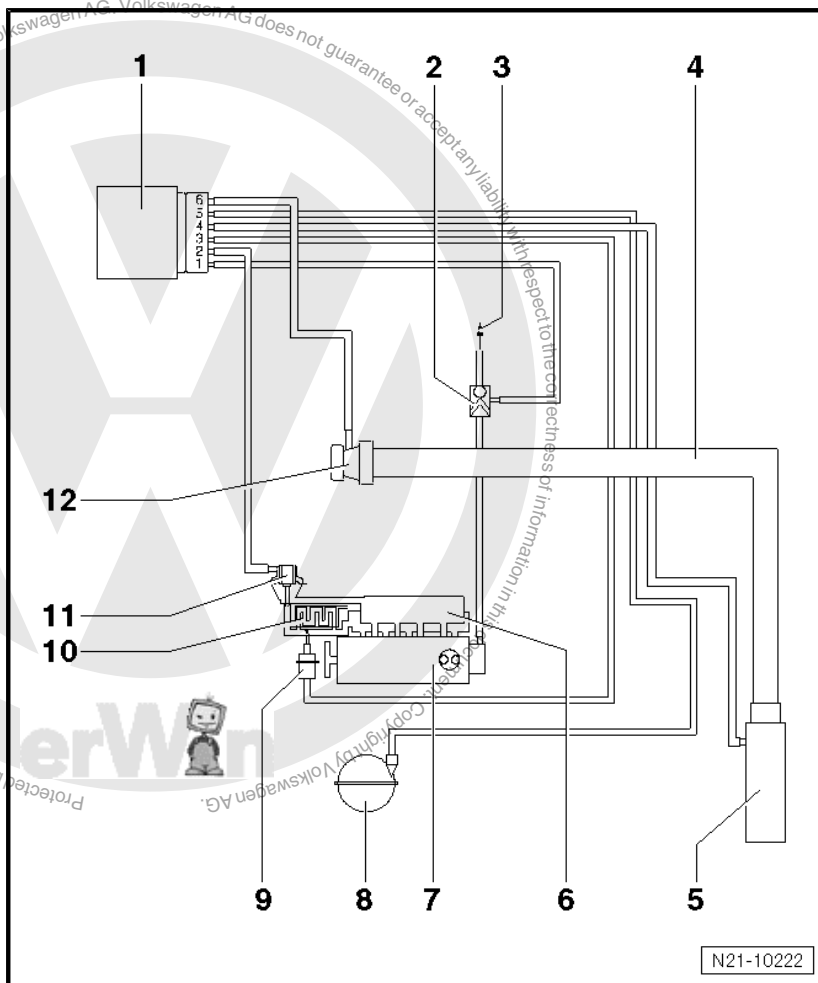


2.2 Schematic diagram - vacuum system, engine code BJB





- 1 - Solenoid valve block
- 2 - Vacuum extraction point
 - ☐ on non-return valve to brake booster
- 3 - To brake booster.
- 4 - Connecting pipe air filter/turbocharger
- 5 - Air filter
- 6 - Intake manifold
- 7 - Cylinder head/cylinder block
- 8 - Vacuum reservoir
- 9 - Bypass flap
 - ☐ For exhaust gas recirculation cooler.
- 10 - Radiator
 - ☐ For exhaust gas recirculation.
- 11 - Exhaust gas recirculation valve - N18-
- 12 - Turbocharger





2.3 Schematic diagram - vacuum system, engine codes BLS, BSU

1 - Turbocharger

2 - Connecting pipe air filter/
turbocharger

3 - Non-return valve

- ☐ Note installation position.

4 - To brake booster.

5 - Charge pressure control
solenoid valve - N75-

6 - Air filter

7 - Cylinder head/cylinder
block

8 - Intake manifold

9 - Bypass flap

- ☐ For exhaust gas recirculation cooler.

10 - Radiator

- ☐ For exhaust gas recirculation.

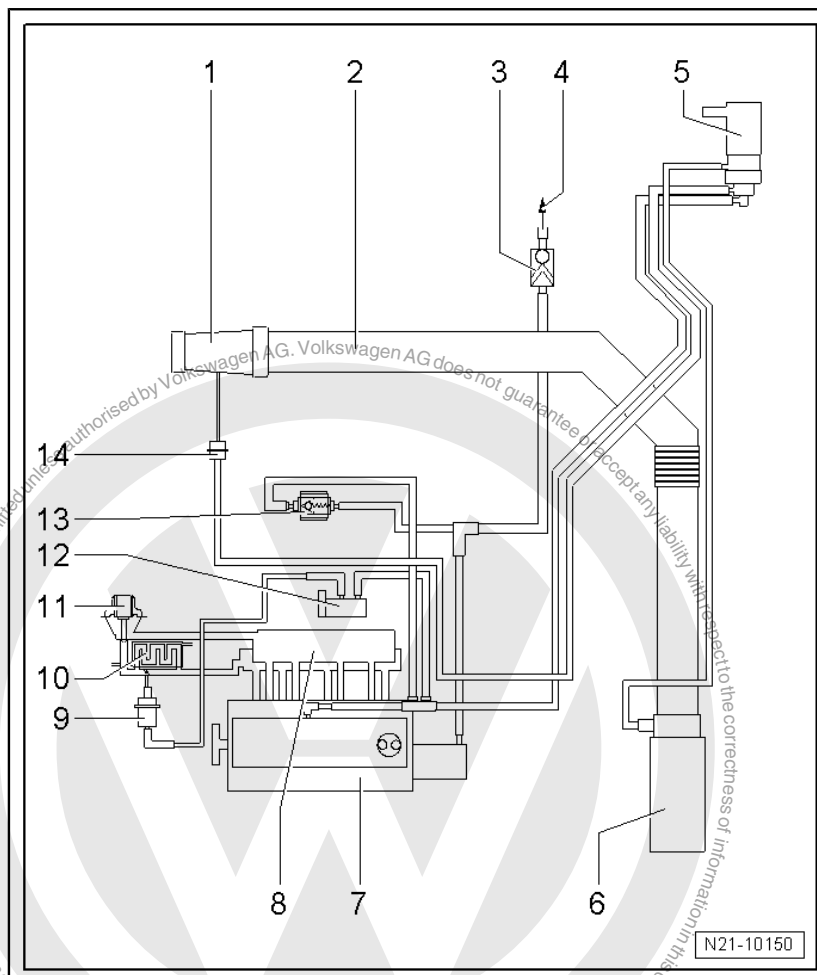
11 - Exhaust gas recirculation
valve - N18-

12 - Exhaust gas recirculation
cooler changeover valve -
N345-

13 - Non-return valve

- ☐ Note installation position.

14 - Vacuum unit for turbo-
charger





3 Air filter

⇒ ["3.1 Assembly overview - air filter", page 181](#)

3.1 Assembly overview - air filter

1 - Intake hose

- ❑ Engine codes BLS, BSU with union for crankcase breather system connection hose.

2 - Air mass meter - G70-

3 - O-ring

- ❑ Renew if damaged.

4 - Bolt

- ❑ 8 Nm

5 - Air filter upper part

6 - Bolt

- ❑ 8 Nm

7 - Vacuum hose

- ❑ With engine code BJB to solenoid valve block ⇒ [page 178](#).
- ❑ With engine codes BLS, BSU to charge pressure control solenoid valve - N75- ⇒ [page 180](#).

8 - Filter element

9 - Air duct

- ❑ To lock carrier.

10 - Air filter lower part

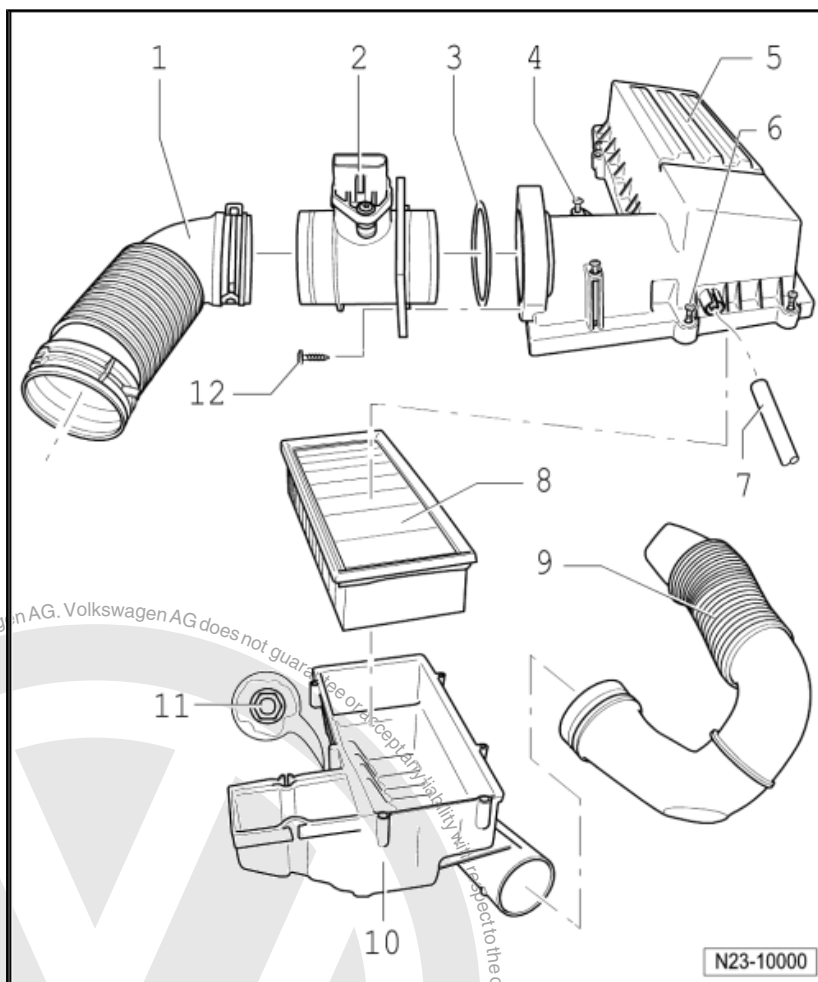
- ❑ With union for water drain.

11 - Bolt

- ❑ 10 Nm

12 - Bolt

- ❑ 3.5 Nm





4 Intake manifold

⇒ "4.1 Assembly overview - intake manifold, engine code BJB",
page 182

⇒ "4.2 Assembly overview - intake manifold, engine codes BLS,
BSU", page 182

⇒ "4.3 Cleaning intake manifold flap connection, engine codes
BLS, BSU", page 183

4.1 Assembly overview - intake manifold, engine code BJB

The intake manifold flap is closed for approx. 3 seconds when
stopping engine and then opens again. This reduces the stop jolt.

1 - Intake manifold

- 22 Nm

2 - O-ring

- Renew after removing.

3 - Intake connecting pipe

- With exhaust gas recir-
culation valve and in-
take manifold flap.

4 - Bolt

- 10 Nm

5 - Gasket

- Renew after removing.

6 - Connecting pipe

- To exhaust gas recircu-
lation cooler.

7 - Bolt

- 10 Nm

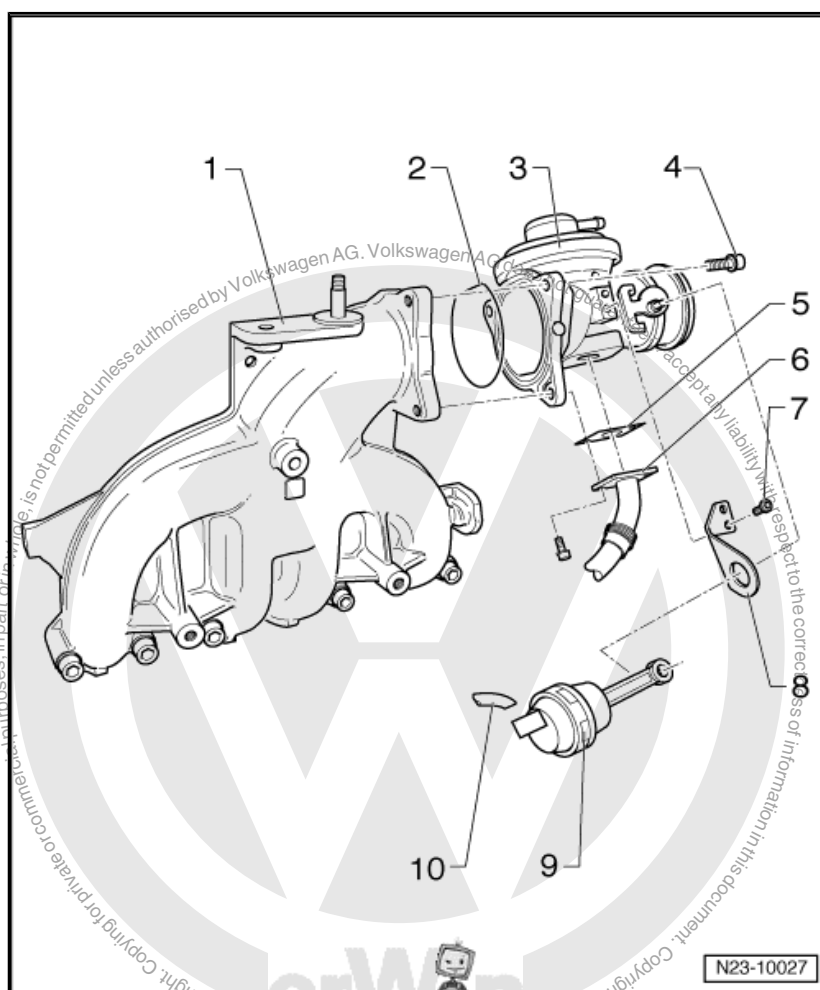
8 - Bracket

9 - Vacuum actuator

10 - To solenoid valve block

11 - Bolt

- 22 Nm

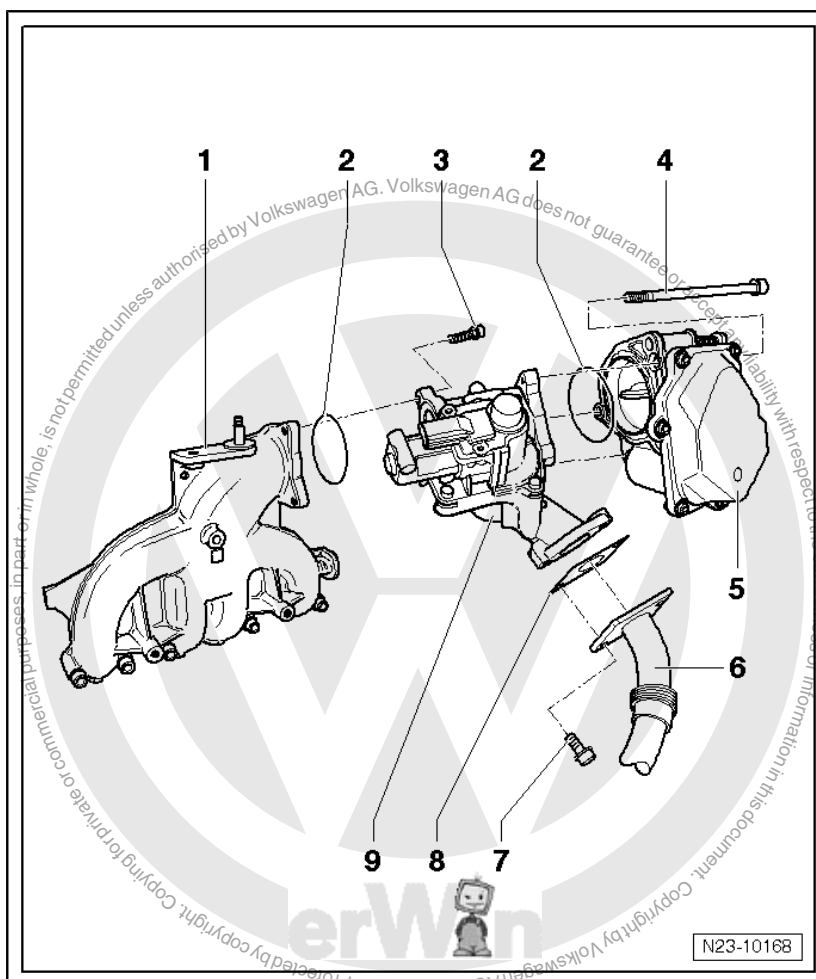


4.2 Assembly overview - intake manifold, engine codes BLS, BSU

The intake manifold flap is closed for approx. 3 seconds when
stopping engine and then opens again. This reduces the stop jolt.



- 1 - Intake manifold
 - ☐ Remove turbocharger
⇒ [page 154](#) to remove.
 - ☐ 22 Nm
- 2 - O-ring
 - ☐ Renew after removing.
- 3 - Bolt
 - ☐ 10 Nm
- 4 - Bolt
 - ☐ 10 Nm
- 5 - Intake manifold flap motor - V157-
- 6 - Connecting pipe
 - ☐ To exhaust gas recirculation cooler.
- 7 - Bolt
 - ☐ 22 Nm
- 8 - Gasket
 - ☐ Renew after removing.
- 9 - Intake connecting pipe
 - ☐ With exhaust gas recirculation valve - N18- and exhaust gas recirculation potentiometer - G212-



4.3 Cleaning intake manifold flap connection, engine codes BLS, BSU



Note

Carbon deposits can occur in the throttle valve support through the combination of unfavourable factors. If these are found, e.g. when disassembling the exhaust gas recirculation valve - N18- or the intake manifold flap motor - V157-, the support will have to be cleaned.



WARNING

Acetone is highly inflammable. Please observe the accidental regulations and safety notes when handling with highly inflammable fluids. Wear eye protection and protective clothing to avoid possible injury and skin contact.

- Remove intake connecting pipe of intake manifold flap.
- Remove exhaust gas recirculation valve - N18- and intake manifold flap motor - V157- .



- Thoroughly clean intake connecting pipe of intake manifold flap, especially around exhaust gas recirculation valve, using cleaning brush and commercially available acetone according to DIN 53247.
- Wipe out intake connecting pipe of intake manifold flap with a lint-free cloth.
- Allow acetone to vent completely, complete cleaned intake connecting pipe of intake manifold flap, renew gaskets and reinstall intake connecting pipe of intake manifold flap.

Specified torques

- ◆ ➔ ["4.2 Assembly overview - intake manifold, engine codes BLS, BSU", page 182](#)





5 Engine control unit

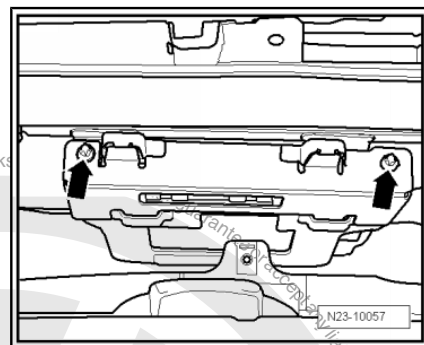
⇒ "5.1 Removing and installing engine control unit", page 185

5.1 Removing and installing engine control unit

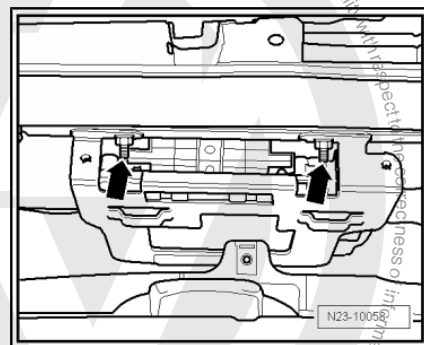
- Before the engine control unit is removed, the control unit identification must be read (and, thus, the coding of the current control unit as well) ⇒ Vehicle diagnostic tester.

Removing

- Switch off ignition.
- Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead .
- Loosen securing bolts -arrows- of control unit cover.



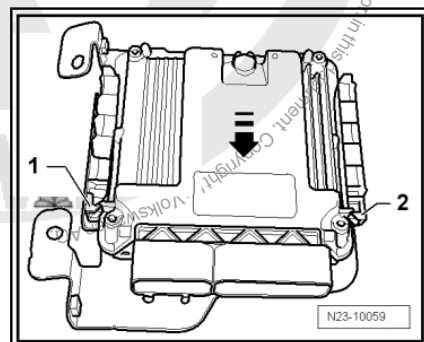
- Then loosen securing nuts -arrows- of control unit bracket.
- Release connector from engine control unit and pull off.



- Press catches -1- and -2- outwards. After that, pull engine control unit off control unit bracket in direction of arrow.

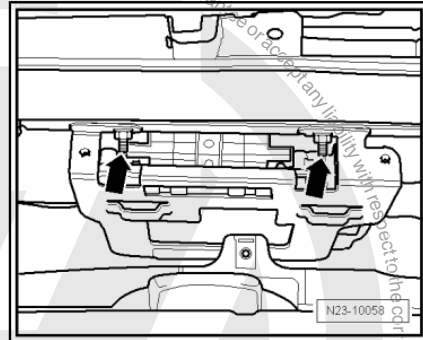
Installing

- Push engine control unit onto control unit bracket until it engages in catches.
- Attach and lock connectors.

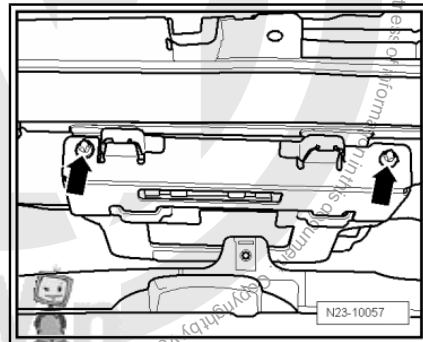




- Tighten securing nuts -arrows-.



- Tighten securing bolts -arrows-.
- Check previous coding and adapt new control unit ⇒ Vehicle diagnostic tester.
- Read event memory of new engine control unit and delete if necessary ⇒ Vehicle diagnostic tester.
- Perform road test.
- Again read control unit event memory.



Specified torque

Component	Specified torque
Securing nuts for control unit	10 Nm
Securing bolts for control unit	5 Nm



6 High-pressure pump

⇒ "6.1 Removing and installing fuel pump", page 187

⇒ "6.2 Checking delivery pressure and tandem pump for leaks - engine codes BJB, BLS, BSU", page 189

6.1 Removing and installing fuel pump

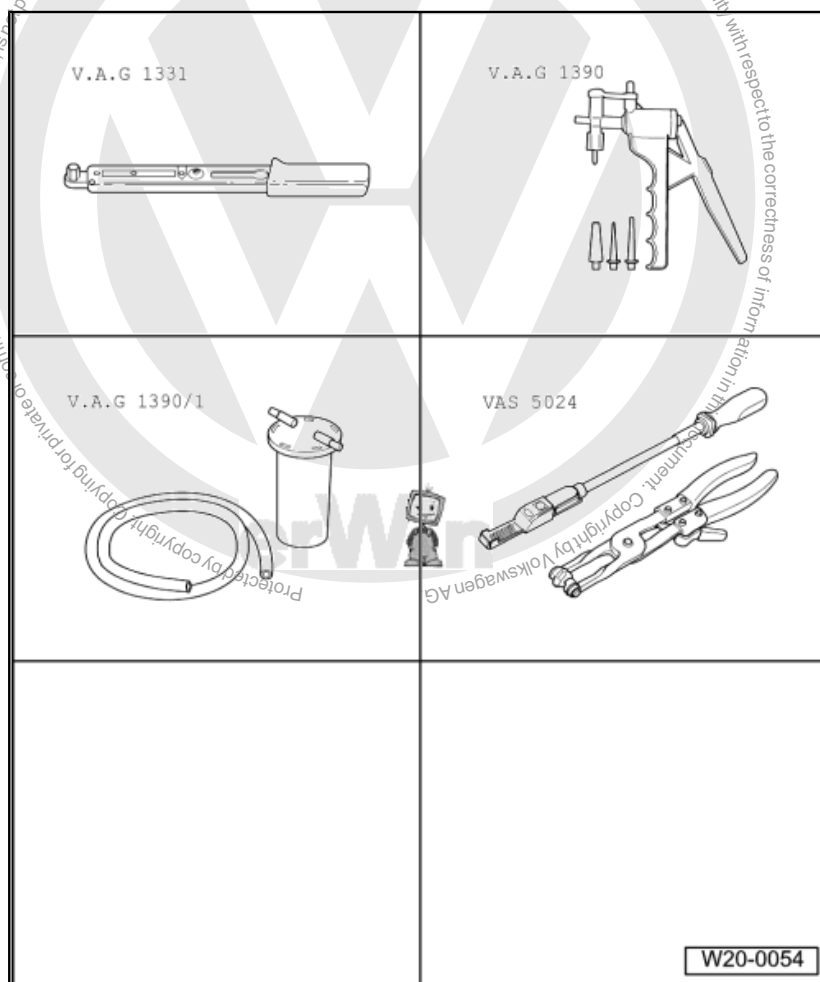


DANGER!

The tandem pump may, under no circumstances, be dismantled as the vacuum part could otherwise malfunction. This would result in the failure of the brake booster.

Special tools and workshop equipment required

- ◆ Torque wrench 5-50 Nm
V.A.G 1331-
- ◆ Hand vacuum pump with accessories - V.A.G 1390-
or hand vacuum pump -
VAS 6213-
- ◆ Water drainage container
V.A.G 1390/1-
- ◆ Spring-type clip pliers -
VAS 5024 A-

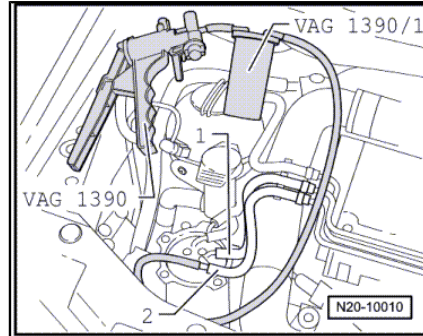


Removing:

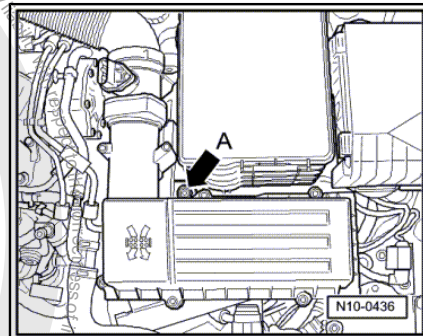
- Pull supply hose (white marking) and return hose (blue marking) off fuel filter.



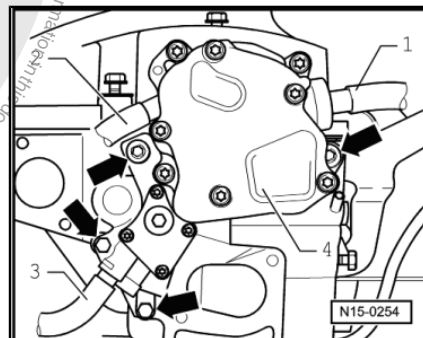
- Connect hand vacuum pump with accessories - V.A.G 1390- or hand vacuum pump - VAS 6213- with water drainage container - V.A.G 1390/1- to return hose -2-.
- Operate hand vacuum pump until no more fuel comes out of return hose. Be careful that no fuel is sucked into hand vacuum pump.
- Remove air filter housing with air mass meter and connecting pipe .



- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.



- Pull brake booster vacuum line -1- off tandem pump -4-.
- Pull supply hose -2- (white marking) and return hose -3- (blue marking) off tandem pump -4-.
- Unscrew securing bolts -arrows-.
- Remove tandem pump -4- from cylinder head.



Installing:

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

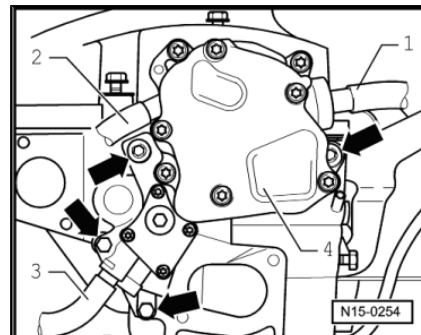


Note

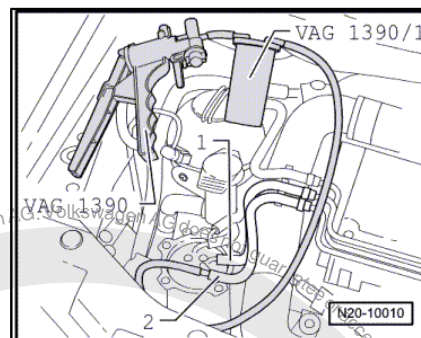
- ◆ Ensure that tandem pump coupling seats properly in cam-shaft.
- ◆ Renew tandem pump seal.
- Install tandem pump and tighten upper securing bolts to 20 Nm.
- Tighten lower securing bolts to 10 Nm.
- Carry out leakage test ➤ [page 191](#) .



- Connect return hose (blue marking) to return connection -3- of tandem pump.
- Connect supply hose (white marking) to supply connection -2- and brake booster vacuum line -1- to tandem pump -4-.
- Connect supply hose (white marking) to fuel filter.



- Connect hand vacuum pump with accessories - V.A.G 1390- or hand vacuum pump - VAS 6213- with water drainage container - V.A.G 1390/1- to return hose -2-.
- Operate hand vacuum pump - V.A.G 1390- or hand vacuum pump - VAS 6213- until fuel comes out of return hose. Be careful that no fuel is sucked into hand vacuum pump.
- Connect return hose (blue marking) to fuel filter.



6.2 Checking delivery pressure and tandem pump for leaks - engine codes BJB, BLS, BSU

Checking delivery pressure ⇒ [page 189](#)

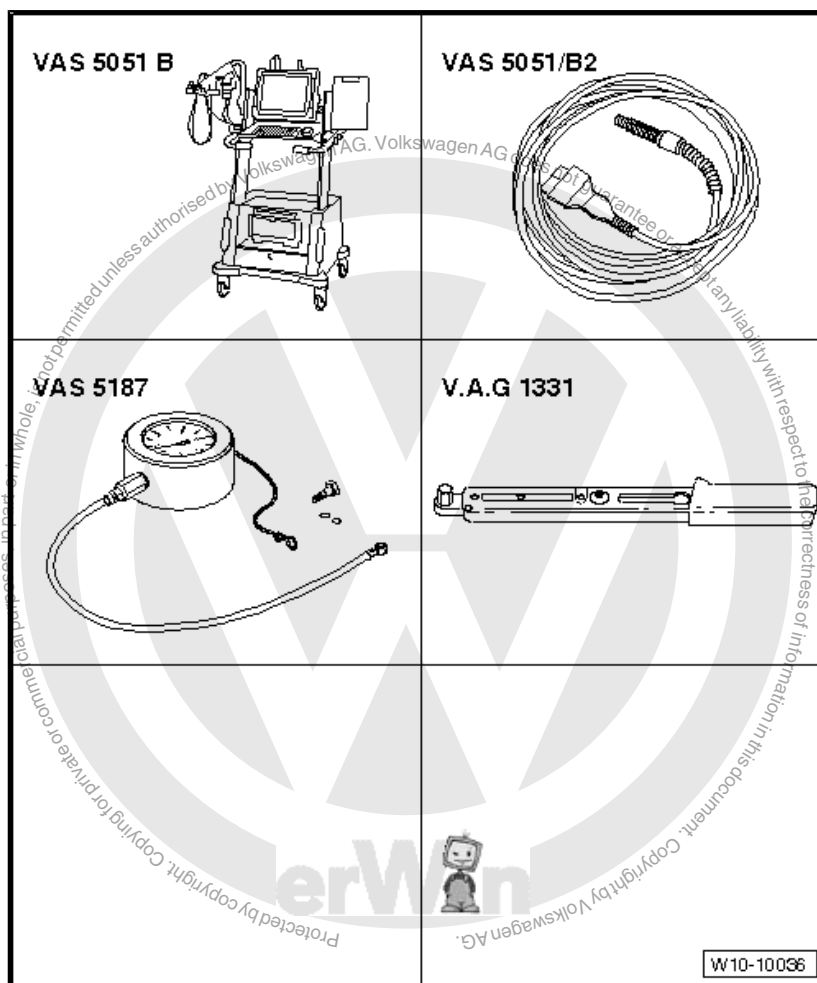
Checking for internal leaks ⇒ [page 191](#)

Checking delivery pressure



Special tools and workshop equipment required

- ◆ Vehicle diagnosis, testing and information system - VAS 5051B-
- ◆ Diagnosis cable, 3 m - VAS 5051B/2-
- ◆ Tandem pump tester - VAS 5187-
- ◆ Torque wrench - V.A.G 1331-

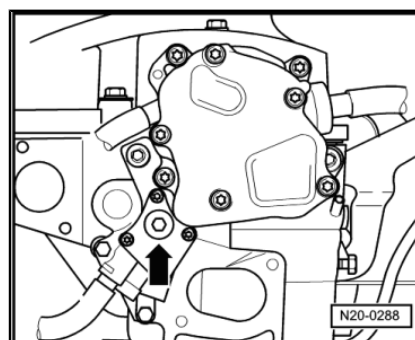


Test prerequisites

- Coolant temperature must be at least 85 °C.
- Unit injectors OK.
- Fuel filter and fuel lines must not be blocked.
- The non-return valve in the fuel supply hose must be OK.

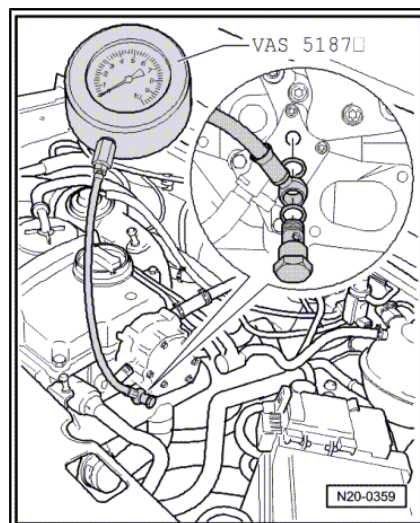
Procedure:

- Unscrew plug -arrow-.





- Connect tandem pump tester - VAS 5187- as shown.
- Start engine and run at idling speed.
- Connect vehicle diagnosis, testing and information system - VAS 5051B- and select "Vehicle self-diagnosis" mode.
- Press button "01 - Engine electronics" on display.
- Press diagnostic function "08-Read measured value block".
- Enter display group "1" using numeric key pad and confirm entry with "Q" key.
- Read off idling speed in display field "1".
- Increase speed to 4000 rpm.
- Observe pressure displayed on pressure gauge.



Specification: min. 7.5 bar

If the specification is not attained:

- Using a hose clamp, clamp off return line between fuel filter and tandem pump.
- Increase speed to 4000 rpm.
- Check displayed pressure on pressure gauge.

Specification: min. 7.5 bar

If specification is now obtained:

Pressure loss at unit injectors.

- Renew O-rings for unit injectors.

If the specification is not attained:

- Renew tandem pump → [page 187](#).



Note

*After removing pressure gauge, tighten sealing plug to 25 Nm.
The seal must be renewed.*

Checking for internal leaks



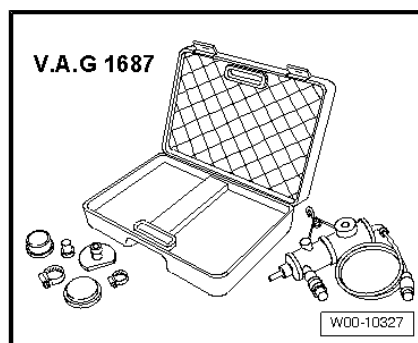
Note

The tandem pump must be checked for internal leaks between fuel side and oil side after reinstalling a used tandem pump, for example after replacing or repairing a cylinder head and/or when installing a "short" engine. In the event of a leak, it is possible for the fuel to mix with the oil which may cause engine damage.

Special tools and workshop equipment required



◆ Charge air system tester - V.A.G 1687-



Procedure:

- Detach fuel supply hose (white marking) and fuel return hose (blue marking) from tandem pump.
- Seal fuel return connection on tandem pump with blind plug. Secure blind plug with spring-type clip.

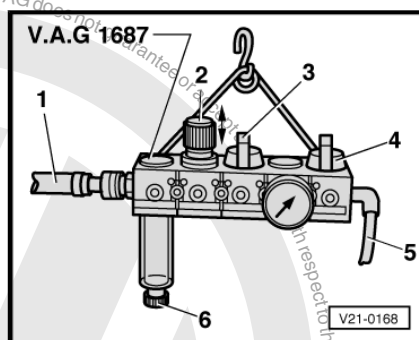
Prepare charge air system tester - V.A.G 1687- as follows:

- Unscrew pressure control valve -2- completely and close valves -3- and -4-.
- Connect test connection -5- to fuel supply connection of tandem pump using commercially available compressed air connection and a section of fuel hose. Secure by means of spring-type clip.



Note

To turn the pressure regulating valve -2- the knob must be pulled upwards.

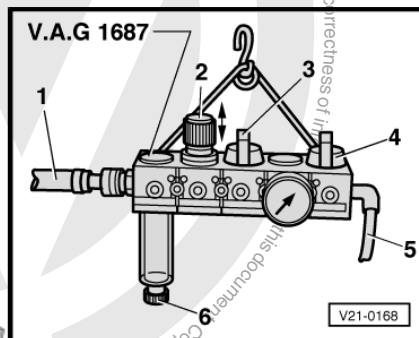


- Connect compressed air hose -1- (compressed air supply) to charge air system tester - V.A.G 1687-.



Note

If water is in inspection glass, drain via drain screw -6-.



- Open valve -3-.
- Adjust pressure to 1.0 bar with pressure control valve -2-.



Caution

The maximum test pressure is 1.3 bar and this must not be exceeded.

- Open valve -4- and wait until test circuit is full. If necessary, regulate pressure to 1.0 bar.
- Close valve -3- to maintain pressure and observe pressure drop over a period of 1 minute.

If the pressure does not drop the tandem pump can be reused, if the pressure drops the tandem pump must be renewed.



26 – Exhaust system

1 Exhaust pipes, silencers

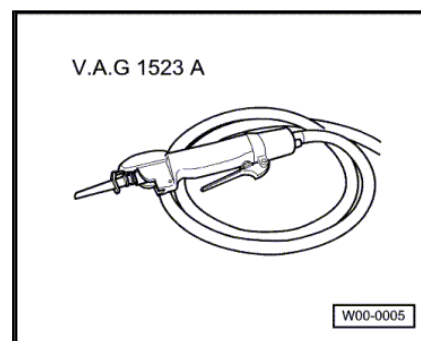
⇒ "1.1 Separating exhaust pipes, silencers", page 193

⇒ "1.2 Aligning exhaust system free of stress", page 193

1.1 Separating exhaust pipes, silencers

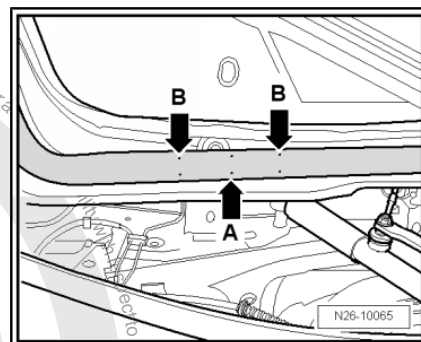
Special tools and workshop equipment required

- ◆ Pneumatic sabre saw - V.A.G 1523 A-



Procedure

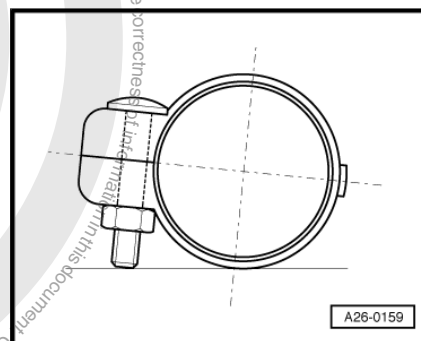
- Cut exhaust pipe at right angles at separating point -arrow A-.
- When installing, position repair double clamp at side markings -arrows B-.



- Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

Specified torque

Component	Specified torque
Clamp M8	25 Nm
Clamp M10	40 Nm



1.2 Aligning exhaust system free of stress

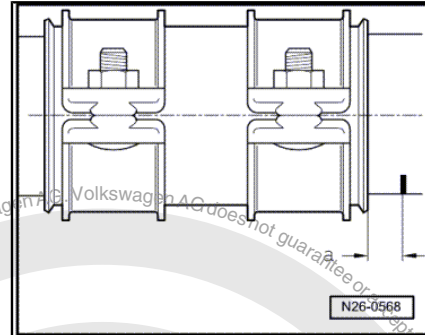
Test prerequisite

- Engine must be cold

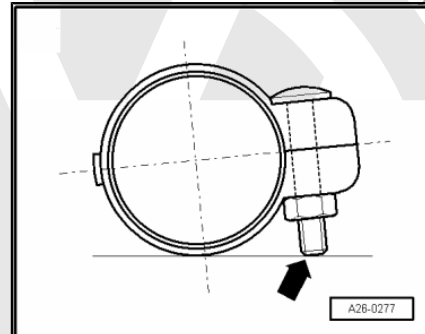


Procedure

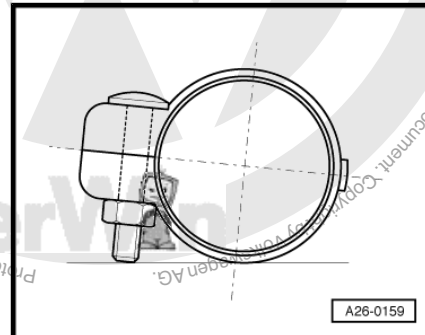
- Loosen threaded connection of double clamp between front exhaust pipe and front silencer.
- Position double clamp at distance -a- = 5 mm from marking on pipe for catalytic converter and lightly tighten front connection.



Installation position of front double clamp



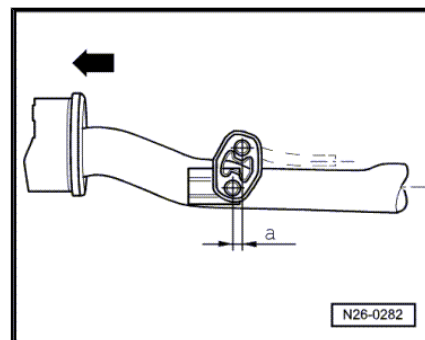
Installation position of rear double clamp



- Push silencer forwards into double clamp until dimension -a- = 15...17 mm between mountings for body and rear silencer is attained. -Arrow- points in direction of travel.
- Align rear silencer horizontally.
- Tighten double clamp bolts in this position.
- Once bolts have been tightened, check distance -a- and correct if necessary.

Specified torque

Component	Specified torque
Clamp M8	25 Nm
Clamp M10	40 Nm





2 Emission control

⇒ [“2.1 Assembly overview – emission control with catalytic converter”, page 195](#)

⇒ [“2.2 Assembly overview – emission control with diesel particulate filter, engine codes BLS, BSU”, page 197](#)

⇒ [“2.3 Removing and installing particulate filter”, page 199](#)

⇒ [“2.4 Removing and installing particulate filter - vehicles with four-wheel drive”, page 202](#)

2.1 Assembly overview – emission control with catalytic converter



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

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



1 - Front exhaust pipe with catalytic converter

2 - Mounting

3 - Nut

☐ 25 Nm

4 - Bolt

☐ 25 Nm

5 - Double clamp

☐ Note installation position ➔ [page 194](#).

6 - Exhaust pipe

7 - Retaining ring

☐ Renew if damaged.

8 - Bracket

☐ Note installation position.

9 - Bolt

☐ 25 Nm

10 - Mounting

☐ With retaining ring.

☐ Renew if damaged.

11 - Rear silencer

12 - Separating point

☐ Marked by impressions on exhaust pipe.

☐ The exhaust pipe and rear silencers are installed as one part during production. For repairs, exhaust pipe and rear silencers are supplied separately.

☐ The connection is made with a double clamp.

☐ Tighten double clamp bolts evenly.

☐ Installation position of rear double clamp ➔ [page 194](#)

☐ Cutting exhaust pipe ➔ [page 193](#).

13 - Bracket

☐ Note installation position.

14 - Retaining ring

☐ Renew if damaged.

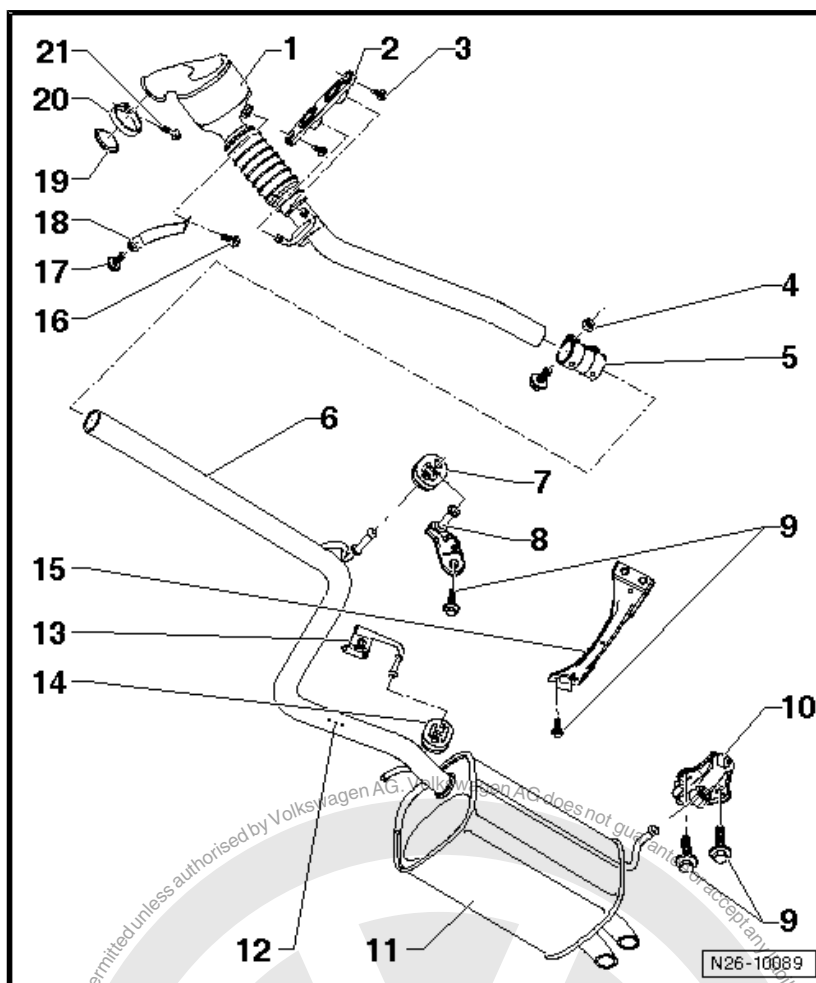
15 - Tunnel cross-piece

16 - Bolt

☐ 40 Nm

17 - Bolt

☐ 40 Nm





18 - Support

19 - Gasket

20 - Clip

21 - Bolt

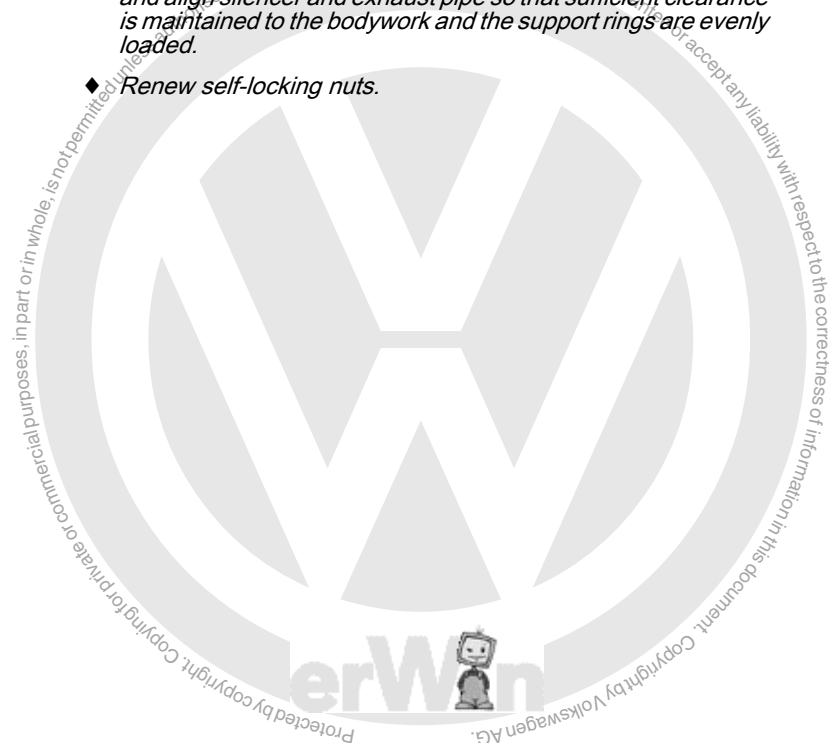
□ 7 Nm

2.2 Assembly overview – emission control with diesel particulate filter, engine co- des BLS, BSU



Note

- ◆ *If a new particulate filter is installed, an ash mass comparison must be carried out in guided fault finding ⇒ Vehicle diagnostic tester.*
- ◆ *After working on the exhaust system, ensure that the system is not under tension and that there is sufficient clearance to the bodywork. If necessary, loosen double and single clamps and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.*
- ◆ *Renew self-locking nuts.*





1 - Particulate filter

- ☐ With decoupling element.
- ☐ Do not bend decoupling element more than 10° - otherwise it can be damaged.
- ☐ Particulate filter add-on parts ➔ [page 206](#)
- ☐ Removing and installing in vehicles with front-wheel drive ➔ [page 199](#).
- ☐ Removing and installing in vehicles with all-wheel drive ➔ [page 202](#).

2 - Double clamp

- ☐ Note installation position ➔ [page 193](#).

3 - Nut

- ☐ 25 Nm

4 - Bolt

5 - Retaining ring

- ☐ Renew if damaged.

6 - Bracket

- ☐ Note installation position.

7 - Bolt

- ☐ 25 Nm

8 - Tunnel cross-piece

9 - Mounting

- ☐ With retaining ring.
- ☐ Renew if damaged.

10 - Bolt

- ☐ 25 Nm

11 - Rear silencer

12 - Separating point

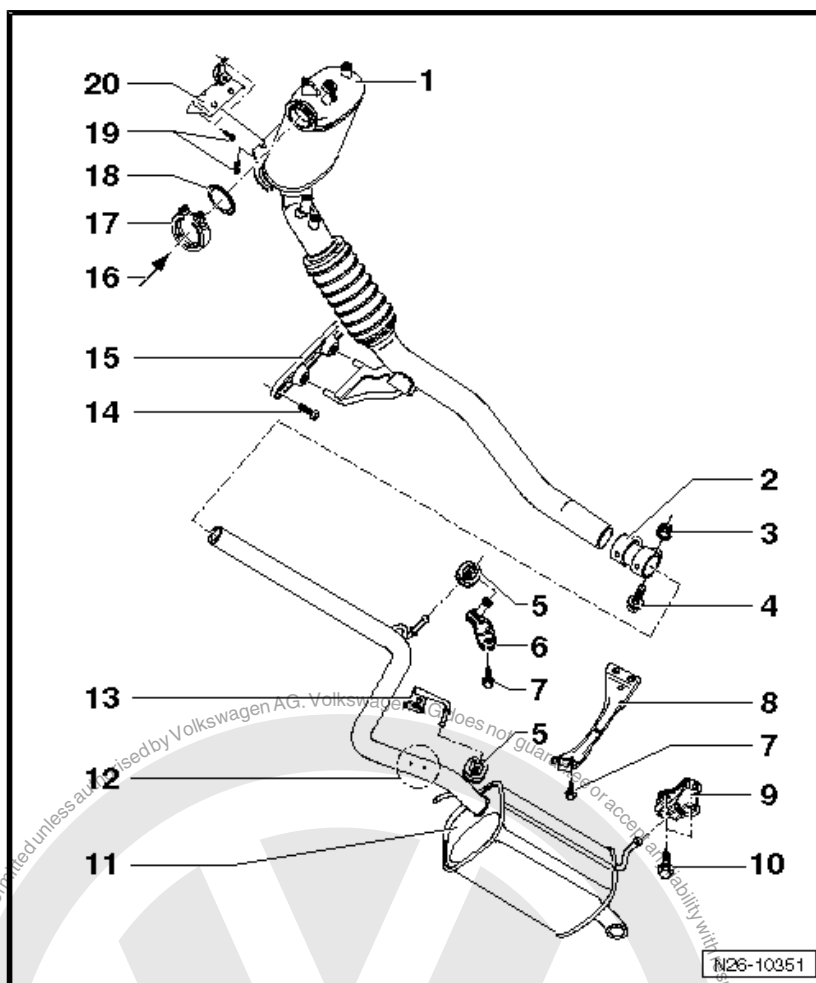
- ☐ Marked by impressions on exhaust pipe.
- ☐ The exhaust pipe and rear silencers are installed as one part during production. For repairs, exhaust pipe and rear silencers are supplied separately.
- ☐ The connection is made with a double clamp.
- ☐ Tighten double clamp bolts evenly.
- ☐ Installation position of rear double clamp ➔ [page 193](#)
- ☐ Cutting exhaust pipe ➔ [page 193](#).

13 - Bracket

- ☐ Note installation position.

14 - Bolt

- ☐ Renew if damaged.
- ☐ 25 Nm





15 - Mounting

16 - To turbocharger.

17 - Screw-type clip

- ☐ Note installation position.
- ☐ 7 Nm

18 - Gasket

- ☐ Renew after removing.
- ☐ Note installation position.

19 - Bolt or nut.

- ☐ 23 Nm

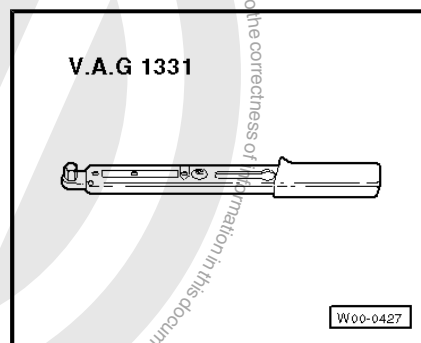
20 - Bracket

- ☐ Bolted to cylinder block.

2.3 Removing and installing particulate filter

Special tools and workshop equipment required

- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

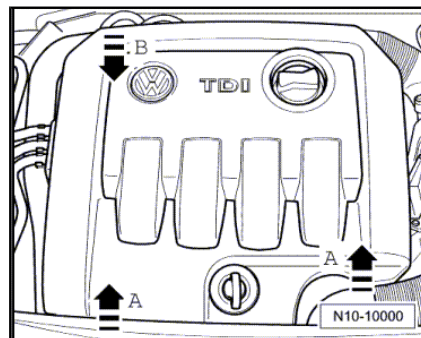


Note

If a new particulate filter is installed, an ash mass comparison must be carried out in guided fault finding ⇒ Vehicle diagnostic tester.

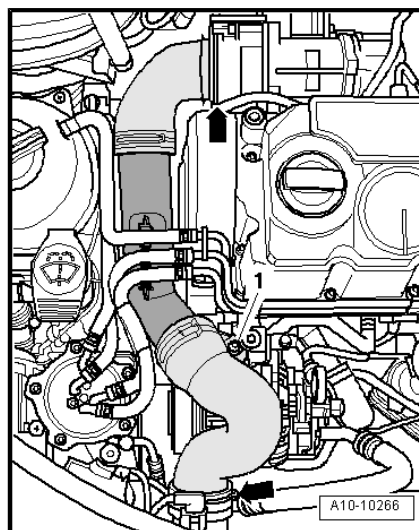
Removing

- Remove engine cover panel, if fitted. To do this, pull engine cover panel upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.

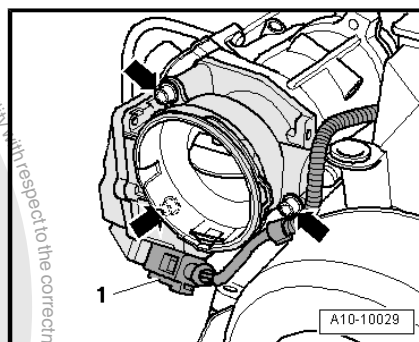




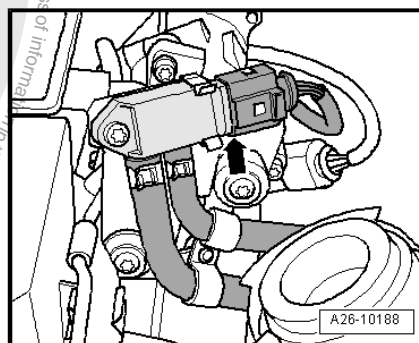
- Unclip fuel and coolant hoses from right air pipe.
- Remove bolt -1-.



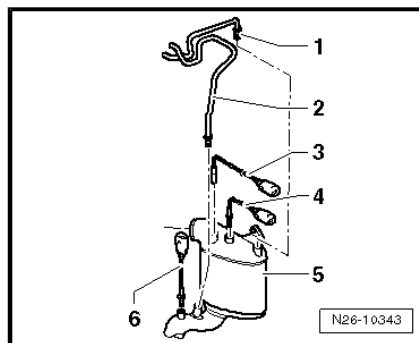
- Install right air pipe. To do this, raise retaining clips -arrows- slightly.
- Disconnect connector -1- on intake manifold flap motor - V157- .
- Unscrew bolts -arrows- and remove intake manifold flap motor - V157- .



- Disconnect electrical connector -arrow- on exhaust gas pressure sensor 1 - G450- .
- Unscrew exhaust gas pressure sensor 1 - G450- with bracket.



- Remove noise insulation => General body repairs, exterior; Rep. gr. 50 ; Noise insulation .
- Loosen control lines -1- and -2- from particulate filter -5-.
- Remove exhaust gas pressure sensor 1 - G450- completely, together with pressure lines.
- Remove exhaust gas temperature sender 2 - G448- -3-.
- Remove Lambda probe - G39- -4-.



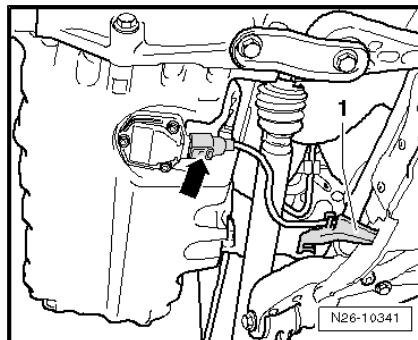


- Loosen exhaust gas temperature sender 3 - G495- -6-.
- Disconnect connector on oil level and oil temperature sender - G266- .
- Remove cable retainer -1-.
- Unbolt right drive shaft from gearbox flange.

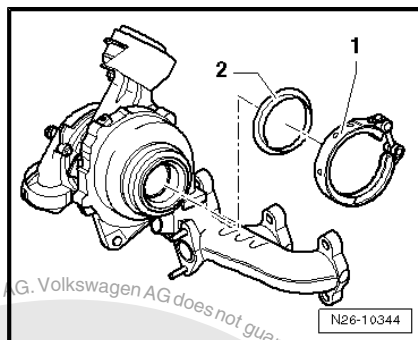


Note

Take care not to damage the surface protection of drive shaft.



- Press right drive shaft forwards.
- Loosen retaining clip -1- with seal -2- for particulate filter.

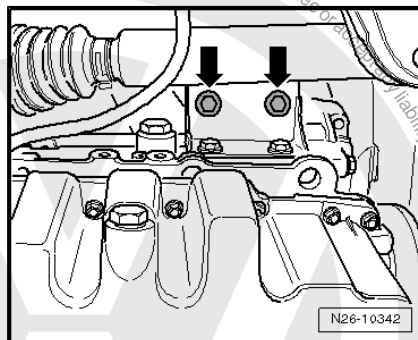


- Remove retaining clip -1-.

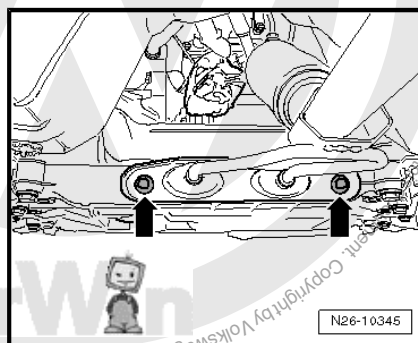


Note

Decoupling elements in front exhaust pipe must not be bent more than 10° - danger of damage.



- Unscrew bolts -arrows- of particulate filter bracket.





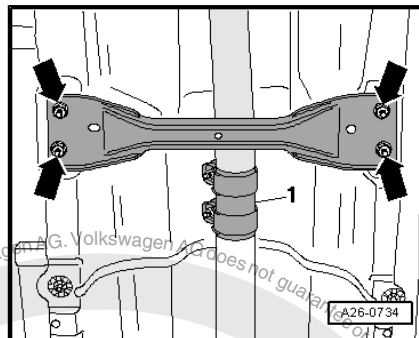
- Unbolt bracket for exhaust system -arrows-.
- Loosen threaded connection -arrows- and remove tunnel cross-piece.
- Loosen double clamp -1- and push to rear.



Note

A second mechanic is required for removal of the particulate filter.

- Remove particulate filter downwards through tunnel in under-body.



Installing

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



Note

- ◆ If G450 is renewed, renew M6x22 bolt also.
- ◆ Renew seals, gaskets and self-locking nuts.
- ◆ Fit all cable ties in the original position when installing.
- Installing particulate filter add-on parts ⇒ [page 206](#)
- Aligning exhaust system free of stress ⇒ [page 193](#).
- After renewing particulate filter perform adaption in "Guided functions" ⇒ Vehicle diagnostic tester.

Specified torques

- ◆ ⇒ ["2.2 Assembly overview – emission control with diesel particulate filter, engine codes BLS, BSU", page 197](#)
- ◆ ⇒ ["3.1 Assembly overview - exhaust gas temperature regulation", page 206](#)
- ◆ ⇒ ["4.2 Assembly overview - intake manifold, engine codes BLS, BSU", page 182](#)
- ◆ Drive shafts; Assembly overview - drive shafts ⇒ Rep. gr. 40 ; Assembly overview - drive shaft .
- ◆ Remove noise insulation ⇒ Rep. gr. 50 ; Body - front; Noise insulation .

2.4 Removing and installing particulate filter - vehicles with four-wheel drive

Special tools and workshop equipment required



- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

V.A.G 1331



W00-0427

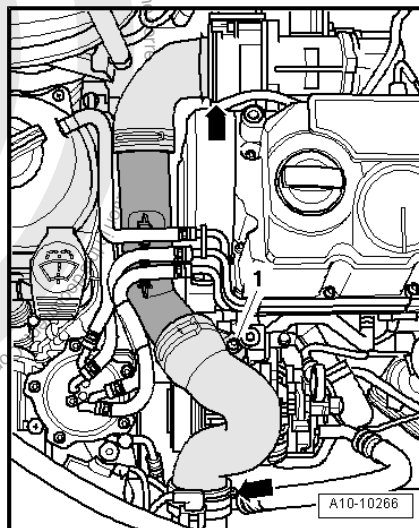


Note

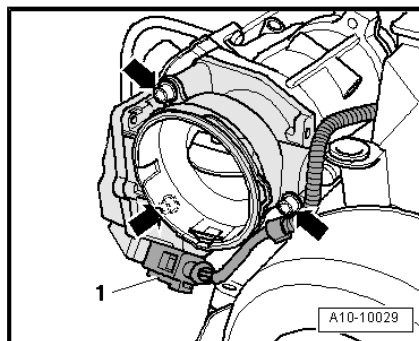
- ◆ *If a new particulate filter is installed, an ash mass comparison must be carried out in guided fault finding ⇒ Vehicle diagnostic tester.*
- ◆ *Assembly overview - particulate filter ⇒ [page 197](#)*

Removing

- Unclip fuel and coolant hoses from right air pipe.
- Remove bolt -1-.
- Remove right air pipe. Raise retaining clips -arrows- slightly to do so.

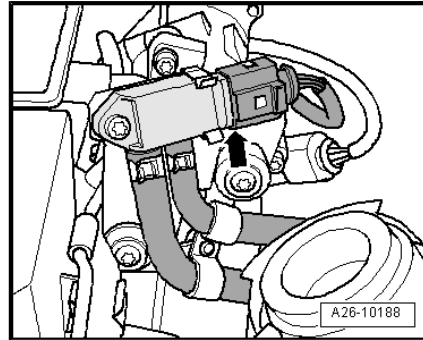


- Disconnect connector -1- on intake manifold flap motor - V157- .
- Unscrew bolts -arrows- and remove intake manifold flap motor - V157- .
- Remove intake hose from air filter/turbocharger.

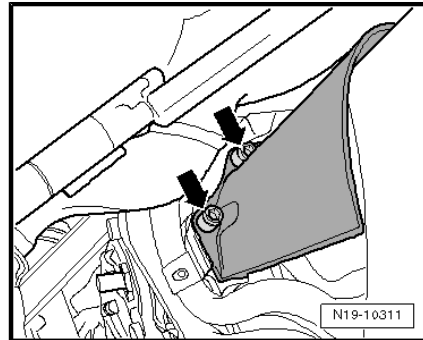




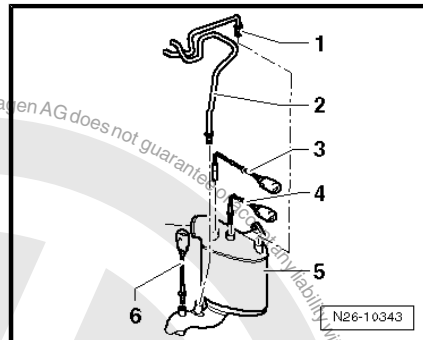
- Disconnect electrical connector -arrow- on exhaust gas pressure sensor 1 - G450- .
- Unscrew exhaust gas pressure sensor 1 - G450- with bracket.
- Remove subframe together with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Removing and installing subframe with hydraulic steering rack .
- Remove right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shafts .



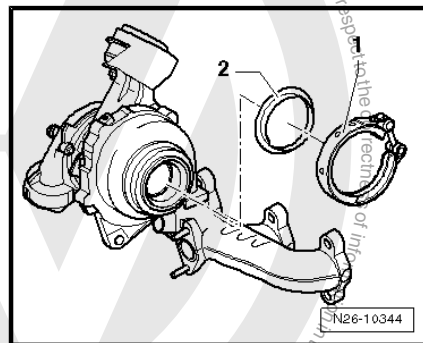
- Unbolt heat shield for right drive shaft from bevel box -arrows-.



- Disconnect control lines -1- and -2- from particulate filter -5- and remove exhaust gas pressure sensor 1 - G450- with control lines.
- Separate connector of exhaust gas temperature sender 2 - G448- -3- from Lambda probe - G39- -4- and exhaust gas temperature sender 3 - G495- -6-.



- Loosen retaining clip -1- with seal -2- for particulate filter.
- Loosen retaining clip -1-.

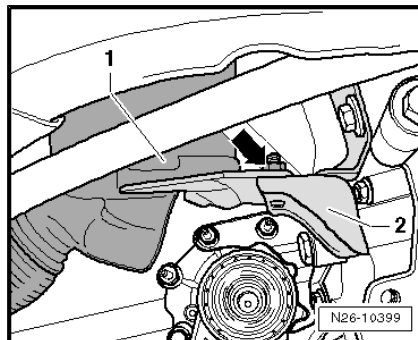




- Unscrew particulate filter -1- from particulate filter bracket -2-.

**Note**

Decoupling elements in front exhaust pipe must not be bent more than 10° - danger of damage.



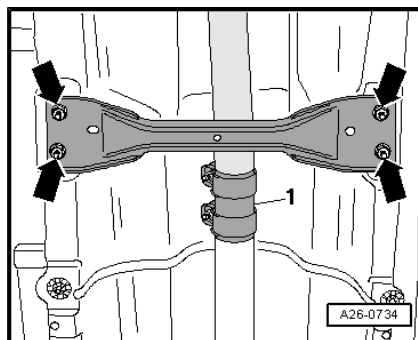
- Loosen double clamp -1- and push to rear.
- Take particulate filter out downwards.

Installing

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

**Note**

- ◆ If G450 is renewed, renew M6x22 bolt also.
- ◆ Decoupling elements in front exhaust pipe must not be bent more than 10° - danger of damage.
- ◆ Renew seals, gaskets and self-locking nuts.
- ◆ Fit all cable ties in the original position when installing.
- Install right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shafts; Removing and installing drive shaft .
- Install subframe together with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Removing and installing sub-frame with hydraulic steering rack .
- Tighten new securing nuts for heat shield.
- Aligning exhaust system free of stress ⇒ [page 193](#) .
- After renewing particulate filter perform adaption in "Guided functions" ⇒ Vehicle diagnostic tester.

**Specified torques**

- ◆ ⇒ ["2.2 Assembly overview - emission control with diesel particulate filter, engine codes BLS, BSU", page 197](#)
- ◆ ⇒ ["3.1 Assembly overview - exhaust gas temperature regulation", page 206](#)
- ◆ ⇒ ["4.2 Assembly overview - intake manifold, engine codes BLS, BSU", page 182](#)
- ◆ Drive shafts; Assembly overview - drive shafts ⇒ Rep. gr. 40 ; Assembly overview - drive shaft .
- ◆ Subframe; Assembly overview - subframe ⇒ Rep. gr. 40 ; Subframe .
- ◆ Remove noise insulation ⇒ Rep. gr. 50 ; Body - front; Noise insulation .





3 Exhaust gas temperature regulation

⇒ "3.1 Assembly overview - exhaust gas temperature regulation",
page 206

3.1 Assembly overview - exhaust gas temperature regulation

1 - Exhaust gas pressure sensor 1 - G450-

If G450 is renewed, renew bolt also.

8 Nm

2 - Control pipe

- ❑ Connection for particulate filter outlet diameter 8 mm.

3 - Control pipe

- ❑ Connection for particulate filter inlet diameter 10 mm.

4 - Turbocharger

5 - Exhaust gas temperature sender 2 - G448-

- ❑ Grease thread with high-temperature paste ⇒ Electronic Parts Catalogue (ETKA) .
- ❑ Remove and install with tool set 17 mm - T10395- .
- ❑ 45 Nm

6 - Lambda probe - G39-

- ❑ Grease only the thread with high-temperature paste ⇒ Electronic Parts Catalogue (ETKA) .
- ❑ Remove and install with Lambda probe opening ring spanner set - 3337- .
- ❑ 50 Nm

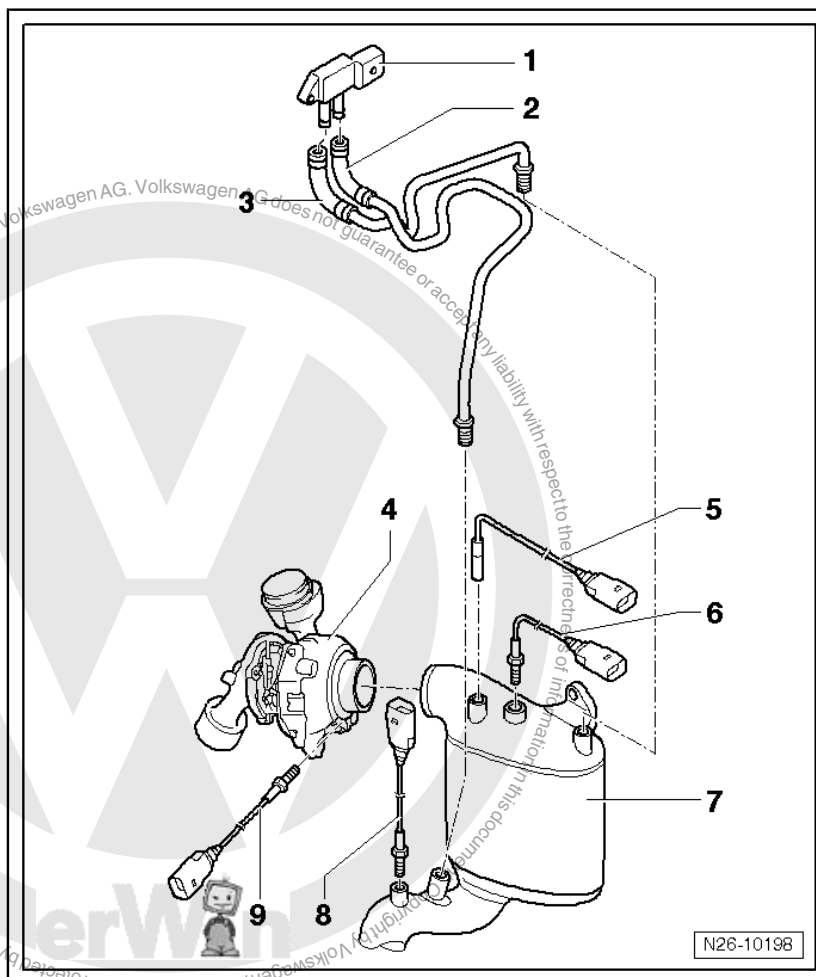
7 - Particulate filter

8 - Exhaust gas temperature sender 3 - G495-

- ❑ Grease thread with high-temperature paste ⇒ Electronic Parts Catalogue (ETKA) .
- ❑ Remove and install with tool set 17 mm - T10395- .
- ❑ 45 Nm

9 - Exhaust gas temperature sender 1 - G235-

- ❑ Grease thread with high-temperature paste ⇒ Electronic Parts Catalogue (ETKA) .
- ❑ Remove and install with tool set 17 mm - T10395- .
- ❑ 45 Nm





4 Exhaust gas recirculation system

⇒ ["4.1 Assembly overview - exhaust gas recirculation system, engine code BJB", page 207](#)

⇒ ["4.2 Assembly overview - exhaust gas recirculation system, engine codes BLS, BSU", page 208](#)

⇒ ["4.3 Removing and installing exhaust gas recirculation cooler, engine codes BLS, BSU", page 209](#)

⇒ ["4.4 Checking mechanical exhaust gas recirculation valve, engine code BJB", page 211](#)

4.1 Assembly overview - exhaust gas recirculation system, engine code BJB



Note

- ◆ *The exhaust gas recirculation system is actuated by the engine control unit - J623- via the exhaust gas recirculation valve - N18-*
- ◆ *The exhaust gas recirculation valve - N18- is located in the solenoid valve block.*
- ◆ *The tapered plunger in the mechanical exhaust gas recirculation valve varies the opening cross-section according to the opening lift.*
- ◆ *Pulsed control enables every conceivable valve position.*
- ◆ *Renew self-locking nuts.*



1 - Intake manifold

- ❑ With exhaust gas recirculation valve and intake manifold flap.

- ❑ 22 Nm

2 - From charge air cooler

3 - Gasket

- ❑ Renew after removing.

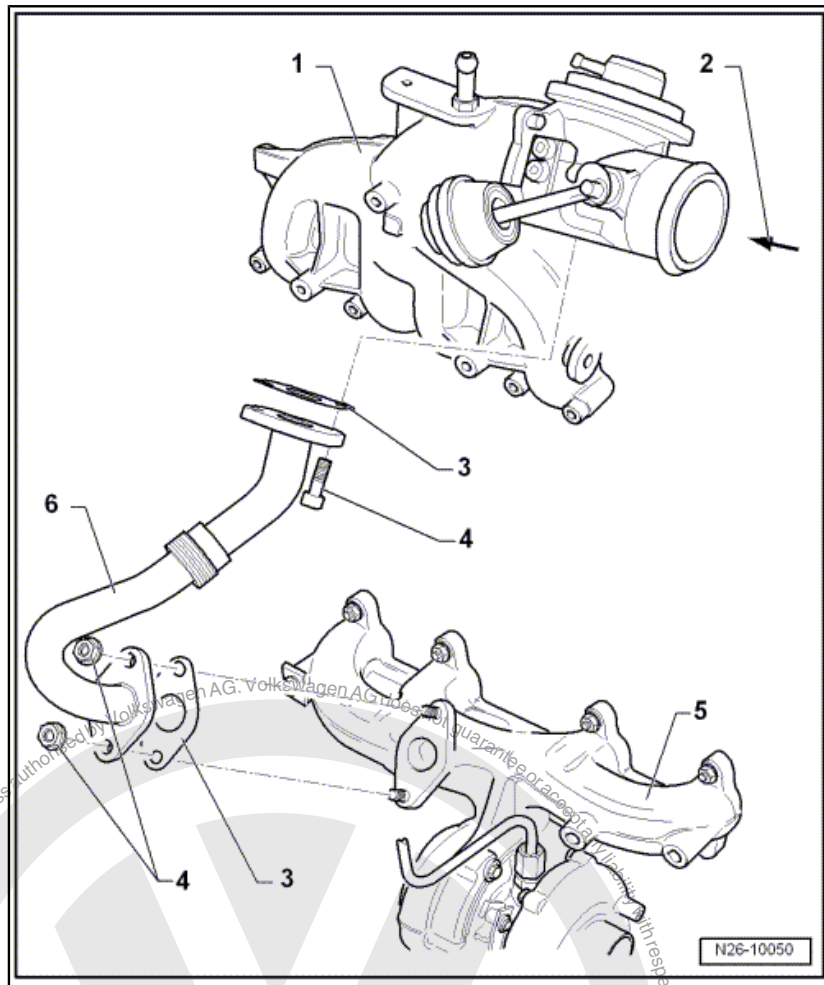
4 - Bolt

- ❑ 22 Nm

5 - Exhaust manifold

- ❑ Removing and installing
⇒ [page 144](#).

6 - Connecting pipe



4.2 Assembly overview - exhaust gas recirculation system, engine codes BLS, BSU



Note

- ◆ The exhaust gas recirculation system is activated by the engine control unit - J623- via the exhaust gas recirculation potentiometer - G212.
- ◆ Renew self-locking nuts.



1 - Intake manifold

- ☐ With exhaust gas recirculation valve - N18- , exhaust gas recirculation potentiometer - G212- and intake manifold flap motor - V157-

2 - Gasket

- ☐ Renew after removing.

3 - Bolt

- ☐ 22 Nm

4 - Exhaust gas recirculation cooler

- ☐ With vacuum unit and by-pass flap
- ☐ Renew together with vacuum unit only.
- ☐ Vacuum connection to exhaust gas recirculation cooler changeover valve - N345-
⇒ [page 178](#) .
- ☐ Removing and installing
⇒ [page 209](#) .

5 - Nut

- ☐ 22 Nm

6 - Connecting pipe

7 - Bolt

- ☐ 22 Nm

8 - Exhaust manifold

- ☐ Removing and installing
⇒ [page 146](#) .

A - To coolant hose connection

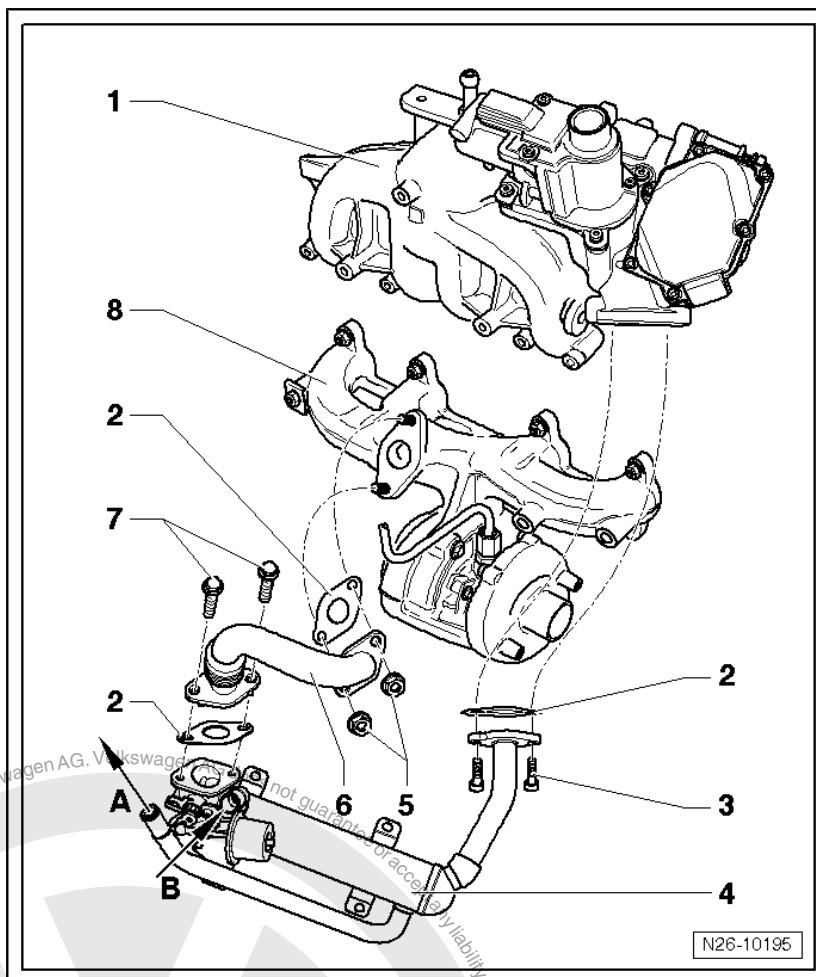
- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

B - From rear coolant pipe

- ☐ Coolant hose schematic diagram ⇒ [page 120](#) .

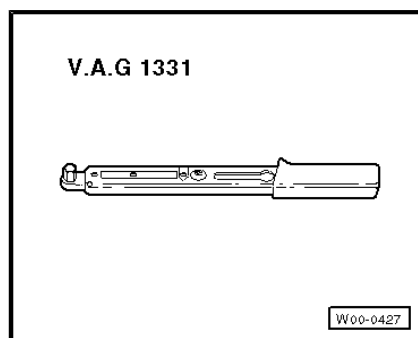
4.3 Removing and installing exhaust gas recirculation cooler, engine codes BLS, BSU

Special tools and workshop equipment required

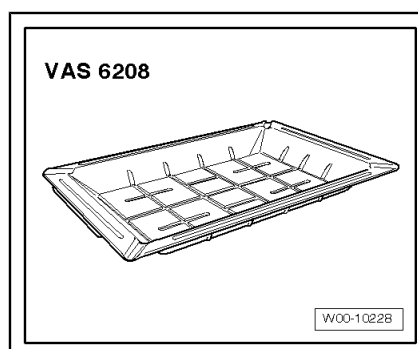




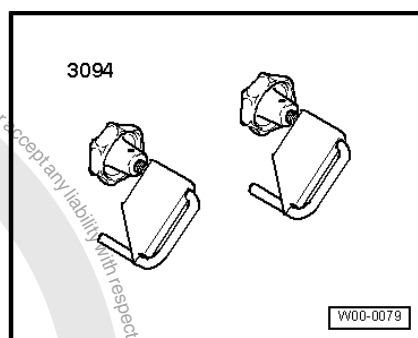
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-



- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Hose clamps up to 25 mm - 3094-



Removing

Vehicles with particulate filter

- Remove particulate filter ⇒ [page 199](#) .

Continuation for all vehicles:

- Remove turbocharger support with oil return pipe ⇒ [page 159](#) .
- Clamp off both coolant hoses using hose clamps, up to 25 mm in diameter - 3094- and pull coolant hoses off exhaust gas recirculation cooler.
- Pull vacuum hose off vacuum unit.
- Loosen securing bolts for exhaust gas recirculation cooler and remove exhaust gas recirculation cooler downwards.

Installing

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



Note

Renew seals, gaskets and self-locking nuts.

- On vehicles with particulate filter, install particulate filter
⇒ [page 199](#).
- Replenish coolant ⇒ [page 121](#).

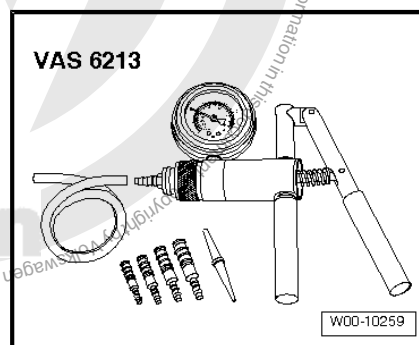
Specified torques

- ◆ ⇒ [“2.2 Assembly overview – emission control with diesel particulate filter, engine codes BLS, BSU”, page 197](#)
- ◆ ⇒ [“4.2 Assembly overview - exhaust gas recirculation system, engine codes BLS, BSU”, page 208](#)
- ◆ ⇒ [“1.2 Assembly overview - turbocharger, engine codes BLS, BSU”, page 146](#)

4.4 Checking mechanical exhaust gas recirculation valve, engine code BJB

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



Test sequence:

- Pull vacuum hose off exhaust gas recirculation valve.
- Connect hand vacuum pump - VAS 6213- to valve.
- Operate hand vacuum pump a few times.
- Pull hand vacuum pump hose off exhaust gas recirculation valve. The diaphragm rod must audibly return to its original position.



28 – Glow plug system

1 Glow plug system

⇒ ["1.1 Removing, installing and checking glow plugs", page 212](#)

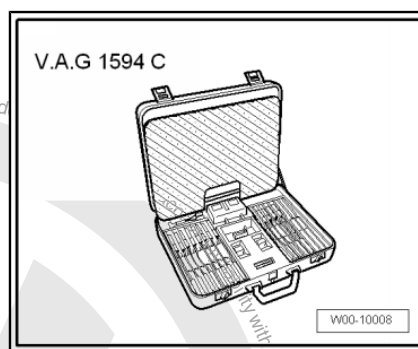
⇒ ["1.2 Removing, installing and checking ceramic glow pin plugs", page 213](#)

⇒ ["1.3 Removing and installing engine speed sender G28 ", page 215](#)

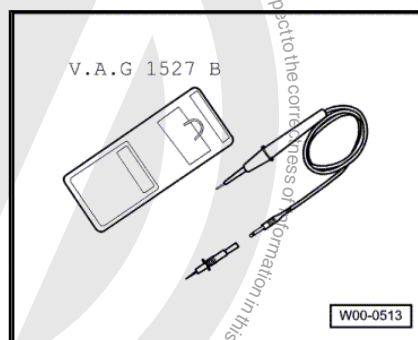
1.1 Removing, installing and checking glow plugs

Special tools and workshop equipment required

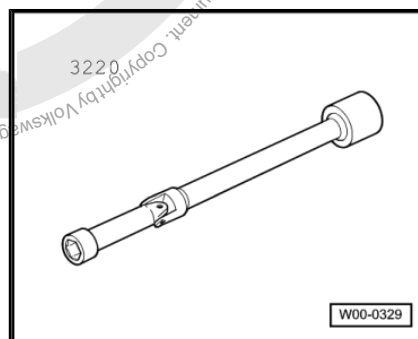
- ◆ Auxiliary measuring set - V.A.G 1594 C-



- ◆ Voltage tester - V.A.G 1527B-



- ◆ U/J extension and socket, 10 mm - 3220-



Test requirements

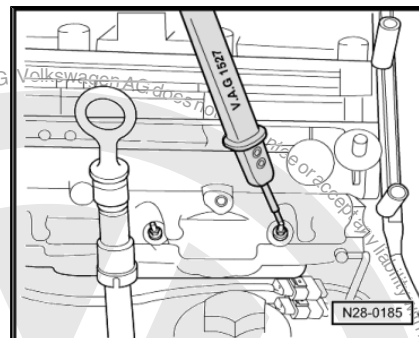
- Battery voltage at least 11.5 V



- Ignition switched off

Test procedure

- Pull connectors off glow plugs.
- Connect voltage tester - V.A.G 1527B- cable to battery positive (+), using clips from auxiliary measuring set - V.A.G 1594 C- .
- Place test probe of voltage tester - V.A.G 1527B- on each glow plug one after the other. Diode lights up: glow plug OK., diode does not light up: renew glow plug.
- Use U/J extension and socket, 10 mm - 3220- to remove and install glow plugs.



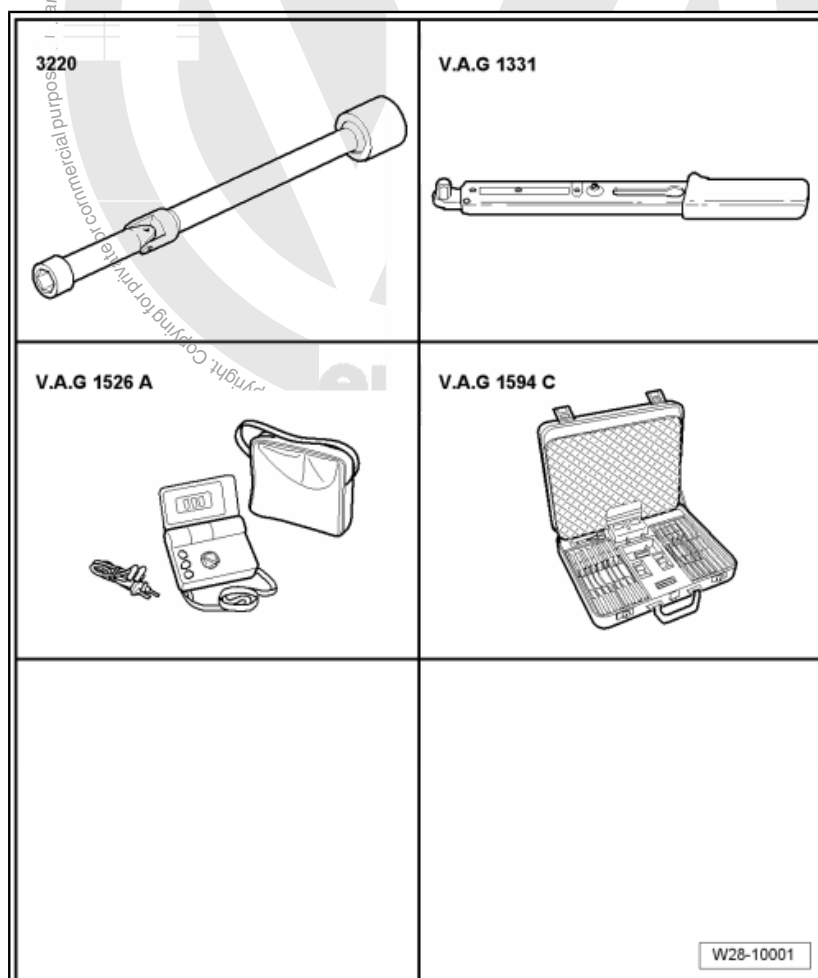
Specified torques

- ◆ ⇒ "1.1 Assembly overview - cylinder head", page 59

1.2 Removing, installing and checking ceramic glow pin plugs

Special tools and workshop equipment required

- ◆ U/J extension and socket, 10 mm - 3220-
- ◆ Torque wrench 5-50 Nm - V.A.G 1331-
- ◆ Hand-held multimeter - V.A.G 1526D-
- ◆ Auxiliary measuring set - V.A.G 1594 C-





Characteristic features of ceramic glow plugs



WARNING

Due to the special properties of the material used, ceramic glow plugs are easily damaged and require special care when handling and removing/installing. Always observe the special instructions when removing and installing ceramic glow plugs.

Transport and store only in original packaging or packed separately in bubble wrap.

Do not remove glow plugs from packaging until they are ready to be installed.

Ceramic glow plugs are sensitive to knocks and bending. For this reason, glow plugs which have been dropped (even from a height of only about 2 cm) must not be installed, even if no damage is apparent (hair-line cracks, for example).

If there is any doubt as to the condition of the ceramic glow plugs, they should be renewed without exception.

Damaged ceramic glow plugs result in engine damage in all cases.

If the heater pin of the glow plug is damaged, the fragments must be removed from the combustion chamber before starting the engine for the first time, otherwise this will invariably cause mechanical damage (piston seizure).

It is not permissible to install a combination of ceramic and metallic glow plugs.

Test prerequisites

- Engine is cold
- Ignition switched off

Procedure



Note

Do not cant ceramic glow pin plugs when removing and installing. Remove any hindering components to install.

- Pull connectors from ceramic glow plugs.
- Remove ceramic glow plugs using U/J extension and socket, 10 mm - 3220- .

Installing

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

- Before installing, completely remove any deposits from the cylinder head hole and thread.



Note

Never oil or grease thread of cylinder head hole or ceramic glow plug.

- Screw ceramic glow pin plugs into cylinder head using U/J extension and socket, 10 mm - 3220- and tighten hand-tight.
- Then tighten ceramic glow pin plugs.

**WARNING**

- ◆ *After installing and before the engine is started, always perform a resistance test on all ceramic glow plugs when engine is cold.*
- ◆ *If the defective ceramic glow plug is broken, remove all fragments from the engine, otherwise these can cause damage to the engine.*

- ◆ Specification: max. 1 Ω
- If specification is exceeded, renew defective ceramic glow pin plug.

Specified torques

- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 59](#)

1.3 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

- ◆ Torque wrench 5-50 Nm - V.A.G 1331-

V.A.G 1331

W00-0427

Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Noise insulation .
- Clamp off coolant hoses on engine oil cooler using a hose clamp, and pull off hoses.
- Remove oil filter bracket ⇒ [page 114](#) .
- Disconnect connector from engine speed sender - G28- .
- Unscrew securing bolt -arrow- and pull out engine speed sender - G28- .

Installing

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

Specified torques

- ◆ ⇒ ["2.1 Assembly overview - cylinder block, gearbox end", page 38](#)
- ◆ ⇒ ["2.1 Assembly overview - oil filter housing, oil pressure switch", page 114](#)
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ Rep. gr. 50 ; Assembly overview - noise insulation

