Repair Manual

Golf Variant 2007 ➤
Golf Variant 2010 ➤
Jetta 2005 ➤
Jetta 2011 ➤

4-Cylinder Diesel Engine (2.0L Engine, Common Rail)									
Engine ID	CBEA	CJAA							

Edition 04.2015

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

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00 – General, Technical Data

1 Technical Data

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⇒ “1.1 Engine Number”, page 1 .

⇒ “1.2 Engine Specifications”, page 1 .

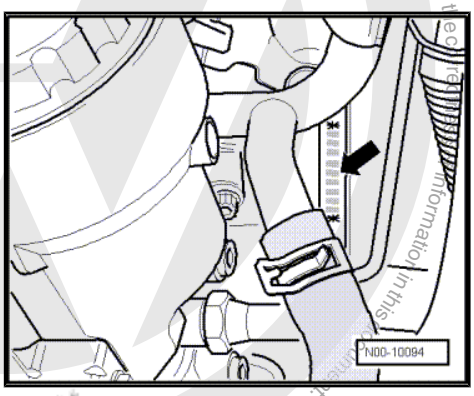
1.1 Engine Number

- Four-letter engine codes were introduced in MY 2008.
- The first three positions describe the mechanical engine structure. They are stamped on the engine. The fourth position describes the engine output and depends on the Engine Control Module - J623- .
- The four-letter engine code is on the type label, the vehicle data label and the Engine Control Module - J623- .
- The vehicle data label is located in both the customer maintenance schedule and on the vehicle rear in the spare tire well or on the luggage compartment floor.

Note

Vehicles for some countries do not have a type label. Vehicle data label and type label locations. Refer to ⇒ Maintenance ; Booklet 20.1 .

- The engine number (“engine code” and “serial number”) are located at the engine/transmission joint -arrow-.
- A sticker with the “engine code” and “serial number” is also on the toothed belt guard.
- The engine number consists of up to nine characters (alpha-numeric).
- The first part (maximum four letters) represents the “engine code”, the second part (six digit) is the “serial number”.
- If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter.



1.2 Engine Specifications

Codes		CBEA	CJAA
Manufactured		from 04/2008	from 05/2009
Emissions values	in accordance with	LEV II standard	ULEV2 Standard
Displacement	liters	2.0	2.0
Output	kW at RPM	103/4000	103/4000
Torque	Nm at RPM	320/1750 to 2500	320/1750 to 2500
Bore	Diameter in mm	81.0	81.0
Stroke	mm	95.5	95.5
Valves per cylinder		4	4
Compression ratio		16.5	16.5
Diesel fuel	in accordance with	ASTM D 975 Standard[1)]	ASTM D 975 Standard[1)]
Ignition sequence		1-3-4-2	1-3-4-2
Balance Shaft Assembly		yes	no

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Codes	CBEA	CJAA
NOx Reduction Catalytic Converter	yes	yes
Slip Catalyst	yes	yes
Exhaust Gas Recirculation (EGR)	yes	yes
Turbocharger, Supercharger	yes	yes
Charge Air Cooler	yes	yes
Particulate Filter	yes	yes

1) with a sulfur content less than 15 mg/kg of diesel fuel

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10 – Engine Assembly

1 Engine, Removing and Installing

⇒ "1.1 Engine, Removing", page 3

⇒ "1.2 Transmission and Engine, Disconnecting and Assembling", page 12

⇒ "1.3 Engine, Securing to Engine and Gearbox Bracket VAS6095A ", page 13

⇒ "1.4 General Installation Information", page 14

1.1 Engine, Removing

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

Special tools and workshop equipment required

- Lifting Tackle - 3033-
- Hose Clamps - Up To 25mm - 3094- (vehicles with manual transmission)
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Step Ladder - VAS5085-
- Shop Crane - VAS6100-
- Shop Crane - Drip Tray - VAS6208-
- Hose Clip Pliers - VAS6362-
- Transportation Lock - T10404-
- Engine Bung Set - VAS6122- (not illustrated)

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

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Note

- *Subframe mount. Refer to ⇒ "2 Subframe Mount, except Jetta from MY 2011", page 17 .*
- *Overview - Body Side Cooling System Components. Refer to ⇒ "1.1 Overview - Cooling System Components, Body Side", page 190 .*
- *Overview - Fuel Filter. Refer to ⇒ "6.2 Overview - Fuel Filter", page 249 .*
- *Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270 .*
- *Overview - Charge Air Cooler Components. Refer to ⇒ "4.2 Overview - Charge Air Cooler Components", page 290*
- *Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 360 .*
- *Overview - EGR Components. Refer to ⇒ "3.1 Overview - Exhaust Gas Recirculation System Components", page 398 .*
- *Hose connections are secured with either spring or hose clamps.*
- *Always replace clamp-type clips with spring-type clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*
- *The Battery - A- ground cable must be disconnected for the following procedure. For this reason check if a coded radio is installed. If necessary, obtain anti-theft code beforehand.*
- *All cable ties which are opened or cut open when removing engine, must be replaced in the same position when installing engine.*
- *The engine is removed forward together with the transmission.*

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

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Requirements

- Ignition switched off.
- Engine must be cold.

Procedure

– Check the DTC memory for all control modules before removal. Refer to Vehicle Diagnostic Tester “Vehicle Self-Diagnosis”.

– Remove the engine cover. Refer to
⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

– Remove the air filter housing. Refer to
⇒ “3.14 Overview - Air Filter”, page 335 .

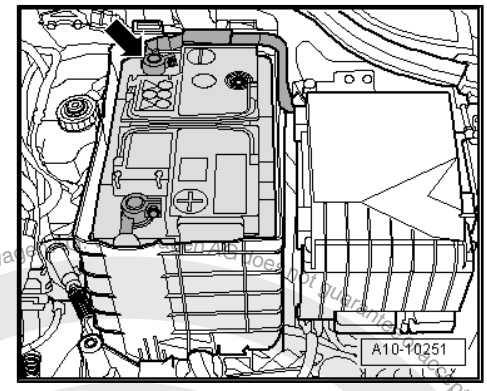
– Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the Hose Clip Pliers - VAS6362- .

Caution

Electronic components could be destroyed when the Battery - A- is disconnected:

- ***Complete the steps for disconnecting the Battery - A- .***

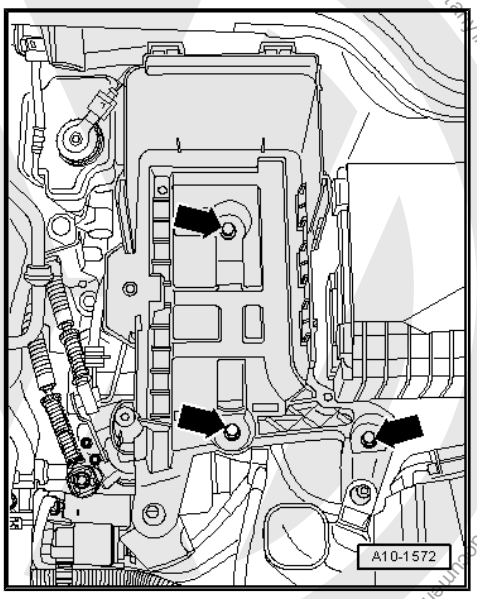
– When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .



– Remove the Battery - A- and the battery tray -arrows-.

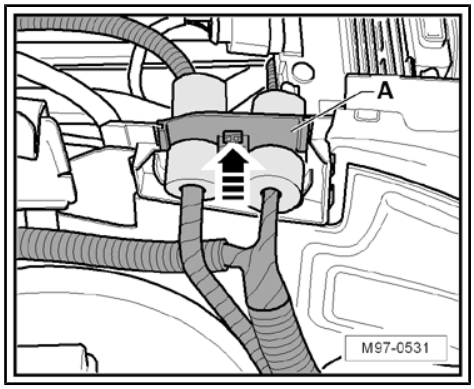
– Disconnect on the Engine Control Module - J623- :

- Refer to ⇒ “4 Engine Control Module”, page 343 .

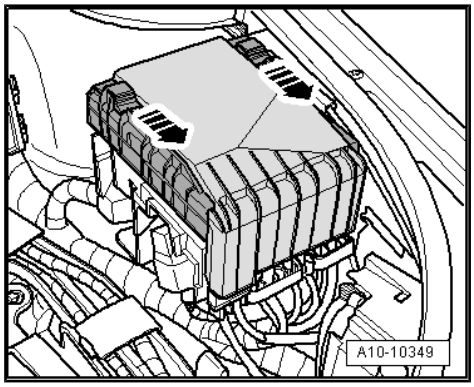


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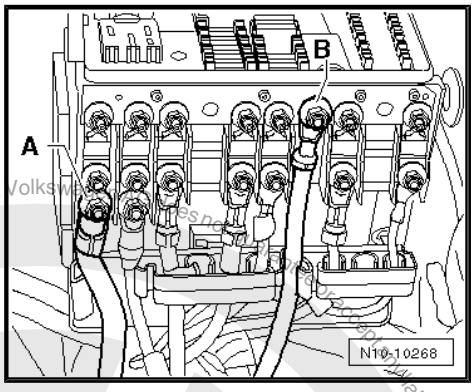
– Release the pass-through for the engine wiring harness -A- in direction of -arrow- and pull it off upward.



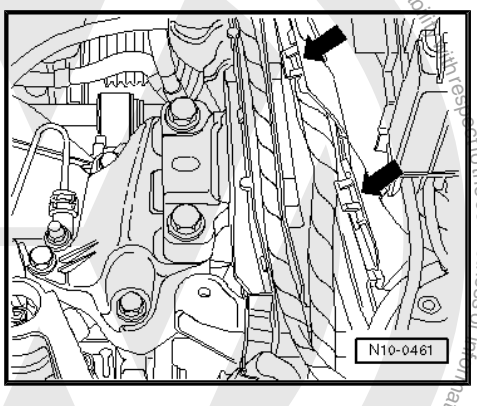
– Remove the E-box cover from the engine compartment by sliding both latches in the direction of -arrows-.



– Disconnect the wire from the Generator - C- -A- and the wire from the Battery - A- -B- at the fuse panel.

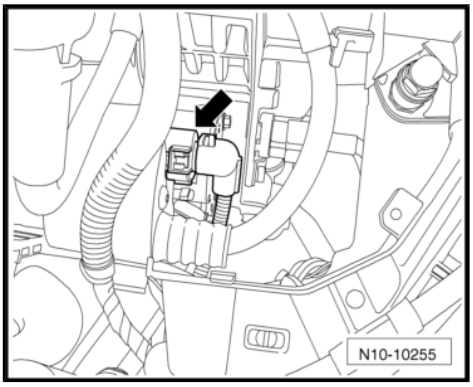


– Open all the cable guide locking mechanisms on the longitudinal member -arrows-.

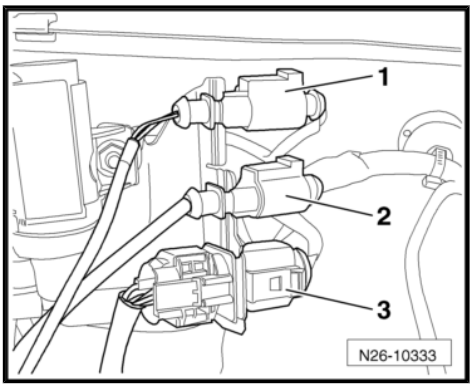


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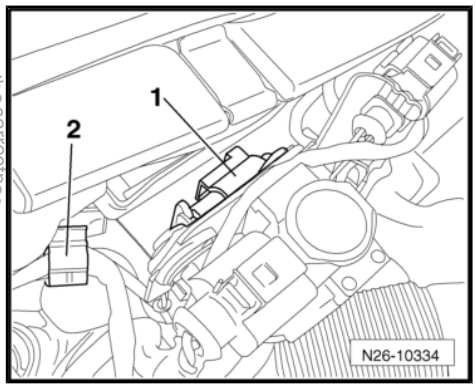
– Disconnect -arrow- from the Starter - B- .
– Remove the ground wire from the transmission holder.



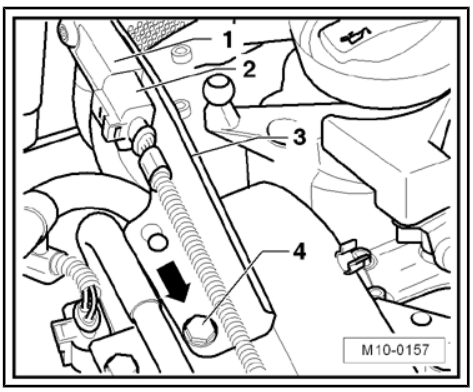
– Disconnect the connector for the Exhaust Gas Temperature Sensor 2 - G448- -1-, the »black« connector for Exhaust Gas Temperature Sensor 1 - G235- -2- as well as the connector for the Heated Oxygen Sensor - G39- -3- on the plenum chamber bulkhead.



– Disconnect the connector for the Exhaust Gas Temperature Sensor 3 - G495- -1- (attached behind the bracket).
– Disconnect the connector -2- from the Exhaust Pressure Sensor 2 - G451- -1-.

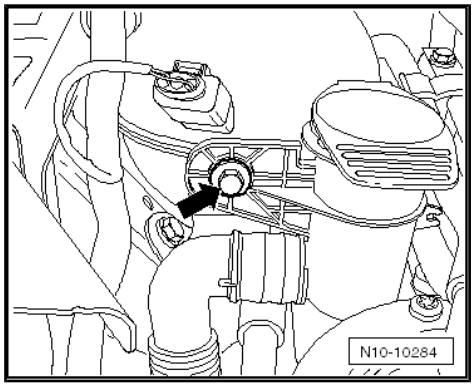


– Remove the bolt -4- and the bracket -3- with the Exhaust Pressure Sensor 2 - G451- -1- in the direction of -arrow- and set aside (control lines remain connected).
– Unbutton the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
– Disconnect the control wire from the Exhaust Pressure Sensor 1 - G450- . Loosen the spring clamp using the Hose Clip Pliers - VAS6362- .
– Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
– Rotate the Wastegate Bypass Regulator Valve - N75- out of the holder and set it on the engine.

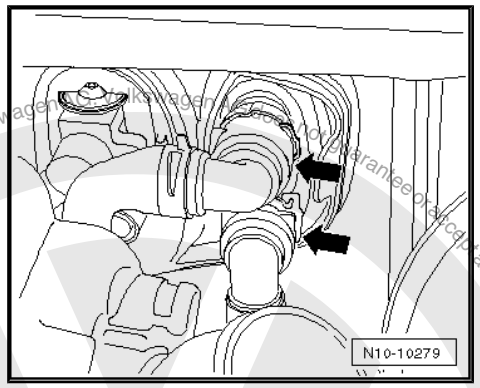


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– Remove the screw -arrow- and move the windshield washer fluid reservoir filler tube to the side.



– Remove the coolant reservoir and set it on the engine (coolant hoses stay connected).
– Remove the fuel filter. Refer to ⇒ “6.3 Fuel Filter, Removing and Installing”, page 251 .
– Remove the Auxiliary Fuel Pump - V393- . Refer to ⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259 .
– Disconnect the vacuum hose from the brake booster.
– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .
– Disconnect the coolant hoses between the engine and radiator. Refer to ⇒ “1.1 Overview - Cooling System Components, Body Side”, page 190 , Overview - Body Side Cooling System Components.



– Open the quick-release couplings for the heat exchanger -arrows- on the plenum chamber bulkhead.

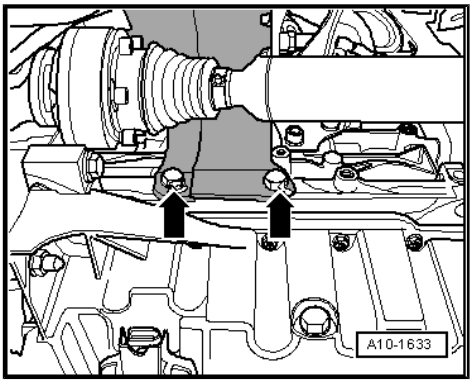
Note

Catch leaking coolant with the Drip Tray - VAS6208- .

– Disconnect the connecting hoses between the engine and the charge air cooler. Refer to ⇒ “4.2 Overview - Charge Air Cooler Components”, page 290 , Overview - Charge Air Cooler Components
– Extract the refrigerant from the A/C system. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .
– Remove the refrigerant lines on the A/C compressor and condenser and secure them on the body without tension. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .
– Remove the lock carrier. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Lock Carrier; Lock Carrier with Attachments, Removing and Installing .

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– Remove the right drive axle heat shield -arrows-.



– Dismount the drive axles only from the transmission. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Drive Axles, Removing and Installing .

Caution

The decoupling elements between the particulate filter and NOx reduction catalytic converter can be damaged. When removing and installing:

- *Do not bend the decoupling element more than 10°.*
- *Do not stretch the decoupling element.*
- *Do not damage the wire mesh on the decoupling element.*
- *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

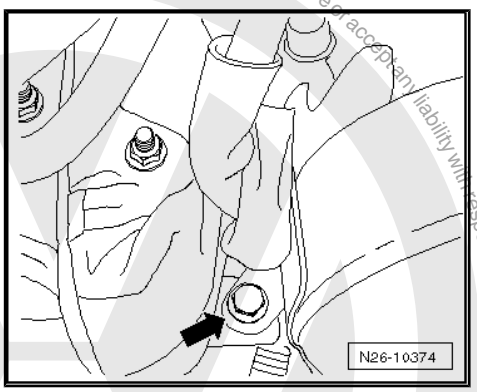
– Remove the lower bracket for the particulate filter.

– Remove the exhaust gas recirculation filter -item 9- ⇒ Item 9 (page 399) .

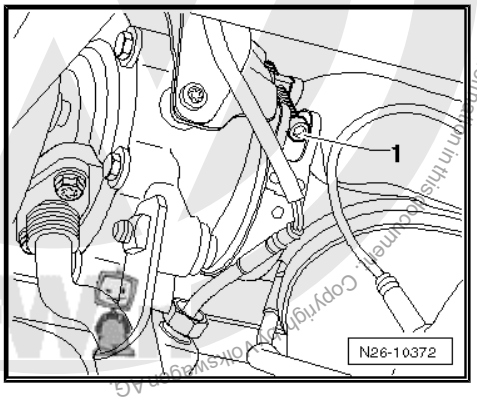
Note

Remove the nuts above the bracket with the Wrench - Sw13 - T10384- .

– Remove the screw -arrow- on the top bracket for the particulate filter. Loosen the bracket on the cylinder head.



– Loosen the clamp -1- between the particulate filter and the turbocharger.



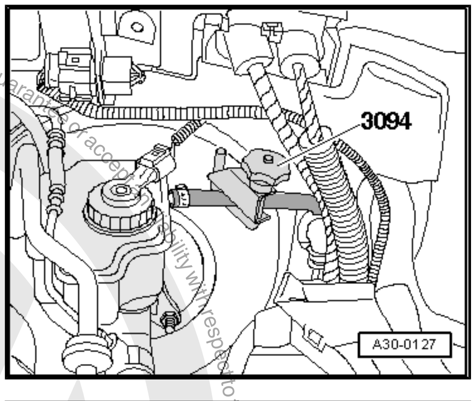
– Secure the particulate filter without tension on the body.

Vehicles with Manual Transmission:

– Remove the shift mechanism from the transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .

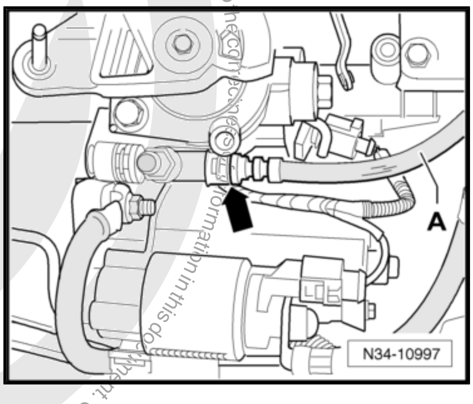
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– Clamp off the return hose to the master cylinder using the Hose Clamps - Up To 25mm - 3094- .



– Remove the clamp -arrow- for the hydraulic clutch hydraulic line -A- all the way.

– Pull the hydraulic line -A- out of the breather/slave cylinder and seal it off.



Caution

Do not operate clutch pedal any more.

Vehicles with DSG® Transmission:

– Disconnect the selector lever cable from the transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

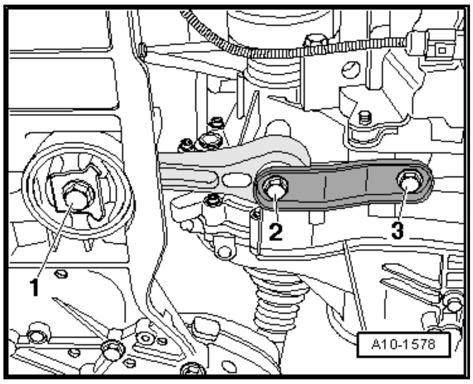
Continuation for All Vehicles:

– Remove/disconnect all wires necessary from engine/transmission and free them up.

Note

Verify that all hose and line/wire connections between the engine, transmission and body have been disconnected.

– Remove the bolts -1 to 3- and then remove the pendulum support.



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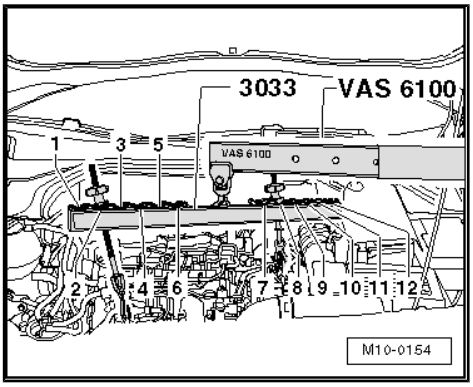
– Engage the Lifting Tackle - 3033- as follows and support the »Engine/transmission assembly« in its installation position using the Shop Crane - VAS6100- .

Vibration damper side:

- item 2

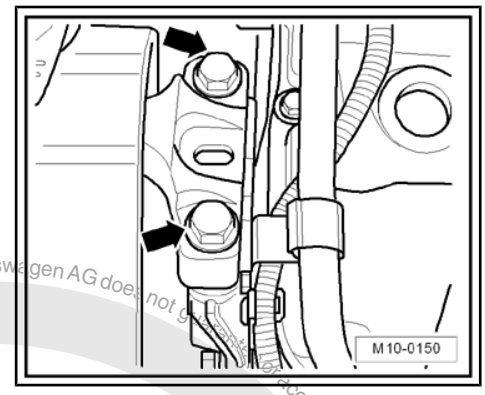
Flywheel side:

- item 8



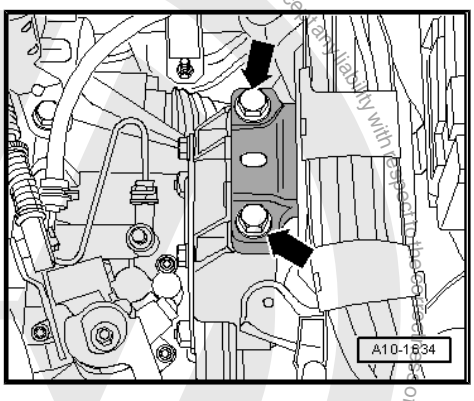
– Remove the subframe bolts -arrows- on the engine.

Vehicles with Manual Transmission:



– Remove the subframe bolts -arrows- on the transmission.

Vehicles with DSG® Transmission:

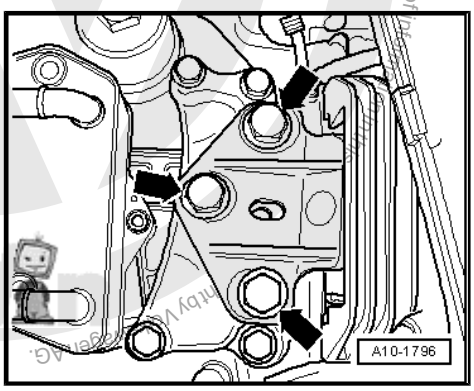


– Remove the subframe bolts -arrows- on the transmission.

Continuation for All Vehicles:

Note

When removing the »engine/transmission subassembly«, guide it out carefully to avoid damaging it.



– Lift the »engine/transmission assembly« slightly and remove it toward the front.

– Separate the transmission from the engine. Refer to ⇒ “1.2 Transmission and Engine, Disconnecting and Assembling”, page 12 .

Secure the engine on the Engine and Gearbox Bracket - VAS6095A- when performing repair work. Refer to ⇒ “1.3 Engine, Securing to Engine and Gearbox Bracket VAS6095A ”, page 13 .

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1.2 Transmission and Engine, Disconnecting and Assembling

Disconnecting:

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

Special tools and workshop equipment required

- Engine/Gearbox Support Shackle (2 pc.) - 10-222A/12-
- Shop Crane - VAS6100-

Conditions

- The »engine/transmission assembly« is removed.

Procedure

– Remove the starter. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Starter; Starter, Removing and Installing .

Engine with DSG® Transmission:

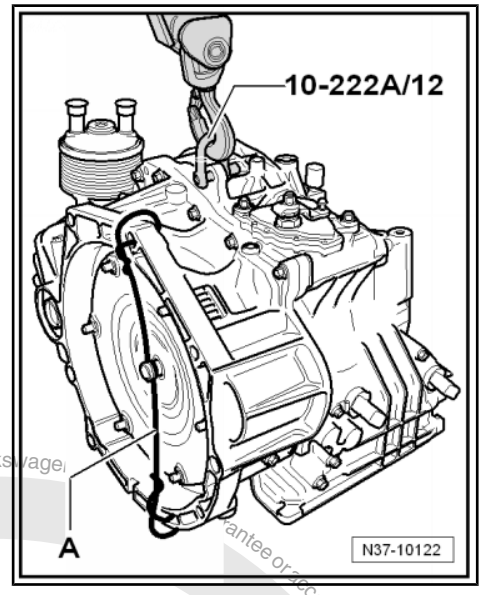
– Remove the coolant hoses from the transmission fluid cooler and seal off the openings.

Continuation for All Types of Transmissions:

– Loosen and free up all electric connections between the transmission and the engine.

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– Secure the transmission with Engine/Gearbox Support Shackle (2 pc.) - 10-222A/12- on the Shop Crane - VAS6100- but do not lift.
– Remove the upper engine/transmission connecting bolts.
– Before removing the last connecting bolts, support the transmission with the Shop Crane .
– Remove the lower engine/transmission connecting bolts.
– Separate the transmission from the engine; when doing this, guide the transmission.



Assembling:

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

Assembly is performed in reverse order of removal; at the same time pay attention to the tightening specifications:

- Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .
- Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

1.3 Engine, Securing to Engine and Gearbox Bracket - VAS6095A-

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

Special tools and workshop equipment required

- Lifting Tackle - 3033-
- Engine and Gearbox Bracket VAS6095A - VAS6095A-
- Shop Crane - VAS6100-

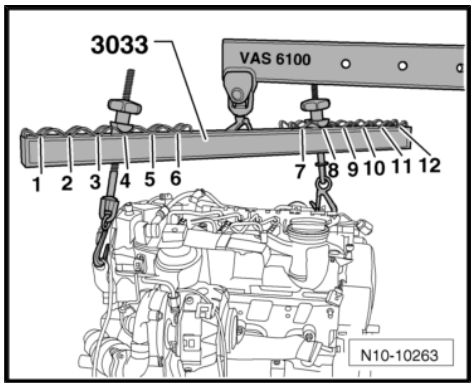
For performing assembly work, secure the engine using the Engine/Transmission Holder - Universal Mounting - VAS6095/1- to the Engine and Gearbox Bracket - VAS6095A- .

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Conditions

- Transmission must be disconnected from the engine.

Procedure



– Engage the Lifting Tackle - 3033- as follows and lift up with the Shop Crane - VAS6100- .

Flywheel side:

- item 4

Vibration damper side:

- item 8

– Fasten the engine to the Engine/Transmission Holder - Universal Mounting - VAS6095/1- using the Engine and Gearbox Bracket - VAS6095A- .

1.4 General Installation Information

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

Install in reverse order of removal. Note the following:

Servicing the Clutch:

- Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 30 .
- Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 30 .

– Check that the alignment bushings for centering the engine/transmission are installed inside the cylinder block. Install them if necessary.

– Make sure there is enough clearance to the subframe and radiator when installing the »engine/transmission assembly«.

– Adjust the subframe mount. Refer to ⇒ “2.3 Subframe Mount, Adjusting”, page 19 .

Note

- *Subframe mount tightening specifications. Refer to ⇒ “2.1 Overview - Subframe Mount”, page 17 , Overview - Subframe Mount.*
- *Electrical connections and routing. Refer to ⇒ Electrical Equipment; Rep. Gr. 97 .*

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Vehicles with Manual Transmission:

– Install the hydraulic clutch hydraulic line. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 30 .

– Install the transmission shift mechanism and adjust it if necessary. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with DSG® Transmission:

– Install the transmission selector lever cable and adjust it if necessary. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

Continuation for All Vehicles:

The Additional Numbered Procedures Must Be Followed to Ensure the Particulate Filter with the NOx Reduction Catalytic Converter Is Installed without Tension:

Note

- *Make sure the particulate filter is not installed under tension after assembly.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*

Caution

The decoupling elements between the particulate filter and NOx reduction catalytic converter can be damaged. When removing and installing:

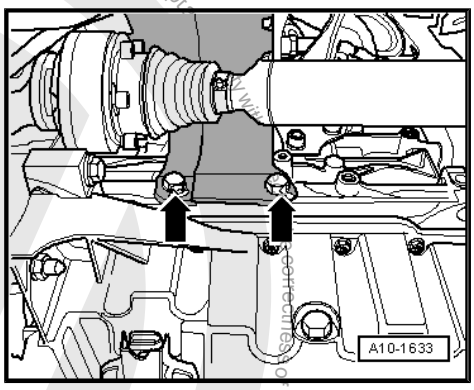
- ***Do not bend the decoupling element more than 10°.***
- ***Do not stretch the decoupling element.***
- ***Do not damage the wire mesh on the decoupling element.***
- ***Use the Transportation Lock -T10404- to secure the decoupling element from overbending.***

– Install the particulate filter with NOx reduction catalytic converter and the EGR filter. Refer to ⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 369 .

– Attach the drive axles to the transmission. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Drive Axles, Removing and Installing .

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– Install the right drive axle heat shield -arrows-.



Vehicles with Manual Transmission:

- Tightening specification. Refer to ⇒ 6-speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with DSG® transmission:

- Tightening specification. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

– Install the lock carrier. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Lock Carrier; Lock Carrier with Attachments, Removing and Installing

– Secure the refrigerant lines on the A/C compressor and condenser without tension. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .

– Fill the A/C system. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .

– Install the Battery - A- and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .

– Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

– Fill with coolant. Refer to
⇒ “1.9 Coolant, Draining and Filling”, page 209 .

– Fill the fuel system. Refer to
⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

– Check the DTC memories of all control modules and erase all DTC entries which may have occurred during the assembly. Refer to Vehicle Diagnostic Tester “Vehicle Self-Diagnosis”.

– Check the headlamp adjustment and adjust if necessary. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions .

Tightening Specifications

Threaded Connection		Tightening Specification
Bolts and Nuts	M6	10 Nm
	M7	15 Nm
	M8	20 Nm
	M10	40 Nm
	M12	65 Nm. Refer to 1).

1) Tightening specification for the M12 collar bolt: 75 Nm

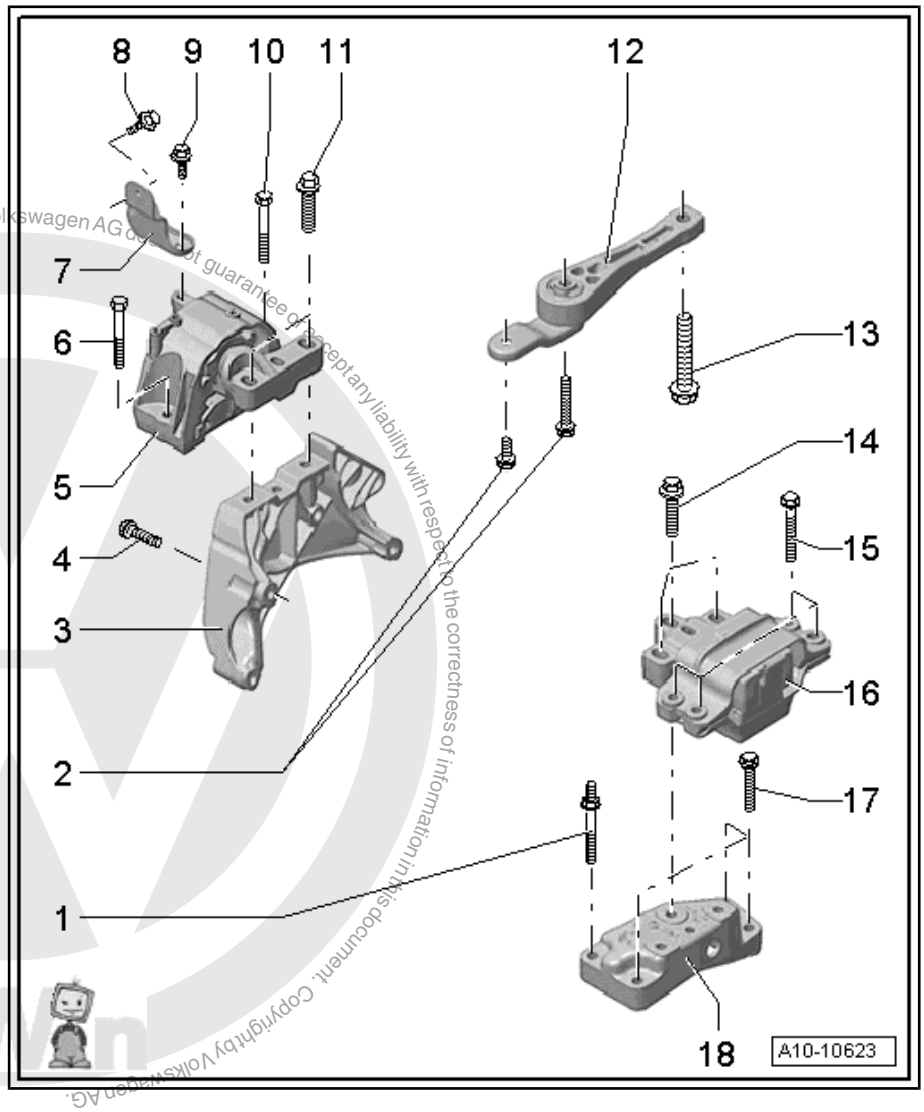
2 Subframe Mount, except Jetta from MY 2011

⇒ "2.1 Overview - Subframe Mount", page 17

⇒ "2.2 Engine-Subframe Mount Adjustment, Checking", page 19

⇒ "2.3 Subframe Mount, Adjusting", page 19

2.1 Overview - Subframe Mount



1 - Bolt

- ❑ For the transmission holder to the transmission

Tightening specification:

- ❑ Vehicles with a manual transmission. Refer to ⇒ Rep. Gr. 34 .
- ❑ Vehicles with DSG® transmission. Refer to ⇒ Rep. Gr. 34 .

2 - Bolts

- ❑ 50 Nm + 1/4 (90°) additional turn
- ❑ Replace
- ❑ For pendulum support to transmission

3 - Engine Bracket

- ❑ Removing and installing. Refer to ⇒ "1.7 Engine Bracket, Removing and Installing", page 52 .

4 - Bolt

- ❑ 40 Nm + 1/2 (180 °) additional turn
- ❑ Replace
- ❑ For engine bracket to cylinder block
- ❑ Note the tightening sequence. Refer to ⇒ Fig. ""Engine Bracket to Cylinder Block Tightening Sequence"" , page 19 .

5 - Engine Mount

6 - Bolt

- ❑ 40 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ For engine mount to body

7 - Bracket

8 - Bolt

- ❑ 20 Nm + 1/4 (90 °) additional turn

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- ❑ Replace
- ❑ For bracket to engine mount

9 - Bolt

- ❑ 20 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ For bracket to body

10 - Bolt

- ❑ 40 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ For engine mount to body

11 - Bolts

- ❑ 60 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ For engine mount to engine bracket

12 - Pendulum Support

13 - Bolt

- ❑ 100 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ For pendulum support to subframe

14 - Bolt

- ❑ 60 Nm + 90° (1/4 turn) additional turn
- ❑ Replace
- ❑ For transmission mount to transmission holder

15 - Bolt

- ❑ 40 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ Transmission mount to body

16 - Transmission Mount

- ❑ The illustration shows the DSG® transmission version

17 - Bolt

- ❑ For the transmission holder to the transmission

Tightening specification:

- ❑ Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 .
- ❑ Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

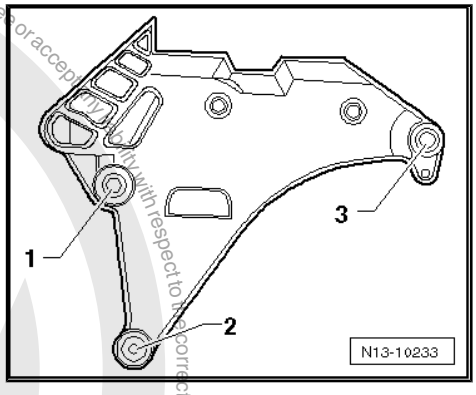
18 - Transmission Holder

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Engine Bracket to Cylinder Block Tightening Sequence

Caution

Always use the correct tightening sequence and specifications for the engine bracket bolts. Otherwise tension could develop in the engine bracket and break it.



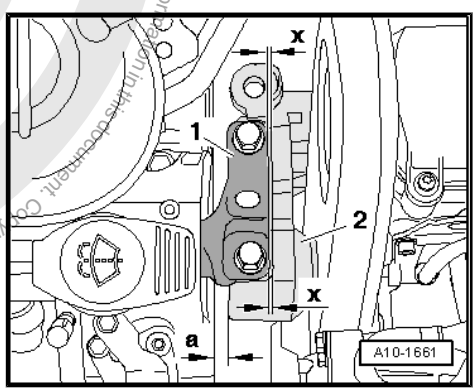
– First tighten the bolts hand-tight in sequence -1 to 3-.

– Then tighten the bolts in that sequence to the tightening specification -item 4- ⇒ Item 4 (page 17) .

2.2 Engine-Subframe Mount Adjustment, Checking

- There must be a distance -a- of at least 10 mm between the engine bracket and right longitudinal member.
- The casting edge on the engine bracket -2- must be parallel to the support arm -1-.

– If the conditions are not met, then adjust the subframe mount. Refer to ⇒ “2.3 Subframe Mount, Adjusting”, page 19 .



2.3 Subframe Mount, Adjusting

Special tools and workshop equipment required

- Engine Support Bridge - 10-222A-
- Engine Support Bridge - Engine Support 3 - 10-222A/3-
- Engine Support Bridge - Gearbox Adapter - 10-222A/13-
- Engine Support Bridge - Engine Support 18 - 10-222A/18-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-

Procedure

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

– Remove the air filter housing. Refer to
⇒ “3.14 Overview - Air Filter”, page 335 .

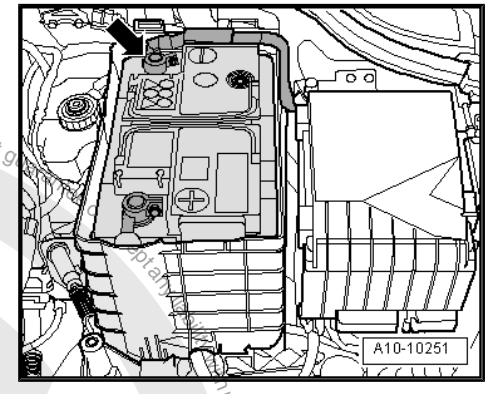
– Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the Hose Clip Pliers - VAS6362- .

Caution

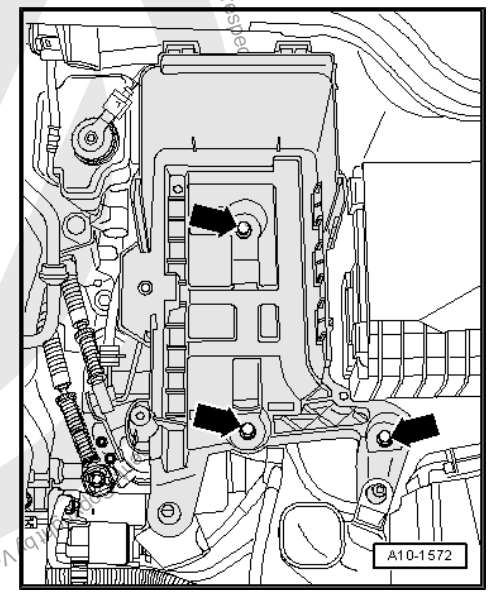
Electronic components could be destroyed when the Battery - A- is disconnected:

- ***Complete the steps for disconnecting the Battery - A- .***

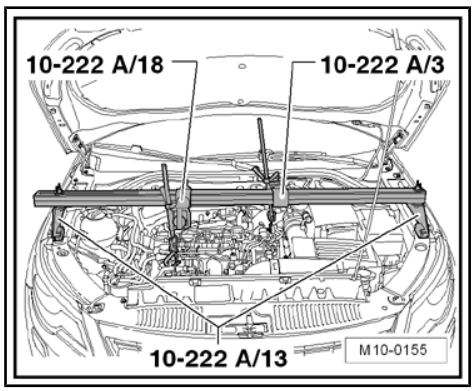
– When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .



– Remove the Battery - A- and the battery tray -arrows-.

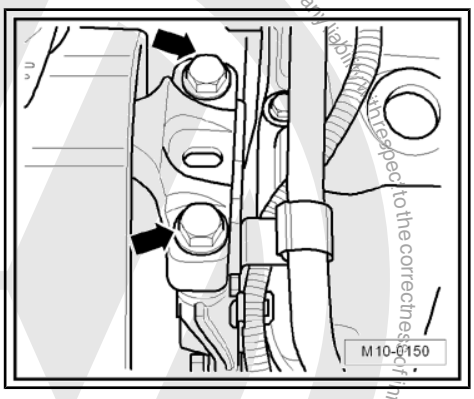


– Remove the Auxiliary Fuel Pump - V393- (fuel lines stay connected). Refer to
⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259 .



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– Position the Engine Support Bridge - 10-222A- using the required Adapters as shown and support the engine in the installation position.



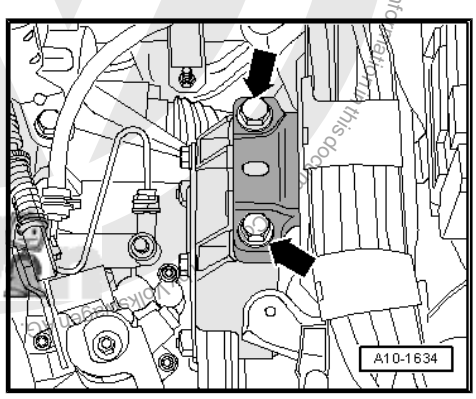
Note

The subframe mount bolts may only be loosened when the engine is supported with the Engine Support Bridge - 10-222A- .

– Replace the engine mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.

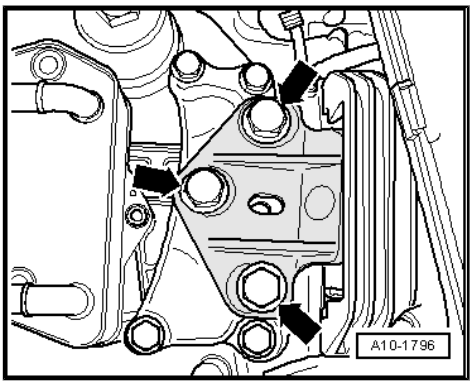
Vehicles with Manual Transmission:

– Replace the transmission mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.



Vehicles with DSG® Transmission:

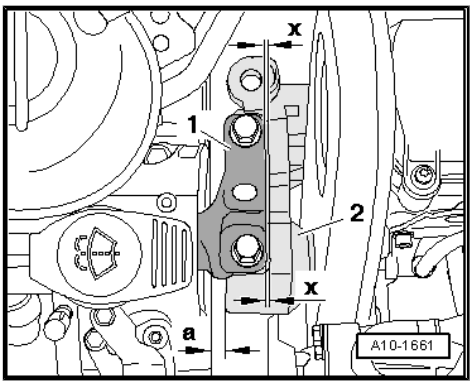
– Replace the transmission mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.



Continuation for All Vehicles:

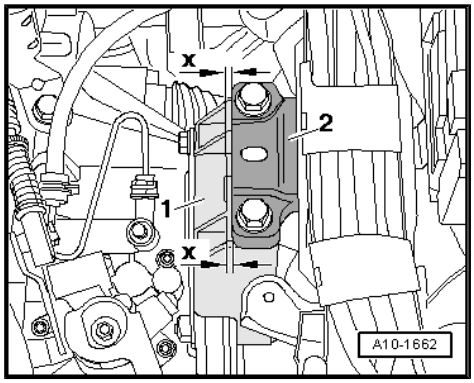
– Loosen left and right support arm bolts approximately two turns.

- There must be a distance -a- of at least 10 mm between the engine bracket and right longitudinal member.
- The casting edge on the engine bracket -2- must be parallel to the support arm -1-.



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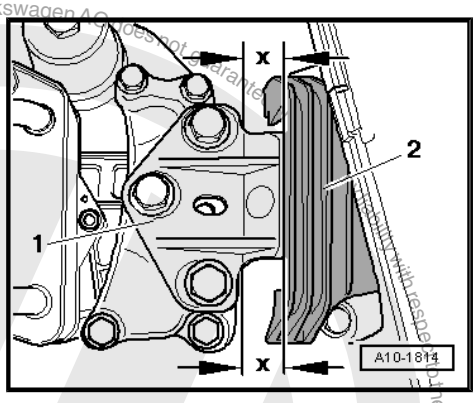
Vehicles with Manual Transmission:



– Make sure that the edges on the support arm -1- and transmission mount -2- are parallel on the transmission side.

• Dimension -x- is the same size on both sides of the mount.

Vehicles with DSG® Transmission:



– Make sure that the edges on the support arm -1- and transmission mount -2- are parallel on the transmission side.

• Dimension -x- is the same size on both sides of the mount.

Continuation for All Vehicles:

– Tighten the subframe mount bolts.

• Tightening specifications. Refer to ⇒ “2.1 Overview - Subframe Mount”, page 17 , Overview - Subframe Mount.

Further installation is the reverse order of removal. Note the following:

• Check the fuel lines for secure fit.

• Do not interchange supply and return lines (return line is blue or has blue marking, supply line is black).

– Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

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3 Assembly Mounts, Jetta from 2011

⇒ “3.1 Overview - Subframe Mount”, page 23

⇒ “3.2 Engine Mount, Removing and Installing”, page 24

⇒ “3.3 Transmission Mount, Removing and Installing”, page 28

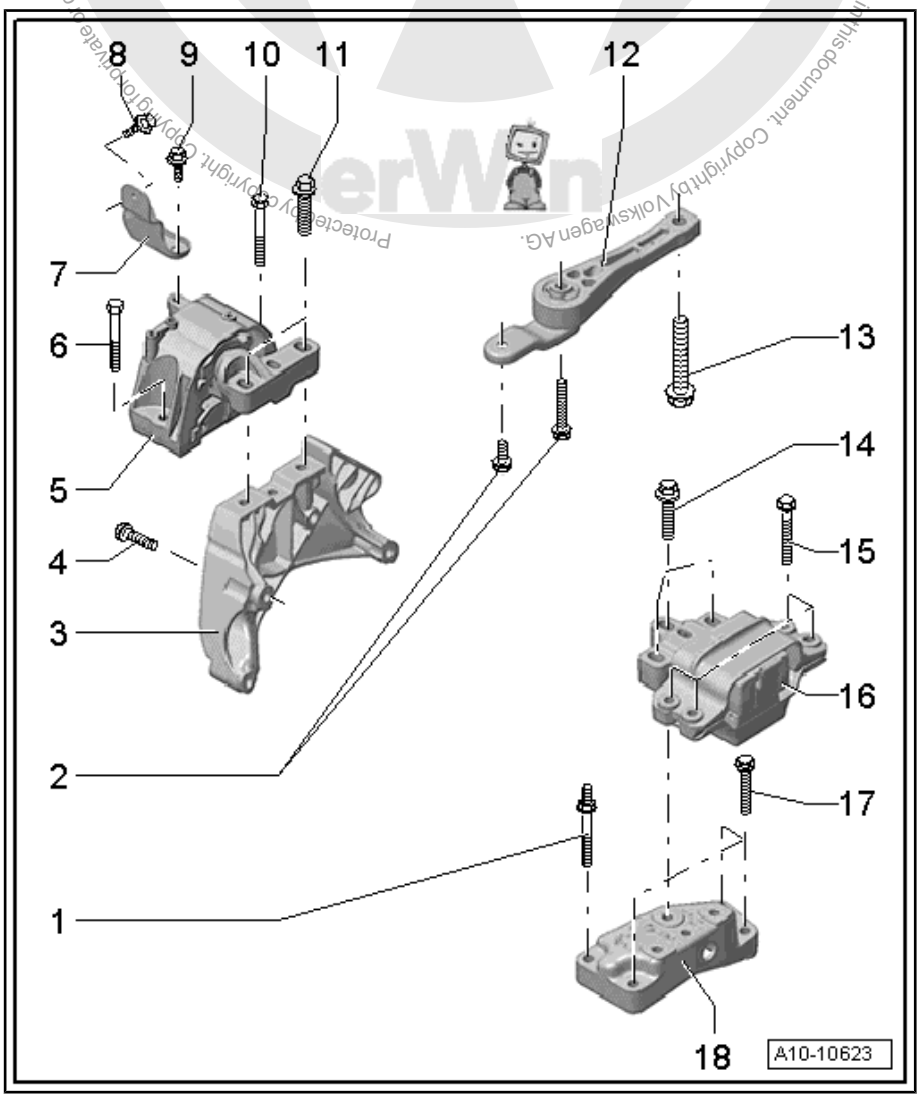
⇒ “3.4 Pendulum Support, Removing and Installing”, page 30

⇒ “3.5 Engine, Supporting in Installation Position”, page 31

⇒ “3.6 Subframe Mount, Adjusting”, page 35

⇒ “3.7 Subframe Mount, Checking Adjustment”, page 36

3.1 Overview - Subframe Mount



1 - Bolt

- ❑ Transmission support to transmission
- ❑ Tightening specification. Refer to ⇒ Rep. Gr. 34 ; Subframe Mount; Overview - Subframe Mount .

2 - Bolts

- ❑ 50 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Pendulum support to transmission

3 - Engine Support

4 - Bolt

- ❑ 40 Nm +180° (1/2 turn) additional turn
- ❑ Replace after removing
- ❑ Engine support to engine

5 - Engine Mount

- ❑ Removing and installing. Refer to ⇒ “3.2 Engine Mount, Removing and Installing”, page 24 .

6 - Bolt

- ❑ 40 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Engine mount to body

7 - Bracket

8 - Bolt

- ❑ 20 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Bracket to engine mount

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9 - Bolt

- ❑ 20 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Bracket to body

10 - Bolt

- ❑ 40 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Engine mount to body

11 - Bolts

- ❑ 60 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Engine mount to engine support

12 - Pendulum Support

- ❑ First install the pendulum support to the transmission and then to the subframe

13 - Bolt

- ❑ 100 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Pendulum support to subframe

14 - Bolt

- ❑ 60 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Transmission mount to transmission support

15 - Bolt

- ❑ 40 Nm + 90° (1/4 turn) additional turn
- ❑ Replace after removing
- ❑ Transmission mount to body

16 - Transmission Mount

- ❑ The illustration shows the DSG® transmission version

17 - Bolt

- ❑ Transmission support to transmission
- ❑ Tightening specification. Refer to ⇒ Rep. Gr. 34 ; Subframe Mount; Overview - Subframe Mount .

18 - Transmission Support

3.2 Engine Mount, Removing and Installing

Special tools and workshop equipment required

- ♦ Torque Wrench 1331 5-50Nm - VAG1331-

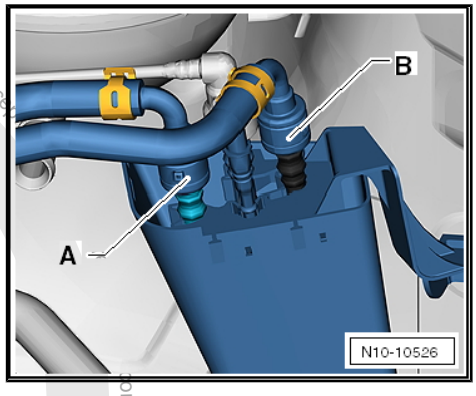
Removing

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

– Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

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– Open the connector couplings -A and B- and remove the fuel lines. Open the connector couplings. Refer to ⇒ Rep. Gr. 20 ; Connector Couplings; Connector Couplings, Separating .



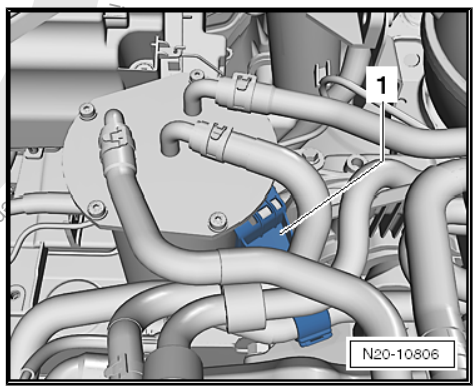
WARNING

Very hot fuel can cause burns.

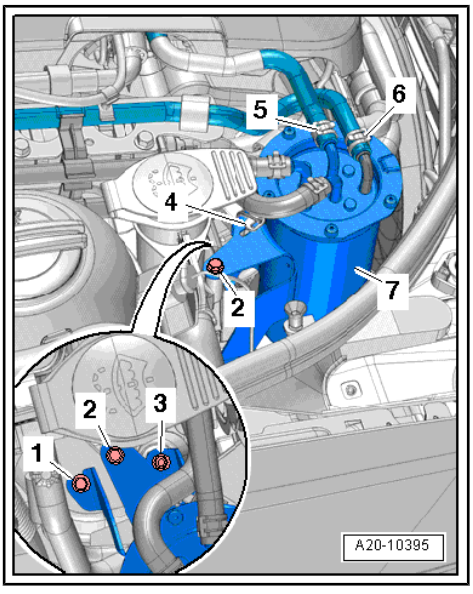
- *In extreme cases, the temperature of the fuel lines and fuel can reach up to 100 °C (212 °F) after stopping the engine. Let the fuel cool down before opening any line connections, otherwise there is a danger of scalding.*
- *Wear safety gloves.*
- *Wear protective eyewear.*

– Unclip the coolant hose bracket -1-.

– Free up the fuel lines.



– Remove the fuel filter -7- from the mountings -1 through 3- and lay it on the engine.



Note

Refer to ⇒ Fuel Supply - Diesel Engines; Rep. Gr. 20 ; Fuel Filter .

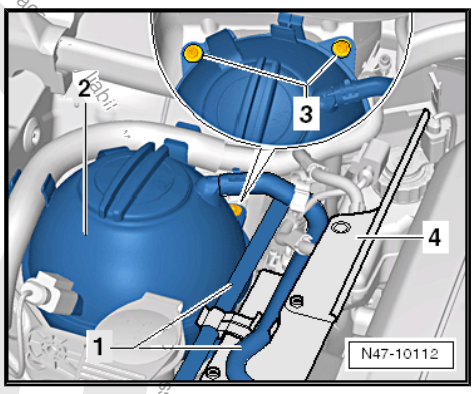
– Disconnect and disconnect for the coolant expansion tank -2-.

– Remove the bolts -3- and the coolant expansion tank -2-.

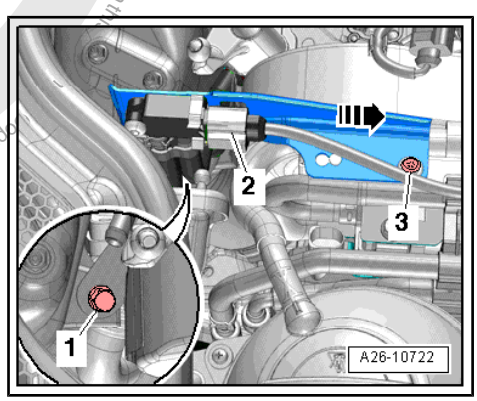
– Unclip and free up the wire -1-.

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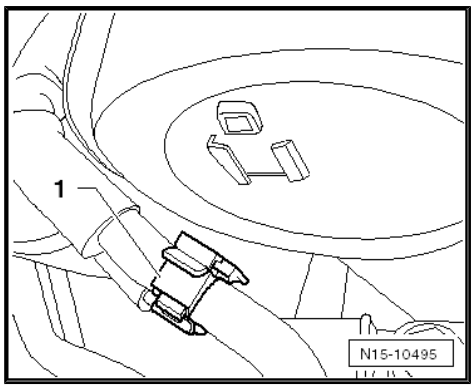
– Lay the coolant reservoir -2- on the engine.
– Disconnect the connector -2-.
– Remove the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
– Remove the control line from the Exhaust Pressure Sensor 1 - G450- .
– Loosen the spring clamp using the Hose Clip Pliers - VAS6362- .
– Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
– Remove the bolt -3- and then remove the Exhaust Pressure Sensor 2 - G451- from the bracket in direction of -arrow-.



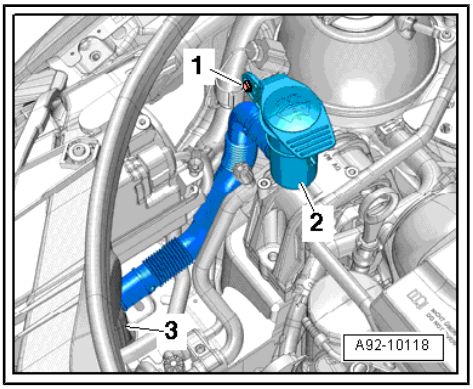
– Remove the bolt -1- at the top of the particulate filter bracket.
– Lay the Exhaust Pressure Sensor 2 - G451- with the bracket on the particulate filter.



– Seal the open lines and connections with clean plugs from the Engine Bung Set - VAS6122- .
– Lay the Exhaust Pressure Sensor 2 - G451- with the bracket on the particulate filter.



– Remove the bolt -1-.
– Push the filler tube and windshield wiper fluid reservoir filler tube -2- to the side.



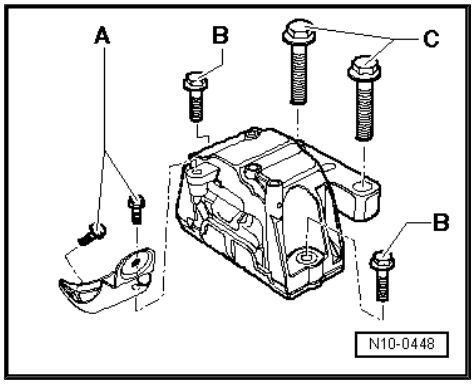
Note

Ignore -3-.

– Support the engine in the installation position. Refer to ⇒ “3.5 Engine, Supporting in Installation Position”, page 31 .
– Tension the engine slightly via the spindles do not lift it.
– Remove the bolts -A- and the bracket.
– Remove the bolts -B and C-.

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– Remove the engine mount upward.



Installing

Install in reverse order of removal. Note the following:

Caution

Risk of damaging threads in transmission support by inserting bolts at an angle.

- ***The transmission support and the transmission mount support arm must be absolutely parallel to each other before installing the bolts. Push the rear of the transmission upward using a floor jack if necessary.***

Caution

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines in their original locations.***
- ***To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.***

– Adjust the subframe mount. Refer to ⇒ “3.6 Subframe Mount, Adjusting”, page 35 .

Tightening Specifications

- Refer to ⇒ “3.6 Subframe Mount, Adjusting”, page 35
- Refer to ⇒ “3.1 Overview - Subframe Mount”, page 23
- Refer to ⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 369
- Refer to ⇒ “4.2 Overview - Charge Air Cooler Components”, page 290
- Fuel filter. Refer to ⇒ Fuel Supply - Diesel Engines; Rep. Gr. 20 ; Fuel Filter .
- Battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

3.3 Transmission Mount, Removing and Installing

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-

Removing

– Remove the engine cover. Refer to ⇒ “1.1 Engine, Removing”, page 3 .

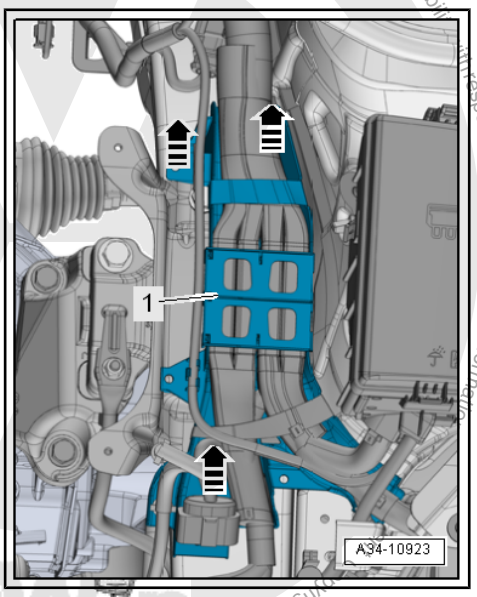
– Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

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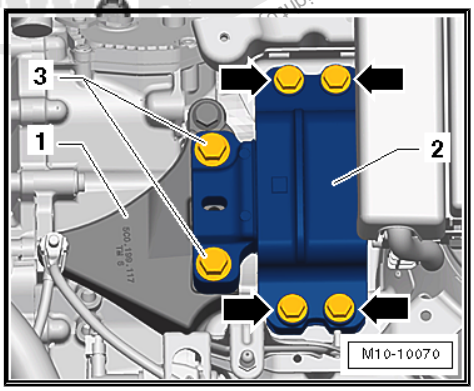
– Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
– Remove the air filter housing with the Mass Airflow Sensor - G70- and connecting pipe. Refer to ⇒ “3.15 Air Filter Housing, Removing and Installing”, page 338 .
– Support the engine mount in the installed position. Refer to ⇒ “3.5 Engine, Supporting in Installation Position”, page 31 .
– Free up the wires at the cable guide.
– Unclip the wiring guide -1- upward in direction of -arrows- and move it slightly to the side.
– Pretension the engine/transmission sub-assembly using the spindles, but do not lift it.

Note

Ignore -1 and 3-.

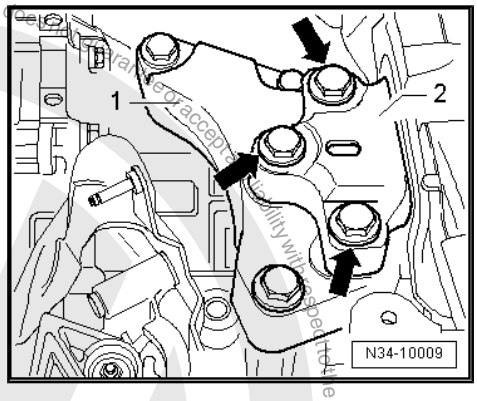


– Remove the bolts -arrows-.
– Remove the bolts -arrows-.



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– Remove the engine mount -2-.



Installing

Install in reverse order of removal and note the following:

Note

Replace the bolts that were tightened with an additional turn.

Caution

Risk of damaging threads in transmission support by inserting bolts at an angle.

- ***The transmission support and the transmission mount support arm must be absolutely parallel to each other before installing the bolts. Push the rear of the transmission upward using a floor jack if necessary.***

Caution

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines in their original locations.***
- ***To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.***

– Adjust the subframe mount. Refer to ⇒ “3.6 Subframe Mount, Adjusting”, page 35 .

Tightening Specifications

- Refer to ⇒ “3.1 Overview - Subframe Mount”, page 23
- Refer to ⇒ “4.2 Overview - Charge Air Cooler Components”, page 290
- Battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .
- Plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

3.4 Pendulum Support, Removing and Installing

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-

Removing

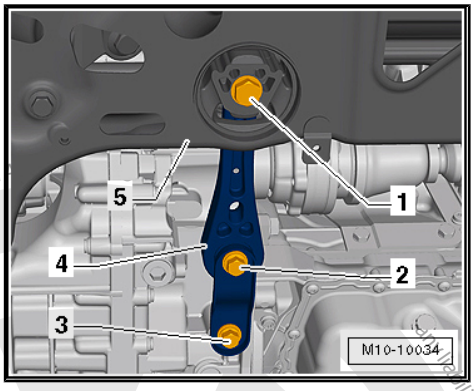
– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

– Remove the bolt -1-.

– Remove the bolts -2 and 3-.

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– Remove the pendulum support.



Installing

Install in reverse order of removal. Note the following.

– Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

Tightening Specifications

♦ Refer to ⇒ “3.1 Overview - Subframe Mount”, page 23

3.5 Engine, Supporting in Installation Position

Special tools and workshop equipment required

♦ Engine Support Bridge - 10-222A-
♦ Engine Support Bridge - Spindle - 10-222A/11-
♦ Engine/Gearbox Support Shackle (2 pc.) - 10-222A/12-
♦ Engine Support - Automatic Transmission Hook - 10-222A/7-
♦ Engine Support Bridge - Engine Support 28 - 10-222A/28-
♦ Engine Support Bridge - Engine Support 31 - 10-222A/31-
♦ Rail with Holes - T40091/2- from the Engine Support - Basic Set - T40091-
♦ Mount - T40093/5- from the Engine Support - Supplement Kit - T40093A-
♦ Engine Support Bridge - Engine Support 28-2 - 10-222A/28-2- , quantity: 2
♦ Engine Support - Basic Set - Square Pipe - T40091/1- (quantity: 2) from the Engine Support - Basic Set - T40091-
♦ Engine Support - Basic Set - Movable Joint - T40091/3- (quantity: 2) from the Engine Support - Basic Set - T40091-
♦ Engine Support - Movable Joint - T40093/4- (quantity: 2) from the Engine Support - Supplement Kit - T40093A-
♦ Torque Wrench 1331 5-50Nm - VAG1331-

Procedure

Caution

For all repair work, especially in the engine compartment due to the tight working conditions, observe the following:

- ***Route all lines in their original locations.***
- ***To prevent damage to the lines, make sure there is sufficient clearance to all moving or hot components.***

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Caution

Risk of damaging the decoupling element:

- *Do not bend the decoupling element more than 10°.*
- *Do not stretch the decoupling element.*
- *Do not damage the wire mesh on the decoupling element.*

– Remove the engine cover. Refer to ⇒ “1.1 Engine, Removing”, page 3 .

– Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

– Remove the air filter housing. Refer to ⇒ “3.15 Air Filter Housing, Removing and Installing”, page 338 .

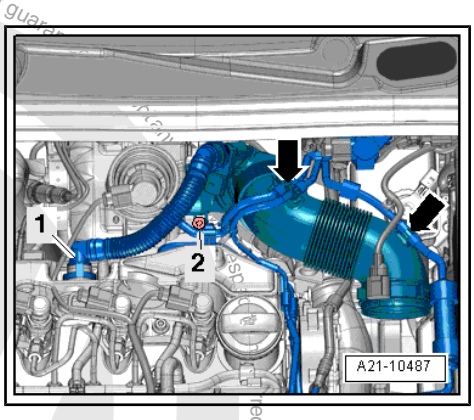
– Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .

– Press the release buttons and remove the crankshaft housing ventilation hose -1- from the cylinder head cover.

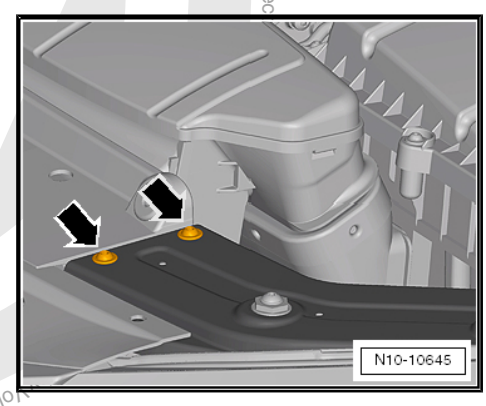
– Disconnect the connector from the crankcase ventilation hose -1-.

– Free up the vacuum hoses -arrows- on the air guide pipe.

– Remove the bolt -2- and tilt the air guide pipe with the intake hose backward and remove from the turbocharger.

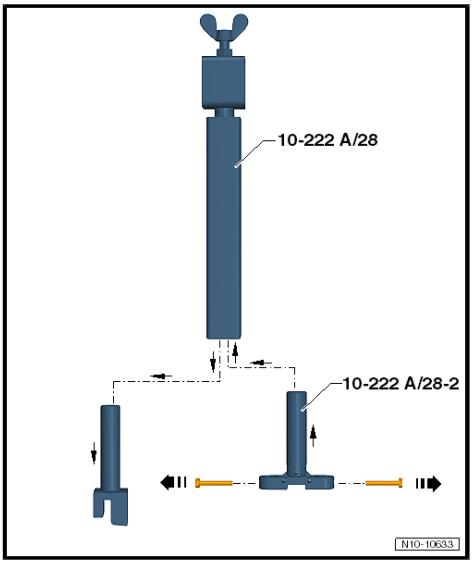


– Remove the bolts -arrows- for the left and right sides of the lock carrier retaining bracket.



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– Remove the lower mounts from the Engine Support Bridge - Engine Support 28 - 10-222A/28- .
– Attach the Engine Support Bridge - Engine Support 28-2 - 10-222A/28-2- .
– Remove the bolts in direction of -arrows- for securing the engine support bridge on the lock carrier from the Engine Support 28-2 - 10-222A/28-2- .

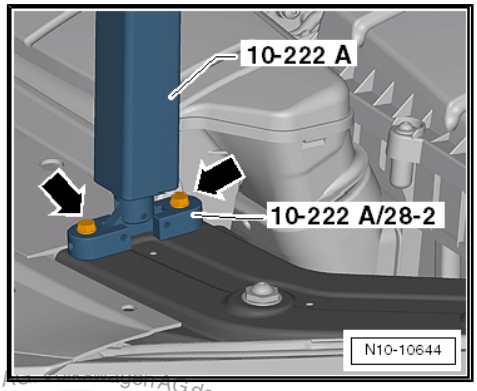


Note

Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2- for attaching the Engine Support Bridge - Engine Support 28 - 10-222A/28- . Do not use the bolts for the retaining bracket.

– Install the Engine Support Bridge - Engine Support 28 - 10-222A/28- and tighten the bolts -arrows-.

• Bolt tightening specification -arrows- 8 Nm



Caution

A second technician is needed to mount the Engine Support Bridge on the vehicle to prevent the Engine Support Bridge from tipping.

Assemble engine support bridge as shown.

Engine Support Bridge - Engine Support Socket - 10-222A/31A-1- on the suspension strut tower.

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1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 - 10-222A/31-2-

2 - Engine Support - Basic Set - Moveable Joint - T40091/3-

3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 - 10-222A/31-1-

4 - Engine Support - Basic Set - Rail with Holes - T40091/2-

5 - Engine Support - Supplement Kit - Movable Joint - T40093/4-

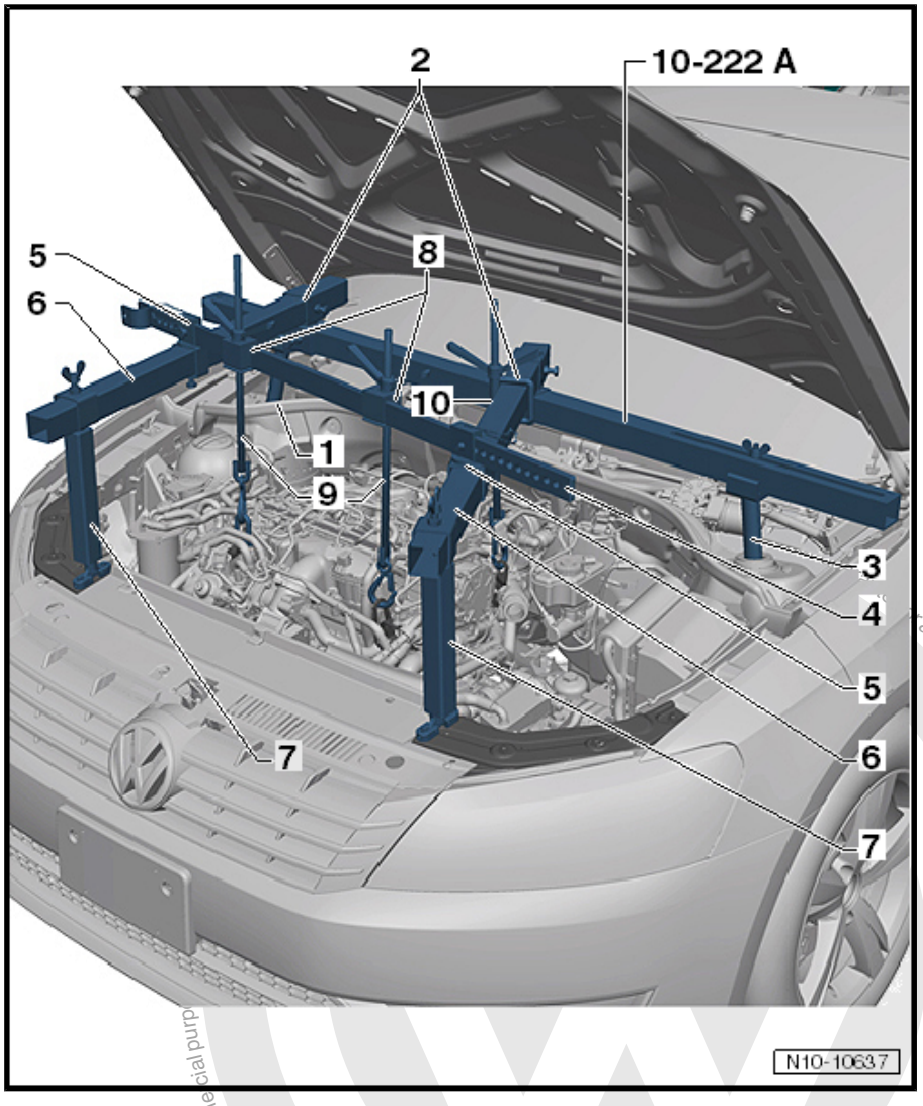
6 - Engine Support - Basic Set - Square Pipe - T40091/1-

7 - Engine Support Bridge - Engine Support 28 - 10-222A/28- with Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-

8 - Engine Support - Supplement Kit - Mount - T40093/5-

9 - Engine Support Bridge - Spindle - 10-222A/11-

10 - Engine Support - Bracket w/Spindle and Hook - 10-222A/10-



– Tighten all bolted connections on the Engine Support Bridge hand-tight. While doing so, adjust the height of the Engine Support Bridge parallel over the Engine Support Bridge - Engine Support 28 - 10-222A/28- .

– Lightly pretension the engine/transmission assembly using the spindles, but do not lift it.

Remove the Engine Support Bridge.

The removal of the engine support bridge is the reverse of installation noting the following.

– Check the adjustment of the subframe mount, in case they were loosened. Refer to ⇒ “2.2 Engine-Subframe Mount Adjustment, Checking”, page 19 .

– Install the engine cover. Refer to ⇒ “1.1 Engine, Removing”, page 3 .

– Install the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

Tightening Specification

♦ Refer to ⇒ “3.1 Overview - Subframe Mount”, page 23

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- Refer to
  ⇒ “4.2 Overview - Charge Air Cooler Components”, page 290
- Battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .

3.6 Subframe Mount, Adjusting

Procedure

WARNING

For all repair work, especially in the engine compartment due to the tight working conditions, observe the following:

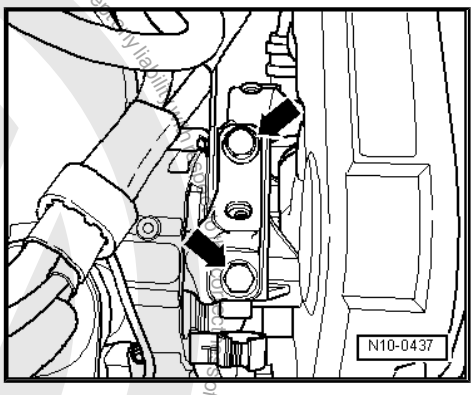
- *Route all wires and lines so that the original path is followed.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

– Support the engine in the installation position. Refer to ⇒ “3.5 Engine, Supporting in Installation Position”, page 31 .

Note

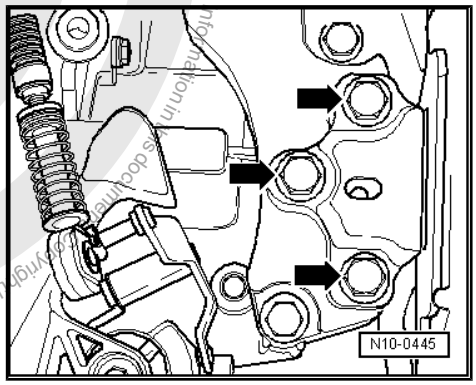
The subframe mount bolts may only be loosened when the engine is supported with the Engine Support Bridge - 10-222A- .

– Replace the engine mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.



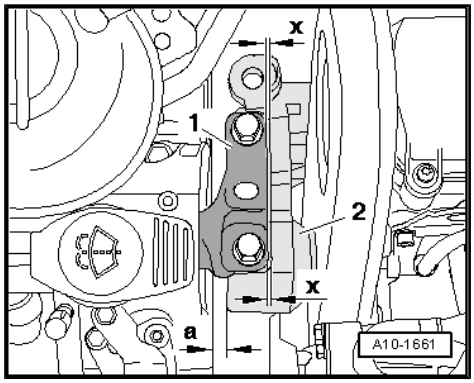
– Replace the transmission mount bolts -arrows- one after the other (if not already done) and tighten them hand-tight.

– Loosen the bolts on the engine side and transmission side of the support arm approximately two turns.



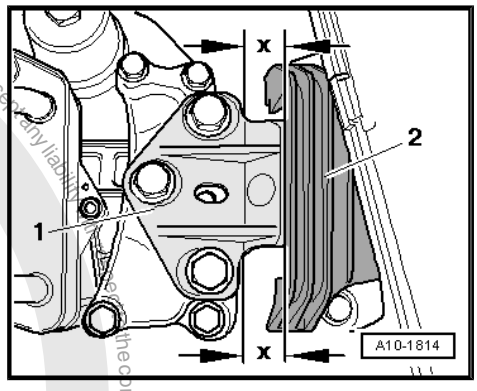
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Engine Mount



- There must be a distance -a- of at least 10 mm between the engine bracket and right longitudinal member.
- The casting edge on the engine bracket -2- must be parallel to the support arm -1-.

Transmission Mount

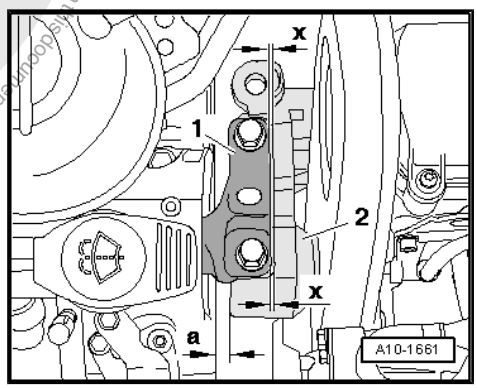


– On the transmission side, pay attention that the edges of the support arm -1- and transmission mount -2- are parallel.
- Dimension -x- is the same size on both sides of the mount.
– Tighten the subframe mount bolts.
- Tightening specifications. Refer to ⇒ “3.1 Overview - Subframe Mount”, page 23 .

Install in reverse order of removal. Note the following:

- Check the fuel lines for secure fit.
- Do not interchange the supply and return lines (return lines are blue or have blue markings, supply lines are black).
– Observe the safety precautions after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

3.7 Subframe Mount, Checking Adjustment



- There must be a distance -a- of 10 to 13 mm between the engine support and right longitudinal member.
- Casting edge on engine support -2- must stand parallel to the support arm -1-.
- Dimension -x- must be the same in the front and in the rear.

Note

Distance -a- can also be checked with corresponding round stock.

If There Is Noise (the Engine or Transmission Hitting the Longitudinal Member When Driving around Curves). Refer to
⇒ “3.6 Subframe Mount, Adjusting”, page 35 .

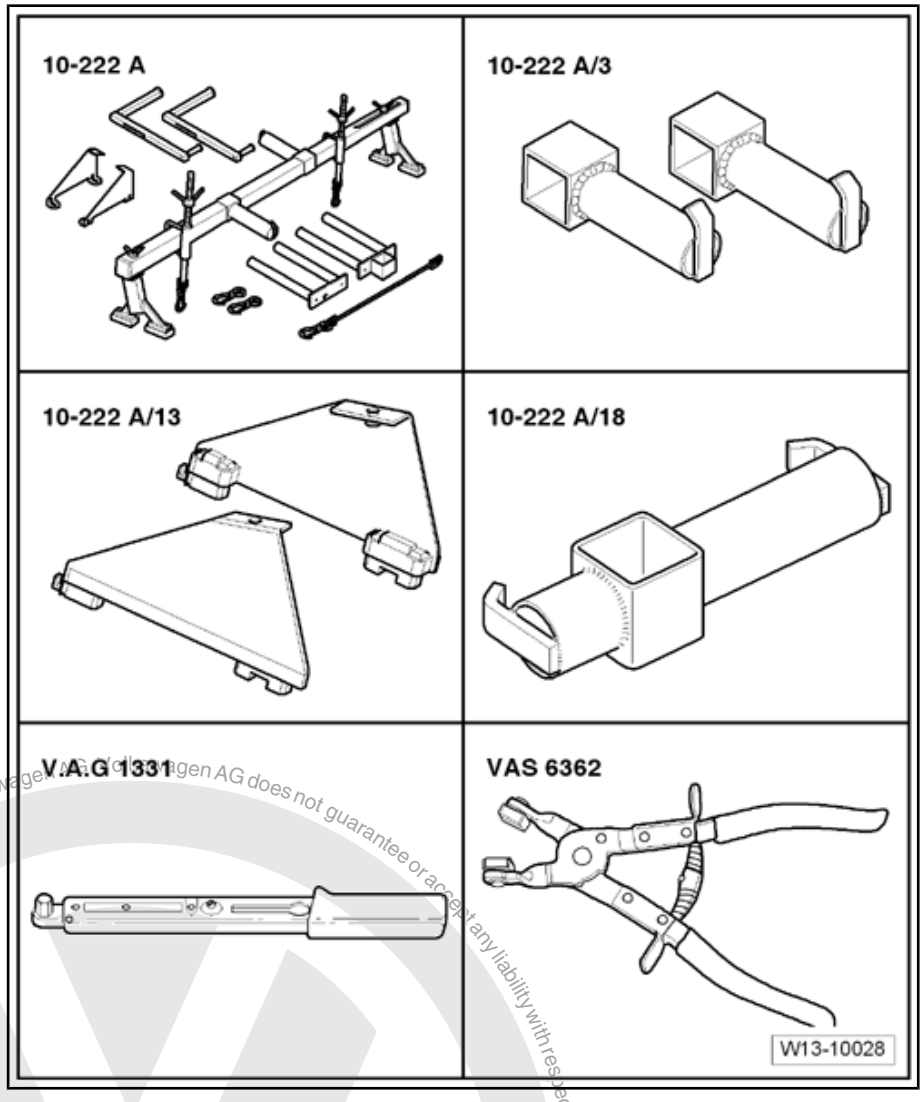
If the Dimension -a- Is Not within 10 to 13 mm. Refer to
⇒ “3.6 Subframe Mount, Adjusting”, page 35 .

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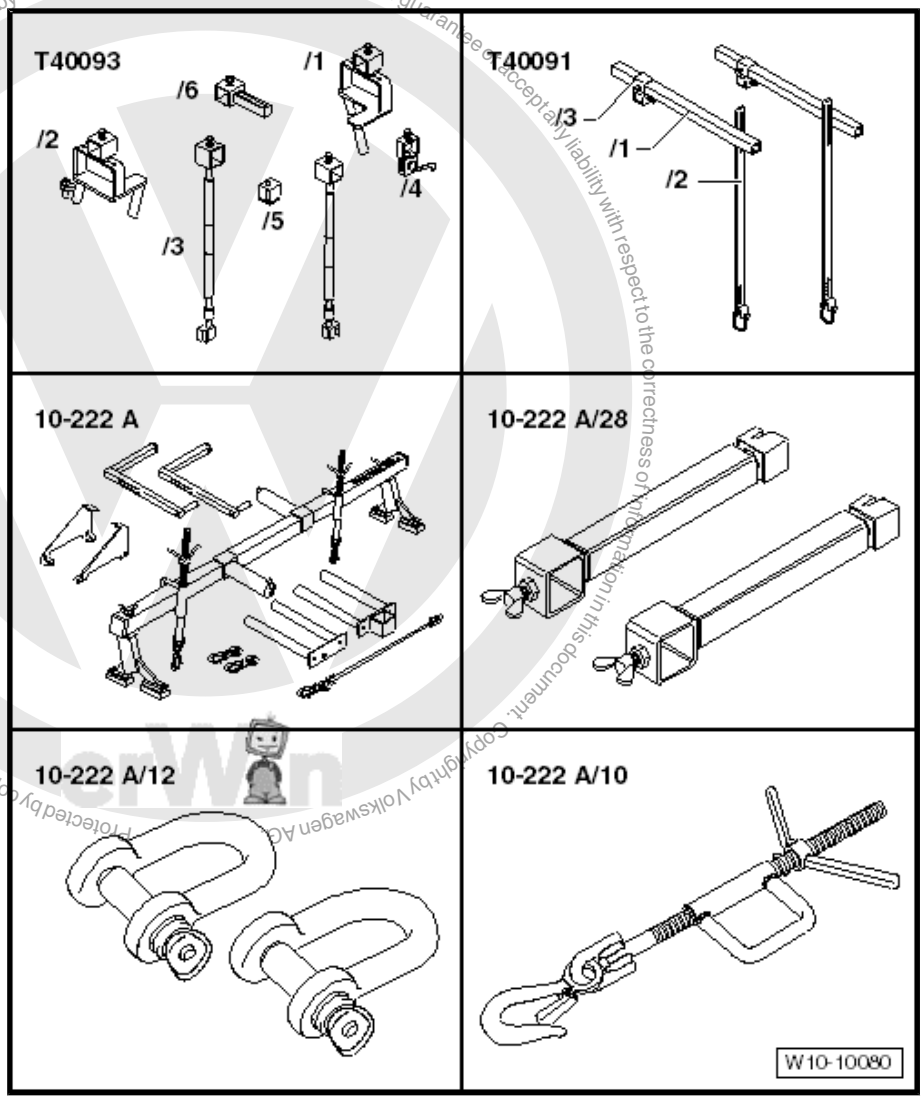
4 Special Tools

Special tools and workshop equipment required

- Engine Support Bridge - 10-222A-
- Engine Support Bridge - Engine Support 3 - 10-222A/3-
- Engine Support Bridge - Gearbox Adapter - 10-222A/13-
- Engine Support Bridge - Engine Support 18 - 10-222A/18-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-



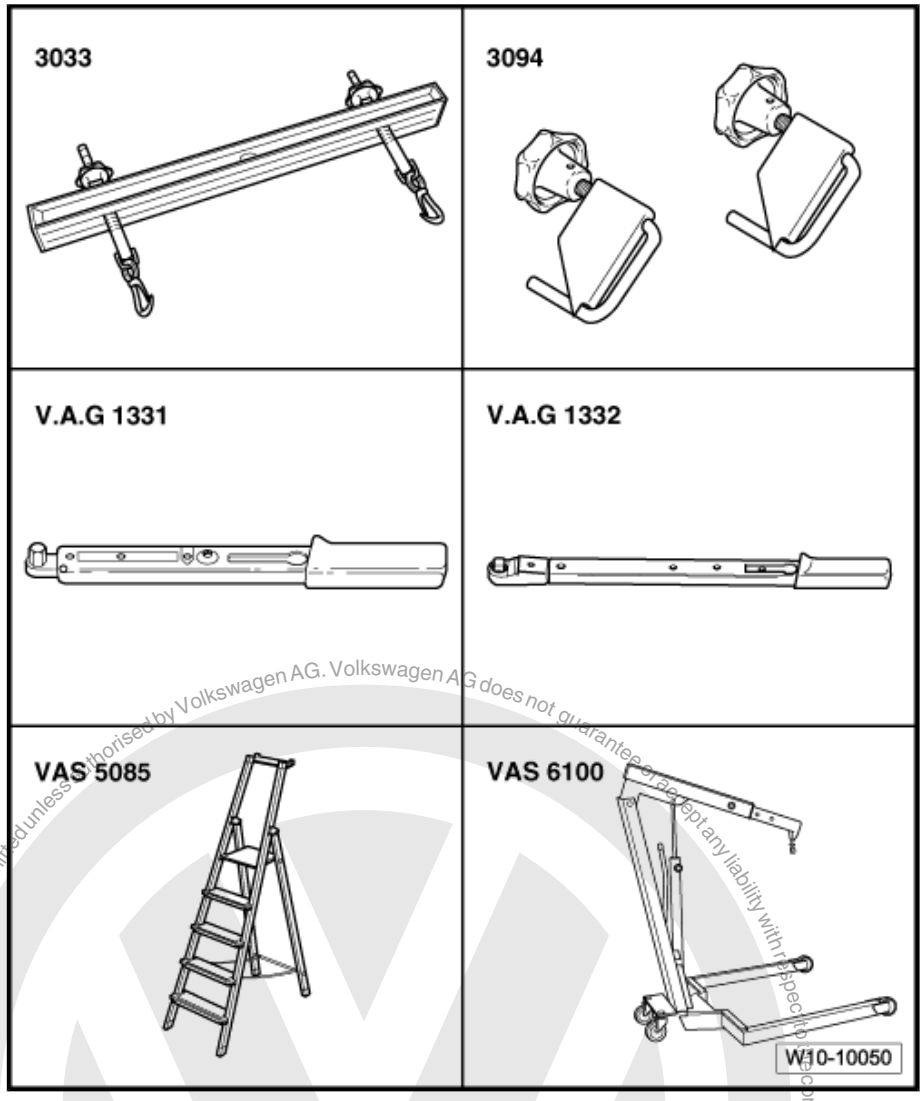
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- Engine Support Bridge - 10-222A-
- Engine Support Bridge - Spindle - 10-222A/11-
- Engine/Gearbox Support Shackle (2 pc.) - 10-222A/12-
- Engine Support - Automatic Transmission Hook - 10-222A/7-
- Engine Support Bridge - Engine Support 28 - 10-222A/28-
- Engine Support Bridge - Engine Support 31 - 10-222A/31-
- Rail with Holes - T40091/2- from the Engine Support - Basic Set - T40091-
- Mount - T40093/5- from the Engine Support - Supplement Kit - T40093A-
- Engine Support Bridge - Engine Support 28-2 - 10-222A/28-2- , quantity: 2
- Engine Support - Basic Set - Square Pipe - T40091/1- (quantity: 2) from the Engine Support - Basic Set - T40091-
- Engine Support - Basic Set - Movable Joint - T40091/3- (quantity: 2) from the Engine Support - Basic Set - T40091-
- Engine Support - Movable Joint - T40093/4- (quantity: 2) from the Engine Support - Supplement Kit - T40093A-

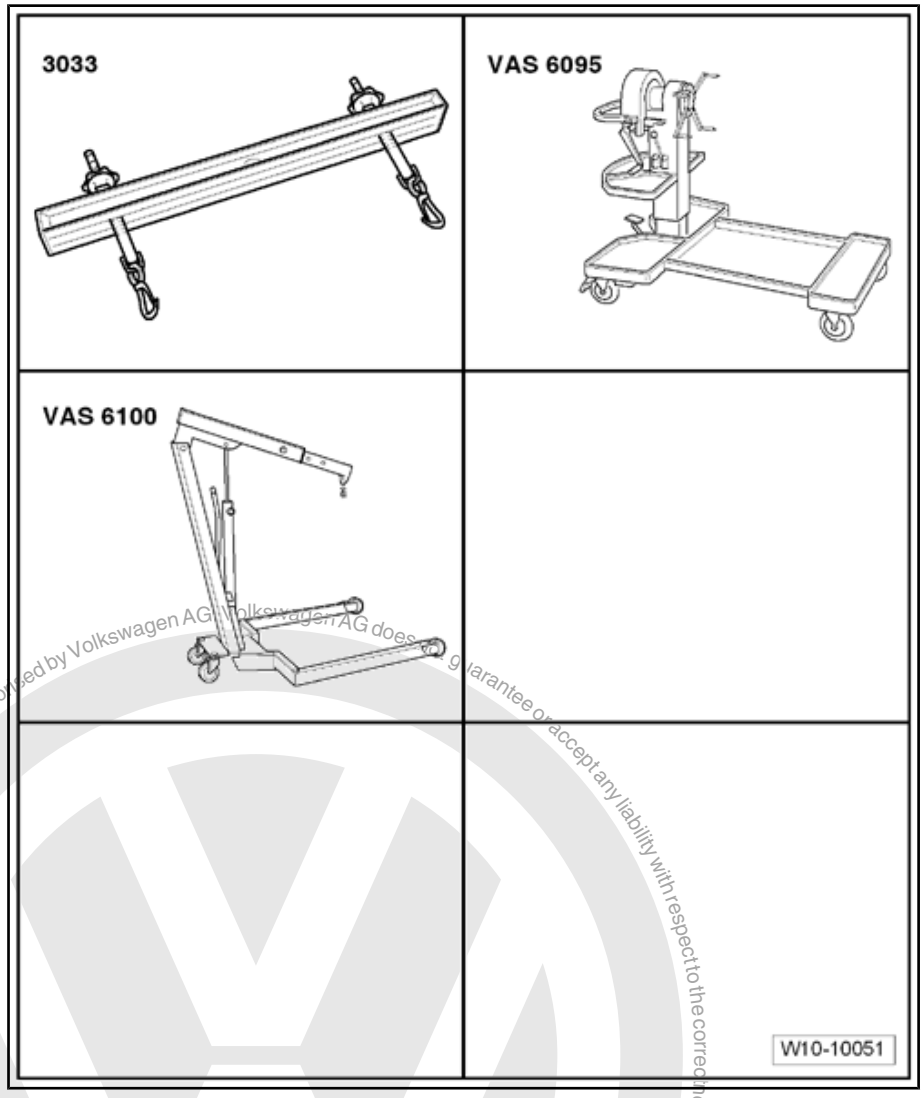
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- Lifting Tackle - 3033-
- Hose Clamps - Up To 25mm - 3094- (vehicles with manual transmission)
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Step Ladder - VAS5085-
- Shop Crane - VAS6100-

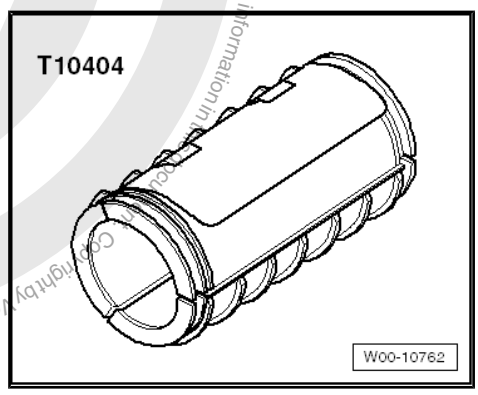


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- Lifting Tackle - 3033-
- Engine and Gearbox Bracket VAS6095A - VAS6095A-
- Shop Crane - VAS6100-

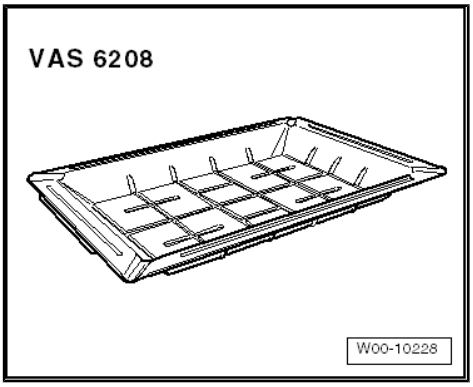


- Transportation Lock - T10404-



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- Shop Crane - Drip Tray - VAS6208-



- Engine Support - Automatic Transmission Adapter - 10-222A/16-
- Engine Bung Set - VAS6122-
- Engine And Transmission Holder - VAS6095-
- Wrench - Sw13 - T10384-
- Engine/Transmission Holder - Universal Mounting - VAS6095/1-

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13 – Crankshaft, Cylinder Block

1 Engine, Disassembling and Assembling

⇒ “1.1 Overview - Ribbed Belt Drive”, page 42

⇒ “1.2 Overview - Toothed Belt Drive”, page 43

⇒ “1.3 Overview - Cylinder Block”, page 46

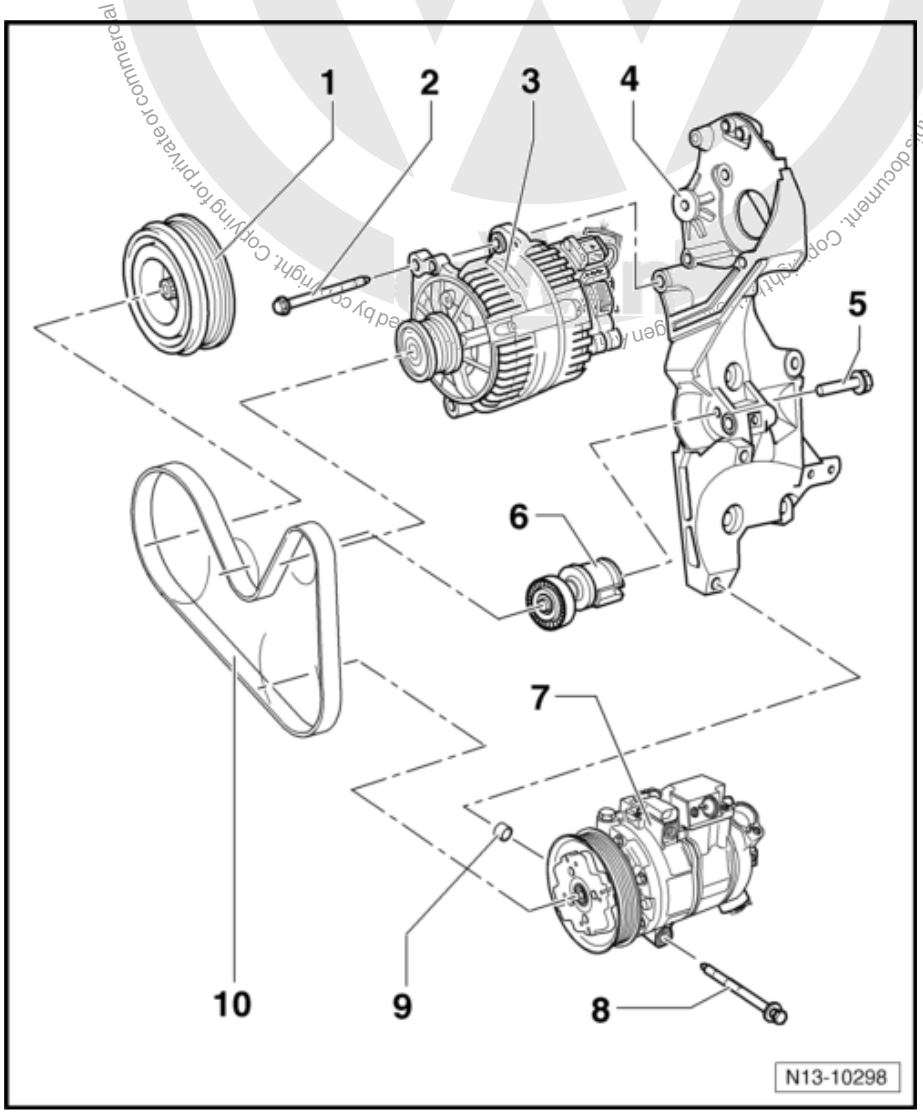
⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47

⇒ “1.5 Ribbed Belt Tensioner, Removing and Installing”, page 49

⇒ “1.6 Sub-Assembly Bracket, Removing and Installing”, page 50

⇒ “1.7 Engine Bracket, Removing and Installing”, page 52

1.1 Overview - Ribbed Belt Drive



1 - Belt Pulley/Vibration Damper

- ❑ Only possible to install in one position - hole are offset

2 - Bolt

- ❑ 25 Nm

3 - Generator - C-

- ❑ Removing and installing. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 .

4 - Bracket

- ❑ For the sub-assembly
- ❑ Removing and installing. Refer to ⇒ “1.6 Sub-Assembly Bracket, Removing and Installing”, page 50 .

5 - Bolt

- ❑ 20 Nm + 1/2 (180 °) additional turn
- ❑ Replace
- ❑ Do not lubricate or grease the threads and collar
- ❑ additional rotation can occur in several stages

6 - Ribbed Belt Tensioner

- ❑ To release the tension on ribbed belt, pivot using a open end wrench. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

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7 - A/C Compressor

- ❑ Removing and installing. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87 .

8 - Bolt

- ❑ 45 Nm

9 - Alignment Sleeve

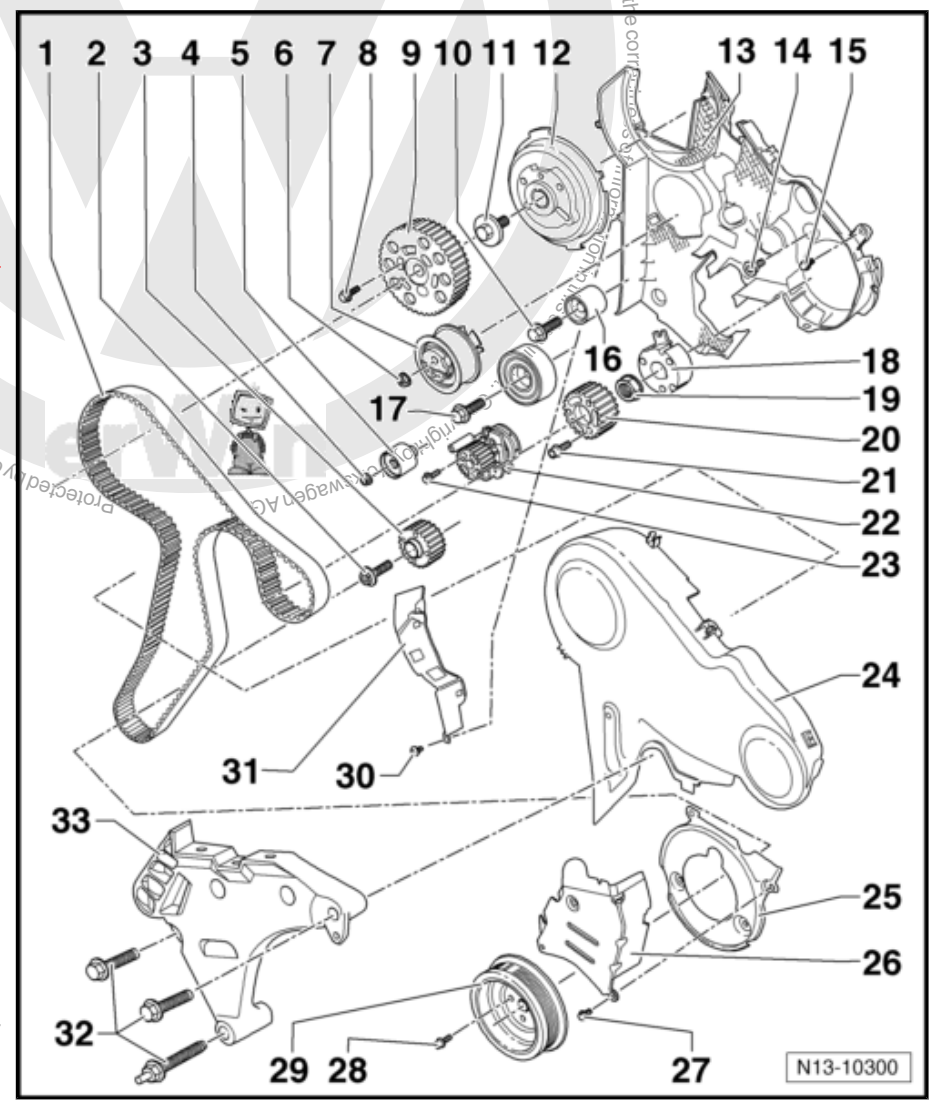
10 - Ribbed Belt

- ❑ Mark the running direction before removing
- ❑ Check for wear
- ❑ Do not kink
- ❑ Removing and installing. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

1.2 Overview - Toothed Belt Drive

1 - Toothed Belt

- ❑ Mark the running direction before removing
- ❑ Check for wear
- ❑ Do not kink
- ❑ Removing and installing, tensioning. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .



2 - Bolt

- ❑ 120 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ Use Counterhold - Crankshaft Sprocket - 3415- when loosening or tightening
- ❑ Do not lubricate or grease the threads and collar
- ❑ Additional rotation can occur in several stages

3 - Crankshaft Toothed Belt Sprocket

4 - Nut

- ❑ 20 Nm

5 - Idler Roller

6 - Nut

- ❑ 20 Nm + 1/8 (45 °) additional turn
- ❑ Replace

7 - Tensioning Roller

- ❑ Remove the engine bracket to remove and install. Refer to ⇒ “1.7 Engine Bracket, Removing and Installing”, page 52 .

8 - Bolt

- ❑ 20 Nm + 1/4 (90 °) additional turn

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- ❑ Replace

9 - Camshaft Sprocket

10 - Bolt

- ❑ 25 Nm

11 - Bolt

- ❑ 100 Nm

12 - Hub

- ❑ Use the Counterhold - Camshaft Gear - T10051- to loosen and tighten
- ❑ To remove, use Puller - Camshaft Sprocket - T10052- .
- ❑ Removing and installing. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 , Camshaft, Removing and Installing

13 - Rear Toothed Belt Guard

14 - Bolt

- ❑ 20 Nm

15 - Bolt

- ❑ 10 Nm
- ❑ Replace

16 - Idler Roller

17 - Bolt

- ❑ 50 Nm + 1/4 (90°) additional turn
- ❑ Replace

18 - Hub

- ❑ Use the Counterhold - Camshaft Gear - T10051- to loosen and tighten
- ❑ Use Puller - Pulley - T40039- to remove.
- ❑ Removing and installing. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .

19 - Nut

- ❑ 95 Nm

20 - High Pressure Fuel Pump Toothed Belt Sprocket

21 - Bolt

- ❑ 20 Nm + 1/4 (90 °) additional turn
- ❑ Replace

22 - Coolant Pump

- ❑ Removing and installing. Refer to ⇒ “1.6 Coolant Pump, Removing and Installing”, page 203 .

23 - Bolt

- ❑ 15 Nm

24 - Toothed Belt Guard Upper Section

- ❑ Installing. Refer to ⇒ Fig. ““Toothed Belt Guard Upper Section, Installing”“ , page 45 .

25 - Toothed Belt Guard Lower Section

26 - Toothed Belt Guard Center Section

27 - Bolt

- ❑ 10 Nm
- ❑ Replace

28 - Bolt

- ❑ 10 Nm + 1/4 (90 °) additional turn

- ❑ Replace

29 - Belt Pulley/Vibration Damper

- ❑ Only possible to install in one position - hole are offset

30 - Bolt

- ❑ 5 Nm

31 - Protective Plate

32 - Bolt

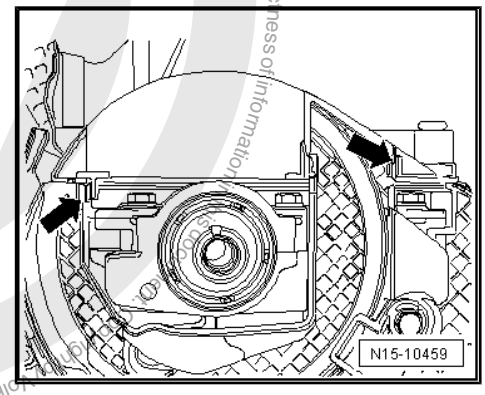
- ❑ 40 Nm + $^1/_2$ (180 °) additional turn
- ❑ Replace
- ❑ Note the tightening sequence. Refer to ⇒ Fig. ""Engine Bracket to Cylinder Block Tightening Sequence"" , page 19 .

33 - Engine Bracket

- ❑ Removing and installing. Refer to ⇒ "1.7 Engine Bracket, Removing and Installing", page 52 .

Toothed Belt Guard Upper Section, Installing

– Make sure the toothed belt guard upper section is clipped into the cylinder head cover correctly.



Note

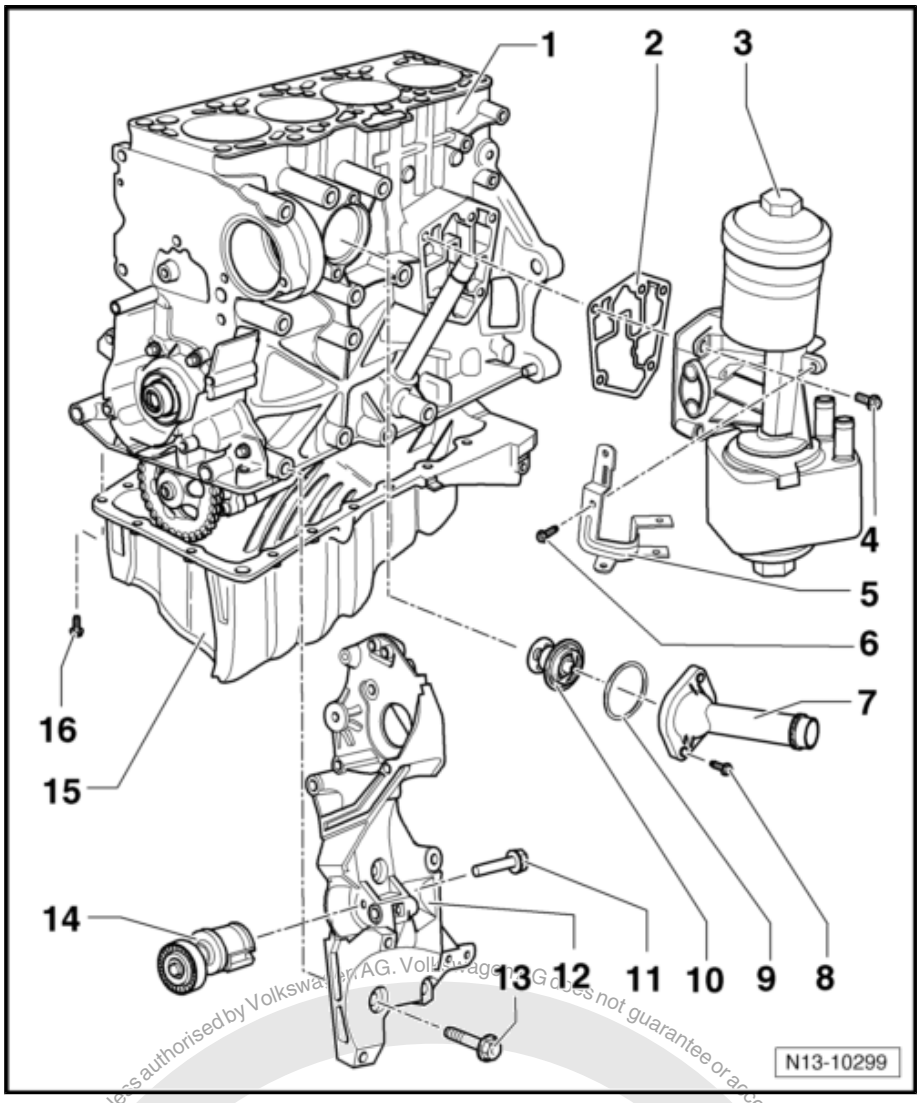
The camshaft is removed here for clarity.

– Press the toothed belt guard upper section near the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.

– Check the clearance between the hub and the toothed belt guard upper section.

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1.3 Overview - Cylinder Block



1 - Cylinder Block

- ❑ Sealing flanges and flywheel, removing and installing. Refer to ⇒ “2 Sealing Flange and Flywheel”, page 55 .
- ❑ Piston and connecting rod. Refer to ⇒ “3 Pistons and Connecting Rod”, page 68 .
- ❑ Crankshaft. Refer to ⇒ “4 Crankshaft”, page 74 .
- ❑ Engine code CBEA with balance shaft assembly
- ❑ Balance Shaft Assembly, Removing and installing. Refer to ⇒ “2 Lubrication System Components, Engine Code CBEA”, page 153 .

2 - Seal

- ❑ Replace

3 - Oil Filter Bracket

- ❑ Overview - Oil Filter Bracket and Oil Cooler. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 177 .

4 - Bolt

- ❑ 15 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ First, fasten upper left and lower right bolts, and then tighten all four bolts in a diagonal sequence

5 - Bracket

- ❑ For wiring harness

6 - Bolt

- ❑ 10 Nm

7 - Connection

- ❑ For the coolant thermostat

8 - Bolt

- ❑ 15 Nm

9 - O-Ring

- ❑ Replace

10 - Coolant Thermostat

- ❑ Note the installation position. Refer to ⇒ “1.7 Coolant Thermostat, Removing and Installing”, page 204 , Coolant Thermostat, Removing and Installing
- ❑ Checking: warm the thermostat in a water bath

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- ❑ Starts to open: approximately 85 °C (185 °F)
- ❑ Ends approximately 105 °C (221 °F)
- ❑ Opening lift minimum 7 mm
- ❑ Coolant thermostat, removing and installing. Refer to ⇒ “1.7 Coolant Thermostat, Removing and Installing”, page 204 .
- ❑ 4/2-Way Valve with Thermostat, Removing and installing. Refer to ⇒ “1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 205 .

11 - Bolt

- ❑ 20 Nm + 1/2 (180 °) additional turn
- ❑ Replace
- ❑ Do not lubricate or grease the threads and collar
- ❑ additional rotation can occur in several stages

12 - Bracket

- ❑ For the sub-assembly
- ❑ Removing and installing. Refer to ⇒ “1.6 Sub-Assembly Bracket, Removing and Installing”, page 50 .

13 - Bolt

- ❑ 40 Nm + 1/4 (90 °) additional turn
- ❑ Replace

14 - Ribbed Belt Tensioner

- ❑ To release the tension on ribbed belt, pivot using a open end wrench. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .
- ❑ Removing and installing. Refer to ⇒ “1.5 Ribbed Belt Tensioner, Removing and Installing”, page 49 .

15 - Oil Pan

- ❑ Clean sealing surface before installing
- ❑ Install with Silicone Sealant - D 176 404 A2-

16 - Bolt

- ❑ 15 Nm
- ❑ Tighten diagonally in steps

1.4 Ribbed Belt, Removing and Installing

⇒ “1.4.1 Removing”, page 47 .

⇒ “1.4.2 Installing”, page 48 .

1.4.1 Removing

Caution

If large quantities of metal shavings or abrasions are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent further damage, perform the following steps after the repair:

- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

Special tools and workshop equipment required

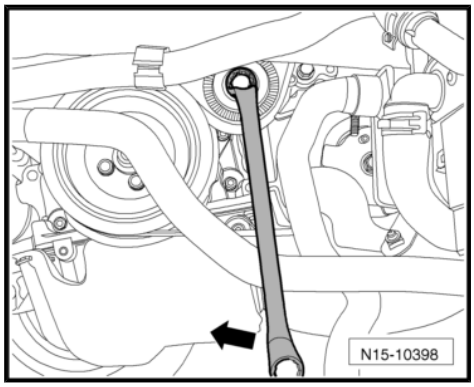
- Locking Pin - T10060A-

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– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

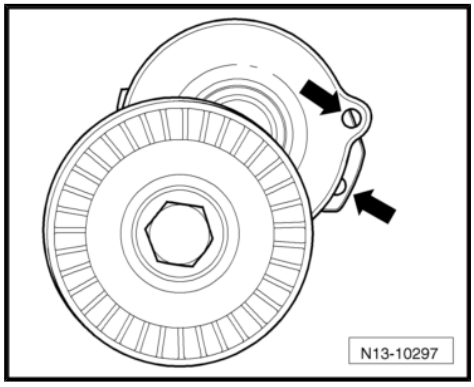
– Mark the ribbed belt running direction.

– Move the tensioner in the direction of the -arrow- to release the tension on the ribbed belt.



– Align the holes -arrows- to the cover and secure the tensioner with the Locking Pin - T10060A- .

– Remove the ribbed belt.



1.4.2 Installing

Install in reverse order of removal. Note the following:

- Secure the Generator - C- and A/C compressor before installing the ribbed belt.
- Note the previously marked direction of belt rotation and make sure that it is seated correctly on pulley.

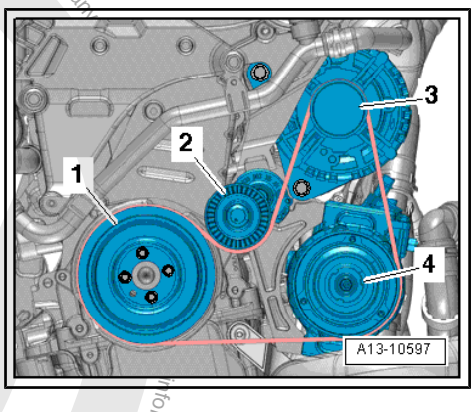
– Install the ribbed belt on the ribbed belt pulley.

1 - Crankshaft

2 - Tensioner

3 - Generator

4 - A/C Compressor



After the belt is installed, always perform the following:

– Start the engine and check the running belt.

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1.5 Ribbed Belt Tensioner, Removing and Installing

Caution

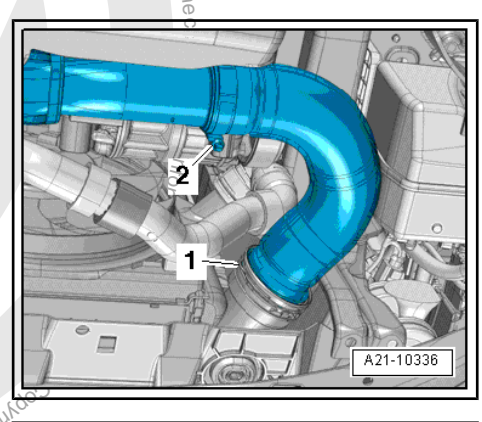
- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

Removing

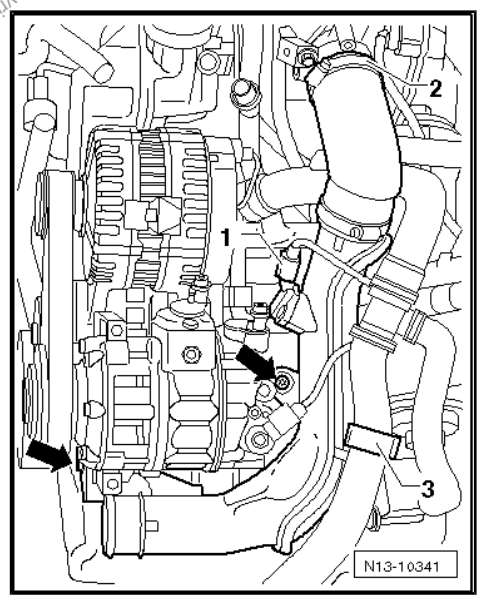
– Remove the ribbed belt. Refer to
⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

– Loosen the clamp -2-, lift the clip -1- and remove the connecting hose »cold side«.

– Remove the air shroud with the Radiator Fan - V7- and Radiator Fan 2 - V177- . Refer to
⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202 .

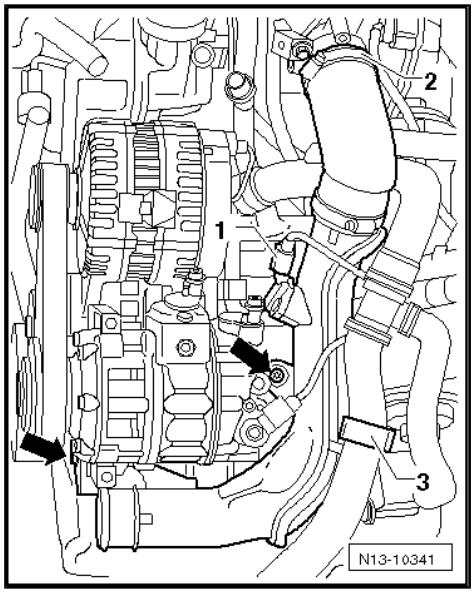


– Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

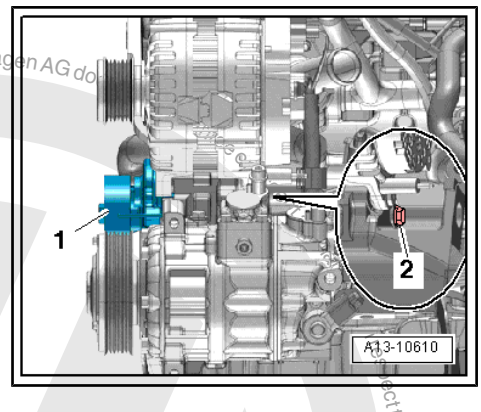


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– Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.



– Remove the bolt -2- and remove the ribbed belt tensioner -1-.



Installing

Install in reverse order of removal. Note the following:

- Replace the screw for the tensioner.
- Tightening specifications. Refer to ⇒ “1.1 Overview - Ribbed Belt Drive”, page 42 .
- Install the ribbed belt. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

1.6 Sub-Assembly Bracket, Removing and Installing

Caution

- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

Special tools and workshop equipment required

- Engine Support Bridge - 10-222A-

Removing

– Remove the engine bracket. Refer to ⇒ “1.7 Engine Bracket, Removing and Installing”, page 52 .

– Remove the high pressure pump. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .

– Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 .

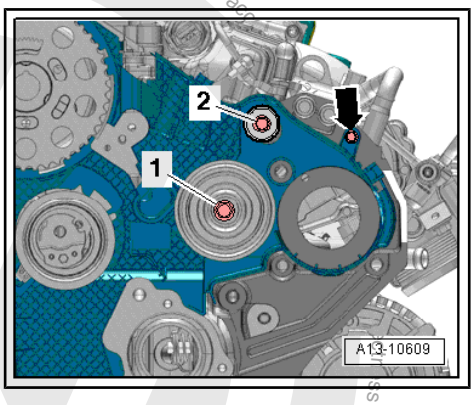
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WARNING

Do not open the A/C system refrigerant circuit.

– Remove the A/C compressor from the sub-assembly bracket and secure it to the lock carrier.

– Remove the idler rollers -1 and 2- and remove the bolt on the toothed belt guard -arrow-.

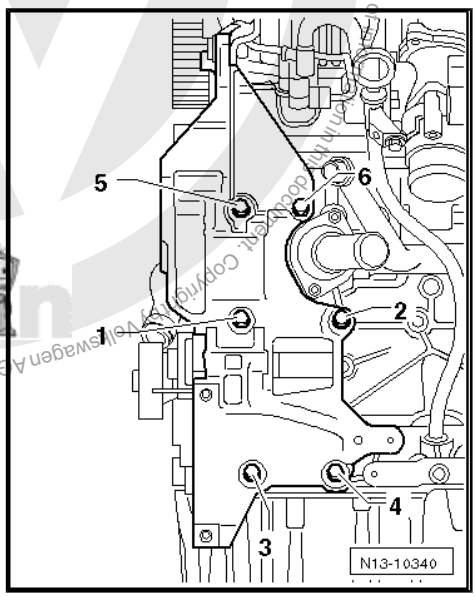


– Remove the bolts -6 to 1- and remove the sub-assembly bracket.

Installing

Install in reverse order of removal. Note the following:

- Make sure there are alignment sleeves inside the sub-assembly bracket and replace any that are missing.
- Replace bolts, which have been tightened to torque.

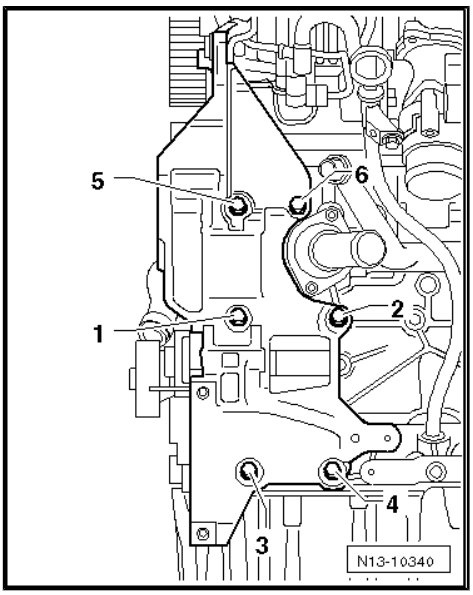


– Tighten the bolts in sequence -1 to 6-. Tightening specification -item 5- ⇒ Item 5 (page 42) .

– Install the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 .

– Install the high pressure pump. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .

– Install the engine bracket. Refer to ⇒ “1.7 Engine Bracket, Removing and Installing”, page 52 .



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1.7 Engine Bracket, Removing and Installing

Caution

- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

Removing

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route lines of all types (for example for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

There is a risk of breaking for work on or near the vehicle alignment.

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

– Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the Hose Clip Pliers - VAS6362- .

– Remove the filler neck from the windshield and headlamp washer fluid reservoir. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Washer System; Washer Fluid Reservoir, Removing and Installing .

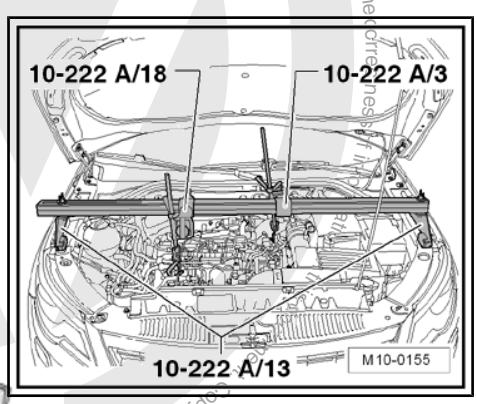
– Remove the coolant expansion tank from the body (the coolant lines remain connected).

– Remove the fuel filter (the fuel lines remain connected).

– Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner .

All Vehicles Except for Jetta from MY 2011.

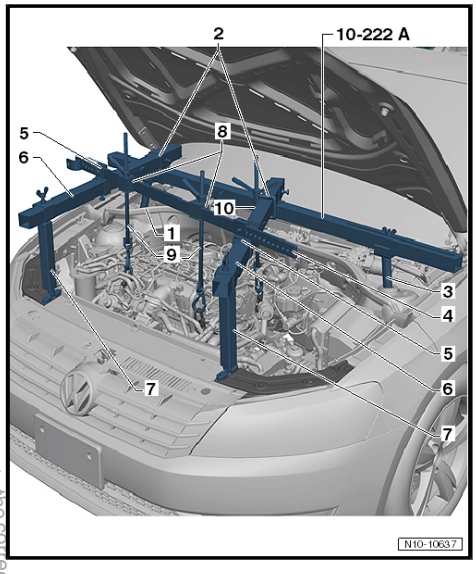
– Support the engine in the installation position. Refer to ⇒ “2.3 Subframe Mount, Adjusting”, page 19 .



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Jetta from MY 2011

– Support the engine in the installation position. Refer to ⇒ “3.5 Engine, Supporting in Installation Position”, page 31 .



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Continuation for All Vehicles

Note

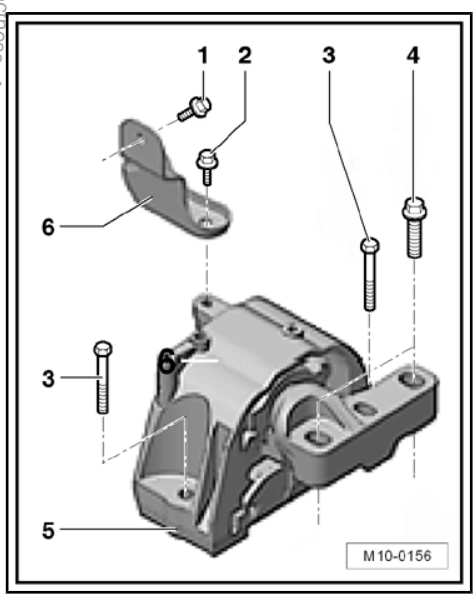
- *The subframe mount bolts may only be loosened when the engine is supported with the Engine Support Bridge - 10-222A- .*
- *The engine bracket may only be loosened only when the engine mount is removed.*

– Loosen the bolts -4- on the engine mount -5-.

– Then remove the engine mount -5- bolts in the following sequence:

1. Bolts -3-
2. Bolts -1 and 2-
3. Bolts -4-

– Remove the engine mount -5-.



WARNING

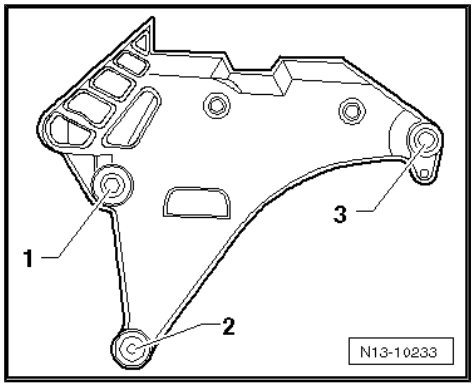
Make sure that no components/hoses are damaged, stretched or torn when lifting or lowering the engine using the Engine Support Bridge - 10-222A- .

Note

The bolt -1- can be reached through an opening in the wheel housing. If necessary, raise and lower the engine with the spindle on the Engine Support Bridge - 10-222A- to remove or install the bolts -2- and -3-.

– Remove the engine bracket bolts in the sequence -3 to 1-.

– Remove the engine bracket upward.



Installing

Caution

Always use the correct tightening sequence and specifications for the engine bracket bolts. Otherwise tension could develop in the engine bracket and break it.

- Subframe mount tightening specifications. Refer to ⇒ “2 Subframe Mount, except Jetta from MY 2011”, page 17 .
- Subframe mount tightening specifications. Refer to ⇒ “3 Assembly Mounts, Jetta from 2011”, page 23 .

Install in reverse order of removal. Note the following:

– Install the engine bracket from above.

Note

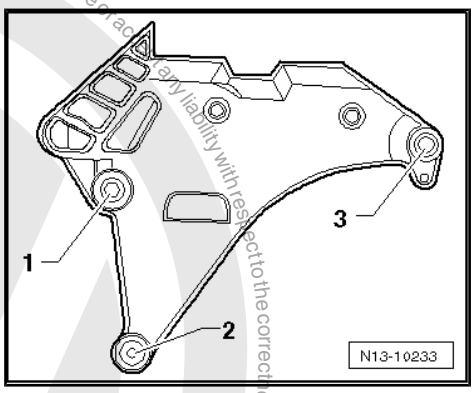
The bolt -1- can be reached through an opening in the wheel housing. If necessary, lift or lower the engine with the spindle for the Engine Support Bridge - 10-222A- to remove or install the bolts -2- and -3-.

– Tighten the new bolts hand-tight in the sequence -1 to 3-.

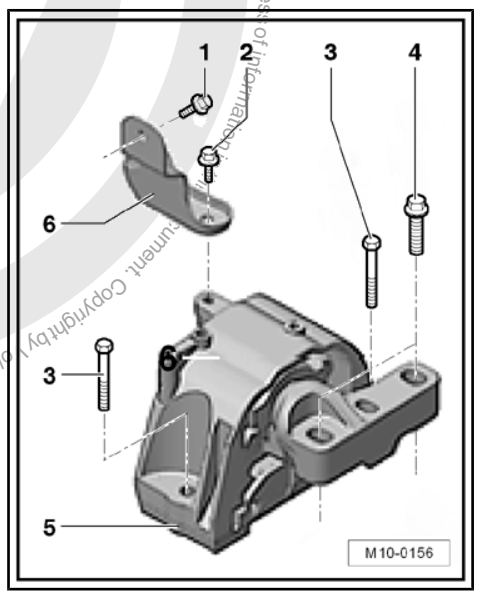
– Tighten the bolts in the sequence -1 to 3- to the tightening specification -item 3- ⇒ Item 3 (page 23) .

– Install the engine mount -5- and tighten the new bolts to the tightening specification in the following sequence:

1. Bolts -3-
2. Bolts -1 and 2-
3. Using the spindle, bring the engine bracket into position on the engine mount -5-.



1. Tighten the bolts -4-.



– Checking the engine-subframe mount adjustment, except Jetta from MY 2011. Refer to ⇒ “2.2 Engine-Subframe Mount Adjustment, Checking”, page 19 .

– Checking the engine-subframe mount adjustment, for Jetta MY from 2011. Refer to ⇒ “3.7 Subframe Mount, Checking Adjustment”, page 36 .

Further installation is the reverse order of removal. Note the following:

- Check the fuel lines for secure fit.
- Do not interchange the supply and return lines (return lines are blue or have blue markings, supply lines are black).

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2 Sealing Flange and Flywheel

⇒ “2.1 Overview - Sealing Flange and Flywheel”, page 55

⇒ “2.2 Crankshaft Sealing Flange, Removing and Installing”, page 56

⇒ “2.3 Crankshaft Seal, Replacing, Belt Pulley Side”, page 63

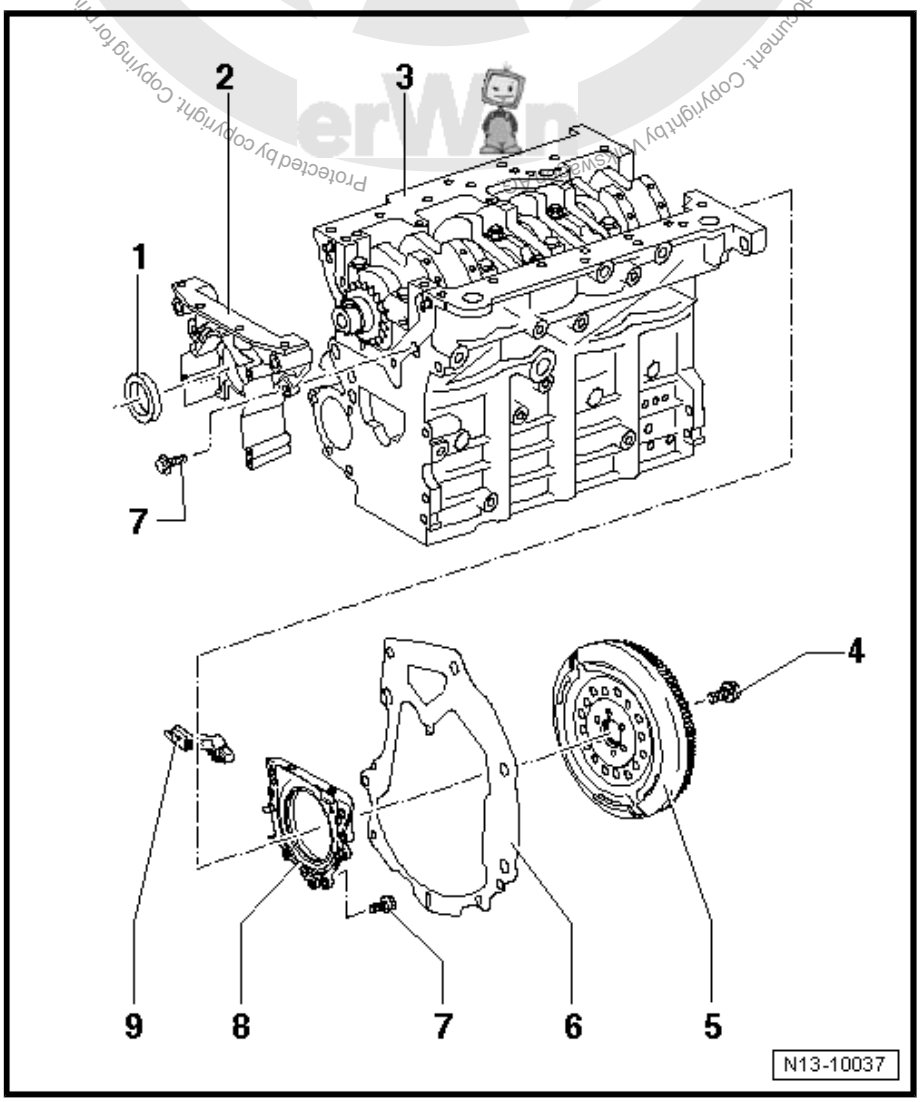
⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 64

⇒ “2.5 Engine Speed Sensor G28 , Removing and Installing”, page 66

2.1 Overview - Sealing Flange and Flywheel

Servicing the Clutch:

- Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 30 .
- Vehicles with DSG® transmission. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 30 .



1 - Seal

- ❑ Do not coat the sealing lip on the seal with oil or grease
- ❑ Before installing, remove oil residue from crankshaft journal with a clean cloth
- ❑ Seal for crankshaft - belt pulley side- replacing. Refer to ⇒ “2.3 Crankshaft Seal, Replacing, Belt Pulley Side”, page 63 .

2 - Sealing Flange

- ❑ Must rest on the alignment sleeves
- ❑ Removing and installing. Refer to ⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 64 .
- ❑ Insert with Silicone Sealant - D 176 404 A2- . Refer to ⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 64 .

3 - Cylinder Block

- ❑ Piston and connecting rod. Refer to ⇒ “3 Pistons and Connecting Rod”, page 68 .
- ❑ Crankshaft. Refer to ⇒ “4 Crankshaft”, page 74 .
- ❑ Engine code CBEA with balance shaft assembly

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- ❑ Balance Shaft Assembly, Removing and installing. Refer to ⇒ “2 Lubrication System Components, Engine Code CBEA”, page 153 .

4 - Bolt

- ❑ 60 Nm + 1/4 (90 °) additional turn
- ❑ Replace

5 - Flywheel

- ❑ To loosen and tighten the bolts, secure the flywheel with the Flywheel Retainer - 3067- .

6 - Intermediate Plate

- ❑ Must rest on the alignment sleeves
- ❑ Be careful not to damage or bend when installing

7 - Bolt

- ❑ 15 Nm

8 - Sealing Flange with Seal

- ❑ With the Engine Speed Sensor - G28- sensor wheel
- ❑ Only replace completely
- ❑ Do not coat the sealing lip on the seal with oil or grease
- ❑ Before installing, remove oil residue from crankshaft journal with a clean cloth
- ❑ Use the support sleeve provided to install
- ❑ Removing and installing. Refer to ⇒ “2.2 Crankshaft Sealing Flange, Removing and Installing”, page 56 .

9 - Engine Speed Sensor - G28-

- ❑ 5 Nm
- ❑ Removing and installing. Refer to ⇒ “2.5 Engine Speed Sensor G28 , Removing and Installing”, page 66 .

2.2 Crankshaft Sealing Flange, Removing and Installing

⇒ , page 56

⇒ , page 57

Removing:

Special tools and workshop equipment required

- ♦ Seal Installer - Rear Crankshaft - T10134-
- ♦ Torque Wrench 1331 5-50Nm - VAG1331-
- ♦ Open Ring Wrench - 24mm - VAG1332/11-
- ♦ Caliper gauge
- ♦ M6 x 35 mm hex bolts (quantity: 3)
- ♦ M7 x 35 mm hex bolts (quantity: 2)

– Remove the transmission:

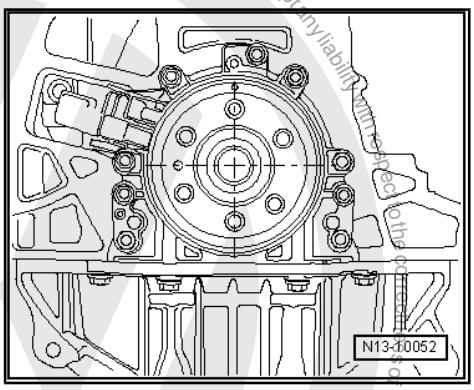
- ♦ Vehicles with manual transmission. Refer to ⇒ 6-Speed Manual Transmission 02Q; Rep. Gr. 34 ; Transmission, Removing and Installing .
- ♦ Vehicles with DSG® transmission. Refer to ⇒ 6-Speed DSG Transmission 02E; Rep. Gr. 34 ; Transmission, Removing and Installing .

– Remove the flywheel -item 5- ⇒ Item 5 (page 56) .

– Remove the intermediate plate -item 6- ⇒ Item 6 (page 56) .

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– Turn the crankshaft to cylinder 1 TDC as shown.



– Remove the oil pan:

  Engine Code CBEA. Refer to
  ⇒ “2 Lubrication System Components, Engine Code CBEA”, page 153

  Engine Codes CJAA. Refer to
  ⇒ “3 Lubrication System Components, Engine Code CJAA”, page 170 .

Note

- *To improve clarity, the work procedures will be shown with the engine removed.*
- *The work procedures are the same with the engine installed and the transmission removed.*

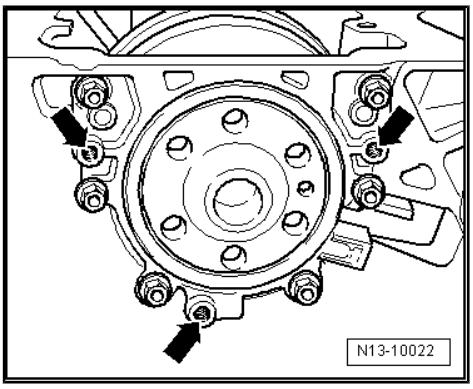
– Remove the Engine Speed Sensor - G28- . Refer to
⇒ “2.5 Engine Speed Sensor G28 , Removing and Installing”, page 66 .

– Remove the sealing flange bolts.

Note

The sealing flange and sensor wheel are pressed together off the crankshaft with three M6 x 35 mm bolts.

– Install the three M6 x 35 mm bolts in the threaded holes on the sealing flange -arrows-.



– Screw the bolts (max. one $^{1}/_{2}$ turn (180°) per bolt) into the sealing flange in an alternating sequence and press the sealing flange together with the sensor wheel off the crankshaft.

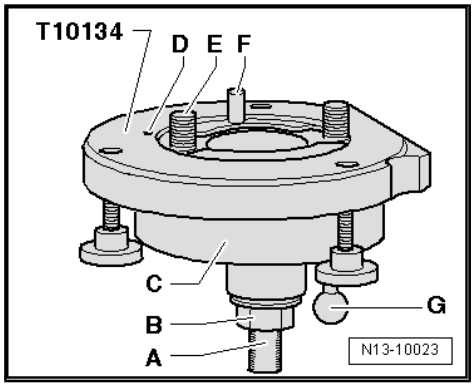
Installing:

Note

- *Sealing flange with PTFE-seal is equipped with a sealing lip support ring. This support ring serves the same function of a guide sleeve and must not be removed before installation.*
- *The sealing flange and sensor wheel must not be separated or rotated after being removed from the replacement part packaging.*
- *The sensor wheel retains the installation position via being located on the locating pin of the Seal Installer - Rear Crankshaft - T10134- .*
- *The sealing flange and seal are one unit and may only be replaced together with the sensor wheel.*
- *The Seal Installer - Rear Crankshaft - T10134- retains the installation position to the crankshaft via a guide pin, which is guided into the hole of the crankshaft.*

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Seal Installer - Rear Crankshaft - T10134-



A - Tension Surface

B - Hex Nut

C - Assembly Bell

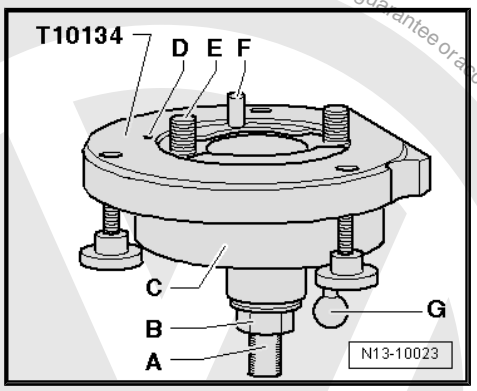
D - Locating Pin

E - Hex Socket Bolt

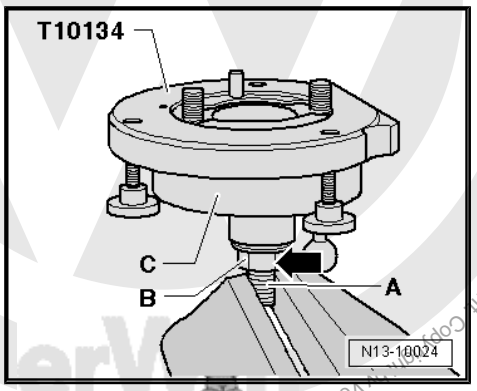
F - Guide Pin for Diesel Engines (Black Handle)

G - Guide Pin for Gasoline Engines (Red Handle)

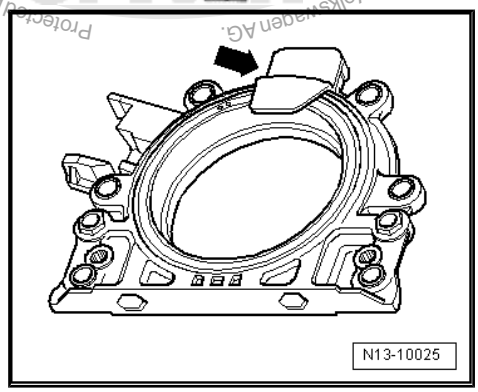
A - Installing the Gasket with Sensor Wheel on the Seal Installer - Rear Crankshaft - T10134-



– Screw on the nut -B- until shortly before the tension surface -A- of the threaded spindle.
– Tension the Seal Installer - Rear Crankshaft - T10134- in a vise on the tension surface -A- of the threaded spindle.
– Push the assembly bell -C- downward so that it rests on the hex nut -B- -arrow-.



– Install the hex nut on the threaded spindle until the inner section of the assembly tool is level with the assembly bell.



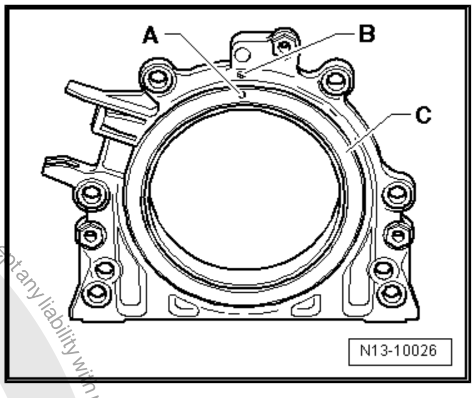
– Remove the securing clip -arrow- from the new sealing flange.

Note

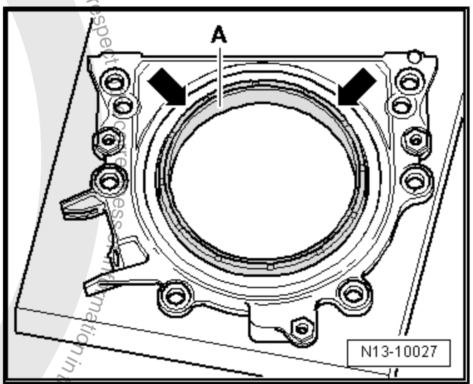
The sensor wheel must not be removed from or rotated in the sealing flange.

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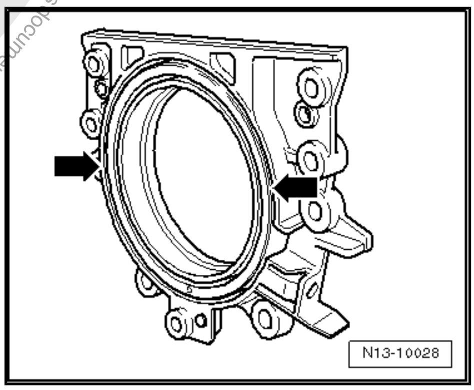
– The locating pin -A- on the sensor wheel -C- must align with the marking -B- on the sealing flange.
– Place the front side of the sealing flange onto a clean level surface.



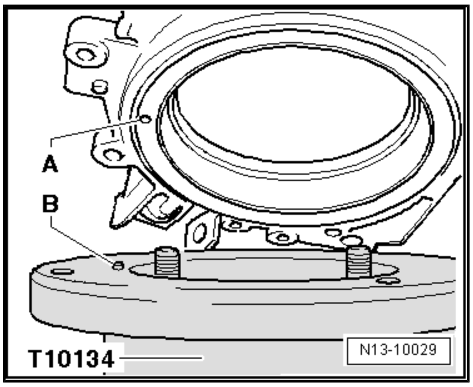
– Press the sealing lip support ring -A- in the direction of -arrow- until it rests on the level surface.



– The upper edge of the sensor wheel and the front edge of the sealing flange must align -arrows-.



– Place the front side of the sealing flange on the Seal Installer - Rear Crankshaft - T10134- so the locating pin -B- is positioned in the hole -A- on the sensor wheel.

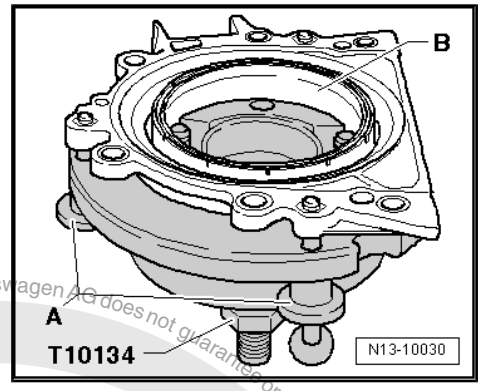


Note

Make sure the sealing flange is positioned flat on the seal installer.

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– Press the sealing flange and the sealing lip support ring -B- onto the surface of the Seal Installer - Rear Crankshaft - T10134- while tightening the three knurled bolts -A- so that the locating pin cannot slip out of the sensor wheel hole.



Note

Make sure the sensor wheel remains fixed inside the assembly tool when installing the sealing flange.

B - Installing the Seal Installer - Rear Crankshaft - T10134- with Sealing Flange on the Crankshaft Flange

Requirements

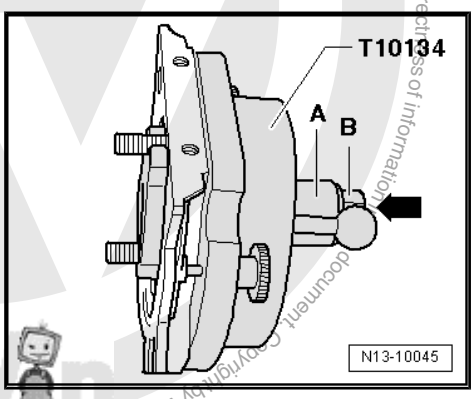
- Crankshaft flange must be free of oil and grease.
- The engine is at cylinder 1 TDC.

Procedure

– Screw the hex nut -B- to the end of the threaded spindle.

– Push the threaded spindle on the Seal Installer - Rear Crankshaft - T10134- in the direction of -arrow- until the hex nut -B- rests on the assembly bell -A-.

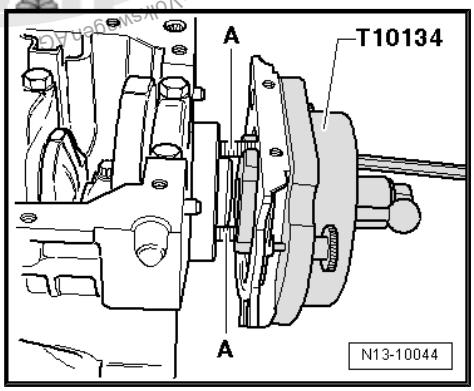
– Position the flattened side of the assembly bell toward the oil pan side of the cylinder block sealing surface.



Note

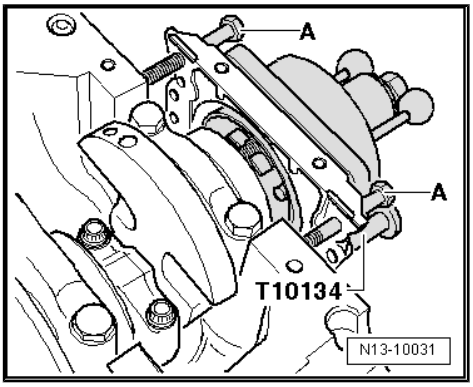
Screw the hex socket bolts -A- approximately five threads into the crankshaft flange.

– Secure the Seal Installer - Rear Crankshaft - T10134- onto the crankshaft flange using the hex socket bolts -A-.



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– Screw two M7 x 35 mm bolts -A- to guide the sealing flange into the cylinder block.



C - Attaching the Seal Installer - Rear Crankshaft - T10134- to the Crankshaft Flange

– Push the assembly bell -C- by hand in the direction of -arrow- until the sealing lip support ring -B- rests on the crankshaft flange -A-.

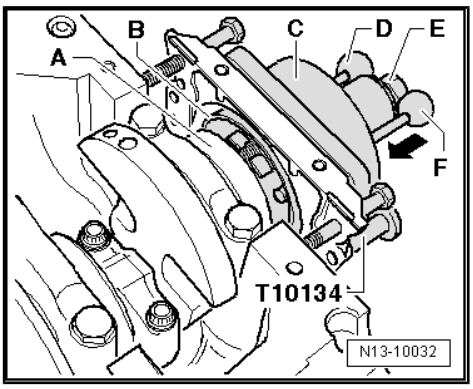
– Push the guide pin for diesel engines (black handle) -D- into the crankshaft hole. Thereby the sensor wheel is retained in the final installation position.

Note

Do not insert the guide pin for gasoline engines (red handle) -F- into the crankshaft threaded hole.

– Hand-tighten both hex socket bolts on the Seal Installer - Rear Crankshaft .

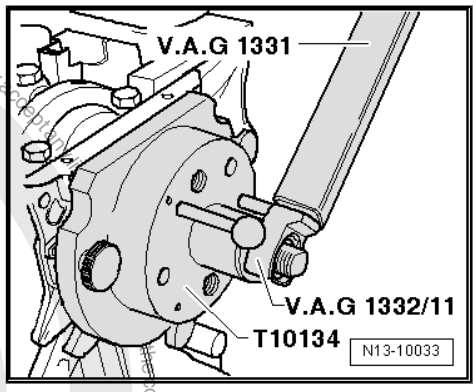
– Install the nut -E- onto the threaded spindle by hand, until it rests on the assembly bell -C-.



D - Installing the Sensor Wheel on the Crankshaft Flange with the Seal Installer - Rear Crankshaft - T10134- .

– Tighten the hex nut on the Seal Installer - Rear Crankshaft - T10134- using a Torque Wrench 5-50Nm - VAG1331- and Torque Wrench 1332 Insert - Open Ring Wrench - 24mm - VAG1332/11- .

- Tightening specification: 35 Nm



Note

After tightening the hex nut to 35 Nm, a minimal air gap must still be present between the cylinder block and sealing flange.

E - Checking the Sensor Wheel Installation Position on the Crankshaft

– Screw the hex nut -E- to the end of the threaded spindle.

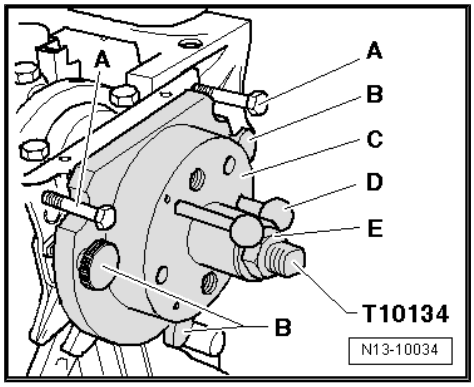
– Remove the two bolts -A- from the cylinder block.

– Remove the three knurled bolts -B- from the sealing flange.

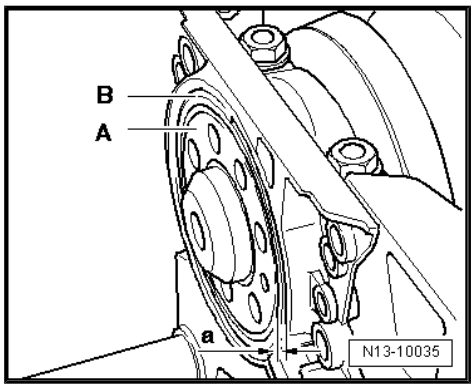
– Remove the Seal Installer - Rear Crankshaft - T10134- .

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– Remove the sealing lip support ring.



The installed position of the sensor wheel on the crankshaft is exact, if a gap -a- of 0.5 mm is present between the crankshaft flange -A- and sensor wheel -B-.

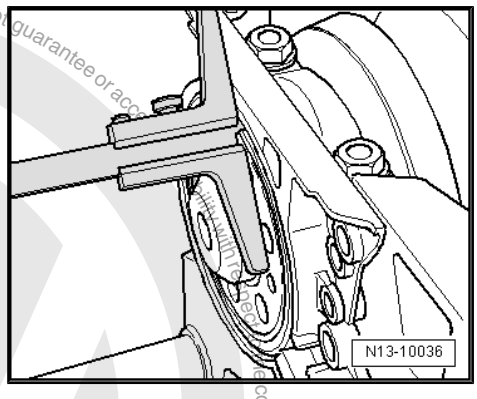


– Set a caliper gauge onto the crankshaft flange.
– Measure the gap -a- between the crankshaft flange and sensor wheel.

If the dimension -a- is too small:

– Press the sensor wheel again. Refer to ⇒ page 62 .

If dimension -a- is obtained:



– Tighten the new sealing flange bolts alternating in a diagonal sequence:
• Tightening specification -item 7- ⇒ Item 7 (page 56) .
– Install the Engine Speed Sensor - G28- . Refer to ⇒ “2.5 Engine Speed Sensor G28 , Removing and Installing”, page 66 .
– Install the oil pan:

  Engine Code CBEA. Refer to ⇒ “2 Lubrication System Components, Engine Code CBEA”, page 153

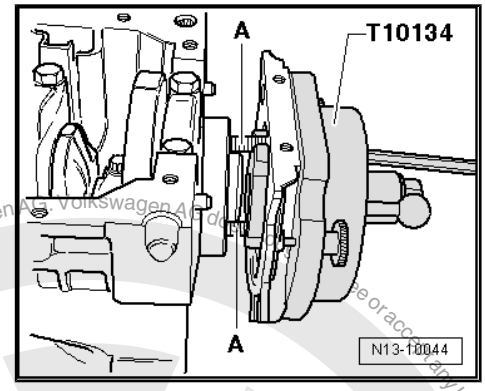
  Engine Codes CJAA. Refer to ⇒ “3 Lubrication System Components, Engine Code CJAA”, page 170 .
– Install the intermediate plate -item 6- ⇒ Item 6 (page 56) .
– Install the flywheel with new bolts:
• Tightening specification -item 4- ⇒ Item 4 (page 56) .

F - Pressing in the Sensor Wheel

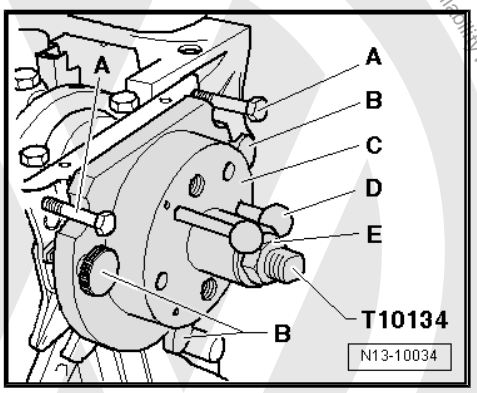
– Secure the Seal Installer - Rear Crankshaft - T10134- onto the crankshaft flange using the hex socket bolts -A-.
– Hand-tighten both hex socket bolts -A-.

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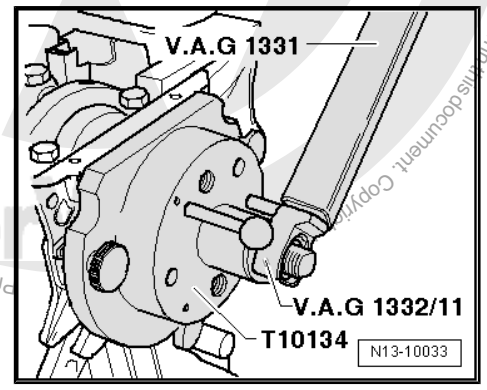
– Push the Seal Installer - Rear Crankshaft - T10134- onto the sealing flange by hand.



– Install the nut -E- onto the threaded spindle by hand, until it rests on the assembly bell -C-.



– Tighten the hex nut on the Seal Installer - Rear Crankshaft - T10134- using a Torque Wrench 5-50Nm - VAG1331- and Torque Wrench 1332 Insert - Open Ring Wrench - 24mm - VAG1332/11- .



- Tightening specification: 40 Nm

– Check the installed position of the sensor wheel on the crankshaft again. Refer to ⇒ page 61 .

If dimension -a- is too small:

– Tighten the nut on the Seal Installer - Rear Crankshaft - T10134- :

- Tightening specification: 45 Nm

– Check the installed position of the sensor wheel on the crankshaft again. Refer to ⇒ page 61 .

2.3 Crankshaft Seal, Replacing, Belt Pulley Side

Removing:

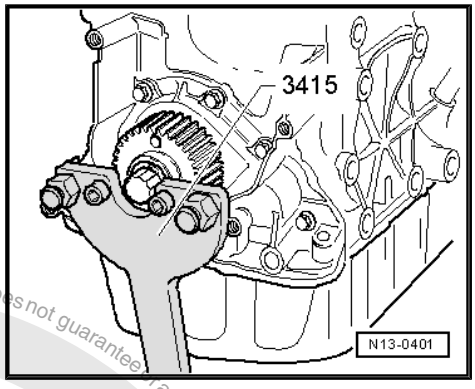
Special tools and workshop equipment required

- Puller - Crankshaft Seal - 3203-
- Counterhold - Crankshaft Sprocket - 3415-
- Seal Installer - Crankshaft Seal - T10053-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-

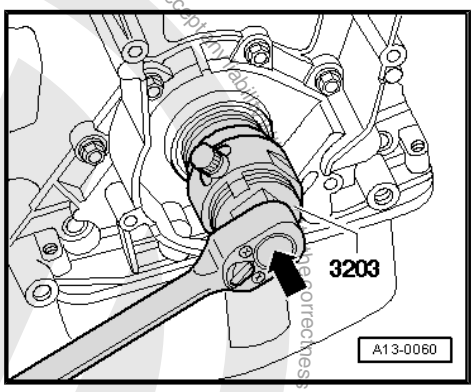
– Remove the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

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– Remove the crankshaft toothed belt sprocket. Secure the toothed belt sprocket with the Counterhold - Crankshaft Sprocket - 3415- .



– To guide the Puller - Crankshaft Seal - 3203- , install the center bolt by hand into the crankshaft all the way.
– Turn the inner section of the Puller - Crankshaft Seal - 3203- two turns (approximately 3 mm) out from the outer section and lock it with the knurled bolt.
– Lubricate the threaded head on the Puller - Crankshaft Seal - 3203- .
– Install the seal puller as far as possible into the seal.
– Loosen the knurled bolt and turn the inner section against the crankshaft until the seal is pulled out.

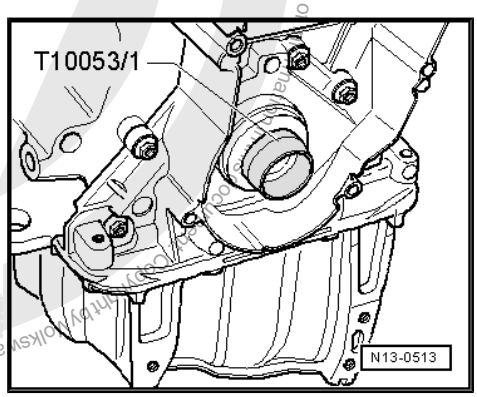


Installing:

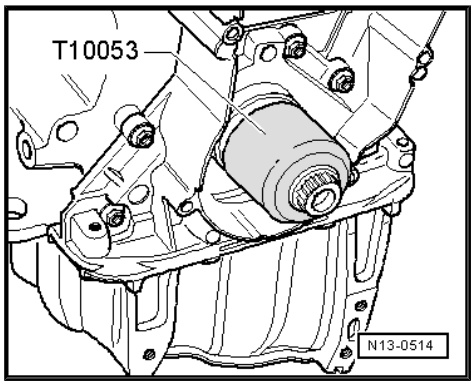
Note

The sealing lip of the seal may not be additionally oiled or greased.

– Wipe off any oil that may still be on the end of the crankshaft with a clean cloth.
– Place Seal Installer - Crankshaft Seal - Guide Sleeve - T10053/1- on the crankshaft journal.
– Push the seal over the Guide Sleeve onto the crankshaft journal.



– Press the seal in all the way with the Seal Installer - Crankshaft Seal - T10053- and the center bolt.
– Install the crankshaft toothed belt sprocket:
• Tightening specification -item 2- ⇒ Item 2 (page 43) .
– Installing and tensioning the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .



2.4 Sealing Flange, Removing and Installing, Belt Pulley Side

Removing

Special tools and workshop equipment required

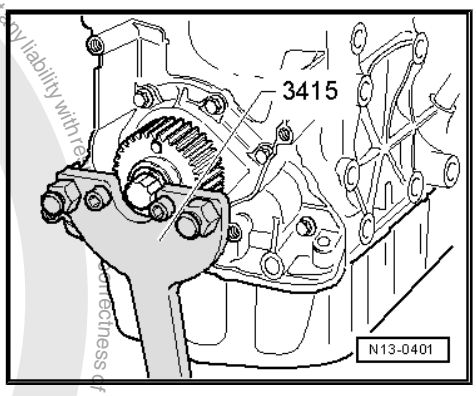
- Counterhold - Crankshaft Sprocket - 3415-
- Seal Installer - Crankshaft Seal - T10053-

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- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Not illustrated
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear
- Flat-Blade Scraper
- Silicone Sealant - D 176 404 A2-

– Remove the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

– Remove the crankshaft toothed belt sprocket. Secure the toothed belt sprocket with the Counterhold - Crankshaft Sprocket - 3415- .



– Remove the oil pan:

Engine Code CBEA. Refer to ⇒ “2 Lubrication System Components, Engine Code CBEA”, page 153

Engine Codes CJAA. Refer to ⇒ “3 Lubrication System Components, Engine Code CJAA”, page 170 .

– Remove the sealing flange belt pulley side.

– Remove the sealing flange. If necessary, loosen it by tapping lightly with a rubber mallet.

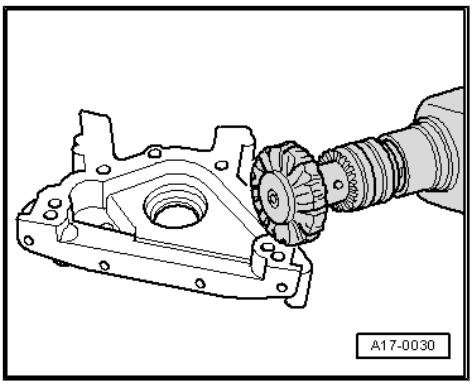
– Remove the sealant residue from cylinder block with a flat-blade scraper.

WARNING

Wear protective eyewear.

– Remove sealant residue from sealing flange using a rotating plastic brush (wear safety glasses).

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



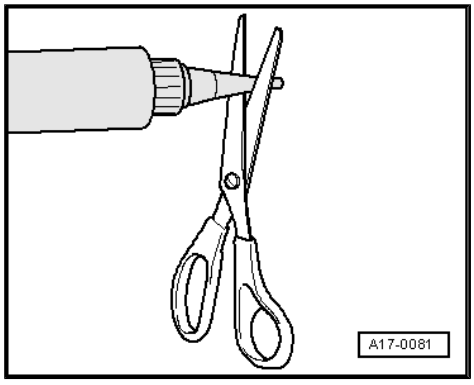
Installing:

Note

- *Note the expiration date for the Sealant .*
- *The sealing flange must be installed within five minutes after applying the Silicone Sealant .*

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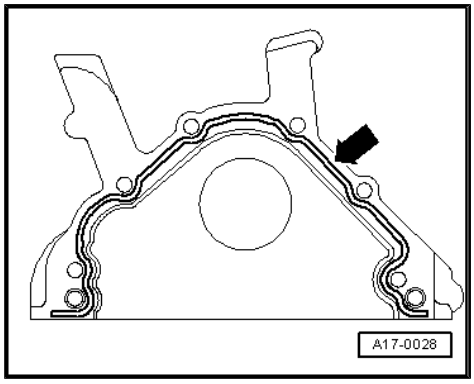
– Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).



Note

- *The sealant bead must not be thicker than 2 to 3 mm.*
- *Otherwise the extra sealant will get into the oil pan and can block the screen in the oil pump suction line.*
- *The sealant also must not drip onto the crankshaft seal sealing surface.*
- *Before applying the bead of sealant, cover the sealing surface on the seal with a clean cloth*

– Apply a silicone sealant bead to the sealing surface of the sealing flange as shown.



– Install the sealing flange immediately and tighten all bolts lightly.

Note

Use Seal Installer - Crankshaft Seal - T10053/1- to position the sealing flange on the installed seal.

– Tighten the sealing flange bolts in a diagonal sequence:
• Tightening specification -item 7- ⇒ Item 7 (page 56) .
– Install the crankshaft toothed belt sprocket:
• Tightening specification -item 2- ⇒ Item 2 (page 43) .
– Install the oil pan:

Engine Code CBEA. Refer to
⇒ “2 Lubrication System Components, Engine Code CBEA”, page 153

Engine Codes CJAA. Refer to
⇒ “3 Lubrication System Components, Engine Code CJAA”, page 170 .

Note

After assembly, allow the Sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.

– Installing and tensioning the toothed belt. Refer to
⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

2.5 Engine Speed Sensor - G28- , Removing and Installing

Removing:

Special tools and workshop equipment required

- Hose Clamps - Up To 25 mm - 3094-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Shop Crane - Drip Tray - VAS6208-

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♦ Hose Clip Pliers - VAS6362-

Conditions

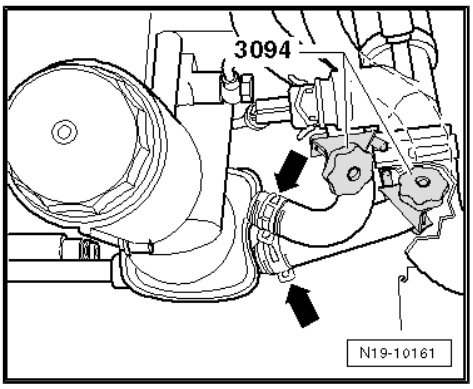
- Engine must be cold.

Procedure

– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

– Clamp off the coolant hoses from the oil cooler using Hose Clamps - Up To 25mm - 3094- .

– Loosen the spring clamps -arrows- using the Hose Clip Pliers - VAS6362- .



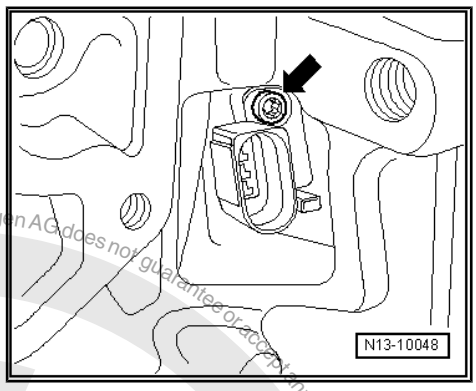
Note

Catch leaking coolant with the Drip Tray - VAS6208- .

– Disconnect the coolant hoses from the oil cooler.

– Remove the oil filter bracket. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 177 .

– Remove the bolt -arrow- and the Engine Speed Sensor - G28- .



Installing:

Install in reverse order of removal. Note the following:

- Engine Speed Sensor - G28- tightening specification -item 9- ⇒ Item 9 (page 56) .
- Oil filter bracket tightening specifications. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 177 , Overview - Oil filter Bracket and Oil Cooler

– Check the coolant level and fill if necessary. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

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3 Pistons and Connecting Rod

⇒ “3.1 Overview - Piston and Connecting Rod”, page 68

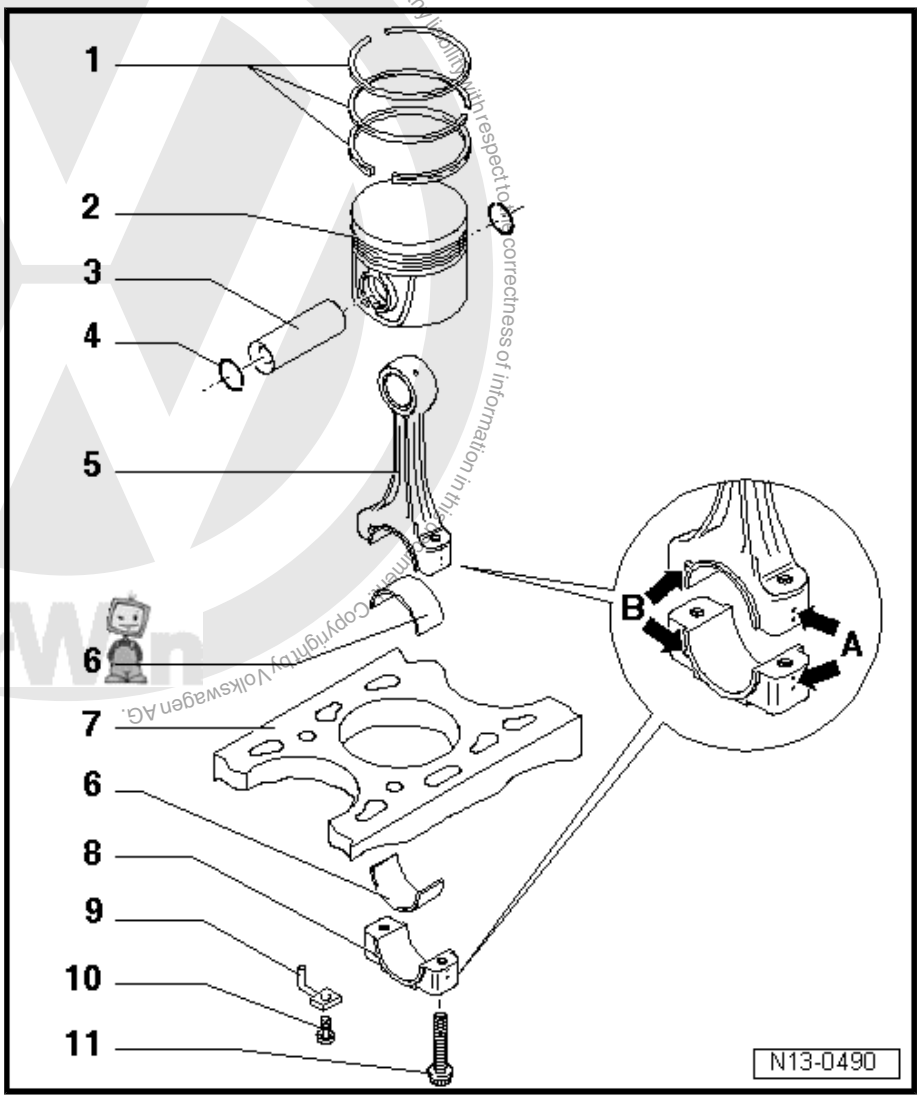
⇒ “3.2 New Connecting Rod, Separating”, page 71

⇒ “3.3 Bearing Shells - Installation Position”, page 72

⇒ “3.4 Piston and Cylinder Dimensions”, page 72

⇒ “3.5 Piston Projection in Top Dead Center (TDC), Checking”, page 72

3.1 Overview - Piston and Connecting Rod



1 - Piston Rings

- ❑ Offset gaps by 120°
- ❑ Use piston ring pliers for removing and installing
- ❑ “TOP” identification faces toward piston crown
- ❑ Checking the ring gap. Refer to ⇒ Fig. ““Checking the Piston Ring Gap”“ , page 69 .
- ❑ Checking the groove clearance. Refer to ⇒ Fig. ““Piston Ring Groove Clearance, Checking”“ , page 70 .

2 - Piston

- ❑ With the internal combustion engine
- ❑ Mark the installed position and cylinder allocation
- ❑ Installed position and allocation, piston/cylinder. Refer to ⇒ Fig. ““Installed Position of Piston and Piston/Cylinder Allocation”“ , page 71 .
- ❑ Arrow on piston crown points toward belt pulley side
- ❑ Install with piston ring compressor
- ❑ Replace the piston if the piston shaft is cracked
- ❑ Check the piston projection in TDC. Refer to ⇒ “3.5 Piston Projection in Top Dead Center (TDC), Checking”, page 72 .

3 - Piston Pin

- ❑ If difficult to move, heat piston to 60 °C (140 °F)
- ❑ Remove and install using the Pilot Drift - VW222A-

4 - Circlip

5 - Connecting Rod

- ❑ Label the allocation to the cylinder using a color marker -A-

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- ❑ Installation position: the marks -B- face the belt pulley side
- ❑ With cracked bearing cap
- ❑ New connecting rod, disconnecting. Refer to ⇒ “3.2 New Connecting Rod, Separating”, page 71 .

6 - Bearing Shell

- ❑ Note the installation position Refer to ⇒ “3.3 Bearing Shells - Installation Position”, page 72 .
- ❑ Pay attention to the version: upper bearing shell (facing the piston) is made from wear resistant material; characteristic: a black line on the running surface near the separating point
- ❑ Do not interchange used bearing shells.
- ❑ Insert bearing shells in the center
- ❑ Check for secure fit
- ❑ Axial play wear limit: 0.37 mm
- ❑ Measure the radial play with Plastigage®: wear limit: 0.08 mm
- ❑ Do not turn the crankshaft when measuring radial clearance

7 - Cylinder Block

- ❑ Checking the cylinder bore. Refer to ⇒ Fig. ““Cylinder Bore, Checking”“ , page 70 .
- ❑ Pistons and cylinder dimensions. Refer to ⇒ “3.4 Piston and Cylinder Dimensions”, page 72 .

8 - Connecting Rod Bearing Cap

- ❑ Note the installation position
- ❑ Due to the separation procedure (cracking) of the connecting rod, the connecting rod bearing cap only fits in one position and only to the corresponding connecting rod.

9 - Oil Spray Jet

- ❑ For piston cooling

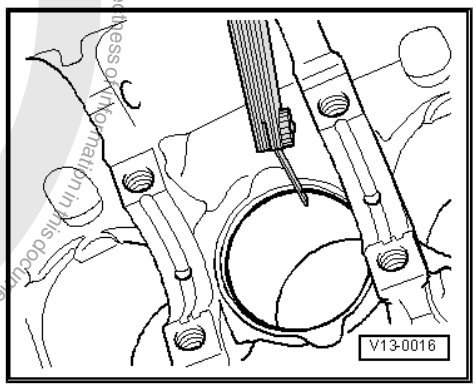
10 - Bolt with Pressure Relief Valve

- ❑ 27 Nm
- ❑ Install without sealant

11 - Connecting Rod Bolt

- ❑ 30 Nm + $^1/_4$ (90°) additional turn
- ❑ Replace
- ❑ Lubricate the threads and contact surface.
- ❑ Use the old bolt to measure the radial clearance

Checking the Piston Ring Gap



Special tools and workshop equipment required

- ♦ Feeler Gauge

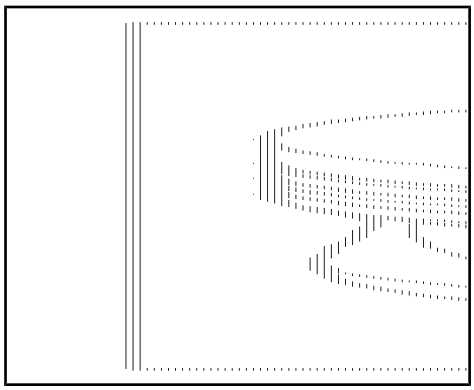
Procedure

– Push the piston ring squarely from above down to approximately 15 mm from edge of the cylinder.

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Piston Ring	Ring Gap	
Dimensions in mm	New	Wear limit
1. Compression ring	0.20 to 0.40	1.0
2. Compression ring	0.20 to 0.40	1.0
Oil Scraping Ring	0.25 to 0.50	1.0

Piston Ring Groove Clearance, Checking



Special tools and workshop equipment required

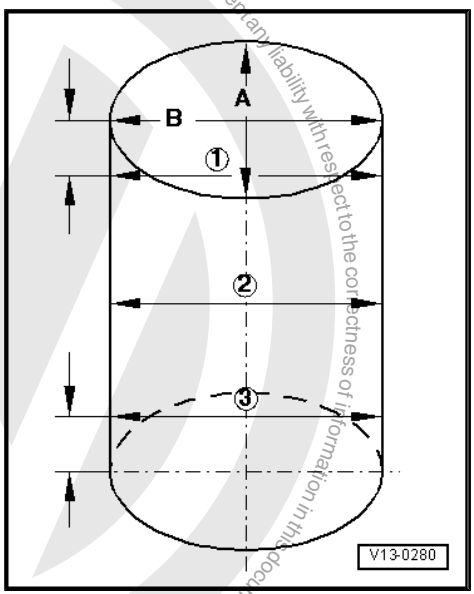
- Feeler Gauge

Procedure

– Clean the ring groove before checking.

Piston Ring	Ring to Groove Clearance	
Dimensions in mm	New	Wear limit
1. Compression ring	0.06 to 0.09	0.25
2. Compression ring	0.05 to 0.08	0.25
Oil Scraping Ring	0.03 to 0.06	0.15

Cylinder Bore, Checking



Special tools and workshop equipment required

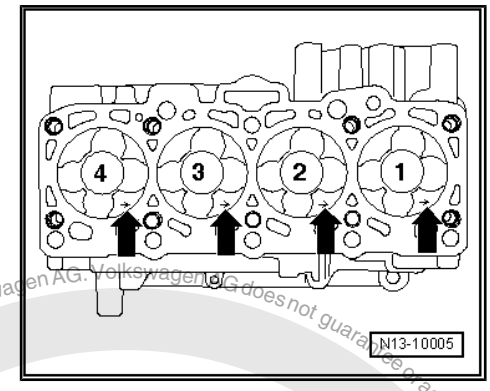
- Inner measuring device 50 to 100 mm

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Procedure

– Measure bores at three locations diagonally transversely -A- and lengthwise -B- in line with crankshaft.

• Deviations to the specified size: maximum 0.10 mm



Note

The cylinder bore must not be measured when the cylinder block is mounted in the Engine and Gearbox Bracket - VAS6095A- because the measurements may be incorrect.

Installed Position of Piston and Piston/Cylinder Allocation

The arrow on the piston crown -arrows- points toward the belt pulley side.

3.2 New Connecting Rod, Separating

New connecting rods might not be completely separated at the predetermined breaking point. If it is difficult to remove the connecting rod bearing cap by hand, do the following:

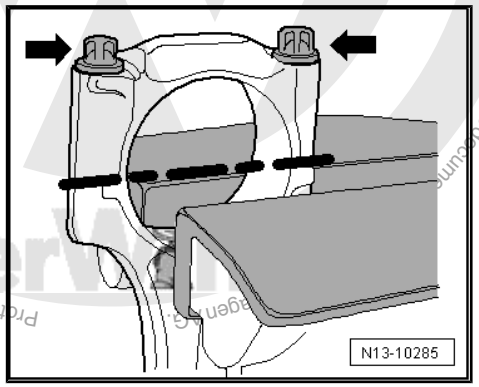
– Mark which cylinder belongs to the connecting rod.

– To prevent damage, only clamp the connecting rod lightly in a vise with protective covers over the jaws as shown.

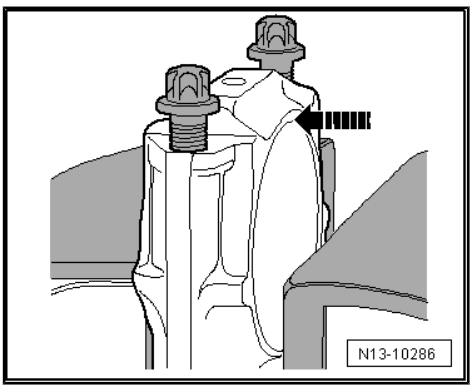
Note

Clamp the connecting rod below the dotted line.

– Remove the bolts -arrows- approximately five turns.



– Carefully tap the connecting rod bearing cap with a plastic hammer in direction of -arrow- until it comes loose.



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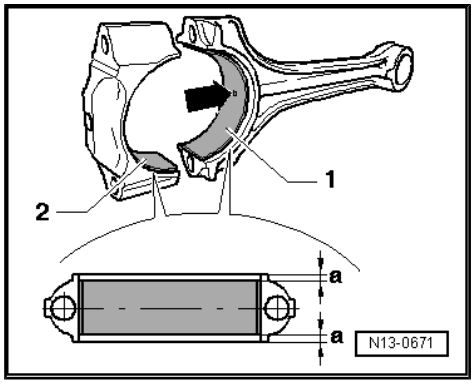
3.3 Bearing Shells - Installation Position

Bearing shell -1- with connecting rod oil filler hole -arrow-.

Bearing shell -2- without oil filler hole for connecting rod cover.

– Place the bearing shells centrally into connecting rod and connecting rod bearing cap.

The dimension -a- must be the same at left and right.



3.4 Piston and Cylinder Dimensions

Honing dimension	Piston and Cylinder Dimensions	
Dimensions in mm	Piston diameter 1)	Cylinder bore diameter
Standard dimension	80.960	81.010

1) Take measurement approximately 12 mm from the lower edge of the piston and offset 90° to the piston pin axis.

3.5 Piston Projection in Top Dead Center (TDC), Checking

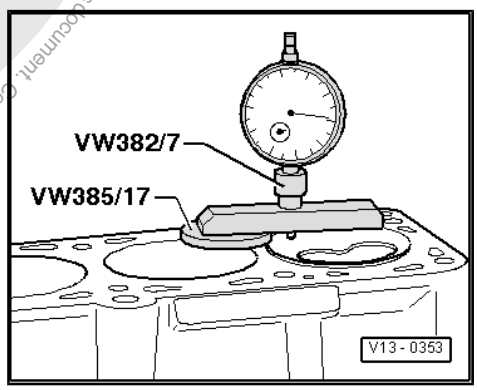
⇒ “3.5.1 Cylinder Head Gasket Identification”, page 73

Special tools and workshop equipment required

- Measuring Bar - VW382/7-
- Measuring Set - Magnetic Plate - 50mm - VW385/17-
- Dial Gauge - 0-10mm - VAS6079-

Test Sequence

When installing new pistons or working with a partial engine, check the piston projection in TDC on all pistons. Depending on the piston projection, install the corresponding cylinder head gasket according to the following table.



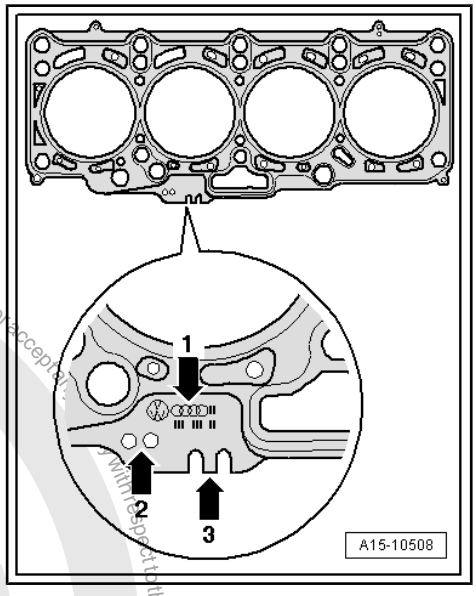
Note

- *To measure the piston position at TDC, turn the engine clockwise.*
- *If varying values occur when measuring the projection, use the gasket for the largest value.*

Piston Projection	Identification Notches/Holes
Dimensions in mm	
0.91 to 1.00	1
1.01 to 1.10	2
1.11 to 1.20	3

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3.5.1 Cylinder Head Gasket Identification



- Part number = -arrow 1-
- Holes = -arrow 2-
- Control code = -arrow 3- (ignore this!)

Note

- *Depending on piston projection, varying cylinder head gasket thicknesses can be installed. Be sure to use a gasket having the identical identification when replacing.*
- *Determine the piston position in TDC when installing new pistons or partial engines. Refer to* *⇒ "3.5 Piston Projection in Top Dead Center (TDC), Checking", page 72* .

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4 Crankshaft

⇒ "4.1 Overview - Crankshaft", page 74

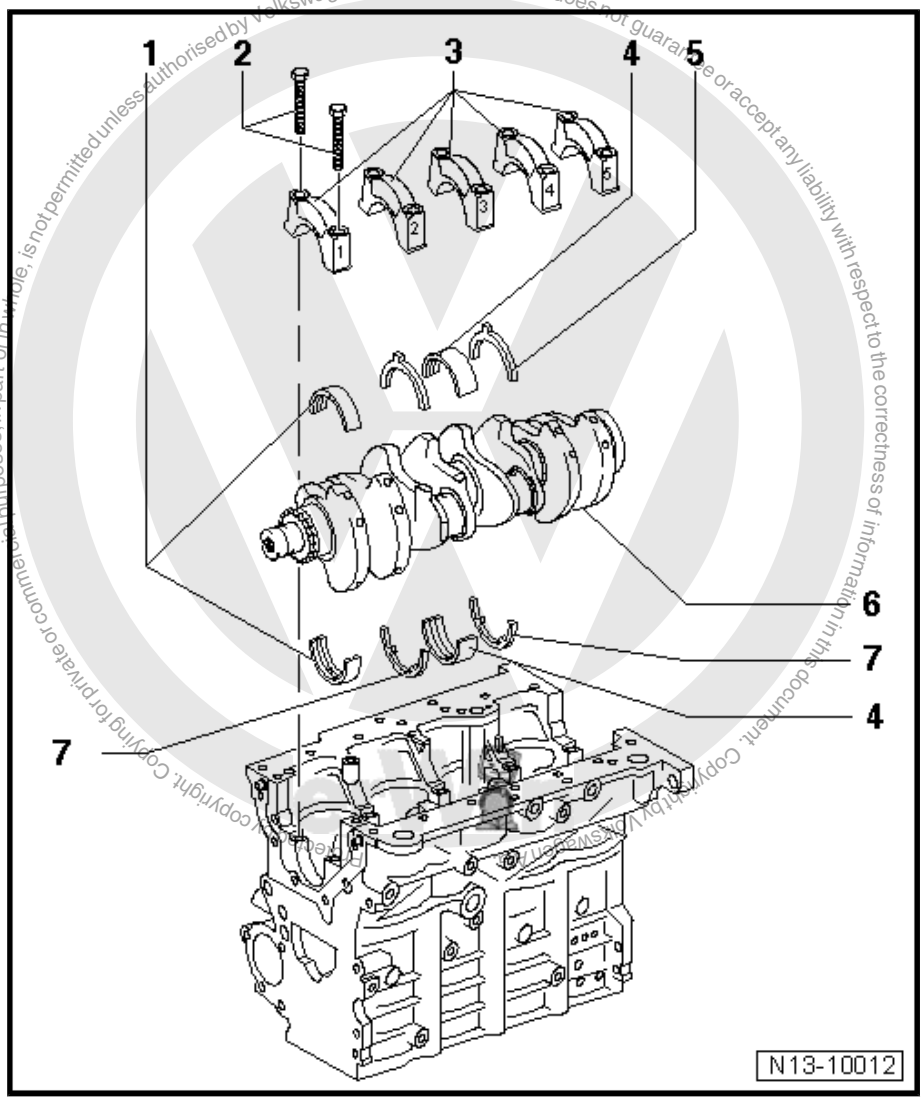
⇒ "4.2 Crankshaft Dimensions", page 75

⇒ "4.3 Needle Bearings, Removing and Installing from Crankshaft", page 75

4.1 Overview - Crankshaft

Caution

- *If the crankshaft is removed, a new intermediate sprocket must -item 14- ⇒ Item 14 (page 154) be installed with coating and the hub -item 11- ⇒ Item 11 (page 154) including the bolt -item 12- ⇒ Item 12 (page 154) and axial bearing discs -item 13- ⇒ Item 13 (page 154) must be replaced, or else the backlash will not be correct.*
- *Installation procedure. Refer to ⇒ "2.4.2 New Balance Shaft Assembly, Installing", page 161 , New Balance Shaft Assembly, Installing*



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 them)

2 - Bolts

- ❑ 65 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ Tighten to 65 Nm to measure radial clearance but do not tighten further.

3 - Bearing Cap

- ❑ Bearing cap 1: belt pulley side
- ❑ Bearing cap 3 with openings for thrust washers
- ❑ Retaining tabs for cylinder block/bearing cap bearing shells must lie above one another

4 - Bearing Shell 3

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

5 - Thrust Washer

- ❑ For the bearing cap 3

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- ❑ Pay attention to the installation position

6 - Crankshaft

- ❑ "Pay attention to the warnings". Refer to ⇒ page 74 .
- ❑ New axial play: 0.07 to 0.17; wear limit: 0.37 mm
- ❑ Measure the radial clearance with Plastigage®. New: 0.03 to 0.08 mm, wear limit: 0.17 mm
- ❑ Do not turn the crankshaft when measuring radial clearance
- ❑ Crankshaft dimensions. Refer to ⇒ "4.2 Crankshaft Dimensions", page 75 .

7 - Thrust Washer

- ❑ For cylinder block, bearing 3

4.2 Crankshaft Dimensions

Dimension	Crankshaft Bearing Pin Diameter		Connecting Rod Bearing Pin Diameter	
Dimensions in mm				
Standard dimension	54.000	-0.022 -0.042	50.90	-0.022 -0.042

4.3 Needle Bearings, Removing and Installing from Crankshaft

Only Vehicles with a DSG® Transmission

Special tools and workshop equipment required

- ♦ Puller - Kukko Internal - 14-19mm - 21/2-
- ♦ Puller - Kukko Counterstay - 22/1-
- ♦ Alignment Tool - Clutch Plate - 3176-
- ♦ Bearing Installer - Bearing Press Piece - VW207C-

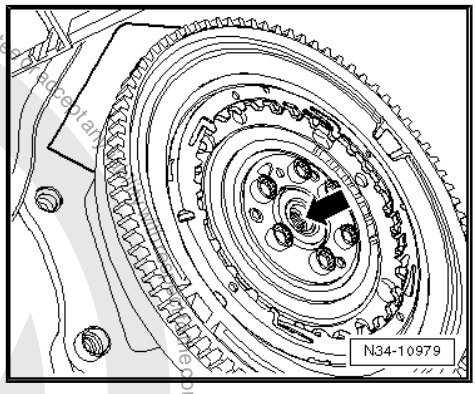
Note

Always replace the needle bearing -arrow- if the engine or the transmission is being removed.

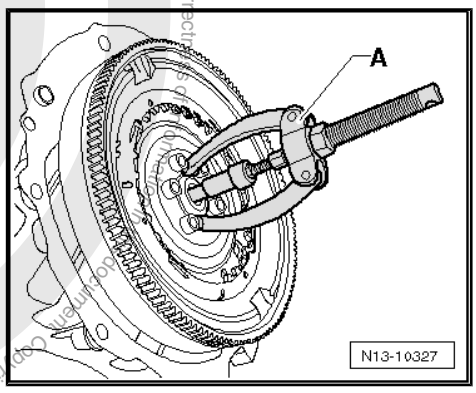
Procedure

- The transmission is unflanged from the engine

Remove the needle bearing:



– Remove with a commercially available puller -A-, for example Puller - Kukko Internal - 14-19mm - 21/2- and Puller - Kukko Counterstay - 22/1- .

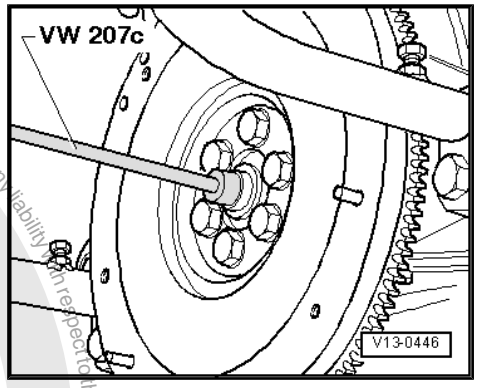


Installing

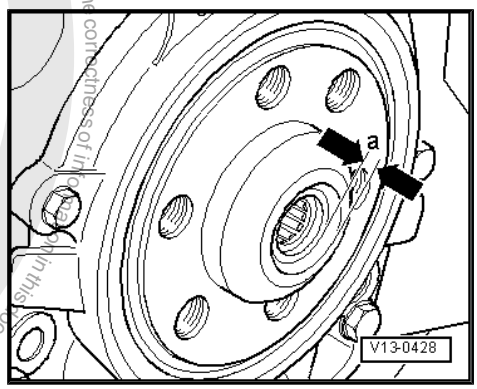
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– Needle bearing with Bearing Installer - Bearing Press Piece - VW207C- or with Alignment Tool - Clutch Plate - 3176- .
– Carefully install the needle bearing.
– Measure the installation depth constantly while installing.

Replace Bearings That Have Been Installed Too Deep.



• Installation depth: dimension -a- = 1.5 to 1.8 mm.

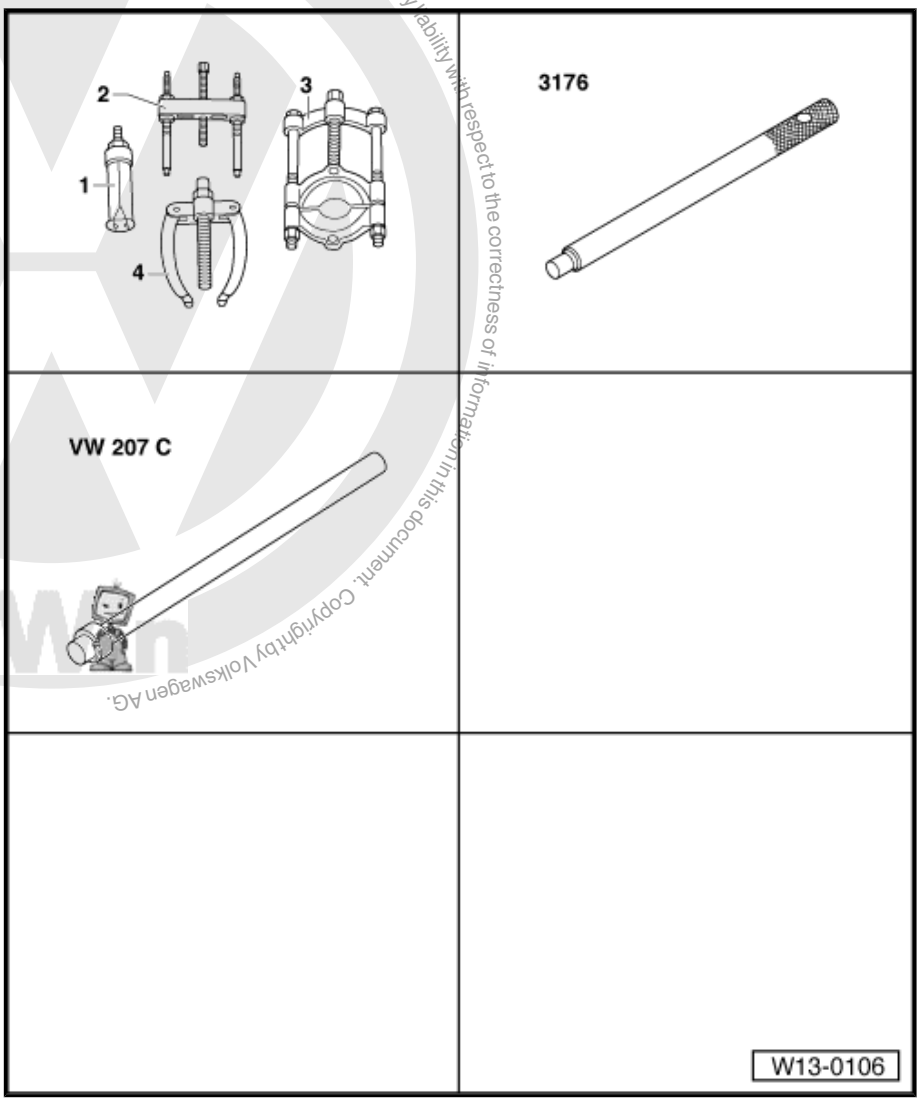


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5 Special Tools

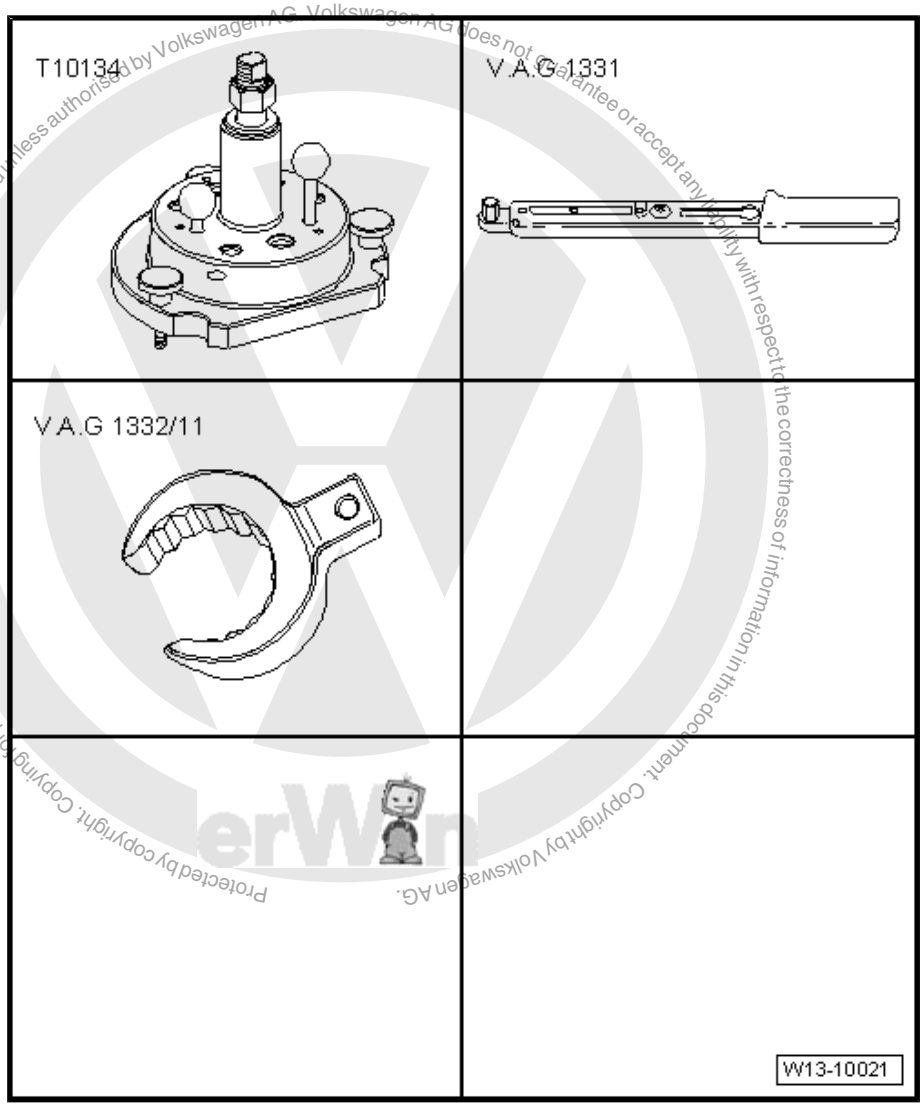
Special tools and workshop equipment required

- -1- Puller - Kukko Internal - 14-19mm - 21/2-
- -4- Puller - Kukko Counter-stay - 22/1-
- Alignment Tool - Clutch Plate - 3176-
- Bearing Installer - Bearing Press Piece - VW207C-



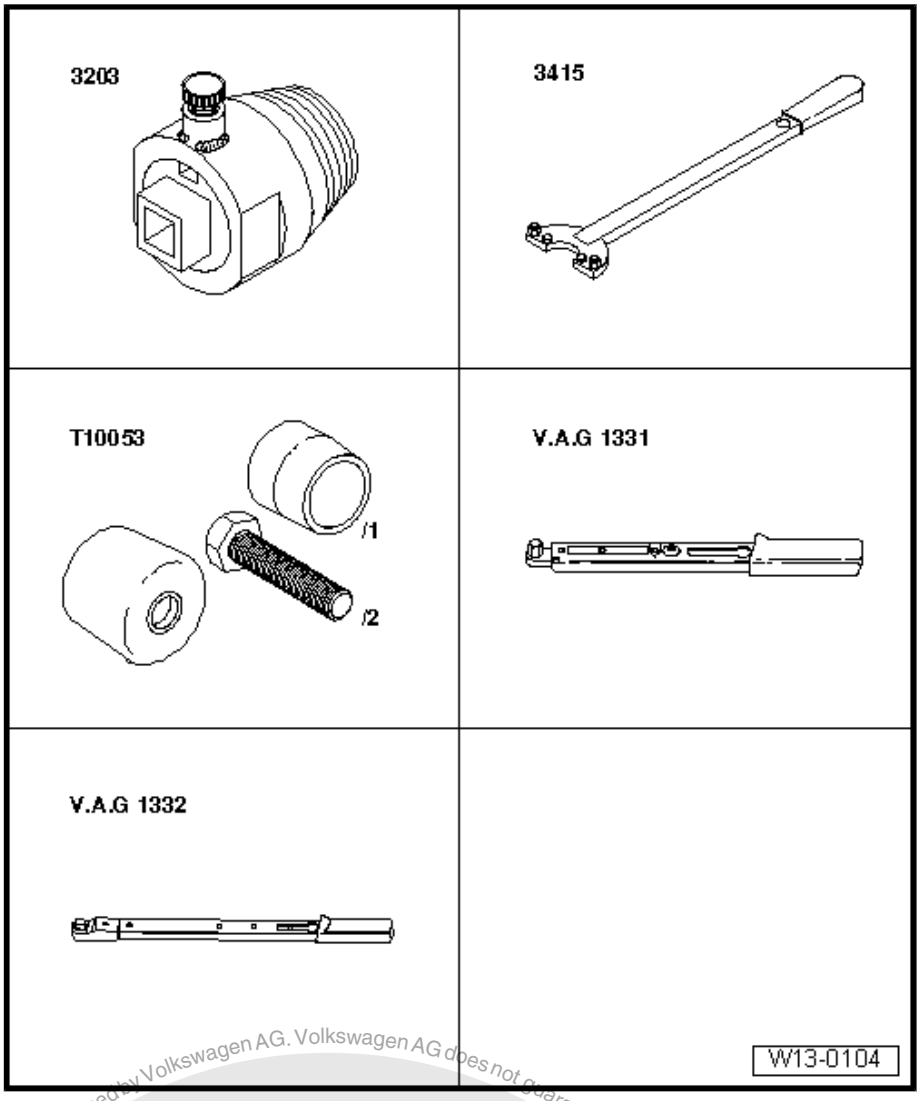
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- Seal Installer - Rear Crankshaft - T10134-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Open Ring Wrench - 24mm - VAG1332/11-



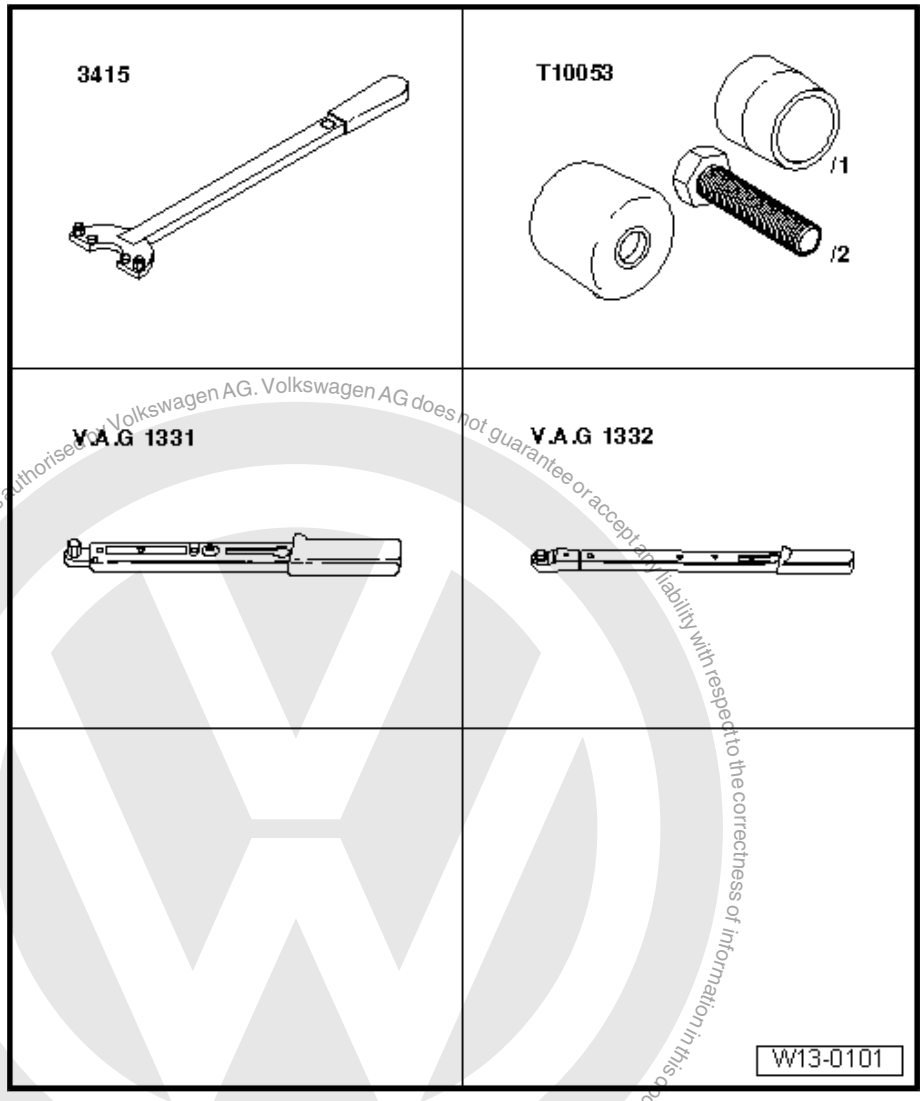
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- Puller - Crankshaft Seal - 3203-
- Counterhold - Crankshaft Sprocket - 3415-
- Seal Installer - Crankshaft Seal - T10053-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-



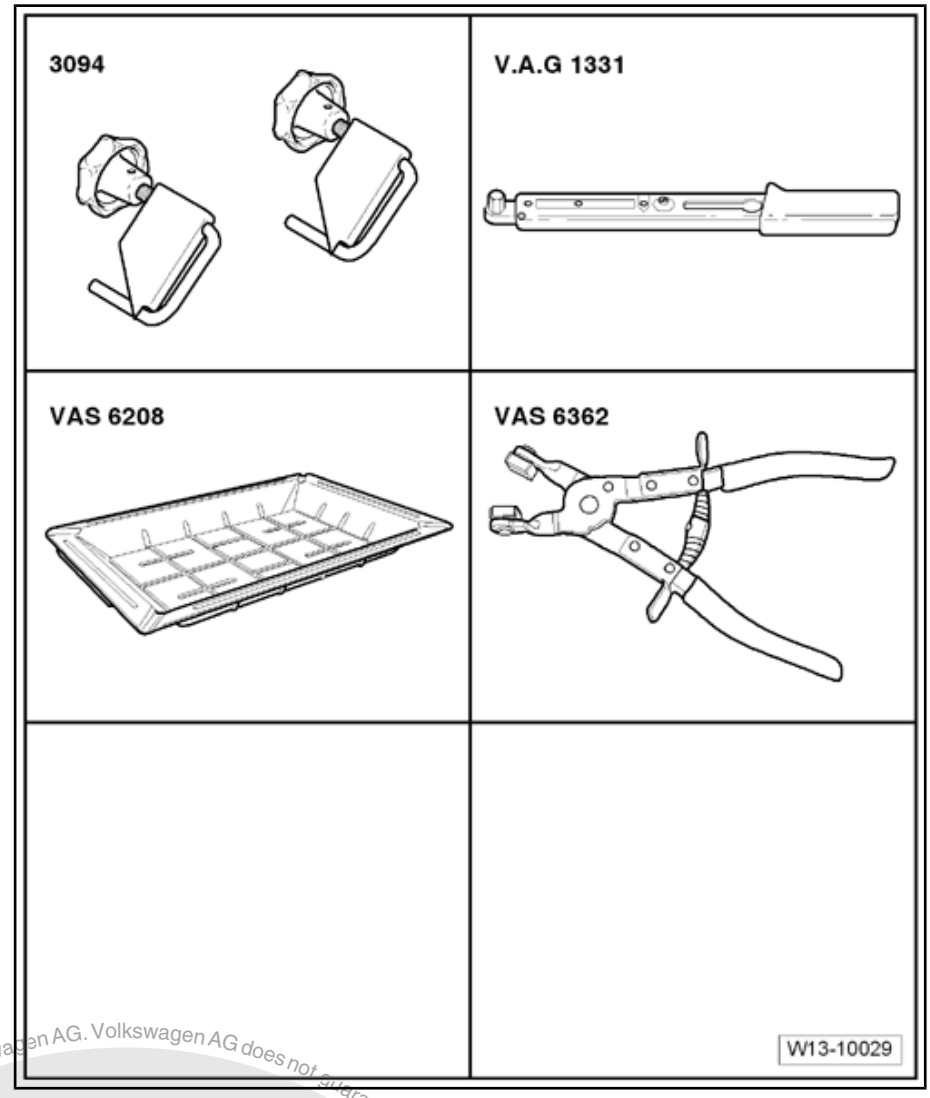
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- Counterhold - Crankshaft Sprocket - 3415-
- Seal Installer - Crankshaft Seal - T10053-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-

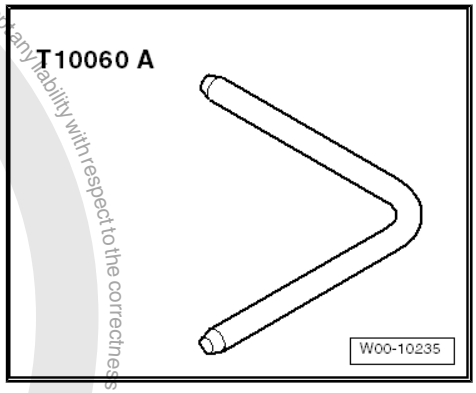


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- Hose Clamps - Up To 25 mm - 3094-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Shop Crane - Drip Tray - VAS6208-
- Hose Clip Pliers - VAS6362-

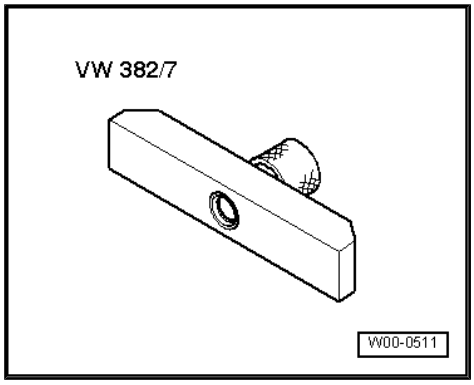


- Locking Pin - T10060A-

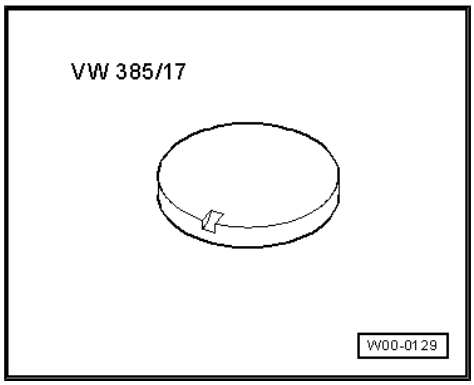


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- Measuring Bar - VW382/7-



- Measuring Set - Magnetic Plate - 50mm - VW385/17-



- Not illustrated:
- Caliper gauge
- M6 x 35 mm hex bolts (quantity: 3)
- M7 x 35 mm hex bolts (quantity: 2)
- Dial Gauge - 0-10mm - VAS6079-
- Engine Support Bridge - 10-222A-
- Seal Installer - Rear Crankshaft - T10134-
- Hose Clamps - Up To 25mm - 3094-

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15 – Cylinder Head, Valvetrain

1 Cylinder Head

⇒ “1.1 Overview - Cylinder Head Cover”, page 83

⇒ “1.2 Overview - Cylinder Head”, page 85

⇒ “1.3 Camshaft Position Sensor G40 , Removing and Installing”, page 87

⇒ “1.4 Engine Cover, Removing and Installing”, page 90

⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90

⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95

⇒ “1.7 Cylinder Head, Removing and Installing”, page 103

⇒ “1.8 Vacuum Pump, Removing and Installing”, page 126

⇒ “1.9 Compression, Checking”, page 127

1.1 Overview - Cylinder Head Cover

1 - Bolt
- ❑ 5 Nm

2 - Bolt
- ❑ 22 Nm

3 - Protective Strip
- ❑ For the rail element (high pressure reservoir) and high pressure lines

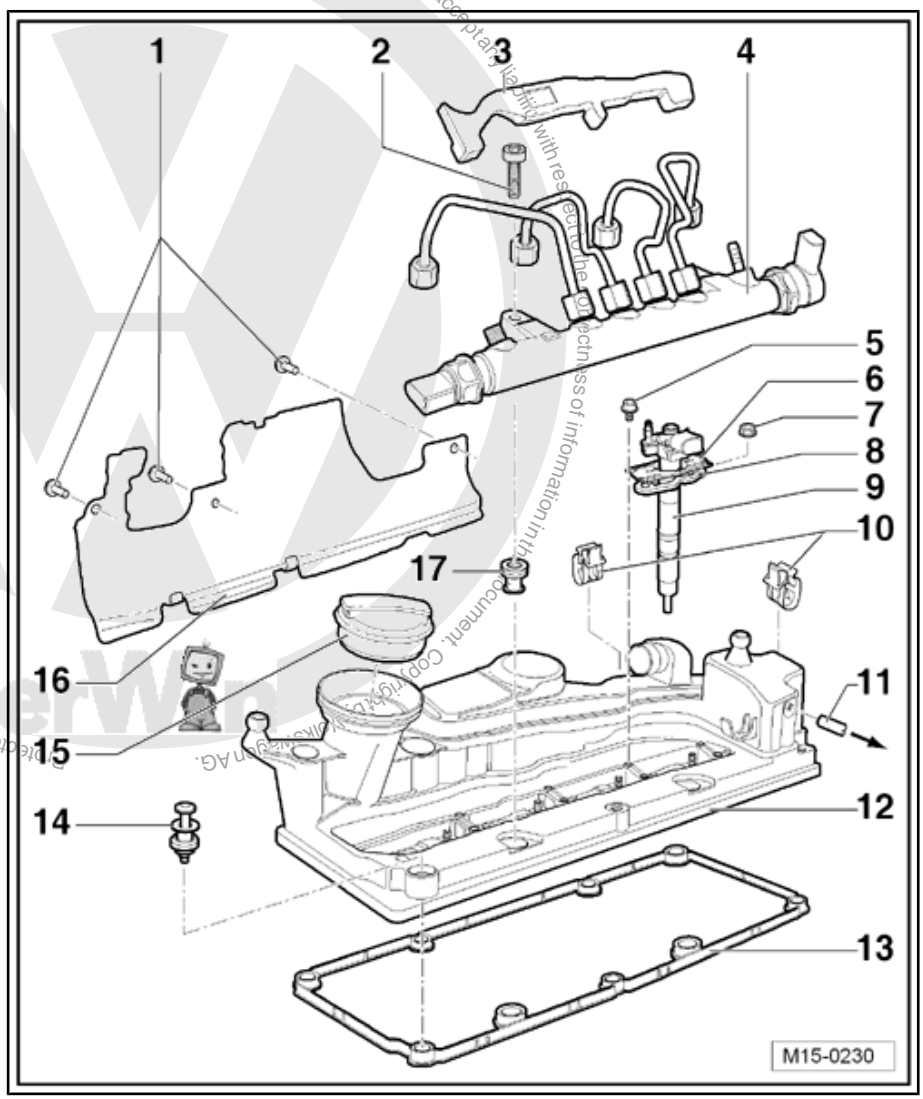
4 - Rail Element (High Pressure Reservoir)
- ❑ With high pressure lines
- ❑ Do not change the angles of the high pressure lines
- ❑ Refer to ⇒ “3.3 Overview - Fuel System”, page 311 . Overview - Fuel System

5 - Bolt
- ❑ 5 Nm

6 - Fuel Injector Cover

7 - Nut
- ❑ 10 Nm

8 - Tensioning Claw
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ Fig. ““Tensioning Bracket Installation Position”“ , page 314 .



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9 - Fuel Injector (Piezo Injector)

Overview - Fuel System. Refer to ⇒ “3.3 Overview - Fuel System”, page 311 .

10 - Bracket

- ❑ For wiring harness

11 - Vacuum Hose

- ❑ Check for secure fit and kink free routing
- ❑ To the Wastegate Bypass Regulator Valve - N75-

12 - Cylinder Head Cover

- ❑ Removing and installing. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

13 - Seal

- ❑ Replace if damaged or leaking

14 - Bolts

- ❑ 10 Nm
- ❑ Observe the sequence for loosening and tightening . Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 , Cylinder Head Cover, Removing and Installing

15 - Cap

- ❑ Replace the seal if damaged.

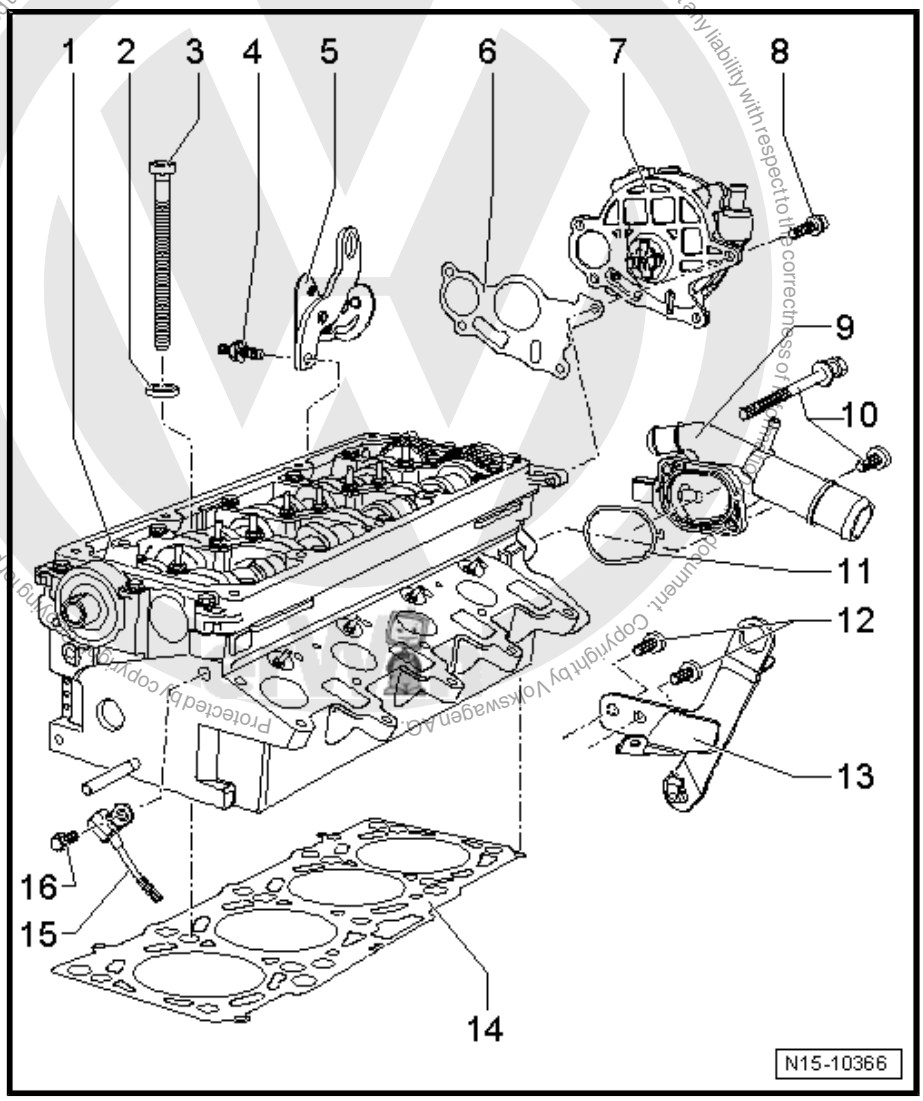
16 - Heat Shield

17 - Bushing

- ❑ For the rail element (high pressure reservoir) - mounting
- ❑ Replace if damaged

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1.2 Overview - Cylinder Head



1 - Cylinder Head

- ❑ Observe the notes. Refer to ⇒ page 94 .
- ❑ Checking for distortion. Refer to ⇒ Fig. ""Cylinder Head, Checking for Distortion"" , page 86
- ❑ Removing and installing. Refer to ⇒ "1.7 Cylinder Head, Removing and Installing", page 103 .
- ❑ All of the coolant must be replaced after installing
- ❑ Compression Pressure, Checking. Refer to ⇒ "1.9 Compression, Checking", page 127 .

2 - Washer

- ❑ For the cylinder head bolt

3 - Cylinder Head Bolt

- ❑ Observe the sequence for loosening and tightening . Refer to ⇒ "1.7 Cylinder Head, Removing and Installing", page 103 , Cylinder Head, Removing and Installing
- ❑ Before installing, insert washers -item 2- ⇒ Item 2 (page 85) into cylinder head

4 - Bolt

- ❑ 25 Nm

5 - Lifting Eye

6 - Seal

- ❑ Replace

7 - Vacuum Pump

> **DANGER!**
> *Do not disassemble the vacuum pump under any circumstances because it can cause the vacuum component to malfunction. The result would be brake booster failure.*

- ❑ Removing and installing. Refer to ⇒ "1.8 Vacuum Pump, Removing and Installing", page 126 .

8 - Bolt

- ❑ 10 Nm

9 - Coolant Connection

- ❑ Coolant Hose Connection Diagram. Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .

10 - Bolt

- ❑ 10 Nm

11 - Seal

- ❑ Replace

12 - Bolt

- ❑ 25 Nm

13 - Lifting Eye

14 - Cylinder Head Gasket

- ❑ Replace
- ❑ Observe the identification. Refer to ⇒ Fig. ““Cylinder Head Gasket Identification”“ , page 87 .
- ❑ All of the coolant must be replaced after replacing

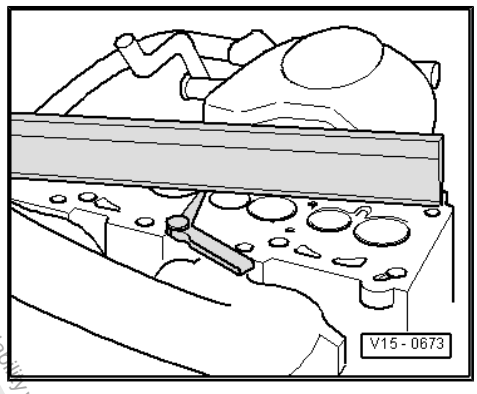
15 - Camshaft Position Sensor - G40-

- ❑ For camshaft position

16 - Bolt

- ❑ 10 Nm

Cylinder Head, Checking for Distortion



Special tools and workshop equipment required

- ◆ Straight Edge - 500mm - VAS6075-
- ◆ Feeler Gauge

Procedure

1. Check the cylinder head in several places for distortion using a Straight Edge and a feeler gauge.
   - Maximum permitted distortion: 0.10 mm.

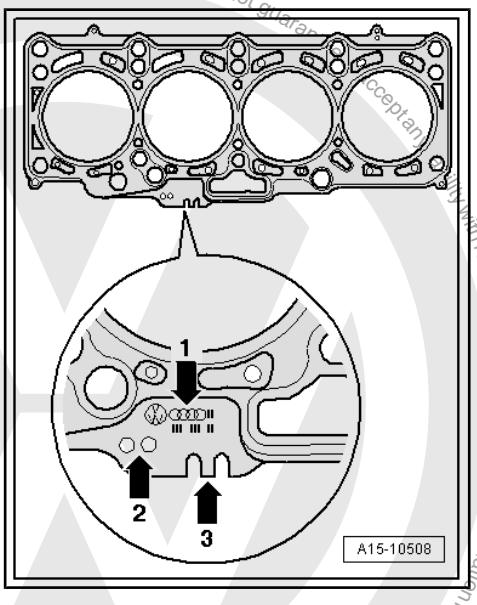
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Note

Remanufacturing diesel cylinder heads is not permitted.

Cylinder Head Gasket Identification

- Part number = -arrow 1-
- Holes = -arrow 2-
- Control code = -arrow 3- (ignore this!)
- Installed position: the identification mark faces up.



Note

- *Depending on piston projection, varying cylinder head gasket thicknesses can be installed. When replacing a gasket, install a gasket with the same identification -arrow 3-.*
- *Determine the piston position at TDC when installing new pistons or a partial engine. Refer to ⇒ "3.5 Piston Projection in Top Dead Center (TDC), Checking", page 72 .*

1.3 Camshaft Position Sensor - G40-, Removing and Installing

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

– Remove the fuel filter and the Auxiliary Fuel Pump - V393- . Refer to ⇒ "6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing", page 259 .

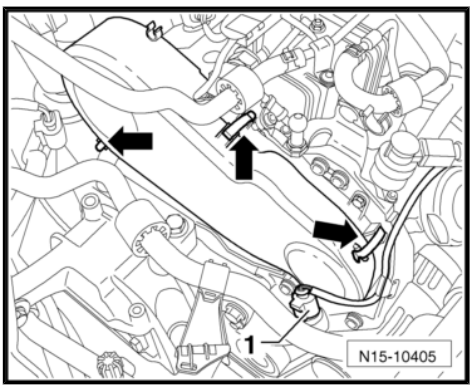
– Disconnect the connector from the Engine Coolant Temperature Sensor on Radiator Outlet - G83- .

– Open the clamps -arrows- and remove the toothed belt guard.

– Remove the right front wheel housing liner.

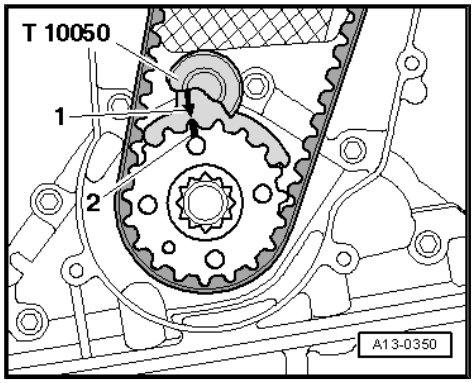
– Remove the ribbed belt. Refer to ⇒ "1.4 Ribbed Belt, Removing and Installing", page 47 .

– Remove the vibration damper -item 29- ⇒ Item 29 (page 45) .



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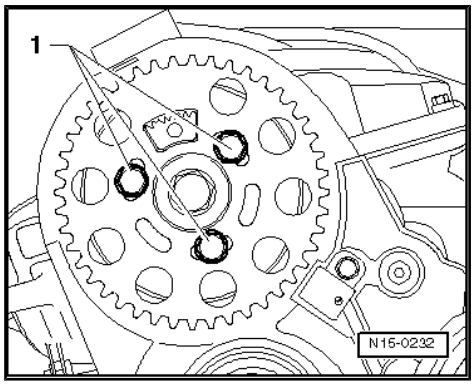
– Rotate the engine to TDC and secure the crankshaft toothed belt sprocket with the Crankshaft Stop - T10050- . Push the crankshaft stop from the front side of the toothed belt sprocket into the splines. The camshaft toothed segment must be in the »12 o'clock« position.



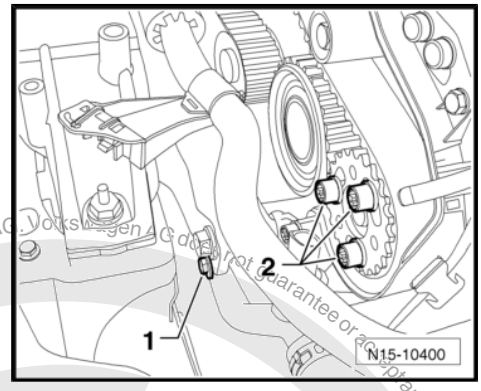
Note

The markings on the crankshaft toothed belt sprocket -2- and the Crankshaft Stop - T10050- -1- must align. The pin on the Crankshaft Stop - T10050- must engage in the hole on the sealing flange.

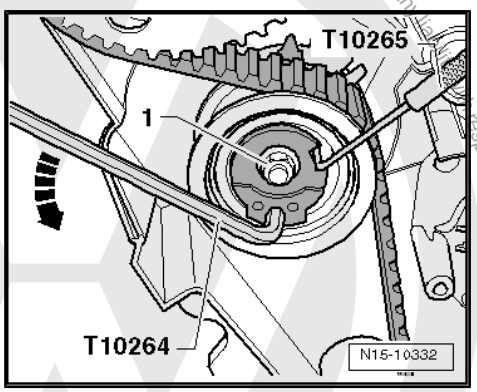
– Loosen the camshaft sprocket bolts -1-.



– Loosen the coolant pipe bolt -1- and then the bolts for the high pressure pump toothed belt sprocket -2-.

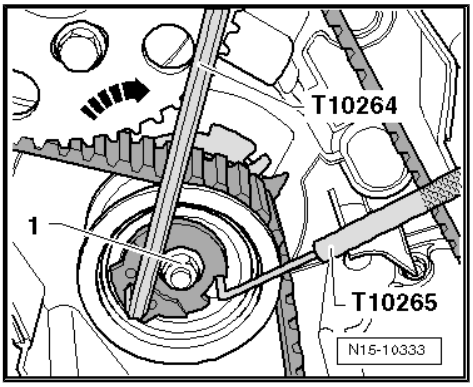


– Loosen the tensioning roller nut -1- and turn the tensioning roller eccentric pulley with the Wrench - Tensioning Roller - T10264- counter-clockwise in direction of -arrow-, until the tensioning roller can be locked with the Tensioning Roller Locking Tool - T10265- .

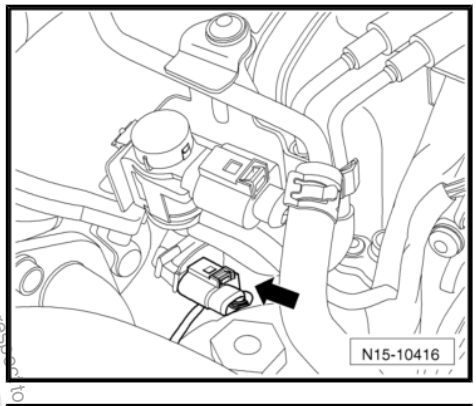


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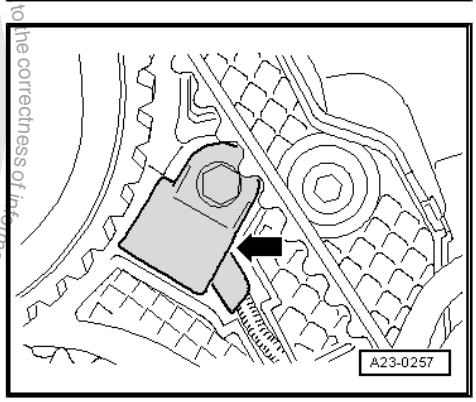
– Now turn the tensioning roller eccentric pulley clockwise in direction of -arrow- all the way and tighten the nut -1- by hand.
– Remove the toothed belt from the idler roller and the high pressure pump.



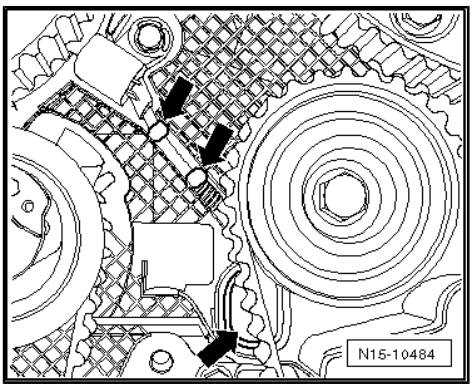
– Disconnect the connector for the Camshaft Position Sensor - G40- -arrow-.
– Disconnect from the retainer.



– Remove the Camshaft Position Sensor - G40- -arrow-.
– Remove the ribs with a screwdriver and remove the cover for the opening -arrows-.



– Remove the Camshaft Position Sensor - G40- from the cylinder head and guide its connector through the opening in the toothed belt guard.



Installing

Install in reverse order of removal. Note the following:

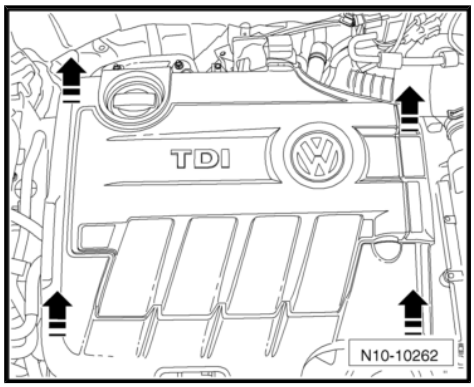
♦ Seal the opening in the toothed belt guard with a rubber plug. Refer to the Parts Catalog.
– Mount the toothed belt and adjust the valve timing. Refer to ⇒ , page 98 .

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1.4 Engine Cover, Removing and Installing

Removal

– Pull the engine cover at the corners in direction of -arrows- upward out of the mounting points with a jerking motion.

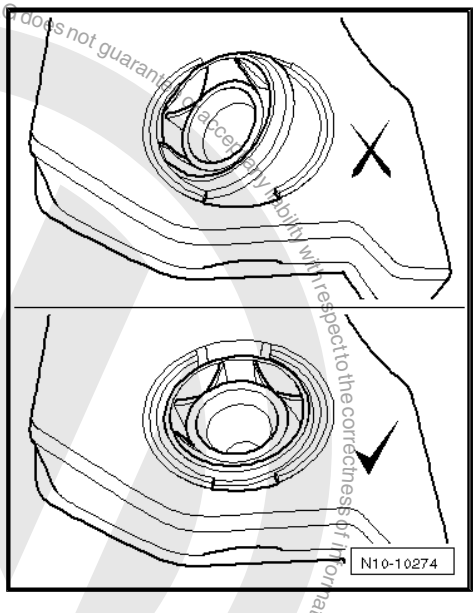


Installing

> **Caution**
>
> ***Make sure the four fasteners (ball sockets) are positioned correctly before installing the engine cover. Move them back into their position, if necessary. Otherwise the engine cover could be damaged.***

– Press the engine cover ball sockets into the correct installation position if necessary.

– Position the engine cover on the mounting points and press the corners into the retainers.



1.5 Cylinder Head Cover, Removing and Installing

> **Note**

- *When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.*
- *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*
- *Overview - Cylinder Head Cover. Refer to* *⇒ "1.1 Overview - Cylinder Head Cover", page 83* .

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-

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- Union Nut Socket - T40055-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-
- Engine Bung Set - VAS6122-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

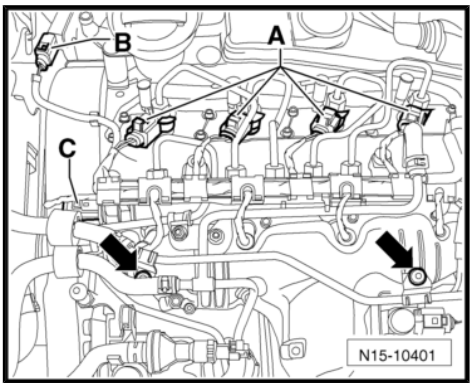
- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

Removing

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

– Remove the protective strip -item 3- ⇒ Item 3 (page 83) .

– Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247- -C-.



– Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.

– Unclip the wiring harness from the wiring guide for the glow plugs.

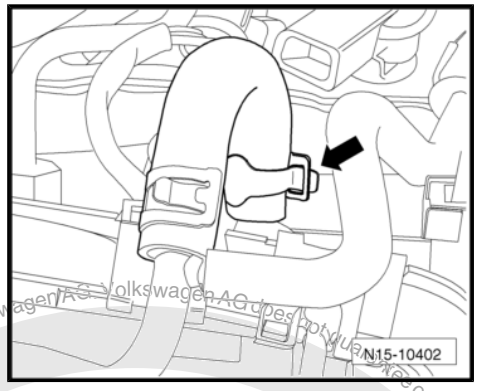
Caution

Always follow the procedure »Glow Plug Connectors, Removing and Installing«.

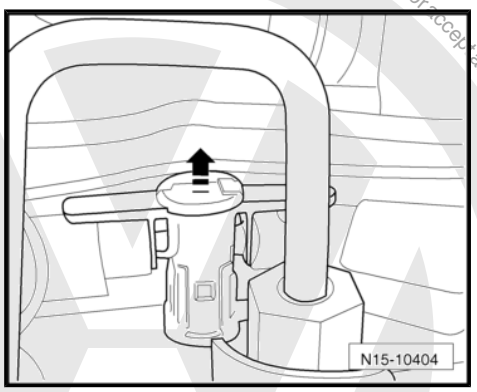
– Remove the glow plug connectors. Refer to ⇒ "1.3 Glow Plug Connectors, Removing and Installing", page 410 .

– Remove the fuel return line bolt -item 3- ⇒ Item 3 (page 312) on the intake manifold.

– Loosen the hose clip -arrow- with the Hose Clip Pliers - VAS6362- and remove the line on the rail element (high pressure reservoir).
– Before removing, clean the return line connection on the fuel injectors (for example using a commercially available detergent).
– Cover the return line connections with a cleaning cloth.



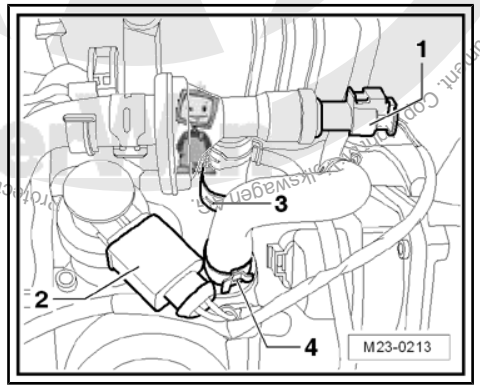
– Remove the fuel return line connections on the fuel injectors. Pull them upward to release them in direction of -arrow-.



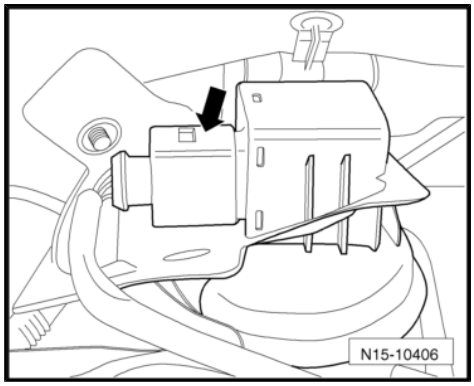
Note

- *Follow the rules of cleanliness.*
- *Do not let any dirt to get into the disconnected return lines or into the connections for the fuel injectors.*

– Loosen the spring clamp with the Hose Clip Pliers - VAS6362- and remove the fuel return line -item 4- ⇒ Item 4 (page 312) .
– Loosen the spring clamp -4- with the Hose Clip Pliers - VAS6362- and disconnect the fuel return line at the high pressure fuel pump.
– Seal the lines so that no dirt can enter the fuel system.
– Remove the fuel return line -item 2- ⇒ Item 2 (page 312) and lay them in front of the intake manifold.

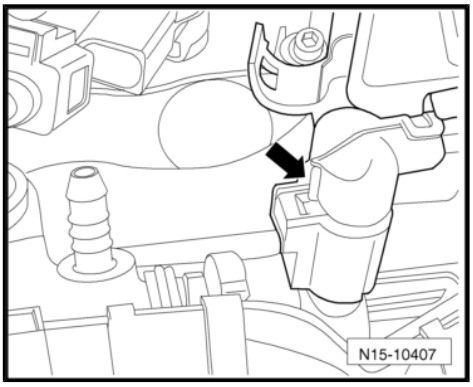


– Disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -arrow- at the turbocharger vacuum diaphragm and guide the line out of the holders.

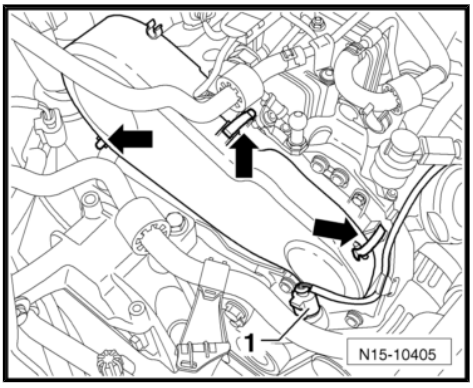


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– Disconnect the connector from the Fuel Pressure Regulator Valve - N276- -arrow-.
– Remove the wiring guide on the rail elements (high pressure reservoir) and move to the side.
– Remove the vacuum hose -item 11- ⇒ Item 11 (page 84) from the cylinder head cover.
– Remove the remaining vacuum hoses from the bracket on the cylinder head cover.



– Disconnect the connector -1- from the Engine Coolant Temperature Sensor on Radiator Outlet - G83- , open the clamps -arrows- and remove the toothed belt guard upper section.
– Remove the crankcase ventilation hose between the intake scoop and the cylinder head cover.

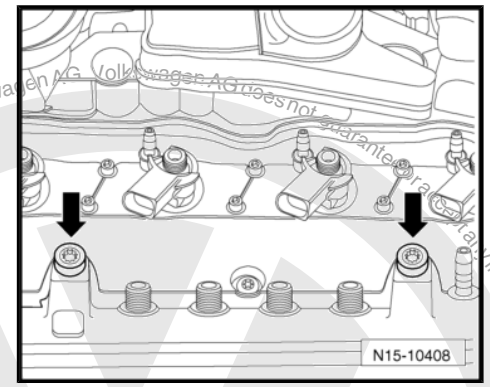


Note

The crankcase ventilation hose is destroyed when it is removed.

– Remove the high pressure line -item 21- ⇒ Item 21 (page 314) between the high pressure fuel pump and rail element (high pressure reservoir).
– Remove the high pressure lines -item 5- ⇒ Item 5 (page 312) between the rail element (high pressure reservoir) and the fuel injectors.

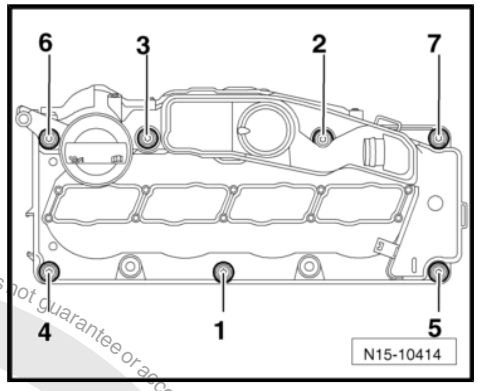
– Remove the bolts -arrows- and remove the rail element (high pressure reservoir).
– Remove the fuel injectors. Refer to ⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315 .



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– Remove the cylinder head cover bolts in the sequence -7 to 1-.

– Remove the cylinder head cover.



Installing:

Note

- *The plastic protectors installed to protect the open valves must only be removed just before mounting the cylinder head.*
- *When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.*
- *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*

Install in reverse order of removal. Note the following:

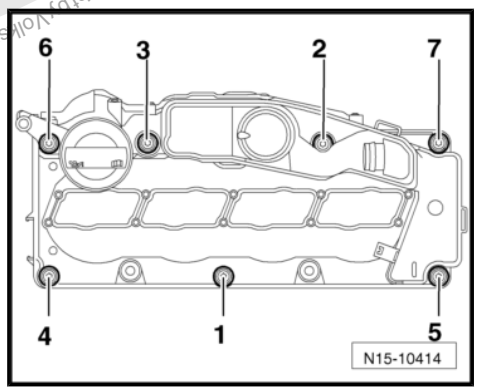
- Replace the cylinder head cover gasket if damaged or leaking. Refer to Parts Catalog.
- When installing the high pressure line or fuel lines, make sure no dirt enters the fuel system.
- Only remove the plugs right before installing the fuel lines.
- Do not change the angles of the high pressure lines
- Make sure the line connections are secure.
- Do not interchange the supply line and the return line.

– First hand-tighten the cylinder head cover bolts in the sequence -1 to 7-.

– Then tighten the cylinder head cover bolts in the sequence -1 to 7-.

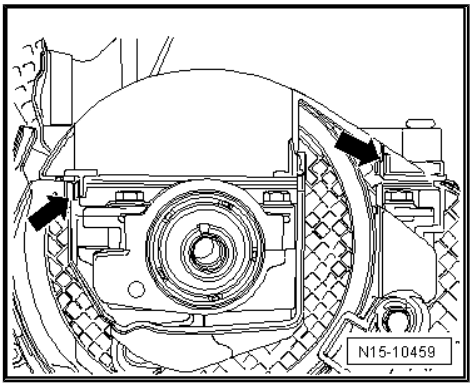
- Tightening specification -item 14- ⇒ Item 14 (page 84) .

– Install the toothed belt guard upper section.



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– Make sure the toothed belt guard upper section is clipped into the cylinder head cover correctly.



Note

The camshaft is removed here for clarity.

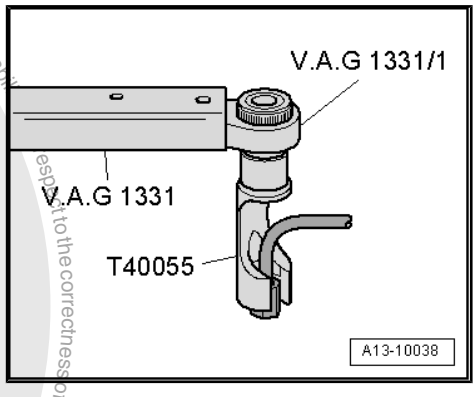
– Press the toothed belt guard upper section near the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.

– Check the clearance between the hub and the toothed belt guard upper section.

– Tighten the high pressure line union nuts hand-tight.

– Make sure the high pressure line is without tension.

– Tighten the high pressure line using the Torque Wrench 1331 5-50Nm - VAG1331- with Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1- and Union Nut Socket - T40055- .



Tightening Specifications:

- Refer to
⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 , Cylinder Head Cover, Removing and Installing
- Overview - Fuel System. Refer to
⇒ “3.3 Overview - Fuel System”, page 311 .

– Fill the fuel system. Refer to
⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

1.6 Toothed Belt, Removing, Installing and Tensioning

Special tools and workshop equipment required

- Diesel Injection Pump Locking Pin - 3359-
- Crankshaft Stop - T10100- or Crankshaft Stop - T10050-
- Counterhold - Kit - Multiple Use - T10172-
- Wrench - Tensioning Roller - T10264-
- Tensioning Roller Locking Tool - T10265-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-

Note

Overview - Toothed Belt Drive. Refer to
⇒ “1.2 Overview - Toothed Belt Drive”, page 43 .

Removing

Requirements

- Ignition switched off.
- Engine must be cold.

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Note

- *Adjustments to toothed belt may generally only be performed when the engine is cold, because the indicator position of the tensioning element changes depending on engine temperature.*
- *The engine bracket must be removed in order to replace the tensioning roller. Refer to ⇒ "1.7 Engine Bracket, Removing and Installing", page 52 .*

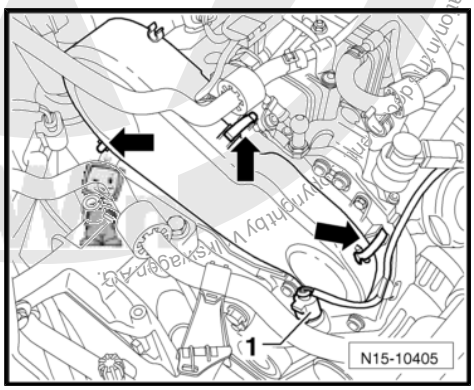
Procedure

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

– Remove the fuel filter. Refer to ⇒ "6.3 Fuel Filter, Removing and Installing", page 251 .

– Remove the Auxiliary Fuel Pump - V393- . Refer to ⇒ "6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing", page 259 .

– Disconnect the connector -1- from the Engine Coolant Temperature Sensor on Radiator Outlet - G83- , open the clamps -arrows- and remove the toothed belt guard upper section.



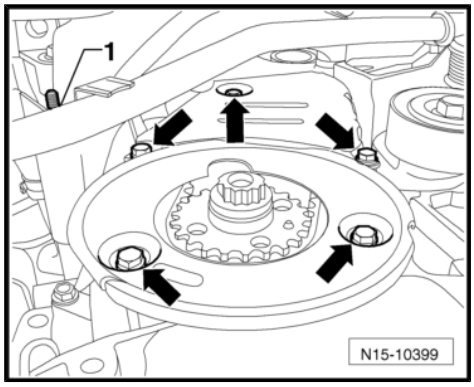
– Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner .

– Remove the ribbed belt. Refer to ⇒ "1.4 Ribbed Belt, Removing and Installing", page 47 .

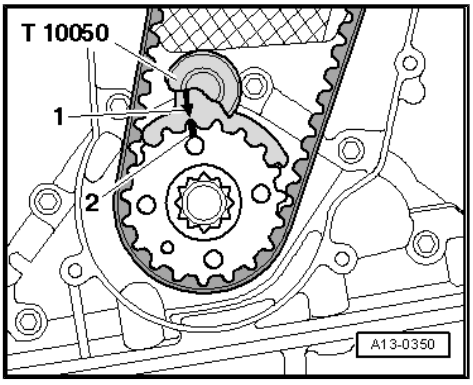
– Remove the belt pulley/vibration damper -item 29- ⇒ Item 29 (page 45) .

– Remove the toothed belt guard lower section and center section -arrows-.

– Remove the nut from the coolant pipe -1-.



– Rotate the engine to Top Dead Center (TDC) and secure the crankshaft toothed belt gear using the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- . Push the crankshaft stop from the front side of the toothed belt gear into the teeth. The toothed gear must be in the “12 o'clock” position.

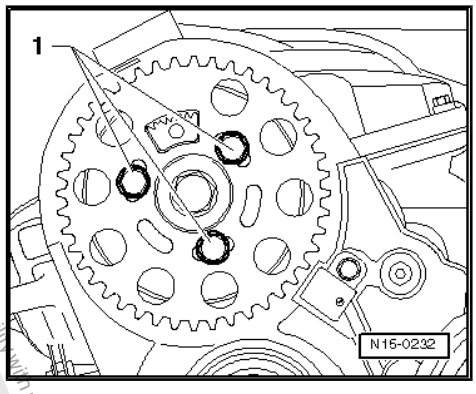


Note

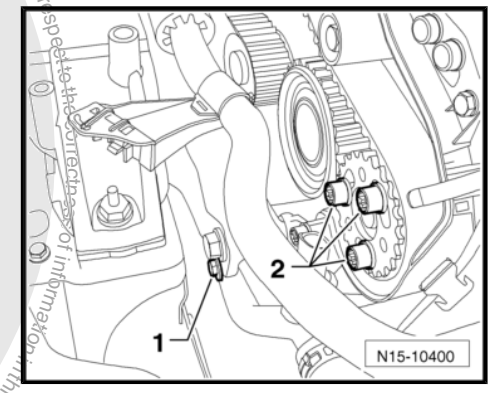
The markings on the crankshaft toothed belt sprocket -2- and the Crankshaft Stop - T10050- -1- must align. The pin on the Crankshaft Stop - T10050- must engage in the hole on the sealing flange.

– Mark the toothed belt running direction.

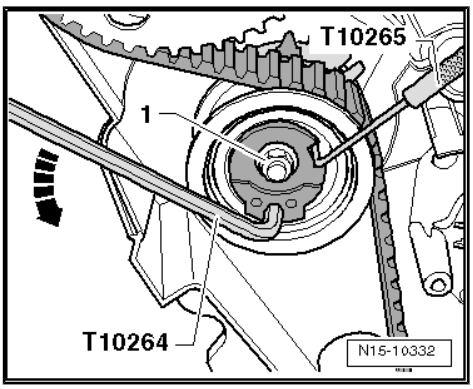
– Loosen the camshaft sprocket bolts -1-.



– Loosen the coolant pipe bolt -1- and then the bolts for the fuel high pressure pump toothed belt sprocket -2-.



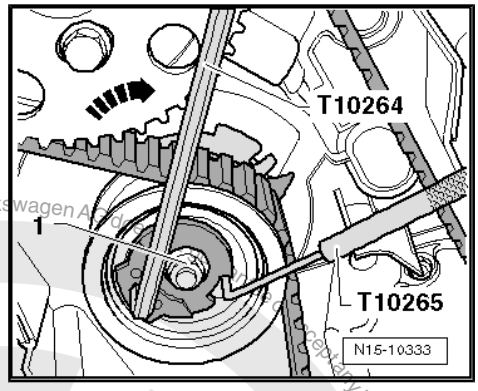
– Loosen the tensioning roller nut -1- and turn the tensioning roller eccentric pulley with the Wrench - Tensioning Roller - T10264- counter-clockwise in direction of -arrow-, until the tensioning roller can be locked with the Tensioning Roller Locking Tool - T10265- .



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– Now turn the tensioning roller eccentric pulley clockwise in direction of -arrow- all the way and tighten the nut -1- by hand.

– First remove the toothed belt from the idler roller and then from the remaining sprockets.



Installing

Requirements

- Ignition switched off.
- Engine must be cold.
- The tensioning roller must be installed with the Tensioning Roller Locking Tool - T10265- and the roller must be secured on the right stop.
- Secure the crankshaft with the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050-.

Note

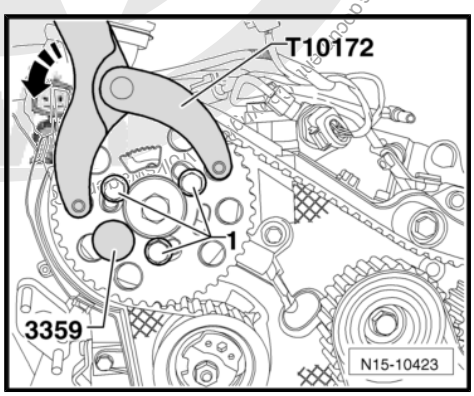
- *Adjustments to toothed belt may generally only be performed when the engine is cold, because the indicator position of the tensioning element changes depending on engine temperature.*
- *The engine bracket must be removed in order to replace the tensioning roller. Refer to*
  ⇒ "1.7 Engine Bracket, Removing and Installing", page 52 .

Procedure

– Turn the camshaft hub with the Counterhold - Kit - Multiple Use - T10172- and the Counterhold - Kit - Adapter 4 - T10172/4- until they can be secured in place. To do so use at least one bolt -1- tightened by hand.

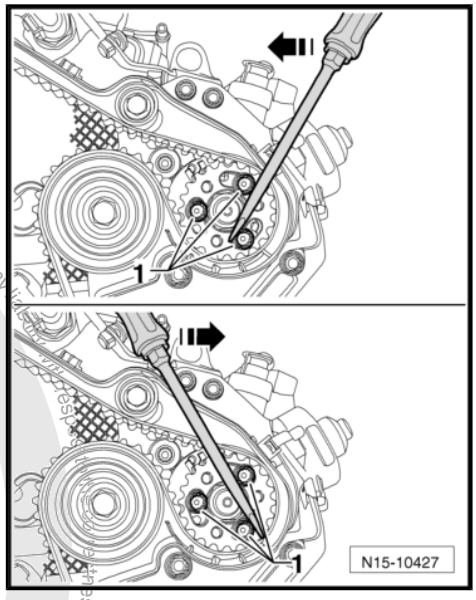
– Lock the camshaft hub with the Diesel Injection Pump Locking Pin - 3359- . To do this, push the pin through the empty outer oblong hole and into the cylinder head hole.

– Loosen the bolts -1-, which were hand-tightened.

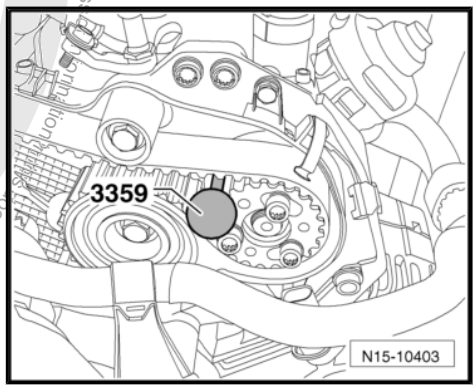


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– If necessary, rotate the high pressure fuel pump hub with a screwdriver at the bolt heads -1- until it can be secured.



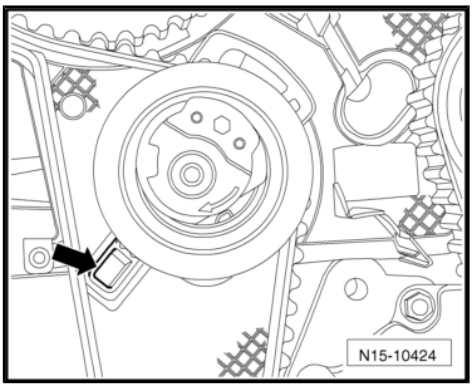
– Lock the high pressure fuel pump hub with the Diesel Injection Pump Locking Pin - 3359- . To do this, slide the pin into the opening outside the toothed belt sprocket.



– Rotate the camshaft sprocket and fuel high pressure pump toothed belt sprocket clockwise in their oblong holes as far as the stop.
– Install the toothed belt on the crankshaft toothed belt sprocket, the tensioning roller, the camshaft sprocket, coolant pump toothed belt sprocket and the fuel high pressure pump toothed belt sprocket.
– Lay the belt on the last pulley.
– Loosen the tensioning roller nut and remove the Tensioning Roller Locking Tool - T10265- .

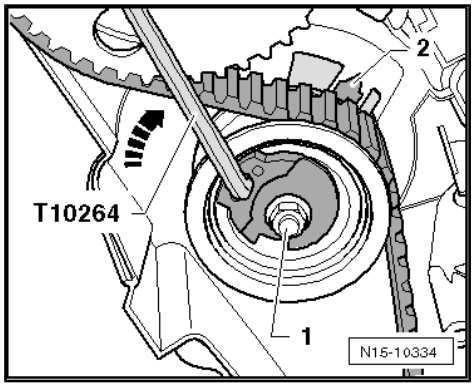
Note

Make sure the tensioning roller is properly positioned in the rear toothed belt guard -arrow-.



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– Carefully turn the tensioning roller eccentric pulley clockwise with the Wrench - Tensioning Roller - T10264- until the indicator is located centrally in the base plate gap -2-.



• Make sure the nut -1- does not rotate with it.

– Hold the tensioning roller in this position and tighten the tensioning roller nut.

• Tightening specification -item 6- ⇒ Item 6 (page 43) .

– Position the Counterhold - Kit - Multiple Use - T10172A- as shown. Push the Counterhold - Multiple Use - T10172A- in the direction of the arrow and hold the camshaft sprocket pretensioned.

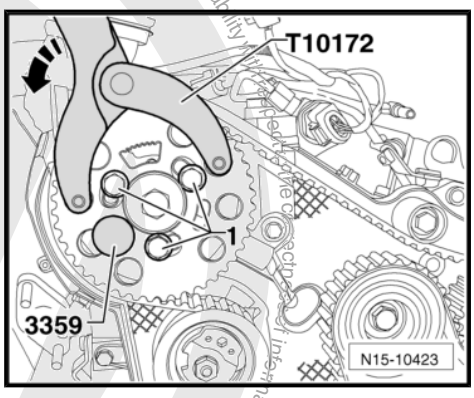
– Tighten the bolts -1- for the camshaft sprocket and the fuel high pressure pump toothed belt sprocket in this position.

• Tightening specification: 20 Nm.

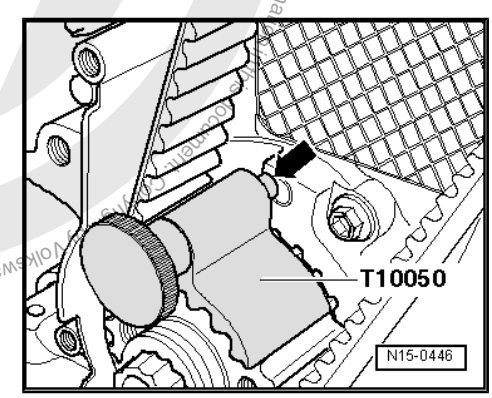
– Remove the Diesel Injection Pump Locking Pin - 3359- and the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- .

– Turn the crankshaft at least two additional turns in the direction of engine rotation in direction of -arrow- and just before TDC for cylinder 1.

– Position the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- on the crankshaft toothed belt sprocket again.



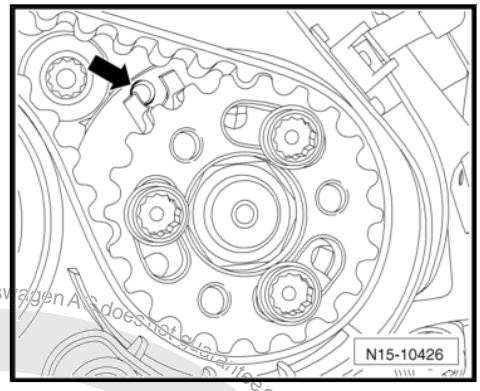
– Now rotate the crankshaft in the direction of engine rotation until the crankshaft stop pin -arrow- engages in the sealing flange from the rotational movement.



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Note

In the following check, only the camshaft and crankshaft are secured. The high pressure fuel pump hub mounting point is very difficult to recover. A small variance -arrow- does not affect engine operation.



– Check if:

- The camshaft hub can be locked with the Diesel Injection Pump Locking Pin - 3359- .
- The tensioning roller indicator points to the center or maximum 5 mm to the right of the gap in the base plate.

If the Camshaft Hub Cannot Be Secured:

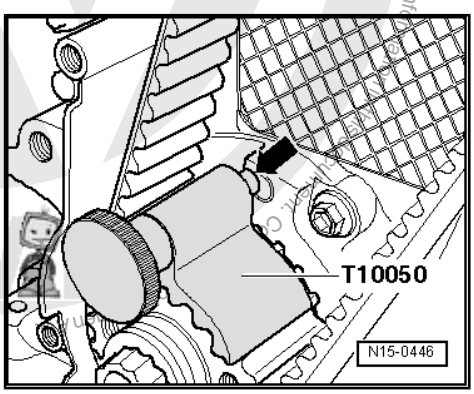
– Pull the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- toward the back until the pin opens the hole.

– Rotate the crankshaft opposite the direction of engine rotation until it is slightly past TDC.

– Now rotate the crankshaft slowly in the direction of engine rotation until the camshaft hub can be secured.

– After securing, loosen the bolts on the camshaft toothed belt sprocket.

If the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- Pin Is to the Left of the Hole:



– Turn the crankshaft in direction of engine rotation until the crankshaft stop tab engages the sealing flange.

– Tighten the camshaft toothed belt sprocket bolts.

- Tightening specification: 20 Nm.

If the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- Pin is to the Right of the Hole:

– Rotate the crankshaft slightly opposite the direction of engine rotation.

– Now turn the crankshaft in the direction of engine rotation until the crankshaft stop pin engages the sealing flange.

– Tighten the camshaft toothed belt sprocket bolts.

- Tightening specification: 20 Nm.

Continuation

– Remove the Diesel Injection Pump Locking Pin - 3359- and the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- .

– Turn the crankshaft at least two additional turns in the direction of engine rotation and just before TDC for cylinder 1.

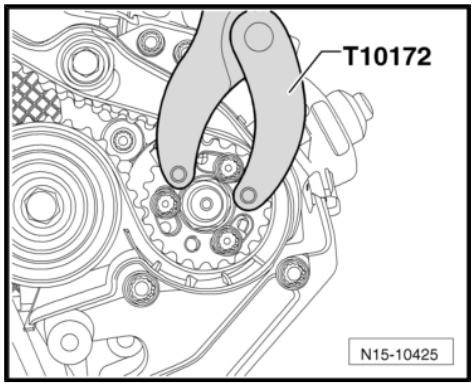
– Check again.

The Camshaft Hub Can Now Be Secured:

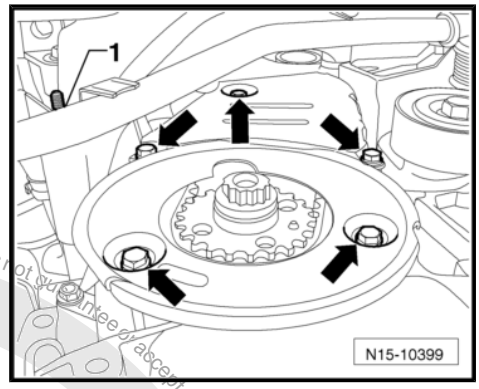
– Tighten the bolts as follows:

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- Camshaft toothed belt sprocket: $^{1}/_{8}$ (45 °) additional turn. Counterhold with Counterhold - Kit - Multiple Use - T10172- and Counterhold - Kit - Adapter 4 - T10172/4- .
- Fuel high pressure pump toothed belt sprocket: $^{1}/_{4}$ (90 °) additional turn. Counterhold with Counterhold - Kit - Multiple Use - T10172- and Counterhold - Kit - Adapter 8 - T10172/8- .

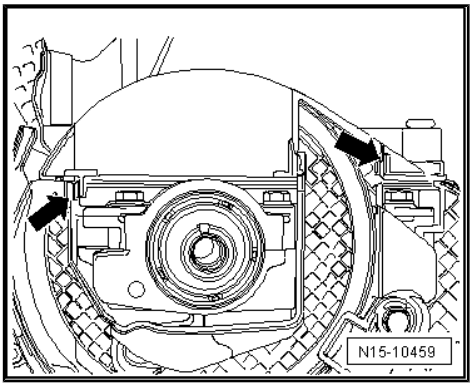


– Install the toothed belt guard lower section and center section -arrows-.
- Tightening specification -item 27- ⇒ Item 27 (page 44) .
– Install the belt pulley/vibration damper.
- Tightening specification -item 28- ⇒ Item 28 (page 44) .
– Install the ribbed belt. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .
– Install the toothed belt guard upper section.



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– Make sure the toothed belt guard upper section is clipped into the cylinder head cover correctly.



Note

The camshaft is removed here for clarity.

– Press the toothed belt guard upper section near the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.

– Check the clearance between the hub and the toothed belt guard upper section.

– Install the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner .

– Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

Further assembly is performed in the reverse order of the removal. Note the following:

- Route the fuel hoses without kinks.
- Check the fuel hoses for secure fit.
- Do not interchange the supply and return lines (the return line is blue or has a blue marking, the supply line is white or has a white marking).
- Clip the fuel hoses back into the retainers.

– Install the Auxiliary Fuel Pump - V393- . Refer to ⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259 .

– Install the fuel filter. Refer to ⇒ “6.3 Fuel Filter, Removing and Installing”, page 251 .

– Install the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

1.7 Cylinder Head, Removing and Installing

⇒ “1.7.1 Cylinder Head, Removing and Installing”, page 103 .

1.7.1 Cylinder Head, Removing and Installing

Special tools and workshop equipment required

- Guide Tool - Cylinder Head - 3070-
- Diesel Injection Pump Locking Pin - 3359-
- Crankshaft Stop - T10050-
- Counterhold - Camshaft Gear - T10051-
- Puller - Camshaft Sprocket - T10052-
- Socket - Xzn 10 - T10385-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Shop Crane - Drip Tray - VAS6208-
- Engine Bung Set - VAS6122- (not illustrated)

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DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

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Note

- *Overview - Toothed Belt Drive. Refer to ⇒ "1.2 Overview - Toothed Belt Drive", page 43 .*
- *Overview - Cylinder Head Cover. Refer to ⇒ "1.1 Overview - Cylinder Head Cover", page 83 .*
- *Overview - Cylinder Head. Refer to ⇒ "1.2 Overview - Cylinder Head", page 85 .*
- *Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270 .*
- *Overview - Charge Air Cooler Components. Refer to ⇒ "4.2 Overview - Charge Air Cooler Components", page 290*
- *Overview - Intake Manifold with Attachments. Refer to ⇒ "3.12 Overview - Intake Manifold with Attachments", page 331 .*
- *Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 360 .*
- *Overview - EGR Components. Refer to ⇒ "3.1 Overview - Exhaust Gas Recirculation System Components", page 398 .*
- *Hose connections are secured with either spring or hose clamps.*
- *Always replace clamp-type clips with spring-type clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*
- *All cable ties which are opened or cut open when removing cylinder head, must be replaced in the same position when installing cylinder head.*
- *When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.*
- *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*

Removing

Note

The Battery - A- ground cable must be disconnected for the following procedure. For this reason check if a coded radio is installed. If necessary, obtain anti-theft code beforehand.

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WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

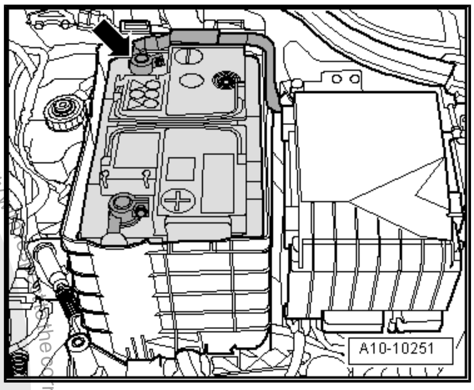
– Remove the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

Caution

Electronic components could be destroyed when the Battery - A- is disconnected:

- *Complete the steps for disconnecting the Battery - A- .*

– When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

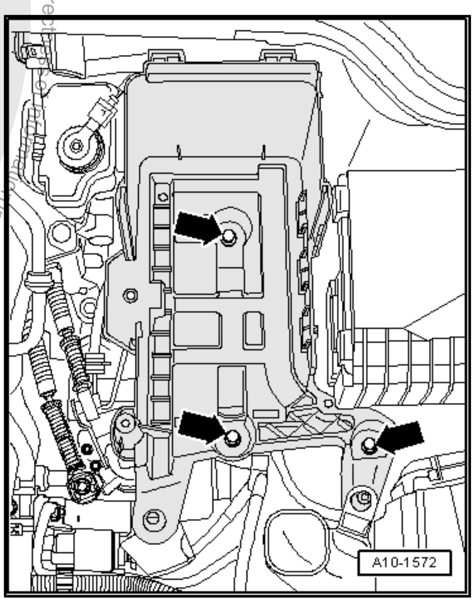


– Remove the Battery - A- and the battery tray -arrows-.

– Remove the cylinder head cover. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

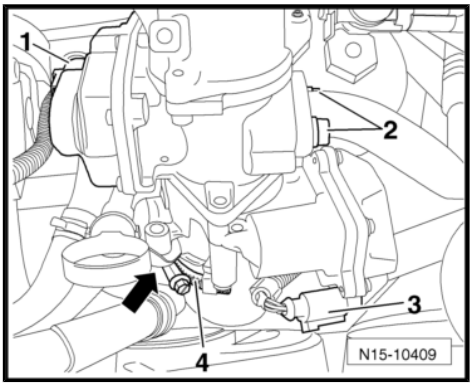
– Remove the toothed belt from the camshaft. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 , Toothed Belt, Removing, Installing and Tensioning.

– Remove the camshaft sprocket and the hub. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 , Camshafts, Removing and installing.

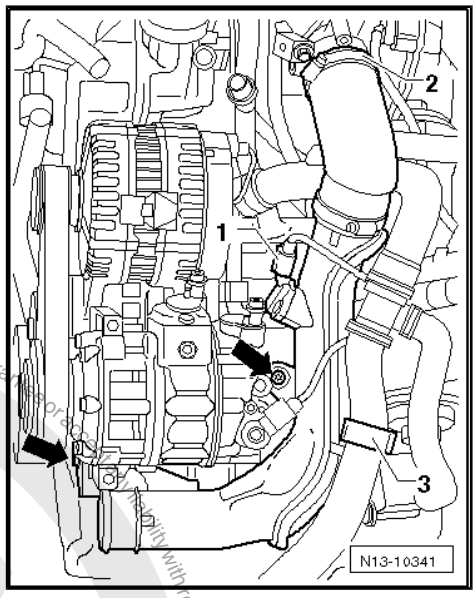


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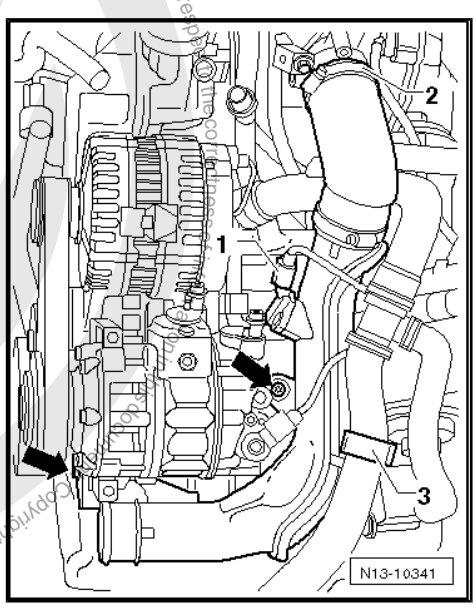
– Disconnect from the EGR Vacuum Regulator Solenoid Valve - N18- -1- and from the Throttle Valve Control Module - J338- -3-.
– Loosen the clamp -4- and remove the charge air hose.
– Remove the oil dipstick bracket -arrow-.
– Remove the air shroud and radiator fans. Refer to ⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202 .



– Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

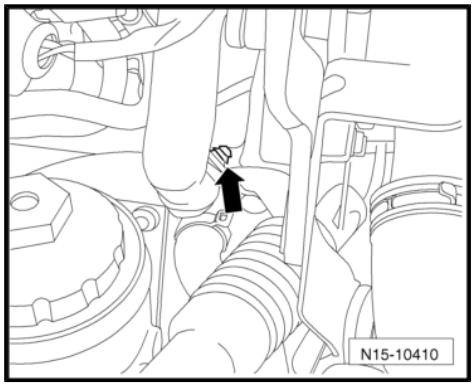


– Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.
– Remove the oil supply line. Refer to ⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 182 .

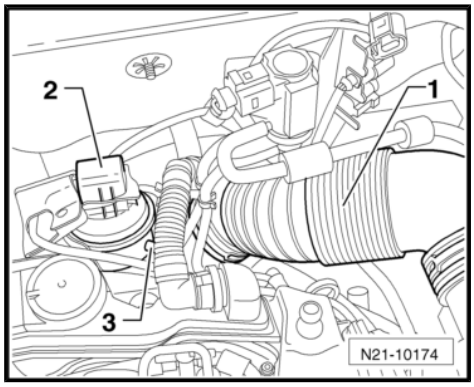


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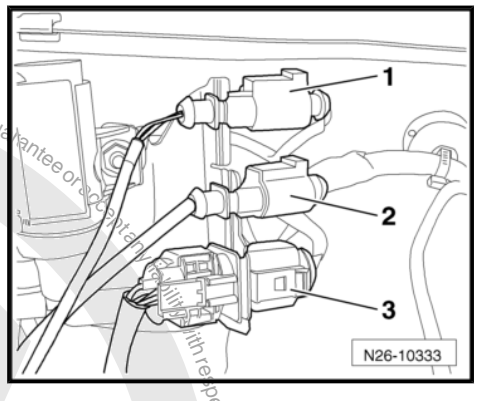
– Unclip the wiring harness to the Engine Control Module - J623- from the cable guide -arrow-.
– Remove the vacuum pump. Refer to ⇒ “1.8 Vacuum Pump, Removing and Installing”, page 126 .



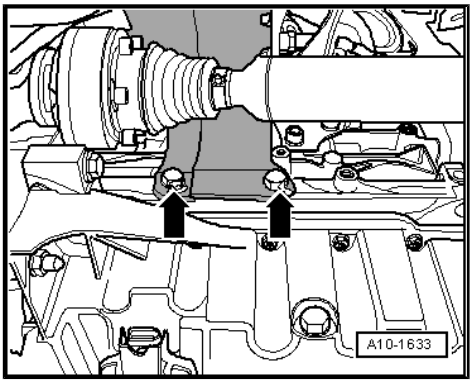
– Disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -2- on the on the turbocharger vacuum diaphragm.
– Disconnect the vacuum hose -3- at the turbocharger vacuum diaphragm.



– Disconnect the »black« connector for the Exhaust Gas Temperature Sensor 1 - G235- -2- at the plenum chamber bulkhead.
– Guide the wire out of the retainer on the plenum chamber bulkhead and on the turbocharger.
– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .



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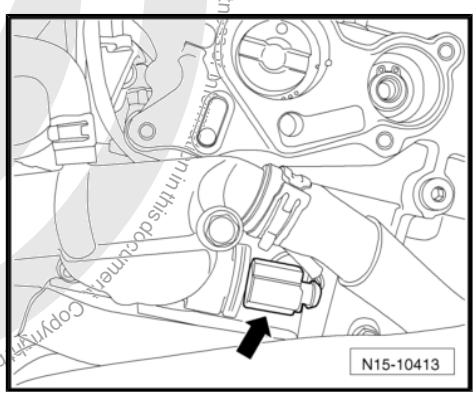


- Remove the right drive axle heat shield -arrows-.
- Remove the charge air pipe bolts -item 15- ⇒ Item 15 (page 291) and remove the connecting hose -item 13- ⇒ Item 13 (page 291) from the pulsation damper on the turbocharger.
- Mark the installation position for the Exhaust Gas Temperature Sensor 1 - G235- -item 37- ⇒ Item 37 (page 274) and remove it.
- Unbutton the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
- Remove the control line between the EGR housing and the Exhaust Pressure Sensor 1 - G450- . Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
- Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
- Remove the lower bracket for the particulate filter.

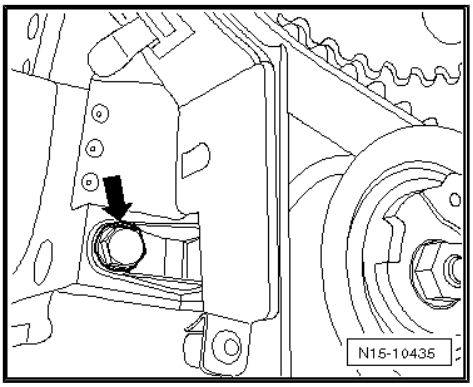
Note

Remove the nuts above the bracket with the Wrench - Sw13 - T10384- .

- Remove the exhaust gas recirculation filter -item 9- ⇒ Item 9 (page 399) .



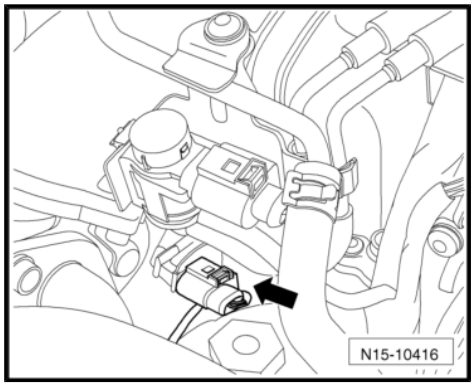
- Disconnect the connector -arrow- from the Engine Coolant Temperature Sensor - G62- and guide the wire out.
- Remove the particulate filter from the upper bracket and loosen the bracket on the cylinder head.
- Remove the clamp between the particulate filter and turbocharger.
- Remove the banjo bolt -item 24- ⇒ Item 24 (page 273) from the turbocharger support.
- Remove the hex bolt -item 17- ⇒ Item 17 (page 272) from the turbocharger support.
- Rotate the lower section of the support 90° and remove the support downward from the upper section.
- Remove the coolant hoses from the coolant connections on the cylinder head.



- Remove the bolt -arrow- from the rear toothed belt guard.
- Remove the nut -item 5- ⇒ Item 5 (page 43) from the toothed belt tensioning roller -item 7- ⇒ Item 7 (page 43) .

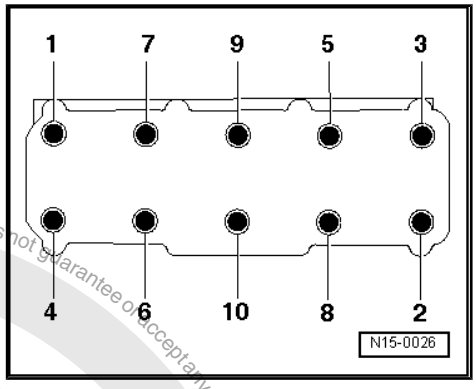
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– Disconnect the connector for the Camshaft Position Sensor - G40- -arrow-.
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .



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– Remove the cylinder head bolts in the sequence -1 to 10-.



Note

- *A second technician is needed when removing the cylinder head.*
- *The toothed belt tensioning roller is pulled off the stud bolt when prying the cylinder head out.*
- *The oil return pipe on the turbocharger is pulled out of the support when removing the cylinder head.*
- *Make sure all necessary lines are loosened.*

– Lift the cylinder head first on the transmission side and guide it out of the rear toothed belt guard. Be careful not to let the toothed belt tensioning roller fall.

– Lay the cylinder head down so that the oil return pipe is not bent. Place a wooden block under the exhaust manifold if necessary.

Installing

Caution

There is a risk of damaging sealing surfaces:

- *Carefully remove the sealant residue from the cylinder head and cylinder block.*
- *Make sure that no long grooves or scratches result.*

Risk of damaging the cylinder block:

- *There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.*

Risk of the cylinder head gasket leaking:

- *Carefully remove all lapping and sanding residue.*
- *Only unpack the new cylinder head gasket immediately before installing.*
- *To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the seal extremely carefully.*

Risk of damaging open valves:

- *If a replacement cylinder head is installed, only remove the accompanying plastic base immediately before installing to protect the open valves.*

Risk of damaging valves and piston heads after working on the valvetrain:

- *To ensure valves do not strike pistons when starting, carefully rotate engine at least two full revolutions.*
- *Before installing, check if the oil return pipe decoupling element is bent or stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return pipe before installing the cylinder head.*

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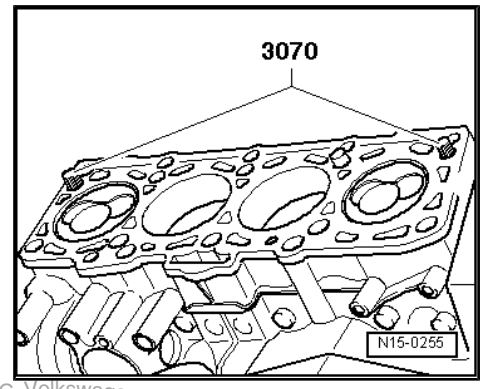
Note

- *Always replace cylinder head bolts.*
- *Replace gaskets, seals and self-locking nuts and clamps.*
- *Carefully remove residual sealant from cylinder head and cylinder block. Make sure that no long grooves or scratches result. When using sand paper, grit must not be below 100.*
- *Thoroughly remove all sanding and lapping residue.*
- *Only unpack the new cylinder head gasket immediately before installing.*

– Before mounting the cylinder head, remove the Crankshaft Stop - T10050- and rotate the crankshaft back opposite the direction of engine rotation until all of the pistons are nearly even under TDC.

– Place the cylinder head gasket with the identification upward.

– To center, slide the Guide Tool - Cylinder Head - 3070- into the outer holes on the intake side.



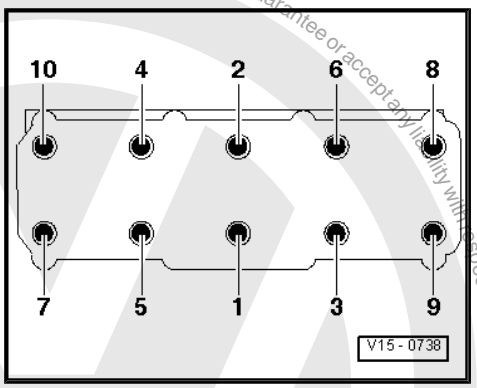
Note

The tensioning roller must be placed on the stud bolt when mounting the cylinder head.

– Install the cylinder head, insert the eight cylinder head bolts and tighten them by hand.

– Remove the Guide Pin using the Pin Remover from the Guide Tool - Cylinder Head - 3070- through the bolt holes and insert the cylinder head bolts.

– Tighten the cylinder head in the tightening sequence, in four stages as follows:



1 - Tighten Using Torque Wrench:

Step I = 35 Nm

Step II = 60 Nm

2 - Tighten Further Using a Solid Wrench:

Step III = $^1/_4$ (90 °) turn

Step IV = $^1/_4$ (90 °) turn

– Secure the toothed belt guard on the back of the cylinder head.

• Tightening specification -item 14- ⇒ Item 14 (page 44) .

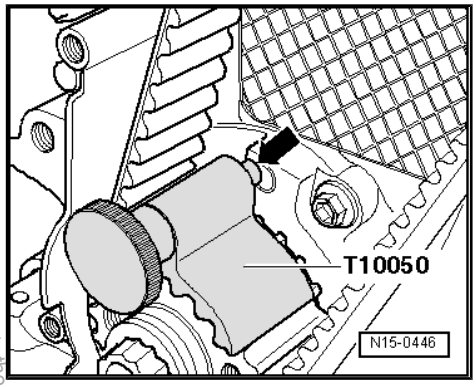
– Install the hub and the camshaft sprocket. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 , Camshafts, Removing and installing.

– Secure the camshaft and the high pressure fuel pump with the Diesel Injection Pump Locking Pin - 3359- .

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– Turn the crankshaft in the direction of engine rotation to TDC and secure the crankshaft with the Crankshaft Stop - T10050- .

– Installing and tensioning the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .



The Additional Numbered Procedures Must Be Followed to Ensure the Particulate Filter with the NOx Reduction Catalytic Converter Is Installed without Tension:

Note

- *After installing the particulate filter with NOx reduction catalytic converter, make sure it is not under stress.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*

Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

- ***Do not bend the decoupling element more than 10°.***
- ***Do not stretch the decoupling element.***
- ***Do not damage the wire mesh on the decoupling element.***

1. Position the lower bracket with the nuts on the cylinder block and on the particulate filter. (Do not tighten the nuts.)
2. Position the new clamp with a new gasket between the particulate filter and turbocharger (do not tighten the clamp):

• Make sure the clamp is in the correct installation position. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

3. Install the EGR filter -item 9- ⇒ Item 9 (page 399) .
4. Position a new clamp between the particulate filter and EGR filter (do not tighten the clamp):

• Make sure the clamp is in the correct installation position. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

5. Position the particulate filter on the upper bracket with the bolt. (Do not tighten the bolt.)

– Tighten the mounting elements in the following sequence:

6. Clamp between the particulate filter and turbocharger.
7. Lower bracket to the cylinder block:
8. Lower bracket to the particulate filter:
9. Upper bracket to the particulate filter:
10. Upper bracket to the cylinder head:
11. Clamp between the particulate filter and EGR filter:

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- Tightening specifications. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

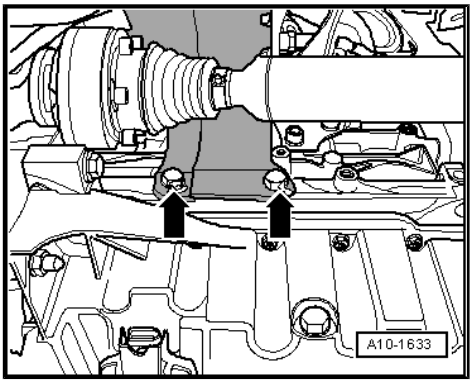
Further installation is the reverse order of removal. Note the following:

- The self-locking nuts and seals must be replaced.
- Position the charge air pipe connecting hose before securing the turbocharger.
- Pay attention to the installation position of the Exhaust Gas Temperature Sensor 1 - G235- .
- Replace the banjo bolt with the turbocharger support gaskets as well as the oil return pipe O-rings.
- Do not stretch the oil return pipe decoupling element when installing the turbocharger support.
- Make sure the line connections are secure.

– Install the cylinder head cover. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

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– Install the right drive axle heat shield -arrows-.



Vehicles with Manual Transmission:

- Tightening specification. Refer to ⇒ 6-speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with DSG® transmission:

- Tightening specification. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

Tightening Specifications:

- Overview - Toothed Belt Drive. Refer to ⇒ “1.2 Overview - Toothed Belt Drive”, page 43 .
- Overview - Cylinder Head Cover. Refer to ⇒ “1.1 Overview - Cylinder Head Cover”, page 83 .
- Overview - Cylinder Head. Refer to ⇒ “1.2 Overview - Cylinder Head”, page 85 .
- Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ⇒ “3.1 Overview - Turbocharger with Exhaust Manifold and Attachments”, page 270 .
- Overview - Charge Air Cooler Components. Refer to ⇒ “4.2 Overview - Charge Air Cooler Components”, page 290 .
- Overview - Intake Manifold with Attachments. Refer to ⇒ “3.12 Overview - Intake Manifold with Attachments”, page 331 .
- Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
- Overview - EGR Components. Refer to ⇒ “3.1 Overview - Exhaust Gas Recirculation System Components”, page 398 .

Note

Electrical connections and routing. Refer to ⇒ Electrical Equipment; Rep. Gr. 97 .

– Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

– Fill with coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

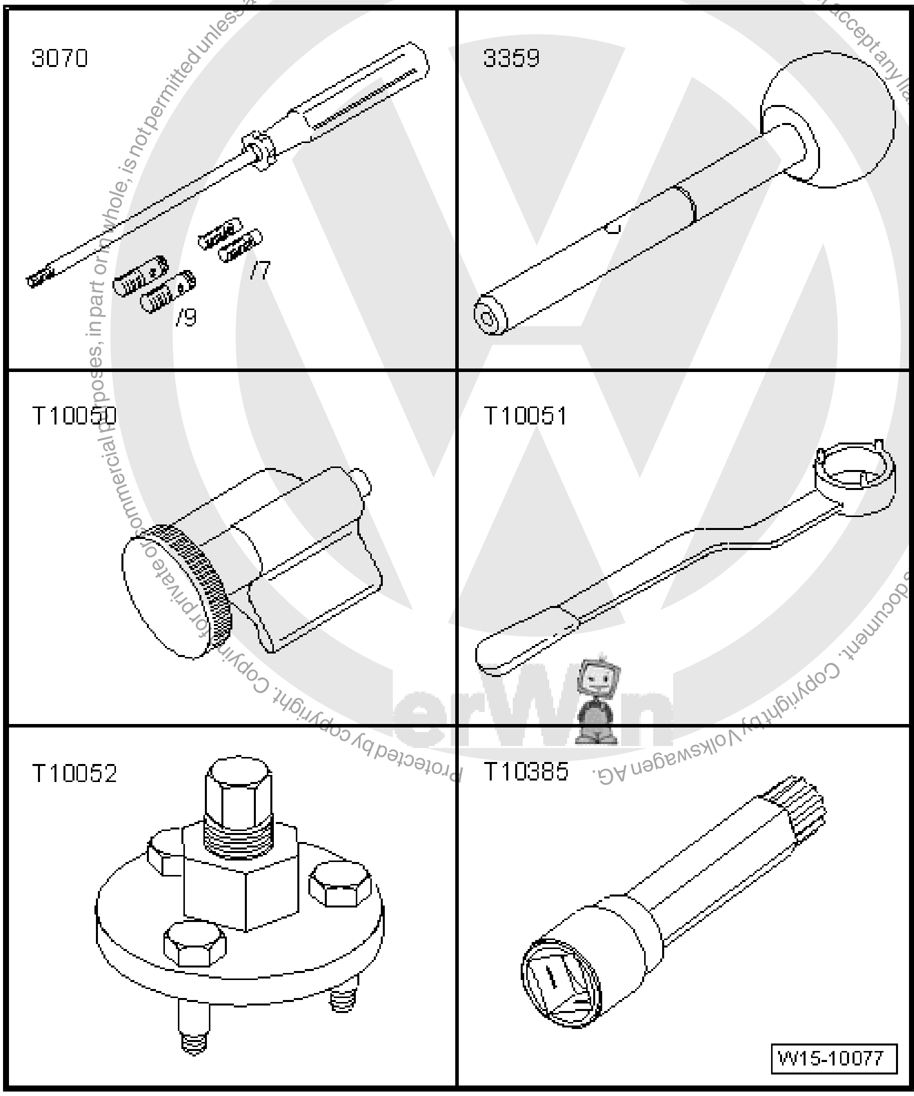
– Fill the fuel system. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

1.7.2 Cylinder Head, Removing and Installing, Engine Codes CBDA, CBDB and CEGA

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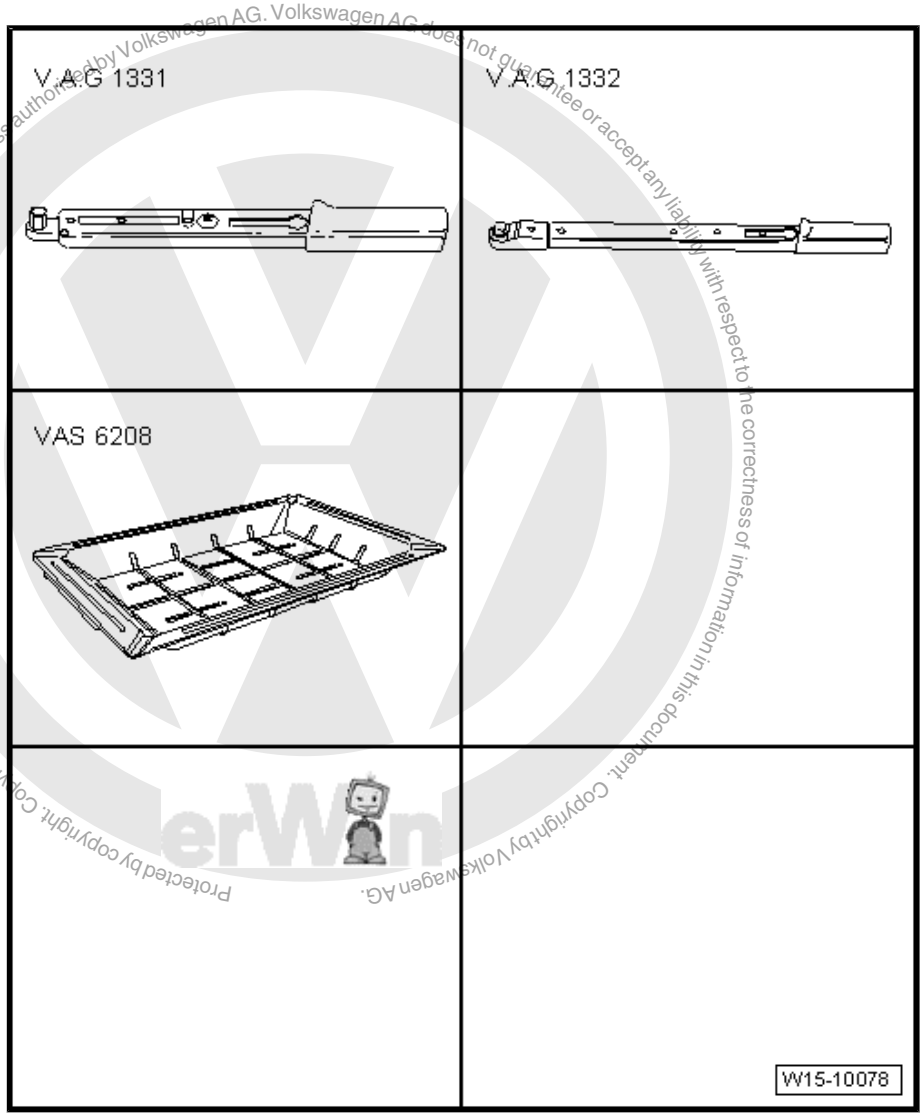
Special tools and workshop equipment required

- ♦ Guide Tool - Cylinder Head - 3070-
- ♦ Diesel Injection Pump Locking Pin - 3359-
- ♦ Crankshaft Stop - T10050-
- ♦ Counterhold - Camshaft Gear - T10051-
- ♦ Puller - Camshaft Sprocket - T10052-
- ♦ Socket - Xzn 10 - T10385-



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- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Shop Crane - Drip Tray - VAS6208-
- Engine Bung Set - VAS6122- (not illustrated)



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DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

Note

- *Overview - Toothed Belt Drive. Refer to* ⇒ *"1.2 Overview - Toothed Belt Drive", page 43* .
- *Overview - Cylinder Head Cover. Refer to* ⇒ *"1.1 Overview - Cylinder Head Cover", page 83* .
- *Overview - Cylinder Head. Refer to* ⇒ *"1.2 Overview - Cylinder Head", page 85* .
- *Overview - Turbocharger with Exhaust Manifold and Attachments,. Refer to* ⇒ *"3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA", page 279* .
- *Overview - Charge Air Cooler Components. Refer to* ⇒ *"4.2 Overview - Charge Air Cooler Components", page 290*
- *Overview - Intake Manifold with Attachments. Refer to* ⇒ *"3.12 Overview - Intake Manifold with Attachments", page 331* .
- *Overview - Front Exhaust Pipe with Particulate Filter. Refer to* ⇒ *"2.1 Overview - Front Exhaust Pipe with Particulate Filter", page 388* .
- *Overview - EGR Components. Refer to* ⇒ *"4.1 Overview - Exhaust Gas Recirculation System Components", page 403* .
- *Hose connections are secured with either spring or hose clamps.*
- *Always replace clamp-type clips with spring-type clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*
- *All cable ties which are opened or cut open when removing cylinder head, must be replaced in the same position when installing cylinder head.*

Removing

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

– Disconnect the battery ground cable when the ignition is switched off. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

– Remove the air filter housing. Refer to ⇒ "3.14 Overview - Air Filter", page 335 .

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– Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .

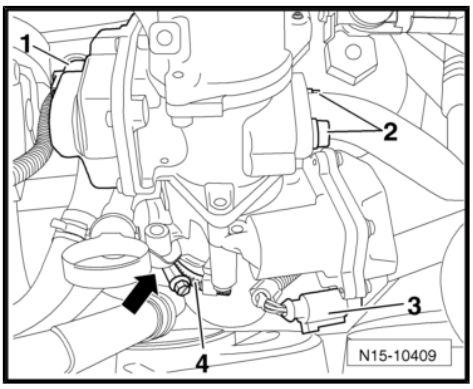
– Remove the air shroud with the Radiator Fan - V7- and Radiator Fan 2 - V177- . Refer to ⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202 .

– Remove the »cold side« hose from the charge air cooler -item 4- ⇒ Item 4 (page 290) .

– Remove the cylinder head cover. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

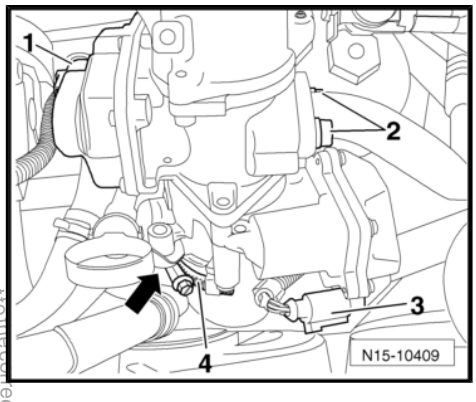
– Remove the toothed belt from the camshaft. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

– Disconnects from the EGR Vacuum Regulator Solenoid Valve - N18- -1- and from the Throttle Valve Control Module - J338- -3-.



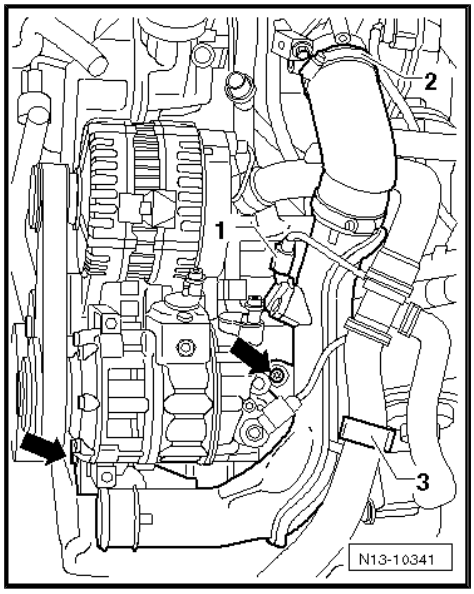
– Remove the bolts from the oil dipstick connection -arrow- and from the EGR connecting pipe -2-.

– Remove the air shroud and radiator fans. Refer to ⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202 .



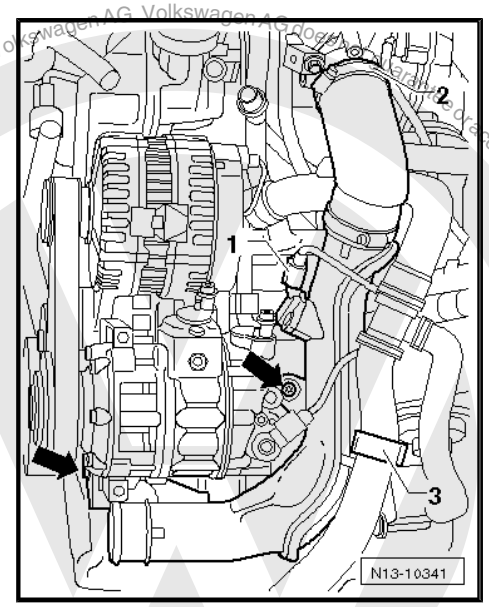
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– Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

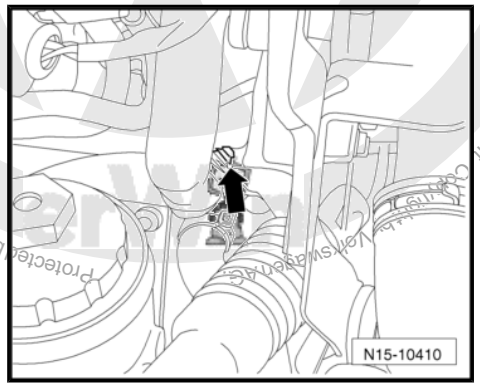


– Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.

– Disconnect the vacuum line from the vacuum pump.

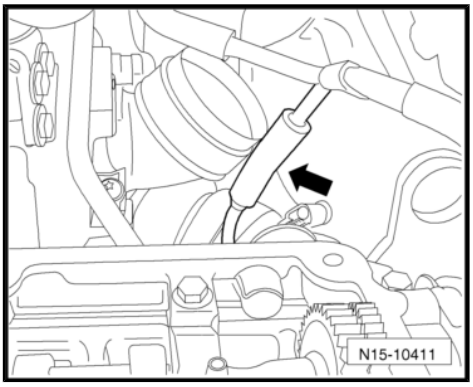


– Unclip the engine cables from the bracket -arrow-.

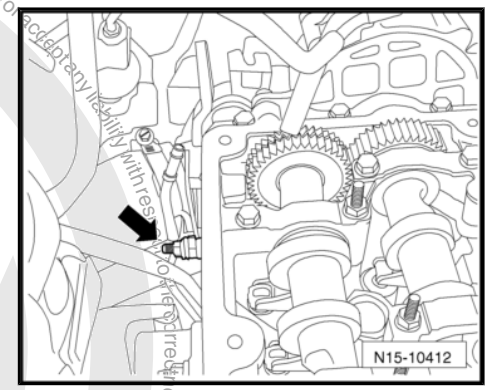


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– Disconnect the vacuum line -arrow-.



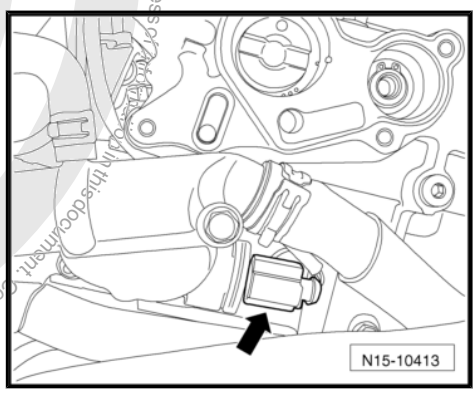
– Remove the vacuum line connection -arrow-.
– Remove the bolts on the charge air pipe -item 15- ⇒ Item 15 (page 291) and remove the connecting hose from the turbocharger.
– Remove the vacuum pump from the cylinder head. Refer to ⇒ “1.8 Vacuum Pump, Removing and Installing”, page 126 .



– Disconnect the connector -arrow- from the Engine Coolant Temperature Sensor - G62- and guide the wire out.

Caution

Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.



– Remove the EGR connecting pipe -item 2- ⇒ Item 2 (page 403) .

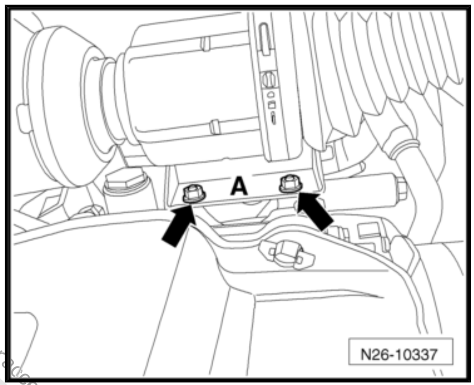
Note

The lower bolt on the EGR cooler is removed with the Socket - Xzn 10 - T10385- .

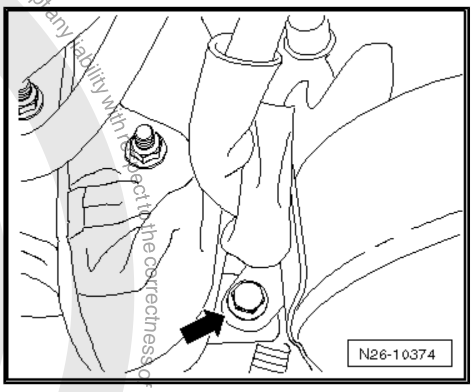
– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

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– Remove the nuts -arrows- on the particulate filter bracket -A- from the crankcase.
– Loosen the clamp between the turbocharger and the particulate filter.

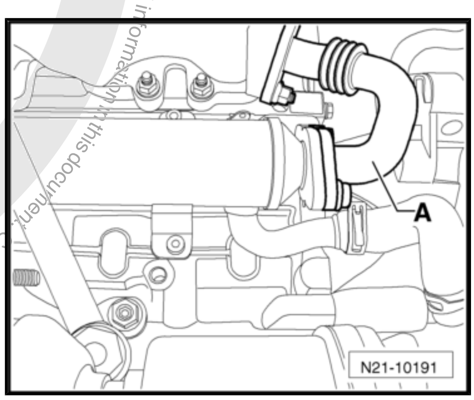


– Remove the bolt from the bracket on the cylinder head -arrow- and move the particulate filter to the side.



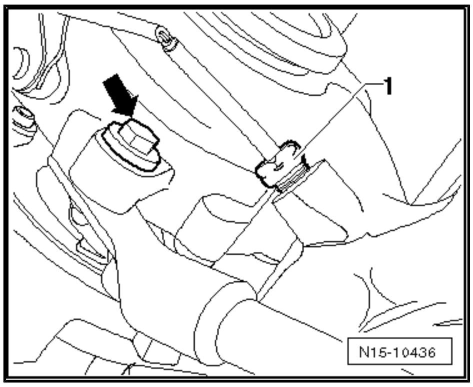
– Remove the connecting pipe -A- to the EGR cooler.

> ⚠ Caution
>
> *The Exhaust Gas Temperature Sensor 1 - G235- covers the upper threaded connection on the turbocharger support and must not be bent. It may not be removed.*



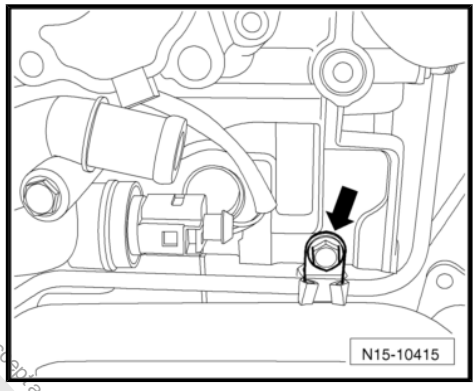
– Remove the Exhaust Gas Temperature Sensor 1 - G235- -1-.

– Remove the screw -arrow- from the support on the turbocharger.
– Remove the coolant hoses from the coolant connections on the cylinder head.

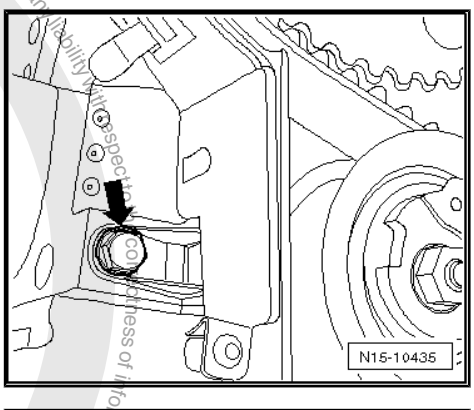


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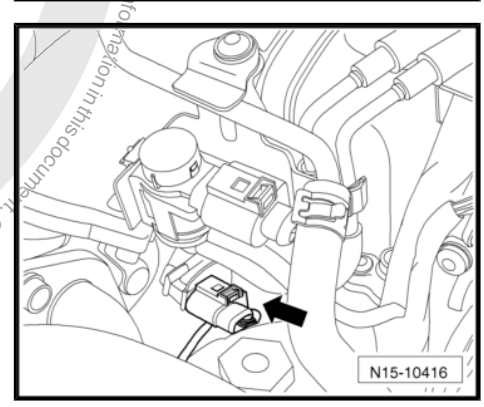
– Remove the oil supply line bolt -arrow- and then remove the oil supply line.
– Remove the camshaft toothed belt sprocket and remove the camshaft hub using the Puller - Camshaft Sprocket - T10052- .



– Remove the bolt -arrow- on the toothed belt guard.
– Remove the nut on the toothed belt tensioning roller.

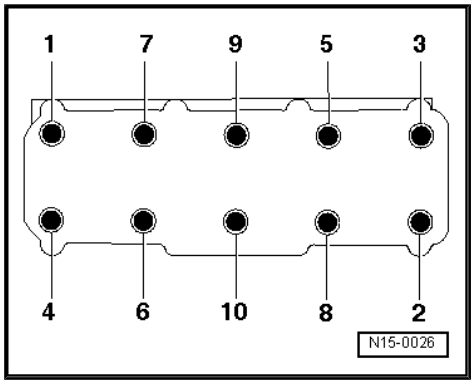


– Disconnect the connector for the Camshaft Position Sensor - G40- -arrow-.



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– Follow the sequence when loosening the cylinder head bolts.



Note

- *A second technician is needed to remove the cylinder head.*
- *The toothed belt tensioning roller is pulled off the stud bolt when prying the cylinder head out.*
- *The turbocharger oil return line is pulled out of the support when lifting the cylinder head out.*

– Lift the cylinder head first on the transmission side and guide it out of the toothed belt guard. Be careful not to let the toothed belt tensioning roller fall.

– Lay the cylinder head down so that the oil return line is not bent. Place a wooden block under the exhaust manifold if necessary.

Installing

Caution

There is a risk of damaging sealing surfaces:

- *Carefully remove the sealant residue from the cylinder head and cylinder block.*
- *Make sure that no long grooves or scratches result.*

Risk of damaging the cylinder block:

- *There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.*

Risk of the cylinder head gasket leaking:

- *Carefully remove all lapping and sanding residue.*
- *Only unpack the new cylinder head gasket immediately before installing.*
- *To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the seal extremely carefully.*

Risk of damaging open valves:

- *If a replacement cylinder head is installed, only remove the accompanying plastic base immediately before installing to protect the open valves.*

Risk of damaging valves and piston heads after working on the valvetrain:

- *To ensure valves do not strike pistons when starting, carefully rotate engine at least two full revolutions.*
- *Before installing, check if the oil return pipe decoupling element is bent or stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return pipe before installing the cylinder head.*

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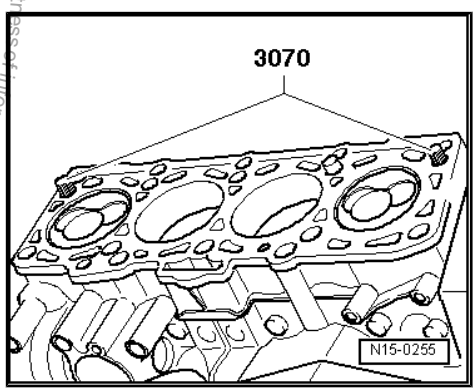
Note

- *Always replace cylinder head bolts.*
- *Carefully remove residual sealant from cylinder head and cylinder block. Make sure that no long grooves or scratches result. When using sand paper, grit must not be below 100.*
- *Thoroughly remove all sanding and lapping residue.*
- *Only unpack the new cylinder head gasket immediately before installing.*
- *Handle the seal carefully. Damages to the silicone layer and in areas of recesses may result in leaks.*

– Before mounting the cylinder head, remove the Crankshaft Stop - T10050- and rotate the crankshaft back opposite the direction of engine rotation until all of the pistons are nearly even under TDC.

– Place the cylinder head gasket with the identification upward.

– To center, slide the Guide Tool - Cylinder Head - 3070- into the outer holes on the intake side.



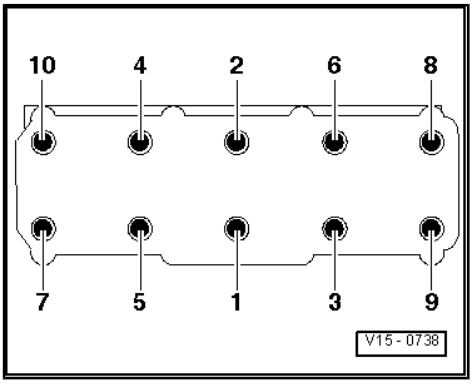
Note

The tensioning roller must be placed on the stud bolt when mounting the cylinder head.

– Install the cylinder head, insert the eight cylinder head bolts and tighten them by hand.

– Remove the guide pins using the guide pin handle from Guide Tool - Cylinder Head 3070, and then insert the cylinder head bolts.

– Tighten the cylinder head in the tightening sequence, in four stages as follows:



1 - Tighten using Torque Wrench:

Step I = 30 Nm

Step II = 50 Nm

2 - Tighten further using a solid wrench:

Step III = $^1/_4$ (90 °) turn

Step IV = $^1/_4$ (90 °) turn

– Secure the rear toothed belt guard on the cylinder head.

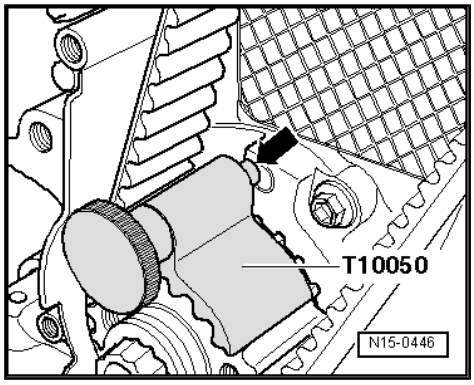
– Install the hub and the camshaft sprocket.

– Use the Diesel Injection Pump Locking Pin - 3359- to secure the camshaft and the high pressure pump.

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– Turn the crankshaft in the direction of engine rotation to TDC and secure the crankshaft with the Crankshaft Stop - T10050- .

– Install the toothed belt. Refer to ⇒ , page 98 .



Further installation is the reverse order of removal. Note the following:

– Install the cylinder head cover. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

– Install the ribbed belt. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

– Fill the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

– Perform a road test and check the DTC memory.

1.8 Vacuum Pump, Removing and Installing

Note

- *When replacing the cylinder head or cylinder head gasket, all of the coolant must be replaced.*
- *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-

DANGER!

Do not disassemble the vacuum pump under any circumstances because it can cause the vacuum component to malfunction. The result would be brake booster failure.

Removing:

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

– Remove the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

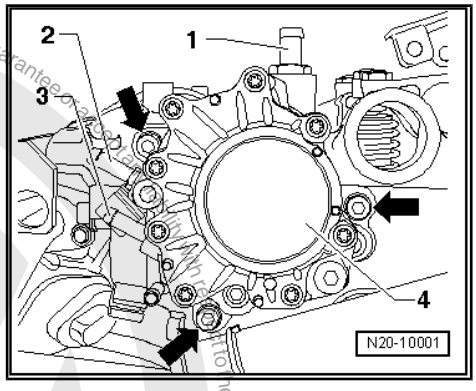
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– Remove the vacuum hose -1- from the vacuum pump -4-.

– Remove the charge air pipe bolts -item 15- ⇒ Item 15 (page 291) and the press the charge air pipe slightly downward to reach the rear threaded connection on the vacuum pump.

– Remove the bolts -arrows-.

– Remove the vacuum pump -4- from the cylinder head.



Installing:

Install in reverse order of removal. Note the following:

- Make sure that vacuum pump coupling has proper seating in camshaft.
- Always replace the vacuum pump seal.
- Make sure the line connections are secure.

– Install the vacuum pump -4- and tighten the bolts -arrows-.

- Tightening specification -item 8- ⇒ Item 8 (page 85) .

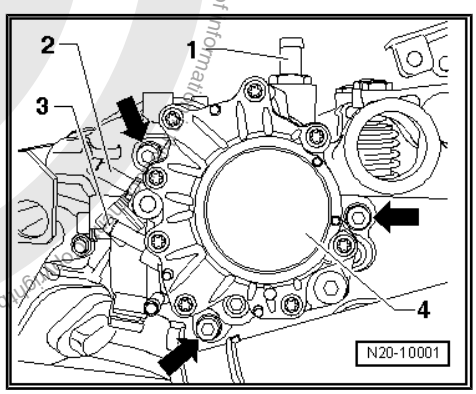
– Tighten the charge air pipe bolts -item 15- ⇒ Item 15 (page 291) .

- Tightening specification -item 11- ⇒ Item 11 (page 291) .

– Connect the brake booster vacuum hose -1- to the vacuum pump.

– Install the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

– Install the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .



1.9 Compression, Checking

Note

The compression can also be checking. Refer to Vehicle Diagnostic Tester .

Special tools and workshop equipment required

♦ Compression Tester Kit - Adapter 12 - VAG1381/12-

♦ Compression Tester Kit - VAG1763-

Test Conditions

- Engine oil temperature must be at least 30 °C (86 °F).
- The battery voltage must be at least 12.7 V.
- All electrical consumers for example lamps and rear window defogger, must be switched off.

Test Sequence

– Remove the glow plug from the applicable cylinder. Refer to ⇒ “1 Glow Plugs”, page 408 .

– Install the Compression Tester Kit - Adapter 12 - VAG1381/12- in place of the glow plugs.

– Check compression using the Compression Tester Kit - VAG1763- .

Note

Refer to the Operating Instructions for information on using the tester.

– Operate the starter until the Tester shows no further pressure increase.

Compression Values:

- New: 25.0 to 31.0 bar (362.59 to 449.617 psi) pressure
- Wear limit: 19.0 bar (275.57 psi) pressure
- Permissible difference between all cylinders: maximum 5.0 bar (72.51 psi)

– Install the glow plug in the applicable cylinder. Refer to ⇒ “1 Glow Plugs”, page 408 .

Note

By separating the connections, DTCs will be stored. After the test, check the DTC memory and erase, if necessary.

– Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester in “Guided Functions”.

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2 Valvetrain

⇒ “2.1 Overview - Valvetrain”, page 129

⇒ “2.2 Camshafts, Removing and Installing”, page 131

⇒ “2.3 Camshaft Seal, Removing and Installing”, page 137

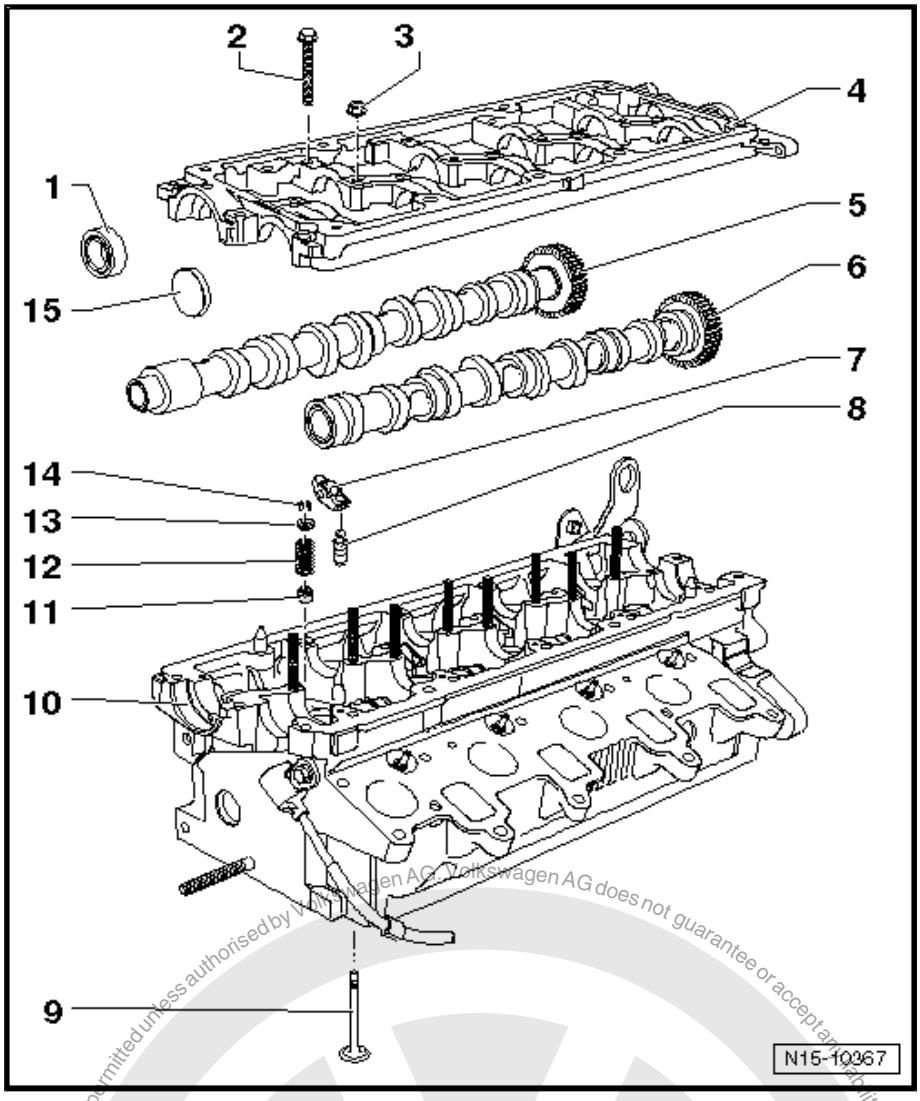
⇒ “2.4 Valve Stem Seals with Cylinder Head Installed, Replacing”, page 138

⇒ “2.5 Valve Guides, Checking”, page 141

Note

- *The plastic protectors installed to protect the open valves must only be removed just before mounting the cylinder head.*
- *When replacing the cylinder head or cylinder head gasket, the coolant must be completely replaced.*
- *Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the tears have a width of maximum 0.5 mm.*
- *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
- *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- *Always replace the gaskets and seals.*

2.1 Overview - Valvetrain



1 - Seal

- ❑ Do not coat the sealing lip on the seal with oil or grease
- ❑ Before installing, remove the oil residue from camshaft journal with a clean cloth
- ❑ To install, tape over the groove on the camshaft cone.
- ❑ Removing and installing. Refer to ⇒ “2.3 Camshaft Seal, Removing and Installing”, page 137 .

2 - Bolt

- ❑ 10 Nm

3 - Nut

- ❑ 10 Nm

4 - Bearing Frame

- ❑ Observe the sequence for loosening and tightening. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 , Camshafts, Removing and Installing
- ❑ Seal with Silicone Sealant - D 176 501 A1-

5 - Exhaust Camshaft

- ❑ Removing and installing. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 .

6 - Intake Camshaft

- ❑ Removing and installing. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 .

7 - Roller Rocker Lever

- ❑ Mark the installed position
- ❑ Do not interchange
- ❑ Check the roller bearing for ease of movement
- ❑ Lubricate the running surfaces before installing

8 - Hydraulic Lifter

- ❑ Mark the installed position
- ❑ Do not interchange
- ❑ Lubricate the running surfaces before installing

9 - Valve

- ❑ Mark the installed position
- ❑ Do not rework, only lapping is permitted
- ❑ Valve Dimensions. Refer to ⇒ Fig. ““Valve Dimensions”“ , page 131 .
- ❑ Valve Guides, Checking. Refer to ⇒ “2.5 Valve Guides, Checking”, page 141 .

10 - Cylinder Head

- ❑ Observe the notes. Refer to ⇒ page 129 .

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- ❑ Checking for distortion. Refer to ⇒ Fig. ""Cylinder Head, Checking for Distortion"" , page 86 .
- ❑ Removing and installing. Refer to ⇒ "1.7 Cylinder Head, Removing and Installing", page 103 .
- ❑ All of the coolant must be replaced after installing

11 - Valve Stem Seal

Replacing. Refer to ⇒ "2.4 Valve Stem Seals with Cylinder Head Installed, Replacing", page 138 .

12 - Valve Spring

13 - Valve Spring Retainer

14 - Cone Piece

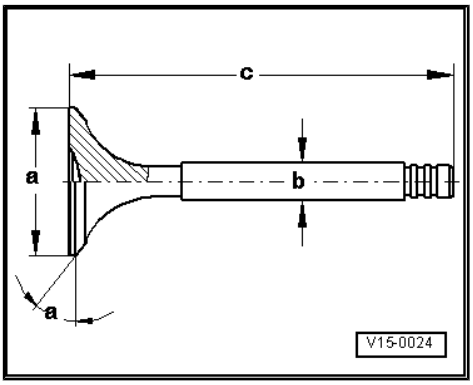
15 - Cap

- ❑ Replace
- ❑ Drive in flush using a suitable drift

Valve Dimensions

Note

Intake and exhaust valves must not be reworked. Only lapping is permitted.



Dimension		Intake Valve	Exhaust Valve
Diameter a	mm	26.60	26.00
Diameter b	mm	5.940	5.940
c	mm	99.30	99.10
α	∠°	45	45

2.2 Camshafts, Removing and Installing

Special tools and workshop equipment required

- ♦ Diesel Injection Pump Locking Pin - 3359-
- ♦ Counterhold - Camshaft Gear - T10051-
- ♦ Puller - Camshaft Sprocket - T10052-
- ♦ Camshaft Fitting Tool - T40094A-
- ♦ Camshaft Fitting Tool - T40095-
- ♦ Camshaft Fitting Tool - T40096 - T40096-
- ♦ Torque Wrench 1331 5-50Nm - VAG1331-
- ♦ Torque Wrench 1332 40-200Nm - VAG1332-
- ♦ Hand Drill with Plastic Brush Attachment
- ♦ Protective Eyewear
- ♦ Silicone Sealant - D 176 501 A1-

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⇒ , page 133 .

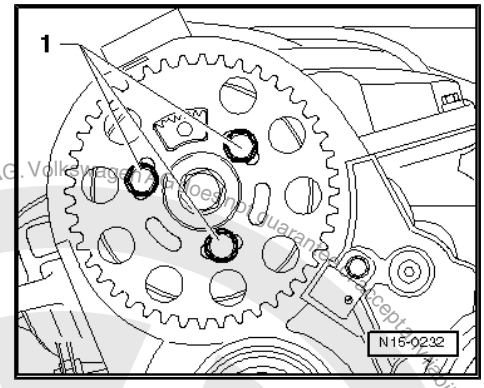
Removing

– Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 , Toothed Belt, Removing, Installing and Tensioning.

– Remove the cylinder head cover. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

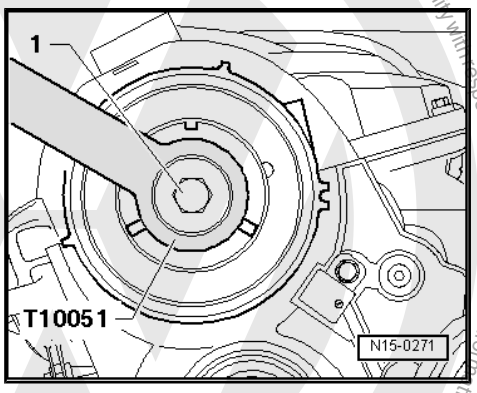
– Remove the bolts -1- for camshaft sprocket.

– Remove the camshaft sprocket from the hub.



– Counterhold the hub with the Counterhold - Camshaft Gear - T10051- and loosen the hub bolt -1-.

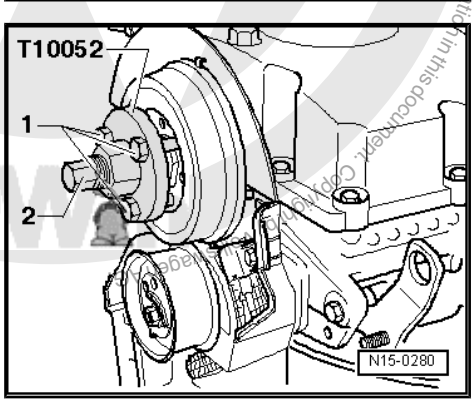
– Unscrew the bolt for the hub by approximately two turns.



– Mount the Puller - Camshaft Sprocket - T10052- and align the Puller - Camshaft Sprocket to the holes in the hub.

– Tighten the bolts -1-.

– Tighten the Puller -2- evenly to tension the hub until the hub loosens from the camshaft cone.



Note

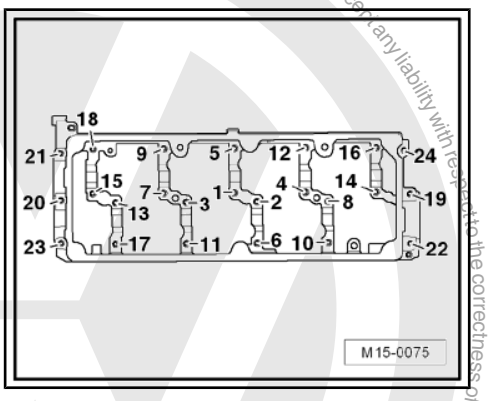
Hold the Puller at the same time with a 30 mm wrench.

– Remove the hub from the camshaft cone.

– Remove the vacuum pump. Refer to ⇒ “1.8 Vacuum Pump, Removing and Installing”, page 126 .

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– Remove the bearing frame bolts or nuts in the sequence -24 to 1-.
– Remove the bearing frame.
– Carefully remove the camshafts.



Installing:

Note

- *Note the expiration date for the Sealant .*
- *Seal the separating surface between the bearing frame and the cylinder head with Silicone Sealant - D 176 501 A1- .*

Caution

- ***The camshafts may only be installed using the Camshaft Fitting Tool - T40094- as described below. Otherwise the axial bearing in the bearing frame will be destroyed and the cylinder head will have to be replaced.***
- ***Make sure that no sealant residue enters the cylinder head or the bearings.***

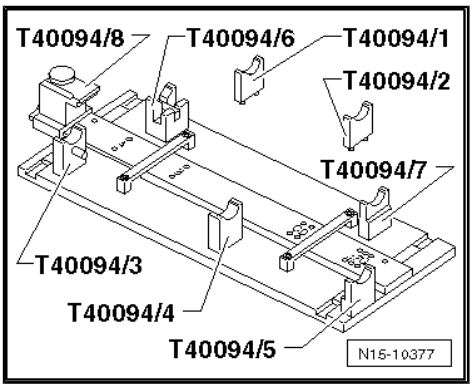
WARNING

Wear protective eyewear.

– Remove any sealant residue from the cylinder head and on the bearing frame using, for example, a rotating plastic brush.
– Clean the sealing surfaces, they must be free of oil and grease.
– Oil the contact surfaces of the camshafts.

Assemble the Camshaft Fitting Tool - T40094- as follows:

– Remove the Camshaft Fitting Tool - Mounts - T40094/3- , - T40094/4- and - T40094/5- from the base plate. Loosen the threaded connections from below.

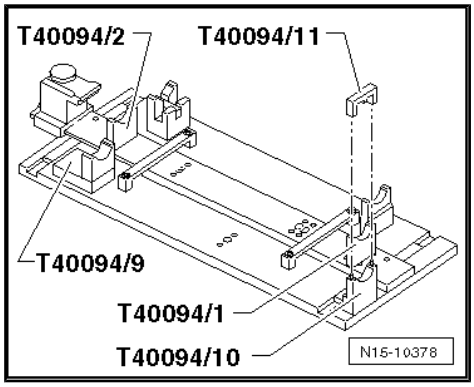


Note

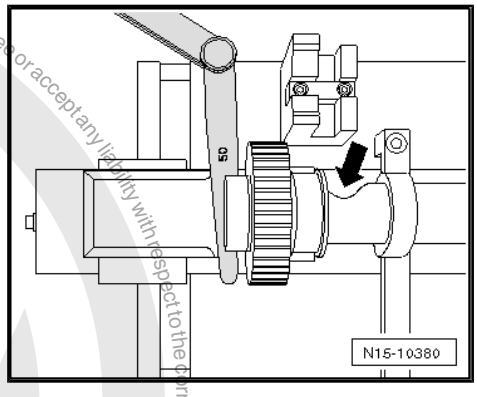
If the Camshaft Fitting Tool - T40094A- mounts are not marked, mark the removed mounts, for example, with numbers, to assure it can be assembled later.

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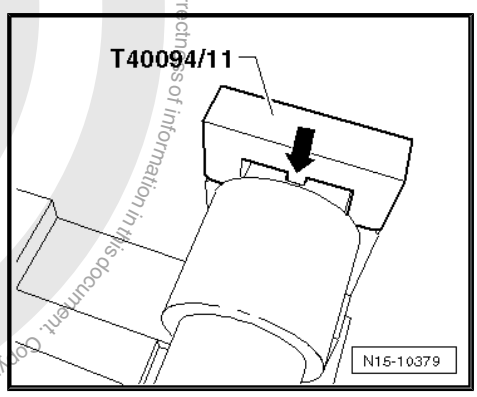
– Instead, mount the Camshaft Fitting Tool - Mounts - T40094/9- and - T40094/10- in the empty outer locations.
– Place the Camshaft Fitting Tool - Mount - T40094/2- at position “A” and Camshaft Fitting Tool - Mount - T40094/1- at position “F”.



– First install the intake camshaft as shown. Make sure the recess -arrow- for the cylinder head bolt faces »outward«.
– Install a 0.50 mm feeler gauge and push the Camshaft Fitting Tool - Mount - T40094/8- into the groove on the intake camshaft.
– Now insert the exhaust camshaft.



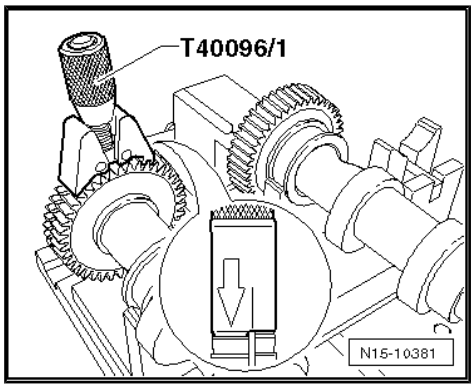
– Secure the exhaust camshaft above its groove -arrow- using the Camshaft Fitting Tool - Cover - T40094/11- .
– Mount the Grip Jaws - T40096/1- on the exhaust camshaft gears.



Caution

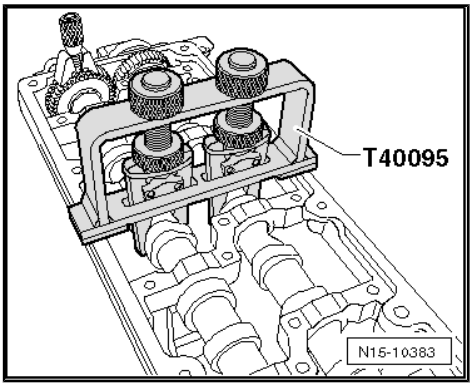
Make sure the clamping bracket marked with an arrow is on the wider sprocket.

– Tighten the Grip Jaws - T40096/1- with the thumbwheel until the tooth flanks align. If necessary use a 13 mm open end wrench.
– Slide the intake camshaft toward the exhaust camshaft until the splines are engaged.
– Position the bearing frame on the camshafts.
• All the camshaft bearings must lie on the camshafts.

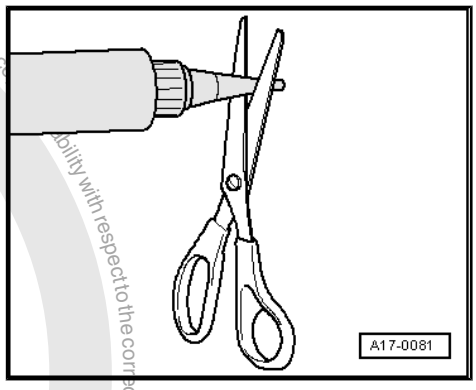


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– Position the Camshaft Fitting Tool - T40095A- as shown and secure the camshafts in the bearing frame.
– Remove the Cover - T40094/11- .
– Remove the Mount - T40094/8- from the groove in the intake camshaft.



– Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).

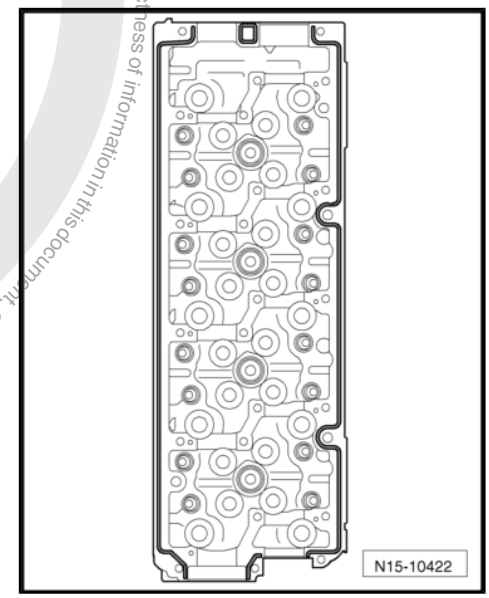


– Apply Silicone Sealant as shown on the clean cylinder head sealing surface. The sealing compound bead must be:

- 2 to 3 mm thick
- Run around inside in the area of the bolt holes

Note

Sealant beads must not be thicker than 2 to 3 mm or else extra sealant can enter camshaft bearing.



– Remove the camshafts together with the bearing frame and the Camshaft Fitting Tool - T40095- from the Camshaft Fitting Tool - T40094- .
– Carefully insert the camshafts and bearing frame in the cylinder head.

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– First tighten the bearing frame bolts or nuts by hand in the sequence -1 to 24-.

• The guide frame must contact the entire contact surface of the cylinder head.

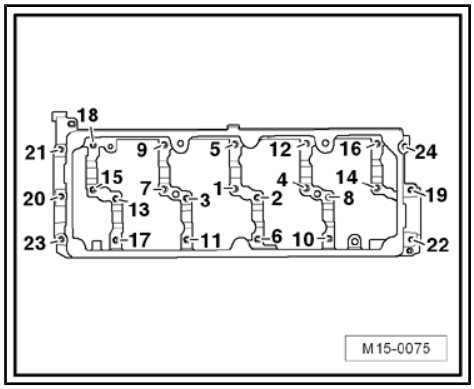
– Tighten the bearing frame bolts or nuts in the sequence -1 to 24-.

• Tightening specifications -item 2- ⇒ Item 2 (page 130) and -item 3- ⇒ Item 3 (page 130) .

– Remove the Camshaft Fitting Tool - T40095- and the Grip Jaws - T40096/1- .

– Replace the camshaft seal. Refer to ⇒ “2.3 Camshaft Seal, Removing and Installing”, page 137 .

– Drive a new cap -item 15- ⇒ Item 15 (page 131) onto the cylinder head with a suitable drift until it is flush.



The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

Note

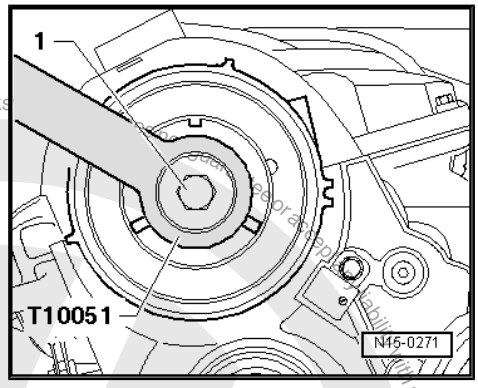
♦ *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*

♦ *After working on the valvetrain, carefully rotate engine by hand at least two full revolutions to ensure that valves do not strike the pistons when starting.*

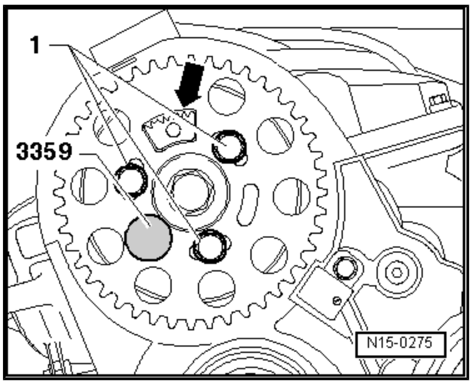
– Place the hub onto the camshaft.

– Counterhold the hub with the Counterhold - Camshaft Gear - T10051- and tighten the hub bolt -1-.

• Tightening specifications. Refer to -item 11- ⇒ Item 11 (page 44) .



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– Push the camshaft sprocket onto the hub.

Note

The toothed segment -arrow- of the camshaft sprocket must face upward.

– Install the bolts -1- into the camshaft sprocket by hand without play.

– Lock the hub with the Diesel Injection Pump Locking Pin -3359- .

– Installing and tensioning the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

– Install the vacuum pump. Refer to ⇒ “1.8 Vacuum Pump, Removing and Installing”, page 126 .

– Install the cylinder head cover. Refer to ⇒ “1.5 Cylinder Head Cover, Removing and Installing”, page 90 .

2.3 Camshaft Seal, Removing and Installing

Special tools and workshop equipment required

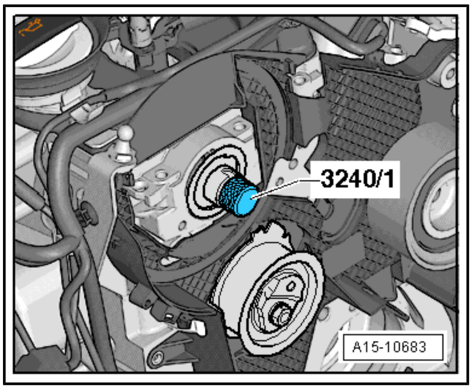
- Seal Installer - Crankshaft/Camshaft - 10-203-
- Puller - Camshaft Seal - 3240-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- M12x65 bolt

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Removing

– Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 , Toothed Belt, Removing, Installing and Tensioning.

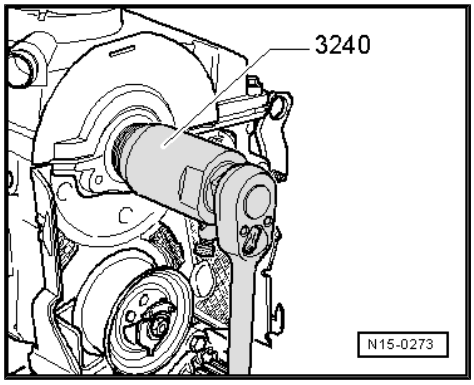
– Remove the camshaft sprocket and the hub. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 , Camshafts, Removing and installing.



– Insert the Puller - Camshaft Seal Supplement -3240/1- into the camshaft.

– Remove the inner section of the Puller - Camshaft Seal - 3240- two rotations (approximately 3 mm) from the outer section and secure with a knurled bolt.

– Lubricate the threaded head on the Puller - Camshaft Seal - 3240- position it and install it as far as possible into the seal using force.
– Loosen the knurled bolt and turn inner section against camshaft until the seal is removed.

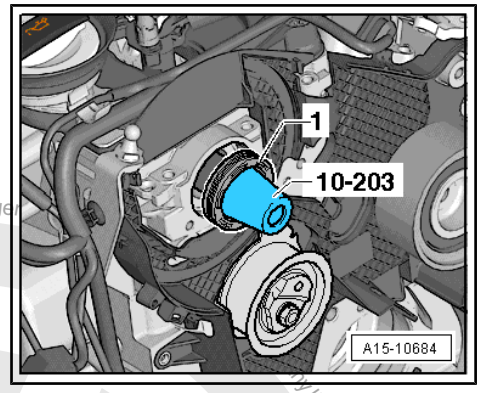


Installing:

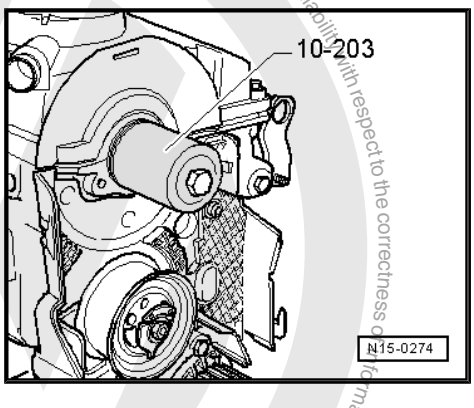
Note

The sealing lip of the seal may not be additionally oiled or greased.

– Clean off any oil residue on the camshaft pin with a clean cloth.
– Mount the guide sleeve from the Puller - Camshaft Seal - 3240- on the camshaft as shown.
– Carefully slide the shaft seal -1- over the guide sleeve and onto the camshaft.



– Press the seal in the thrust piece from the Seal Installer - Crankshaft/Camshaft - 10-203- and install the M12x65 bolt all the way.
– Install the camshaft sprocket and the hub. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 , Camshafts, Removing and installing.
– Installing and tensioning the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .



2.4 Valve Stem Seals with Cylinder Head Installed, Replacing

Special tools and workshop equipment required

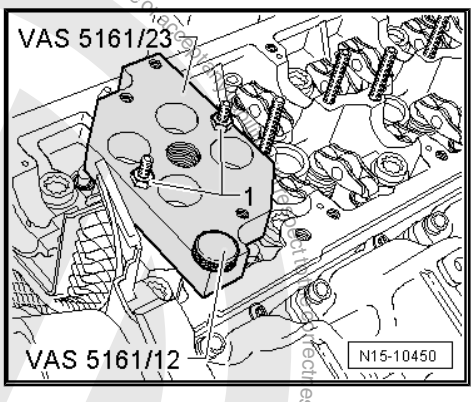
- Puller - Valve Seal - 3364-
- Seal Installer - Valve Stem - 3365-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Valve Keeper Tool Kit - VAS5161A-

Removing:

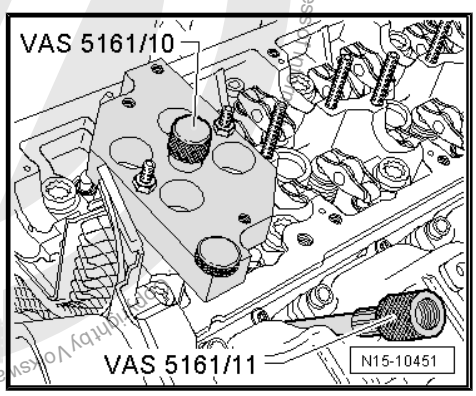
– Remove all the glow plugs. Refer to ⇒ “1 Glow Plugs”, page 408 .
– Remove the camshafts. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 .

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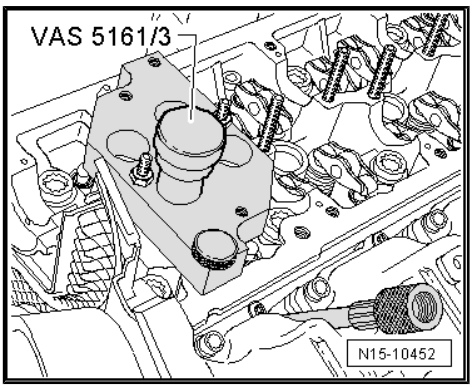
– Position the Valve Cotter Tool Kit - Guide Plate 23 - VAS5161/23- on the cylinder head.
– Secure the Guide Plate on the intake manifold side using the Valve Cotter Tool Kit - Knurled Bolt - VAS5161/12- and to the stud bolts hand-tight with threadless M6 nuts -1-.



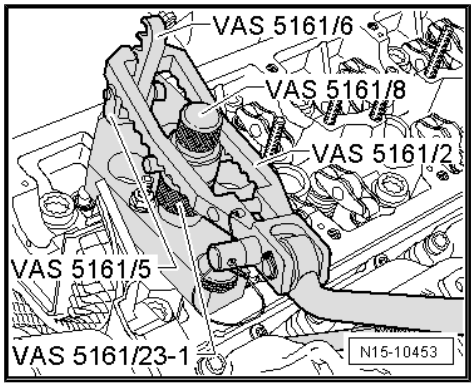
– Install the Valve Keeper Tool Kit - Compression Stud - VAS5161/10- in the Guide Plate .
– Install the Valve Keeper Tool Kit - Adapter for Compressed Air Connection - VAS5161/11- hand-tight in the respective glow plug threads.



– Insert the Valve Cotter Tool Update Kit - Punch - VAS5161/3- into the Guide Plate and loosen the stuck valve retainers with a plastic mallet.



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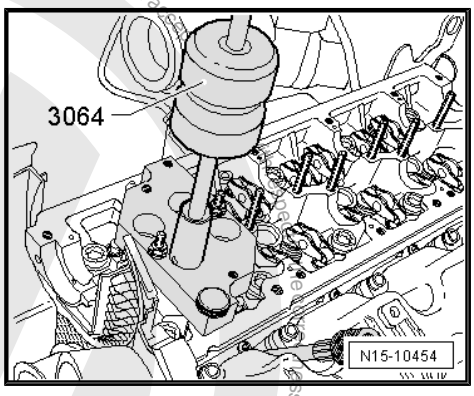
– Install the Valve Cotter Tool Kit - Guide Forks M6/M8 with Threaded Studs - VAS5161/5- using the Valve Cotter Tool Kit - Retainer - VAS5161/6- into the Guide Plate .
– Slide the Valve Cotter Tool Kit - Guide Plate Sleeve - VAS5161/23-1- onto the Valve Cotter Tool Kit - Assembly Cartridge - VAS5161/8A- .
– Connect the Valve Cotter Tool Kit - Adapter - VAS5161/11- to compressed air with a commercially available connector and apply constant pressure.

• Minimum pressure: 6 bar (87.02 psi)

– Engage the Valve Cotter Tool Kit - Pressure Fork with Lever for Assembly Cartridge - VAS5161/2- on the Valve Cotter Tool Kit - Retainer and press the Assembly Cartridge downward.
– At the same time, turn the Assembly Cartridge knurled bolt to the right until the points engage in the valve retainers.
– Move the knurled bolt gently back and forth, causing the valve retainers to be pressed apart and gripped in the Assembly Cartridge .
– Release the Pressure Fork .
– Remove the Assembly Cartridge with the Knurled Spacer Ring , the valve plate and the valve spring.

Note

The Valve Seal Removal Tool - 3064- is shown, the Puller - Valve Seal - 3364- is used for removing the valve stem seals.



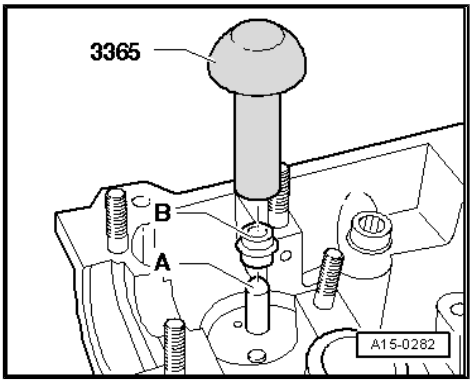
– Pull off valve stem seals using the Puller - Valve Seal - 3364- .

Installing:

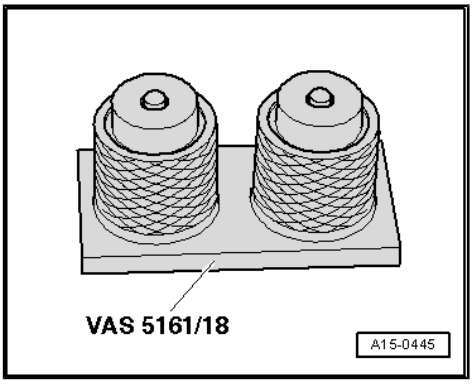
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Note

A plastic sleeve -A- is supplied with the new valve stem seals.



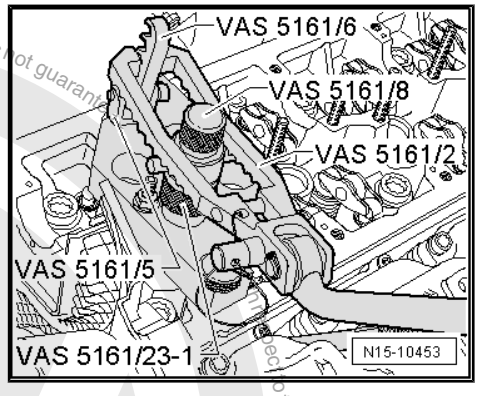
- Place the plastic sleeve -A- on valve stem to prevent damage to new valve stem seals -B-.
- Lightly oil the sealing lips of the valve stem seal -B-.
- Push the valve stem seal -B- on the plastic sleeve -A-.
- Carefully press valve stem seal onto valve guide using Seal Installer - Valve Stem - 3365- .
- Tap lightly on the driver with a plastic mallet until the valve stem seal is at the stop.
- Remove the plastic sleeve -A- again.
- Insert the valve spring and valve plate in the cylinder head.
- If the valve retainers were removed from the Assembly Cartridge , they must first be inserted into the Valve Keeper Tool Kit - Valve Insertion Device - VAS5161/18- .



Note

The large diameter of the valve retainers point upward.

- Press the Assembly Cartridge onto the Insertion Tool from above and remove the valve retainers.
- Insert the Valve Keeper Tool Kit - Assembly Cartridge - VAS5161/8A- in the Guide Plate .
- Press the Pressure Fork down and pull the knurled bolt upward while turning it left and right to insert the valve retainers.
- Release the Pressure Fork with the knurled bolt still tightened.



The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

- Install the camshafts. Refer to ⇒ “2.2 Camshafts, Removing and Installing”, page 131 .

Note

- *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
- *After working on the valvetrain, carefully rotate engine by hand at least two full revolutions to ensure that valves do not strike the pistons when starting.*

- Install all the glow plugs. Refer to ⇒ “1 Glow Plugs”, page 408 .

2.5 Valve Guides, Checking

Special tools and workshop equipment required

- Dial Gauge Holder - VW387-

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♦ Dial Gauge - 0-10mm - VAS6079-

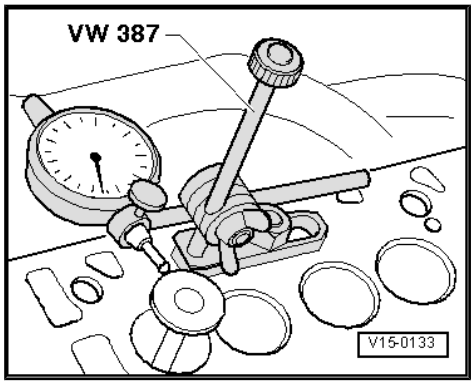
Test Sequence

– Insert a new valve into the guide. The end of the valve stem must be flush with the guide. Use only the intake valve in the intake guide or the exhaust valve in the exhaust guide.

– Determine the tilting clearance.

• Wear limit: 1.30 mm

– If the tilting clearance exceeds the wear limit, the cylinder head must be replaced.

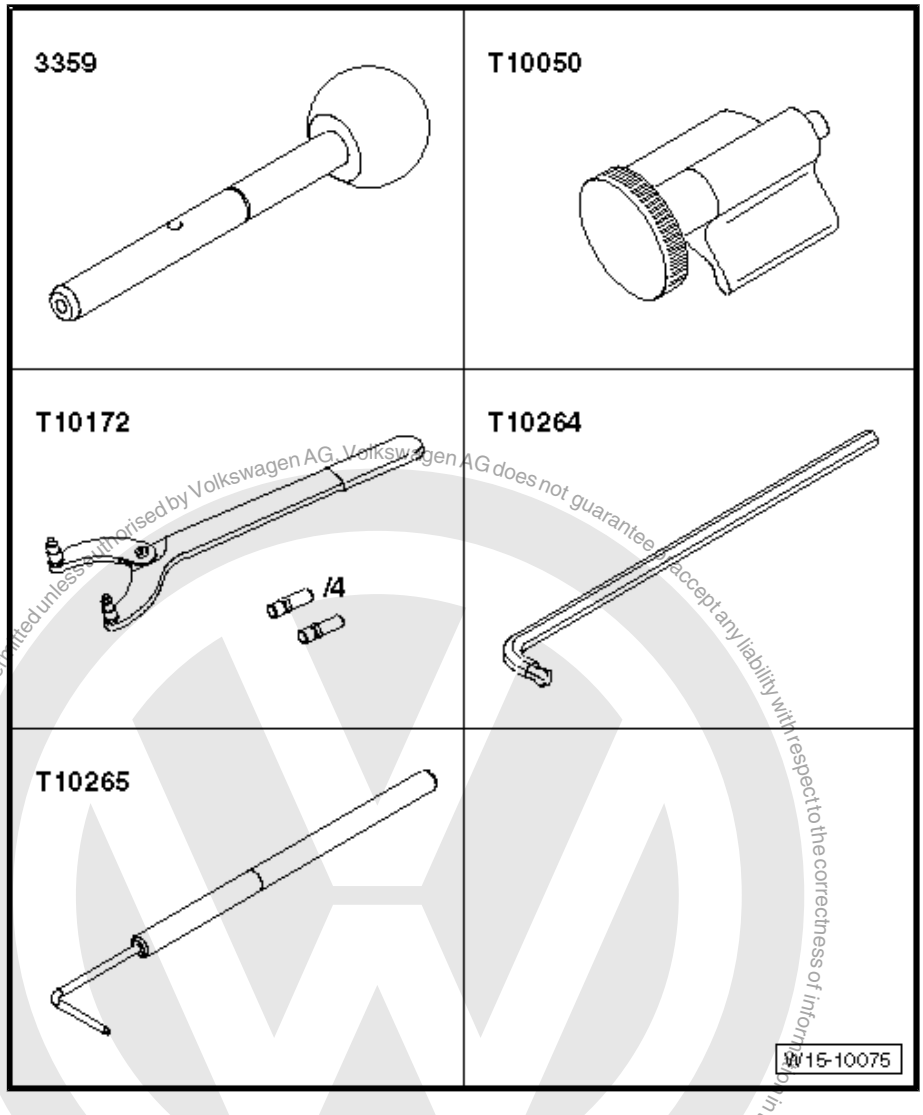


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3 Special Tools

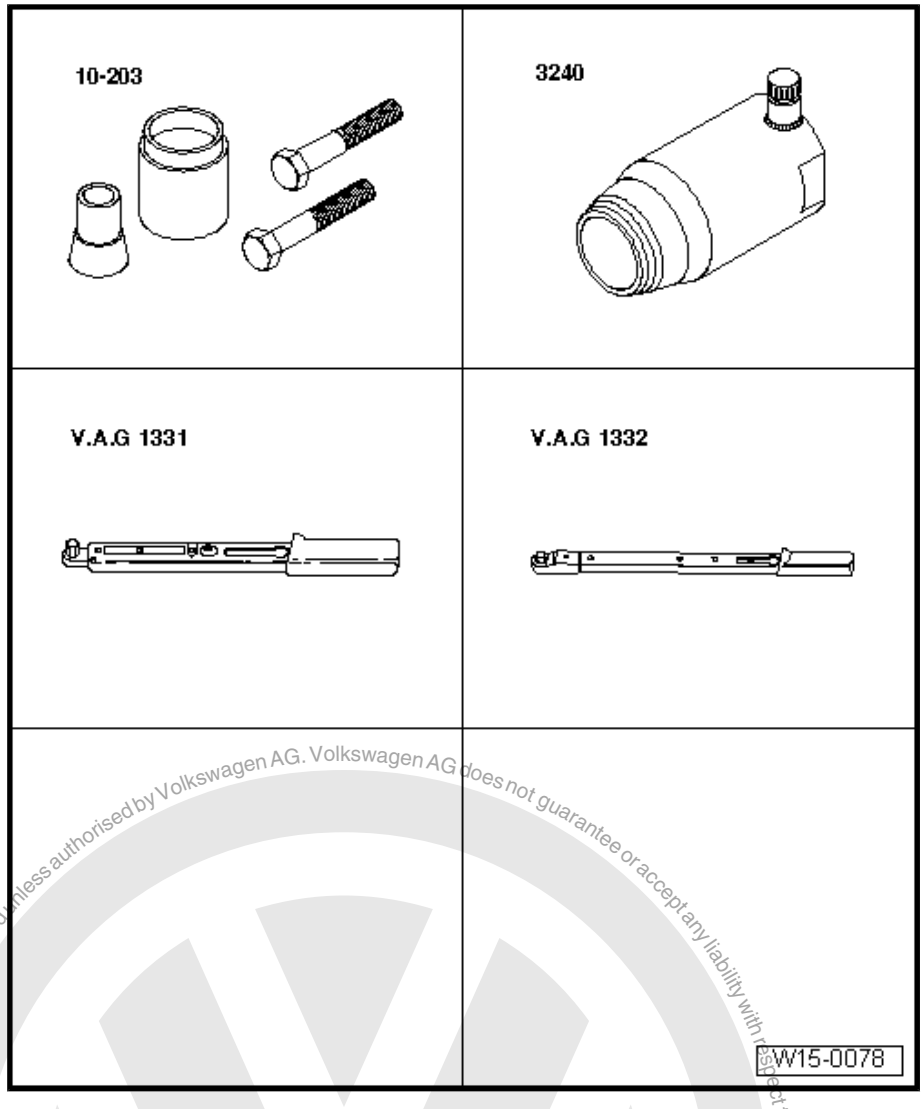
Special tools and workshop equipment required

- Diesel Injection Pump Locking Pin - 3359-
- Crankshaft Stop - T10100- or Crankshaft Stop - T10050- (is shown)
- Counterhold - Multiple Use - T10172A-
- Wrench - Tensioning Roller - T10264-
- Tensioning Roller Locking Tool - T10265-



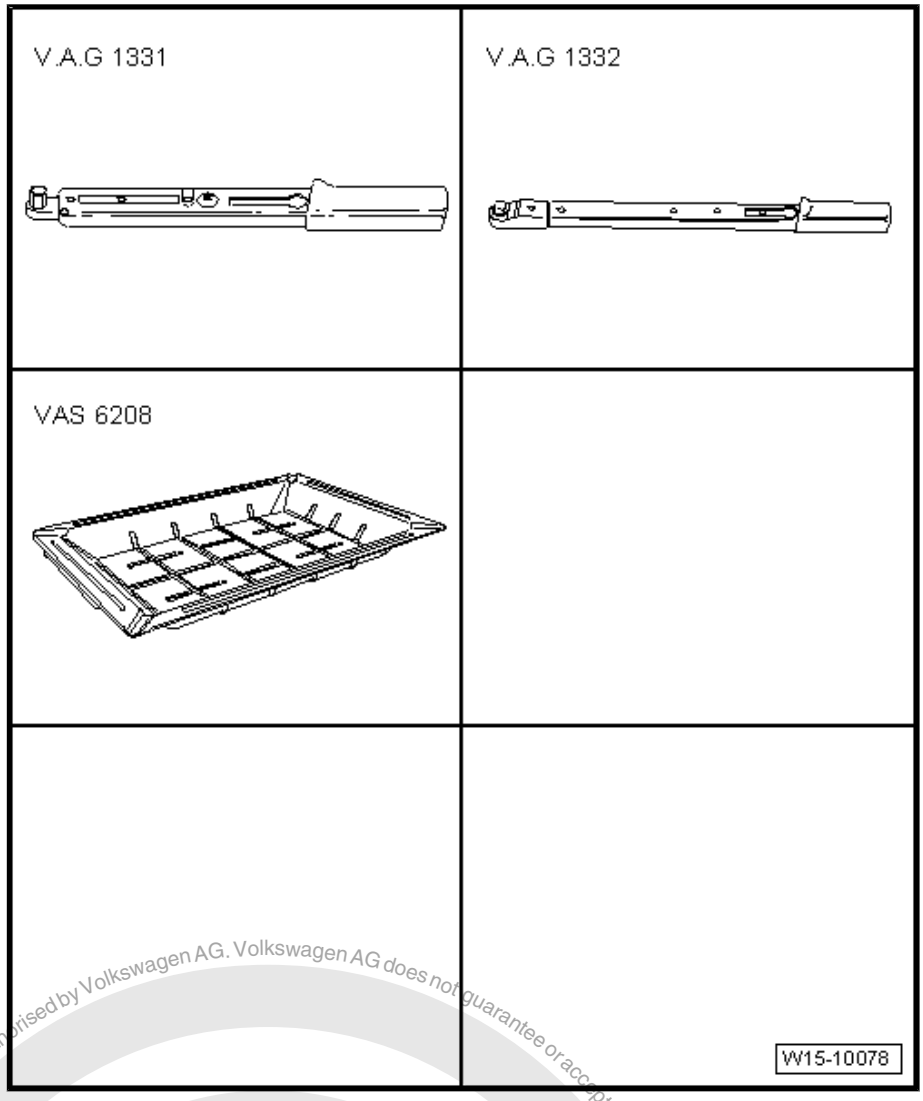
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- Seal Installer - Crankshaft/ Camshaft - 10-203-
- Puller - Camshaft Seal - 3240-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- M12x65 bolt



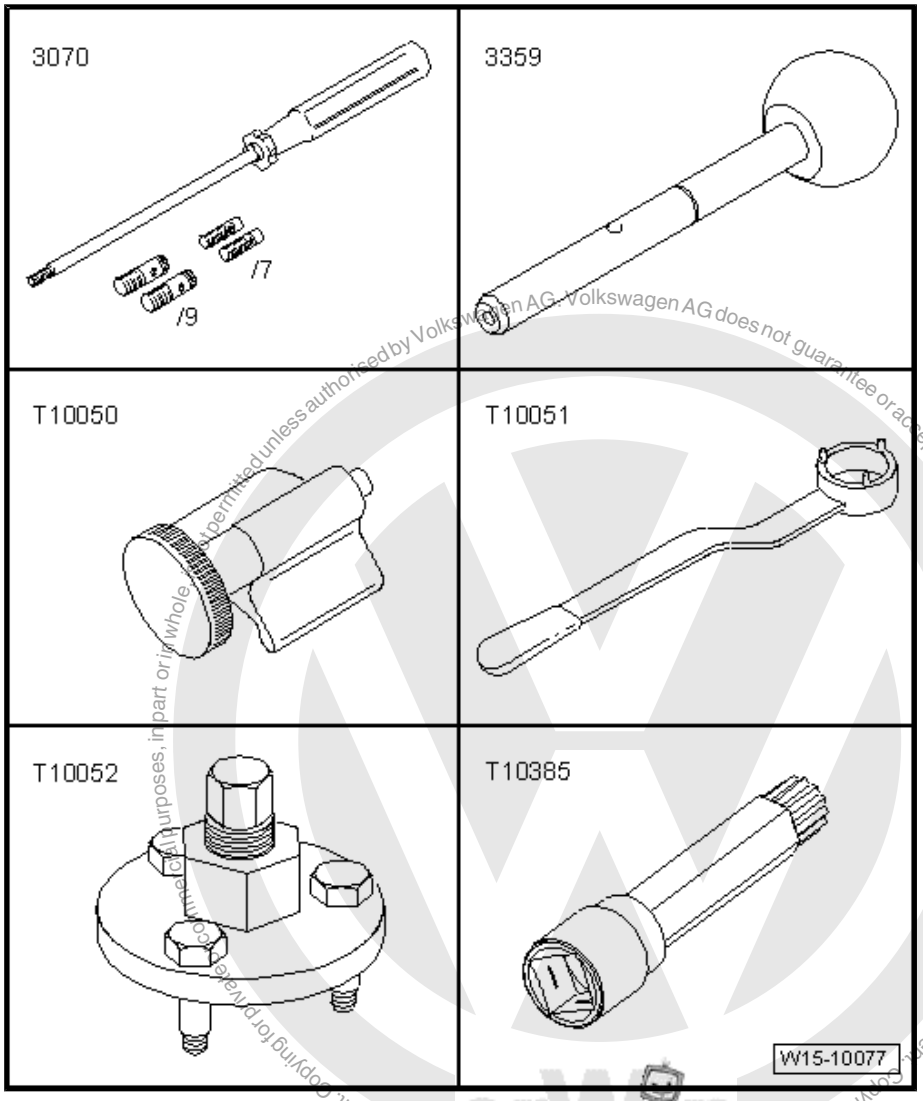
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- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Shop Crane - Drip Tray - VAS6208-
- Engine Bung Set - VAS6122- (not illustrated)



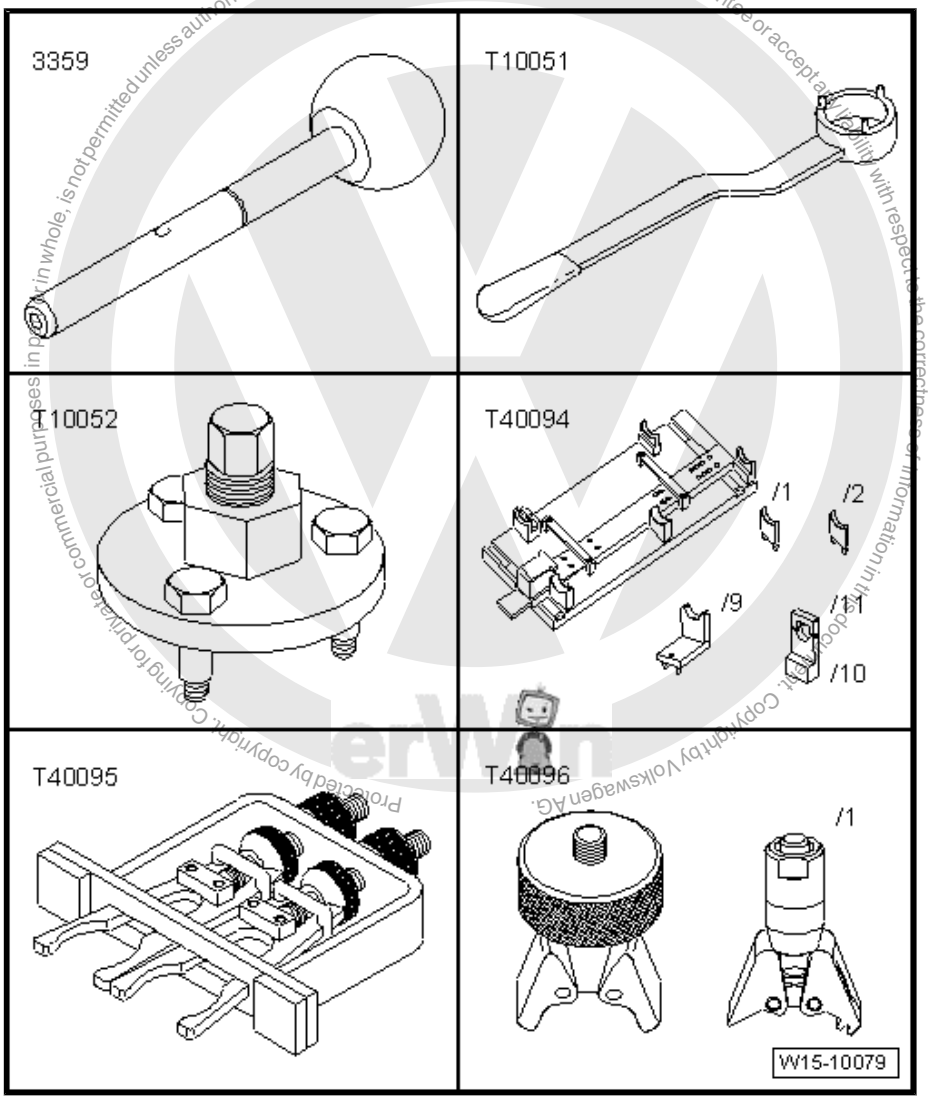
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- Guide Tool - Cylinder Head - 3070-
- Diesel Injection Pump Locking Pin - 3359-
- Crankshaft Stop - T10050-
- Counterhold - Camshaft Gear - T10051-
- Puller - Camshaft Sprocket - T10052-
- Socket - Xzn 10 - T10385-

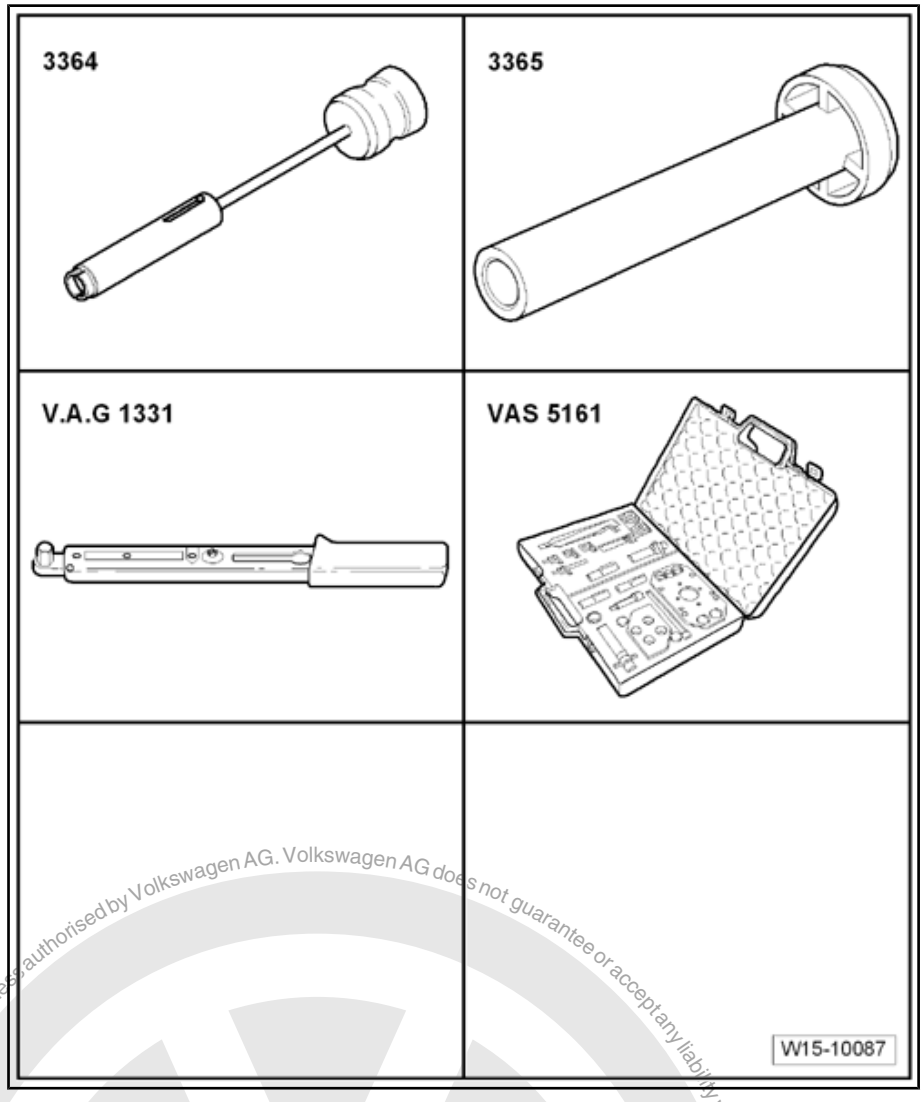


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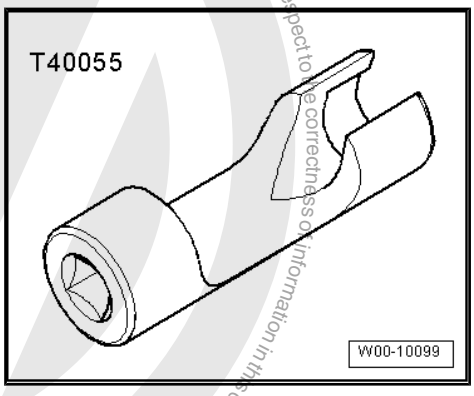
- Diesel Injection Pump Locking Pin - 3359-
- Counterhold - Camshaft Gear - T10051-
- Puller - Camshaft Sprocket - T10052-
- Camshaft Fitting Tool - T40094A-
- Camshaft Fitting Tool - T40095-
- Camshaft Fitting Tool - T40096 - T40096-



- Puller - Valve Seal - 3364-
- Seal Installer - Valve Stem - 3365-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Valve Keeper Tool Kit - VAS5161A-

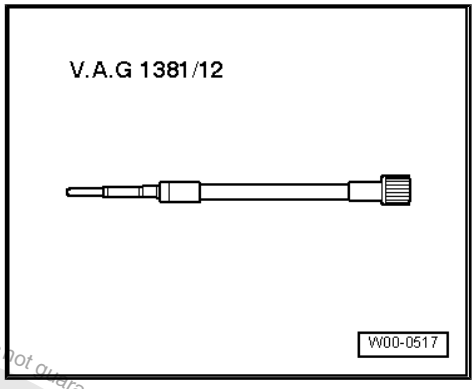


- Union Nut Socket - T40055-

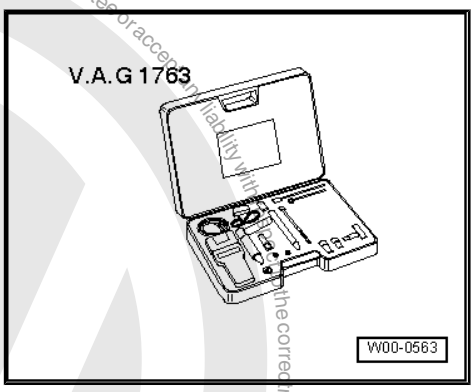


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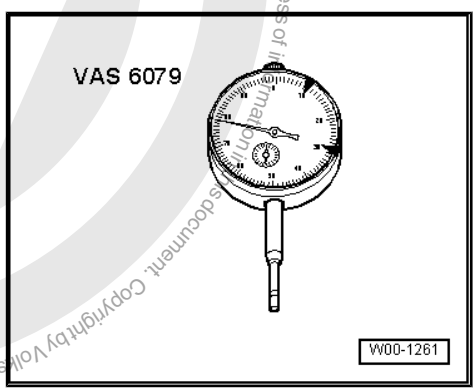
- Compression Tester Kit - Adapter 12 - VAG1381/12-



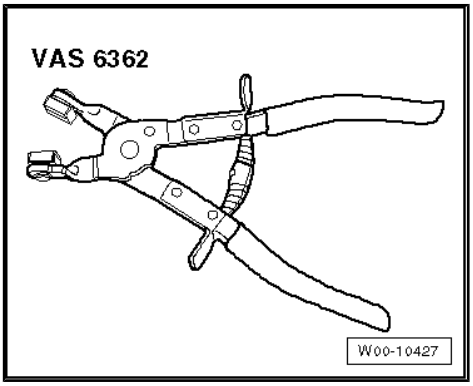
- Compression Tester Kit - VAG1763-



- Dial Gauge - 0-10mm - VAS6079-

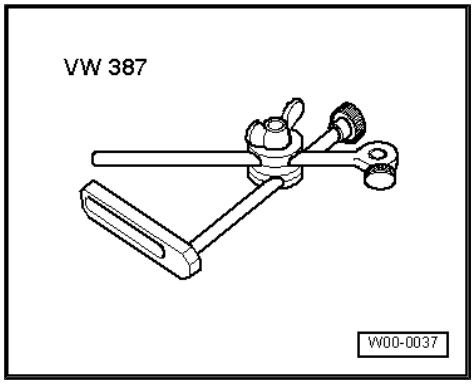


- Hose Clip Pliers - VAS6362-



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- Dial Gauge Holder - VW387-



- Not Illustrated:
- Straight Edge - 500mm - VAS6075-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-
- Engine Bung Set - VAS6122-
- Guide Tool - Cylinder Head - 3070-
- Counterhold - Camshaft Gear - T10051-
- Puller - Camshaft Sprocket - T10052-
- Socket - Xzn 10 - T10385-
- Shop Crane - Drip Tray - VAS6208-
- Camshaft Fitting Tool - T40094A-
- Camshaft Fitting Tool - T40095-
- Camshaft Fitting Tool - T40096 - T40096-
- Seal Installer - Crankshaft/Camshaft - 10-203-
- Puller - Camshaft Seal - 3240-
- Puller - Valve Seal - 3364-
- Seal Installer - Valve Stem - 3365-
- Valve Cotter Tool Kit - VAS5161A-
- Valve Cotter Tool Kit - Guide Plate 23 - VAS5161/23-
- Valve Cotter Tool Kit - Guide Plate 23 - Guide Plate Sleeve - VAS5161/23–1-
- Compression Tester Kit - Adapter 8 - VAG1763/8-

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17 – Lubrication

1 Engine Oil

Note

The oil level must not go above the MAX mark - danger of causing damage to the catalytic converter! Markings. Refer to ⇒ *"1.2 Engine Oil, Checking Level", page 151* .

Draining the Engine Oil. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions; Engine Oil, Draining or Extracting and Filling, Replacing Oil Filter .

Engine Oil Specification. Refer to the ⇒ Maintenance Intervals; Rep. Gr. 03 .

⇒ "1.1 Oil Capacities", page 151

⇒ "1.2 Engine Oil, Checking Level", page 151

1.1 Oil Capacities

⇒ "1.1.1 Engine Code CBEA", page 151

⇒ "1.1.2 Engine Code CJAA", page 151

1.1.1 Engine Code CBEA

Refer to ⇒ Fluid Capacity Tables; Rep. Gr. 03

– If necessary, fill up to the MAX mark on the oil dipstick. Refer to ⇒ "1.2 Engine Oil, Checking Level", page 151 .

1.1.2 Engine Code CJAA

Refer to ⇒ Fluid Capacity Tables; Rep. Gr. 03

– If necessary, fill up to the MAX mark on the oil dipstick. Refer to ⇒ "1.2 Engine Oil, Checking Level", page 151 .

1.2 Engine Oil, Checking Level

Note

The oil level must not go above the MAX mark - danger of causing damage to the catalytic converter!

Test Conditions

- Engine oil temperature: minimum 60 °C (140 °F)
- Vehicle must be at a level position.
- After stopping engine, wait a few minutes to allow oil to flow back into oil pan.

Test Sequence

– Pull out the oil dipstick, wipe off with a clean cloth and insert it all the way.

– Remove the dipstick again and check the oil level.

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Range of markings on dipstick:

1 - MIN Mark

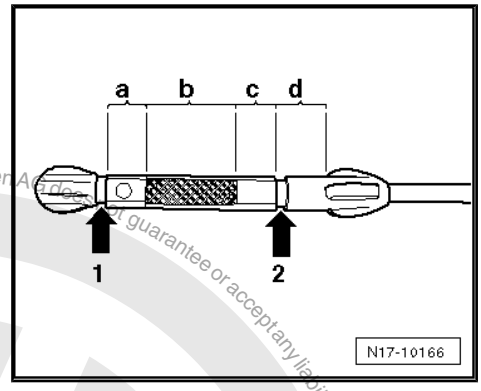
2 - MAX Mark

a - Oil level is near the MIN mark: add oil.

b - Oil level in the center: engine oil can be filled.

c - Oil level is near the MAX mark: do not add engine oil.

d - The oil level may stay at this level due to certain operating conditions.



Note

The engine oil level may stay in the -d- range due to fuel entering the oil or unfavorable operating conditions after filling. This is normal and will correct itself. Engine oil does not need to be drained.

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2 Lubrication System Components, Engine Code CBEA

⇒ “2.1 Overview - Oil Pump, Oil Pan and Balance Shaft Assembly”, page 153

⇒ “2.2 Oil Pan, Removing and Installing”, page 156

⇒ “2.3 Oil Pump, Removing and Installing”, page 158

⇒ “2.4 Balance Shaft Assembly, Removing and Installing”, page 159

⇒ “2.5 Spur Gear, Removing from Crankshaft and Shrink-Fitting New Spur Gear”, page 166

Caution

If large quantities of metal shavings or abraded material are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following steps after the repair:

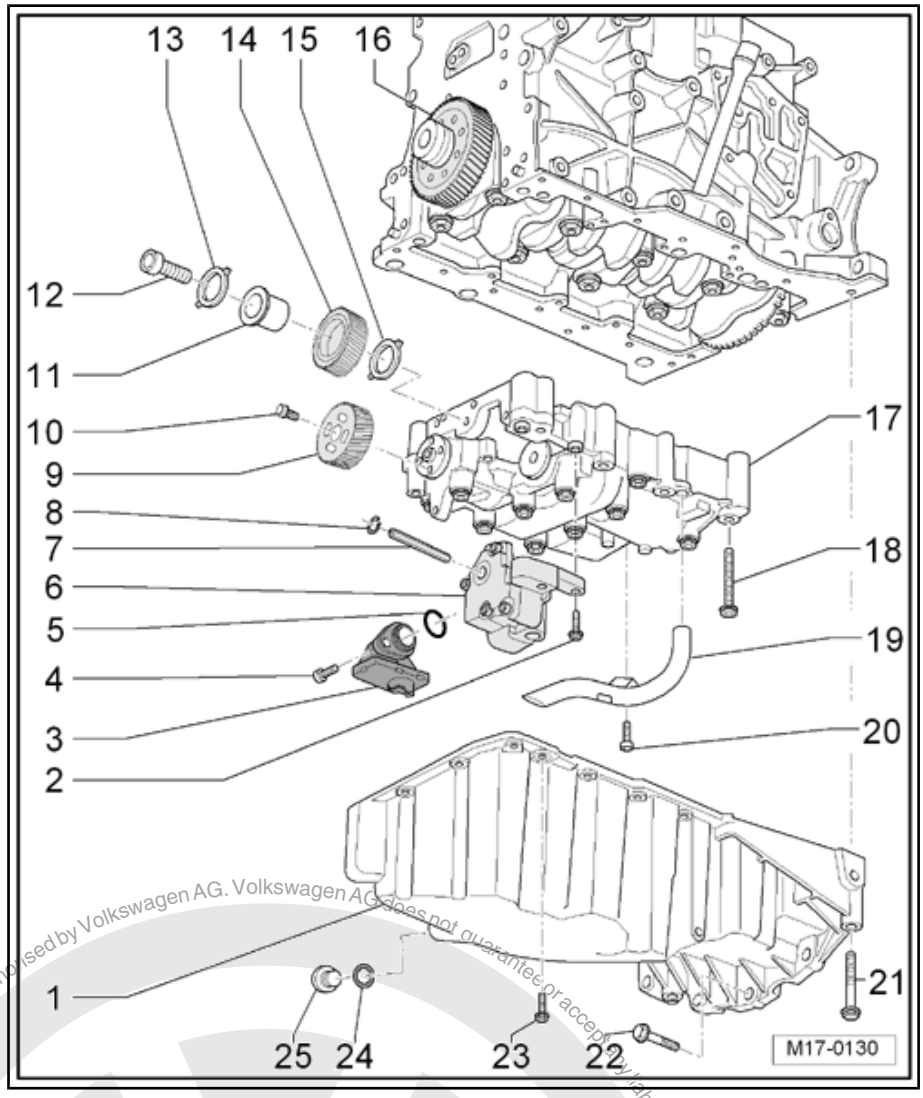
- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

2.1 Overview - Oil Pump, Oil Pan and Balance Shaft Assembly

“Pay attention to the warnings”. Refer to ⇒ page 153 .

Oil spray nozzle and pressure relief valve. Refer to ⇒ Fig. ““Oil Spray Jet and Pressure Relief Valve”“ , page 156 .

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1 - Oil Pan

- ❑ Removing and installing. Refer to ⇒ “2.2 Oil Pan, Removing and Installing”, page 156 .

2 - Bolt

- ❑ 10 Nm

3 - Intake Tube

- ❑ Clean the screen if there are debris

4 - Bolt

- ❑ 10 Nm

5 - O-Ring

- ❑ Replace

6 - Oil Pump

- ❑ Removing and installing. Refer to ⇒ “2.3 Oil Pump, Removing and Installing”, page 158 .
- ❑ Before installing, check if both alignment sleeves for centering the oil pump on the balance shaft assembly are present.

7 - Oil Pump Input Shaft

8 - Circlip

- ❑ Replace damaged or stretched circlips
- ❑ Must lie in the base of the groove

9 - Balance Shaft Spur Gear

10 - Bolt

- ❑ 20 Nm + 90° (1/4) additional turn
- ❑ Replace

11 - Hub

- ❑ Replace
- ❑ For the intermediate sprocket

12 - Bolt

- ❑ Replace
- ❑ 90 Nm + 90° (1/4 turn) additional turn

13 - Axial Bearing Disc

- ❑ Replace
- ❑ For the intermediate sprocket
- ❑ Note the installation position Refer to ⇒ Fig. ““Axial Bearing Disc Installation Position”“ , page 156 .

14 - Intermediate Sprocket

- ❑ Replace
- ❑ To achieve the correct backlash, a coating is applied to the intermediate sprocket. The correct play adjustment is made through the wear.

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- ❑ For the correct installation position, a white dot is applied on the intermediate sprockets with coating on parts of the circumference
- ❑ If there is no white dot, the entire circumference of the intermediate sprocket is coated.

Caution

When installing the intermediate sprocket, make sure the axial bearing disc is seated correctly. Refer to ⇒ Fig. ""Axial Bearing Disc Installation Position"", page 156 .

- ❑ Installation position: the part number must be visible
- ❑ Removing and installing. Refer to ⇒ "2.4 Balance Shaft Assembly, Removing and Installing", page 159 ; Balance Shaft Assembly, Removing and Installing

15 - Axial Bearing Disc

- ❑ Replace
- ❑ For the intermediate sprocket
- ❑ Note the installation position Refer to ⇒ Fig. ""Axial Bearing Disc Installation Position"" , page 156 .
- ❑ If necessary, secure to the housing with lubricant to install the intermediate sprocket

16 - Crankshaft Spur Gear

- ❑ Spur Gear, Removing from Crankshaft and Shrink-Fitting a New Spur Gear. Refer to ⇒ "2.5 Spur Gear, Removing from Crankshaft and Shrink-Fitting New Spur Gear", page 166 .

17 - Balance Shaft Assembly

- ❑ Removing and installing. Refer to ⇒ "2.4 Balance Shaft Assembly, Removing and Installing", page 159 .
- ❑ Before installing, check if both alignment sleeves for centering the balance shaft assembly on the cylinder block are present.

18 - Bolt

M7 bolt:

- ❑ 13 Nm + 90° ($^1/_4$) additional turn
- ❑ M8 bolt:
- ❑ 20 Nm + 90° ($^1/_4$) additional turn
- ❑ Replace
- ❑ Note the tightening sequence. Refer to ⇒ "2.4 Balance Shaft Assembly, Removing and Installing", page 159 , Balance Shaft Assembly, Removing and Installing

19 - Oil Intake Pipe

20 - Bolt

- ❑ 10 Nm

21 - Bolt

- ❑ 40 Nm

22 - Bolt

- ❑ 45 Nm

23 - Bolt

- ❑ 15 Nm
- ❑ Tighten diagonally in steps

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24 - Seal

- ❑ Replace

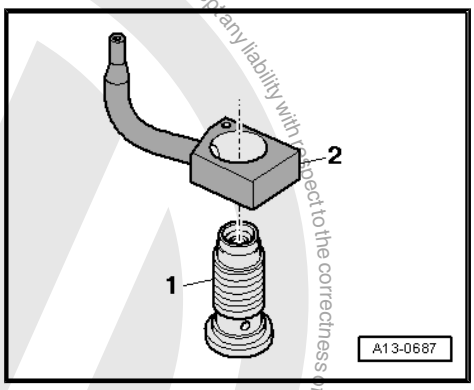
25 - Oil Drain Plug

- ❑ 30 Nm

Oil Spray Jet and Pressure Relief Valve

1 - Bolt with Pressure Relief Valve, 27 Nm (Insert Without Sealant)

2 - Piston Cooling Oil Spray Jet



Note

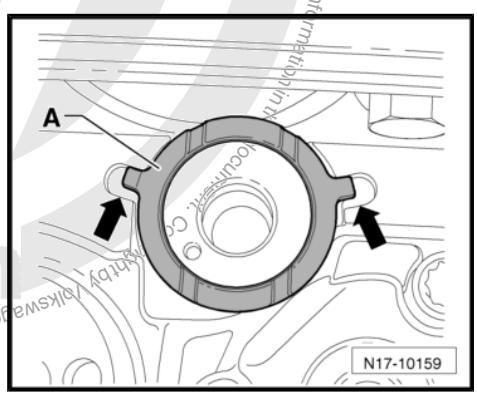
When replacing the oil injector jet, pay attention to the correct allocation for the pistons. Refer to Parts Catalog

“Pay attention to the warnings”. Refer to ⇒ page 153 .

Axial Bearing Disc Installation Position

Caution

Make sure the axial bearing disc -A- does not slip out of the recesses on the balance shaft housing during installation -arrows- which would cause it to get stuck. If necessary, secure with grease on the balance shaft assembly.



2.2 Oil Pan, Removing and Installing

Special tools and workshop equipment required

- ♦ T Bar And Socket - 10mm - 3185-
- ♦ Hex Ball Socket - T10058-
- ♦ Torque Wrench 1331 5-50Nm - VAG1331-
- ♦ Used Oil Collection and Extraction Unit - SMN372500-
- ♦ Hand Drill with Plastic Brush Attachment
- ♦ Protective Eyewear
- ♦ Flat-Blade Scraper
- ♦ Silicone Sealant - D 176 404 A2-

Removing:

– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

– Drain the engine oil. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions .

Note

Follow all waste disposal regulations!

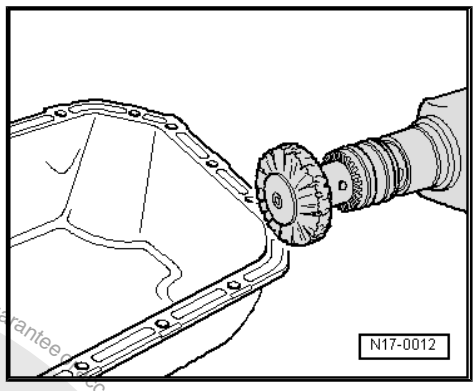
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– Install the insulation on the oil pan.
– Remove the bolts connecting the oil pan and transmission.
– Remove the oil pan.
– Tap the oil pan lightly with a rubber hammer to loosen it, if necessary.
– Remove the sealant residue from cylinder block with a flat-blade scraper.

WARNING

Wear protective eyewear.

– Remove the sealant residue on the oil pan using a rotating brush such as a hand drill with a plastic brush attachment.
– Clean the sealing surfaces. They must be free of oil and grease.

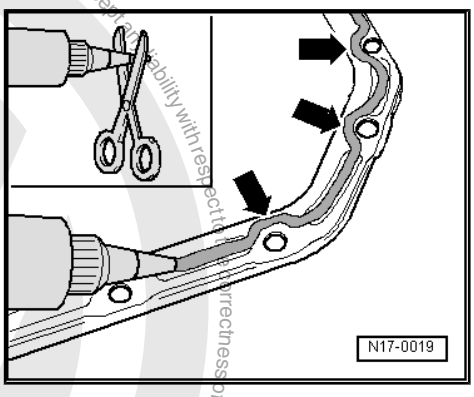


Installing:

Note

- *Note the expiration date for the Sealant .*
- *The oil pan must be installed within five minutes after applying the Silicone Sealant .*

– Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).



Note

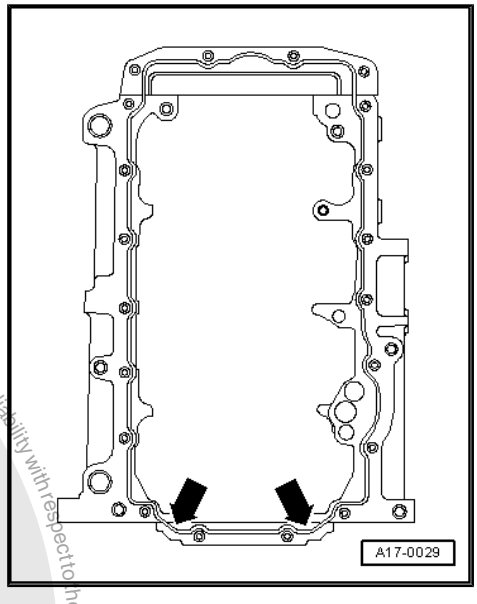
The sealant bead must not be thicker than 2 to 3 mm, or else excess sealant could get into oil pan and block the screen in the oil pump intake tube.

– Apply the Silicone Sealant as shown on the clean oil pan sealing surface. The sealing compound bead must be:

- 2 to 3 mm thick
- run around inside of bolt holes -arrows-

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– Apply Silicone Sealant to the clean oil pan sealing surface as shown. (The illustration shows the location of the sealant bead on the cylinder block.)
– Position the oil pan immediately and gently tighten the bolts connecting the oil pan to the transmission and all of the oil pan bolts. Make sure the oil pan lies flush on the intermediate plate/ transmission flange.



Note

When installing the oil pan on a removed engine, make sure that the oil pan is positioned flush with the cylinder block on the flywheel side.

– Tighten the oil pan bolts in a diagonal sequence.
• Tightening specification -item 23- ⇒ Item 23 (page 155) .
– Tighten the oil pan/cylinder block bolts.
• Tightening specification -item 21- ⇒ Item 21 (page 155) .
– Tighten the oil pan/transmission bolts.
• Tightening specification -item 22- ⇒ Item 22 (page 155) .

Note

After installing the oil pan, allow the Sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.

Further installation is the reverse order of removal.

2.3 Oil Pump, Removing and Installing

Special tools and workshop equipment required

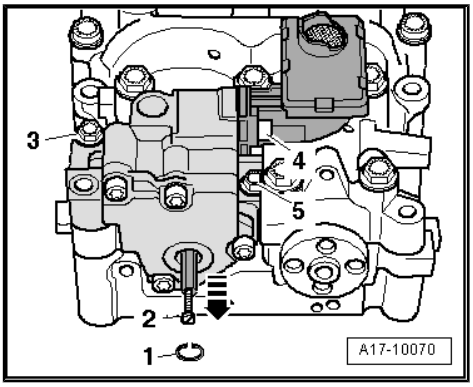
♦ Torque Wrench 1331 5-50Nm - VAG1331-

Removing:

– Remove the oil pan. Refer to ⇒ “2.2 Oil Pan, Removing and Installing”, page 156 .

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– Remove the circlip -1- with locking ring pliers.
– Install an M3 bolt -2- and remove the input shaft from the oil pump in direction of -arrow-.
– Remove the screw -4- and remove the intake tube from the oil pump.
– Remove the bolts -3 and 5- and the oil pump.



Caution

Do not loosen the bolt on the intermediate sprocket.

Installing:

Install in reverse order of removal. Note the following:

- Replace the O-ring.
- Replace damaged or stretched circlips.
- The circlip must lie in the base of the groove.
- Tightening specifications. Refer to ⇒ “2.1 Overview - Oil Pump, Oil Pan and Balance Shaft Assembly”, page 153 , Overview - Oil Pump, Oil Pan and Balance Shaft Assembly

– Check that the alignment sleeves to center the oil pump on the balance shaft assembly are present before installing the oil pump.
– Install the oil pan. Refer to ⇒ “2.2 Oil Pan, Removing and Installing”, page 156 .

2.4 Balance Shaft Assembly, Removing and Installing

⇒ “2.4.1 Balance Shaft Assembly, Removing”, page 159 .

⇒ “2.4.2 New Balance Shaft Assembly, Installing”, page 161

⇒ “2.4.3 Used Balance Shaft Assembly, Installing”, page 165

2.4.1 Balance Shaft Assembly, Removing

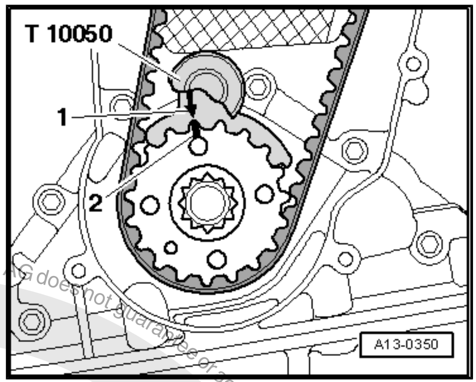
Special tools and workshop equipment required

♦ Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- for engines with a round crankshaft toothed belt sprocket
♦ Locking Tool - T10255-

– Remove the ribbed belt. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .
– Remove the belt pulley/vibration damper -item 29- ⇒ Item 29 (page 45) .
– Remove the toothed belt guard lower section -item 25- ⇒ Item 25 (page 44) .
– Remove the oil pan. Refer to ⇒ “2.2 Oil Pan, Removing and Installing”, page 156 .

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– Rotate the engine to TDC and secure the crankshaft toothed belt sprocket with the Crankshaft Stop - T10050- . Push the crankshaft stop from the front side of the toothed belt sprocket into the splines. The camshaft toothed segment must be in the »12 o'clock« position.

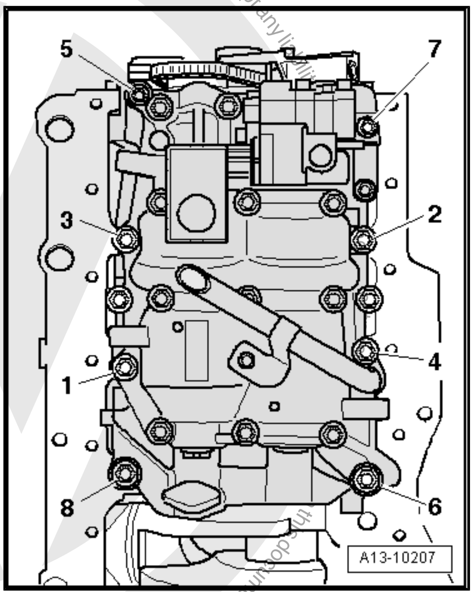


Note

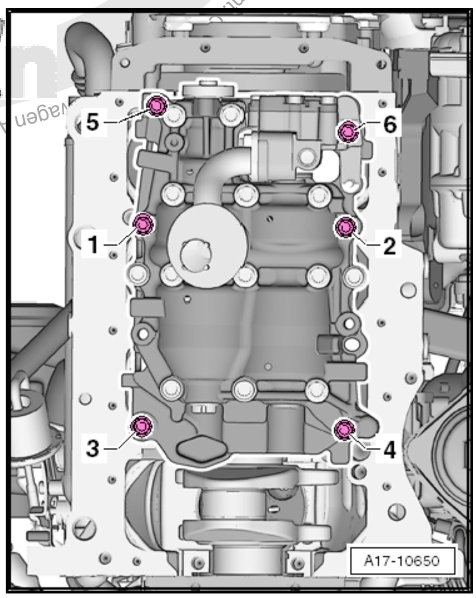
The markings on the crankshaft toothed belt sprocket -2- and the Crankshaft Stop - T10050- -1- must align. The pin on the Crankshaft Stop - T10050- must engage in the hole on the sealing flange.

– Remove the bolts in the sequence -8 to 1- and remove the balance shaft assembly with the oil pump.

Loosening Sequence - Balance Shaft Module with Six Attachment Points



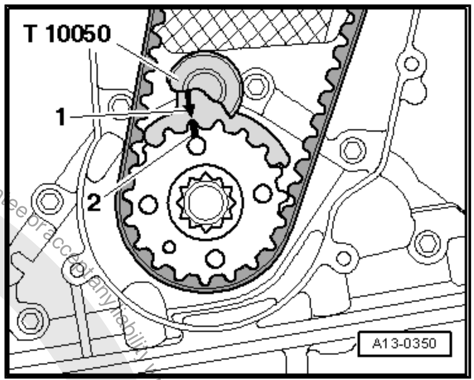
– Remove the bolts in the sequence -6 through 1- and remove the balance shaft module with the oil pump.



Refer to
⇒ “2.4.2 New Balance Shaft Assembly, Installing”, page 161

Refer to
⇒ “2.4.3 Used Balance Shaft Assembly, Installing”, page 165

2.4.2 New Balance Shaft Assembly, Installing



Conditions

- Crankshaft secured using the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- .

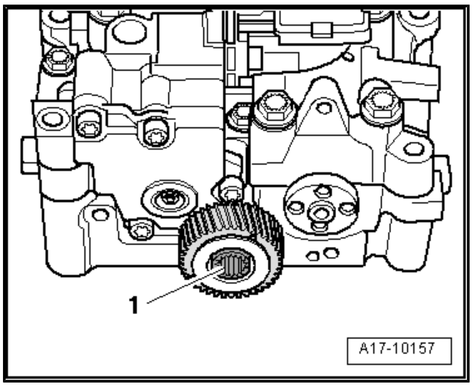
Note

- *The balance shaft assembly spur gear drive must be installed with the correct backlash.*
- *A coating is applied to the new intermediate sprocket to achieve the correct backlash.*
- *When the intermediate sprocket has a white dot, only sections of the circumference are coated. When there is not a white dot, then the entire circumference of the intermediate sprocket is coated.*
- *The coating wears off in a short period of time and this ensures the correct backlash.*
- *For this reason, a new balance shaft assembly must always be installed in conjunction with a new intermediate sprocket with coating.*
- *Only intermediate sprockets with a partial coating have a white dot to indicate the correct installation position.*
- *No installation position must be observed for intermediate sprockets with coating on the entire circumference.*
- *Replace the bolts which have been tightened to torque.*

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Caution

- ***The intermediate sprocket threaded connection must be loosened to position the balance shaft assembly. When doing so, make sure the bolt is not loosened too much. Otherwise the bearing disc could slip behind the intermediate sprocket.***
- ***Axial bearing disc installation position. Refer to*** ***⇒ Fig. ""Axial Bearing Disc Installation Position"" , page 156 .***

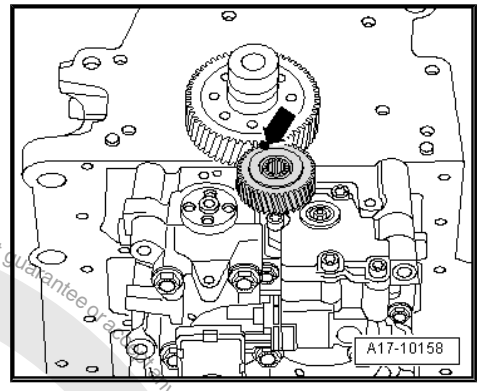


– Loosen the bolt -1- for the intermediate sprocket approximately 45° (1/8 turn) before mounting the balance shaft assembly on the cylinder block.

– Check that the alignment sleeves for centering the balance shaft assembly on the cylinder block are present.

– Place the balance shaft assembly on the cylinder block and make sure the partially-coated intermediate sprocket is in the correct position:

• The white dot -arrow- on the intermediate sprocket must be centered to the crankshaft.



Note

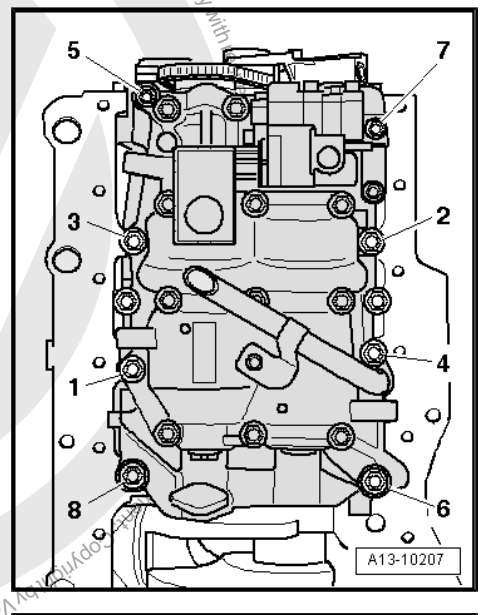
- *Make sure the coating on the intermediate sprocket is not damaged.*
- *Due to the gear ratio, the white dot -arrow- does not go back to its original position after the engine is turned over.*

– Also install the new bolts in the sequence -1 to 8- hand-tight.

– Tighten the balance shaft assembly bolts as follows:

1. Pretighten the bolts in sequence -1 to 8- to 6 Nm.
2. Tighten the bolts -5 and 7- to 13 Nm.
3. Turn the bolts -5 and 7- an additional 90° ($^1/_4$ turn) using a rigid wrench.
4. Tighten the bolts -1 to 4, 6 and 8- to 20 Nm.
5. Turn the bolts -1 to 4, 6 and 8- an additional 90° ($^1/_4$ additional turn) using a rigid wrench.

– Secure the balance shaft with the Locking Tool - T10255- . Rotate the balance shaft if necessary.



Tightening Sequence - Balance Shaft Module with Six Attachment Points

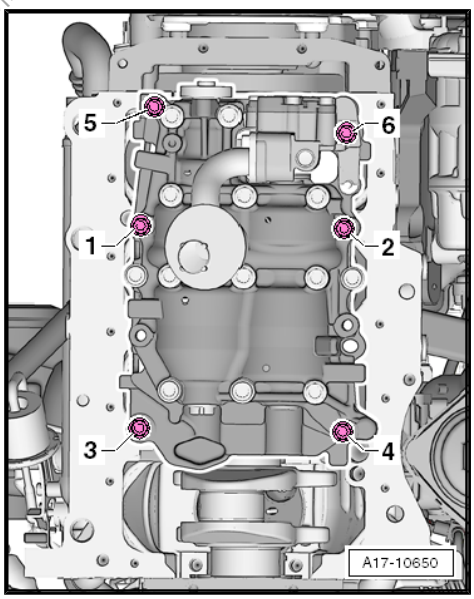
– Install the new bolts in the sequence -1 through 6- and tighten them by hand.

– Tighten the balance shaft module bolts in four stages as follows:

– 1. Tight the bolts -1 through 6- to 6 Nm.

– 2. Tighten the bolts -1 through 4- to 20 Nm.

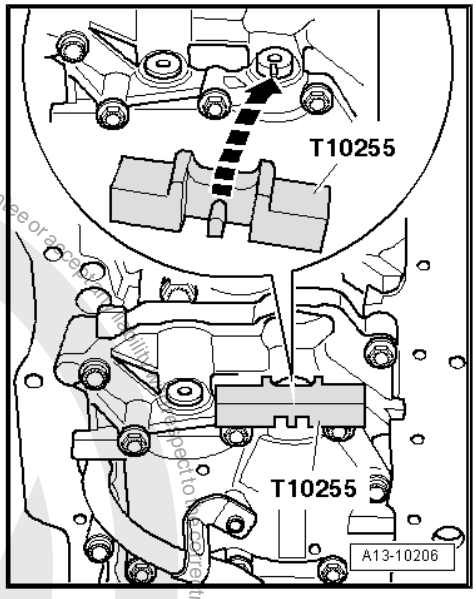
– 3. Tighten the bolts in sequence -5 and 6- to 13 Nm.



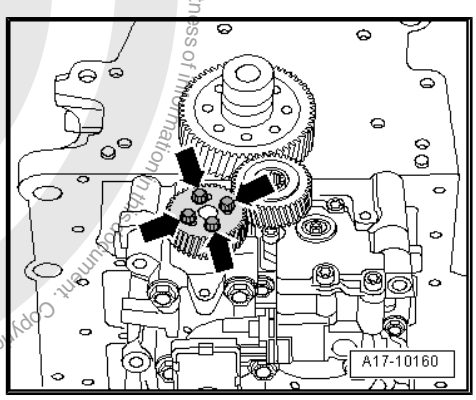
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– 4. Tighten the bolts in sequence -1 through 6- turn an additional 90° (1/4) turn using a ratchet.

• The locking tool pins must engage in the groove on the balance shaft.



– Carefully position the balance shaft spur gear on the balance shaft while pressing the intermediate sprocket to the side slightly.



Note

♦ *Make sure the threaded holes on the balance shaft are centered as much as possible in the oblong holes on the balance shaft spur gear.*

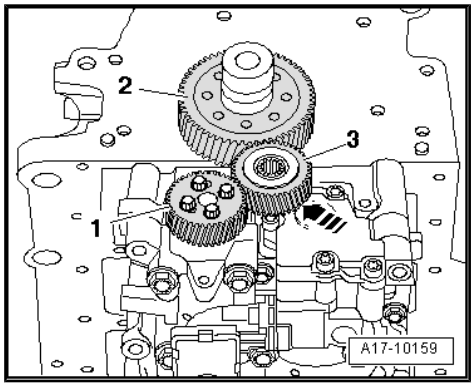
♦ *If the oblong holes in the balance shaft spur gear cannot be aligned with the threaded holes in the cover, rotate the balance shaft spur gear the corresponding number of teeth and position it again.*

– Tighten the bolts for the balance shaft spur gear -arrows-.

– Remove the Locking Tool - T10255- .

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The follow three steps must be performed at the same time (a second technician is required):



– Press the intermediate gear -3- forcefully in the direction of -arrow- into the splines of the crankshaft spur gear -2- and the balance shaft spur gear -1- using a wooden block if necessary.
– Rotate the balance shaft spur gear counter-clockwise slightly.
– Tighten the new intermediate sprocket bolt:
• Tightening specification -item 12- ⇒ Item 12 (page 154) .
– Remove the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- .

Note

The intermediate sprocket must not have any backlash after installation. This can be checked by pressing slightly by hand.

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

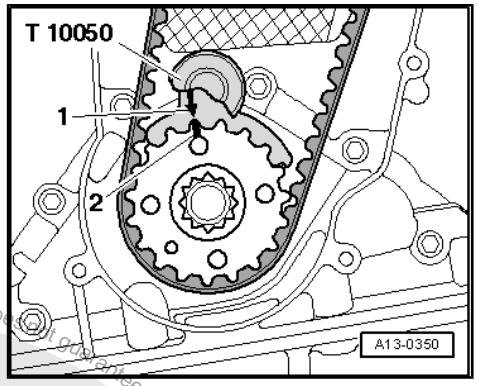
– Install the oil pan. Refer to ⇒ “2.2 Oil Pan, Removing and Installing”, page 156 .
– Install the toothed belt guard lower section:
• Tightening specification -item 27- ⇒ Item 27 (page 44) .
– Install the belt pulley/vibration damper.
• Tightening specification -item 28- ⇒ Item 28 (page 44) .
– Install the ribbed belt. Refer to ⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

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2.4.3 Used Balance Shaft Assembly, Installing

Conditions

- Crankshaft secured using the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- .



Caution

- *If the intermediate sprocket bolt was loosened, the crankshaft spur gear was replaced, or the crankshaft was removed, then a new intermediate sprocket with coating must be installed and the hub -item 11- ⇒ Item 11 (page 154) including the bolt -item 12- ⇒ Item 12 (page 154) and axial bearing disc -item 13- ⇒ Item 13 (page 154) must be replaced. Otherwise the backlash will not be correct.*
- *Installation procedure. Refer to ⇒ "2.4.2 New Balance Shaft Assembly, Installing", page 161 , New Balance Shaft Assembly, Installing*

Note

- *Proceed as follows if the used balance shaft assembly will be installed again and neither the crankshaft spur gear was replaced nor the crankshaft was removed. Never loosen the intermediate sprocket.*
- *Replace the bolts which have been tightened to torque.*

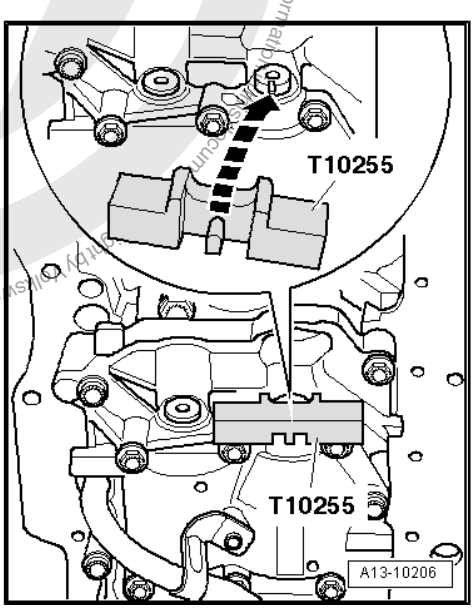
– Secure the balance shaft with the Locking Tool - T10255- . Rotate the balance shaft if necessary.

- The locking tool pins must engage in the groove on the balance shaft.

– Check that the alignment sleeves for centering the balance shaft assembly on the cylinder block are present.

– Position the balance shaft assembly on the cylinder block.

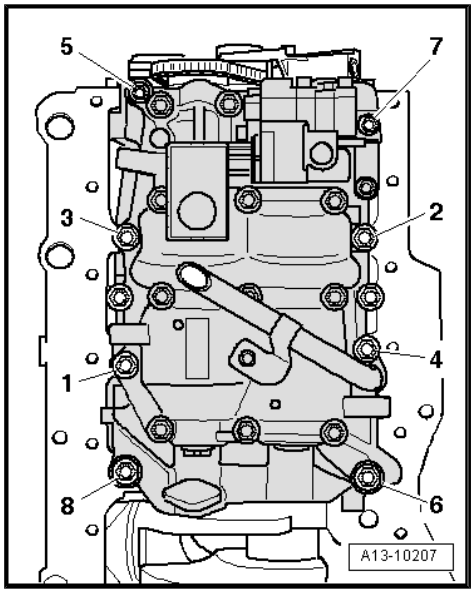
- The intermediate sprocket must engage in the spur gear on the crankshaft when the balance shaft is locked.
- The intermediate sprocket must have slight noticeable backlash.



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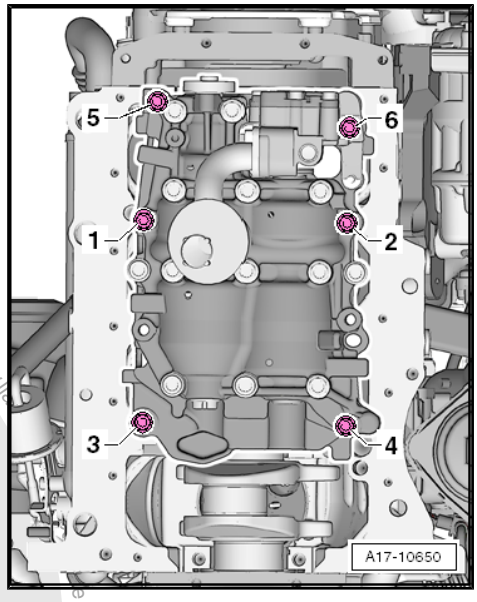
– Also install the new bolts in the sequence -1 to 8- hand-tight.
– Tighten the balance shaft assembly bolts as follows:

1. Pretighten the bolts in sequence -1 to 8- to 6 Nm.
2. Tighten the bolts -5 and 7- to 13 Nm.
3. Turn the bolts -5 and 7- an additional 90° (1/4 turn) using a rigid wrench.
4. Tighten the bolts -1 to 4, 6 and 8- to 20 Nm.
5. Turn the bolts -1 to 4, 6 and 8- an additional 90° (1/4 additional turn) using a rigid wrench.



Tightening Sequence - Balance Shaft Module with Six Attachment Points

– Install the new bolts in sequence -1 through 6- and tighten them by hand.
– Tighten the balance shaft module bolts in four stages as follows:
– 1. Tight the bolts -1 through 6- to 6 Nm.
– 2. Tighten the bolts -1 through 4- to 20 Nm.
– 3. Tighten the bolts in sequence -5 and 6- to 13 Nm.
– 4. Tighten the bolts in sequence -1 through 6- turn an additional 90° (1/4) turn using a ratchet.
– Remove the Crankshaft Stop - T10100- or the Crankshaft Stop - T10050- .



The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

– Install the oil pan. Refer to
⇒ “2.2 Oil Pan, Removing and Installing”, page 156 .
Install the toothed belt guard lower section:
• Tightening specification -item 27- ⇒ Item 27 (page 44) .
Install the belt pulley/vibration damper.
• Tightening specification -item 28- ⇒ Item 28 (page 44) .
– Install the ribbed belt. Refer to
⇒ “1.4 Ribbed Belt, Removing and Installing”, page 47 .

2.5 Spur Gear, Removing from Crankshaft and Shrink-Fitting New Spur Gear

⇒ “2.5.1 Spur Gear, Removing from Crankshaft”, page 166 .
⇒ “2.5.2 New Spur Gear, Shrink-Fitting”, page 168 .

2.5.1 Spur Gear, Removing from Crankshaft

Special tools and workshop equipment required

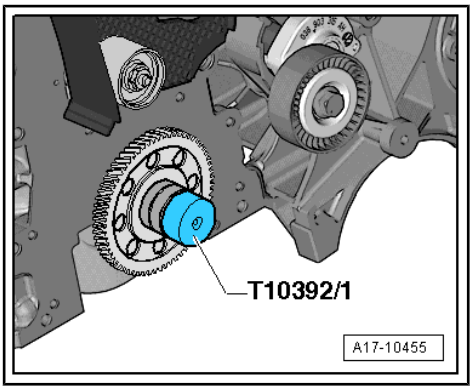
♦ Seal Installer - Crankshaft/Camshaft - 10-203-
♦ Commercially available hotplate
♦ Puller - Spur Gear - T10392- with

- ♦ Puller - Spur Gear - Press Piece - T10392/1-
- ♦ Digital Thermometer - VAS6519-
- ♦ Safety Gloves

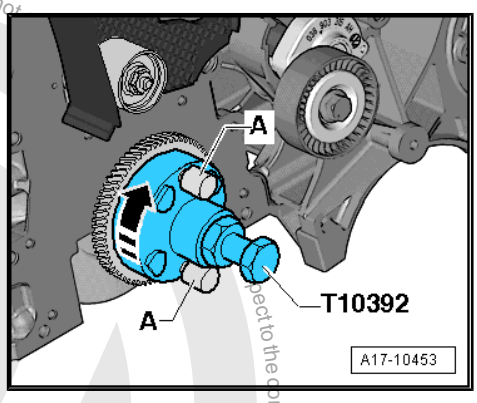
– Remove the belt pulley side sealing flange. Refer to ⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 64 .

– Remove the balance shaft assembly. Refer to ⇒ “2.4 Balance Shaft Assembly, Removing and Installing”, page 159 .

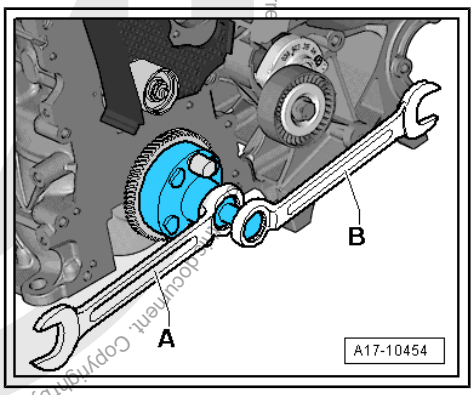
– Insert the Puller - Spur Gear - Press Piece 1 - T10392/1- into the crankshaft journal.



– Insert the Puller - Spur Gear - T10392- into the holes in the spur gear and turn it clockwise in direction of -arrow-, then install the locating pin -A-.



– Counterhold the crankshaft with a wrench -A-. Remove the spur gear by installing the spindle with the wrench -B- or ratchet.



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2.5.2 New Spur Gear, Shrink-Fitting

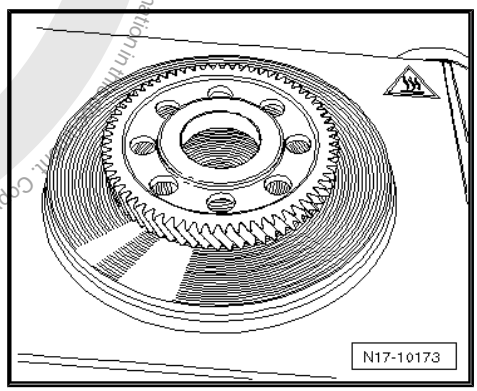
Note

- *Check the temperature with the Digital Thermometer - VAS6519- when heating up the new spur gear.*
- *When the temperature reaches 200 °C (392 °F), there are about four seconds to position the spur gear on the crankshaft.*
- *A higher temperature increases the amount of time available for positioning (220 °C (428 °F) = approximately six seconds).*
- *Make sure the crankshaft journal is clean.*

Caution

Do not exceed the maximum temperature of 240 °C (464 °F). Otherwise the spur gear will discolor and possibly become distorted.

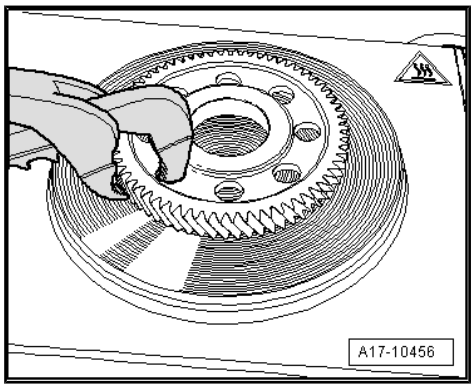
– Lay the entire surface of the new spur gear on a commercially available hot plate and heat it to at least 200 °C (392 °F), maximum 240 °C (464 °F). The lettering faces upward.



WARNING

There is a risk of burns. Wear suitable safety gloves during the rest of the procedure.

– After the temperature is reached, remove the spur gear from the pliers as shown.



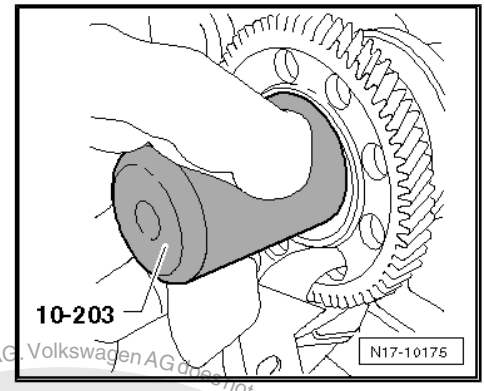
Note

Make sure the splines on the spur gear are not damaged.

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– Quickly slide the spur gear by onto the crankshaft journal all the way by hand. Use the Seal Installer - Crankshaft/Camshaft - 10-203- for assistance and do not tilt the gear.

– Let the spur gear cool a few minutes.



The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

– Install the balance shaft assembly. Refer to ⇒ “2.4 Balance Shaft Assembly, Removing and Installing”, page 159 .

– Install the belt pulley side sealing flange. Refer to ⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 64 .

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3 Lubrication System Components, Engine Code CJAA

⇒ “3.1 Overview - Oil Pump and Oil Pan”, page 170

⇒ “3.2 Oil Pan, Removing and Installing”, page 172

⇒ “3.3 Oil Pump, Removing and Installing”, page 175

Caution

If large quantities of metal shavings or abraded material are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following steps after the repair:

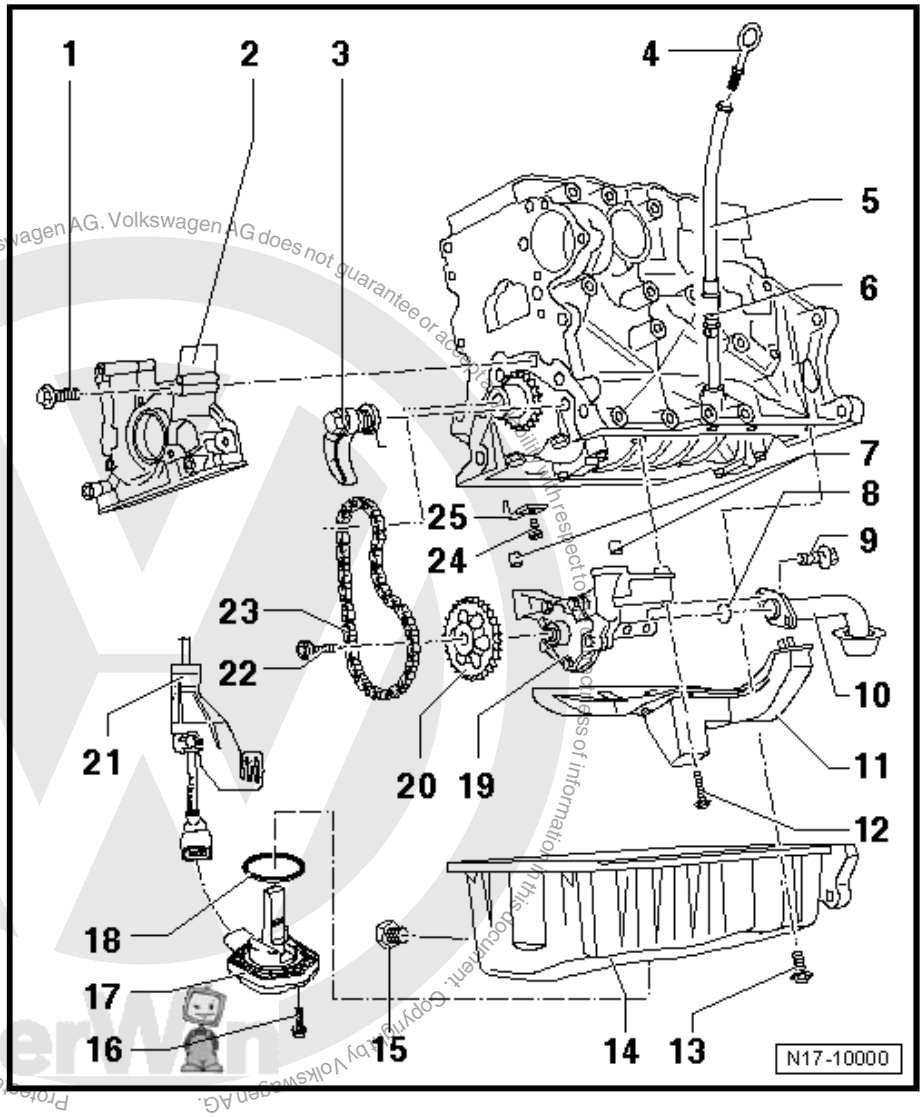
- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

3.1 Overview - Oil Pump and Oil Pan

“Pay attention to the warnings”. Refer to ⇒ page 170 .

Oil spray nozzle and pressure relief valve. Refer to ⇒ Fig. ““Oil Spray Jet and Pressure Relief Valve”“ , page 172 .

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1 - Bolt

- ❑ 15 Nm

2 - Sealing Flange

- ❑ With gasket
- ❑ Must rest on the alignment sleeves
- ❑ Removing and installing. Refer to ⇒ “2.4 Sealing Flange, Removing and Installing, Belt Pulley Side”, page 64 .
- ❑ Insert with Silicone Sealant - D 176 404 A2- .
- ❑ Do not coat the sealing lip on the seal with oil or grease
- ❑ Before installing, remove oil residue from crankshaft journal with a clean cloth.

3 - Chain Tensioner with Tensioning Rail

- ❑ 15 Nm
- ❑ When installing, pretension the spring and engage it

4 - Oil Dipstick

- ❑ Oil level must not be above the MAX. mark!
- ❑ Marks. Refer to ⇒ “1.2 Engine Oil, Checking Level”, page 151 .

5 - Funnel

6 - Guide Tube

7 - Alignment Sleeves

8 - O-Ring

- ❑ Replace

9 - Bolt

- ❑ 15 Nm

10 - Suction Line

- ❑ Clean the screen if there are debris

11 - Splash Wall

12 - Bolt

- ❑ 15 Nm

13 - Bolt

- ❑ 15 Nm

14 - Oil Pan

- ❑ Removing and installing. Refer to ⇒ “3.2 Oil Pan, Removing and Installing”, page 172 .
- ❑ Clean sealing surface before installing
- ❑ Install with silicone sealant D 176 404 A2

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15 - Oil Drain Plug

- ❑ 30 Nm
- ❑ Replace

16 - Bolt

- ❑ 10 Nm

17 - Oil Level Thermal Sensor - G266-

- ❑ Black 3-pin connector
- ❑ Checking. Refer to Vehicle Diagnostic Tester .

18 - Seal

- ❑ Replace

19 - Oil Pump

- ❑ With pressure relief valve 12 bar (174.04 psi)
- ❑ Replace if it moves with difficulty
- ❑ Check if the oil pump moves with difficulty
- ❑ Before installing, check to be sure both alignment sleeves are present (for centering oil pump/cylinder block)
- ❑ Removing and installing. Refer to ⇒ “3.3 Oil Pump, Removing and Installing”, page 175

20 - Chain Sprocket for Oil Pump

21 - Bracket

- ❑ For the wiring harness Oil Level Thermal Sensor - G266-

22 - Bolt

- ❑ 20 Nm + 1/4 (90 °) additional turn

23 - Chain

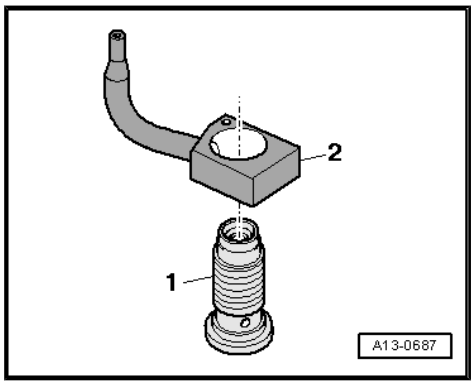
24 - Bolt

- ❑ 25 Nm
- ❑ Install without sealant

25 - Oil Spray Jet

- ❑ For the piston cooling. Refer to ⇒ Fig. ““Oil Spray Jet and Pressure Relief Valve”“ , page 172 .

Oil Spray Jet and Pressure Relief Valve



1 - Bolt with Pressure Relief Valve, 27 Nm

2 - Piston Cooling Oil Spray Jet

Note

When replacing the oil injector jet, pay attention to the correct allocation for the pistons. Refer to Parts Catalog

“Pay attention to the warnings”. Refer to ⇒ page 170 .

3.2 Oil Pan, Removing and Installing

Special tools and workshop equipment required

- ♦ T Bar And Socket - 10mm - 3185-
- ♦ Hex Ball Socket - T10058-
- ♦ Torque Wrench 1331 5-50Nm - VAG1331-
- ♦ Used Oil Collection and Extraction Unit - SMN372500-

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- Silicone Sealant - D176404A2-
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear
- Flat-Blade Scraper

Removing

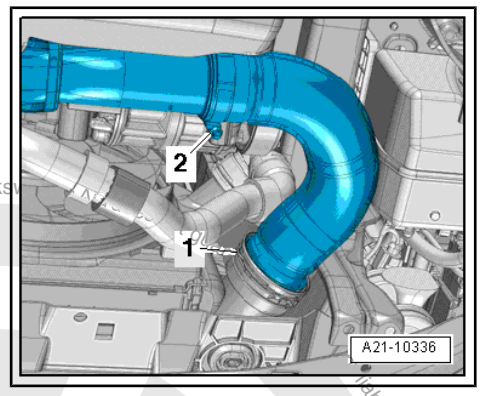
– Remove the noise insulation. Refer to ⇒ Rep. Gr. 50 .

– Place the Used Oil Collection and Extraction Unit - SMN372500- under the engine and drain the engine oil.

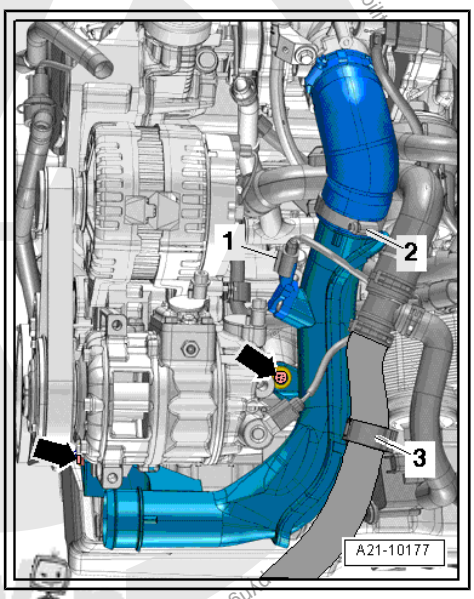
Note

Follow all waste disposal regulations!

– Loosen the clamp -2-, lift the clip -1- and remove the connecting hose »cold side«.

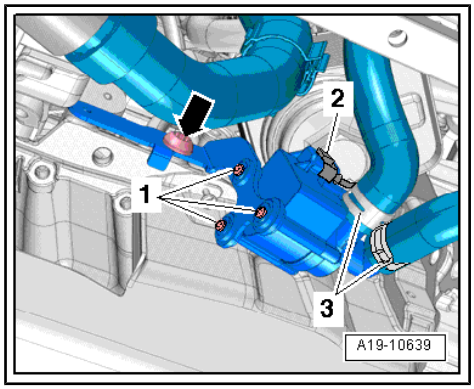


– Remove the bolts -arrows- on the charge air pipe and move it to the side.

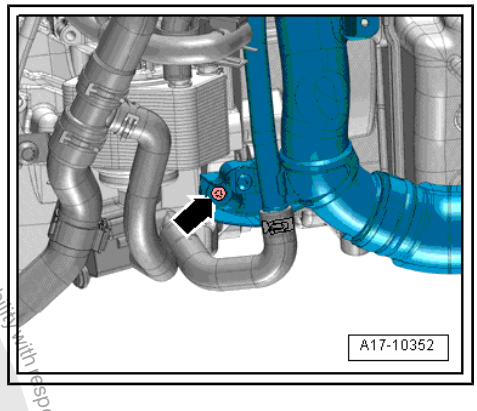


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– Remove the bolt -arrow- and move the Engine Coolant Circulation Pump 2 - V178- to the side.



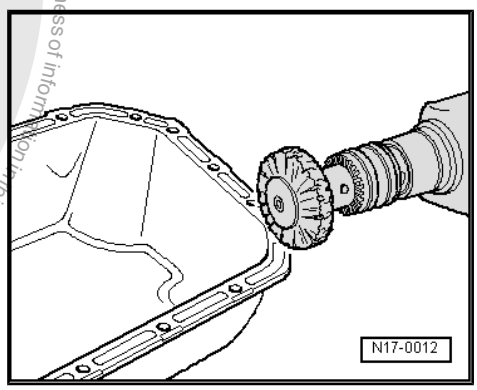
– Remove the bolt -arrow- on the charge air pipe on the »hot side«.
– Disconnect the connector from the Oil Level Thermal Sensor - G266- .
– Remove the bolts connecting the oil pan and transmission.
– Remove the oil pan screws in a diagonal sequence.
– Tap the oil pan lightly with a rubber hammer to loosen it, if necessary.
– Remove the sealant residue from the crankshaft housing with a flat-blade scraper.



WARNING

Wear protective eyewear.

– Remove any sealant residue on the oil pan using a rotating brush, for example, a hand drill with a plastic brush attachment.
– Clean the sealing surfaces. They must be free of oil and grease.



Installing

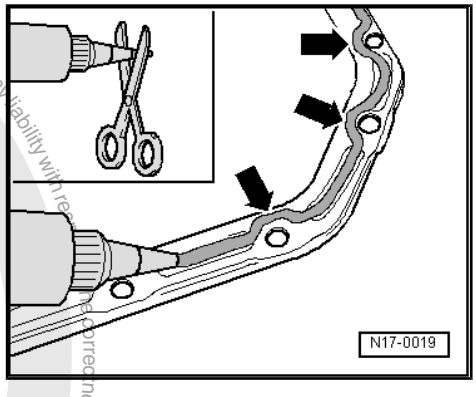
Note

- *Note the expiration date for the sealant.*
- *The oil pan must be installed within five minutes after applying the silicone sealant.*

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– Cut the tube nozzle at front marking (nozzle diameter: approximately 3 mm).
– Apply the silicone sealant as shown on the clean oil pan sealing surface. The sealing compound bead must be:

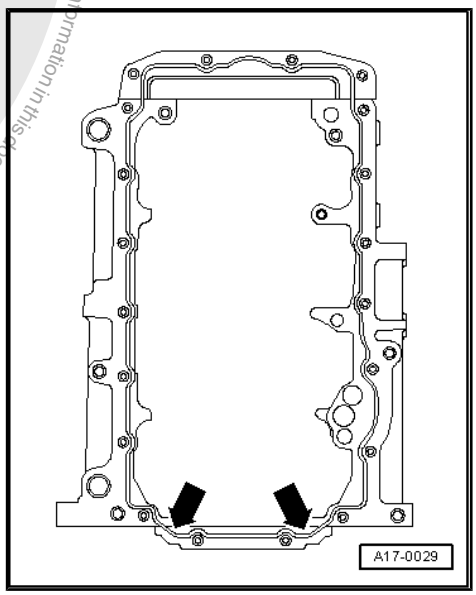
♦ 2 to 3 mm thick
♦ and run on inside in the area of the bolt holes -arrows-



Note

Sealant bead must not be thicker than specified. Otherwise, excess sealant could get into oil pan and clog the screen in intake line of oil pump.

– Apply a silicone sealing compound bead as shown to the clean sealing surface of the oil pan. (The illustration shows the location of the sealant bead on the crankshaft housing.)
– Position the oil pan immediately and gently tighten the bolts connecting the oil pan to the transmission and all of the oil pan bolts. Make sure the oil pan lies flush on the intermediate plate/transmission flange.



Note

When installing the oil pan on a removed engine, make sure that the oil pan is positioned flush with the crankshaft housing on the flywheel side.

– Tighten the oil pan bolts in a diagonal sequence to 15 Nm.
– Tighten the oil pan/transmission bolts to 40 Nm.

Note

After installing the oil pan, allow the sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.

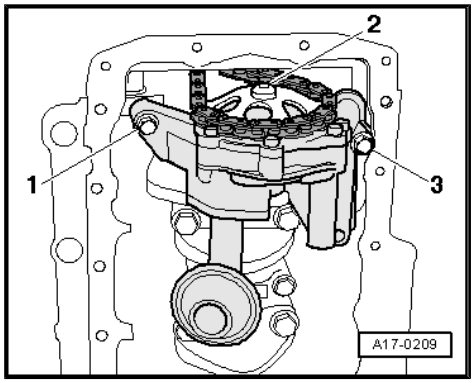
Further assembly is performed in the reverse order of the removal.

3.3 Oil Pump, Removing and Installing

Removing

– Remove the oil pan and the splash wall. Refer to
⇒ “3.2 Oil Pan, Removing and Installing”, page 172

– Remove the screw -2-.
– Pull off chain sprocket from oil pump shaft.
– Remove the bolts -1 and 3- and remove the oil pump.



Installing

Install in reverse order of removal. Note the following:

– Insert the alignment sleeves at the top of the oil pump.

Insert the chain sprocket can only be positioned one way on the oil pump shaft (flat side).

– Install the oil pan. Refer to
⇒ “3.2 Oil Pan, Removing and Installing”, page 172

Tightening Specifications

Component	Nm
Chain sprocket to oil pump shaft	20 Nm + 90°. Refer to 2).
Oil pump to cylinder block	15

2) Replace the bolts.

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4 Oil Filter Bracket, Oil Cooler, Oil Pressure and Oil Supply Line

⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 177

⇒ “4.2 Oil Filter Bracket with Oil Cooler, Removing and Installing”, page 179

⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 182

⇒ “4.4 Oil Pressure and Oil Pressure Switch F1 , Checking”, page 184

Caution

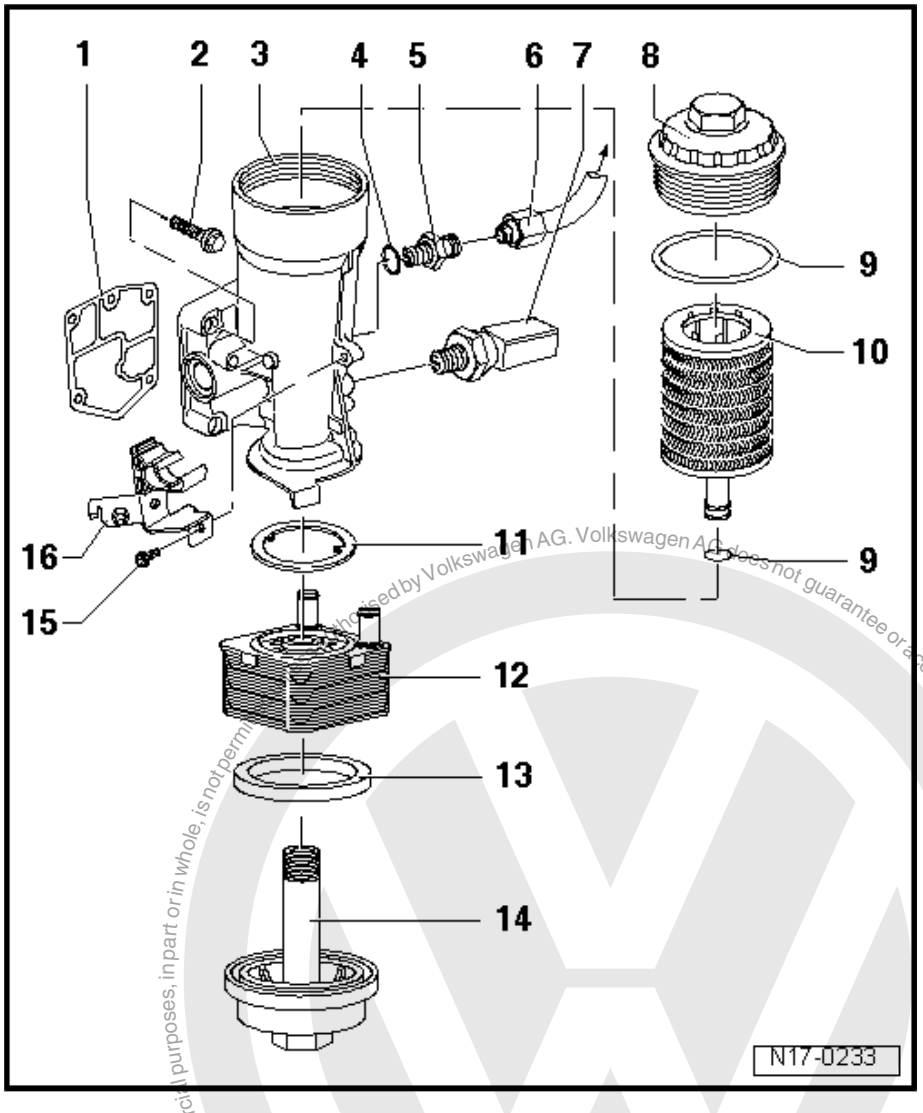
If large quantities of metal shavings or abraded material are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following steps after the repair:

- *Clean the oil channels carefully*
- *Replace the oil spray jets*
- *Replace the oil cooler*
- *Replace the oil filter.*

4.1 Overview - Oil Filter Bracket and Oil Cooler

“Pay attention to the warnings”. Refer to ⇒ page 177 .

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1 - Seal

- ❑ Replace

2 - Bolt

- ❑ 15 Nm + 1/4 (90 °) additional turn
- ❑ Replace
- ❑ First, fasten upper left and lower right bolts, and then tighten all four bolts in a diagonal sequence

3 - Oil Filter Bracket

- ❑ Make sure there is enough space to the surrounding components

4 - Seal

- ❑ Replace

5 - Connection

- ❑ 30 Nm

6 - Oil Supply Line

- ❑ 22 Nm
- ❑ Do not change the angles of the oil supply line
- ❑ Install without tension
- ❑ To turbocharger, engine codes CBEA and CJAA -item 4- ⇒ Item 4 (page 271)
- ❑ Removing and installing. Refer to ⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 182 .
- ❑ Before installing, check the oil supply line for clear passage
- ❑ Fill with engine oil before installing the turbocharger oil supply line on the connections

7 - Oil Pressure Switch - F1-

- ❑ 22 Nm
- ❑ Identification: brown
- ❑ 0.7 bar (10.15 psi)
- ❑ If sealing ring is leaking cut open and replace.
- ❑ Oil Pressure and Oil Pressure Switch - F1- , Checking. Refer to ⇒ “4.4 Oil Pressure and Oil Pressure Switch F1 , Checking”, page 184 .

8 - Cover

- ❑ 25 Nm

9 - O-Ring

- ❑ Replace

10 - Oil Filter Element

- ❑ “Pay attention to the warnings”. Refer to ⇒ page 177 .
- ❑ Follow the replacement intervals. Refer to ⇒ Maintenance ; Booklet 20.1 ; Procedure Descriptions .

11 - Seal

- ❑ Replace

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- ❑ Coat with oil before assembly
- ❑ snaps into the tabs of the oil cooler

12 - Oil Cooler

- ❑ “Pay attention to the warnings”. Refer to ⇒ page 177 .
- ❑ Make sure there is enough space to the surrounding components
- ❑ Coolant Hose Connection Diagram. Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .
- ❑ Oil Cooler, Checking for Leaks. Refer to ⇒ “1.11 Oil Cooler, Checking for Leaks”, page 214 .

13 - Seal

- ❑ Replace

14 - Sealing Plug

- ❑ 25 Nm

15 - Bolt

- ❑ 10 Nm

16 - Bracket

- ❑ For wiring harness

4.2 Oil Filter Bracket with Oil Cooler, Removing and Installing

Special tools and workshop equipment required

- ♦ Elbow Assembly Tool - T10118-
- ♦ Drip tray for the oil

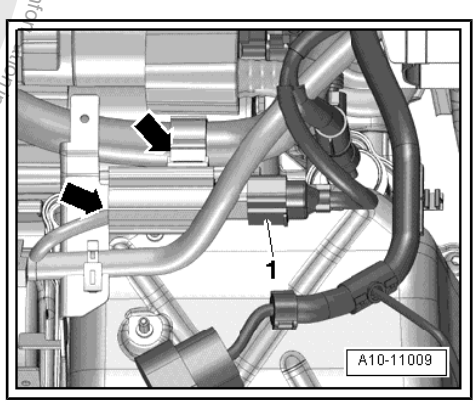
Removing

– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

– Remove the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

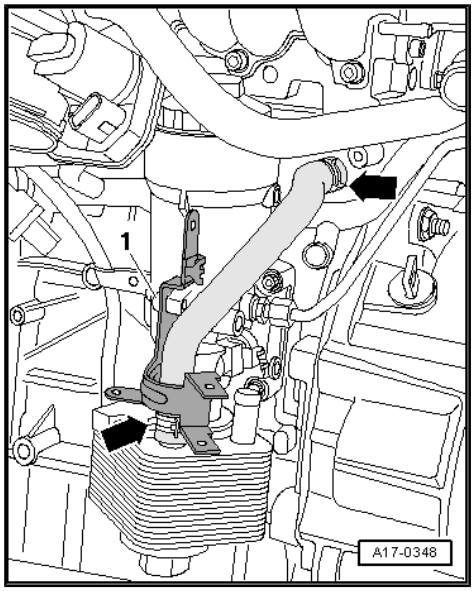
– Remove the air shroud. Refer to ⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202 .

– Free up the wiring harnesses -arrows- and the connector -1- on the charge air pipe on the »hot side«.

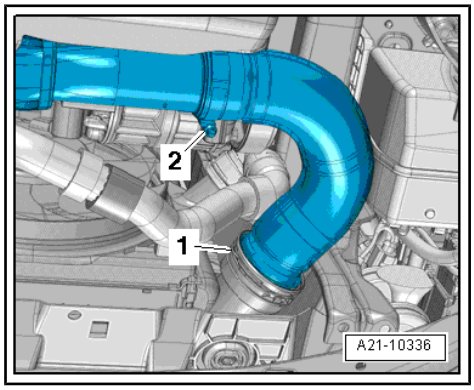


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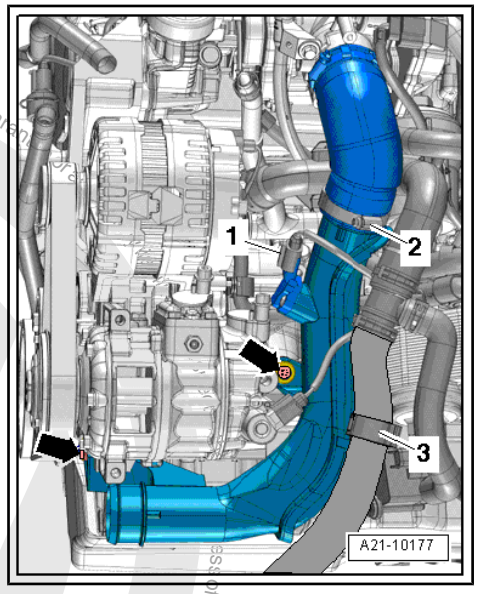
– Remove the bolt -1- and remove the bracket.
– Disconnect the coolant hoses from the oil cooler.



– Loosen the clamp -2-, lift the clip -1- and remove the hose »cold side« from the charge air cooler.
– Remove the bolts -arrows- from the charge air pipe and then disconnect the connector -1- from the Charge Air Pressure Sensor - G31- .

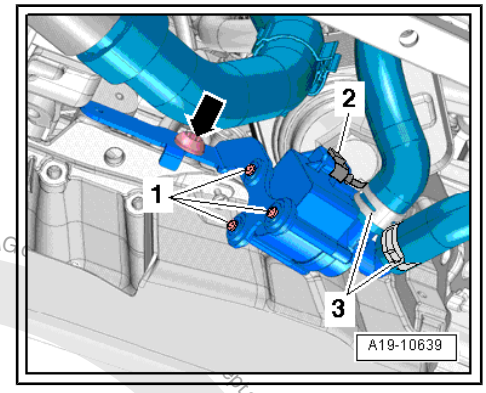


– Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.

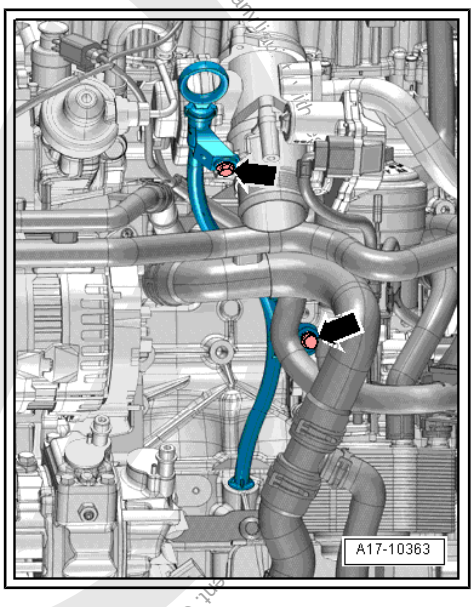


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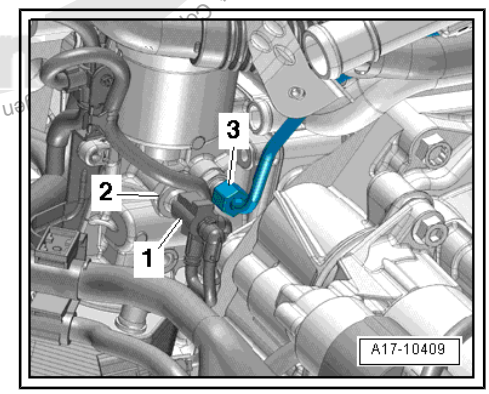
– Remove the bolt -arrow- and move the Engine Coolant Circulation Pump 2 - V178- to the side.



– Remove the bolts -arrows- on the oil dipstick tube.
– Remove the guide tube upward from the crankshaft housing and move it to the side.

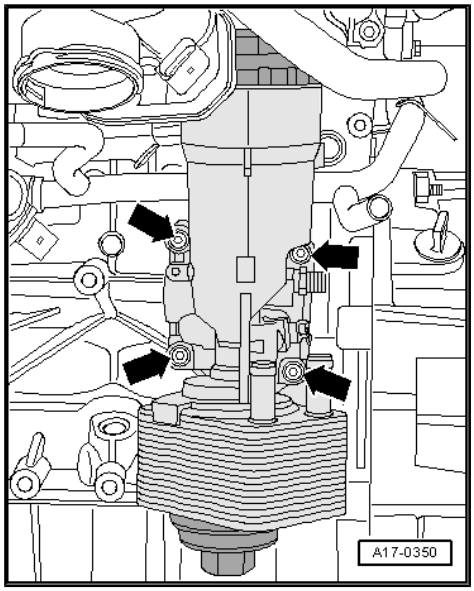


– Disconnect the connector -1- on the Oil Pressure Switch - F1- using the Elbow Assembly Tool - T10118- and remove the oil pressure switch.
– Remove the oil supply line -3- on the oil filter bracket. Counterhold it if necessary with an open end wrench.
– Place the oil drip tray under the engine.



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– Unscrew the bolts -arrows- and remove oil filter bracket.



Installing

Install in reverse order of removal while noting the following:

- Replace all seals, gaskets and O-rings.
- Oil filter bracket tightening specification. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 177 .
- Charge air cooler tightening specifications. Refer to ⇒ “4.2 Overview - Charge Air Cooler Components”, page 290 .
- Fill the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

4.3 Oil Supply Line to Turbocharger, Removing and Installing

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-
- Union Nut Socket - T40055-

Removing:

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

– Remove the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

– Remove the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 . Loosen the spring clamps using the Hose Clip Pliers - VAS6362- .

– Remove the intake scoop -item 35- ⇒ Item 35 (page 273) .

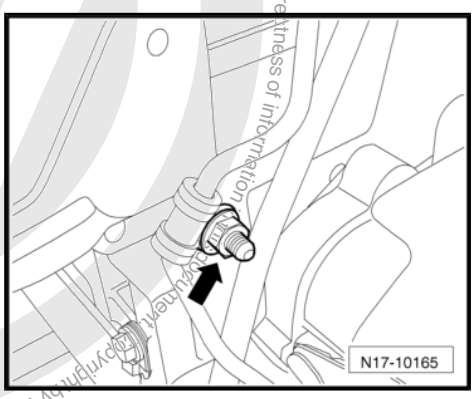
– Remove the warm air collector plate -item 2- ⇒ Item 2 (page 271) .

– Remove the connecting pipe between the exhaust manifold and intake manifold -item 29- ⇒ Item 29 (page 273) .

– Remove the charge air pipe -item 15- ⇒ Item 15 (page 291) .

– Remove the rear clamp -arrow- from the cylinder head.

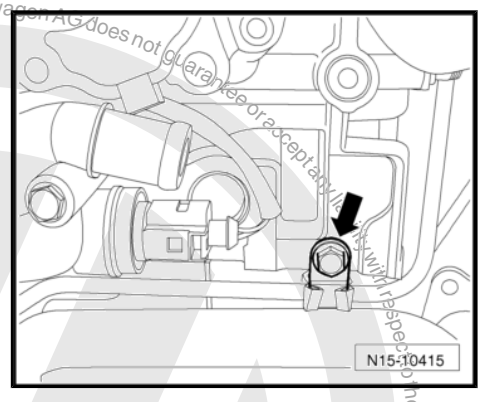
– Loosen the union nuts on the oil filter bracket and turbocharger with Union Nut Socket - T40055- .



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– Remove the oil supply line clamp -arrow- on the side of the cylinder head.

– Remove the oil supply line.



Installing:

– Check the oil supply line for leaks.

– Fill the turbocharger with engine oil at the oil supply line connection.

The Additional Numbered Steps Must Be Followed to Ensure the Oil Supply Line Is Installed Correctly:

1. Set the union nuts of the oil supply line onto the connections.
2. Tighten the union nut on the oil filter bracket hand-tight.
3. Tighten the union nut on the turbocharger hand-tight.
4. Tighten the union nuts on the oil filter bracket first and then tighten the union nuts on the turbocharger.

• Tightening specification -item 6- ⇒ Item 6 (page 178) .

5. Mount the clamps and tighten the bolt and nut:

• Tightening specification 10 Nm.

The rest of the installation is performed in reverse order of removal, while doing so pay attention to the following:

Caution

Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.

Note

The connecting pipe between the exhaust manifold and intermediate sprocket must be replaced after removal.

– Install the connecting pipe between the exhaust manifold and intake manifold -item 29- ⇒ Item 29 (page 273) .

– Install the warm air collector plate -item 2- ⇒ Item 2 (page 271) .

– Install the intake scoop -item 35- ⇒ Item 35 (page 273) .

– Install the charge air pipe -item 15- ⇒ Item 15 (page 291) .

– Install the intake hose between the Mass Airflow Sensor - G70- and the intake scoop. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

– Install the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

– Install the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

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4.4 Oil Pressure and Oil Pressure Switch - F1- , Checking

⇒ “4.4.1 Oil Pressure Switch F1 , Checking”, page 184 .

⇒ “4.4.2 Oil Pressure, Checking”, page 184 .

4.4.1 Oil Pressure Switch - F1- , Checking

Special tools and workshop equipment required

- Oil Pressure Gauge Kit - VAG1342-
- Voltage Tester VAS6839 - VAS6839-
- Connector Test Set - VAG1594D-
- Wiring diagram. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.

Test Conditions

- The engine oil level is OK, Checking. Refer to ⇒ “1.2 Engine Oil, Checking Level”, page 151 .
- The engine oil temperature is at least 80 °C (176 °F) (the Radiator Fan - V7- must start up once).

Test Sequence

Note

Functional check and servicing of the optical and acoustic oil pressure gauge. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations and Voltage Tester VAS6839 - VAS6839- “Function and Component Selection”.

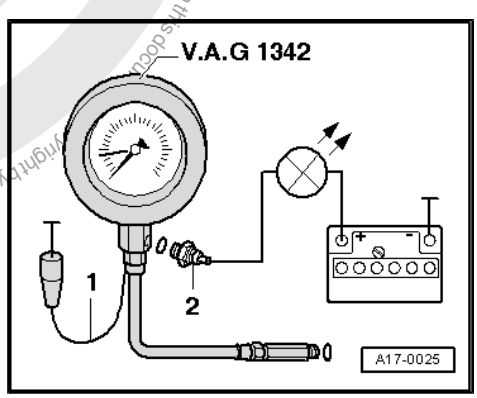
– Disconnect the connector from the Oil Pressure Switch - F1- .

– Remove the Oil Pressure Switch - F1- -2- and install it in the Oil Pressure Gauge Kit - VAG1342- .

– Install the Tester in place of the Oil Pressure Switch - F1- into the bracket.

– Connect the brown wire -1- of the Tester to the ground.

– Connect the Voltage Tester VAS6839 - VAS6839- to Battery - A- positive (+) terminal and the Oil Pressure Switch - F1- using adapter cables from the Connector Test Set - VAG1594D- .



- LED must not turn on.

If the LED turns on:

– Replace the Oil Pressure Switch - F1- :

- Tightening specification -item 7- ⇒ Item 7 (page 178) .

If the LED does not turn on:

– Start the engine and slowly increase the speed:

- LED must light up at 0.55 to 0.85 bar (7.97 to 12.32 psi) pressure, otherwise replace the Oil Pressure Switch - F1- .
- Tightening specification -item 7- ⇒ Item 7 (page 178) .

4.4.2 Oil Pressure, Checking

Special tools and workshop equipment required

- Oil Pressure Gauge Kit - VAG1342-
- Wiring diagram. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.

Conditions

- The Oil Pressure Gauge Kit - VAG1342- is connected. Refer to ⇒ "4.4.1 Oil Pressure Switch F1 , Checking", page 184 , Oil Pressure Switch - F1- , Checking.

Test Sequence

– Increase the speed further.

- At 2000 RPM and an oil temperature of 80 °C (176 °F), the oil pressure should be at least 2.0 bar (29 psi).
- At higher engine speeds, the oil pressure must not exceed 7.0 bar (101.52 psi)

If the specified value is not obtained:

– Replace the oil filter bracket if necessary. Refer to ⇒ "4.1 Overview - Oil Filter Bracket and Oil Cooler", page 177 , Overview - Oil Filter Bracket and Oil Cooler

Note

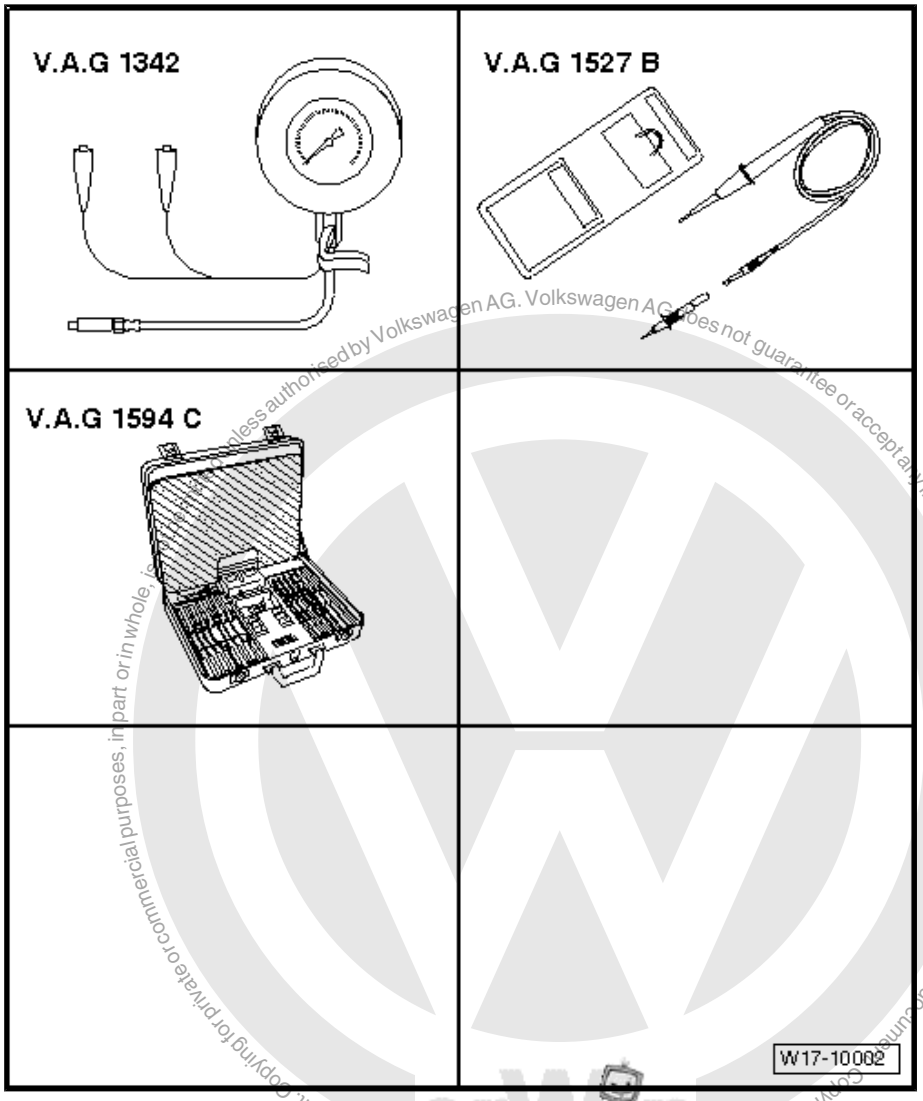
Also, mechanical damage, for example, bearing damage can also be the cause of too low oil pressure.

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5 Special Tools

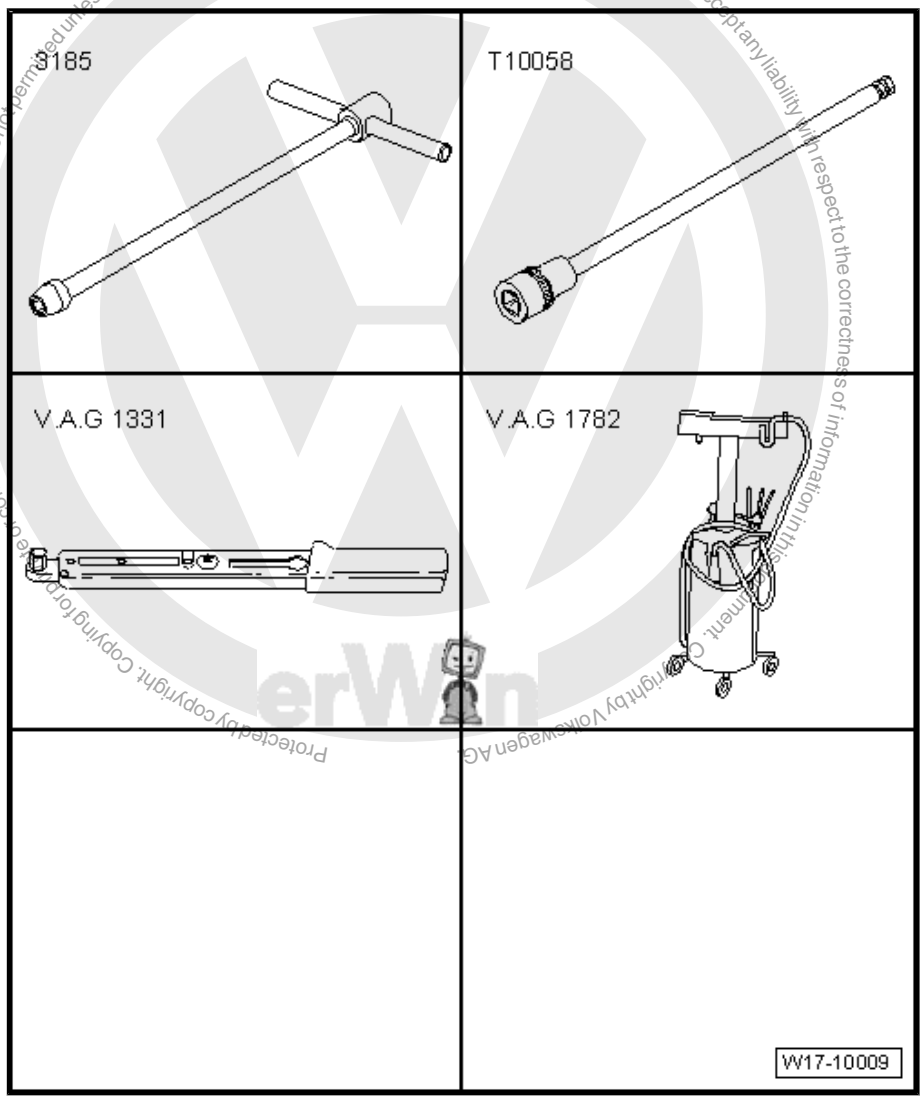
Special tools and workshop equipment required

- Oil Pressure Gauge Kit - VAG1342-
- Voltage Tester - VAG1527B-
- Connector Test Set - VAG1594D- supersedes Connector Test Set - VAG1594C-

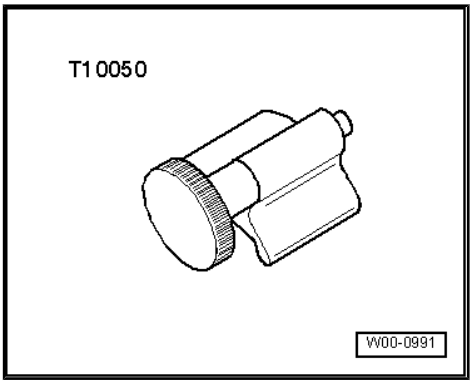


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- T Bar And Socket - 10mm - 3185-
- Hex Ball Socket - T10058-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Used Oil Collection And Extraction Unit - SMN372500-

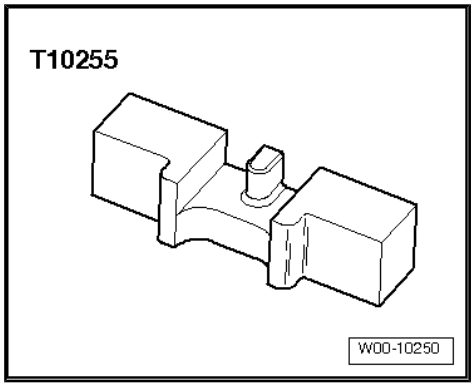


- Crankshaft Stop - T10050-

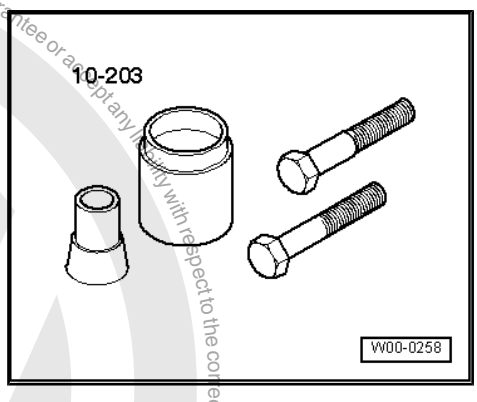


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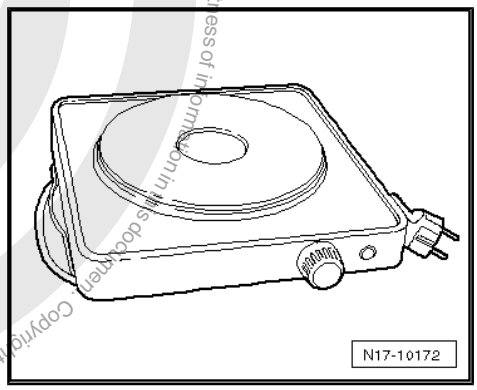
- Locking Tool - T10255-



- Seal Installer - Crankshaft/Camshaft - 10-203-



- Commercially available hotplate



- Not illustrated:
- Puller - Spur Gear - T10392-
- Puller - Spur Gear - Thrust Piece - T10392/1-
- Digital Thermometer - VAS6519-
- Elbow Assembly Tool - T10118-

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19 – Cooling System

1 Cooling System Components

DANGER!

Risk of scalding due to hot steam and hot coolant:

- *The cooling system is under pressure when the engine is warm.*
- *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*



Note

- *Secure all hose connections with hose clamps appropriate to the model. Refer to the Parts Catalog.*
- *Hoses are secured with spring clips. If a repair is required only use spring clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*
- *When installing coolant hoses without tension, make sure they do not come into contact with other components (observe the marks on the coolant connections and hoses).*

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⇒ “1.1 Overview - Cooling System Components, Body Side”, page 190

⇒ “1.2 Cooling System Components, Engine-Side”, page 192

⇒ “1.3 Coolant Hose Connection Diagram”, page 197

⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202

⇒ “1.5 Radiator, Removing and Installing”, page 202

⇒ “1.6 Coolant Pump, Removing and Installing”, page 203

⇒ “1.7 Coolant Thermostat, Removing and Installing”, page 204

⇒ “1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 205

⇒ “1.9 Coolant, Draining and Filling”, page 209

⇒ “1.10 Cooling System, Checking for Leaks”, page 212

⇒ “1.11 Oil Cooler, Checking for Leaks”, page 214

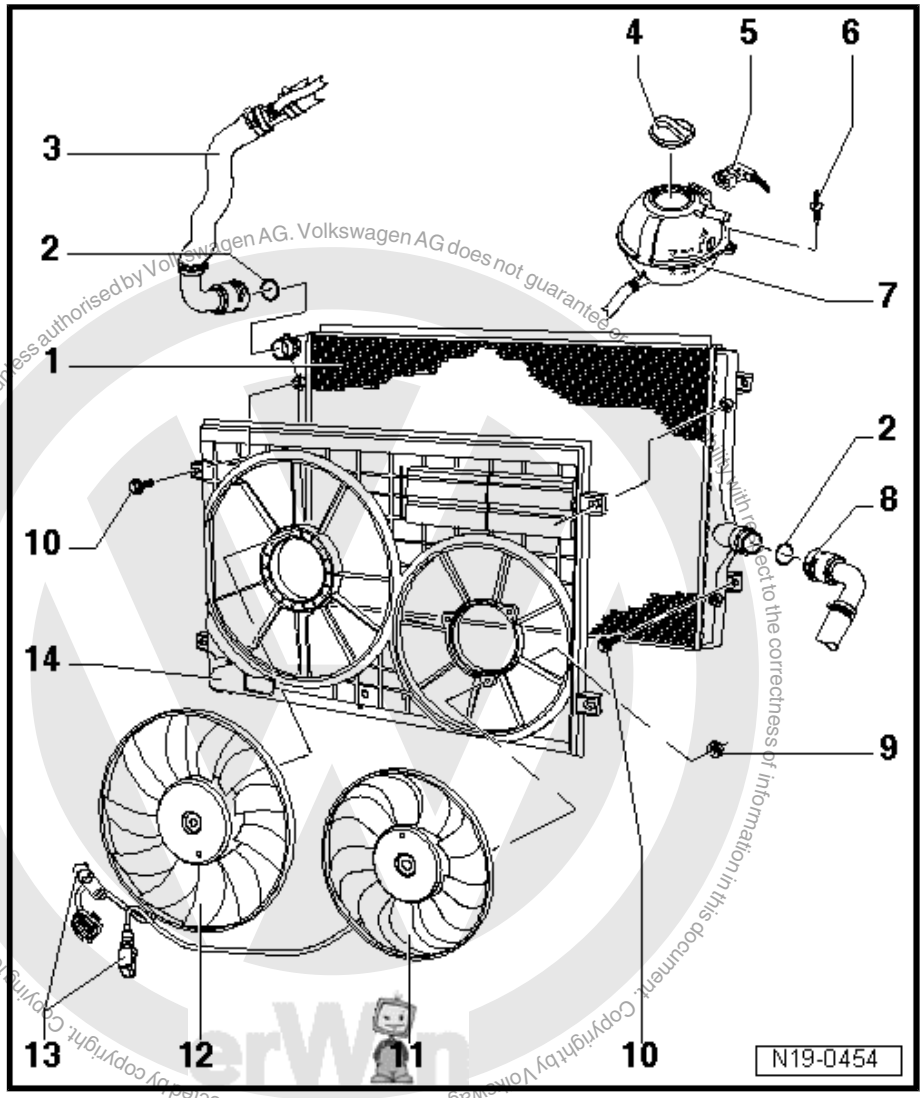
⇒ “1.12 Engine Preheater”, page 216

Special tools and workshop equipment required

- Hose Clip Pliers - VAS6362-

1.1 Overview - Cooling System Components, Body Side

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1 - Radiator

- ❑ Removing and installing. Refer to ⇒ “1.5 Radiator, Removing and Installing”, page 202 .
- ❑ Replace all of the coolant after replacing. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 , Coolant, Draining and Filling

2 - O-Ring

- ❑ Replace if damaged

3 - Upper Coolant Hose

- ❑ With a quick-release coupling
- ❑ Check for secure fit
- ❑ Coolant Hose Connection Diagram. Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .

4 - Cap

- ❑ Check the pressure valve in the cap. Refer to ⇒ “1.10 Cooling System, Checking for Leaks”, page 212 , Cooling System, Checking for Leaks

5 - Connector

6 - Bolt

- ❑ 3 Nm

7 - Coolant Expansion Tank

- ❑ Cooling System, Checking for Leaks. Refer to ⇒ “1.10 Cooling System, Checking for Leaks”, page 212 .

8 - Lower Coolant Hose

- ❑ With a quick-release coupling
- ❑ Check for secure fit
- ❑ Coolant Hose Connection Diagram. Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .

9 - Nut

- ❑ 5 Nm

10 - Bolt

- ❑ 5 Nm

11 - Radiator Fan 2 - V177-

12 - Radiator Fan - V7-

13 - Connector

14 - Air Shroud

- ❑ Removing and installing. Refer to ⇒ “1.4 Air Shroud with Radiator Fan V7 and Radiator Fan 2 V177 , Removing and Installing”, page 202 .

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1.2 Cooling System Components, Engine-Side

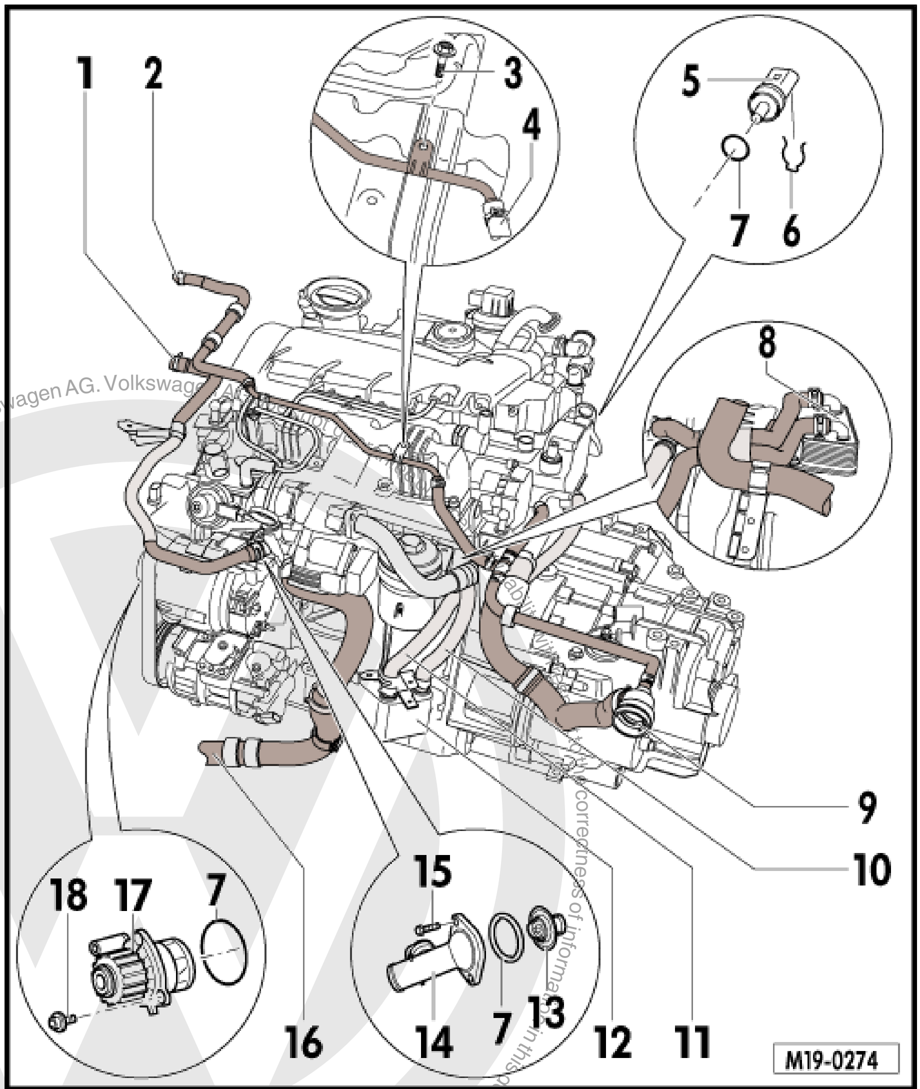
⇒ “1.2.1 Overview - Cooling System Components, Intake Side, without Engine Preheater”, page 192 .

⇒ “1.2.2 Overview - Cooling System Components, Intake Side, with Engine Preheater”, page 193 .

⇒ “1.2.3 Overview - Cooling System Components, Transmission Side”, page 194 .

1.2.1 Overview - Cooling System Components, Intake Side, without Engine Preheater

Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .



1 - Lower Expansion Tank Coolant Hose

2 - Upper Expansion Tank Coolant Hose

3 - Bolt

- ❑ 10 Nm

4 - Bleed Pipe

5 - Engine Coolant Temperature Sensor - G62-

6 - Clip

7 - O-Ring

- ❑ Replace

8 - Transmission Fluid Cooler

- ❑ Only on vehicles with the DSG® transmission

9 - To the Upper Radiator

10 - Engine Oil Cooler Coolant Supply Hose

- ❑ On vehicles without a transmission fluid cooler

Transmission Fluid Cooler Return Coolant Hose

- ❑ On vehicles with a transmission fluid cooler

11 - Engine Oil Cooler Coolant Return Hose

12 - Engine Oil Cooler

13 - Thermostat/4/2-Way Valve with Thermostat

- ❑ Checking: warm the thermostat in a water bath
- ❑ Starts to open: approximately 87 °C (188.6 °F)
- ❑ Stops opening: approximately 102 °C (215.6 °F)
- ❑ Opening lift: minimum 7 mm
- ❑ Coolant thermostat, removing and installing. Refer to ⇒ “1.7 Coolant Thermostat, Removing and Installing”, page 204 .

❑ 4/2-Way Valve with Thermostat, Removing and installing. Refer to ⇒ “1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 205 .

14 - Connection

15 - Bolt

❑ 15 Nm

16 - Hose to Lower Radiator

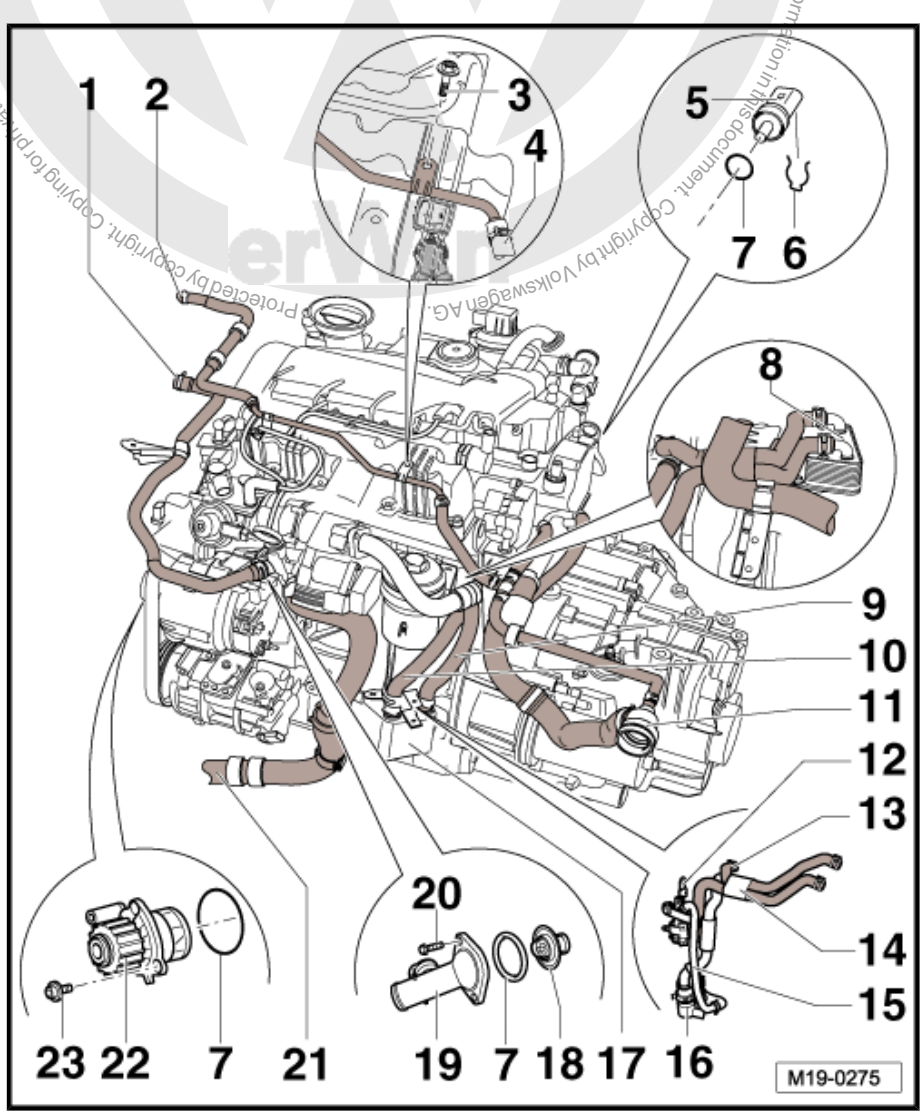
17 - Coolant Pump

18 - Bolt

❑ 15 Nm

1.2.2 Overview - Cooling System Components, Intake Side, with Engine Preheater

Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .



1 - Lower Expansion Tank Coolant Hose

2 - Upper Expansion Tank Coolant Hose

3 - Bolt

❑ 10 Nm

4 - Bleed Pipe

5 - Engine Coolant Temperature Sensor - G62-

6 - Clip

7 - O-Ring

❑ Replace

8 - Transmission Fluid Cooler

❑ Only on vehicles with the DSG® transmission

9 - Engine Oil Cooler Coolant Supply Hose

❑ On vehicles without a transmission fluid cooler

❑ From the connection on the cylinder block

Transmission Fluid Cooler Return Coolant Hose

❑ On vehicles with a transmission fluid cooler

10 - Engine Oil Cooler Coolant Return Hose

11 - To the Upper Radiator

12 - Bracket for Wiring Harness and Coolant Pipe

❑ Secured on the oil filter bracket -item 16- ⇒ Item 16 (page 179)

13 - Coolant Hose

❑ To the coolant pipe on the cylinder block

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14 - Coolant Hoses

- ❑ For the transmission fluid cooler
- ❑ Only on vehicles with the DSG® transmission

15 - Coolant Pipe

- ❑ For the engine preheater
- ❑ Overview. Refer to ⇒ “1.12.1 Overview - Engine Preheater”, page 216 .
- ❑ Connection to the engine preheater and the engine oil cooler return line -item 10- ⇒ Item 10 (page 193)
- ❑ Secured in the upper area on the bracket for the wiring harness and coolant pipe -item 16- ⇒ Item 16 (page 179)
- ❑ Secured in the lower area on the charge air pipe with the engine preheater bracket

-Item 15- ⇒ Item 15 (page 291)

16 - Engine Preheater

- ❑ Overview. Refer to ⇒ “1.12.1 Overview - Engine Preheater”, page 216 .
- ❑ Removing and installing. Refer to ⇒ “1.12.2 Engine Preheater, Removing and Installing”, page 217 .

17 - Engine Oil Cooler

18 - Coolant Thermostat

- ❑ Checking: warm the thermostat in a water bath
- ❑ Starts to open: approximately 87 °C (188.6 °F)
- ❑ Stops opening: approximately 102 °C (215.6 °F)
- ❑ Opening lift: minimum 7 mm
- ❑ Coolant thermostat, removing and installing. Refer to ⇒ “1.7 Coolant Thermostat, Removing and Installing”, page 204 .
- ❑ 4/2-Way Valve with Thermostat, Removing and installing. Refer to ⇒ “1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 205 .

19 - Connection

20 - Bolt

- ❑ 15 Nm

21 - Hose to Lower Radiator

22 - Coolant Pump

23 - Bolt

- ❑ 15 Nm

1.2.3 Overview - Cooling System Components, Transmission Side

Coolant Hose Connection Diagram. Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .

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1 - Coolant Supply Hose

2 - Coolant Hose to the Ventilation Pipe -item 4-
⇒ Item 4 (page 193)

3 - EGR Cooler Coolant Return Hose

- ❑ EGR cooler installation position -item 6-
⇒ Item 6 (page 398)

4 - Radiator Return Coolant Hose

5 - Heat Exchanger Coolant Supply Hose

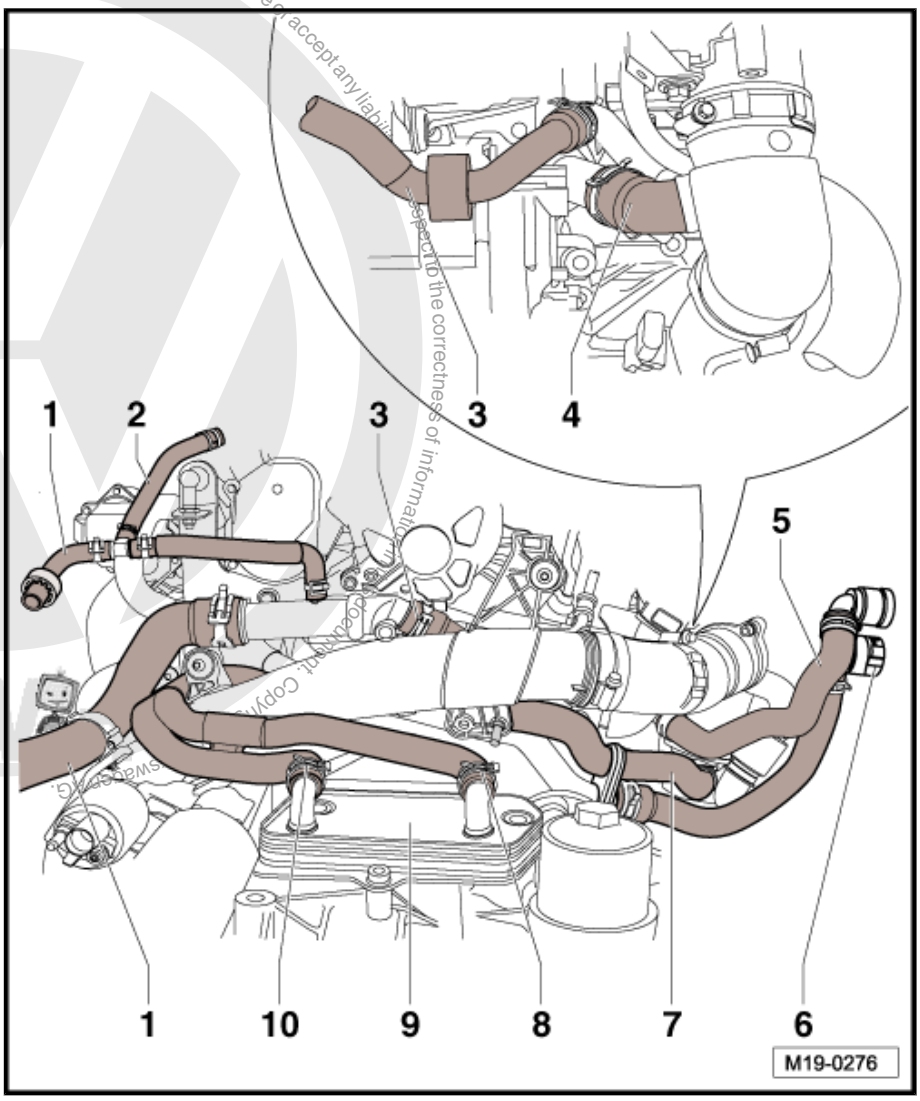
6 - Heat Exchanger Coolant Return Hose

7 - EGR Cooler Coolant Supply Hose

8 - Transmission Fluid Cooler Coolant Supply Hose

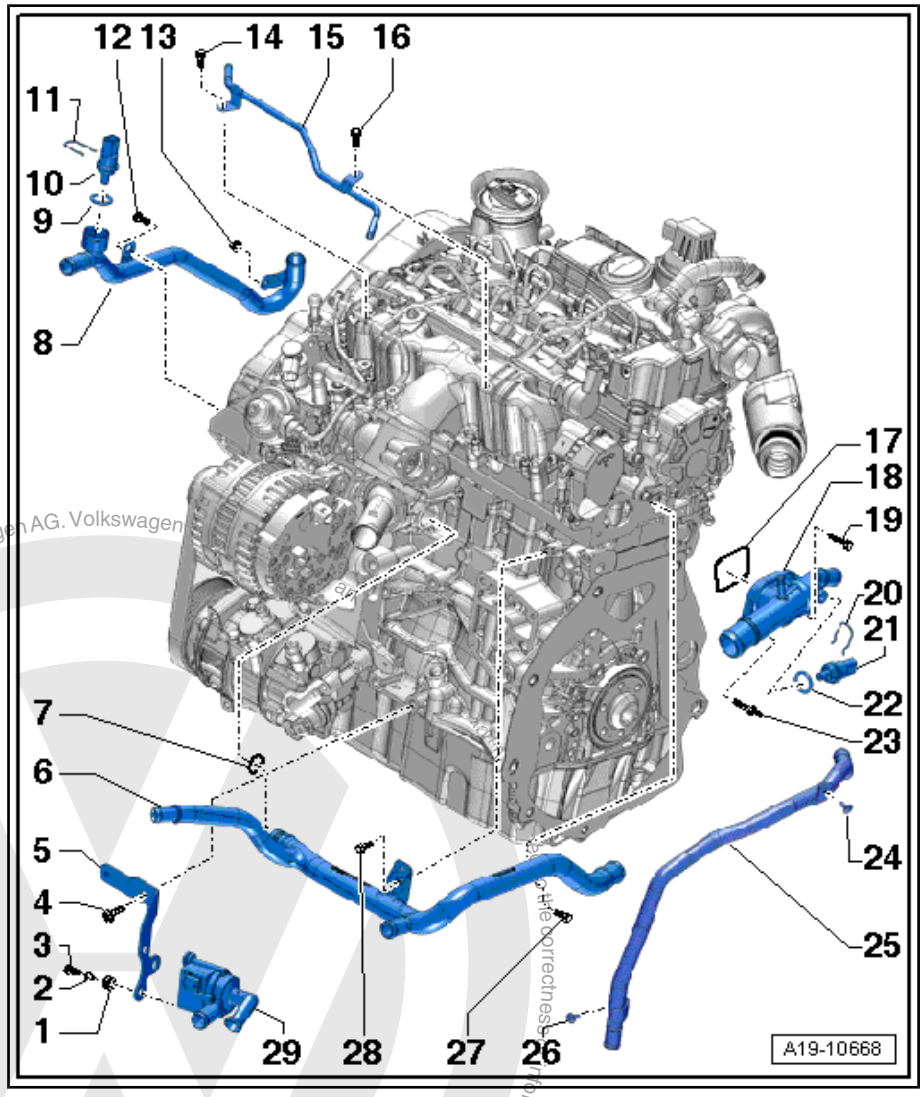
9 - Transmission Fluid Cooler

10 - »Transmission Fluid Cooler Return« Coolant Hose



1.2.4 Overview - Cooling System Components, Engine-Side, Engine Codes CBDA, CBDB and CEGA

Coolant Hose Connection Diagram. Refer to
⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .



1 - Grommet
- ❑ Not available separately.

2 - Sleeve
- ❑ Not available separately.

3 - 2.7 Nm

4 - 40 Nm

5 - Bracket
- ❑ For Engine Coolant Circulation Pump 2 - V178-

6 - Front Coolant Pipe

7 - O-Ring
- ❑ Replace

8 - Right Coolant Pipe

9 - O-Ring
- ❑ Replace

10 - Engine Coolant Temperature Sensor on Radiator Outlet - G83-

11 - Clip

12 - 9 Nm

13 - 9 Nm

14 - 9 Nm

15 - Coolant Line

16 - 9 Nm

17 - Seal
- ❑ Replace

18 - Connection

19 - 9 Nm

20 - Clip

21 - Engine Coolant Temperature Sensor - G62-

22 - O-Ring
- ❑ Replace

23 - Double Bolt, 9 Nm
- ❑

24 - 9 Nm

25 - Left Coolant Pipe

26 - 9 Nm

27 - 40 Nm

28 - 13 Nm

29 - Engine Coolant Circulation Pump 2 - V178-

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1.3 Coolant Hose Connection Diagram

⇒ “1.3.1 Coolant Hose Connection Diagram, without Engine Preheater”, page 197

⇒ “1.3.2 Coolant Hose Connection Diagram, with Engine Preheater”, page 198

⇒ “1.3.4 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, All Vehicles Except Jetta from MY 2011”, page 200

⇒ “1.3.5 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, Only Jetta from MY 2011”, page 201

1.3.1 Coolant Hose Connection Diagram, without Engine Preheater

1 - Coolant Expansion Tank

- ❑ With cap
- ❑ Pressure relief valve inside cap, checking. Refer to ⇒ “1.10.2 Pressure Relief Valve in Cap, Checking”, page 214 .

2 - Cylinder Head/Cylinder Block

- ❑ Change the coolant after replacing

3 - EGR Cooler

- ❑ Change the coolant after replacing
- ❑ Overview. Refer to ⇒ “3 EGR System”, page 398 .

4 - Heater Core for the Heater

- ❑ With a quick-release coupling

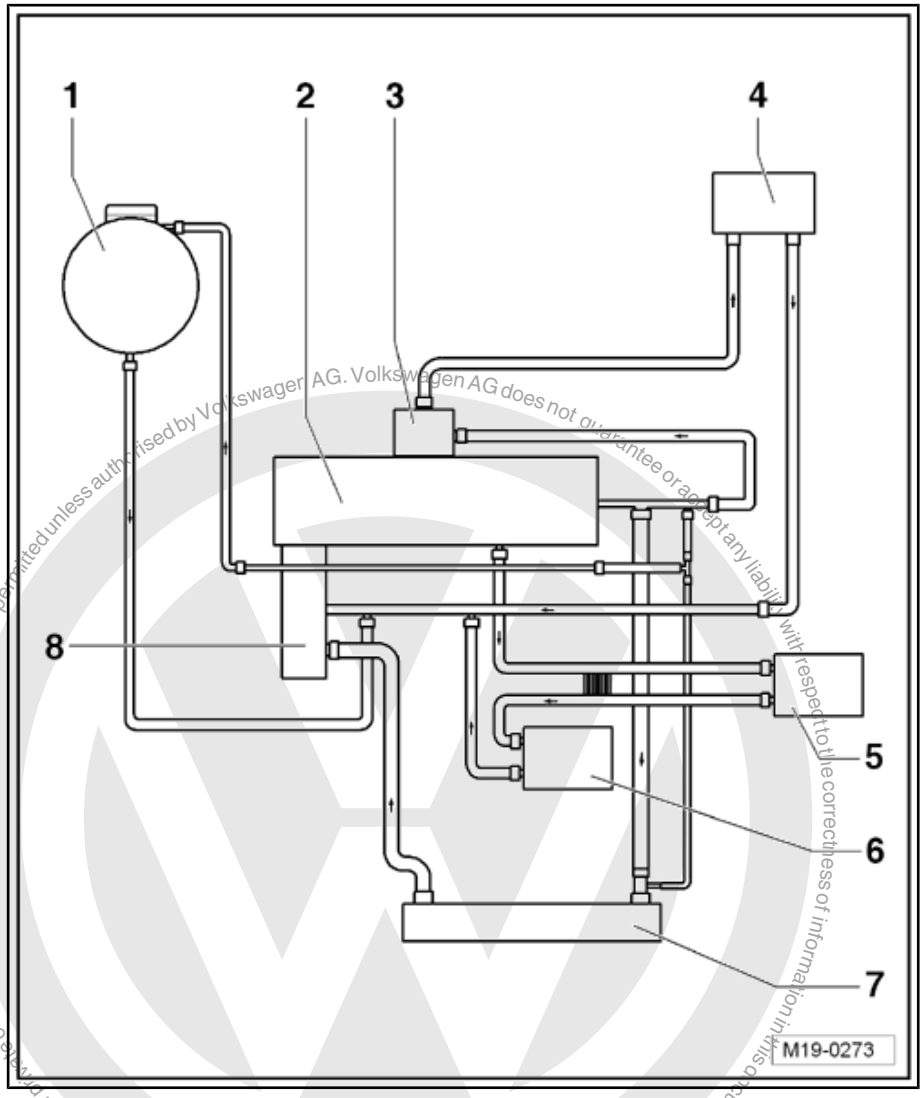
5 - Transmission Fluid Cooler

- ❑ Only on vehicles with the DSG® transmission

6 - Engine Oil Cooler

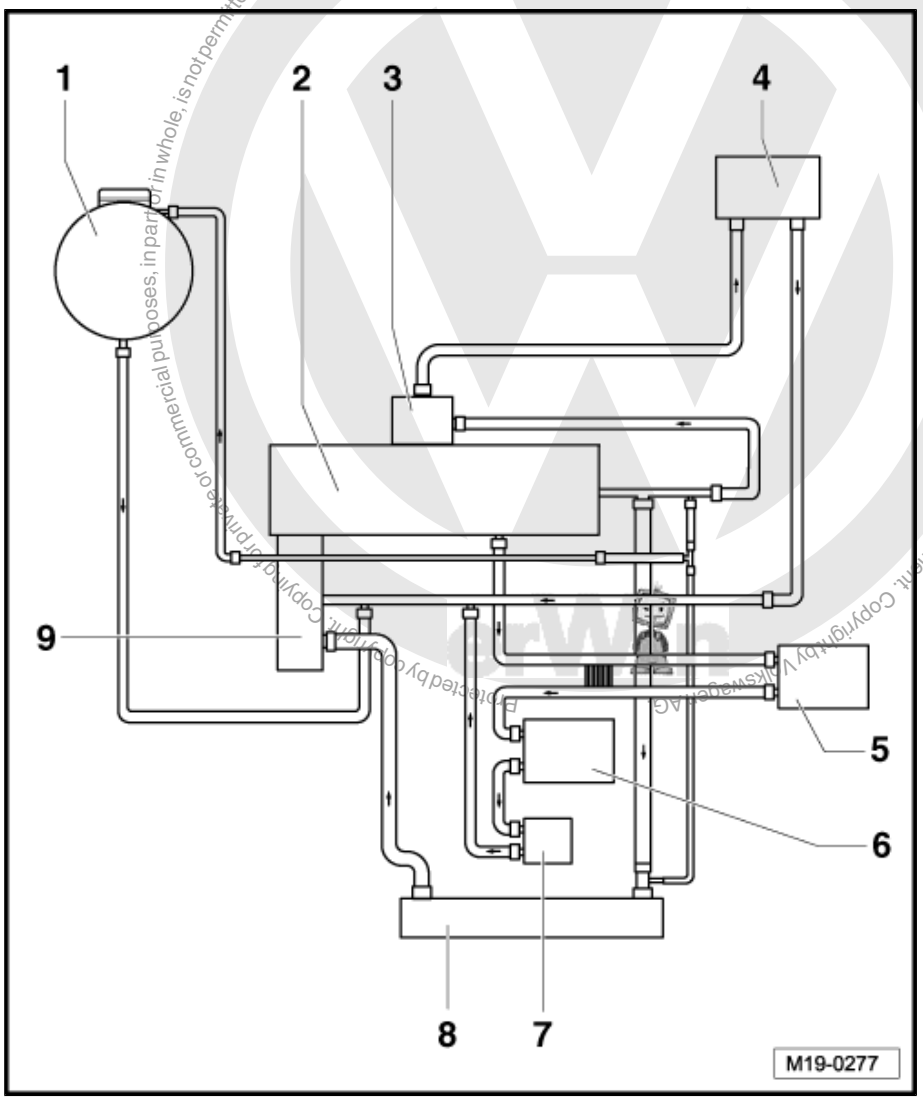
7 - Radiator

8 - Coolant Pump/Coolant Thermostat



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1.3.2 Coolant Hose Connection Diagram, with Engine Preheater



1 - Coolant Expansion Tank

- ❑ With cap
- ❑ Pressure relief valve inside cap, checking. Refer to ⇒ “1.10.2 Pressure Relief Valve in Cap, Checking”, page 214 .

2 - Cylinder Head/Cylinder Block

- ❑ Change the coolant after replacing

3 - EGR Cooler

- ❑ Change the coolant after replacing
- ❑ Overview. Refer to ⇒ “3 EGR System”, page 398 .

4 - Heater Core for the Heater

- ❑ With a quick-release coupling

5 - Transmission Fluid Cooler

- ❑ Only on vehicles with the DSG® transmission

6 - Engine Oil Cooler

7 - Engine Preheater

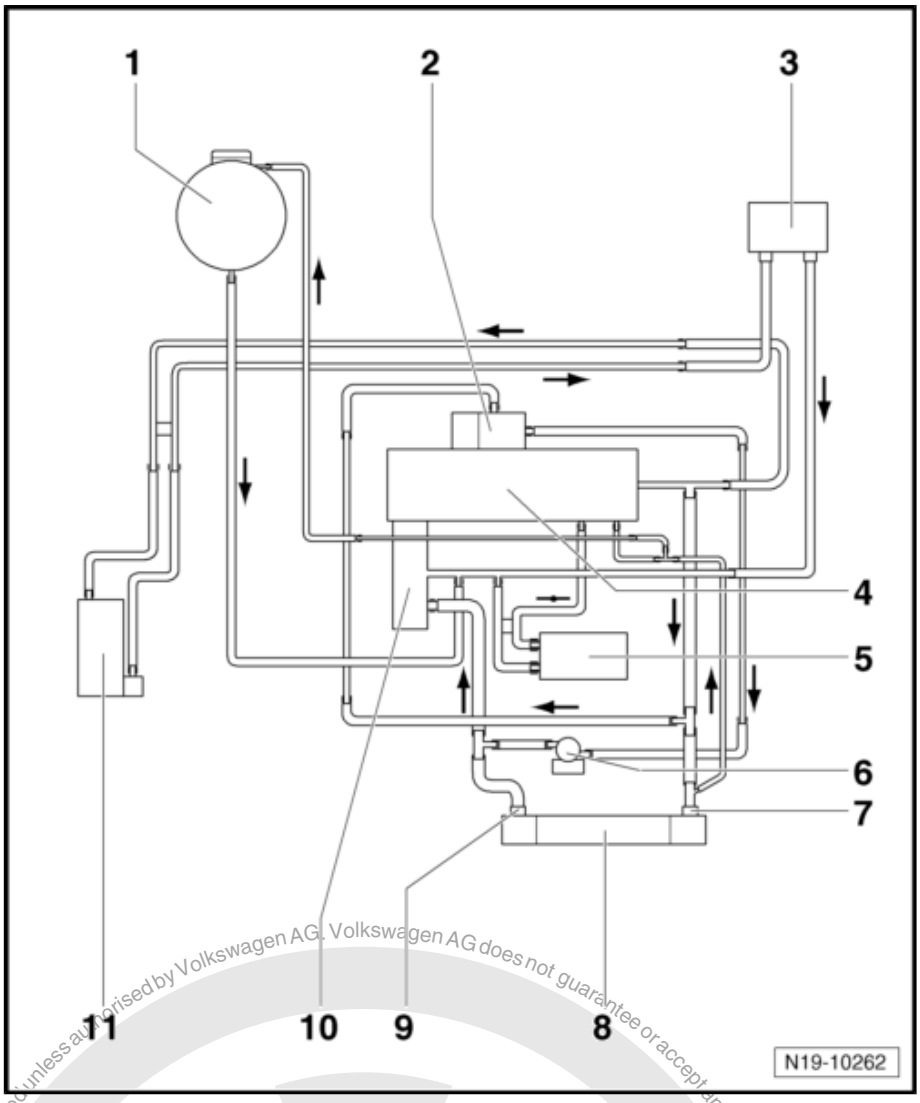
- ❑ Overview. Refer to ⇒ “1.12.1 Overview - Engine Preheater”, page 216 .
- ❑ Removing and installing. Refer to ⇒ “1.12.2 Engine Preheater, Removing and Installing”, page 217 .

8 - Radiator

9 - Coolant Pump/Coolant Thermostat

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1.3.3 Coolant Hose Connection Diagram, Engine Codes CBDA, CBDB and CEGA



1 - Coolant Expansion Tank

- ❑ With cap
- ❑ Pressure relief valve inside cap, checking. Refer to ⇒ “1.10.2 Pressure Relief Valve in Cap, Checking”, page 214 .

2 - EGR Cooler

- ❑ Change the coolant after replacing
- ❑ Overview. Refer to ⇒ “3 EGR System”, page 398 .

3 - Heater Core for the Heater

- ❑ With a quick-release coupling

4 - Cylinder Head/Cylinder Block

- ❑ Change the coolant after replacing

5 - Engine Oil Cooler

6 - Engine Coolant Circulation Pump 2 - V178-

7 - Upper Coolant Hose

- ❑ With a quick-release coupling

8 - Radiator

9 - Lower Coolant Hose

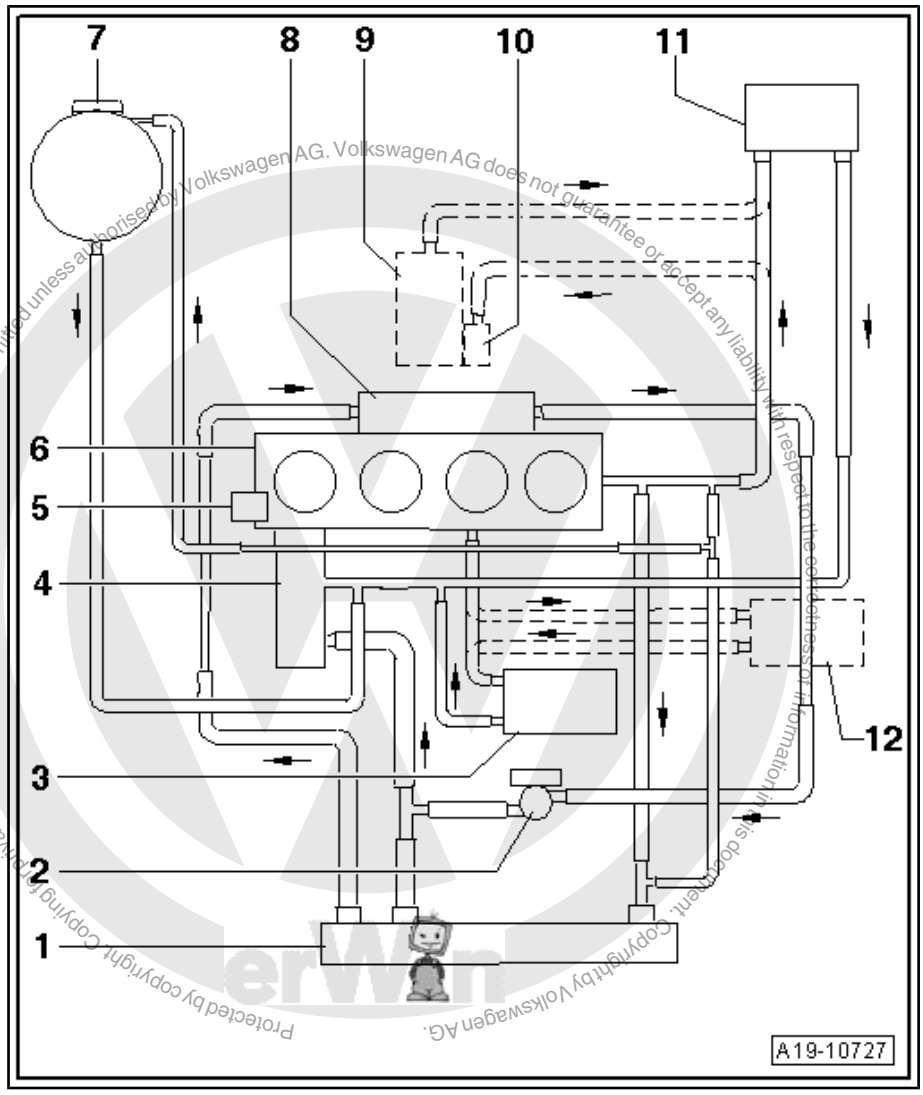
- ❑ With a quick-release coupling

10 - Coolant Pump/Coolant Thermostat

11 - Auxiliary Heater

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1.3.4 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, All Vehicles Except Jetta from MY 2011



1 - Radiator

2 - Engine Coolant Circulation Pump 2 - V178-

3 - Engine Oil Cooler

4 - 4/2-Way Valve

- ❑ With coolant thermostat
- ❑ Removing and installing. Refer to ⇒ “1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 205 .

5 - Coolant Pump

- ❑ Removing and installing. Refer to ⇒ “1.6 Coolant Pump, Removing and Installing”, page 203 .

6 - Cylinder Head/Cylinder Block

- ❑ Change the coolant after replacing

7 - Coolant Expansion Tank

- ❑ With cap
- ❑ Pressure relief valve inside cap, checking. Refer to ⇒ “1.10.2 Pressure Relief Valve in Cap, Checking”, page 214 .

8 - EGR Cooler

- ❑ Change the coolant after replacing
- ❑ Overview. Refer to ⇒ “3 EGR System”, page 398 .

9 - Auxiliary/Parking Heater

- ❑ Depending on the equipment

10 - Recirculation Pump - V55-

- ❑ Depending on the equipment

11 - Heater Core for the Heater

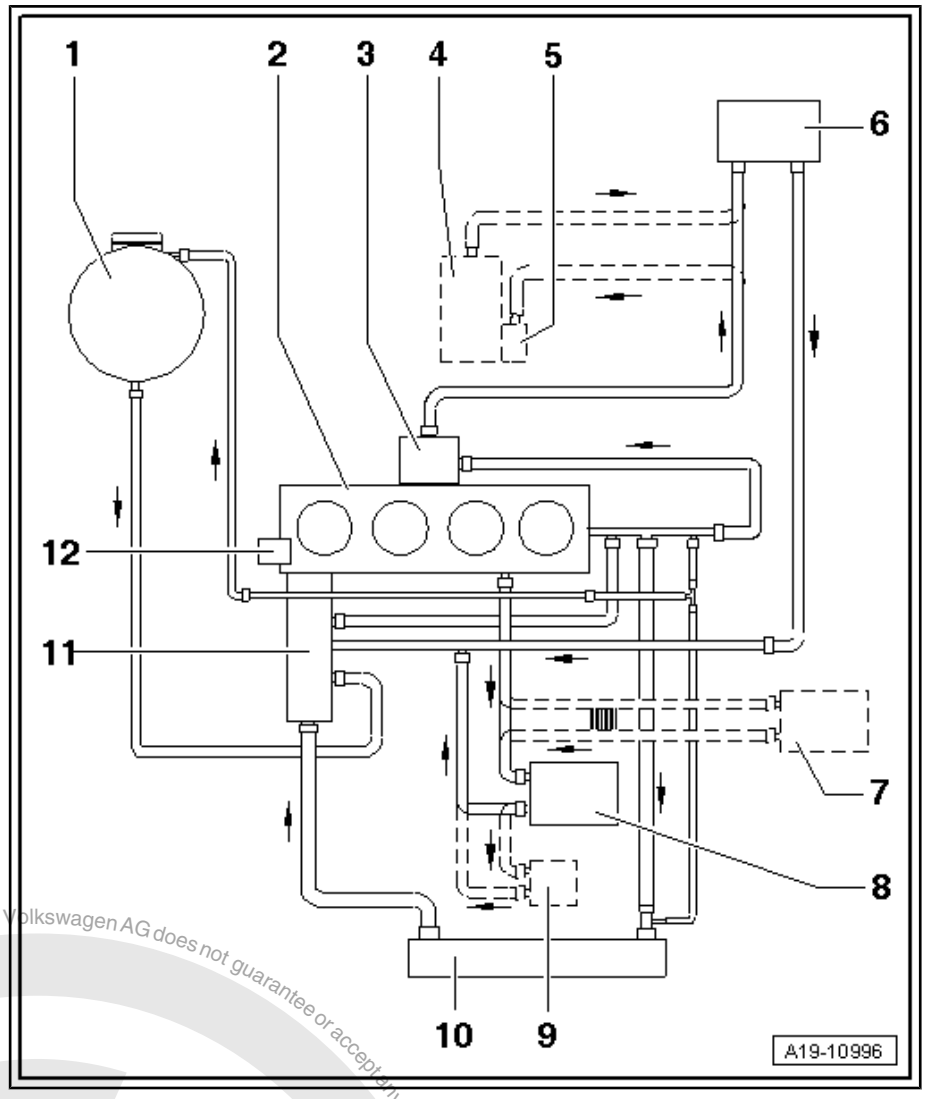
- ❑ With a quick-release coupling

12 - Transmission Fluid Cooler

- ❑ Only for vehicles with a DSG® transmission/automatic transmission

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1.3.5 Coolant Hose Connection Diagram, Vehicles with 4/2-Way Valve, Only Jetta from MY 2011



1 - Coolant Expansion Tank

- ❑ With cap
- ❑ Pressure relief valve inside cap, checking. Refer to ⇒ “1.10.2 Pressure Relief Valve in Cap, Checking”, page 214 .

2 - Cylinder Head/Cylinder Block

- ❑ Change the coolant after replacing

3 - EGR Cooler

- ❑ Change the coolant after replacing
- ❑ Overview. Refer to ⇒ “3 EGR System”, page 398 .

4 - Auxiliary/Parking Heater

- ❑ Depending on the equipment

5 - Recirculation Pump - V55-

- ❑ Depending on the equipment

6 - Heater Core for the Heater

- ❑ Change the coolant after replacing

7 - Transmission Fluid Cooler

- ❑ Only for vehicles with a DSG® transmission/automatic transmission

8 - Engine Oil Cooler

9 - Engine Preheater

- ❑ Overview. Refer to ⇒ “1.12.1 Overview - Engine Preheater”, page 216 .
- ❑ Removing and installing. Refer to ⇒ “1.12.2 Engine Preheater, Removing and Installing”, page 217 .

10 - Radiator

- ❑ Removing and installing. Refer to ⇒ “1.5 Radiator, Removing and Installing”, page 202 .
- ❑ Change the coolant after replacing

11 - 4/2-Way Valve

- ❑ With coolant thermostat
- ❑ Removing and installing. Refer to ⇒ “1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing”, page 205 .

12 - Coolant Pump

- ❑ Removing and installing. Refer to ⇒ “1.6 Coolant Pump, Removing and Installing”, page 203 .

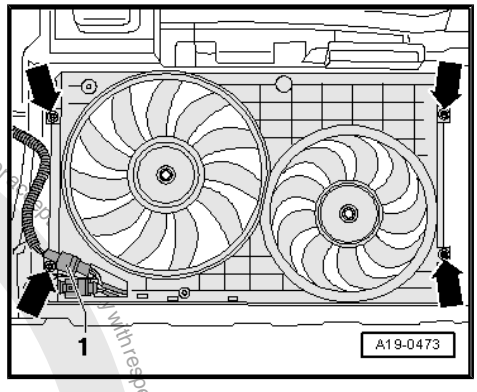
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1.4 Air Shroud with Radiator Fan - V7- and Radiator Fan 2 - V177- , Removing and Installing

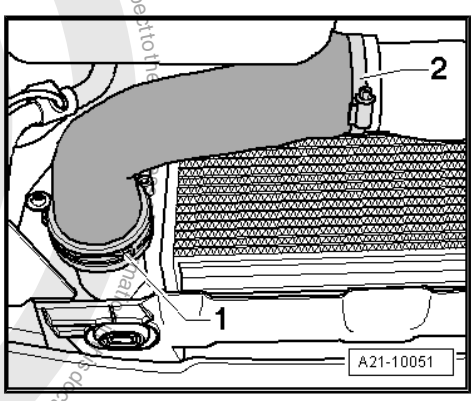
Removing

– Remove the screws -upper arrows- from the air shroud.

– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .



– Remove the »hot side« connecting hose to the charge air pipe. Loosen the hose clamp -2- and lift the clip -1-.

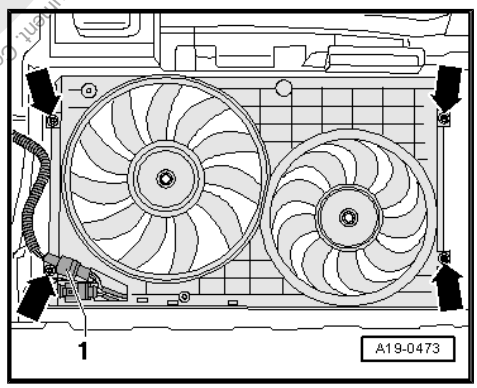


– Disconnect the connector -1-.

– Remove the bottom screw -lower arrow-.

– Remove the air shroud and the radiator fans upward.

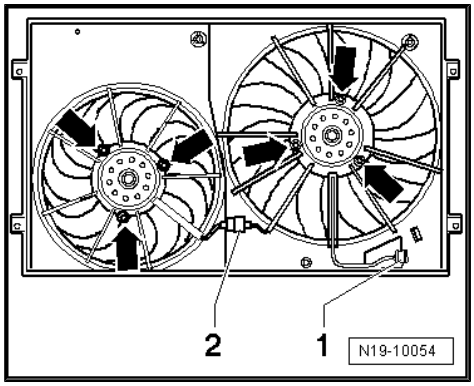
– Disconnect the connector -1- and (if equipped) -2- and free up the wires.



– Remove the nuts -arrows- and remove the radiator fans.

Installing

Install in reverse order of removal.



1.5 Radiator, Removing and Installing

Special tools and workshop equipment required

- ♦ Refractometer - T10007A-
- ♦ Torque Wrench 1783 - 2-10Nm - VAG1783-
- ♦ Shop Crane - Drip Tray - VAS6208-

Removing:

- – Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .
- – Remove the clamp from the upper coolant hose and pull the coolant hose from the radiator quick-release coupling.
- – Remove the Radiator Fan - V7- connector.
- – Remove the bolts on the radiator -item 10- ⇒ Item 10 (page 191) and remove the radiator with the Radiator Fan - V7- upward.

Installing:

Install in reverse order of removal. Note the following:

- • Tightening specification for radiator bolts -item 10- ⇒ Item 10 (page 191) .
- – Fill with coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

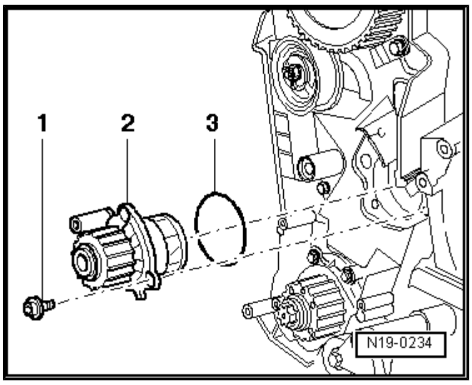
1.6 Coolant Pump, Removing and Installing

Special tools and workshop equipment required

- ♦ Refractometer - T10007A-
- ♦ Shop Crane - Drip Tray - VAS6208-
- ♦ Torque Wrench 1331 5-50Nm - VAG1331-
- ♦ Hose Clip Pliers - VAS6362-

Removing:

- – Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .
- – Remove the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .
- – Remove the bolts -1- of the coolant pump -2- and carefully take out the coolant pump.



Installing:

Install in reverse order of removal. Note the following:

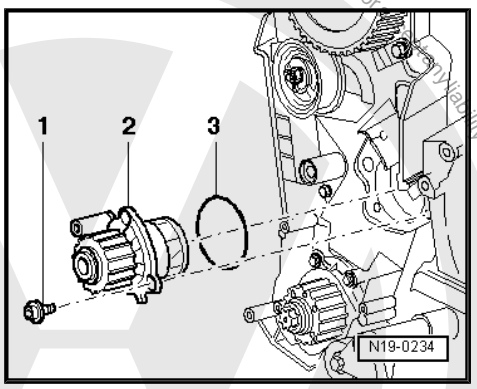
- • Replace the seals, gaskets and O-rings.

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– Coat the new O-ring -3- with coolant.

– Insert the coolant pump -2- in the cylinder block and tighten the bolts -1-.

• Tightening specification, 15 Nm



Note

The plug from the coolant pump faces downward.

– Installing and tensioning the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

– Fill with coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

1.7 Coolant Thermostat, Removing and Installing

Special tools and workshop equipment required

♦ T Bar And Socket - 10mm - 3185-

♦ Refractometer - T10007A-

♦ Hex Ball Socket - T10058-

♦ Torque Wrench 1331 5-50Nm - VAG1331-

♦ Shop Crane - Drip Tray - VAS6208-

♦ Hose Clip Pliers - VAS6362-

Removing:

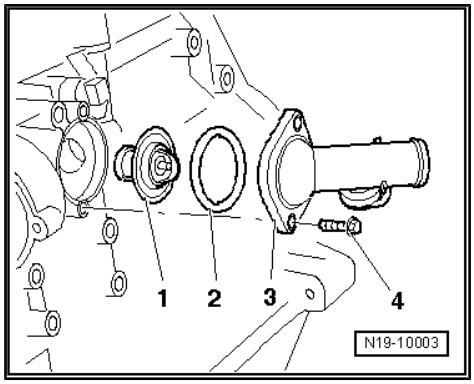
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

– Remove the Throttle Valve Control Module - J338- . Refer to ⇒ “3.12 Overview - Intake Manifold with Attachments”, page 331 , Overview - Intake Manifold with Attachments

– Remove the coolant hose from the connection.

– Loosen the bolts -4- from the connection -3- with T Bar And Socket - 10mm - 3185- and remove using the Hex Ball Socket - T10058- and remove the connection -3- with the coolant thermostat -1-.

– Turn the thermostat -1- $^{1}/_{4}$ turn (90°) to the left and remove it from the connection -3-.

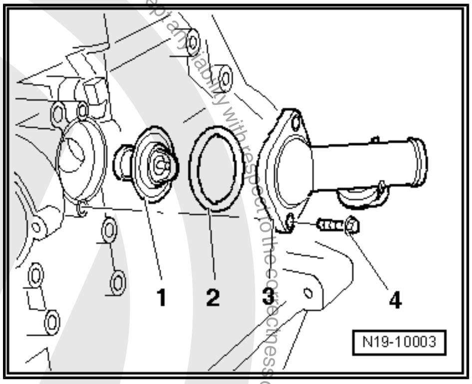


Removing:

Install in reverse order of removal. Note the following:

• Replace the seals, gaskets and O-rings.

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– Coat the new O-ring -2- with coolant.

– Insert the coolant thermostat -1- into the connection -3- and turn it 1/4 turn (90°) to the right.

Note

The clip of thermostat must be positioned at approximately a right angle.

– Install the connection -3- and the thermostat -1- in the cylinder block.

– Tighten the bolts -4- with T Bar And Socket - 10mm - 3185- .

• Tightening specification, 15 Nm

– Secure the coolant hose to the connection.

– Install the Throttle Valve Control Module - J338- . Refer to ⇒ “3.12 Overview - Intake Manifold with Attachments”, page 331 , Overview - Intake Manifold with Attachments

– Fill with coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

1.8 4/2-Way Valve with Coolant Thermostat, Removing and Installing

Special tools and workshop equipment required

♦ T Bar And Socket - 10mm - 3185-

♦ Refractometer - T10007A-

♦ Hex Ball Socket - T10058-

♦ Torque Wrench 1331 5-50Nm - VAG1331-

♦ Shop Crane - Drip Tray - VAS6208-

♦ Hose Clip Pliers - VAS6340-

♦ Swivel Socket - Xzn 8 - T10445-

Removing

Note

The thermostat is inside the 4/2-way valve and cannot be replaced separately.

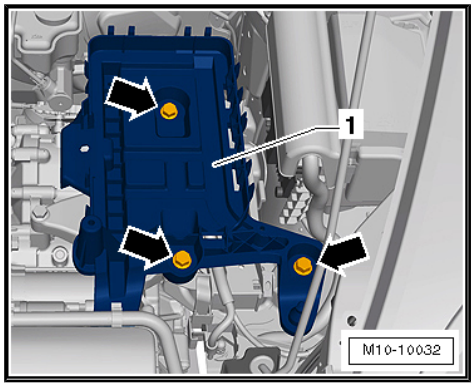
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

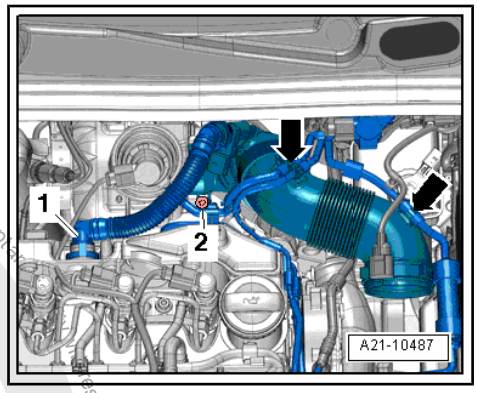
– Remove the air filter housing with the mass airflow sensor and connecting pipe. Refer to ⇒ “3.15 Air Filter Housing, Removing and Installing”, page 338 .

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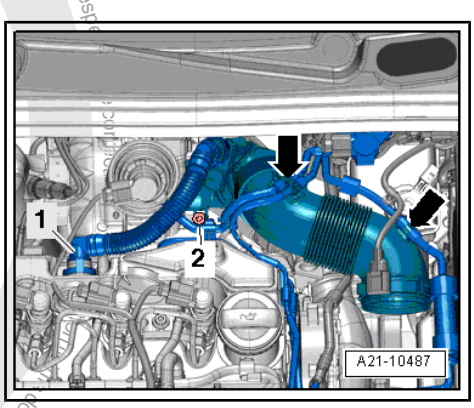
– Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .



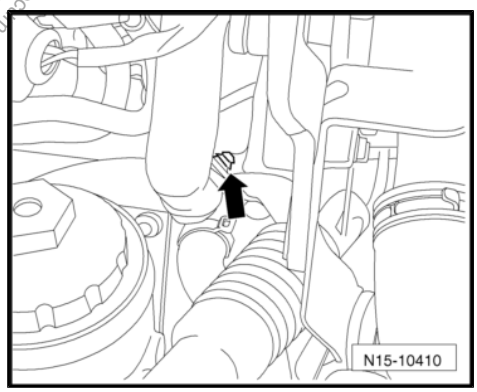
– Remove the crankcase ventilation hose -1- from the cylinder head cover. To do this press the release button.
– Free up the vacuum hoses -arrows- on the air duct pipe.



– Remove the bolt -2-, swivel the air guide pipe and intake tube to the rear and remove them from the turbocharger.

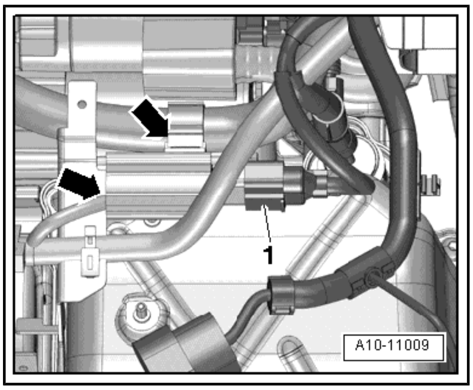


– Remove the wiring harness from the bracket -arrow-.



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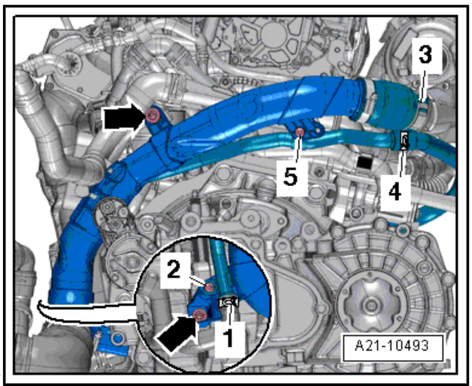
– Free up the wiring harnesses -arrows- and the connector -1- on the bracket.



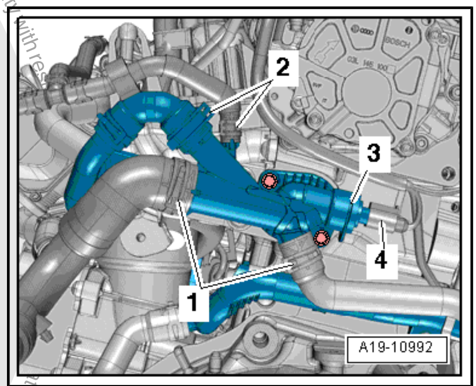
– Remove the bolts -2 and 5- and -arrows-.

– Free up the wires and hoses on the left air duct pipe using the Pry Lever - 80-200- .

– Loosen the hose clamp -3- and remove the left air guide pipe.



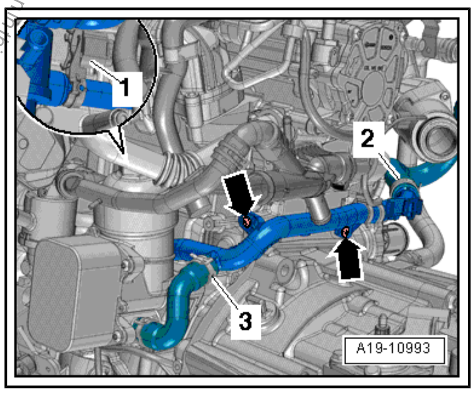
– Remove the coolant hoses. Loosen the clamps -1- to do this.



– Disconnect the connector -1- for the Camshaft Position Sensor - G40- from out of the bracket.

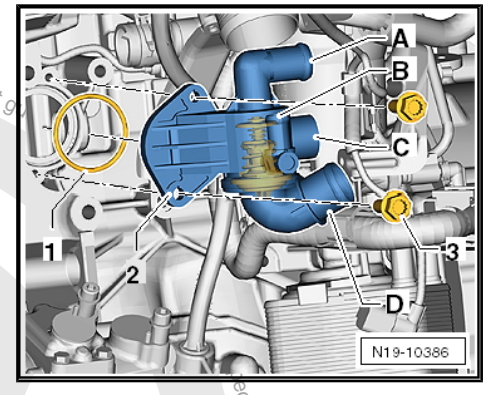
– Remove the bolts -arrows-.

– Loosen the bolt on the coolant pipe behind the oil filter a few turns. Use the Swivel Socket - Xzn 8 - T10445- .

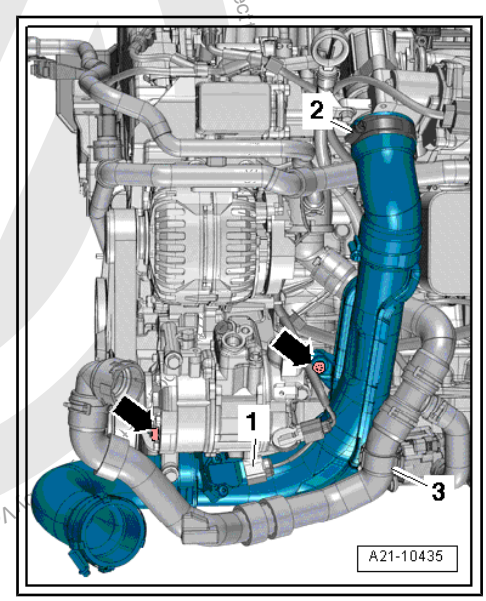


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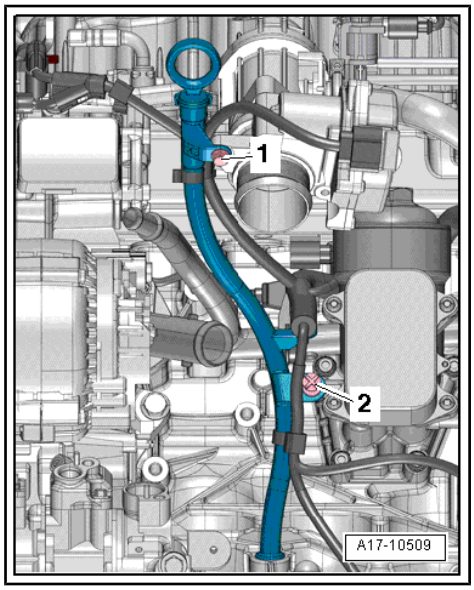
– Pull the coolant pipe out of the connection -C- on the 4/2-way valve. Leave it in its component location.



– Remove the bolts -arrows-.
– Free up the coolant hose -3-.
– Loosen the hose clamp -2-.
– Disconnect the connector -1- from the Charge Air Pressure Sensor - G31- / Intake Air Temperature Sensor - G42- and remove the right air duct pipe.
– Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .

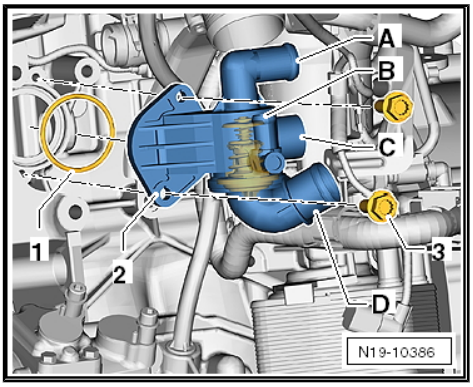


– Remove the bolt -1-.
– Remove the clip -2- using Pry Lever - 80-200- .
– Pull the oil dipstick tube upward out of the cylinder block and move it to the side.
– Remove the coolant hoses from the connections -A, B and D-.
– Remove the bolts -3- from the 4/2-way valve -2-.



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– Pull the valve out of the cylinder block and then to the left in order to remove the connection -C- from the coolant pipe.



Installing

Note

Replace the gaskets and seals.

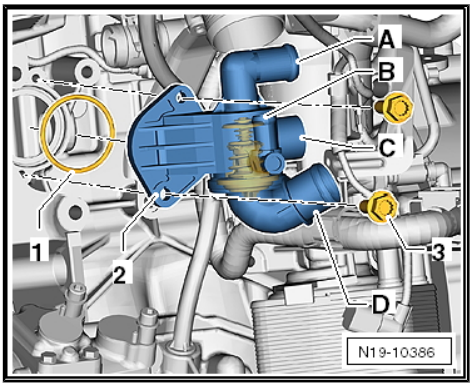
Install in reverse order of removal while noting the following:

– First attach the 4/2-way valve with the connection -C- to the coolant pipe and then install them in the cylinder block.

– Coat the new O-ring -1- with coolant.

– Tighten the bolts -3- to 15 Nm.

– Tighten the bolt on the coolant pipe behind the oil filter. Use the Swivel Socket - Xzn 8 - T10445- . Tightening specification: 10 Nm.



1.9 Coolant, Draining and Filling

Special tools and workshop equipment required

- Refractometer - T10007A-
- Drip Tray - VAG1306-
- Hose Clip Pliers - VAS6362-
- Cooling System Charge Kit - VAS6096-
- Cooling System Tester - Adapter - VAG1274/8-

Draining:

DANGER!

Risk of scalding due to hot steam and hot coolant:

- ***The cooling system is under pressure when the engine is warm.***
- ***Wear protective eyewear and protective clothing to prevent eye injury and scalding.***
- ***Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.***

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Note

- *Drained coolant must be stored in a clean container for disposal or reuse.*
- *Follow all waste disposal regulations.*

– Open the cap on the coolant expansion tank.

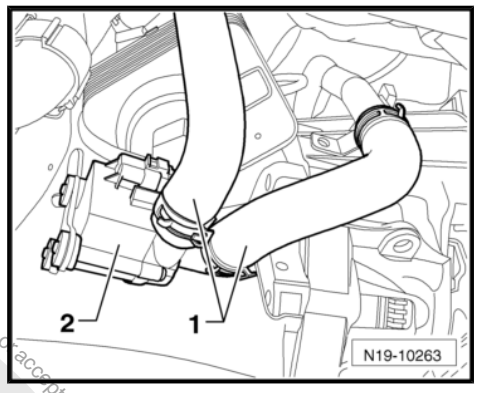
– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

Note

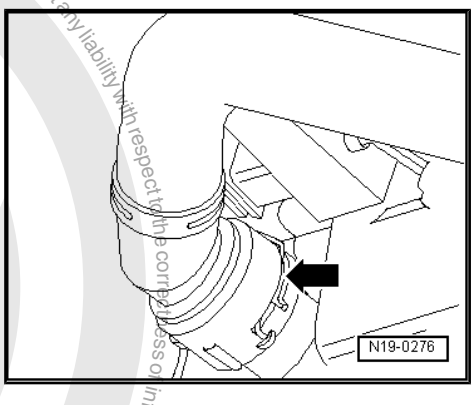
Catch leaking coolant with the Drip Tray - VAS6208- .

– Place the Shop Crane - Drip Tray - VAS6208- under the engine.

– Remove the coolant hoses -1- on the Coolant Recirculation Pump 2 - V178- -2-.

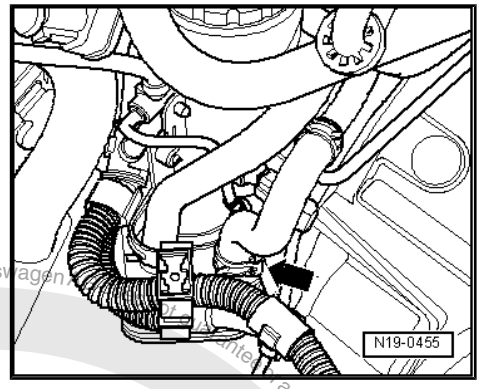


– Remove the coolant hose clip -arrow- downward and remove the coolant hose from the radiator quick-release coupling.



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– In addition, to drain the coolant from the engine, disconnect the coolant hose at the oil cooler -arrow-.



Filling:

Caution

Only use distilled water for mixing with G12 plus plus. Using distilled water provides optimum corrosion protection.

Note

- *Only use coolant additive G 12 Plus Plus that conforms to TL VW774 G.*
- *Use distilled water for mixing.*
- *G12 plus-plus prevents freeze and corrosion damage and scaling and it increases the boiling temperature. For this reason the cooling system must be filled all year round with coolant and corrosion protection additives.*
- *Because of its high boiling point, the coolant contributes to engine reliability under heavy engine loads, particularly in countries with tropical climates.*
- *Freeze protection should be guaranteed to about -25 °C (-13 °F) (in countries with arctic climates: to about -35 °C (-31 °F)).*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive portion must be at least 40%.*
- *If a stronger freeze protection is required, the G12 plus-plus ratio can be increased.*
- *But only up to 60% (freeze protection down to approximately -40 °C (-40 °F)). Otherwise the freeze protection is lessened and the cooling effect will be diminished.*
- *Do not use the old coolant again if replacing the radiator, heater core, cylinder head or cylinder head gasket.*
- *The Refractometer - T10007- is recommended for determining the current freeze protection density.*

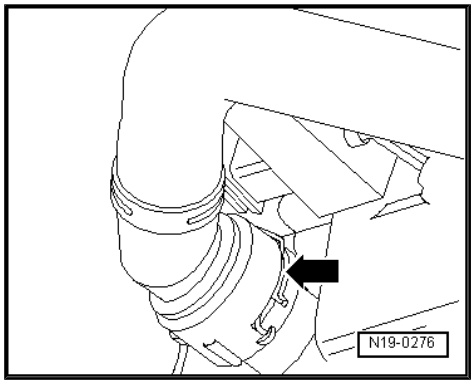
Recommended Mixture Ratios:

Frost Protection to	Freeze Protection Portion	-G 12 plus-plus- . Refer to [3].	Distilled Water. Refer to [3] .
-25 °C (-13 °F)	40 %	3.2 liters (3.38 quarts)	4.8 liters (5.07 quarts)
-35 °C (-31 °F)	50 %	4.0 liters (4.22 quarts)	4.0 liters (4.22 quarts)

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

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– Install the lower coolant hose and secure with the clamp -arrow-.



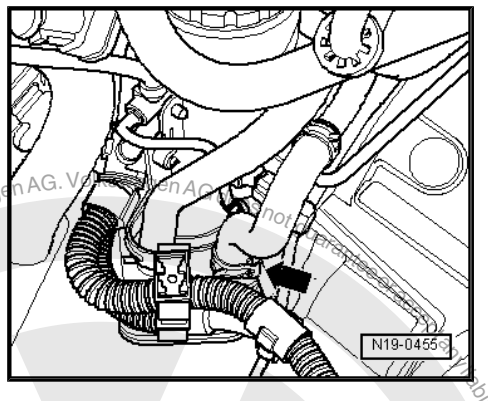
– Connect the coolant hose to the oil cooler -arrow-.

– Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

With Cooling System Charge Kit - VAS6096- :

– Install the Cooling System Tester - Adapter - VAG1274/8- in the coolant expansion tank.

– Fill the coolant circuit using Cooling System Charge Kit - VAS6096- . Refer to Operating Instructions for Cooling System Charge Kit VAS6096.



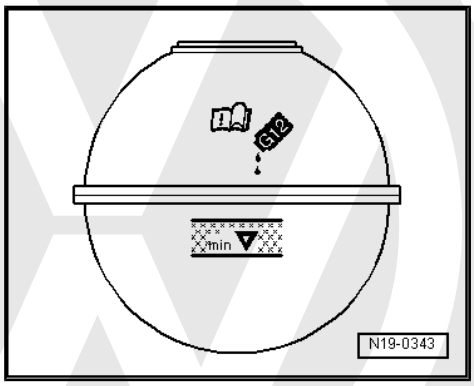
Without Cooling System Charge Kit - VAS6096- :

– Slowly fill the coolant up to the upper marking in the hatched area on the expansion tank.

– Seal the coolant expansion tank.

– Start the engine and keep the engine speed at about 2000 RPM for approximately three minutes.

– Let the engine run in idle until the Radiator Fan - V7- switches on.



DANGER!

Risk of scalding due to hot steam and hot coolant:

- ***The cooling system is under pressure when the engine is warm.***
- ***Wear protective eyewear and protective clothing to prevent eye injury and scalding.***
- ***Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.***

– Check the coolant level and fill if necessary.

• When engine is warm, coolant level must be at top marking and when the engine is cold, it must be in the middle of the hatched field.

1.10 Cooling System, Checking for Leaks

⇒ "1.10.1 Pressure Checking", page 212

⇒ "1.10.2 Pressure Relief Valve in Cap, Checking", page 214 .

1.10.1 Pressure Checking

Special tools and workshop equipment required

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- Cooling System Tester - VAG1274B-
- Cooling System Tester - Adapter - VAG1274/8-
- Cooling System Tester - Adapter - VAG1274/9-

Test Conditions

- Engine at operating temperature

Test Sequence

DANGER!

Risk of scalding due to hot steam and hot coolant:

- *The cooling system is under pressure when the engine is warm.*
- *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*

– Open the cap on the coolant expansion tank.

– Install the Cooling System Tester - Adapter - VAG1274/8- in the coolant expansion tank.

– Clamp the Adapter - VAG1274B/1- in the Cooling System Tester - Adapter - VAG1274/8- .

– Connect the Adapter - VAG1274B/1- to the Cooling System Tester - VAG1274B- using the connecting hose provided.

– Generate approximately 1 bar (14.5 psi) pressure using the cooling system tester hand pump.

DANGER!

Risk of scalding due to hot steam and hot coolant:

- *The existing pressure must be reduced before disconnecting the Cooling System Tester - VAG1274B- from the connecting hose or the Adapter - VAG1274B/1- .*
- *To do this, press the pressure release valve on the Cooling System Tester - VAG1274B- until the pressure gauge displays the value »0«.*

If the pressure drops:

– Look for leaks and correct.

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1.10.2 Pressure Relief Valve in Cap, Checking

DANGER!

Risk of scalding due to hot steam and hot coolant:

- *The cooling system is under pressure when the engine is warm.*
- *Wear protective eyewear and protective clothing to prevent eye injury and scalding.*
- *Reduce the pressure by covering the coolant reservoir cap with a cloth and carefully opening.*

– Open the cap on the coolant expansion tank.

– Install the cap in the Cooling System Tester - Adapter - VAG1274/9- .

– Clamp the Adapter - VAG1274B/1- in the Cooling System Tester - Adapter - VAG1274/9- .

– Connect the Adapter - VAG1274B/1- to the Cooling System Tester - VAG1274B- using the connecting hose provided.

– Generate a maximum pressure of 1.6 bar (23.2 psi) using the hand pump on the Cooling System Tester - VAG1274B- .

• Pressure relief valve must not open yet.

If pressure relief valve opens prematurely:

– Replace the cap.

– Increase the pressure to above 1.6 bar (23.2 psi).

• Pressure relief valve must open.

If the pressure relief valve does not open:

– Replace the cap.

1.11 Oil Cooler, Checking for Leaks

Special tools and workshop equipment required

- Refractometer - T10007A-
- Hose Clamps - Up To 25 mm - 3094-
- Cooling System Tester - VAG1274B-
- Cooling System Tester - Adapter - VAG1274/8-
- Hose Clip Pliers - VAS6362-
- Shop Crane - Drip Tray - VAS6208-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Expansion Tank - 1K0 121 407 A or 6Q0 121 407 A or 1J0 121 407 B-
- Plug - 191 211 343-
- Closure Cap - 1J0 121 324-
- Coolant Hose - 251 265 056-

Test Conditions

• Engine must be cold.

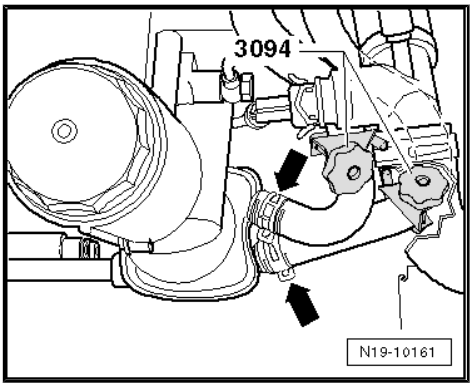
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Test Sequence

– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

– Clamp off the coolant hoses from the oil cooler using Hose Clamps - Up To 25mm - 3094- .

– Loosen the spring clamps -arrows- using the Hose Clip Pliers - VAS6362- .



Note

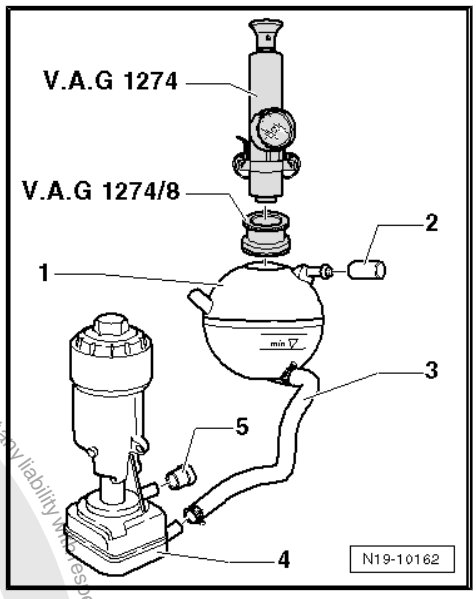
Catch leaking coolant with the Drip Tray - VAS6208- .

– Disconnect the coolant hoses from the oil cooler.

– Mount the Closure Cap -5- on the rear connection on the oil cooler -4-.

– Attach the Plug -2- to the coolant expansion tank vent connection -1-.

– Secure the coolant hose -3- on the oil cooler and on the coolant expansion tank.



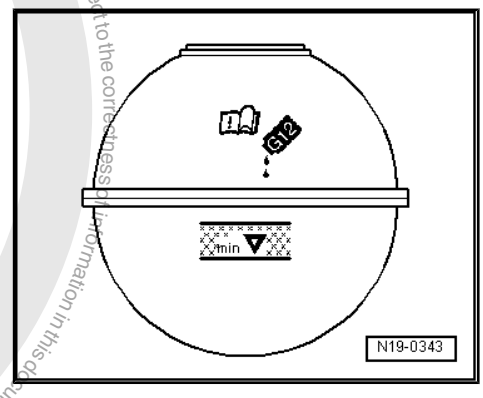
– Slowly fill the coolant up to the upper marking in the hatched area on the expansion tank.

– Position the Cooling System Tester - VAG1274B- with the Cooling System Tester - Adapter - VAG1274/8- on the coolant expansion tank.

– Generate a pressure of approximately 1.6 bar (23.2 psi) using the hand pump on the Cooling System Tester - Adapter - VAG1274/8- .

– Watch the pressure decrease on the pressure gauge.

• The pressure must not fall within 10 minutes.



If the pressure drops:

– Replace the oil cooler. Refer to ⇒ “4.1 Overview - Oil Filter Bracket and Oil Cooler”, page 177 , Overview - Oil Filter Bracket and Oil Cooler

Install in reverse order of removal. Note the following:

– Check the coolant level and fill if necessary. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

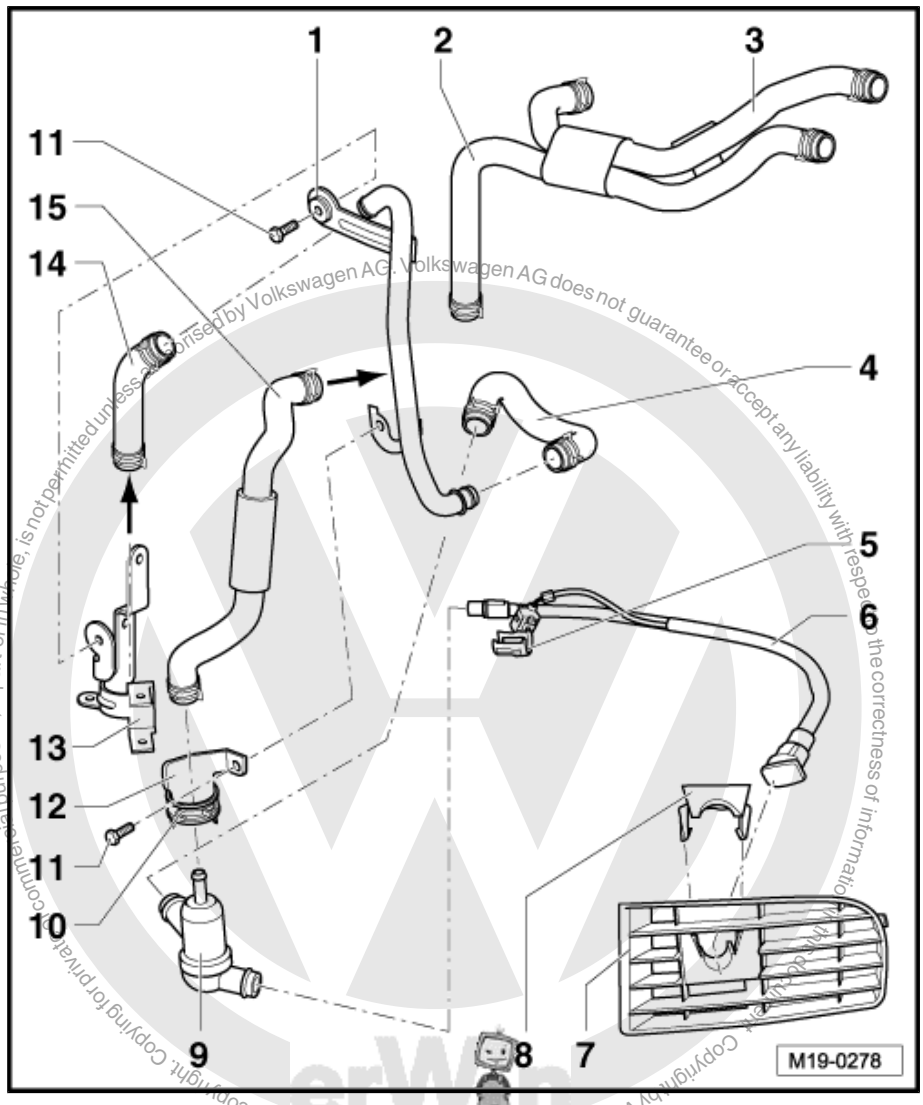
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1.12 Engine Preheater

⇒ “1.12.1 Overview - Engine Preheater”, page 216 .

⇒ “1.12.2 Engine Preheater, Removing and Installing”, page 217 .

1.12.1 Overview - Engine Preheater



1 - Coolant Pipe for Engine Preheater

- ❑ Secured in the upper area on the bracket for the wiring harness and coolant pipe -item 13- ⇒ Item 13 (page 216)
- ❑ Secured in the lower area on the charge air pipe with the engine preheater bracket

-item 15- ⇒ Item 15 (page 291)

2 - Coolant Hose from the Cylinder Block Connection to the Transmission Fluid Cooler

3 - Coolant Hose from the Transmission Fluid Cooler to the Engine Oil Cooler

4 - Coolant Hose from the Engine Preheater Coolant Pipe to the Engine Preheater

5 - Locking Mechanism

6 - External Power Supply Connecting Cable

7 - Left Air Grille

- – Air Grille, Removing and installing. Refer to ⇒ Body Exterior; Rep. Gr. 63 ; Front Bumper Cover; Front Bumper Cover Attachments .

8 - Bracket

9 - Engine Preheater

- ❑ Removing and installing. Refer to ⇒ “1.12.2 Engine Preheater, Removing and Installing”, page 217 .

10 - Engine Preheater Clamp

- ❑ Secured on the bracket

11 - Bolt

- ❑ 10 Nm

12 - Engine Preheater Bracket

13 - Bracket for Wiring Harness and Coolant Pipe

- ❑ Secured on the oil filter bracket -item 16- ⇒ Item 16 (page 179)

14 - Coolant Hose from the Engine Oil Cooler to the Engine Preheater Coolant Pipe

15 - Coolant Hose from the Engine Preheater to the Coolant Hose on the Cylinder Block

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1.12.2 Engine Preheater, Removing and Installing

Special tools and workshop equipment required

- Refractometer - T10007A-
- Shop Crane - Drip Tray - VAS6208-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-

Removing:

– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

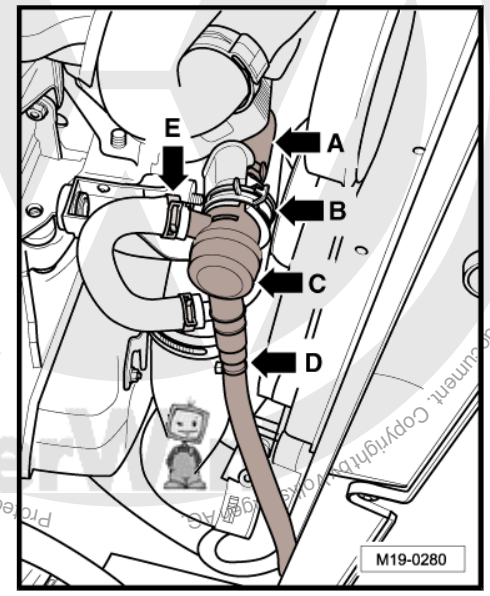
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

– Loosen the coolant hose clamp and remove the coolant hose from the connection -arrow A-.

– Unclip the retainer and disconnect the Engine Preheater connector -arrow D-.

– Loosen the coolant hose clamp and remove the coolant hose from the connection -arrow E-.

– Release the clamp -arrow B- and remove the Engine Preheater -arrow C- downward.



Installing:

Install in reverse order of removal.

– Fill with coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

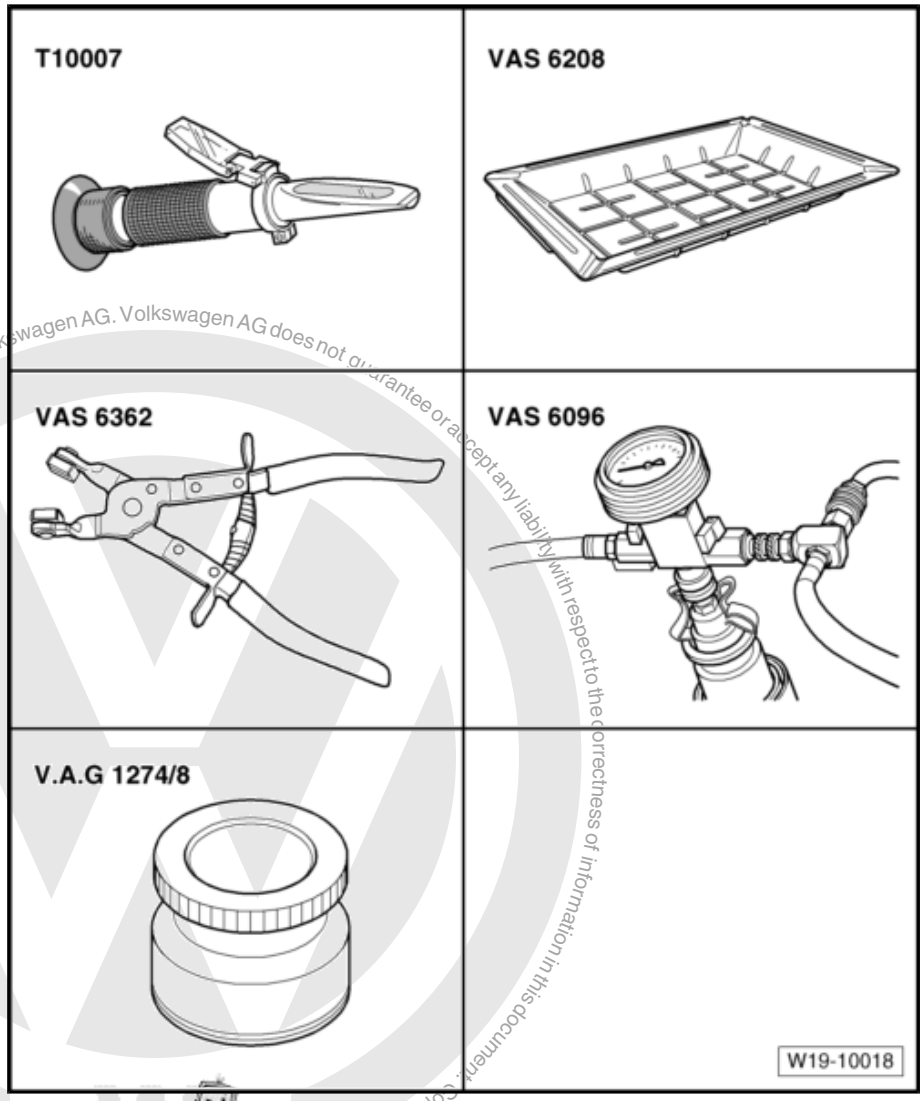
– Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

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2 Special Tools

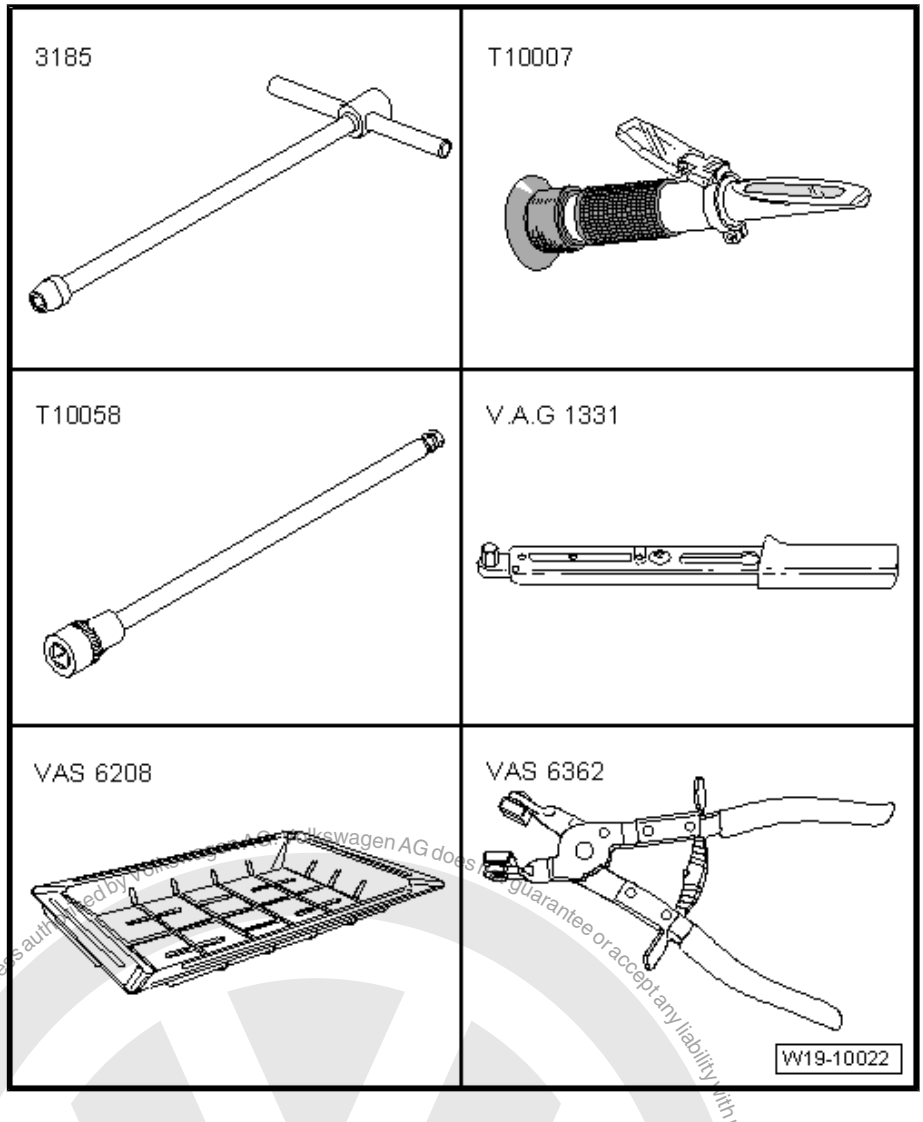
Special tools and workshop equipment required

- Refractometer - T10007A-
- Shop Crane - Drip Tray - VAS6208-
- Hose Clip Pliers - VAS6362-
- Cooling System Charge Kit - VAS6096-
- Cooling System Tester - Adapter - VAG1274/8-



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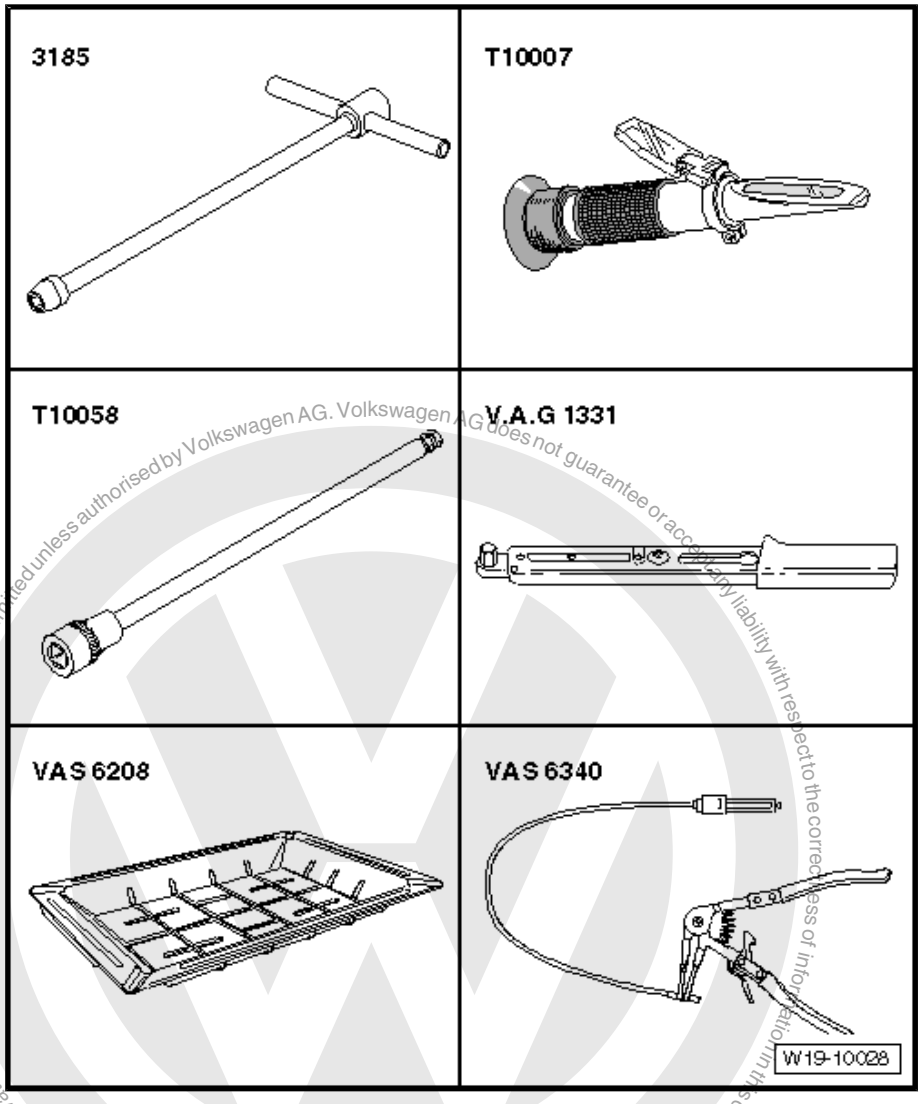
- T Bar And Socket - 10mm - 3185-
- Refractometer - T10007A-
- Hex Ball Socket - T10058-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Shop Crane - Drip Tray - VAS6208-
- Hose Clip Pliers - VAS6362-



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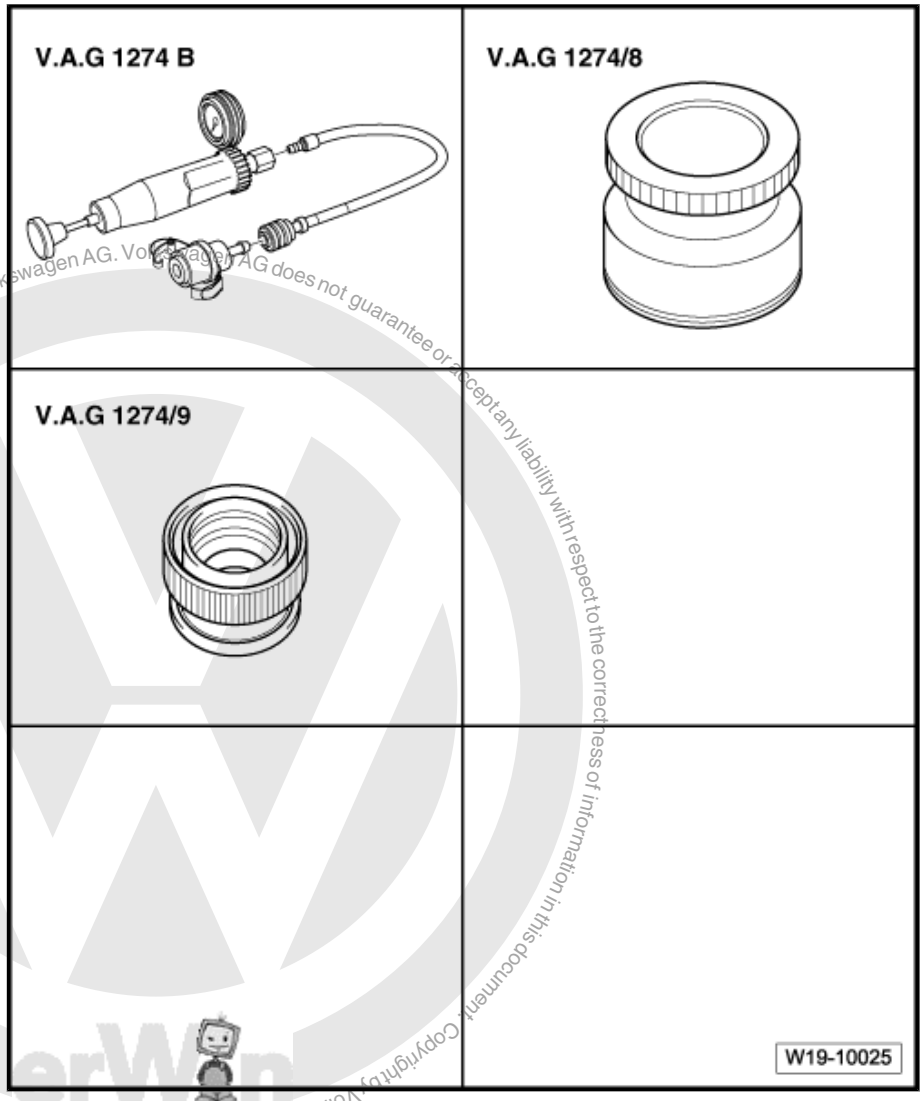
Special tools and workshop equipment required

- T Bar And Socket - 10mm - 3185-
- Refractometer - T10007 A-
- Hex Ball Socket - T10058-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Shop Crane - Drip Tray - VAS6208-
- Hose Clip Pliers - VAS6340-



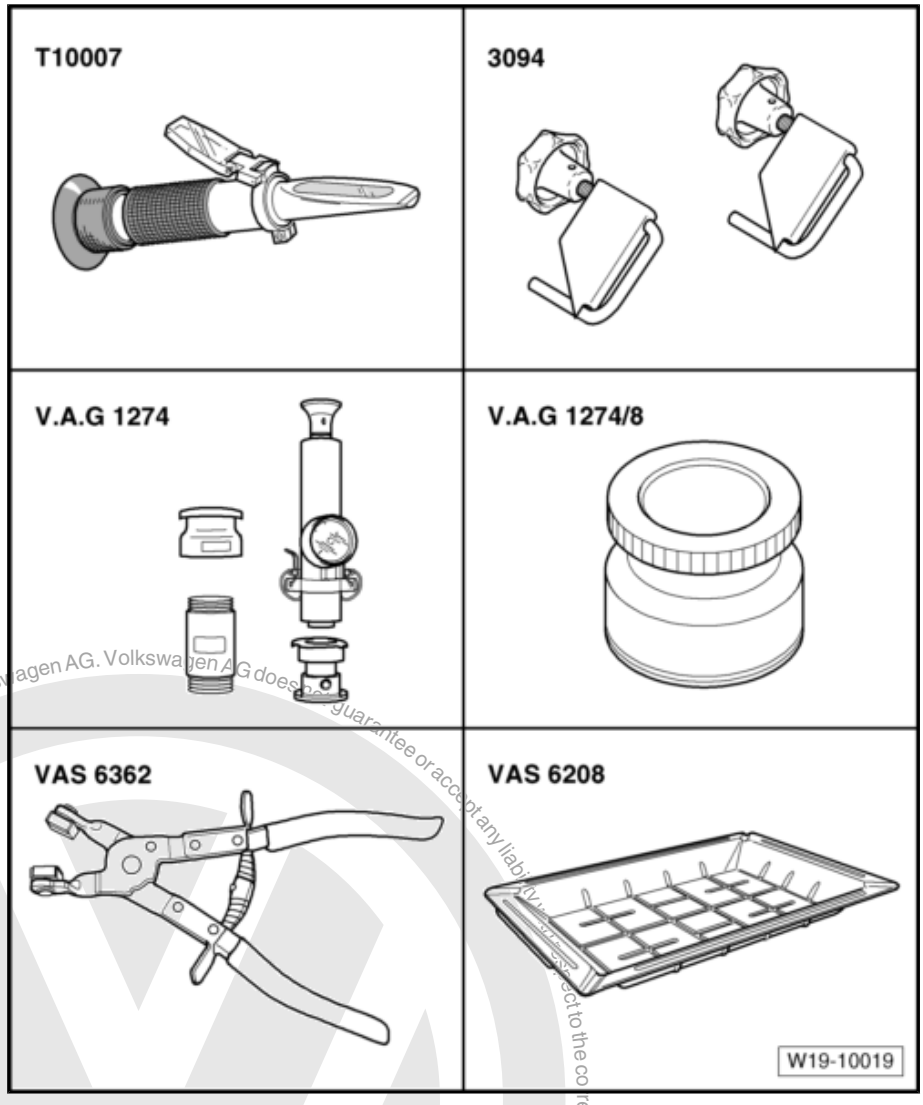
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- Cooling System Tester - VAG1274B-
- Cooling System Tester - Adapter - VAG1274/8-
- Cooling System Tester - Adapter - VAG1274/9-

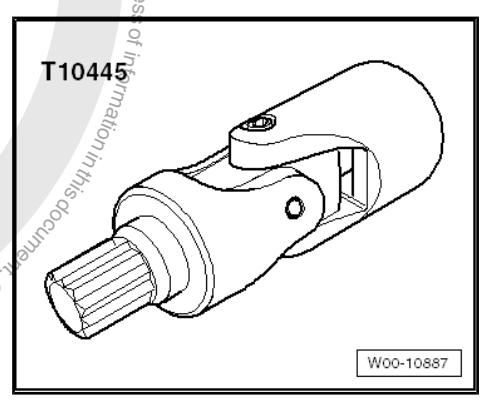


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- Refractometer - T10007A-
- Hose Clamps - Up To 25 mm - 3094-
- Cooling System Tester - VAG1274B-
- Cooling System Tester - Adapter - VAG1274/8-
- Hose Clip Pliers - VAS6362-
- Shop Crane - Drip Tray - VAS6208-



- Swivel Socket - Xzn 8 - T10445-



- Pry Lever - 80-200-
- Cooling System Tester - VAG1274B-
- Torque Wrench 1783 - 2-10Nm - VAG1783-

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20 – Fuel Supply

1 Safety Precautions when Working on Fuel Supply System

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*
- *The fuel or fuel lines in fuel system can become very hot (danger of scalding)!*
- *In addition, the fuel system is under pressure! Before opening the system, place rags around the connection area and release pressure by carefully loosening the connection!*
- *Always wear protective eyewear, safety gloves and protective clothing when performing any work on the fuel system to avoid eye injuries and burns.*
- *If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ "3.9 Fuel System, Filling/Bleeding", page 328 . (Running the high pressure fuel pump when dry must always be avoided).*

Always Pay Attention to the following When Removing and Installing the Fuel Level Sensor - G- or the Fuel Pump - G23- (Fuel Delivery Unit) From Full or Partially Filled Fuel Tanks.

- Before starting work, switch the exhaust extraction system on and place an extraction hose close to the fuel tank installation opening to extract fuel fumes. If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a delivery volume greater than 15 m^3/h can be used.
- Do not let fuel come in contact with skin. Wear fuel-resistant gloves.

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2 Guidelines for Clean Working Conditions

When Working on the Fuel Supply/Injection System, Pay Careful Attention to the following "7 rules" of Cleanliness:

- Thoroughly clean the connection points and the surrounding area before loosening.
- Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- Carefully cover or seal opened components if the repair is not performed immediately.
- Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- Supplied transport and protective packaging and sealing cover should only be removed immediately before installing.
- When the fuel system is open: avoid working with compressed air if possible. Do not move the vehicle if possible.
- In addition, do not let diesel fuel flow onto the coolant hoses. If necessary, the hoses must be cleaned again immediately. Replace corroded hoses.

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3 Misfueling

⇒ "3.1 Step 1 (Engine Was Started with Incorrect Fuel)", page 225

⇒ "3.2 Step 2 (Engine Was Not Started with Incorrect Fuel)", page 226

⇒ "3.3 Step 3 (Shavings in the Fuel Delivery Unit and Reservoir)", page 227

⇒ "3.4 Step 4 (No Shavings in the Fuel Delivery Unit and Reservoir)", page 228

⇒ "3.5 Step 5 (Shavings in the High Pressure Pump)", page 228

⇒ "3.6 Step 6 (No Shavings in the High Pressure Pump)", page 229

Caution

Fueling incorrectly can cause insufficient lubrication which can lead to irreversible damage to the high pressure components, especially the high pressure pump. Damage caused by seizing and particle abrasion should be expected. These particles will cause further damage in the pressure control valve and the injectors.

Note

- *This information guides the reader through the individual procedures like a flowchart.*
- *The connector couplings must »audibly« engage when locking.*
- *Note the color coding when installing the connector coupling. Refer to ⇒ page 245 !*
- *Pull on the connector coupling to check for secure fit.*
- *Disconnect the connector couplings. Refer to ⇒ "5 Connector Couplings, Disconnecting", page 245 .*

Was the Engine Started with the Incorrect Fuel?

Yes. Refer to ⇒ "3.1 Step 1 (Engine Was Started with Incorrect Fuel)", page 225 .

No. Refer to ⇒ "3.2 Step 2 (Engine Was Not Started with Incorrect Fuel)", page 226 .

3.1 Step 1 (Engine Was Started with Incorrect Fuel)

– Empty the fuel tank as much as possible through the filler neck using the Fuel Extraction Unit - VAS5190- . Refer to ⇒ "4.4 Fuel Tank, Draining", page 235 .

– Remove the rear bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .

– Remove the flange cover.

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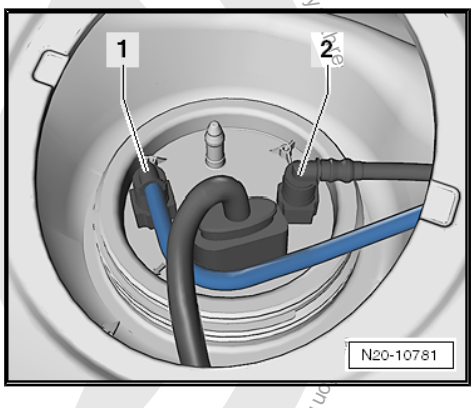
Note

Press the locking ring to release the fuel line.

WARNING

If the battery is connected, make sure that the fuel pump is not activated when the door is opened. Fuel may leak out when the system is open.

- Remove the fuel return line, which is blue or has a blue marking, -1- from the fuel delivery unit. Disconnect the coupling. Refer to
⇒ “5 Connector Couplings, Disconnecting”, page 245 .
- Connect the Diesel Pressure Tester Kit - Adapter Set - Connection Hose 2 -VAS6551/5-2- to the fuel return line -1-.
- Guide the free end of the Diesel Pressure Tester Kit - Adapter Set - Connection Hose 2 -VAS6551/5-2- into a suitable container.
- Connect the vehicle tester and perform the Guided Function “Activate Fuel Pump (evacuate the fuel system)”.



Note

The fuel pump is now activated.

- Repeat this procedure as necessary until the fuel tank is completely empty.

Remove the Fuel Delivery Unit. Refer to
⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .

- Check the fuel tank for shavings.
- Empty the fuel delivery unit reservoir.
- Check the reservoir visually for large contaminants and shavings and on the screen.

Are There Any Shavings?

Yes. Refer to
⇒ “3.3 Step 3 (Shavings in the Fuel Delivery Unit and Reservoir)”, page 227 .

No. Refer to
⇒ “3.4 Step 4 (No Shavings in the Fuel Delivery Unit and Reservoir)”, page 228 .

3.2 Step 2 (Engine Was Not Started with Incorrect Fuel)

- Empty the fuel tank as much as possible through the filler neck using the Fuel Extraction Unit - VAS5190- . Refer to
⇒ “4.4 Fuel Tank, Draining”, page 235 .
- Remove the rear bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .
- Fold the carpet to the side or forward if necessary.
- Remove the flange cover.

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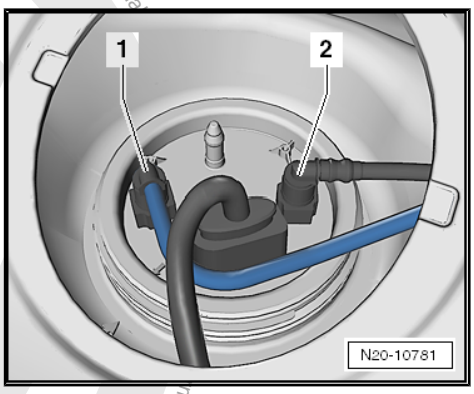
Note

Press the locking ring to release the fuel line.

WARNING

If the battery is connected, make sure that the fuel pump is not activated when the door is opened. Fuel may leak out when the system is open.

- Remove the fuel return line, which is blue or has a blue marking, -1- from the fuel delivery unit. Disconnect the coupling. Refer to
⇒ “5 Connector Couplings, Disconnecting”, page 245 .
- Connect the Diesel Pressure Tester Kit - Adapter Set - Connection Hose 2 -VAS6551/5-2- to the fuel return line -1-.
- Guide the free end of the Diesel Pressure Tester Kit - Adapter Set - Connection Hose 2 -VAS6551/5-2- into a suitable container.
- Connect the Vehicle Diagnostic Tester and perform the Guided Function “Activate Fuel Pump”.

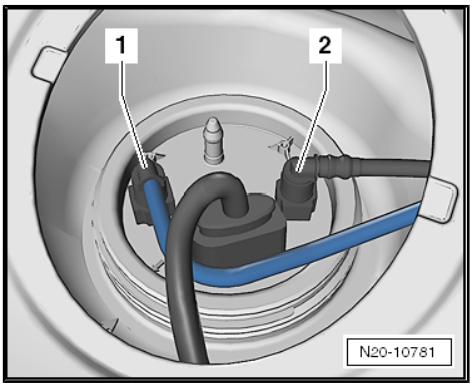


Note

The fuel pump is now activated.

- Repeat this procedure as necessary until the fuel tank is completely empty.
- Fill the fuel tank with five liters (5.28 quarts) of diesel fuel.
- Drain the fuel tank again completely as described above.
- Reconnect the fuel return line (blue, or blue marking) -1-.
- Replace the fuel filter. Refer to ⇒ Maintenance ; Booklet 20.1 .
- Fuel the vehicle and perform a road test.

End



3.3 Step 3 (Shavings in the Fuel Delivery Unit and Reservoir)

- Clean the fuel delivery unit and the fuel tank with the Suction Pump - VAS5226- .
- Install the fuel delivery unit. Refer to
⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .
- Fill the fuel tank with five liters (5.28 quarts) of diesel fuel.
- Drain the fuel tank again completely as described above.

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– Replace the following high pressure components:

- High pressure pump. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .
- High pressure lines. Refer to ⇒ “3.4.1 High Pressure Lines, Installing”, page 318 .
- High pressure reservoir (Rail) including Fuel Pressure Regulator Valve - N276- and Fuel Pressure Sensor - G247- . Refer to ⇒ “3.2 System Overview”, page 307
- Injector. Refer to ⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315
- Fuel return lines (oil overflow lines). Refer to ⇒ “3.3 Overview - Fuel System”, page 311 .
- Replace the fuel filter. Refer to ⇒ “6.3 Fuel Filter, Removing and Installing”, page 251 .

– Fuel the vehicle.

– Bleed the fuel system. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

– Perform a road test.

End

3.4 Step 4 (No Shavings in the Fuel Delivery Unit and Reservoir)

– Fill the fuel tank with five liters (5.28 quarts) of diesel fuel.

– Drain the fuel tank again completely as described above.

Caution

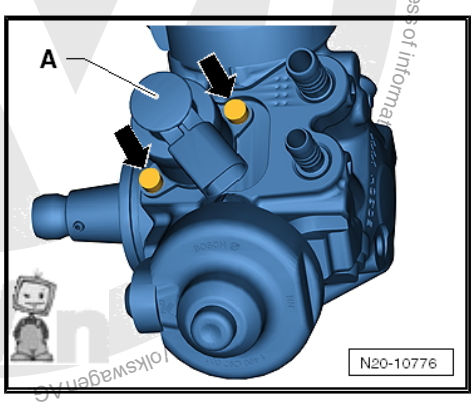
Removing the Fuel Metering Valve - N290- increases the risk that the high pressure pump will be damaged from the outside by debris. For this reason, always ensure the utmost cleanliness.

– Carefully clean the high pressure pump near the Fuel Metering Valve - N290- .

– Disconnect from the valve.

– Remove the bolts -arrows- and carefully remove the Fuel Metering Valve - N290- .

– Inspect the Fuel Metering Valve - N290- and the high pressure pump for shavings.



Are There Any Shavings?

Yes. Refer to ⇒ “3.5 Step 5 (Shavings in the High Pressure Pump)”, page 228 .

No. Refer to ⇒ “3.6 Step 6 (No Shavings in the High Pressure Pump)”, page 229 .

3.5 Step 5 (Shavings in the High Pressure Pump)

– Replace the following high pressure components:

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- High pressure pump. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .
- High pressure lines. Refer to ⇒ “3.4.1 High Pressure Lines, Installing”, page 318 .
- High pressure reservoir (Rail) including Fuel Pressure Regulator Valve - N276- and Fuel Pressure Sensor - G247- . Refer to ⇒ “3.2 System Overview”, page 307
- Injector. Refer to ⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315
- Fuel return lines (oil overflow lines). Refer to ⇒ “3.3 Overview - Fuel System”, page 311 .
- Replace the fuel filter. Refer to ⇒ “6.3 Fuel Filter, Removing and Installing”, page 251 .

– Fuel the vehicle.

– Bleed the fuel system. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

– Perform a road test.

End

3.6 Step 6 (No Shavings in the High Pressure Pump)

Caution

Make sure that the seals for the Fuel Metering Valve - N290- are not damaged. The high pressure pump must be replaced if the seal is damaged.

– Coat the lower seal for the Fuel Metering Valve - N290- with fuel.

– Slide the valve into the high pressure pump by lightly twisting it.

– Install both bolts -arrows- by hand.

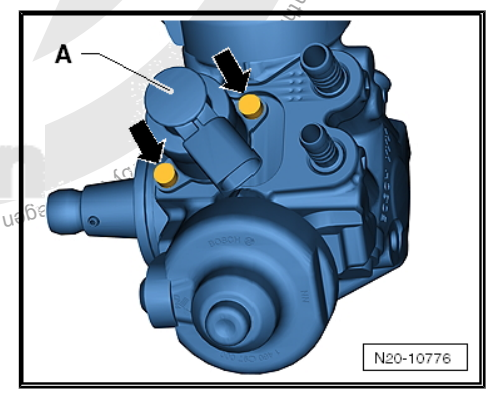
– First tighten the bolts to 3 Nm and then tighten them to 7 Nm.

– Replace the fuel filter. Refer to ⇒ Maintenance ; Booklet 20.1

– Bleed the fuel system. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

– Fuel the vehicle and perform a road test.

End



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4 Fuel Supply System Components

⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223

⇒ “2 Guidelines for Clean Working Conditions”, page 224

⇒ “4.1 General Information”, page 230

⇒ “4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011”, page 231

⇒ “4.3 Overview - Fuel Tank, Jetta from MY 2011 Only”, page 233

⇒ “4.4 Fuel Tank, Draining”, page 235

⇒ “4.5 Fuel Tank, Removing and Installing”, page 238

⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241

⇒ “4.7 Fuel Level Sensor G , Removing and Installing”, page 243

4.1 General Information

Special tools and workshop equipment required

- Hose Clip Pliers - VAS6362-

Note

- *Hose connections are secured with either spring or hose clamps.*
- *Always replace hose clamps with spring clamps. Refer to Parts Catalog.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

DANGER!

- ***Observe safety precautions when working on fuel supply. Refer to ⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .***

Always pay attention to these instructions before and during work.

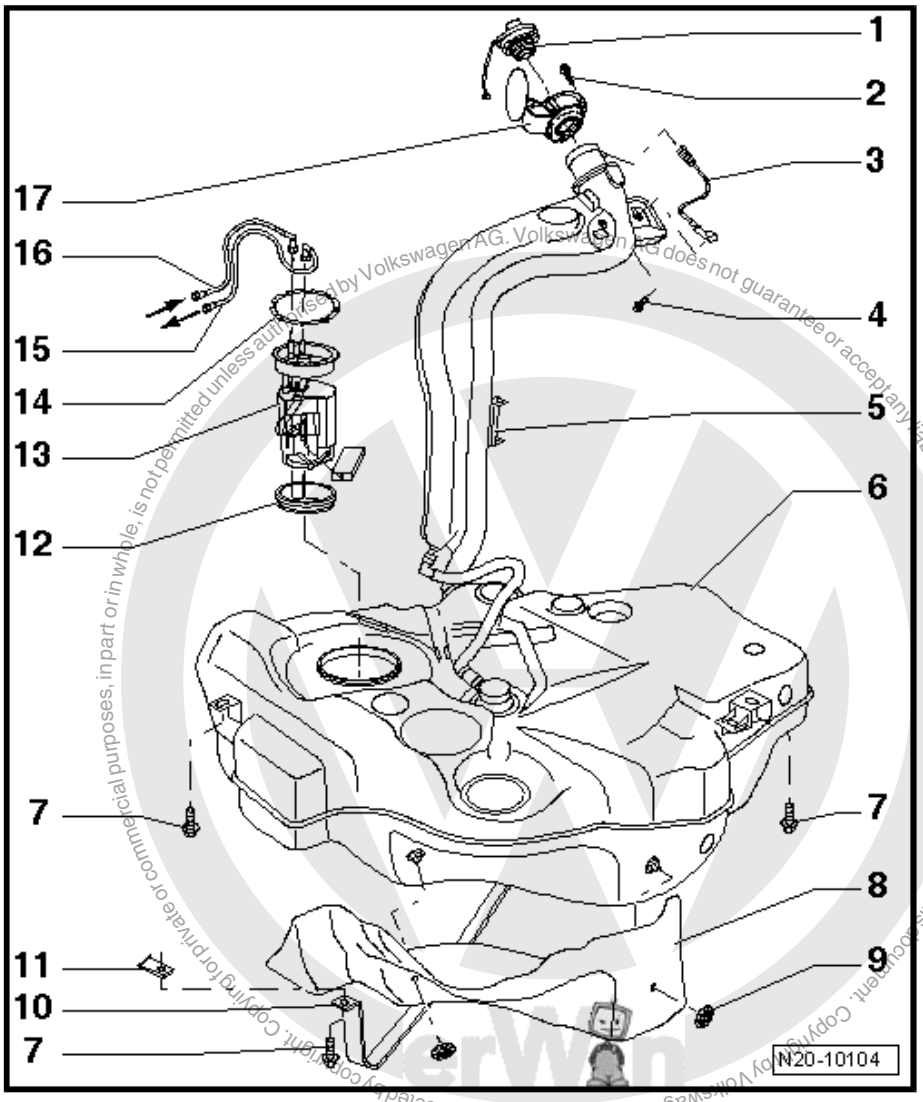
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4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 224 .*

Always pay attention to these instructions before and during work.



1 - Cap
- ❑ Replace if damaged

2 - Bolt
- ❑ 1.5 Nm

3 - Ground Connection
- ❑ Check for secure fit

4 - Bolt
- ❑ 11 Nm

5 - Bracket
- ❑ For the ABS speed sensor wire

6 - Fuel Tank
- ❑ Draining. Refer to ⇒ "4.4 Fuel Tank, Draining", page 235 .
- ❑ Removing and installing. Refer to ⇒ "4.5 Fuel Tank, Removing and Installing", page 238 .
- ❑ Support while removing with the Engine and Gearbox Jack - VAS6931- .

7 - Bolt
- ❑ 25 Nm
- ❑ Replace

8 - Heat Shield

9 - Lock Washer

10 - Mounting Strap
- ❑ Note the installation position

11 - Mount
- ❑ For the front muffler of the exhaust system -item 2- ⇒ Item 2 (page 381)

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12 - Seal

- ❑ Replace if damaged
- ❑ Insert dry into the fuel tank opening
- ❑ Coat with fuel only when installing the flange

13 - Fuel Delivery Unit

- ❑ Note the installation position of the fuel delivery unit flange. Refer to ⇒ Fig. ""Fuel Delivery Unit Flange Installation Position"" , page 232
- ❑ Fuel Delivery Unit, Removing and installing. Refer to ⇒ "4.6 Fuel Delivery Unit, Removing and Installing", page 241 .
- ❑ With the Fuel Level Sensor - G-
- ❑ Fuel Level Sensor - G- , Removing and installing. Refer to ⇒ "4.7 Fuel Level Sensor G , Removing and Installing", page 243 .
- ❑ With the Transfer Fuel Pump - G6-
- ❑ Transfer Fuel Pump - G6- , Checking. Refer to ⇒ "6.4 Transfer Fuel Pump G6 , Checking", page 252 .

14 - Locking Ring

- ❑ 110 Nm
- ❑ Check for secure fit
- ❑ Remove and install with the Wrench - Fuel Sending Unit - T10202- .

15 - Fuel Supply Line

- ❑ Black
- ❑ Attached to the side of the fuel tank
- ❑ Check for secure fit
- ❑ To disconnect, press the release button on the connecting piece
- ❑ To fuel filter -item 1- ⇒ Item 1 (page 250)

16 - Fuel Return Line

- ❑ Blue
- ❑ Attached to the side of the fuel tank
- ❑ Check for secure fit
- ❑ To disconnect, press the release button on the connecting piece
- ❑ From fuel filter -item 3- ⇒ Item 3 (page 250)

17 - Fuel Filler Door Unit

- ❑ With rubber gasket
- ❑ Removing and installing. Refer to ⇒ Body Exterior; Rep. Gr. 55 ; Fuel Filler Door Unit; Fuel Filler Door Unit, Removing and Installing .

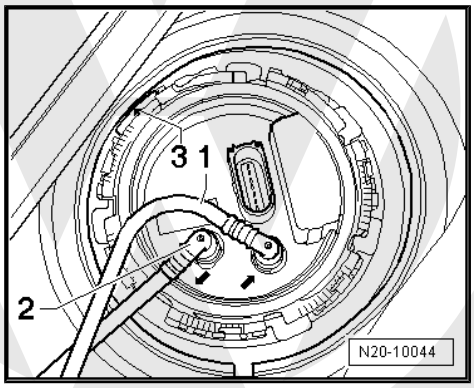
Fuel Delivery Unit Flange Installation Position

The mark -3- on the flange points opposite the direction of travel.

1 - Fuel Return Line (Blue)

2 - Fuel Supply Line (Black)

3 - Marking



Note

- ♦ *The fuel delivery unit flange can only be installed in this position.*
- ♦ *Make sure the supply and return lines are still clipped to the fuel tank after the fuel delivery unit flange has been installed.*

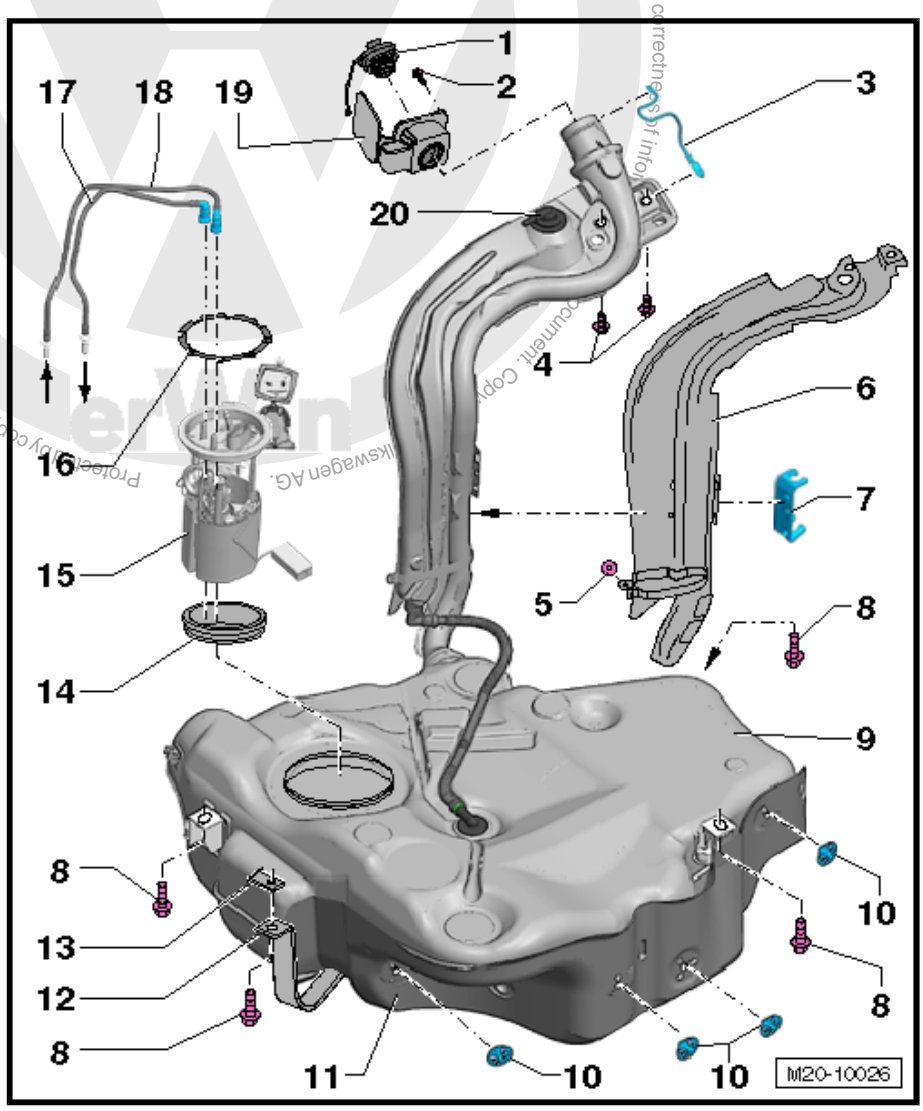
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4.3 Overview - Fuel Tank, Jetta from MY 2011 Only

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 224 .*

Always pay attention to these instructions before and during work.



1 - Cap
- ❑ Replace if damaged

2 - Bolt
- ❑ 1.5 Nm

3 - Ground Connection
- ❑ Check for secure fit

4 - Bolt
- ❑ 11 Nm

5 - Rivet

6 - Protective Plate
- ❑ Riveted to lower clamp at factory
- ❑ When replacing fuel tank, set protective plate on filler tube and rivet clamp (holes on protective plate must coincide with holes on filler tube).

7 - Cable Guide
- ❑ For the ABS line
- ❑ Clipped to the shield

8 - Bolt
- ❑ 25 Nm
- ❑ Replace

9 - Fuel Tank
- ❑ Draining. Refer to ⇒ "4.4 Fuel Tank, Draining", page 235 .
- ❑ Removing and installing. Refer to ⇒ "4.5 Fuel Tank, Removing and Installing", page 238 .
- ❑ Support while removing with the Engine and Gearbox Jack - VAS6931- .

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10 - Lock Washer

11 - Heat Shield

12 - Mounting Strap

- ❑ Note the installation position

13 - Mount

- ❑ For the exhaust system -item 2- ⇒ Item 2 (page 383)

14 - Seal

- ❑ Replace if damaged
- ❑ Insert dry into the fuel tank opening
- ❑ Coat with fuel only when installing the flange

15 - Fuel Delivery Unit

- ❑ Note the installation position of the fuel delivery unit flange. Refer to ⇒ Fig. ""Fuel Delivery Unit Flange Installation Position"" , page 235
- ❑ Fuel Delivery Unit, Removing and installing. Refer to ⇒ "4.6 Fuel Delivery Unit, Removing and Installing", page 241 .
- ❑ With the Fuel Level Sensor - G-
- ❑ Fuel Level Sensor - G- , Removing and installing. Refer to ⇒ "4.7 Fuel Level Sensor G , Removing and Installing", page 243 .
- ❑ With the Transfer Fuel Pump - G6-
- ❑ Transfer Fuel Pump - G6- , Checking. Refer to ⇒ "6.4 Transfer Fuel Pump G6 , Checking", page 252 .

16 - Locking Ring

- ❑ 110 Nm
- ❑ Check for secure fit
- ❑ Remove and install with the Wrench - Fuel Sending Unit - T10202- .

17 - Fuel Supply Line

- ❑ Black
- ❑ Attached to the side of the fuel tank
- ❑ Check for secure fit
- ❑ To disconnect, press the release button on the connecting piece
- ❑ To fuel filter -item 1- ⇒ Item 1 (page 250)

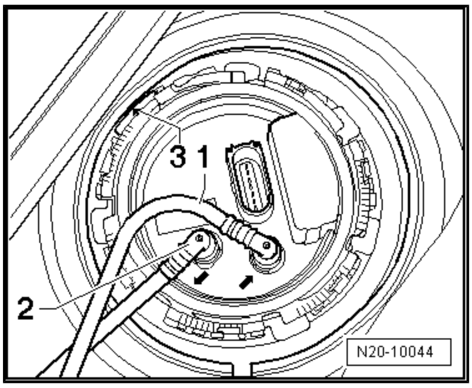
18 - Fuel Return Line

- ❑ Blue
- ❑ Attached to the side of the fuel tank
- ❑ Check for secure fit
- ❑ To disconnect, press the release button on the connecting piece
- ❑ From fuel filter -item 3- ⇒ Item 3 (page 250)

19 - Fuel Filler Door Unit

- ❑ With rubber gasket
- ❑ Removing and installing. Refer to ⇒ Body Exterior; Rep. Gr. 55 ; Fuel Filler Door Unit; Fuel Filler Door Unit, Removing and Installing .

20 - Ventilation



Fuel Delivery Unit Flange Installation Position

The mark -3- on the flange points opposite the direction of travel.

1 - Fuel Return Line (Blue)

2 - Fuel Supply Line (Black)

3 - Marking

Note

- *The fuel delivery unit flange can only be installed in this position.*
- *Make sure the supply and return lines are still clipped to the fuel tank after the fuel delivery unit flange has been installed.*

4.4 Fuel Tank, Draining

⇒ “4.4.1 Fuel Tank, Draining When More than 3/4 Full”, page 235

⇒ “4.4.2 Fuel Tank, Draining When Less Than 3/4 Full”, page 236 .

4.4.1 Fuel Tank, Draining When More than 3/4 Full

Special tools and workshop equipment required

- Wrench - Fuel Sending Unit - T10202-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Fuel Extraction Unit - VAS5190-

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to* *⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to* *⇒ “2 Guidelines for Clean Working Conditions”, page 224 .*

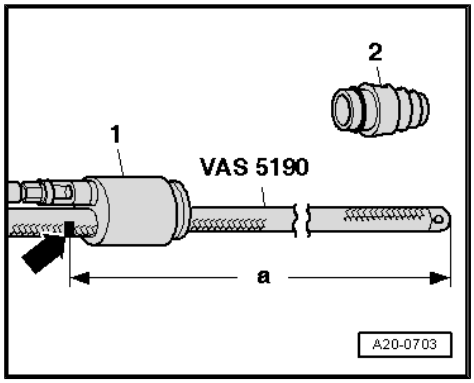
Always pay attention to these instructions before and during work.

Caution

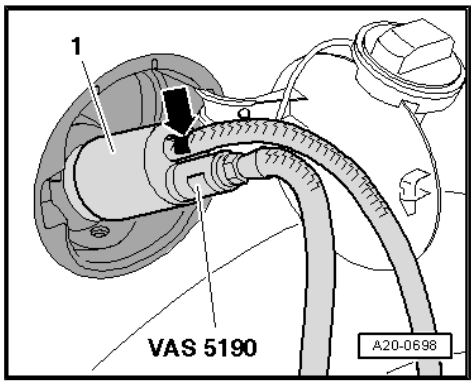
Secure the Fuel Extraction Unit - VAS5190- ground wire to a bare area of the chassis.

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– Remove the cone piece -2- from the shaft piece -1- on the Fuel Extraction Unit - VAS5190- .
– Using insulating tape, apply a mark on the hose -arrow- -a- = 1,180 mm from the end of the suction hose.



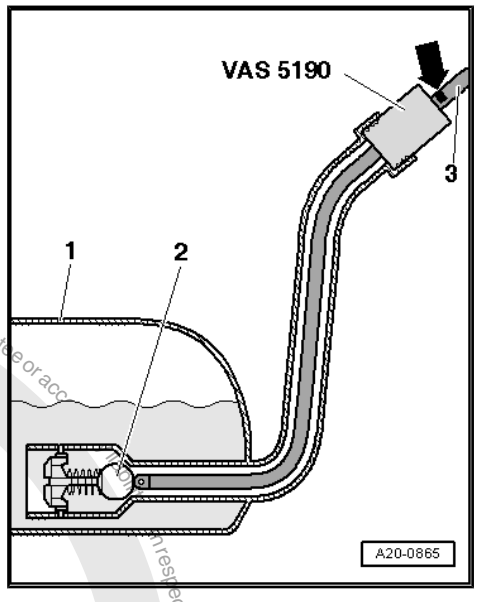
– Open fuel tank flap and remove fuel tank cap.
– Attach the shaft piece -1- from the Fuel Extraction Unit - VAS5190- to the fuel tank filler tube.
– Slide the suction hose as far into fuel tank until the mark applied earlier -arrow- stands on shaft piece.



Note

There is a ball valve -2- located at the lower end of the filler neck in the fuel tank -1- that must not be damaged by the suction hose -3-. Therefore slide in hose only up to the marking -arrow- applied earlier.

– Empty the fuel tank as much as possible via the filler neck.
– Carefully pull out the suction hose.



Note

- *When no more fuel can be extracted, the tank is emptied only enough for the fuel delivery unit to be opened without any danger.*
- *Fuel tank must be drained completely. Refer to* *⇒ "4.4.2 Fuel Tank, Draining When Less Than 3/4 Full", page 236* .

4.4.2 Fuel Tank, Draining When Less Than 3/4 Full

Special tools and workshop equipment required

- Wrench - Fuel Sending Unit - T10202-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Fuel Extraction Unit - VAS5190-

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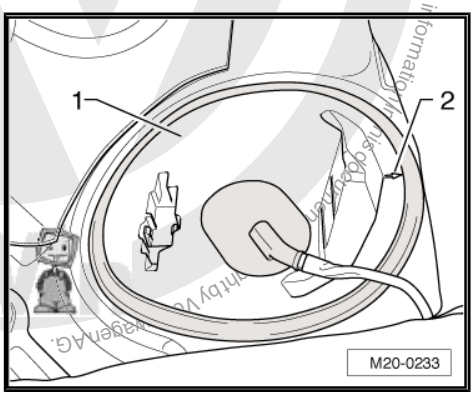
DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 224 .*

Always pay attention to these instructions before and during work.

– Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .

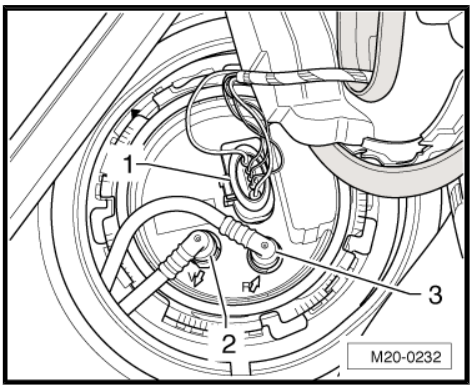
– Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



DANGER!

- *The fuel supply line is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and contact with skin.*
- *Wrap a cloth around the wiring connections before loosening hose connections. Then release pressure by carefully pulling off the line.*

– Disconnect -1-, the black supply line -2- and the blue return line -3-.



Note

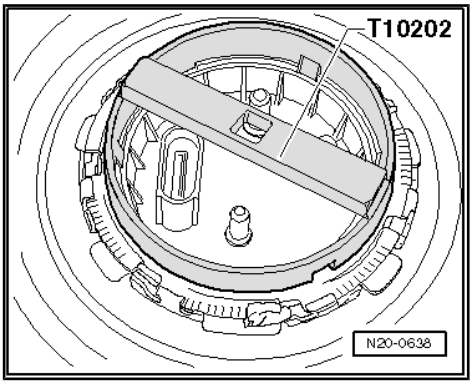
Press the locking ring to release the fuel lines.

– Seal the lines so that no dirt can enter the fuel system.

– Open locking ring using Wrench - Fuel Sending Unit - T10202- .

– Slightly lift out the fuel delivery unit flange.

– Insert the suction hose from the Fuel Extraction Unit - VAS5190- as far as possible into the fuel tank and extract the fuel.



If the fuel tank only needed to be emptied, install the fuel delivery unit again. Refer to ⇒ "4.6 Fuel Delivery Unit, Removing and Installing", page 241 .

4.5 Fuel Tank, Removing and Installing

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 224 .*

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-
- Engine and Gearbox Jack - VAS6931-

Removing:

Conditions

- Fuel tank may be a maximum of 1/4 full.

Note

If necessary, empty the fuel tank using the Fuel Extraction Unit - VAG5190- . Refer to ⇒ "4.4 Fuel Tank, Draining", page 235 .

Procedure

Caution

Electronic components could be destroyed when the Battery - A- is disconnected:

- *Complete the steps for disconnecting the Battery - A- .*

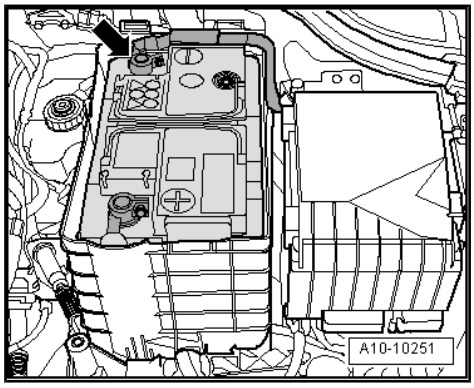
– When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

– Clean the surrounding area around the fuel filler tube.

– Open fuel tank flap and remove fuel tank cap.

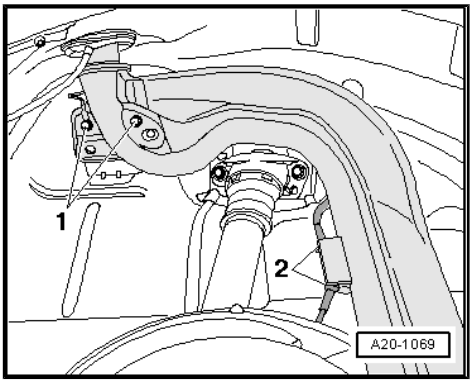
– Remove the bolts from the fuel filler door unit and then remove the fuel filler door unit. Refer to ⇒ Body Exterior; Rep. Gr. 55 ; Fuel Filler Door Unit .

– Remove the right rear wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66 ; Wheel Housing Liner .

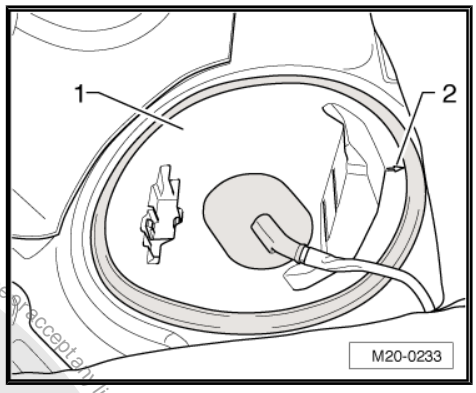


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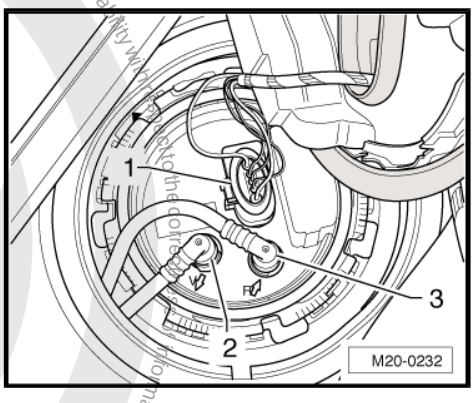
– Remove the bolts -1- for the fuel filler neck.
– Disengage the ABS speed sensor wire -2- on the filler neck bracket.
– Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .



– Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



– Disconnect -1- from the fuel delivery unit flange.
– Remove the center muffler and exhaust pipe. Refer to ⇒ “1.7 Overview - Muffler”, page 381 .



Note

The front and rear muffler may need to be removed beforehand. Refer to ⇒ “1.8 Exhaust System, Disconnecting and Connecting”, page 384.

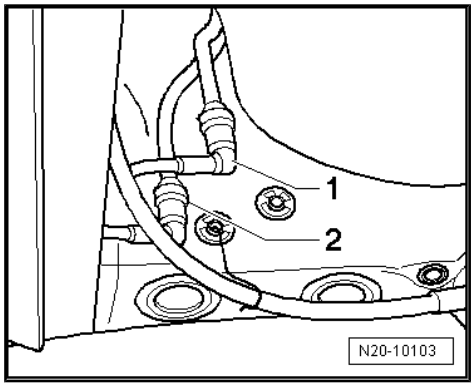
Continuation for All Vehicles

DANGER!

- ***The fuel supply line is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and contact with skin.***
- ***Wrap a cloth around the wiring connections before loosening hose connections. Then release pressure by carefully pulling off the line.***

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– Disconnect the black supply line -1- and the blue return line -2- between the fuel tank and the assembly.



Note

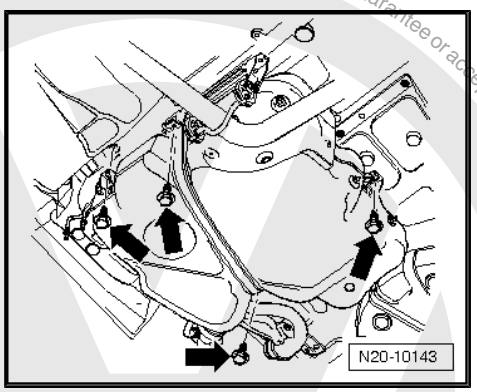
Press the locking ring to release the fuel lines.

– Seal the lines so that no dirt can enter the fuel system.

Note

A second technician is required for the remainder of the procedure to help support the fuel tank.

– Remove the mounting strap and bolts -arrows-. Support the fuel tank using the Engine and Gearbox Jack - VAS6931- when doing this.



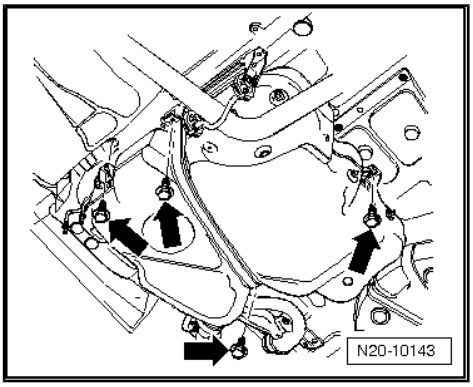
– Slowly lower fuel tank.

Note

The fuel filler neck must be "guided out" between the body and rear axle. To do so, lift the fuel tank down from the Engine and Gearbox Jack - VAS6931- with the help of a second technician.

Installing:

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– With the help of a second technician, guide the fuel filler neck between rear axle and body. Then place the fuel tank on the Engine and Gearbox Jack - VAS6931- .

– Lift the fuel tank slowly up to the installation position and secure it with new bolts -arrows-.

- Tightening specification -item 7- ⇒ Item 7 (page 231) / -item 8- ⇒ Item 8 (page 233) .

Further installation is the reverse order of removal. Note the following:

- Tightening Specifications: Refer to ⇒ “4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011”, page 231 , Overview - Fuel Tank - All Vehicles Except Jetta from MY 2011
- Tightening Specifications: Refer to ⇒ “4.3 Overview - Fuel Tank, Jetta from MY 2011 Only”, page 233 , Overview - Fuel Tank - Jetta from MY 2011 Only
- Route the fuel lines without kinks.
- Do not interchange supply and return line (return line blue, supply line black).
- Make sure the line connections are secure.
- Check the fuel tank/body ground connection on the filler neck for secure fit -item 3- ⇒ Item 3 (page 231) / -item 3- ⇒ Item 3 (page 233) .
- Make sure the fuel lines are still attached to the fuel tank after installing the fuel tank.
- Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

4.6 Fuel Delivery Unit, Removing and Installing

DANGER!

- ***Observe safety precautions when working on fuel supply. Refer to ⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .***

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

- Wrench - Fuel Sending Unit - T10202-
- Torque Wrench 1332 40-200Nm - VAG1332-

Removing:

Conditions

- Fuel tank may be a maximum of $^1/_2$ full.

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Note

If necessary, empty the fuel tank using the Fuel Extraction Unit - VAG5190- . Refer to ⇒ "4.4 Fuel Tank, Draining", page 235 .

Procedure

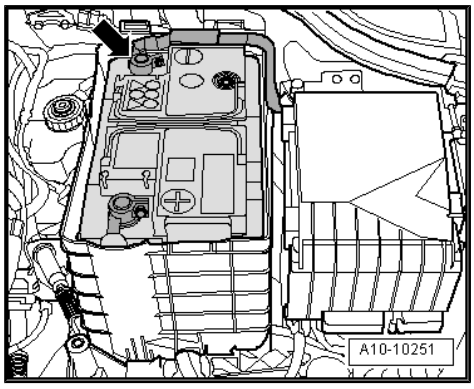
Caution

Electronic components could be destroyed when the Battery - A- is disconnected:

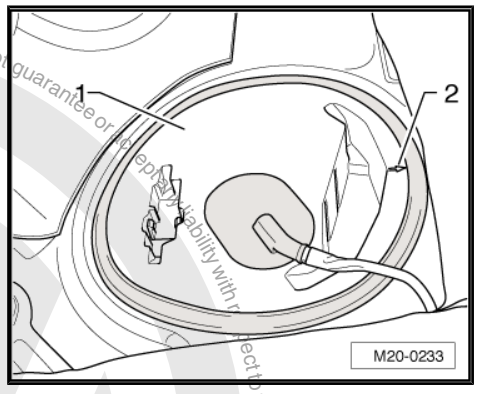
- ***Complete the steps for disconnecting the Battery - A- .***

– When the ignition is switched off, disconnect the ground cable -arrow- from the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

– Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .



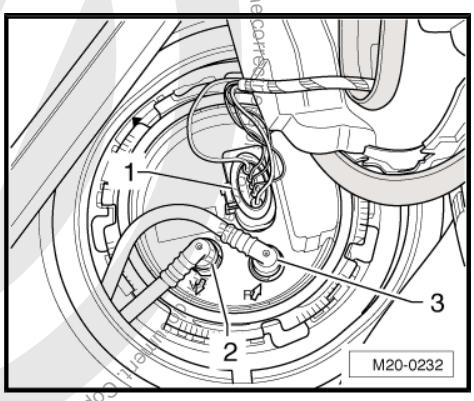
– Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



DANGER!

- ***The fuel supply line is under pressure. Always wear protective eyewear and protective clothing to prevent injuries and contact with skin.***
- ***Wrap a cloth around the wiring connections before loosening hose connections. Then release pressure by carefully pulling off the line.***

– Disconnect -1-, the black supply line -2- and the blue return line -3-.



Note

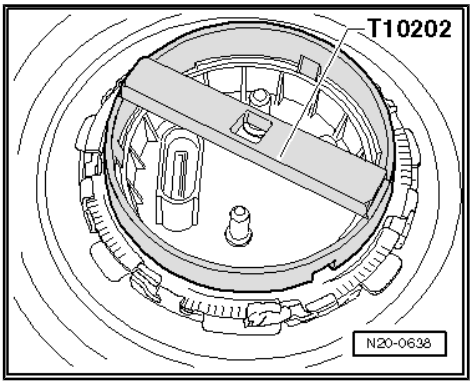
Press the locking ring to release the fuel lines.

– Seal the lines so that no dirt can enter the fuel system.

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– Open locking ring using Wrench - Fuel Sending Unit - T10202- .

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



Note

- *If the fuel delivery unit is to be replaced then drain old delivery unit before disposal.*
- *Follow all waste disposal regulations.*

Installing:

Install in reverse order of removal. Note the following:

- Locking ring tightening specification -item 14- ⇒ Item 14 (page 232) / -item 16- ⇒ Item 16 (page 234) .
- Do not bend the Fuel Level Sensor - G- when inserting the fuel delivery unit.
- Replace the gasket on the fuel delivery unit if damaged and insert it dry into the fuel tank opening.
- Coat the seal with fuel only for installing the fuel delivery unit.
- Note the installation position of the fuel delivery unit flange:
- For the Jetta from MY 2005 through 2010, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 2009 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 2010. Refer to ⇒ Fig. ""Fuel Delivery Unit Flange Installation Position"" , page 232 .
- For Jetta from MY 2011. Refer to ⇒ Fig. ""Fuel Delivery Unit Flange Installation Position"" , page 235 .
- Route the fuel lines without kinks.
- Do not interchange supply and return line (return line blue, supply line black).
- Make sure the line connections are secure.

– Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting .

4.7 Fuel Level Sensor - G- , Removing and Installing

DANGER!

- ***Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 223 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 224 .***

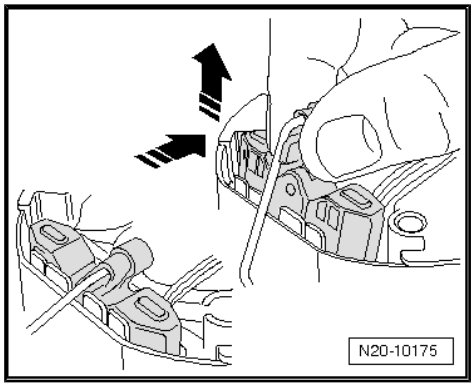
Always pay attention to these instructions before and during work.

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Removing:

– Remove the fuel delivery unit. Refer to
⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .

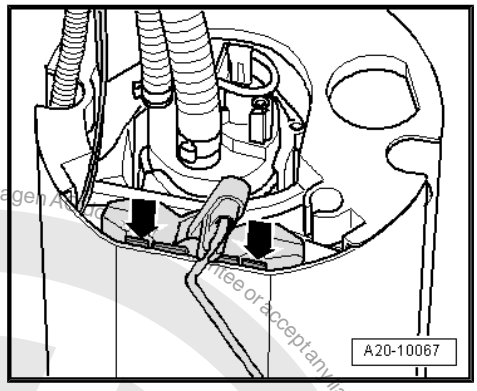
– Move the Fuel Level Sensor - G- slightly to the side and upward at the same time.



– Push the tabs -arrows- to the side if it is not possible to release the sensor.

– Write down the cable color coding for reinstallation.

– Disconnect the connectors -1 through 3-.



– Bend back the hooks on the connector.

Installing:

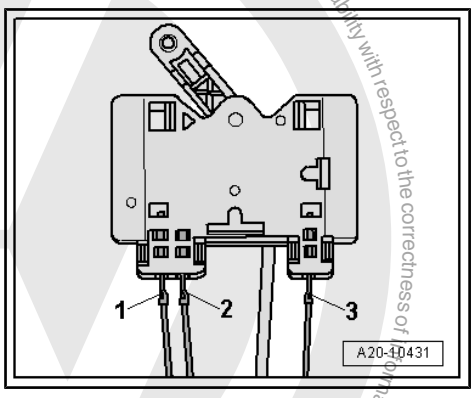
Install in reverse order of removal. Note the following:

– Connect the connectors -1 through 3-.

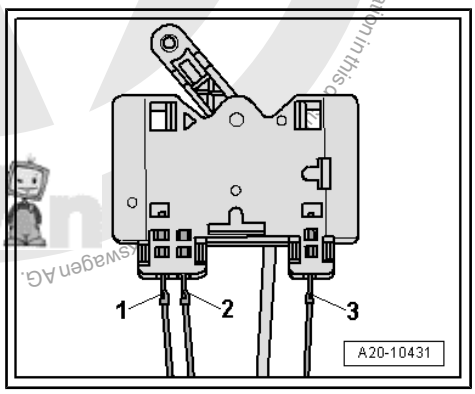
– Pay attention to the color coding.

– Pull on the connectors to make sure they are secure.

– Insert the Fuel Level Sensor - G- in the guide on the fuel delivery unit and push down until it engages.



– Install the fuel delivery unit. Refer to
⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .



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5 Connector Couplings, Disconnecting

Special tools and workshop equipment required

- Lever - Fuel Line - T10468-

Connector Coupling Allocation

Note

- *The connector couplings for fuel, vacuum and vent lines are color-coded. There is either a colored dot on the connector coupling or the release button is the corresponding color.*
- *The connector couplings must »audibly« engage when locking.*
- *Pull on the connector coupling to check for secure fit.*

Connector Coupling	Color Coding on the Connector Coupling
Fuel supply	Black
Fuel Return Line	Blue
Ventilation	White, beige
Vacuum	Green

WARNING

The fuel supply line is under pressure. Wear protective eyewear and protective clothing to avoid injury and contact with skin. Place a cleaning cloth around the connection point before loosening hose connections. Remove the hose connection carefully to reduce the pressure.

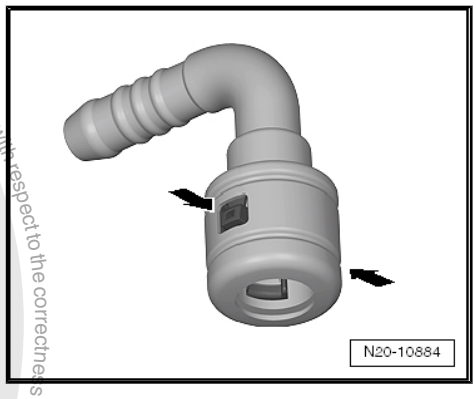
Version 1

Connector coupling with right and left release buttons -arrows-.

Opening

It is necessary to counterhold the fuel separating point -1-.

– Insert the Lever - Fuel Line - T10468- between the heat shield and the fuel line stop -arrow- -2- and counterhold it.



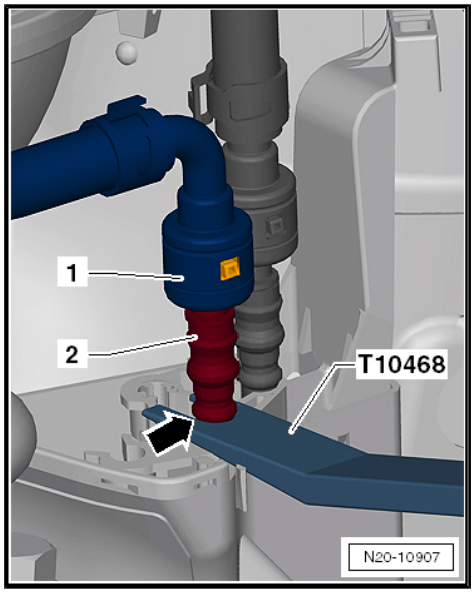
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Continuation for all separating points on the fuel system

– Push the connector coupling -1- in the direction of -arrow A-.
– Press the release buttons and hold it down.
– Disconnect the connector coupling -1- from the fuel line -2- in the direction of -arrow B-.

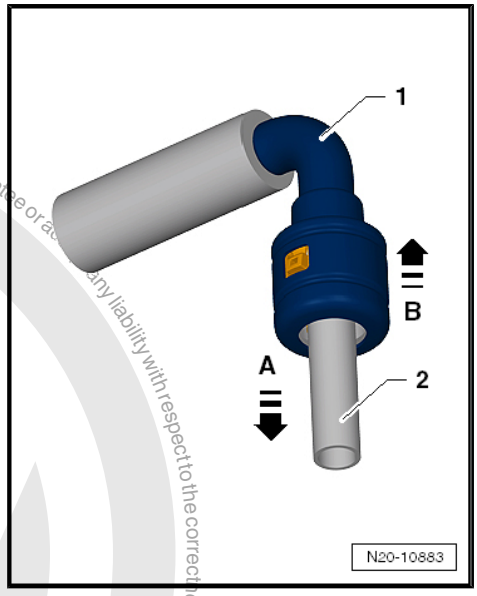
Follow the color coding during installation. Refer to ⇒ page 245

The connector couplings must »audibly« engage when locking.



– Pull on the connector coupling to check for secure fit.

Version 2



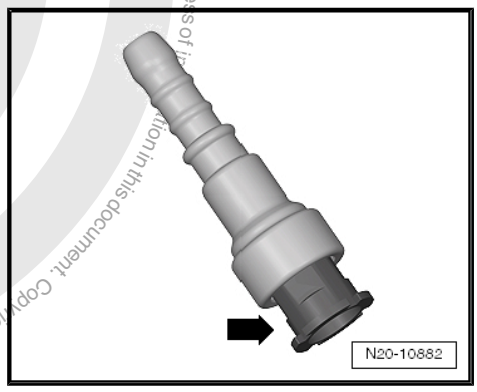
Coupling with pull release -arrow-

Opening

– Push the connector coupling -1- in the direction of -arrow A-.
– Pull the pull release -2- in the direction of -arrow B-.
– Pull the connector coupling -1- off the fuel line -3- in the direction of -arrow B-.

Follow the color coding during installation. Refer to ⇒ page 245

The connector couplings must »audibly« engage when locking.



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– Pull on the connector coupling to check for secure fit.

Version 3

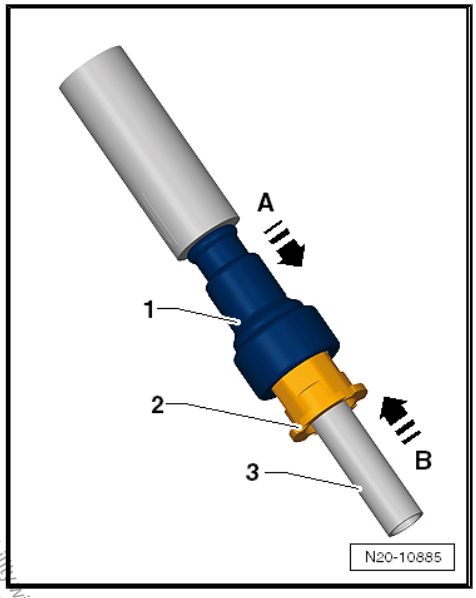
Coupling with button on the front -arrow-

Opening

– Press the release button -arrow- and disconnect couplings.

Follow the color coding during installation. Refer to ⇒ page 245

The connector couplings must »audibly« engage when locking.



– Pull on the connector couplings to make sure they are secure.

Version 4

Connector coupling with right and left release buttons -arrows-.

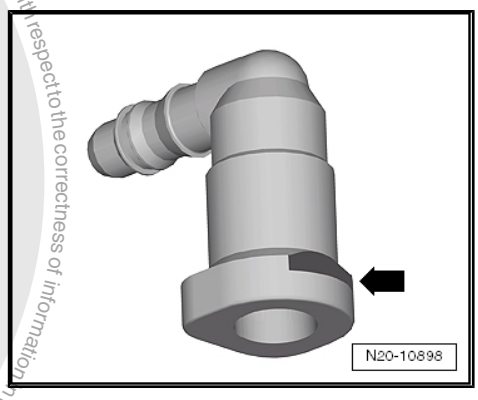
Opening

– Push the connector coupling in the direction of -arrow A-.

– Press the release buttons -arrows- and disconnect coupling.

Follow the color coding during installation. Refer to ⇒ page 245

The connector couplings must »audibly« engage when locking.



– Pull on the connector coupling to check for secure fit.

Version 5

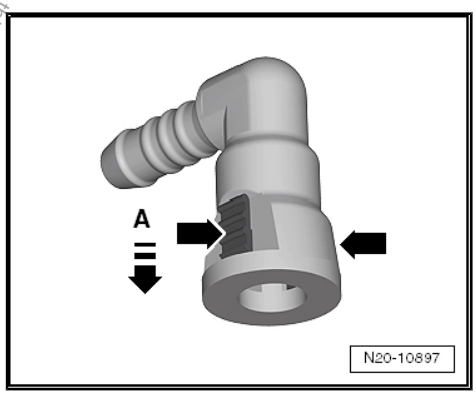
Connector coupling with right and left release buttons -arrows-.

Opening

– Press the release buttons -arrows- and disconnect coupling.

Follow the color coding during installation. Refer to ⇒ page 245

The connector couplings must »audibly« engage when locking.



– Pull on the connector coupling to check for secure fit.

Version 6

Connector coupling with right and left release buttons -arrows-.

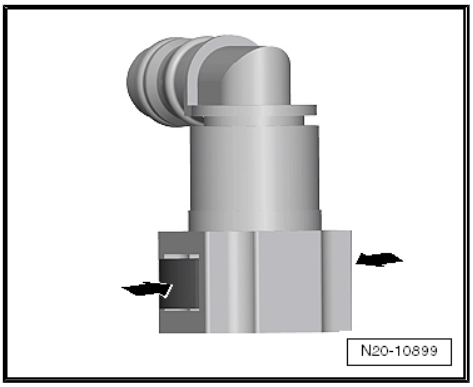
Opening

– Press the connector coupling -1- in the direction of -arrow- and hold it down.

– Press the release buttons -arrows- and disconnect coupling.

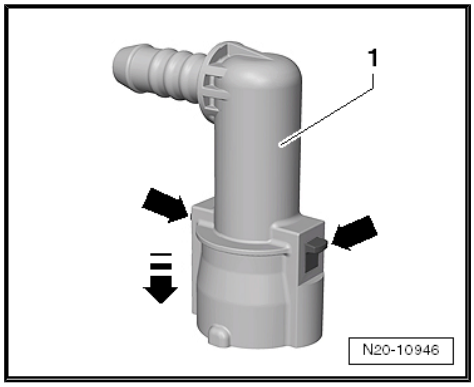
Note the color coding when installing. Refer to ⇒ page 245 .

The connector couplings must »audibly« engage when locking.



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– Pull on the connector coupling to check for secure fit.



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6 Fuel Supply System, Servicing

⇒ “6.1 General Information”, page 249

⇒ “6.2 Overview - Fuel Filter”, page 249

⇒ “6.3 Fuel Filter, Removing and Installing”, page 251

⇒ “6.4 Transfer Fuel Pump G6 , Checking”, page 252

⇒ “6.5 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Checking”, page 257

⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259

6.1 General Information

Note

- *Hose connections are secured with either spring or hose clamps.*
- *Always replace clamp-type clips with spring-type clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

6.2 Overview - Fuel Filter

Special tools and workshop equipment required

- Hose Clip Pliers - VAS6362-

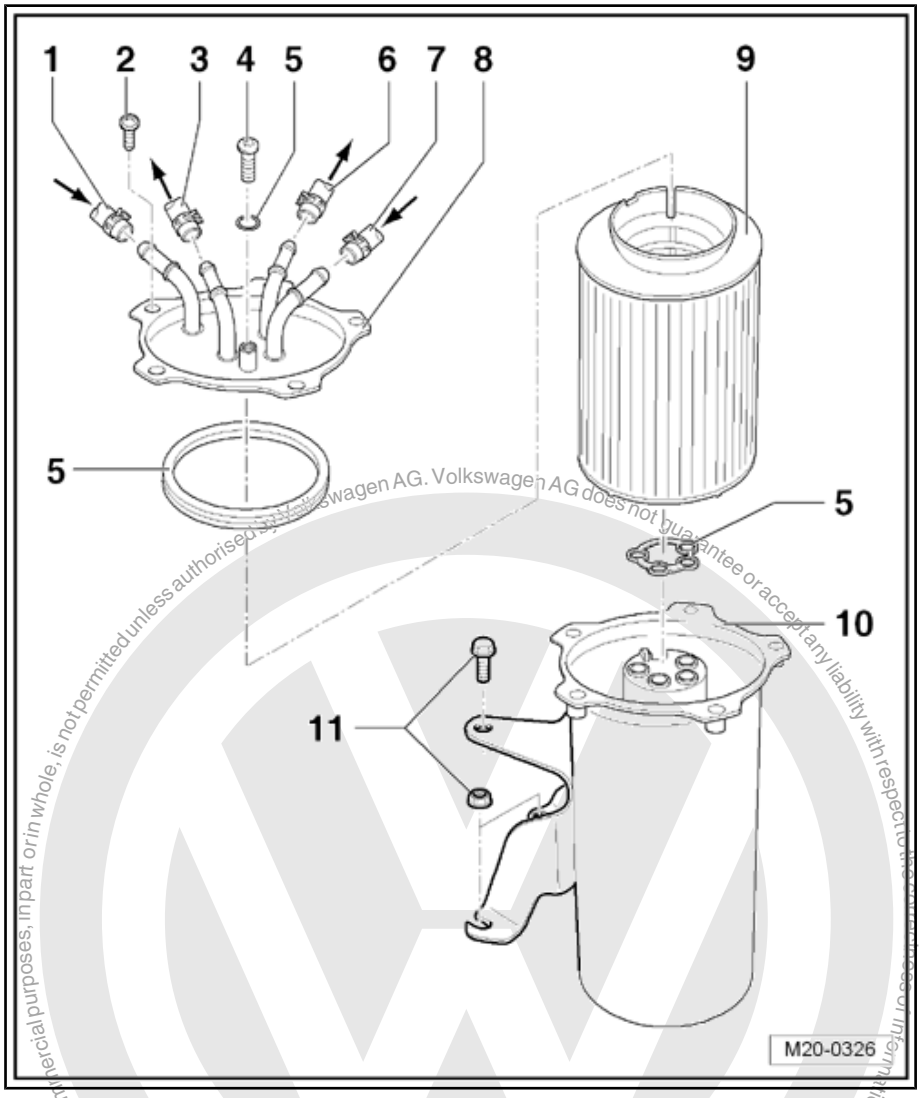
DANGER!

- *Observe safety precautions when working on fuel supply. Refer to* *⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to* *⇒ “2 Guidelines for Clean Working Conditions”, page 224 .*

Always pay attention to these instructions before and during work.

Fuel Filter, Removing and installing. Refer to ⇒ “6.3 Fuel Filter, Removing and Installing”, page 251 .

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1 - Fuel Supply Line

- ❑ Black
- ❑ Check for secure fit
- ❑ From Fuel Tank- All Vehicles Except Jetta from MY 2011 -item 15- ⇒ Item 15 (page 232)
- ❑ From Fuel Tank - Jetta from MY 2011 Only -item 17- ⇒ Item 17 (page 234)

2 - Screw

- ❑ 9 Nm

3 - Fuel Return Line

- ❑ Blue or with blue marking
- ❑ Check for secure fit
- ❑ To Fuel Tank- All Vehicles Except Jetta from MY 2011 -item 16- ⇒ Item 16 (page 232)
- ❑ To Fuel Tank - Jetta from MY 2011 Only -item 18- ⇒ Item 18 (page 234)

4 - Plug

- ❑ 5 Nm
- ❑ For water extraction
- ❑ Remove and extract approximately 100 cm^3 of fluid with Suction Pump - VAS5226-

5 - Seal

- ❑ Replace

6 - Fuel Supply Line

- ❑ White or with white markings
- ❑ Check for secure fit
- ❑ To Auxiliary Fuel Pump - V393-
- ❑ Auxiliary Fuel Pump - V393- , Removing and installing. Refer to ⇒ "6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing", page 259

7 - Fuel Return Line

- ❑ Blue or with blue marking
- ❑ Check for secure fit
- ❑ -item 4- ⇒ Item 4 (page 312)

8 - Fuel Filter Upper Section

9 - Fuel Filter Insert

- ❑ Note the change intervals. Refer to ⇒ Maintenance Intervals; Rep. Gr. 03

10 - Fuel Filter Lower Section

11 - Bolt

- ❑ 8 Nm

12 - Seal

- ❑ Replace

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6.3 Fuel Filter, Removing and Installing

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ "1 Safety Precautions when Working on Fuel Supply System", page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 224 .*

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

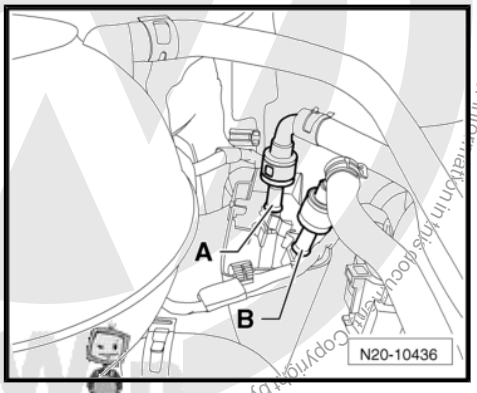
- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-

Removing:

– Disconnect the fuel lines to the fuel tank.

A - Fuel Supply Line, Black

B - Fuel Return Line, Blue or with Blue Marking



– Seal the lines so that no dirt can enter the fuel system.

– Loosen the spring clamps with the Hose Clip Pliers - VAS6362- and remove the fuel hoses -item 6- ⇒ Item 6 (page 250) and -item 7- ⇒ Item 7 (page 250) from the fuel filter.

– Seal the lines so that no dirt can enter the fuel system.

– Remove the bolt and nut -item 11- ⇒ Item 11 (page 250) .

– Remove the fuel filter upward.

Installing:

Install in reverse order of removal. Note the following:

- Bolt and nut tightening specification -item 11- ⇒ Item 11 (page 250) .
- Route the fuel hoses without kinks.
- Check the fuel hoses for secure fit.
- Do not interchange the supply and return lines (the return line is blue or has a blue marking, the supply line is white or has a white marking).
- Clip the fuel hoses back into the retainers.

– Fill the fuel system. Refer to ⇒ "3.9 Fuel System, Filling/Bleeding", page 328 .

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6.4 Transfer Fuel Pump - G6- , Checking

⇒ “6.4.1 Fuel Delivery Rate, Checking”, page 252 .

⇒ “6.4.2 Power Supply, Checking”, page 253

⇒ “6.4.3 Current Draw, Checking”, page 255 .

6.4.1 Fuel Delivery Rate, Checking

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .*

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

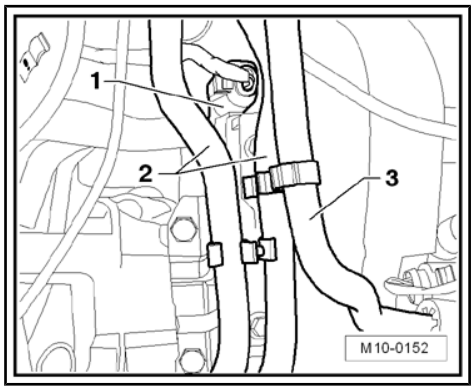
- Vehicle Diagnostic Tester
- Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-
- Pickup clamp - VAG1526B/2-
- Analog/Digital Multimeter - FLU83III-
- Pressure Tester Kit - VAS6551-
- Container > 3L with measuring scale

Test Conditions:

- The battery voltage must be at least 12.0V.
- The fuses must be OK.
- All electrical consumers for example lamps and rear window defogger, must be switched off.

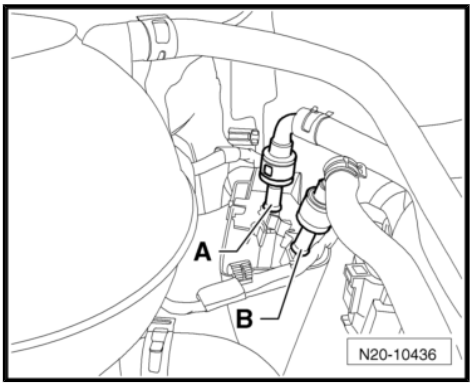
Test Sequence

– Disconnect -1- from the Auxiliary Fuel Pump - V393- .

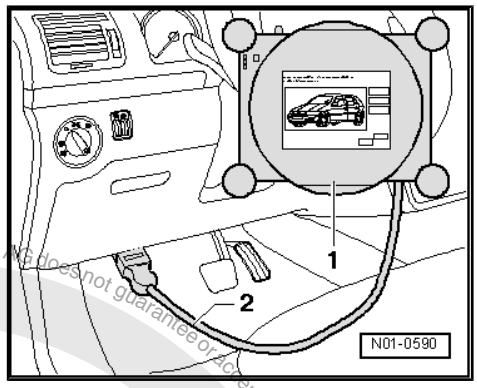


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– Disconnect the fuel supply line (black) -A- to the fuel tank.
– Connect the line from the Pressure Tester Kit - VAS6550- on the fuel supply line -A- to the fuel tank.
– Guide the open end of the hose from the Pressure Tester Kit - VAS6550- into the measuring container.
– Open the shut-off valves in front of and behind the pressure gauge in the flow direction and connect the lower shut-off valve.



– Connect the Vehicle Diagnostic Tester -1- as follows:
– Connect diagnostic cable -2- to Data Link Connector (DLC) in driver footwell.
– Switch the ignition on.
– Perform “Guided Functions, check electric fuel pump(s)”. Refer to Vehicle Diagnostic Tester .



Note

The fuel pump now runs for 30 seconds.

– Turn off the ignition.
– Read the quantity of fuel in the measuring container.

Specified Values

- Minimum 1000 ml for 30 seconds

If the quantity of fuel delivered is less than the specified value:

– Check the fuel pump voltage supply. Refer to ⇒ “6.4.2 Power Supply, Checking”, page 253 . Check the current draw. Refer to ⇒ “6.4.3 Current Draw, Checking”, page 255 .

6.4.2 Power Supply, Checking

DANGER!

- ***Observe safety precautions when working on fuel supply. Refer to ⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .***

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

- Vehicle Diagnostic Tester
- Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-
- Pickup clamp - VAG1526B/2-

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- Analog/Digital Multimeter - FLU83III-
- Pressure Tester Kit - VAS6551-

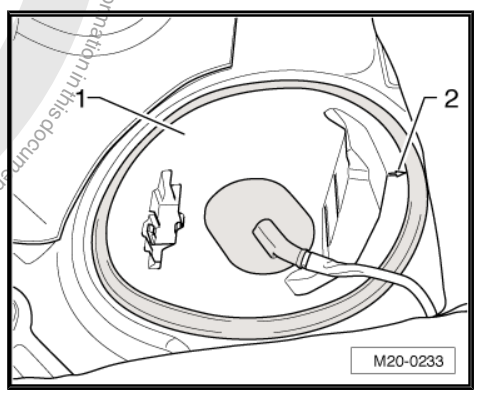
Test Conditions

- The battery voltage must be at least 12.0V.
- The fuses must be OK.
- All electrical consumers for example lamps and rear window defogger, must be switched off.

Test Sequence

– Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .

– Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



– Switch the ignition on.

- The Transfer Fuel Pump - G6- must run audibly for approximately 2 seconds.

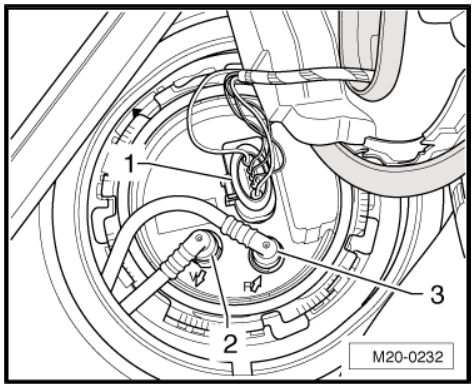
Note

The Transfer Fuel Pump - G6- runs very quietly.

– Switch off the ignition.

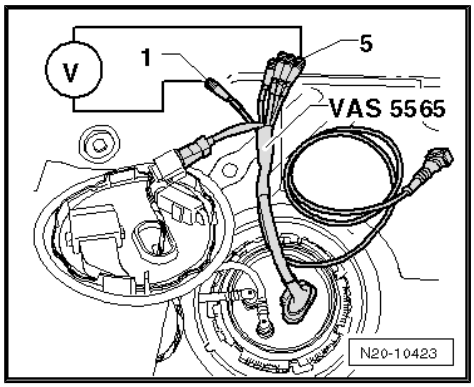
If the Transfer Fuel Pump - G6- does not run:

– Disconnect -1- from the fuel delivery unit flange.

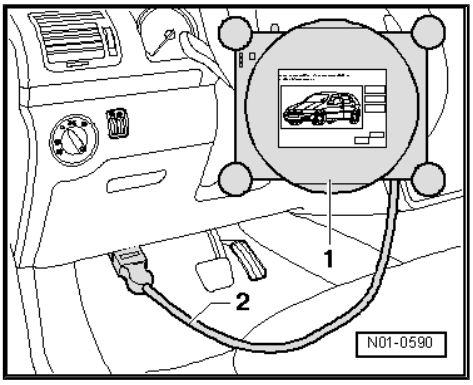


– Connect the Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565- between the connector and the flange.

– Connect the Analog/Digital Multimeter - FLU83III- to the test contacts -1- and -5- on the Adapter .



– Connect the Vehicle Diagnostic Tester -1- as follows:
– Connect diagnostic cable -2- to Data Link Connector (DLC) in driver footwell.
– Switch the ignition on.
– Perform “Guided Functions, check electric fuel pump(s)”. Refer to Vehicle Diagnostic Tester .



Note

The Transfer Fuel Pump - G6- is now activated for 60 seconds.

– Read the voltage value on the Analog/Digital Multimeter .
• Specified value: approximately battery voltage
– Switch off the ignition.

If there is no voltage:

– Check the Fuel Pump Relay - J17- activation and check the wires for interruption and short circuit. Refer to Vehicle Diagnostic Tester .

Voltage supply OK:

– Remove the fuel delivery unit. Refer to ⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .
– Check if the wires between the flange and Fuel Pump Relay - J17- are connected and have a continuous passage.

If no open circuits are found:

– Replace the fuel delivery unit if the Fuel Pump Relay - J17- is faulty. Refer to ⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .

6.4.3 Current Draw, Checking

DANGER!

- *Observe safety precautions when working on fuel supply. Refer to ⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .*

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

- Vehicle Diagnostic Tester
- Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-
- Pickup clamp - VAG1526B/2-
- Analog/Digital Multimeter - FLU83III-
- Pressure Tester Kit - VAS6551-

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Test Conditions

- The battery voltage must be at least 12.0V.
- The fuses must be OK.
- All electrical consumers for example lamps and rear window defogger, must be switched off.
- Fuel temperature in the fuel tank above 10 °C (50 °F).

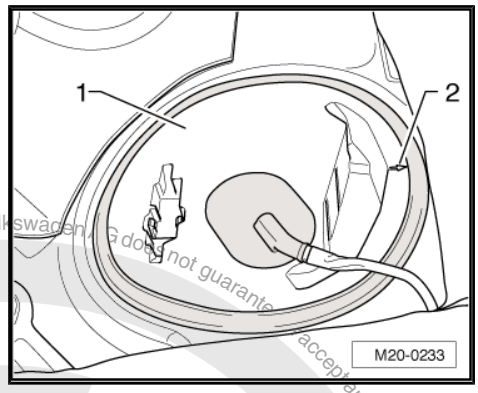
Note

The battery voltage and the temperature of the diesel fuel strongly influence the current draw of the fuel pump. Make sure the battery voltage is at least 12 Volts and the temperature of the diesel fuel inside the fuel tank is not at the freezing point.

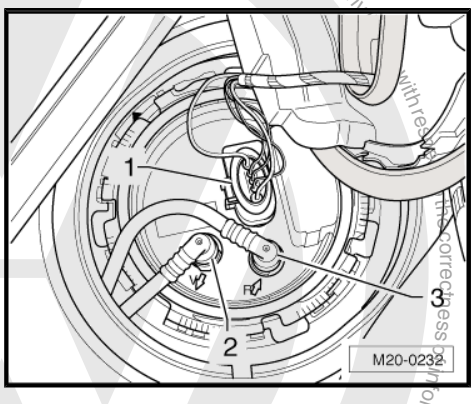
Test Sequence

– Remove the bench seat. Refer to ⇒ Body Interior; Rep. Gr. 72 ; Rear Seats; Rear Bench Seat, Removing and Installing .

– Unclip the cover -1- for the fuel delivery unit. The arrow -2- points in the direction of travel.



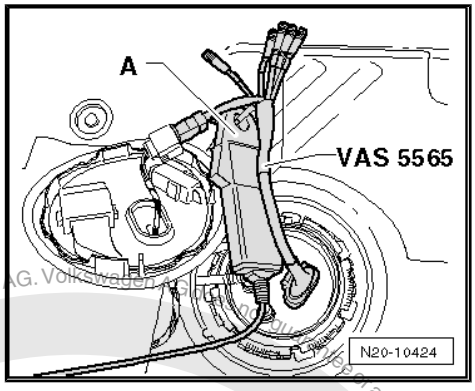
– Disconnect -1- from the fuel delivery unit flange.



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– Connect the Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565- between the connector and the flange.

– Connect the current probe -A- to the red cable with the word “current probe” on the Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565- .

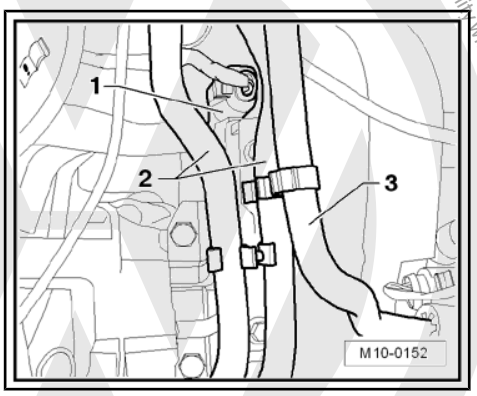


Note

The current probe of the Analog/Digital Multimeter - FLU83III- can also be connected to the red cable - with the label “current probe” - for the Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565- .

– Connect the Analog/Digital Multimeter - FLU83III- to the Pick-up Clamp .

– Disconnect the connector -1- from the Auxiliary Fuel Pump - V393- (in right side of engine compartment).

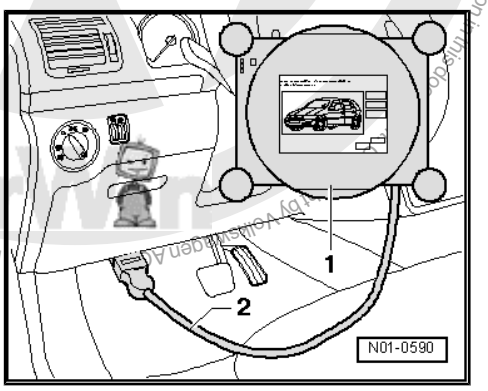


– Connect the Vehicle Diagnostic Tester -1- as follows:

– Connect diagnostic cable -2- to Data Link Connector (DLC) in driver footwell.

– Switch the ignition on.

– Perform “Guided Functions, check electric fuel pump(s)”. Refer to Vehicle Diagnostic Tester .



Note

The Auxiliary Fuel Pump - V393- is now activated for 60 seconds.

– Read the current draw on the Analog/Digital Multimeter .

Specified Value:

- minimum 5.5 amp
- maximum 7.5 amp

– Switch off the ignition.

If the current draw is outside of the specified value:

– Replace the fuel delivery unit if the Auxiliary Fuel Pump - V393- is faulty. Refer to
⇒ “4.6 Fuel Delivery Unit, Removing and Installing”, page 241 .

6.5 Auxiliary Fuel Pump - V393- (Inline Fuel Pump), Checking

Special tools and workshop equipment required

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- Diesel Pressure Tester Kit - VAS6551-

Test Conditions:

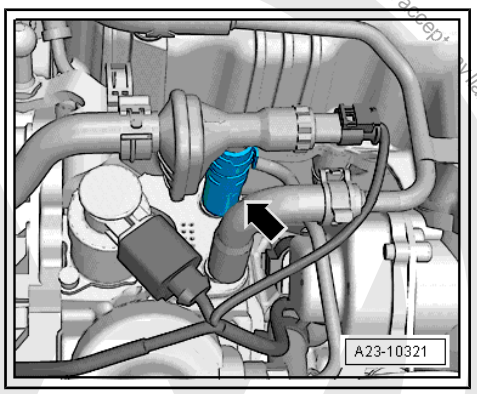
- Battery voltage at least 12.5 V.
- The fuel filter is OK.
- Fuel tank is minimum $^{1}/_{2}$ full.
- Ignition switched off.

– Remove the engine cover. Refer to
⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

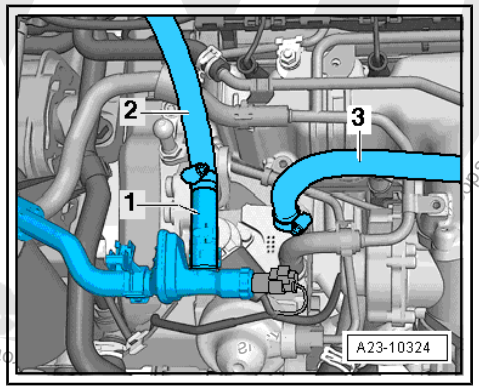
WARNING

- *Follow the guidelines and instructions for clean working conditions when working on the fuel system. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .*
- *Always follow these guidelines and instructions for clean working conditions before and during work.*
- *Before opening the fuel system, lay a clean cloth around the connection point and carefully loosen it, which lowers the pressure.*

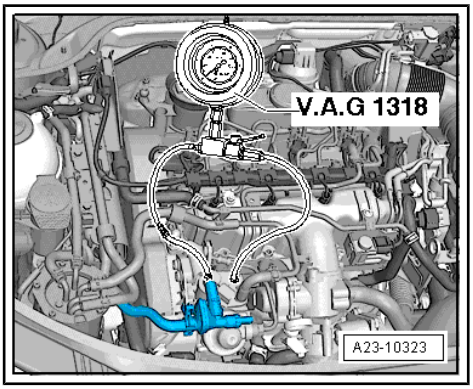
– Remove the fuel supply line -arrow- from the high pressure pump.



– Connect the Diesel Pressure Tester Kit - VAS6551- using the corresponding adapter -2- to the fuel supply line -1-. Connect the other adapter -3- from the Diesel Pressure Tester Kit - VAS6551- to the open connection on the high pressure pump.



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Note

- *The Diesel Pressure Tester Kit - VAS6551- is switched on in the fuel supply line.*
- *Illustration shows VAG1318, use Diesel Pressure Tester Kit - VAS6551- .*

– Connect the Vehicle Diagnostic Tester and perform the Guided Function “Check electrical fuel pumps”.

Note

The fuel pump is now activated for 30 seconds.

– Let the fuel pumps run until the highest fuel pressure is reached.

- Specified value: minimum 3.5 bar (50.76 psi)

If the specified value is not obtained:

Check the connection between the fuel pressure gauge and fuel line for leaks.

Check the pressure gauge for leaks.

Check the fuel lines and their connections for leaks.

Fuel filter clogged?

Check the delivery rate of the Transfer Fuel Pump - G6- . Refer to ⇒ “6.4.1 Fuel Delivery Rate, Checking”, page 252 .

Note

Check the fuel system for leaks.

6.6 Auxiliary Fuel Pump - V393- (Inline Fuel Pump), Removing and Installing

DANGER!

- ***Observe safety precautions when working on fuel supply. Refer to ⇒ “1 Safety Precautions when Working on Fuel Supply System”, page 223 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 224 .***

Always pay attention to these instructions before and during work.

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-

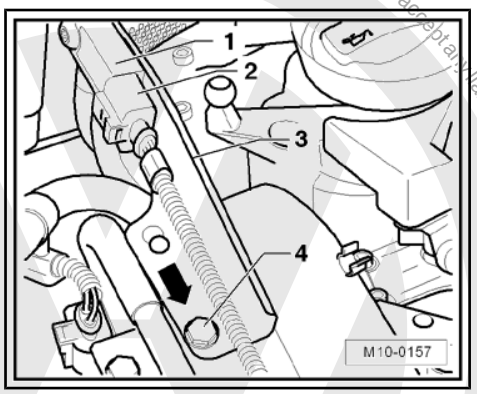
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Removing:

– Disconnect the connector -2- from the Exhaust Pressure Sensor 2 - G451- -1-.

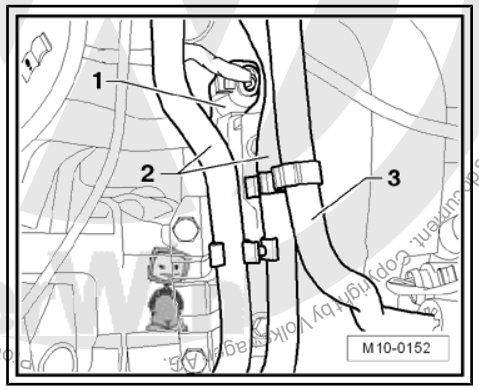
– Remove the bolt -4- and the bracket -3- with the Exhaust Pressure Sensor 2 - G451- -1- in the direction of -arrow- and set to the side (control lines remain connected).

– Disconnect -1- from the Auxiliary Fuel Pump - V393- .



– Unclip the fuel hoses -2 and 3- from the holder.

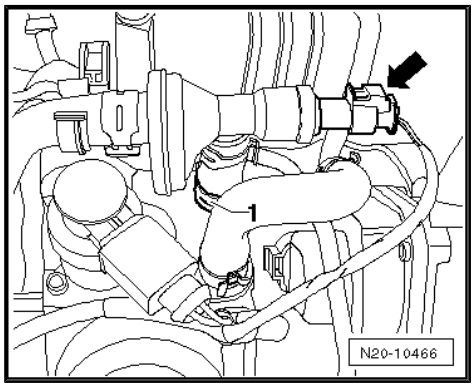
– Loosen the spring clamp with the Hose Clip Pliers - VAS6362- and remove the fuel supply line -item 6- ⇒ Item 6 (page 250) from the fuel filter.



– Disconnect the connector from the Fuel Temperature Sensor - G81- -arrow-.

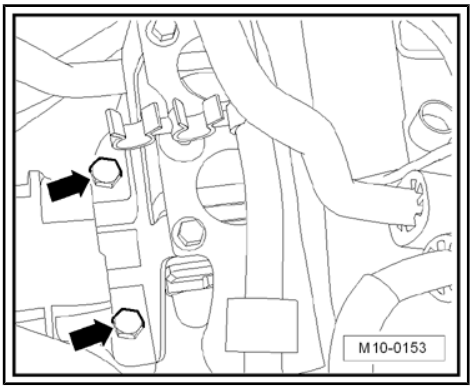
– Loosen the spring clamp -1- with the Hose Clip Pliers - VAS6362- and disconnect the fuel supply line at the high pressure fuel pump.

– Seal the lines so that no dirt can enter the fuel system.



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– Remove the bolts -arrows- and remove the Auxiliary Fuel Pump - V393- .



Installing:

Install in reverse order of removal. Note the following:

- Route the fuel hoses without kinks.
- Check the fuel hoses for secure fit.
- Do not interchange the supply and return lines (the return line is blue or has a blue marking, the supply line is white or has a white marking).
- Clip the fuel and coolant hoses back into the holders.

Tightening Specifications:

- Bolt for Exhaust Pressure Sensor 2 - G451- bracket: 8 Nm.
- Bolts for the Auxiliary Fuel Pump - V393- : 20 Nm.

– Fill the fuel system. Refer to
⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

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7 Electronic Engine Output Control (EPC)

⇒ “7.1 EPC System Function”, page 262

⇒ “7.2 Overview - Accelerator Pedal Module”, page 262

⇒ “7.3 Accelerator Pedal Module, Removing and Installing”, page 263

7.1 EPC System Function

For EPC, the throttle valve is not operated by a cable from the accelerator pedal. There is no mechanical connection between the gas pedal and the throttle valve.

The position of the accelerator pedal is transmitted to the Engine Control Module - J623- via two accelerator pedal position sensors (adjustable resistances, accommodated in one housing), that are connected to the accelerator pedal.

The position of the accelerator pedal (driver controlled) is a main input for the Engine Control Module - J623- .

Throttle valve operation occurs via an electric motor (throttle valve actuator) in the Throttle Valve Control Module - GX3- and this occurs over the entire engine speed and engine load spectrum.

The throttle valve is operated by the throttle drive according to the instructions of the Engine Control Module - J623- .

With the engine stopped and the ignition switched on, the Engine Control Module - J623- activates the throttle valve actuator according to the specifications from the Throttle Position Sensor - G69- . This means, if the accelerator pedal is depressed half way, the throttle drive opens the throttle valve to the same degree. The throttle valve is then opened approximately half way.

With engine running (under load) the Engine Control Module - J623- can open and close the throttle valve independently of the Throttle Position Sensor - G69- .

This means, for example, that the throttle valve could be fully opened even though the accelerator pedal has only been depressed half way. This has the advantage of preventing torque losses at the throttle valve.

After evaluating the torque requirements of the various components (such as the A/C system, automatic transmission, ABS/ESP, etc.), the Engine Control Module - J623- calculates the optimal throttle valve opening angle for the current situation.

Aside from that, it results in clearly better pollutant output and consumption values under certain load conditions.

“E-Gas” is a system containing all components that contribute to recognizing, controlling and monitoring the position of the throttle valve, for example the Throttle Position Sensor - G69- , Throttle Valve Control Module - GX3- , EPC Indicator Lamp - K132- , Engine Control Module - J623- .

7.2 Overview - Accelerator Pedal Module

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1 - Connector

- ❑ Black 6-pin

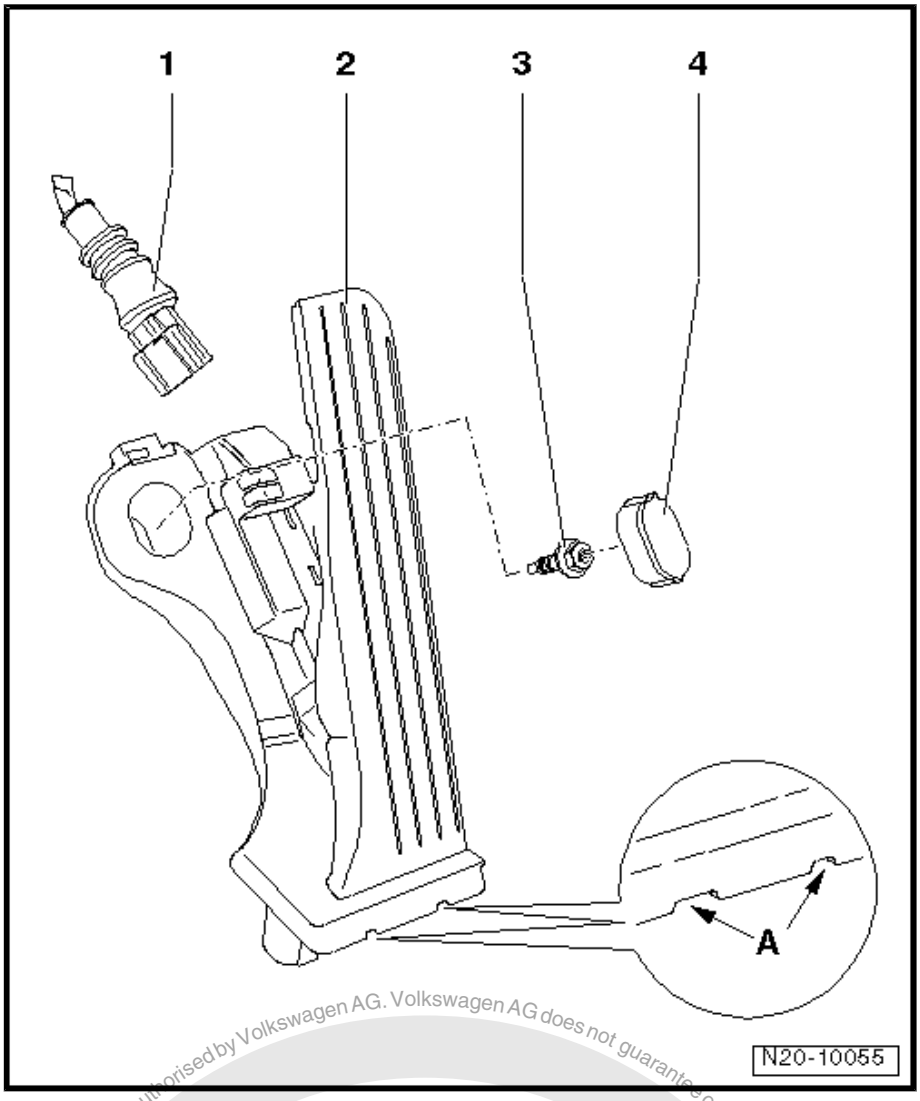
2 - Accelerator Pedal Module

- ❑ With Accelerator Pedal Position Sensor - G79- and Accelerator Pedal Position Sensor 2 - G185-
- ❑ Not adjustable
- ❑ -A- Openings for Release Tool
- ❑ Removing and installing. Refer to ⇒ "7.3 Accelerator Pedal Module, Removing and Installing", page 263 .
- ❑ Checking. Refer to Vehicle Diagnostic Tester .

3 - Bolt

- ❑ 9 Nm

4 - Cap



7.3 Accelerator Pedal Module, Removing and Installing

Special tools and workshop equipment required

- ♦ Accelerator Pedal Module Release Tool - T10238-

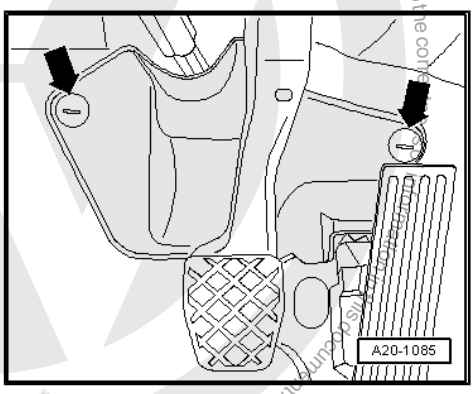
Removing:

– Remove the steering column cover -arrows-.

– Pry out the cap -item 4- ⇒ Item 4 (page 263) using a screwdriver.

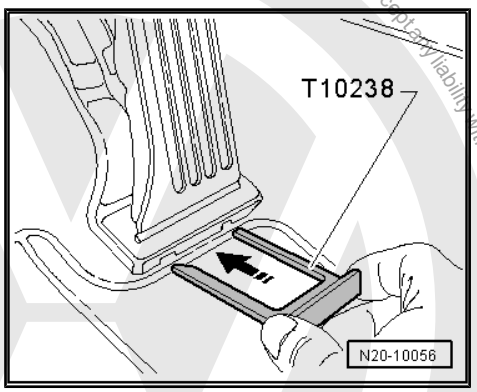
– Remove the bolt -item 3- ⇒ Item 3 (page 263) .

– Slide the Accelerator Pedal Module Release Tool - T10238- into the designated openings for it until it stops and remove accelerator pedal module.



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– Disconnect the connector from the accelerator pedal module.



Installing:

– Connect the connector -2- to the accelerator pedal module -5- and push the rubber grommet -1- onto the connector again.

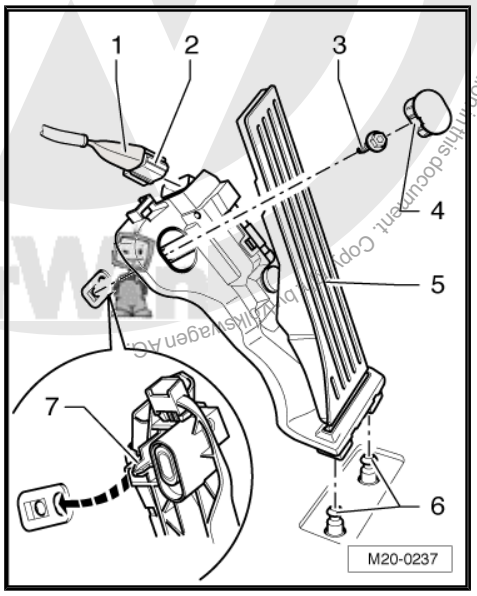
– Press the accelerator pedal module onto the retaining pins -6-.

– Insert centering pin -7- into hole on vehicle floor.

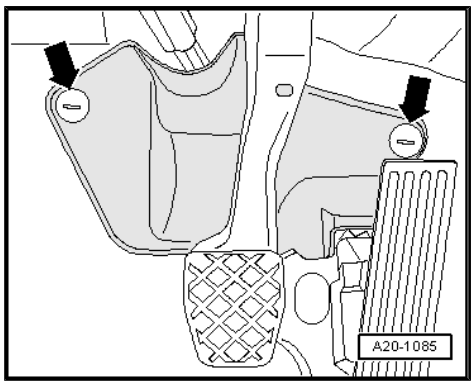
– Secure the accelerator pedal module with the bolt -3-.

• Tightening specification -item 3- ⇒ Item 3 (page 263) .

– Install the cap -4-.



– Install the steering column cover -arrows-.

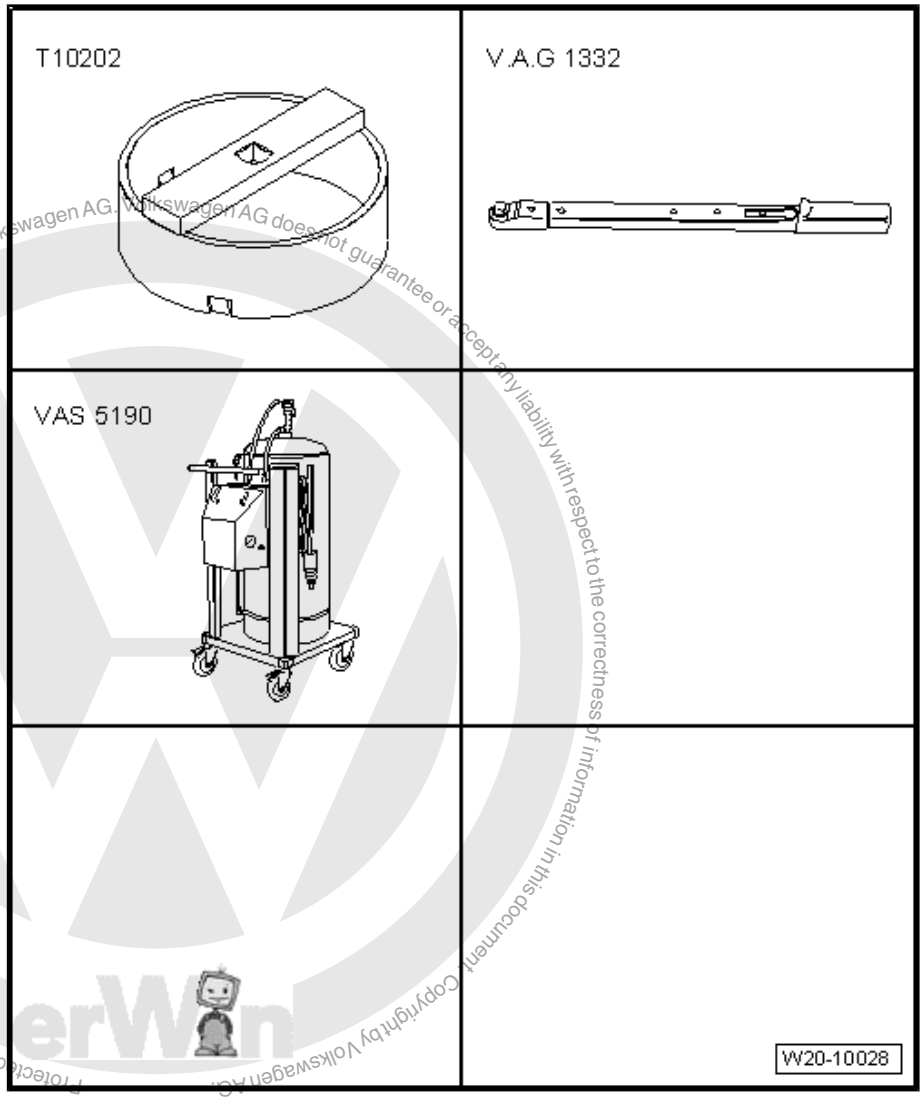


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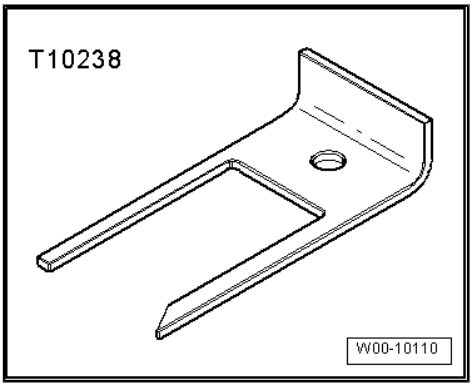
8 Special Tools

Special tools and workshop equipment required

- Wrench - Fuel Sending Unit - T10202-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Fuel Siphoning Device - VAS5190A-

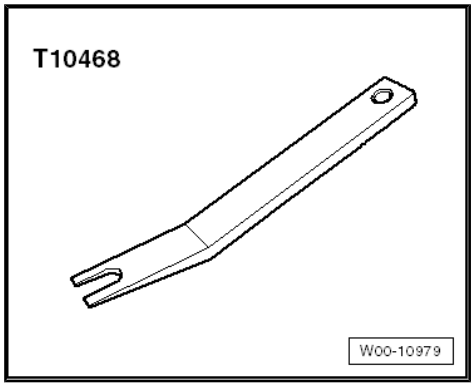


- Accelerator Pedal Module Release Tool - T10238-

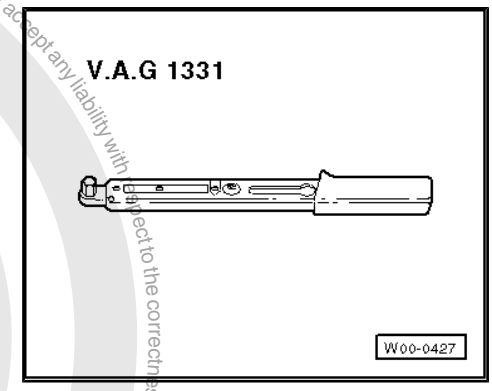


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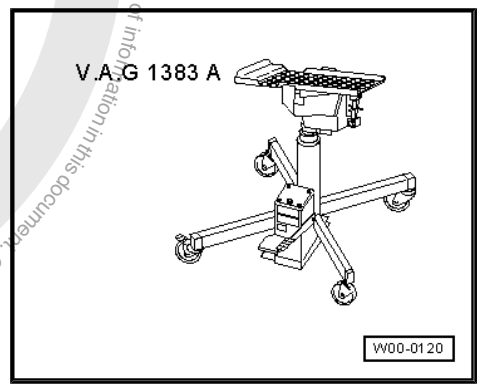
- Lever - Fuel Line - T10468-



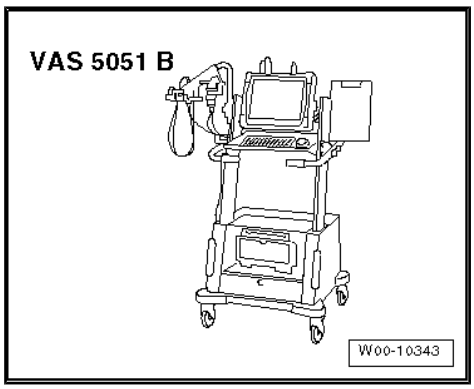
- Torque Wrench 1331 5-50Nm - VAG1331-



- Engine/Gearbox Jack - VAG1383A-

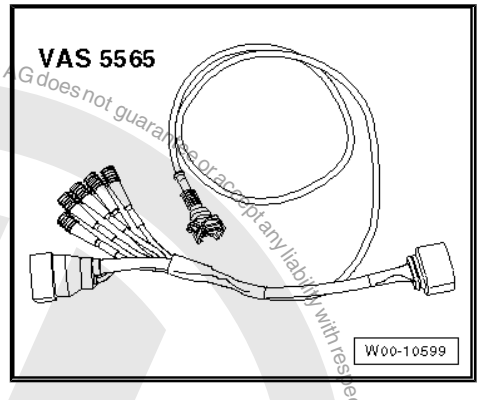


- Vehicle Diagnosis System - VAS5051B-

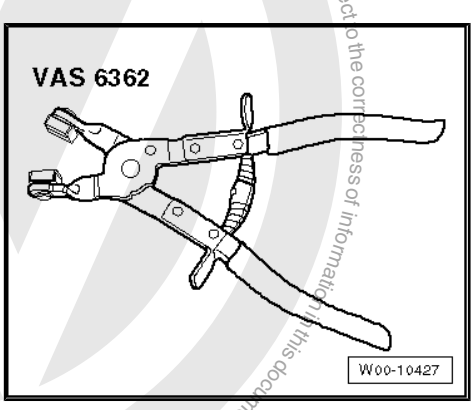


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- Vehicle Diagnostic Tester - Test Adapter - 5 Pin - VAS5565-



- Hose Clip Pliers - VAS6362-



- Not Illustrated:
- Pickup Clamp - VAG1526B/2-
- Diesel Pressure Tester Kit - VAS6551-
- Diesel Pressure Tester Kit - Adapter Set - Connection Hose 2 - VAS6551/5-2-
- Suction Pump - VAS5226-

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21 – Turbocharger, Supercharger

1 Safety Precautions when Working on Charge Air System And Turbocharger

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

If testing equipment is required during a road test, note the following:

- The testing equipment must always be secured to the rear seat and operated by a second technician from this location.

If the vehicle is involved in a collision while testing equipment is operated from the front passenger seat, the person sitting in that seat could be seriously injured when the airbag deploys.

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2 Guidelines for Clean Working Conditions

When Working on the Charge Air System and Turbocharger, Carefully Follow the "7 rules" for Clean Working Conditions:

- Thoroughly clean the connection points and the surrounding area before loosening.
- Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- Carefully cover or seal opened components if the repair is not performed immediately.
- Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- Transport and protective packaging and sealing caps are to be removed only immediately prior to installation.
- During repairs, clean oil from connections and hose ends.
- When the fuel system is open: avoid working with compressed air if possible. Do not move the vehicle if possible.

When working on the turbocharger, carefully observe the following rules for clean working conditions:

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3 Turbocharger

Note

- *Various hose connections are secured.*
- *The charge air system must be properly sealed.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*
- *Fill with engine oil before installing the turbocharger oil supply line on the connections*
- *After installing the turbocharger, let engine idle for approximately one minute to ensure adequate oil supply to the turbocharger.*

Caution

- ***Follow the safety precautions when working on the charge air system and turbocharger. Refer to*** ***⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to*** ***⇒ "2 Guidelines for Clean Working Conditions", page 269 .***

Always pay attention to these instructions before and during work.

⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270

⇒ "3.2 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBEA, CJAA", page 276

⇒ "3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA", page 279

⇒ "3.4 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581 , Replacing", page 282

3.1 Overview - Turbocharger with Exhaust Manifold and Attachments

Caution

- ***Follow the safety precautions when working on the charge air system and turbocharger. Refer to*** ***⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to*** ***⇒ "2 Guidelines for Clean Working Conditions", page 269 .***

Always pay attention to these instructions before and during work.

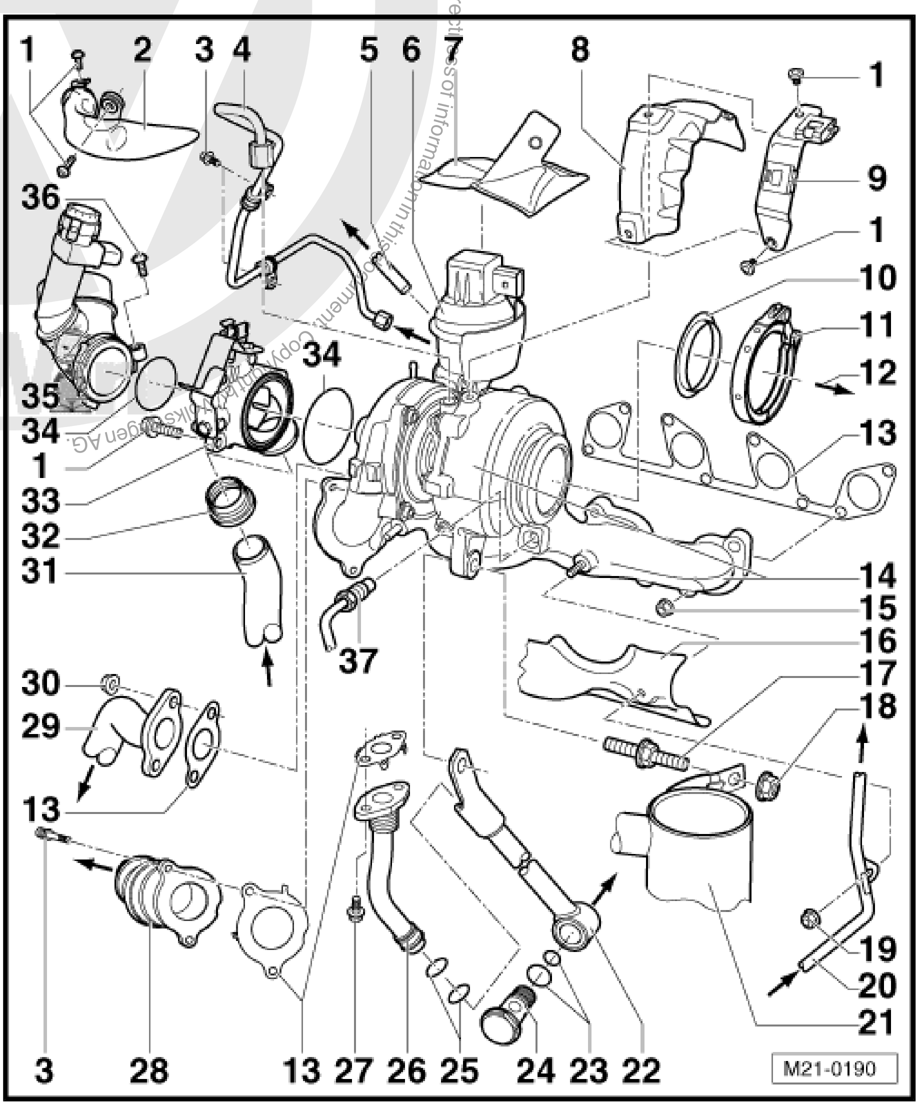
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⇒ “3.1.1 Engine Codes CBEA, CJAA”, page 271
⇒ “3.1.2 Engine Codes CBDA, CBDB and CEGA”, page 274

3.1.1 Engine Codes CBEA, CJAA

Note

Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .



1 - Bolt

- ❑ 8 Nm

2 - Warm Air Collector Plate

- ❑ To the warm air intake connecting hose on the air filter -item 12- ⇒ Item 12 (page 336)

3 - Bolt

- ❑ 10 Nm

4 - Oil Supply Line

- ❑ 22 Nm
- ❑ Do not change the angles of the oil supply line
- ❑ Install without tension
- ❑ From oil filter bracket -item 6- ⇒ Item 6 (page 178)
- ❑ Removing and installing. Refer to ⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 182 .
- ❑ Before installing, check the oil supply line for clear passage
- ❑ Fill with engine oil before installing the turbocharger oil supply line on the connections

5 - Vacuum Hose

- ❑ Check for secure fit and kink free routing
- ❑ To the Wastegate Bypass Regulator Valve - N75-
- ❑ Connection diagram for vacuum hoses. Refer to ⇒ “4.5 Vacuum Hose Connection Diagram”, page 295 .

6 - Vacuum Diaphragm

- ❑ With the Charge Air Pressure Actuator Position Sensor - G581-
- ❑ Removing and installing. Refer to ⇒ “3.4 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581 , Replacing”, page 282 .
- ❑ Unit with turbocharger and exhaust manifold (cannot be replaced separately)

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7 - Heat Shield

- ❑ Replace if damaged

8 - Heat Shield

9 - Bracket

- ❑ For wiring harness

10 - Seal

- ❑ Replace

11 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

12 - To the Particulate Filter

- ❑ Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360

13 - Seal

- ❑ Replace
- ❑ Note the installation position

14 - Turbocharger

- ❑ Unit with exhaust manifold and pressure cell (cannot be replaced separately)
- ❑ Removing and installing. Refer to ⇒ “3.2 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBEA, CJAA”, page 276 .

15 - Nut

- ❑ 23 Nm
- ❑ Replace
- ❑ Grease the exhaust manifold stud bolts with Hot Bolt Paste - G 052 112 A3- .

16 - Heat Shield

17 - Stud Bolt

- ❑ 20 Nm

18 - Nut

- ❑ 23 Nm
- ❑ installed on the hex stud bolt -item 17- ⇒ Item 17 (page 272) on the turbocharger

19 - Nut

- ❑ 23 Nm
- ❑ Secure on the exhaust manifold with the heat shield -item 16- ⇒ Item 16 (page 272)

20 - Control Line

- ❑ 23 Nm
- ❑ Do not change the angles of the control line
- ❑ between the EGR housing -item 16- ⇒ Item 16 (page 399) and Exhaust Pressure Sensor 1 - G450- -item 1- ⇒ Item 1 (page 361)
- ❑ To loosen at the housing -item 16- ⇒ Item 16 (page 399) remove the exhaust gas recirculation filter -item 9- ⇒ Item 9 (page 399)
- ❑ Install without tension

21 - Filter

- ❑ For the EGR
- ❑ -item 9- ⇒ Item 9 (page 399)

22 - Support

- ❑ For the turbocharger

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23 - Seal

- ❑ Replace

24 - Banjo Bolt

- ❑ 60 Nm
- ❑ Replace

25 - O-Ring

- ❑ Replace

26 - Oil Return Pipe

- ❑ Install without tension

27 - Bolt

- ❑ 15 Nm

28 - Pulsation Damper

- ❑ To the »hot« side connecting hose, upper -item 13- ⇒ Item 13 (page 291)

29 - Connecting Pipe

Caution

Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.

- ❑ between the exhaust manifold and intake manifold -item 5- ⇒ Item 5 (page 332)
- ❑ Replace
- ❑ Install without tension

30 - Nut

- ❑ 20 Nm
- ❑ Grease the exhaust manifold stud bolts with Hot Bolt Paste - G 052 112 A3- .

31 - Connecting Pipe

- ❑ From the exhaust gas recirculation housing -item 2- ⇒ Item 2 (page 398)
- ❑ For removing and installing, also loosen the connections -item 33- ⇒ Item 33 (page 273) on the turbocharger

32 - Seal

- ❑ Replace if damaged

33 - Connection

34 - O-Ring

- ❑ Replace if damaged

35 - Intake Scoop

- ❑ Check for secure fit
- ❑ Clean if there is contamination
- ❑ from the intake hose on the air filter -item 1- ⇒ Item 1 (page 336)
- ❑ With Positive Crankcase Ventilation Heating Element - N79-

Removing:

– Disconnect the crankcase ventilation hose at the intake scoop.

Note

The crankcase ventilation hose is destroyed when it is removed.

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– Remove the bolt -item 36- ⇒ Item 36 (page 274) .

– Rotate the intake scoop clockwise and remove it from the connections -item 33- ⇒ Item 33 (page 273) .

Installing:

– Clean the intake scoop. It must be free of oil and grease.

– Slide the intake scoop onto the connections -item 33- ⇒ Item 33 (page 273) and rotate it counterclockwise until it engages on the connections.

– Tighten the bolt -item 36- ⇒ Item 36 (page 274) .

– Install a new crankcase ventilation hose.

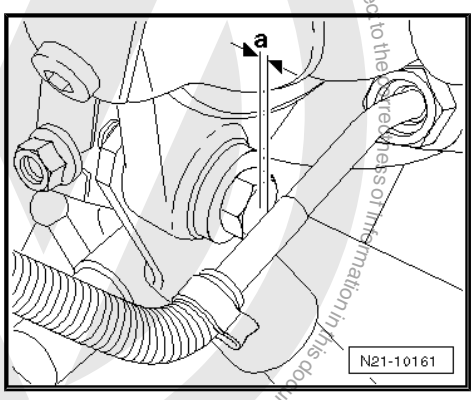
36 - Bolt

❑ 8 Nm

37 - Exhaust Gas Temperature Sensor 1 - G235-

❑ 45 Nm
❑ Remove using Diesel Engine Tool Set - 17mm - T10395A-
❑ Note the installation position Refer to ⇒ Fig. ""Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft"" , page 274 .
❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft



Note

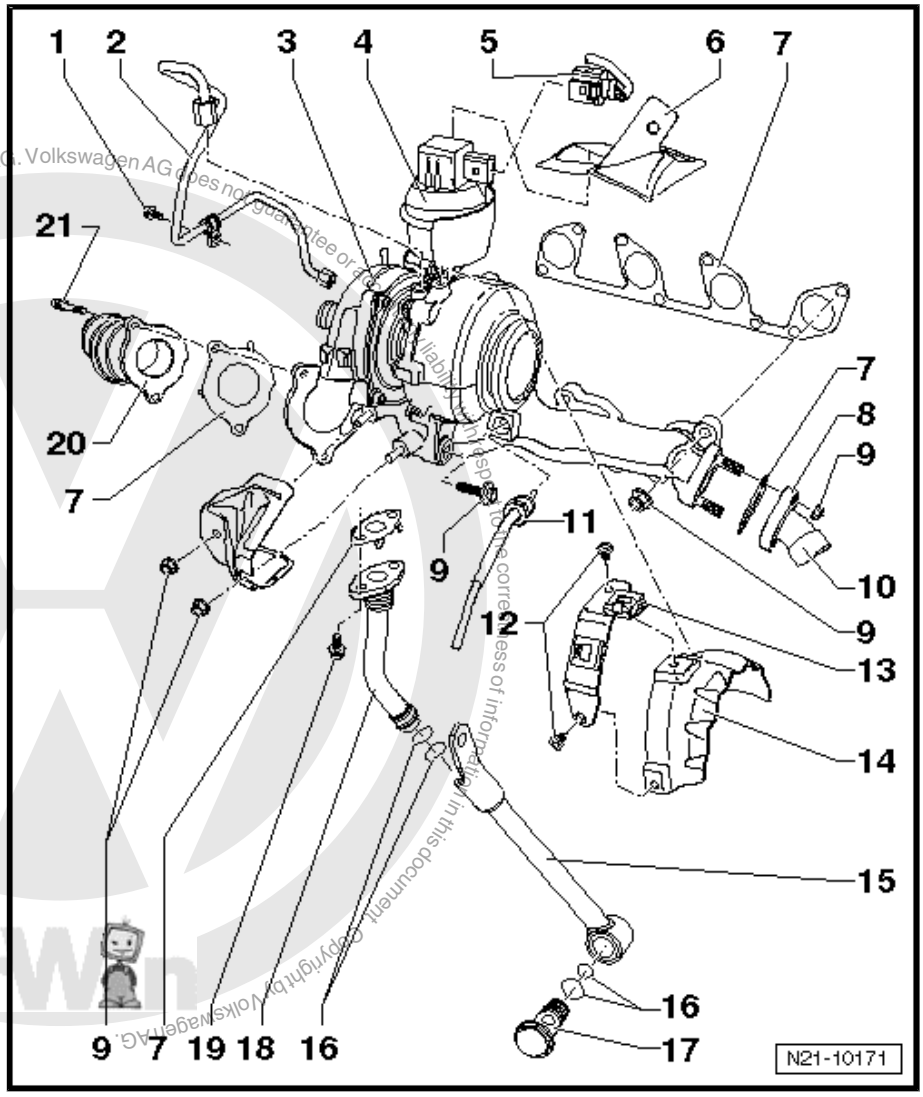
Always keep the dimension -a- of 3 to 5 mm to the threaded connection for the turbocharger support when installing the Exhaust Gas Temperature Sensor with an angled shaft.

3.1.2 Engine Codes CBDA, CBDB and CEGA

Note

Overview - Front Exhaust Pipe with Particulate Filter. Refer to ⇒ "2.1 Overview - Front Exhaust Pipe with Particulate Filter", page 388 .

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1 - 10 Nm

2 - Oil Supply Line

- ❑ Removing and installing. Refer to ⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 182 .
- ❑ Before installing, check the oil supply line for clear passage
- ❑ Before installing, fill turbocharger with engine oil at connection of oil supply line

3 - Turbocharger

- ❑ Replace completely together with the exhaust manifold and the pressure cell
- ❑ Removing and installing. Refer to ⇒ “3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA”, page 279 .

4 - Vacuum diaphragm

- ❑ with the Charge Air Pressure Actuator Position Sensor - G581-
- ❑ Removing and installing. Refer to ⇒ “3.4 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581 , Replacing”, page 282 .

5 - Connector

- ❑ to the Charge Air Pressure Actuator Position Sensor - G581-

6 - Heat shield

- ❑ Replace if damaged

7 - Seal

- ❑ Replace

8 - Connecting Pipe

- ❑ To EGR cooler

9 - 20 Nm

10 - Decoupling element

- ❑ do not bend or stretch

11 - Exhaust Gas Temperature Sensor 1 - G235-

- ❑ 45 Nm
- ❑ Coat the thread on the sensor with Hot Bolt Paste - G 052 112 A3-
- ❑ Note the installation position Refer to ⇒ Fig. ““Installed position, exhaust gas temperature sensor with angled shaft”“ , page 276 .

12 - 10 Nm

13 - Bracket

- ❑ For oil supply line

14 - Heat Shield

15 - Support

- ❑ Between turbocharger and cylinder block

16 - Seal

- ❑ Replace

17 - Banjo Bolt, 60 Nm

- ❑ Replace

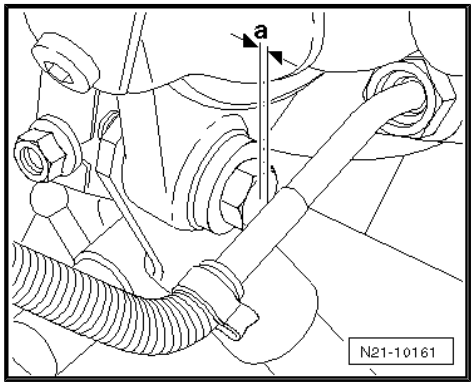
18 - Oil Return Pipe

19 - 15 Nm

20 - Pulsation Damper

21 - 10 Nm

Installed position, exhaust gas temperature sensor with angled shaft



Note

Always keep the dimension -a- of 3 to 5 mm to the threaded connection for the turbocharger support when installing the Exhaust Gas Temperature Sensor with an angled shaft.

3.2 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBEA, CJAA

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-
- Diesel Engine Tool Set - 17mm - T10395A-

Caution

- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 269 .*

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Removing

Caution

If mechanical damage is found on exhaust turbocharger, for example a destroyed compression wheel, it is not enough to just replace the turbocharger. Perform the following steps to prevent subsequent damage.

Check the air filter housing, the air filter insert and the intake hoses for contamination. Refer to ⇒ "3.14 Overview - Air Filter", page 335 , Overview - Air Filter

If foreign objects are found in the charge air system:

- *Check the entire charge air circuit and the charge air cooler for foreign objects. Refer to ⇒ "4.2 Overview - Charge Air Cooler Components", page 290 , Overview - Charge Air Cooling System Components*
- *Replace the connecting pipe between the exhaust manifold and intake manifold -item 29- ⇒ Item 29 (page 273) .*
- *Clean the entire charge air circuit and replace the charge air cooler if necessary.*
- *Check the housing and the exhaust gas recirculation cooler for foreign objects. Refer to ⇒ "3.1 Overview - Exhaust Gas Recirculation System Components", page 398 , Overview - Exhaust Gas Recirculation Components*
- *Check the oil lines on the turbocharger for contamination and foreign objects. Refer to ⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270 , Overview - Turbocharger with Exhaust Manifold and Attachments*

– Remove the particulate filter with NOx reduction catalytic converter. Refer to ⇒ "1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing", page 369 .

Caution

The Exhaust Gas Temperature Sensor 1 - G235- covers the upper threaded connection on the turbocharger support and must not be bent. It may not be removed.

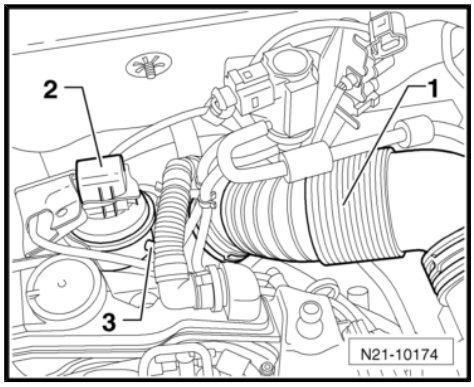
– Remove the Exhaust Gas Temperature Sensor 1 - G235- with Diesel Engine Tool Set - 17mm - T10395A- .

– Remove the control line between the EGR housing and the Exhaust Pressure Sensor 1 - G450- -item 8- ⇒ Item 8 (page 398) .

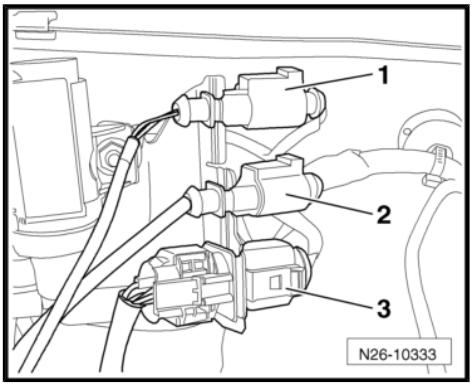
– Remove the housing with the exhaust gas recirculation cooler. Refer to ⇒ "3.1 Overview - Exhaust Gas Recirculation System Components", page 398 , Overview - Exhaust Gas Recirculation Components

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– Disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -2- on the on the turbocharger vacuum diaphragm.
– Disconnect the vacuum hose -3- at the turbocharger vacuum diaphragm.



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– Disconnect the »black« connector for the Exhaust Gas Temperature Sensor 1 - G235- -2- at the plenum chamber bulkhead.
– Guide the wire out of the retainer on the plenum chamber bulkhead and on the turbocharger.
– Remove the connecting pipe -item 31- ⇒ Item 31 (page 273) .
– Remove the oil supply line. Refer to ⇒ “4.3 Oil Supply Line to Turbocharger, Removing and Installing”, page 182 .
– Remove the banjo bolt -item 24- ⇒ Item 24 (page 273) from the turbocharger support.
– Remove the hex bolt -item 17- ⇒ Item 17 (page 272) from the turbocharger support.
– Rotate the lower section of the support 90° and remove the support downward from the upper section.
– Remove the heat shield -item 16- ⇒ Item 16 (page 272) on the exhaust manifold.
– Remove the exhaust manifold nuts -item 15- ⇒ Item 15 (page 272) .
– Remove the turbocharger with the exhaust manifold from the cylinder head. Turn it so that the intake side points downward and remove the turbocharger with the exhaust manifold downward.

Installing

Caution

Before installing, check if the oil return pipe decoupling element is bent or stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return pipe before installing the turbocharger.

Install in reverse order of removal. Note the following:

- Always replace the self-locking nuts, seals, gaskets and clamps.
- Insert the turbocharger with the pressure side upward.
- Position the charge air pipe connecting hose before securing the turbocharger.
- Pay attention to the installation position of the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ “Fig. ““Installed Position, Exhaust Gas Temperature Sensor with Angled Shaft”“ , page 274 :
- Replace the banjo bolt with the turbocharger support gaskets as well as the oil return pipe O-rings.
- Do not stretch the oil return pipe decoupling element when installing the turbocharger support.

3.3 Turbocharger with Exhaust Manifold, Removing and Installing, Engine Codes CBDA, CBDB, CEGA

Special tools and workshop equipment required

♦ Torque Wrench 1331 5-50Nm - VAG1331-

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Caution

- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 269 .*

Always pay attention to these instructions before and during work.

Removing

Caution

If mechanical damage is found on exhaust turbocharger, for example a destroyed compression wheel, it is not enough to just replace the turbocharger. Perform the following steps to prevent subsequent damage.

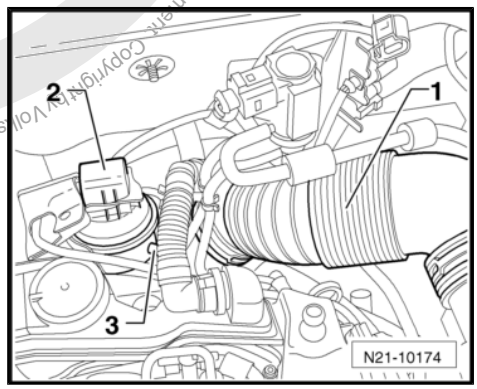
Check the air filter housing, the air filter insert and the intake hoses for contamination. Refer to ⇒ "3.14 Overview - Air Filter", page 335 , Overview - Air Filter

If foreign objects are found in the charge air system:

- *Check the entire charge air circuit and the charge air cooler for foreign objects. Refer to ⇒ "4.2 Overview - Charge Air Cooler Components", page 290 , Overview - Charge Air Cooling System Components*
- *Clean the entire charge air circuit and replace the charge air cooler if necessary.*
- *Check the housing and the exhaust gas recirculation cooler for foreign objects. Refer to ⇒ "4.1 Overview - Exhaust Gas Recirculation System Components", page 403 , Overview - Exhaust Gas Recirculation Components*
- *Check the oil lines on the turbocharger for contamination and foreign objects. Refer to ⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270 , Overview - Turbocharger with Exhaust Manifold and Attachments*

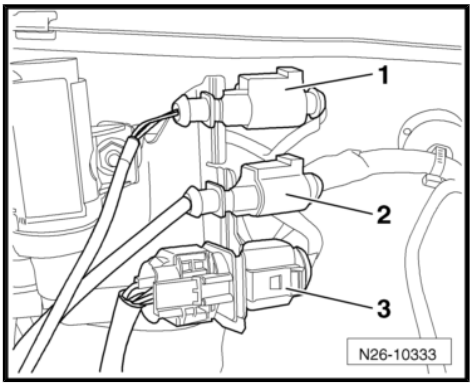
– Remove the intake line -1- and disconnect from the Charge Air Pressure Actuator Position Sensor - G581- -2- on the turbocharger.

– Disconnect the vacuum line -3- on the turbocharger.

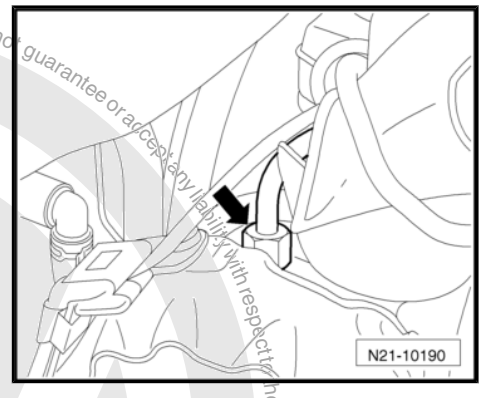


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– Disconnect the connector for Exhaust Gas Temperature Sensor 1 - G235- -1- on the plenum chamber bulkhead and guide the wire out of the retainers.

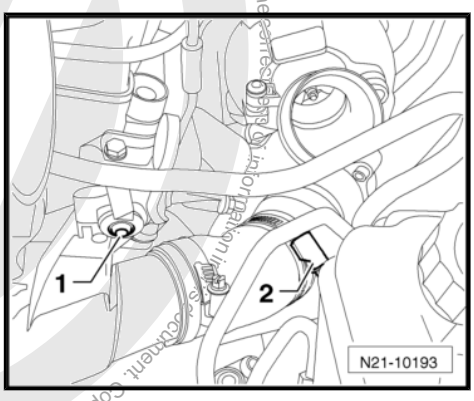


– Remove the oil supply line on the turbocharger -arrow-.

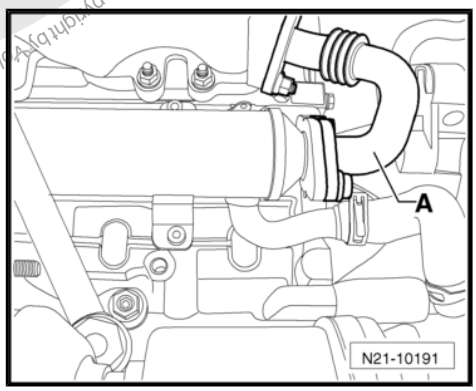


– Remove the charge air pipe screw -1-, loosen the clamp -2- and pull off the connecting hose from the turbocharger as far as possible.

– Remove the particulate filter. Refer to ⇒ “2 Exhaust System, Engine Codes CBDA, CBDB and CEGA”, page 388 .



– Remove the connecting pipe -A- to the EGR cooler.



Caution

The Exhaust Gas Temperature Sensor 1 - G235- covers the upper threaded connection on the turbocharger support and must not be bent. It may not be removed.

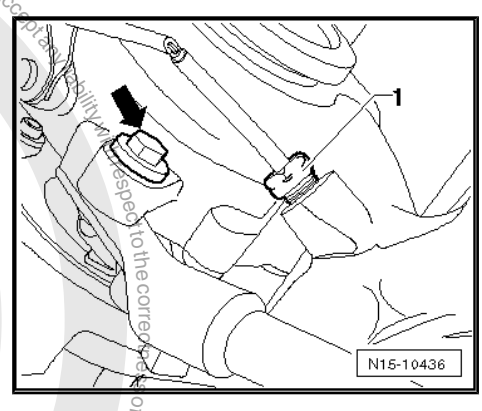
– Remove the Exhaust Gas Temperature Sensor 1 - G235- .

– Remove the right axle shaft from the bevel box. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 .

– Remove the banjo bolt -item 24- ⇒ Item 24 (page 273) from the turbocharger support.

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– Remove the upper screw -arrow- from the support on the turbocharger.
– Rotate the lower section of the support 90° and remove the support downward from the upper section.
– Remove the heat shield on the exhaust manifold.
– Remove the exhaust manifold nuts.
– Remove the turbocharger and then turn it so that the intake side is facing downward and the remove the turbocharger downward.



Installing

Caution

Before installing, check if the oil return line decoupling element is hidden and therefore stretched. If this is the case, there could be micro tears which could result in leaks. If necessary, replace the oil return line before installing the turbocharger.

– Install in reverse order of removal. Note the following:

♦ Insert the turbocharger with the pressure side upward.
♦ Position the charge air pipe connecting hose before securing the turbocharger.
♦ Pay attention to the installation position of the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ Fig. ""Installed position, exhaust gas temperature sensor with angled shaft"" , page 276 :
♦ Replace the banjo bolt for the turbocharger support and the O-rings for the oil return line.
♦ Be careful not to overstretch the decoupling element for the oil return line when installing the turbocharger support.

3.4 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor - G581- , Replacing

Special tools and workshop equipment required

♦ Actuator Socket - 10mm - T10422A-
♦ Union Nut Socket - T40055-
♦ Ring Wrench 10x12mm - T10423-
♦ Vehicle Diagnostic Tester

Caution

The specified special tools, in particular the Actuator Socket - 10mm - T10422A- , are designed exclusively for use according to the following work procedure and may not be used for other screw connections. Higher torques can cause deformation.

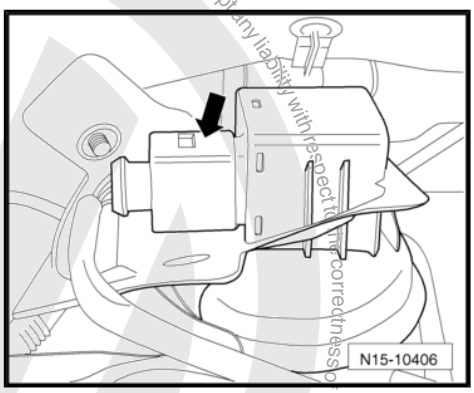
Note

There is a replacement part kit available for replacing the vacuum diaphragm with Charge Air Pressure Actuator Position Sensor - G581- . Refer to Parts Catalog.

Removing

– Remove the air filter housing with the mass air flow sensor and connecting pipe. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

– Open the heat shield mat and disconnect the connector -arrow- from the Charge Air Pressure Actuator Position Sensor - G581- .



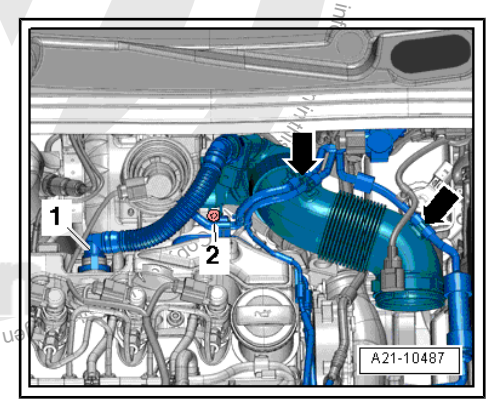
- All Vehicles Except Jetta from MY 2011

– Press the release buttons and remove the crankcase ventilation connecting pipe -1- from the cylinder head cover.

– Free up the vacuum hoses -arrows-.

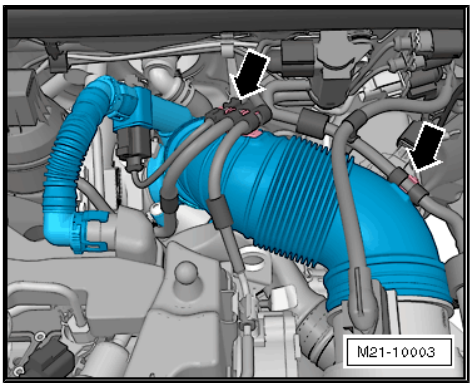
– Unscrew the bolt -2- (permanent) and tilt the air duct pipe with the intake tube toward the rear and remove from the turbocharger.

– Seal the opening on the turbocharger with the cap from the replacement part kit.



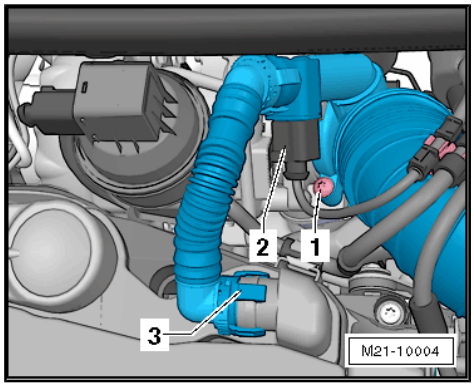
Jetta from MY 2011

– Free up the vacuum hoses -arrows-.

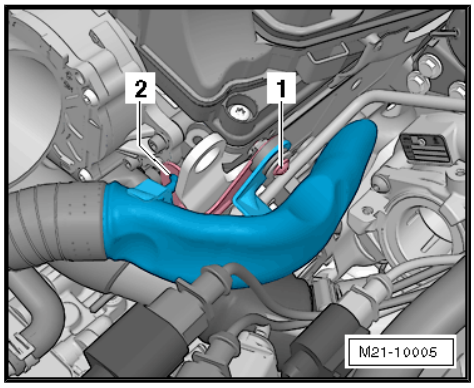


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– Press the release buttons and remove the crankcase ventilation connecting pipe -3- from the cylinder head cover.
– Disconnect -2-.
– Loosen the bolt -2- (permanent) and tilt the air guide pipe with the intake tube backward and remove from the turbocharger.
– Seal the opening on the turbocharger with the cap from the replacement part kit.

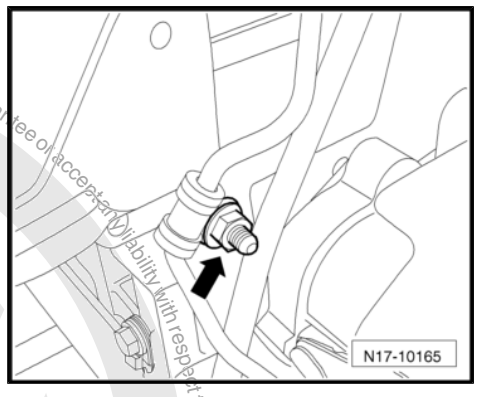


– Remove the bolt -1- and the warm air pipe from the guide -2-.



Continuation for All Vehicles

– Remove the vacuum line on the turbocharger.
– Unscrew the securing nut -arrow- of the oil supply line/vacuum line connection on the cylinder head.



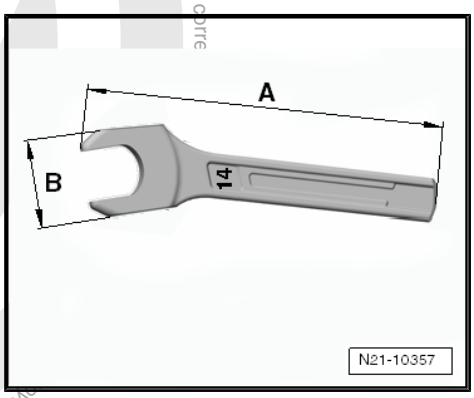
Caution

When disconnecting the oil supply line, the connection must be counter-held. Risk of subsequent damage.

– Prepare 14 mm open end wrench as shown for counter-holding purposes.

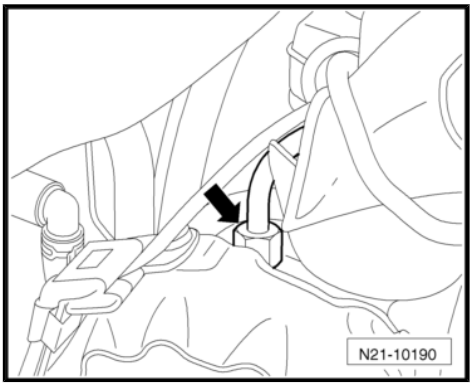
14 mm Tool for Counter-Holding the Oil Supply Line Connection Fitting

- A = 110 mm
- B = 25 mm



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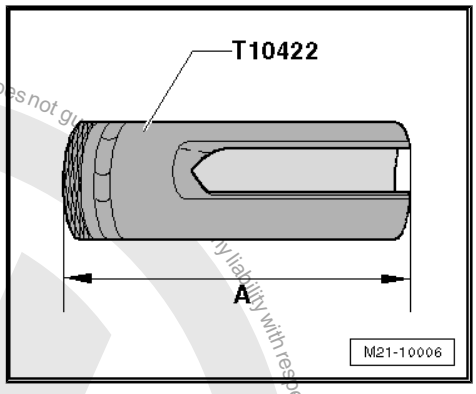
– Counter hold the connection using the Wrench - Open End - 14mm - T10461- and remove the oil supply line -arrow- from the turbocharger using the Union Nut Socket - T40055- .
– Seal the oil supply opening on the turbocharger with plugs from the replacement part kit.



Jetta from MY 2011

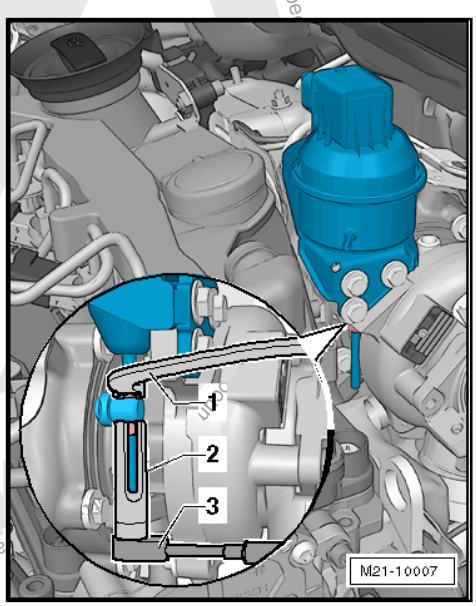
– Set the Actuator Socket - 10mm - T10422A- to the dimension -A-.

♦ A = 57 mm

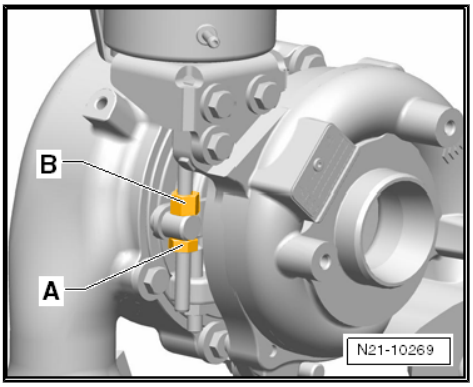


Continuation for All Vehicles

– Position the Ring Wrench 10x12mm - T10423- -1- and Actuator Socket - 10mm - T10422A- -2- with the Reversible Ratchet -3- as shown.

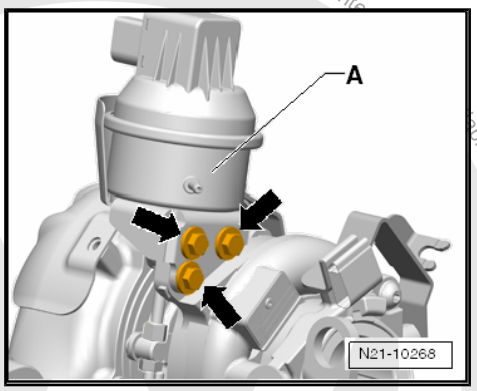


– Counterhold the lock nut -B- with the Ring Wrench 10x12mm - T10423- and unscrew the securing nut -A- with the Actuator Socket - 10mm - T10422AA- from the control rod.



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– Unscrew the bolts of the pressure cell -arrows- and remove vacuum diaphragm -A-.

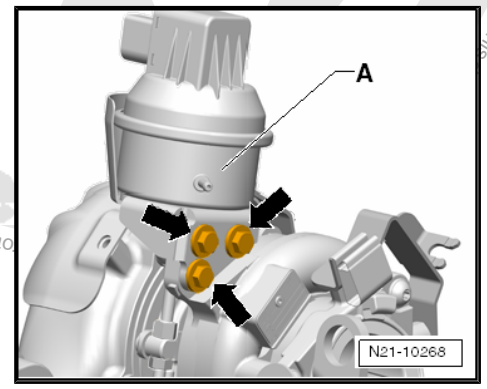


Installing

Caution

Only use new screws and nuts from the replacement part kit.

– Remove the lower nut of the control rod from the new vacuum diaphragm if necessary.
– Screw the lock nut onto the control rod by hand to the stop in the direction of the pressure cell.
– Conduct the control rod through the adjusting lever on the turbocharger, install the vacuum diaphragm -A-, and insert the bolts.
– Tighten the bolts -arrows- to 8 Nm.

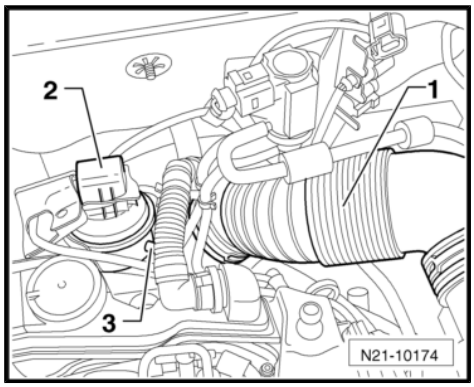


Note

Ensure that the guide moves easily on the control rod.

– Remove the protective cap, install the oil supply line on the turbocharger, and tighten to 22 Nm.

– Connect the connector -2- to the Charge Air Pressure Actuator Position Sensor - G581- and connect the heat shield mat.
– Connect the Vehicle Diagnostic Tester .



Selecting Operating Mode:

– Press the “vehicle self-diagnosis” button on the display.

Vehicle System Selection:

– Press the “01 - engine electronics” button on the display.

The display shows the control module identification and the coding for the engine control module.

Selecting Diagnosis Function:

– Press the “011 - measured values” button on the display.
– Enter the measured value block “120” via the 10-key keyboard and confirm the input with the “Q” button.
– Connect the Hand Vacuum Pump - VAS6213- to the vacuum diaphragm.
– Set a voltage of 0.760 V by generating a vacuum while observing the lowest value of the measured value block.

Caution

Maintain a constant vacuum and voltage of 0.706 V during the subsequent adjustment procedure for the control rod.

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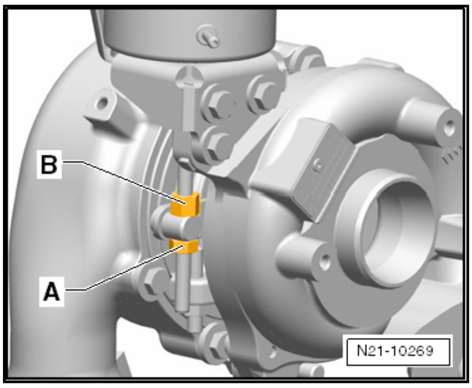
– Slowly screw lock nut -B- of the control rod down by hand. The adjusting lever is on the lower »stop«.

– Counter-hold lock nut -B- and turn securing nut -A- on the control rod against the adjustment lever. Tighten slightly with the Ring Wrench 10x12mm - T10423- .

– Release the vacuum from the vacuum diaphragm.

– Observe the lowest value of the measured value block. With no pressure, a value of 3.30 to 3.90 V must be set.

– Attach the Actuator Socket - 10mm - T10422AA- , counterhold the lock nut -B- with the Ring Wrench 10x12mm - T10423- and tighten the securing nut -A-.

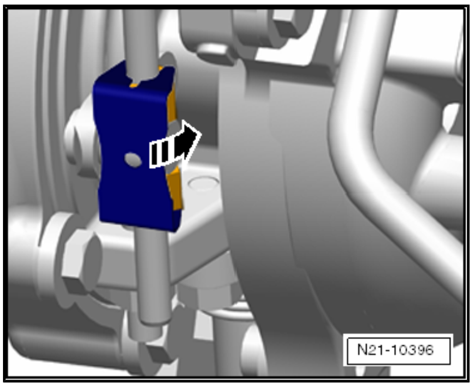


> ⚠ Caution
>
> *Generate a vacuum of 0.75 ± 0.05 bar (10.87 ± 0.72 psi) at the vacuum diaphragm to ensure that the adjustment lever is at the »stop«. A voltage of 0.760 V must be set in this process.*

Voltage Value OK.

– Manually press the locking plate onto the control rod and turn it 90° in the direction of -arrow-.

– Seal the control rod/nut connection with sealing wax from the replacement part kit.

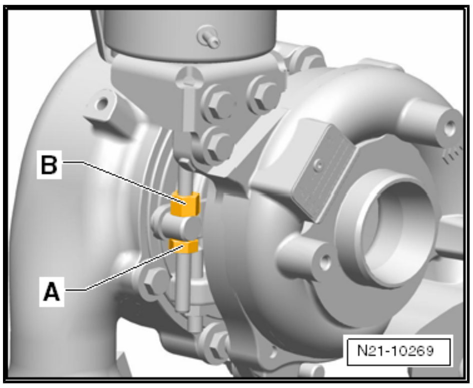


Voltage Value Not OK.

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– Counterhold the lock nut -B-, loosen the control rod nut -A- and correct the value by rotating the lock nut -B-.

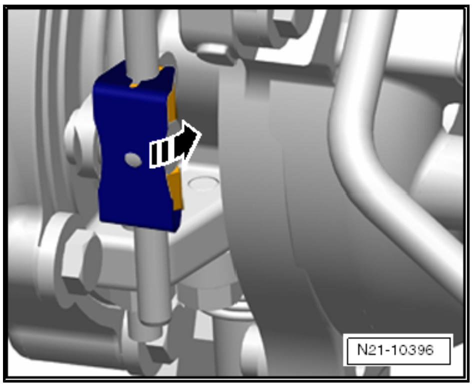
– Counter-hold the lock nut -B-, counter-rotate the nut -A-, and tighten with the Actuator Socket - 10mm - T10422AA- .

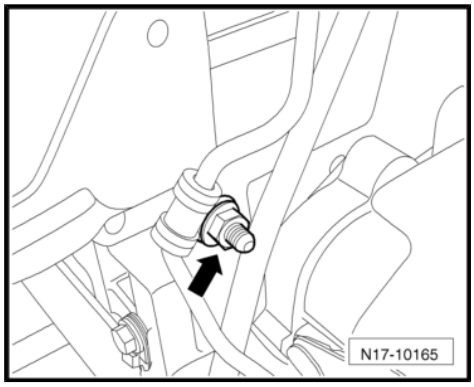


– Manually press the locking plate onto the control rod and turn it 90° in the direction of -arrow-.

– Seal the control rod/nut connection with sealing wax from the replacement part kit.

Continuation





– Place the securing nut -arrow- of the oil supply line/vacuum line connection on the cylinder head and tighten.
– Remove the cap on the turbocharger.
– Reassemble the engine.
– Start the engine and delete the DTC memory.
– Check the adjustment as follows:

Selecting Diagnosis Function:

– Press the “006 - basic setting” button on the display.
– Enter the measured value block “120” via the 10-key keyboard and confirm the input with the “Q” button.
– Press the “activate” button on the lower half of the screen.
– Observe the value in the lower window. It must fluctuate between 0.65-0.85 V and 3.30-3.90 V (pressure cell alternates between the two end positions).

If the voltage values are OK:

– End the basic setting.

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4 Charge Air System

⇒ “4.1 General Information”, page 289

⇒ “4.2 Overview - Charge Air Cooler Components”, page 290

⇒ “4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling”, page 291

⇒ “4.4 Charge Air System, Checking for Leaks”, page 293

⇒ “4.5 Vacuum Hose Connection Diagram”, page 295

⇒ “4.6 Vacuum Hose Connection Diagram, Engine Codes CBDA, CBDB, CEGA”, page 296

⇒ “4.7 Vacuum System, Checking”, page 297

4.1 General Information

Note

- *Charge air system must be properly sealed.*
- *All hose connections for the charge air system are secured by screw-type clamps, spring-type clamps or by connector couplings. Be sure to follow the assembly guidelines when installing the connectors. Refer to ⇒ “4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling”, page 291 .*
- *Tighten the screw-type clamps by hand - using a screwdriver is not permitted.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

Caution

- ***Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ “1 Safety Precautions when Working on Charge Air System And Turbocharger”, page 268 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 269 .***

Always pay attention to these instructions before and during work.

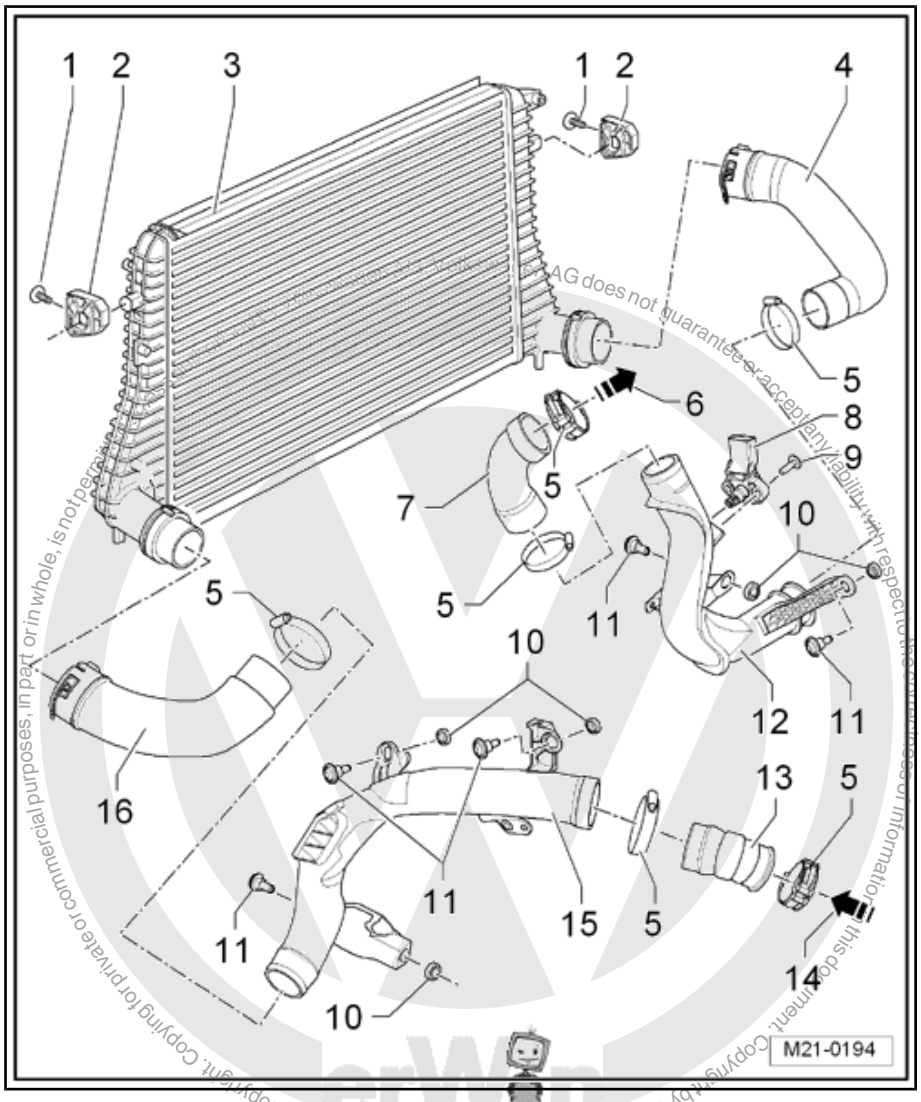
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4.2 Overview - Charge Air Cooler Components

Caution

- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 269 .*

Always pay attention to these instructions before and during work.



1 - Bolt
- ❑ 5 Nm

2 - Bearing
- ❑ For the charge air cooler

3 - Charge Air Cooler
- ❑ To remove, bring the lock carrier into the service position. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Lock Carrier; Service Position .

4 - Connecting Hose
- ❑ »Cold« side, bottom
- ❑ Check for secure fit
- ❑ Replace the seal if it is damaged or if there are leaks.
- ❑ Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling. Refer to ⇒ "4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling", page 291

5 - Screw Clamp
- ❑ 5 Nm

6 - To the Throttle Valve Control Module - J338-
- ❑ -item 9- ⇒ Item 9 (page 332)

7 - Connecting Hose
- ❑ »Cold« side, top
- ❑ Check for secure fit

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8 - Charge Air Pressure Sensor - G31-

- ❑ With Intake Air Temperature Sensor - G42-

9 - Bolt

- ❑ 3 Nm

10 - Rubber Grommet

- ❑ Replace if damaged

11 - Bolt

- ❑ 8 Nm

12 - Charge Air Pipe

- ❑ »Cold« side

13 - Connecting Hose

- ❑ »Hot« side, top
- ❑ Check for secure fit

14 - From the Turbocharger

15 - Charge Air Pipe

- ❑ »Hot« side

16 - Connecting Hose

- ❑ »Hot« side, bottom
- ❑ Check for secure fit
- ❑ Replace the seal if it is damaged or if there are leaks.
- ❑ Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling. Refer to
⇒ “4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling”, page 291

4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling

Caution

- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to*
⇒ “1 Safety Precautions when Working on Charge Air System And Turbocharger”, page 268 .
- *Pay attention to the guidelines for clean working conditions. Refer to*
⇒ “2 Guidelines for Clean Working Conditions”, page 269 .

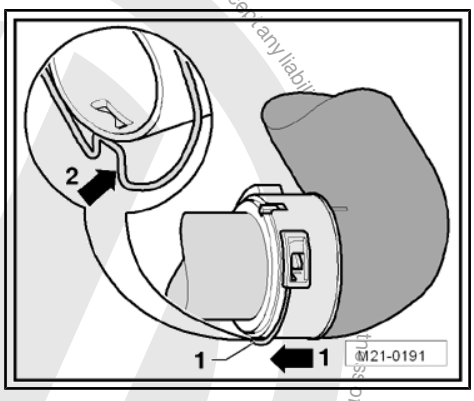
Always pay attention to these instructions before and during work.

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Dissemble

Version with Positioning Tab

– Press the connector coupling on the connecting hose -arrow 1- together.



Note

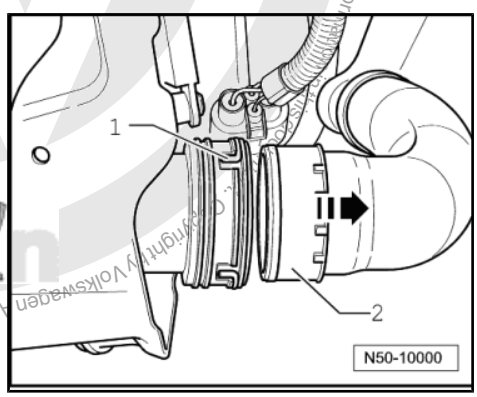
The clamp -1- can only be completely engaged when the connector coupling is pressed together.

– Bring the clamp in direction of -arrow 2- into the release position.

– Disconnect the connector coupling without using tools.

Version without Positioning Tab

– Release the connector coupling by pulling the clip -1-. Remove the hose/pipe -2- without using a tool.



Assembly:

Version with Positioning Tab

Caution

The connector coupling sealing ring can be damaged if the clamp is in locked position when installing. This would result in a leak. Follow the assembly instructions.

– Clean the sealing surfaces in the connector coupling.

– When replacing the seal, lay the seal in the groove of the connecting hose. Ensure gasket is completely seated in groove all the way around.

– Lightly oil the sealing surfaces and the seal.

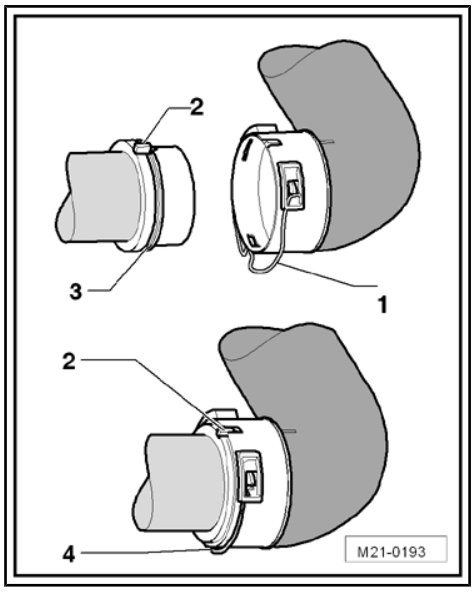
– Bring the clamp -1- into the release position.

– Slide the connecting hose all the way into the clutch. Pay attention to the positioning tab -2- while doing this.

– Bring the clamp into the locked position -4-. During this, the clamp engages in the groove -3-.

– Then press in the connecting hose again.

– Check that the connector coupling is correctly positioned and locked by pulling on the connecting hose.



Version without Positioning Tab

– When replacing sealing ring, lay ring in charge air hose groove. Ensure gasket is completely seated in groove all the way around.

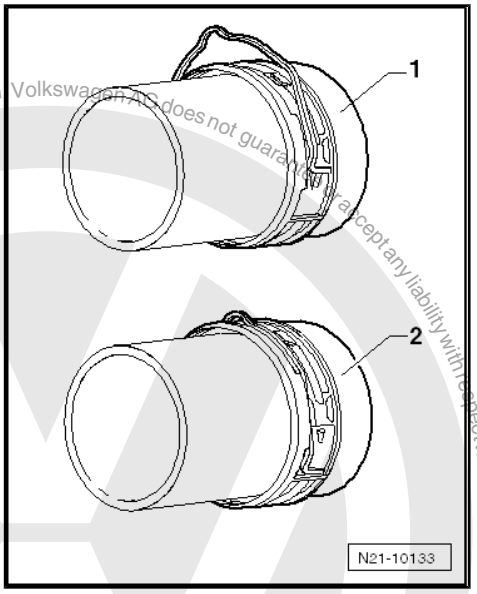
– Oil the sealing surfaces and the gasket.

– Bring the clip into the release position -1-.

– Slide the charge air hose into clutch until it stops.

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– Bring the clip into the lock position -2- and then press the charge air hose back again.
– Check for correct seating and proper locking of connector by pulling on the hose.



4.4 Charge Air System, Checking for Leaks

Special tools and workshop equipment required

- Turbo System Tester Kit - VAG1687- with Turbo System Tester Kit - Adapter 10 - VAG1687/10-
- Ultrasonic Tester - VAG1842- or commercially available leak detection spray

Caution

- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to* *⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268* *.*
- *Pay attention to the guidelines for clean working conditions. Refer to* *⇒ "2 Guidelines for Clean Working Conditions", page 269* *.*

Always pay attention to these instructions before and during work.

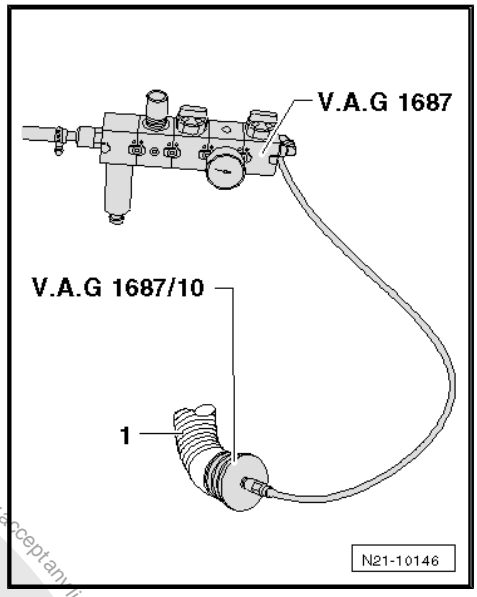
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Test Sequence

– Remove the intake hose -1- from the Mass Airflow Sensor - G70- . Loosen the spring clamps using the Hose Clip Pliers - VAS6362- .

– Insert the Turbo System Tester Kit - Adapter 1 - VAG1687/1- in the intake hose -1- and secure it with a clamp.

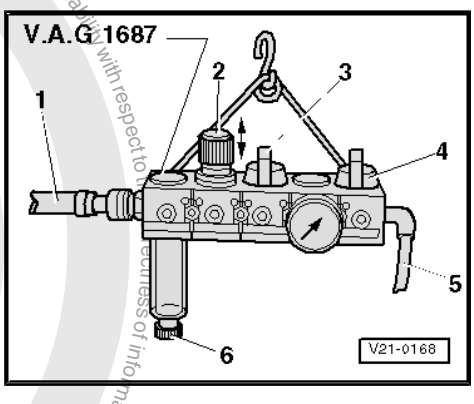
Prepare the Turbo System Tester Kit - VAG1687- as follows:



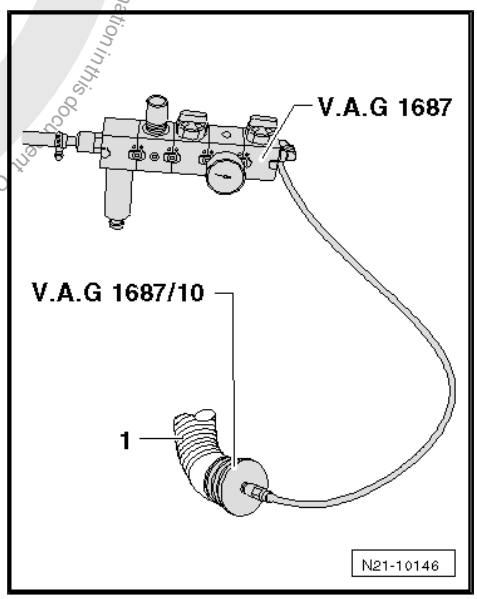
– Fully turn out the pressure regulator valve -2- to the closed position and close valves -3 and 4-.

Note

The rotary knob must be pulled upward -arrow- so that the pressure regulator valve -2- can be turned.

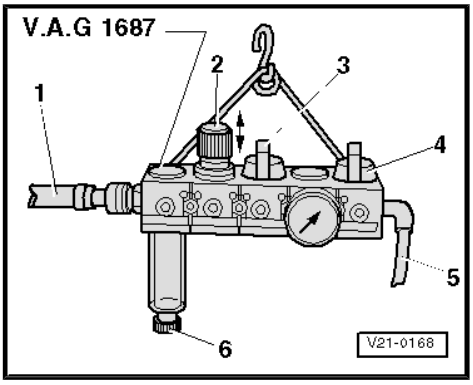


– Connect the Turbo System Tester Kit - VAG1687- to the Turbo System Tester Kit - Adapter 10 - VAG1687/10- as shown.



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– Connect the pressure hose -1- (pressurized air supply) to the Turbo System Tester Kit - VAG1687- .



Note

If water is located in viewing glass, drain it via the water drain plug -6-.

– Open the valve -3-.

– Set pressure to 0.5 bar (7.2 psi) using the pressure regulator valve -2-.

Caution

The pressure must not exceed 0.5 bar (7.2 psi)! A pressure set too high may damage the engine.

– Open the valve -4- and wait until the test circuit is filled. Adjust the pressure to 0.5 bar (7.2 psi) if necessary.

– Check the charge air system for leaks by listening, feeling and using a commercially available leak detection spray or using the Ultrasonic Tester - VAG1842S- .

Note

- *Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling. Refer to* *⇒ "4.3 Connector Coupling Between Charge Air Cooler and Connecting Hose, Disassembling and Assembling", page 291*
- *Small leaks on the intake side of the turbocharger are permitted because the intake hoses are not designed for positive pressure.*
- *A small quantity of air dissipates via the valves in the engine. For this reason a pressure retention test is not possible.*
- *Information on the Ultrasonic Tester - VAG1842S- . Refer to the Operating Instructions.*
- *If a poorly sealed area is discovered, observe the notes for charge air system when repairing. Refer to* *⇒ "4 Charge Air System", page 289* .
- *Before removing the adapter, discharge the pressure in testing circuit by pulling off the coupling from the Turbo System Tester Kit - Adapter 10 - VAG1687/10- .*

4.5 Vacuum Hose Connection Diagram

Caution

When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.

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1 - Vacuum Diaphragm

- ❑ On the turbocharger
- ❑ With the Charge Air Pressure Actuator Position Sensor - G581-
- ❑ Removing and installing. Refer to ⇒ “3.4 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581 , Replacing”, page 282 .

2 - Wastegate Bypass Regulator Valve - N75-

3 - From Brake Booster

4 - To the Vacuum Pump

5 - Connecting Piece

- ❑ At the vacuum pump

6 - Check Valve

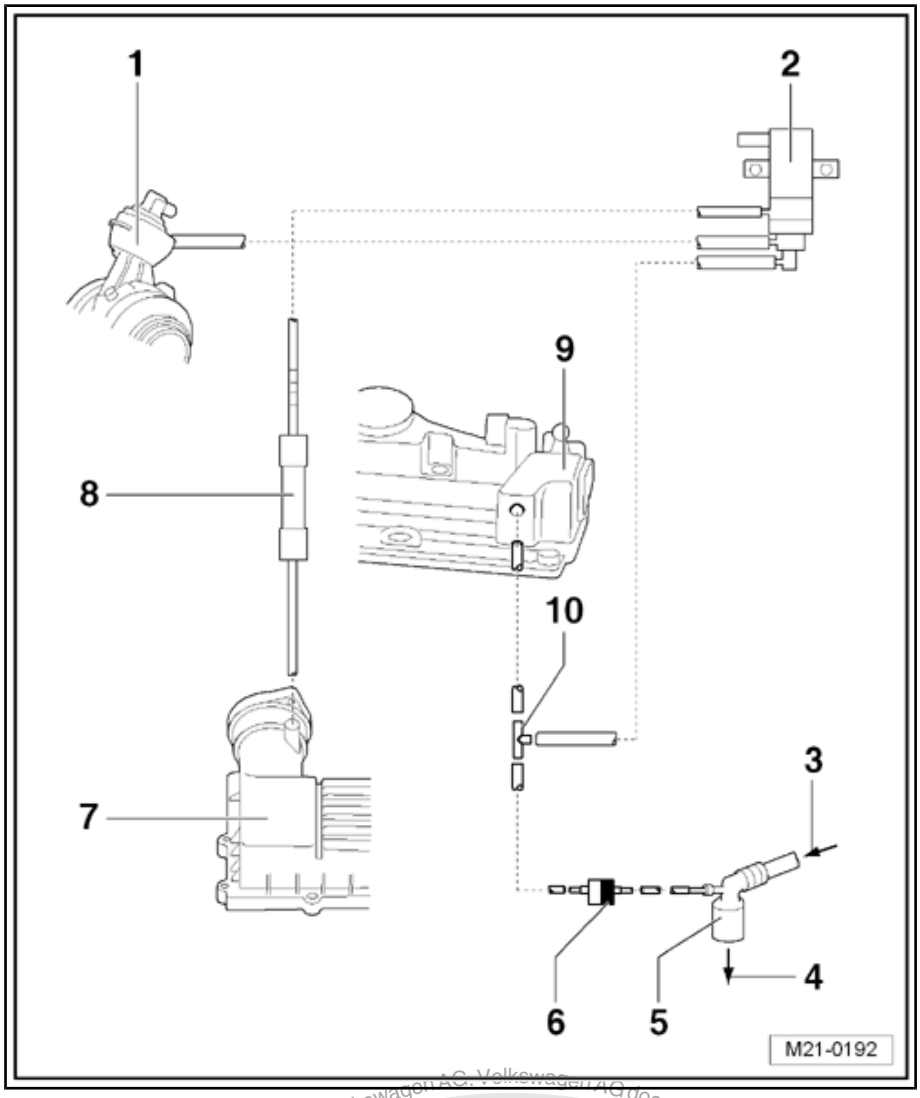
- ❑ Pay attention to the installed position: the white connection faces the junction piece -item 10- ⇒ Item 10 (page 296)
- ❑ Checking. Refer to ⇒ “4.7 Vacuum System, Checking”, page 297 , Vacuum System, Checking

7 - Air Filter

8 - Muffler

9 - Cylinder Head Cover

10 - Junction Piece



4.6 Vacuum Hose Connection Diagram, Engine Codes CBDA, CBDB, CEGA

Caution

When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.

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1 - Vacuum diaphragm

- ❑ On the turbocharger
- ❑ With the Charge Air Pressure Actuator Position Sensor - G581-
- ❑ Removing and installing. Refer to ⇒ "3.4 Vacuum Diaphragm with Charge Air Pressure Actuator Position Sensor G581 , Replacing", page 282 .

2 - Wastegate Bypass Regulator Valve - N75-

3 - Muffler

4 - Air Filter

5 - To the Brake Booster

6 - Connecting Piece

- ❑ at the vacuum pump

7 - Check Valve

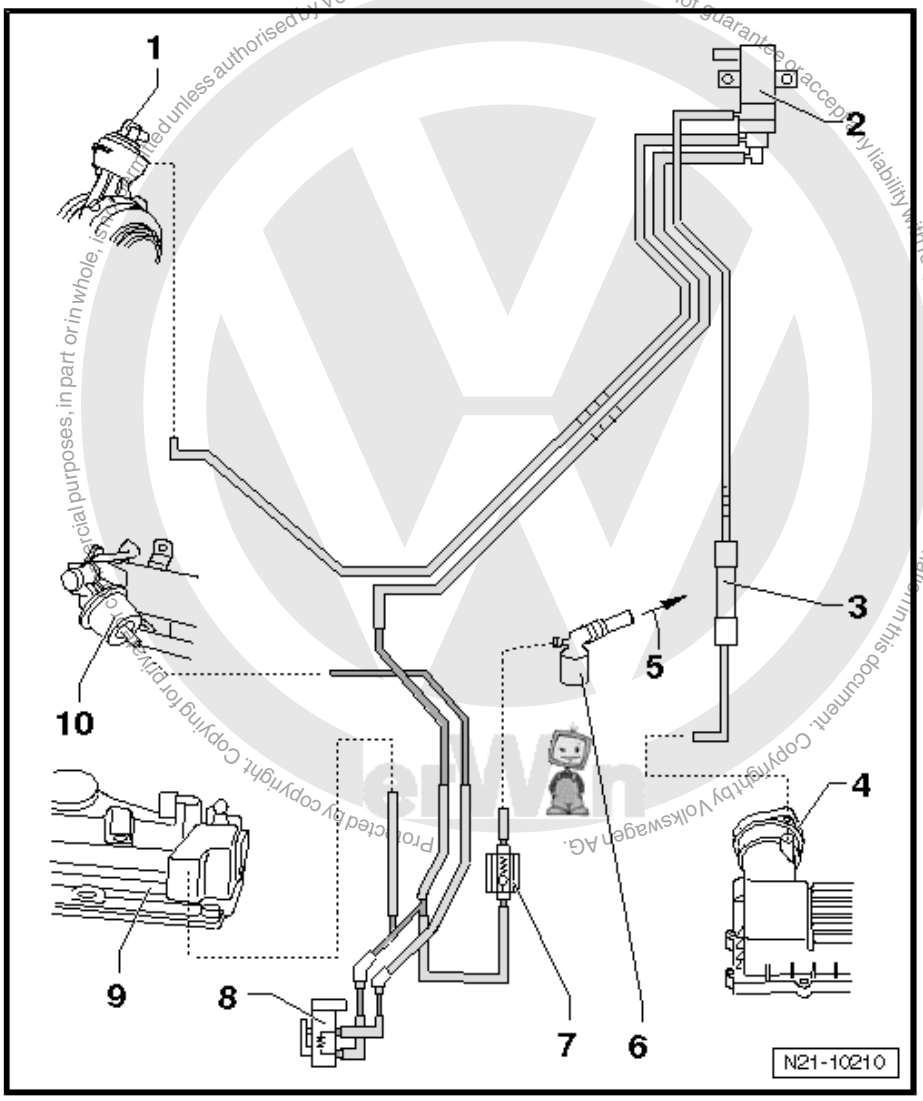
- ❑ Note the installation position

8 - EGR Cooler Switch-Over Valve - N345-

9 - Cylinder Head Cover

10 - Vacuum Diaphragm

- ❑ For the EGR cooler change over



4.7 Vacuum System, Checking

⇒ "4.7.1 Supply Line and Check Valve, Checking", page 297

⇒ "4.7.2 Control Line to Turbocharger, Checking", page 299 .

4.7.1 Supply Line and Check Valve, Checking

Special tools and workshop equipment required

- ♦ Hand Vacuum Pump - VAS6213-

Caution

- *When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.*
- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 269 .*

Always pay attention to these instructions before and during work.

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

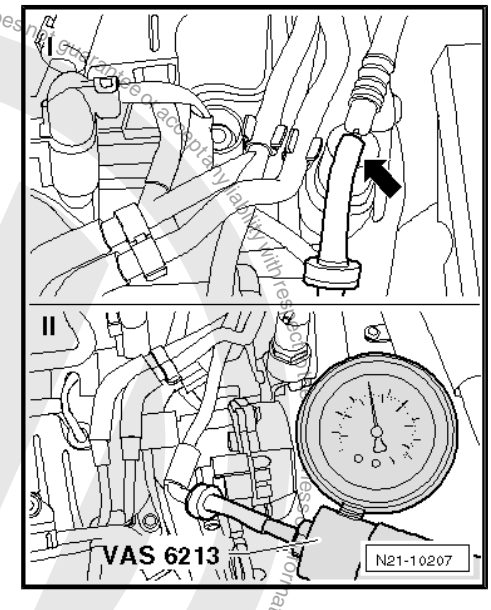
Remove the vacuum hose on the lower connection from the Wastegate Bypass Regulator Valve - N75- -arrow in II-.

– Seal the open hose end with a suitable blind plug.

Note

Do not use threaded bolts or pins.

– Disconnect the vacuum hose -arrow- at the vacuum pump connecting piece.
– Connect the Hand Vacuum Pump - VAS6213- to the removed hose and generate a vacuum pressure of 0.6 bar (8.7 psi).
– Watch the pressure gauge on the Hand Vacuum Pump - VAS6213- for approximately 30 seconds.
• The vacuum must not drop.



If vacuum drops:

– Replace the hose piece if there is damage or leaks in the hose line connection.

If the vacuum does not decrease:

– First disconnect the hose at the Hand Vacuum Pump - VAS6213- .
– Remove the blind plug from the hose end.
– If the check valve -item 6- ⇒ Item 6 (page 296) functions, a noticeable hissing can be heard as the vacuum pressure reduces.

If there is not a hissing sound:

– Replace the check valve -item 6- ⇒ Item 6 (page 296) .

If there is a hissing sound:

– Connect all the vacuum hoses.
– Check the control line to the turbocharger. Refer to ⇒ "4.7.2 Control Line to Turbocharger, Checking", page 299 .

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4.7.2 Control Line to Turbocharger, Checking

Special tools and workshop equipment required

- Hand Vacuum Pump - VAS6213-

Caution

- *When routing the vacuum lines, make sure they are not kinked, twisted or pinched. They could disable the vehicle.*
- *Follow the safety precautions when working on the charge air system and turbocharger. Refer to ⇒ "1 Safety Precautions when Working on Charge Air System And Turbocharger", page 268 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 269 .*

Always pay attention to these instructions before and during work.

– Remove the vacuum hose at the center connection of the Wastegate Bypass Regulator Valve - N75- -item 2- ⇒ Item 2 (page 296) as well as at the turbocharger vacuum diaphragm -item 1- ⇒ Item 1 (page 296) .

– Seal an open end of the hose with a suitable blind plug.

Note

Do not use threaded bolts or pins.

– Connect the Hand Vacuum Pump - VAS6213- to the other end of the hose and generate a vacuum of 0.6 bar (8.7 psi).

– Watch the pressure gauge on the Hand Vacuum Pump - VAS6213- for approximately 30 seconds.

• The vacuum must not drop.

If vacuum drops:

– Replace the vacuum hose.

– Connect all the vacuum hoses.

– Install the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

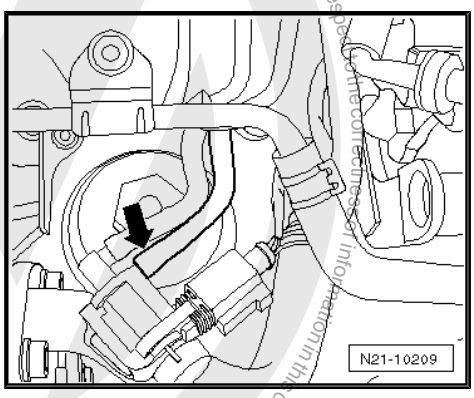
If the vacuum does not decrease:

– Connect all the vacuum hoses.

– Install the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

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4.7.3 Control Line to EGR Cooler Switch-Over Vacuum Diaphragm, Checking, Engine Codes CBDA, CBDB, CEGA



– Remove the hose at the center connection of the EGR Cooler Switch-Over Valve - N345- -arrow-.
– Connect the Hand Vacuum Pump - VAS6213- to the removed hose and generate a vacuum pressure of 0.6 bar (8.7 psi).
– Watch the pressure gauge on the hand vacuum pump for approximately 30 seconds. The vacuum must not drop.

If the pressure drops:

– Remove the vacuum hose on the vacuum diaphragm for the EGR cooler switch-over.
– Connect the Hand Vacuum Pump - VAS6213- with the supplied test hose to the vacuum diaphragm and create a pressure of 0.6 bar (8.7 psi).

Note

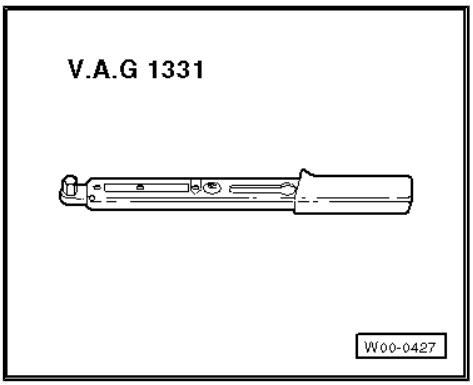
- *The adjusting travel of the vacuum diaphragm must be recognizable and the vacuum must not drop. If it is not, replace the EGR cooler. Refer to*
  ⇒ "4.1 Overview - Exhaust Gas Recirculation System Components", page 403 .
- *If a fault is not identified at the vacuum diaphragm, replace the vacuum line on the EGR Cooler Switch-Over Valve - N345- .*
- *Install the engine cover. Refer to*
  ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

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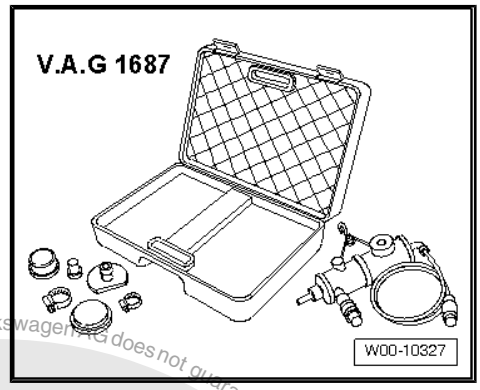
5 Special Tools

Special tools and workshop equipment required

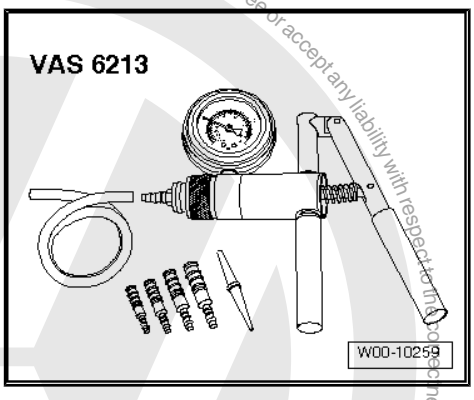
- Torque Wrench 1331 5-50Nm - VAG1331-



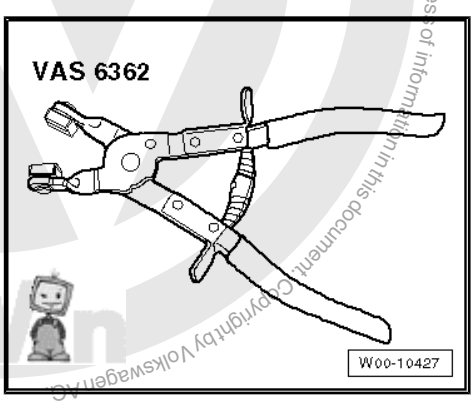
- Turbo System Tester Kit - VAG1687-



- Hand Vacuum Pump - VAS6213-



- Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340-



- Not Illustrated:
- Wrench - Open End - 14mm - T10461-

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- Ultrasonic Measuring Device - VAG1842-
- Turbo System Tester Kit - Adapter 10 - VAG1687/10-
- Union Nut Socket - T40055-
- Actuator Socket - 10mm - T10422AA-
- Ring Wrench 10x12mm - T10423-

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23 – Diesel Fuel Injection

1 Safety Precautions when Working on Diesel Direct Fuel Injection System

WARNING

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *Route all lines and wires in their original locations.*
- *For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.*
- *Make sure that there is sufficient clearance to all moving or hot components.*

DANGER!

When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- *The fuel or fuel lines in fuel system can become very hot (danger of scalding)!*
- *Always wear protective eyewear, safety gloves and protective clothing when performing any work on the fuel system to avoid eye injuries and burns.*
- *In addition, the fuel system is under pressure! Before opening the system, place rags around the connection area and release pressure by carefully loosening the connection!*
- *If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ "3.9 Fuel System, Filling/Bleeding", page 328 . (Running the high pressure fuel pump when dry must always be avoided).*

If Testing Equipment Is Required during a Road Test, Note the Following:

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

If the vehicle is involved in a collision while testing and measuring equipment is operated from the front passenger seat, the person sitting in that seat could be seriously injured when the airbag deploys.

To Reduce the Risk of Personal Injury and/or Damage to the Fuel Injection and Glow Plug System, Always Observe the Following:

- Only disconnect and reconnect wires for glow plug and fuel injection systems, including test leads, when the ignition is switched off.

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- The Battery - A- may only be disconnected and connected when the ignition is switched off, otherwise it could damage the Engine Control Module - J623- .

– Observe the notes after connecting the Battery - A- . Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

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2 Guidelines for Clean Working Conditions

When Working on the Fuel Supply/Injection System, Pay Careful Attention to the Following "7 rules" of Cleanliness:

- Thoroughly clean the connection points and the surrounding area before loosening.
- Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- Carefully cover or seal opened components if the repair is not performed immediately.
- Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- Transport and protective packaging and sealing caps are to be removed only immediately prior to installation.
- When the fuel system is open: avoid working with compressed air if possible. Do not move the vehicle if possible.
- In addition, do not let diesel fuel flow onto the coolant hoses. If necessary, the hoses must be cleaned again immediately. Replace corroded hoses.

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3 Diesel Direct Injection System

⇒ “3.1 General Information”, page 306

⇒ “3.2 System Overview”, page 307

⇒ “3.3 Overview - Fuel System”, page 311

⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315

⇒ “3.5 Fuel Pressure Regulator Valve N276 , Checking”, page 321

⇒ “3.6 Fuel Pressure Regulator Valve N276 , Removing and Installing”, page 322

⇒ “3.7 Fuel Pressure Sensor G247 , Removing and Installing”, page 323

⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325

⇒ “3.9 Fuel System, Filling/Bleeding”, page 328

⇒ “3.10 Fuel System, Performing Leak Test”, page 329

⇒ “3.11 Pressure Retaining Valve in Fuel Return, Checking”, page 330

⇒ “3.12 Overview - Intake Manifold with Attachments”, page 331

⇒ “3.13 Intake Manifold, Removing and Installing”, page 333

⇒ “3.14 Overview - Air Filter”, page 335

⇒ “3.15 Air Filter Housing, Removing and Installing”, page 338

⇒ “3.16 Air Filter Element, Removing and Installing”, page 339

⇒ “3.17 Mass Airflow Sensor G70 , Removing and Installing”, page 341

3.1 General Information

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 305 .*

Always pay attention to these instructions before and during work.

Note

The Engine Control Module - J623- is equipped with a DTC memory. Before and after repairs or adjustments, the DTC memory must be checked. Refer to Vehicle Diagnostic Tester in “Guided Functions”.

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3.2 System Overview

⇒ "3.2.1 System Overview", page 307

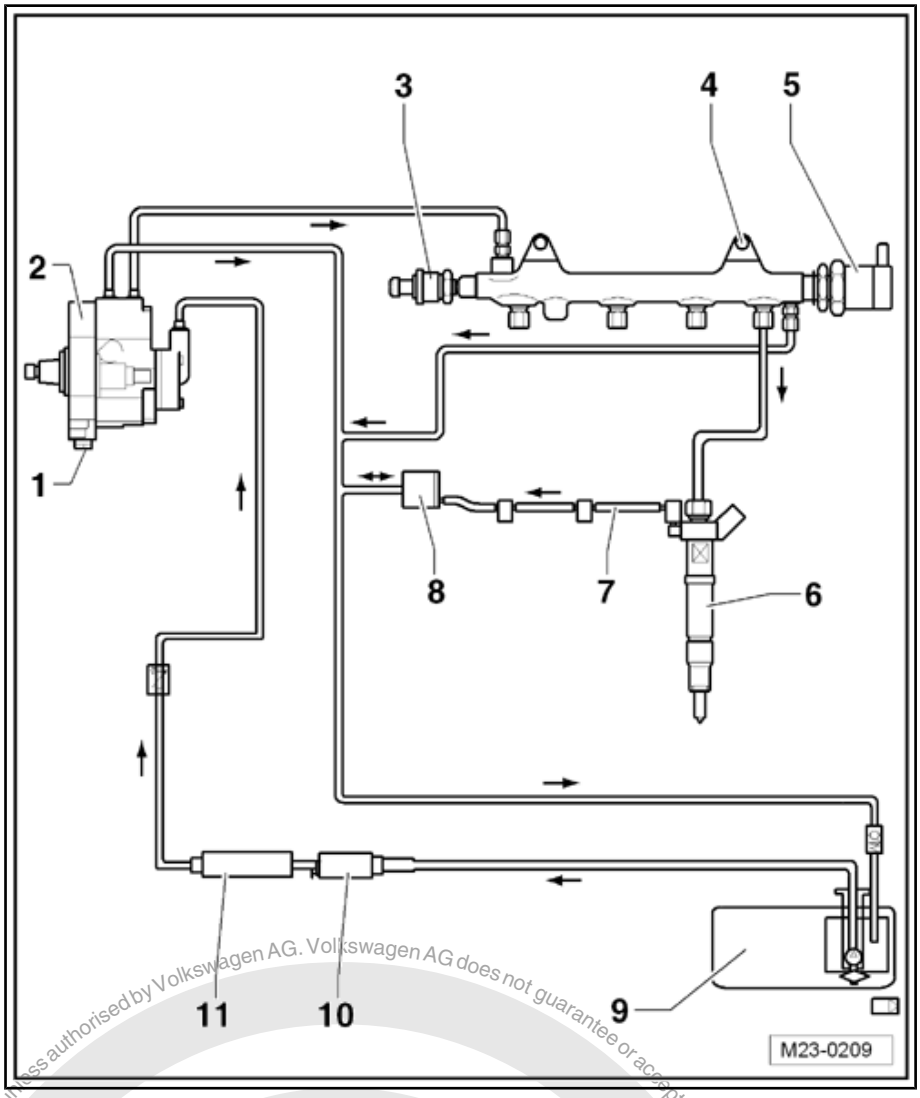
3.2.1 System Overview

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*
- *If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ "3.9 Fuel System, Filling/Bleeding", page 328 . (Never let the high pressure pump run dry).*

Always pay attention to these instructions before and during work.

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1 - Fuel Metering Valve - N290-

- ❑ Do not open

2 - High Pressure Fuel Pump

- ❑ Removing and installing. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .
- ❑ The fuel system “must” always be filled after replacing (never run dry) (refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328), Fuel System, Filling.

3 - Fuel Pressure Sensor - G247-

- ❑ Removing and installing. Refer to ⇒ “3.7 Fuel Pressure Sensor G247 , Removing and Installing”, page 323 .

4 - Rail Element (High Pressure Reservoir)

5 - Fuel Pressure Regulator Valve - N276- , 80 Nm

- ❑ Removing and installing. Refer to ⇒ “3.6 Fuel Pressure Regulator Valve N276 , Removing and Installing”, page 322 .

6 - Fuel Injector (Piezo Injectors)

- ❑ Cylinder 1 Fuel Injector - N30-
- ❑ Cylinder 2 Fuel Injector - N31-
- ❑ Cylinder 3 Fuel Injector - N32-
- ❑ Cylinder 4 Fuel Injector - N33-
- ❑ Removing and installing. Refer to ⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315 .

7 - Fuel Return Lines

- ❑ The fuel return line must be routed correctly. They may be replaced only with the pressure retaining valve.
- ❑ Run the engine at idle for approximately two minutes after replacing to bleed the fuel system and then check the fuel return lines for leaks.

8 - Pressure Retaining Valve

- ❑ The check valve always maintains a residual pressure (control quantity) of approximately 10 bar (145.03 psi) in the fuel return lines.
- ❑ The fuel injectors require this control quantity to function correctly.
- ❑ The pressure retaining valve must be replaced completely with the fuel return lines -item 7- ⇒ Item 7 (page 308) .
- ❑ The engine must run at idle for approximately two minutes after replacing to bleed the fuel system.
- ❑ Pressure Retention Valve in Fuel Return Line, Checking. Refer to ⇒ “3.11 Pressure Retaining Valve in Fuel Return, Checking”, page 330 .

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9 - Fuel Tank

- ❑ Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011. Refer to ⇒ “4.2 Overview - Fuel Tank, All Vehicles Except Jetta from MY 2011”, page 231
- ❑ Overview - Fuel Tank, Jetta from MY 2011 Only. Refer to ⇒ “4.3 Overview - Fuel Tank, Jetta from MY 2011 Only”, page 233

10 - Fuel Filter

- ❑ Overview - Fuel Filter. Refer to ⇒ “6.2 Overview - Fuel Filter”, page 249 .

11 - Auxiliary Fuel Pump - V393-

- ❑ Removing and installing. Refer to ⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259 .

3.2.2 System Overview - Engine Codes CBDA, CBDB, CEGA

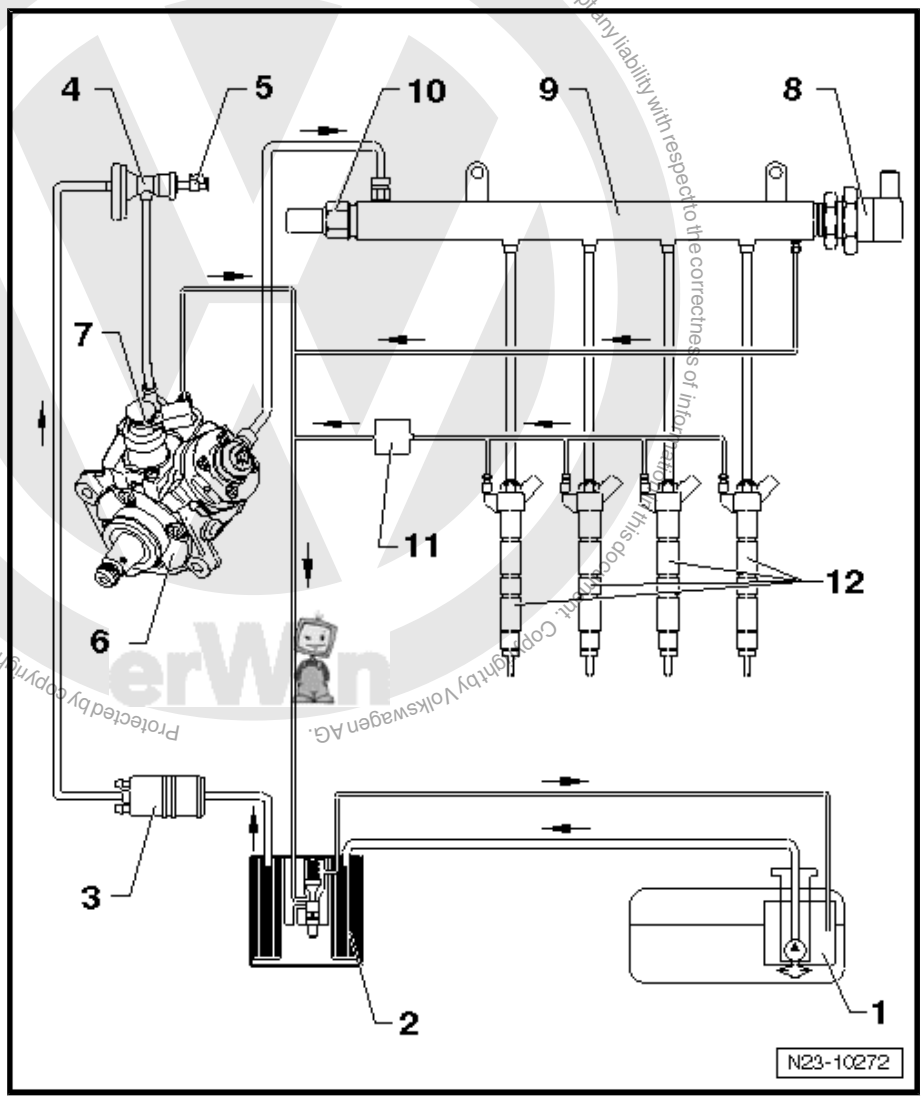
DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 305 .*
- *If fuel system components between the fuel tank and high pressure fuel pump were removed or replaced, the fuel system must be filled in order to bleed it. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 . (Never let the high pressure pump run dry).*

Always pay attention to these instructions before and during work.

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1 - Fuel Tank

- ❑ With the Transfer Fuel Pump - G6-

2 - Fuel Filter

- ❑ with pre-warm valve
- ❑ Overview - Fuel Filter. Refer to ⇒ “6.2 Overview - Fuel Filter”, page 249 .
- ❑ Removing and installing. Refer to ⇒ “6.3 Fuel Filter, Removing and Installing”, page 251

3 - Auxiliary Fuel Pump - V393-

Removing and installing. Refer to ⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259 .

4 - Filter

5 - Fuel Temperature Sensor - G81-

6 - High Pressure Pump

- ❑ After replacing, the fuel tank must be filled (never run dry). Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .
- ❑ Removing and installing. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .

7 - Fuel Metering Valve - N290-

- ❑ Must not be removed

8 - Fuel Pressure Regulator Valve - N276-

- ❑ Removing and installing. Refer to ⇒ “3.6 Fuel Pressure Regulator Valve N276 , Removing and Installing”, page 322 .

9 - High Pressure Reservoir (Rail)

10 - Fuel Pressure Sensor - G247-

- ❑ Removing and installing. Refer to ⇒ “3.7 Fuel Pressure Sensor G247 , Removing and Installing”, page 323 .

11 - Pressure Retaining Valve

- ❑ The pressure retaining valve always maintains a residual pressure (control quantity) of approximately 10 bar (145.03 psi) in the fuel return lines.
- ❑ The Piezo injectors need this control quantity for their function.
- ❑ The pressure retaining valve can be replaced only with the complete fuel return lines.
- ❑ The engine must run at idle for approximately two minutes after replacing to bleed the fuel system.
- ❑ Check the pressure retaining valve. Refer to ⇒ “3.11 Pressure Retaining Valve in Fuel Return, Checking”, page 330 .

12 - Fuel Injector (Piezo Injectors)

- ❑ Cylinder 1 Fuel Injector - N30-

- ❑ Cylinder 2 Fuel Injector - N31-
- ❑ Cylinder 3 Fuel Injector - N32-
- ❑ Cylinder 4 Fuel Injector - N33-
- ❑ Removing and installing. Refer to
⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315 .

3.3 Overview - Fuel System

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to*
⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 303 .
- *Pay attention to the guidelines for clean working conditions. Refer to*
⇒ “2 Guidelines for Clean Working Conditions”, page 305 .

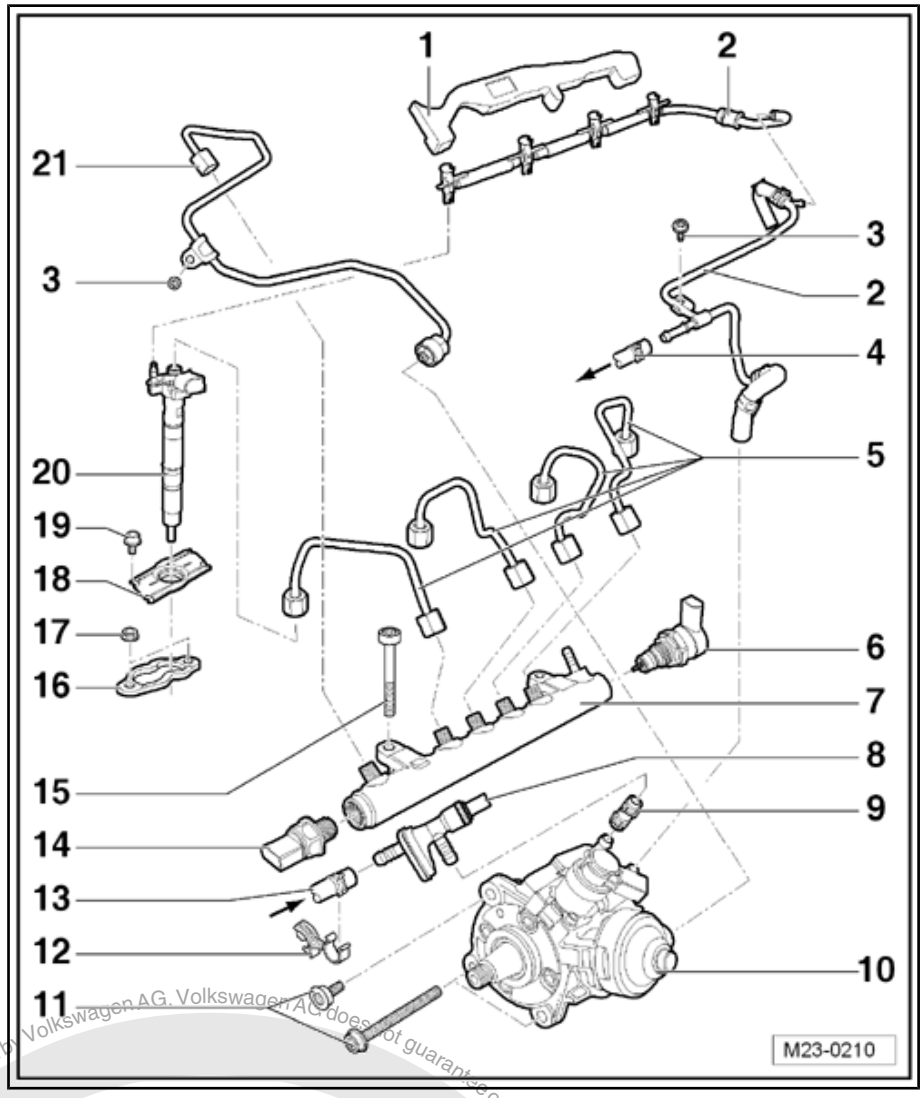
Always pay attention to these instructions before and during work.

Caution

Follow the points below to avoid running the high pressure fuel pump dry and to start the engine quickly after replacing the components:

- *If the fuel system components between the fuel tank and the high pressure fuel pump are removed or replaced,*
- *the basic setting “transfer fuel pump test” must be performed to vent the fuel system.*
- *If a fuel pump, fuel line (between the fuel tank and the high pressure fuel pump) or fuel filter is removed or replaced,*
- *the “transfer fuel pump test” basic setting must be performed »1 time« before starting the engine for the first time.*
- *If the high pressure fuel pump was removed or replaced, the “check the transfer fuel pump” basic setting must be performed »three times« before starting the engine for the first time.*
- *Fill the fuel tank after installing the high pressure pump. Refer to*
⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

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1 - Protective Strip

- For the rail element (high pressure reservoir) -item 7- ⇒ Item 7 (page 313) and high pressure lines -item 5- ⇒ Item 5 (page 312)

2 - Fuel Return Lines

- With pressure retaining valve -item 8- ⇒ Item 8 (page 308)
- The fuel return line must be routed correctly. They may be replaced only with the pressure retaining valve.
- Run the engine at idle for approximately two minutes after replacing to bleed the fuel system and then check the fuel return lines for leaks.
- Pressure Retention Valve in Fuel Return Line, Checking. Refer to ⇒ “3.11 Pressure Retaining Valve in Fuel Return, Checking”, page 330 .

3 - Bolt

- 8 Nm

4 - Fuel Return Line

- Blue or with blue marking
- Check for secure fit
- From fuel filter -item 7- ⇒ Item 7 (page 250)

5 - High Pressure Lines

- 28 Nm
- Between the rail element (high pressure reservoir) -item 7- ⇒ Item 7 (page 313) and fuel injector -item 20- ⇒ Item 20 (page 313)

Caution

The high pressure lines can be reused only after the following tests:

- *Check the sealing cone on each high pressure line for the deformation and cracks.*
- *The holes for the lines must not be deformed, narrowed or damaged.*
- *Do not use corroded lines again.*

- Do not interchange.
- When installing, the fuel injectors -item 20- ⇒ Item 20 (page 313) and high pressure lines may only be installed on the same cylinder as before.

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- ❑ Do not change the angles of the high pressure lines
- ❑ Install without tension

6 - Fuel Pressure Regulator Valve - N276- , 80 Nm

- ❑ Removing and installing. Refer to ⇒ “3.6 Fuel Pressure Regulator Valve N276 , Removing and Installing”, page 322 .

7 - Rail Element (High Pressure Reservoir)

8 - Fuel Temperature Sensor - G81-

9 - Fuel Supply Line

- ❑ Check for secure fit
- ❑ Between the Fuel Temperature Sensor - G81- -item 8- ⇒ Item 8 (page 313) and high pressure fuel pump -item 10- ⇒ Item 10 (page 313) .

10 - High Pressure Fuel Pump

- ❑ With Fuel Metering Valve - N290- -item 1- ⇒ Item 1 (page 308)
- ❑ Removing and installing. Refer to ⇒ “3.8 High Pressure Fuel Pump, Removing and Installing”, page 325 .
- ❑ The fuel system “must” always be filled after replacing (never run dry) (refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328), Fuel System, Filling.

11 - Bolt

- ❑ 20 Nm

12 - Bracket

- ❑ For the Fuel Temperature Sensor - G81- -item 8- ⇒ Item 8 (page 313)

13 - Fuel Supply Line

- ❑ white or with white markings
- ❑ Check for secure fit
- ❑ From the Auxiliary Fuel Pump - V393-
- ❑ Auxiliary Fuel Pump - V393- , Removing and installing. Refer to ⇒ “6.6 Auxiliary Fuel Pump V393 (Inline Fuel Pump), Removing and Installing”, page 259

14 - Fuel Pressure Sensor - G247- , 100 Nm

- ❑ Removing and installing. Refer to ⇒ “3.7 Fuel Pressure Sensor G247 , Removing and Installing”, page 323 .

15 - Bolt

- ❑ 22 Nm

16 - Tensioning Claw

- ❑ Replace
- ❑ Note the installation position Refer to ⇒ Fig. ““Tensioning Bracket Installation Position”“ , page 314 .

17 - Nut

- ❑ 10 Nm

18 - Fuel Injector Cover

19 - Bolt

- ❑ 5 Nm

20 - Fuel Injector (Piezo Injector)

- ❑ The following components and seals and/or O-ring must be replaced at every removal and installation: “tension bracket”, “copper washer”, “fuel injection unit shaft O-ring” and “fuel injection return O-ring”.
- ❑ The following components and seals and/or O-ring must be replaced when replacing the fuel injection unit: “tensioning claw”, “fuel injection line”, “copper washer” “fuel injection unit shaft O-ring” “fuel injection unit return O-ring”
- ❑ When installing, the fuel injectors -item 5- ⇒ Item 5 (page 312) and high pressure lines may only be installed on the same cylinder as before.
- ❑ Removing and installing. Refer to ⇒ “3.4 Fuel Injector (Piezo Injector), Removing and Installing”, page 315 .

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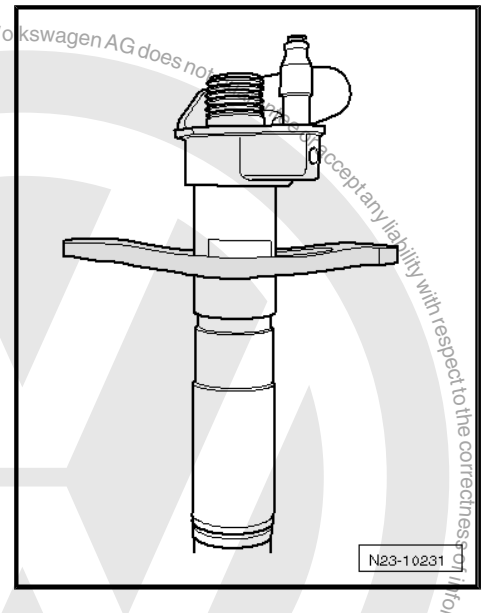
21 - High Pressure Line

- ❑ 28 Nm
- ❑ between the high pressure fuel pump -item 10- ⇒ Item 10 (page 313) and rail element (high pressure reservoir) -item 7- ⇒ Item 7 (page 313)

> **Caution**
> *The high pressure lines can be reused only after the following tests:*
> *Check the sealing cone on each high pressure line for the deformation and cracks.*
> *The holes for the lines must not be deformed, narrowed or damaged.*
> *Do not use corroded lines again.*

- ❑ Do not bend the high pressure line to a different angle.
- ❑ Install without tension

Tensioning Bracket Installation Position

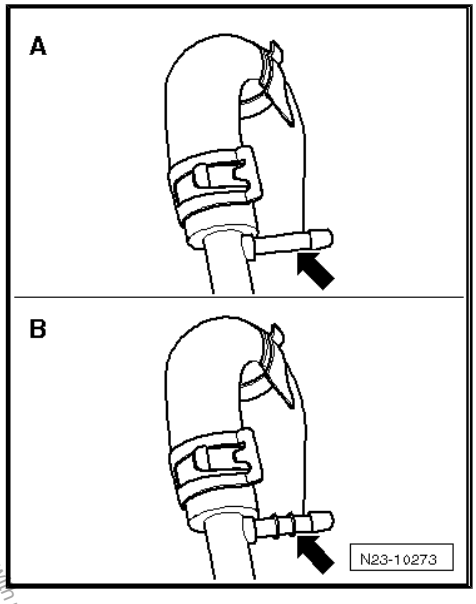


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Fuel Return Line Differences

-A-, No ribbing: for connecting the overflow oil line, use a clamp. Refer to the Parts Catalog.

-B-, With ribbing: for connecting the overflow oil line, do NOT use a clamp



3.4 Fuel Injector (Piezo Injector), Removing and Installing

Special tools and workshop equipment required

- Puller - Unit Injector - T10055- with Puller - Unit Injector Adapter 1 - T10055/1-
- O-Ring Assembly Sleeve - T10377-
- Union Nut Socket - T40055-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

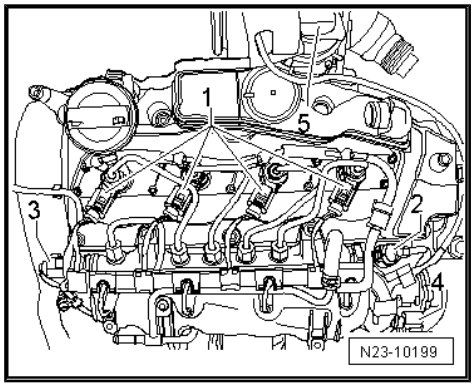
Removing:

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

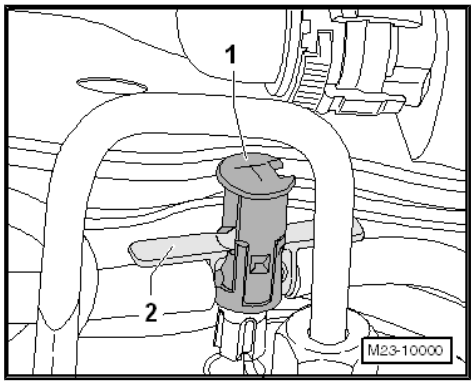
– Remove the protective strip, if equipped -item 1- ⇒ Item 1 (page 312) .

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– Disconnect the connector -1- from the fuel injectors to be removed.
– Before removing, dry the return line connection on the fuel injectors that will be removed (for example using a commercially available detergent).
– Clean and dry the return line connections.
– Cover the return line connection with a rag.



– Remove the fuel return line connections -1- from the fuel injectors to be removed. Pull them upward to release.



Note

Pay attention to cleanliness. Dirt and contaminants must not enter the return lines and the connections on the fuel injectors.

– Remove the high pressure line -item 5- ⇒ Item 5 (page 312) between the rail element (high pressure reservoir) and the fuel injectors to be removed.
– Remove the bolts in the cover -item 18- ⇒ Item 18 (page 313) on the fuel injectors to be removed.
– Raise the cover slightly and rotate it 90° to free up the fuel injector nuts.

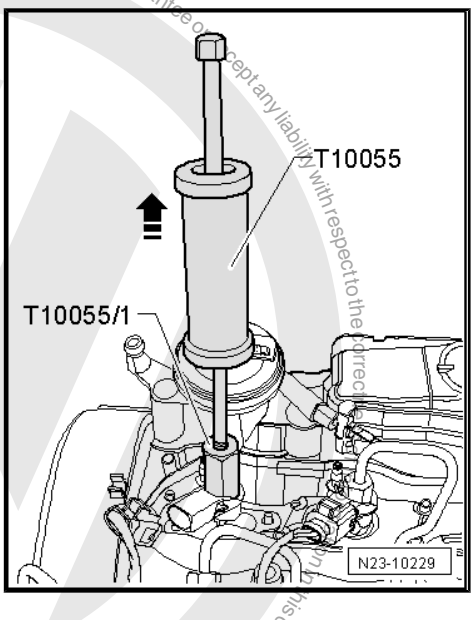
Caution

When removing the fuel injector nuts, the nut could fall into the cylinder head. Work very carefully to avoid unnecessary work or damage.

– Remove the nuts from the corresponding fuel injector.

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– Position the Puller - Unit Injector - T10055- with the Puller - Unit Injector - Adapter 1 - T10055/1- , as shown, and remove the fuel injector upward by tapping.



Installing:

Important Instructions on Installing the Fuel Injectors:

- The following components, seals and O-rings must be replaced during every removal and installation: “tensioning claw” “copper washer”, “O-ring from the fuel injector shaft” and the “O-ring for the fuel injector return”.
- The following components, seals and/or O-rings must be replaced when replacing an injector: “tensioning bracket”, “injection line”, “copper washer”, “injector shaft O-ring” and “fuel injector return O-ring”
- Fuel injection unit must be installed in the same cylinder.
- Check the fuel injectors and installation locations for contamination before assembling.
- The fuel injectors must not have any damage.
- Lubricate all of the O-rings with assembly oil or engine oil before installing.

If a Used Fuel Injector Is Installed:

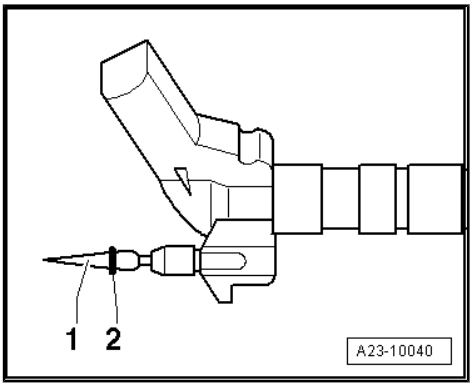
– Spray the tip of the fuel injector with a rust removing spray. Remove the rust or oil particles with a rag after approximately five minutes.

– To remove the used copper gasket from the fuel injector, clamp the gasket carefully in a vise until the clamping jaws on the vise prevent the copper gasket from turning. Pull the fuel injector out of the copper gasket by hand with slight rotating and pulling motions.

– Use a plastic socket to install the copper gasket.

– To avoid damaging the O-ring, slide the new O-ring -2- for the fuel return connection over the assembly mandrel -1-.

– To remove rust particles on the fuel injector sealing surface, clean the fuel injector duct in the cylinder head with a cloth dampened with engine oil or rust remover. Do not damage the sealing flanges.

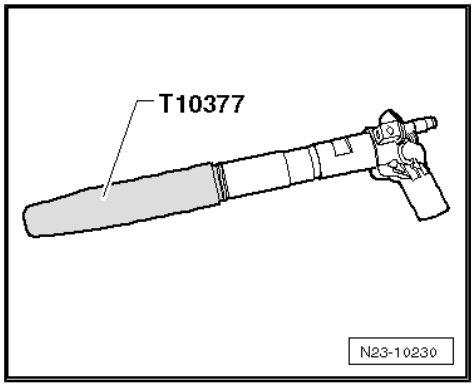


– Replace the fuel injector shaft seal using the O-Ring Assembly Sleeve - T10377- .

– Slide the fuel injector cover on.

– Slide the clamping bracket onto the fuel injector and make sure it is positioned correctly. Refer to ⇒ Fig. ""Tensioning Bracket Installation Position"" , page 314 .

– Insert the fuel injector in the fuel injector shaft.



Caution

When installing the fuel injector nuts, the nut could fall into the cylinder head. Work very carefully to avoid unnecessary work or damage.

– Mount the nuts on the tension bracket by hand and tighten them. Tightening specification -item 17- ⇒ Item 17 (page 313) .

– Turn the cover for the fuel injectors to its installed position and tighten it. Tightening specification -item 19- ⇒ Item 19 (page 313) .

– Install the high pressure lines. Refer to ⇒ "3.4.1 High Pressure Lines, Installing", page 318 .

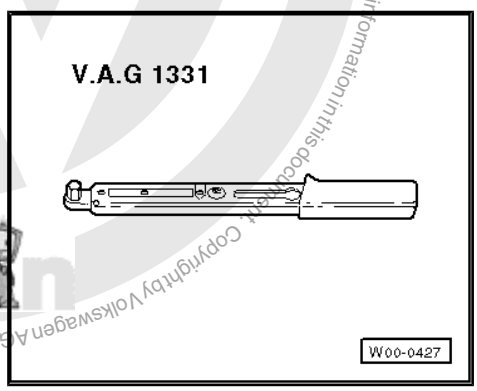
Note

After replacing one or more injectors, the "injector quantity calibration" and the "injection pressure calibration" for the new injectors must be must be programmed into the engine control module using. Refer to Vehicle Diagnostic Tester in Guided Functions.

3.4.1 High Pressure Lines, Installing

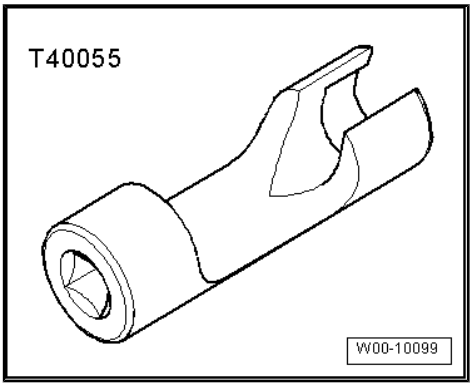
Special tools and workshop equipment required

♦ Torque Wrench 1331 5-50Nm - VAG1331-



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♦ Union Nut Socket - T40055-



Caution

Loosen the rail and move it slightly. This makes it possible to mount the fuel injection line free of tension. The lines must not be bent or under stress. Long term this would cause the line to break.

Note

The following describes installing new fuel injection lines. If installing fuel injection lines, which were already removed, then be sure to check the points listed in -item 5- ⇒ Item 5 (page 312) . The procedure is otherwise identical.

Installing the Individual Fuel Injection Lines (Cylinder 1 through 4, between the Rail and Fuel Injector)

Tightening specifications. Refer to ⇒ "3.3 Overview - Fuel System", page 311 .

– Remove the new fuel injection line from the packaging, remove the plugs and place the line between the rail and injector immediately.

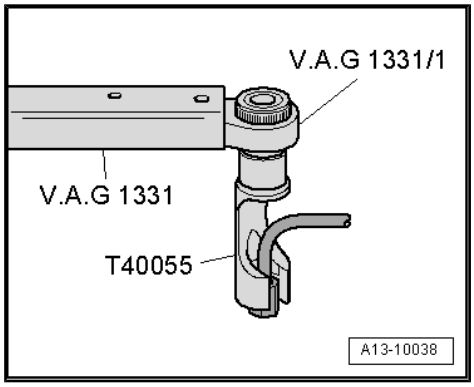
– First tighten the union nuts by hand on the fuel injection line without using tools. Make sure the line is installed correctly.

– Proceed the same way with the other fuel injection lines, if necessary.

– Tighten the rail, if necessary, again to the tightening specification.

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– Tighten the union nuts on all the newly installed fuel injection lines to the tightening specification using Torque Wrench 1331 5-50Nm - VAG1331- and Union Nut Socket - T40055- .



Installing the Fuel Line (between the High Pressure Pump and the Rail) or the Entire Wiring Harness

Tightening specifications. Refer to
⇒ “3.3 Overview - Fuel System”, page 311 .

– Loosen the bolts on the Rail and make sure it is possible to move the rail, if this was not done before.

– Then remove the fuel line from its packaging, remove the plugs and position the line immediately between the high pressure pump and the rail.

– First tighten the union nuts by hand on the fuel injection line without using tools. Make sure the line is installed correctly.

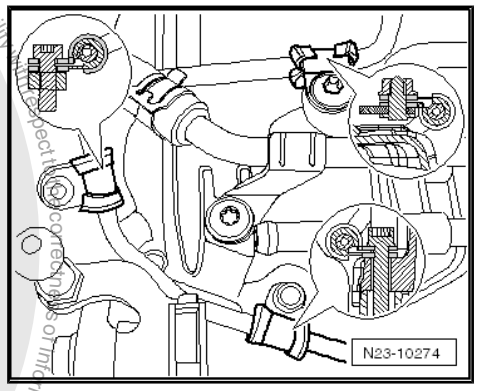
– Proceed in the same way with the four fuel injection lines, if the entire wiring harness has to be installed.

– Install all three clamps over the fuel line. Make sure they are aligned.

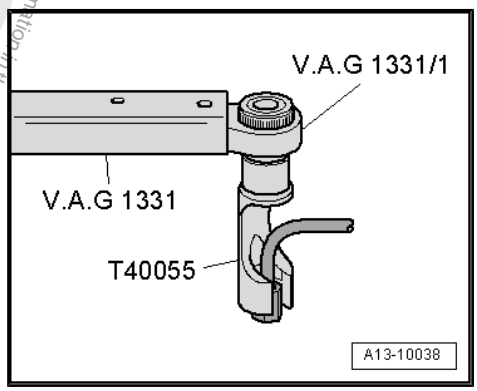
– Install the clamp screws approximately 3 thread turns.

– Tighten the rail again.

– Tighten the top clamp on the intake manifold to 8 Nm.



– Tighten the union nuts on all the newly installed fuel injection lines to the tightening specification using Torque Wrench 1331 5-50Nm - VAG1331- and Union Nut Socket - T40055- .



– Tighten the other two clamps to 8 Nm.

– Press the return line connections carefully over the sealing ring onto the injector (check the sealing ring first for damage). The connection must engage audibly. Then press the release pin down carefully.

– Fill the fuel system. Refer to
⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

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3.5 Fuel Pressure Regulator Valve - N276- , Checking

DANGER!

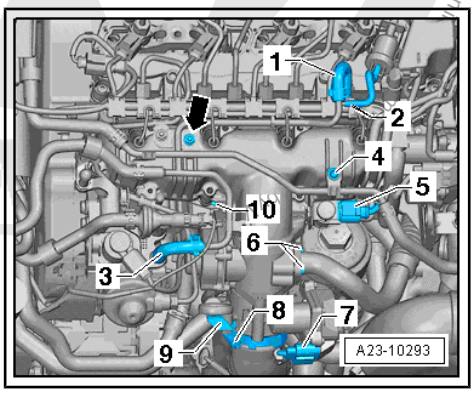
- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to* *⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303* .
- *Pay attention to the guidelines for clean working conditions. Refer to* *⇒ "2 Guidelines for Clean Working Conditions", page 305* .

Always pay attention to these instructions before and during work.

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

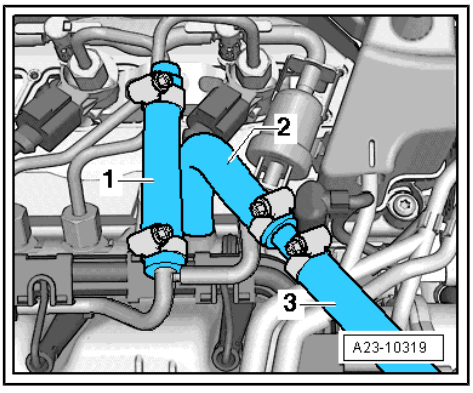
– Remove the noise insulation from the injectors.

– Disconnect the fuel return line -1-.



– Seal the open return line connection with a plug -1-.

– Connect the return line -2- with a hose -3-.

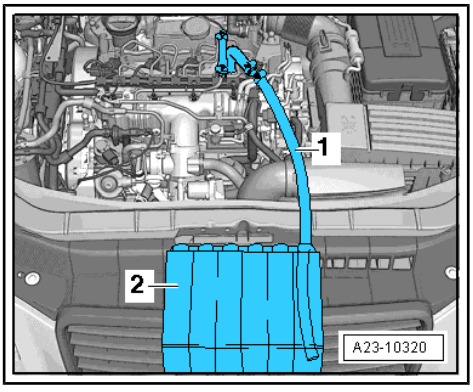


– Hold his hose -1- inside a suitable container -2- in order to measure the return quantity.

– Start engine and let it run at idle.

• Target value in 30 seconds: 90 to 110 ml (3.0 to 3.7 ounces).

If the specified value is not attained, then the fuel pressure regulator valve is faulty.



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3.6 Fuel Pressure Regulator Valve - N276- , Removing and Installing

Function

The Fuel Pressure Regulator Valve - N276- is located in the rail element (high pressure reservoir) and maintains a constant pressure in the rail element and in the high pressure lines (high pressure fuel circuit).

If the pressure in the high pressure fuel circuit is too high, the Fuel Pressure Regulator Valve - N276- opens so a portion of the fuel leaves the rail element through the return line and goes back into the fuel tank.

If the pressure in the fuel high pressure circuit is too low, the Fuel Pressure Regulator Valve - N276- closes and seals off the high pressure side from the low pressure side.

Special tools and workshop equipment required

- Torque Wrench 1332 40-200Nm - VAG1332-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

⇒ , page 323 .

Removing:

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

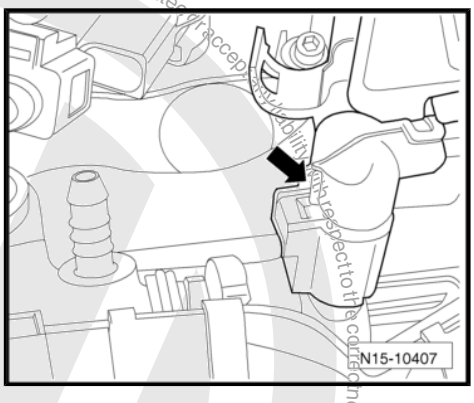
– Before removing, clean the threaded area around the Fuel Pressure Regulator Valve - N276- (for example using commercially available coolant). Contamination must not enter the bore in the rail element (high pressure reservoir).

Note

- *Clean carefully, cleaner must not enter the connector.*
- *The Fuel Pressure Regulator Valve - N276- cannot be used again.*

– Dry the Fuel Pressure Regulator Valve - N276- .

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– Disconnect the connector from the Fuel Pressure Regulator Valve - N276- -arrow-.
– Counterhold at the housing hex bolt and loosen the union nut. Then remove it by hand.
– Extract the contamination from the rail element bore (threads and sealing surface). Do not use mechanical tools.

Note

Seal the rail element bore immediately with a suitable plug to prevent contaminants from entering.

Installing:

Note

- *Check the Fuel Pressure Regulator Valve - N276- sealing surface and threads for damage.*
- *Check the sealing surface on the rail element bore.*
- *The threads on the Fuel Pressure Regulator Valve - N276- must be free of oil and grease.*

– First tighten the union nut on the Fuel Pressure Regulator Valve - N276- by hand.
– Align the Fuel Pressure Regulator Valve - N276- so the connecting line is not taut after connecting the electrical connector.
– Counterhold at the housing hex bolt and tighten the union nut:
• Tightening specification -item 6- ⇒ Item 6 (page 313) .
– After installing, let the engine run at a moderate speed for a few minutes and then stop it.
– Check the fuel system for leaks. Refer to ⇒ “3.10 Fuel System, Performing Leak Test”, page 329 .
– Read the DTC memory for the Engine Control Module - J623- again. Refer to Vehicle Diagnostic Tester in “Guided Functions”.
– Install the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

3.7 Fuel Pressure Sensor - G247- , Removing and Installing

Function

The Fuel Pressure Sensor - G247- (rail pressure sensor) is located in the rail element (high pressure reservoir). It measures the current fuel pressure in the high pressure system and delivers a voltage signal to the Engine Control Module - J623- .

If the Fuel Pressure Sensor - G247- malfunctions, the pressure is controlled via an Engine Control Module - J623- characteristic map (maximum engine speed is limited to approximately 3000 RPM in emergency operation mode).

Special tools and workshop equipment required

- Torque Wrench 1332 40-200Nm - VAG1332-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

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Removing:

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

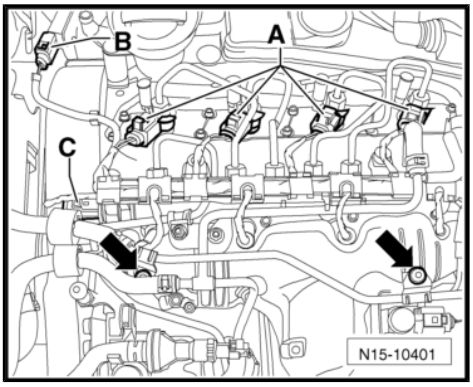
– Before removing, clean the threaded area around the Fuel Pressure Sensor - G247- (for example using commercially available coolant). Contamination must not enter the bore in the rail element (high pressure reservoir).

Note

Clean carefully, cleaner must not enter the connector.

– Dry the Fuel Pressure Sensor - G247- .

– Disconnect the connector from the Fuel Pressure Sensor - G247- -C-.
– Remove the Fuel Pressure Sensor - G247- .
– Extract the contamination from the rail element bore (threads and sealing surface). Do not use mechanical tools.



Note

Seal the rail element bore immediately with a suitable plug to prevent contaminants from entering.

Installing:

Note

- *Check the Fuel Pressure Sensor - G247- sealing surface and threads for damage.*
- *Check the sealing surface on the rail element bore.*
- *The Fuel Pressure Sensor - G247- threads are coated with an anti-friction coating so they must be free of oil and grease.*

– First tighten the Fuel Pressure Sensor - G247- by hand.
– Tighten the Fuel Pressure Sensor - G247- :
• Tightening specification -item 14- ⇒ Item 14 (page 313) .
– After installing, let the engine run at a moderate speed for a few minutes and then stop it.
– Check the fuel system for leaks. Refer to ⇒ “3.10 Fuel System, Performing Leak Test”, page 329 .
– Read the DTC memory for the Engine Control Module - J623- again. Refer to Vehicle Diagnostic Tester in “Guided Functions”.
– Install the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

3.8 High Pressure Fuel Pump, Removing and Installing

Special tools and workshop equipment required

- Counterhold - Camshaft Gear - T10051-
- Union Nut Socket - T40055-
- Puller - Pulley - T40064-
- Puller - Pulley - Pressure Pad - T40064/1-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-
- Hose Clip Pliers - VAS6362-
- Engine Bung Set - VAS6122- (not illustrated)

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DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to* *⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303* .
- *Pay attention to the guidelines for clean working conditions. Refer to* *⇒ "2 Guidelines for Clean Working Conditions", page 305* .

Always pay attention to these instructions before and during work.

Removing:

Requirements

- Ignition switched off.
- Engine must be cold.

Note

- *Only remove the high pressure fuel pump when the engine is cold.*
- *Make sure no contaminants enter the fuel system when removing the high pressure fuel pump.*
- *Seal off the connections in the fuel system using the plugs from the Engine Bung Set - VAS6122- .*

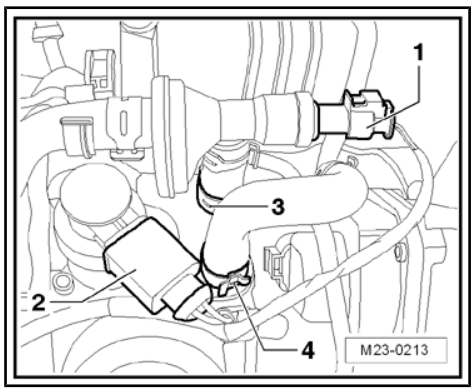
Procedure

– Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to ⇒ "1.6 Toothed Belt, Removing, Installing and Tensioning", page 95 , Toothed Belt, Removing, Installing and Tensioning.

– Disconnect from the Fuel Temperature Sensor - G81- -1- and from the Fuel Metering Valve - N290- on the high pressure fuel pump -2-.

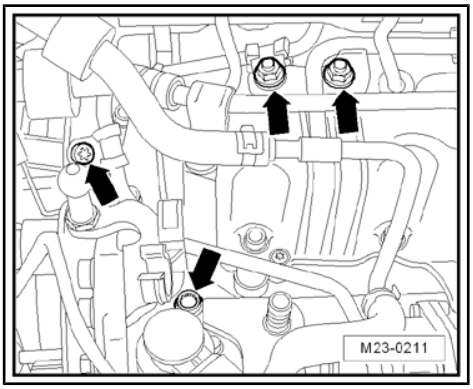
– Loosen the spring clips -3 and 4- with the Hose Clip Pliers - VAS6362- and disconnect the fuel lines at the high pressure fuel pump.

– Seal the lines so that no dirt can enter the fuel system.

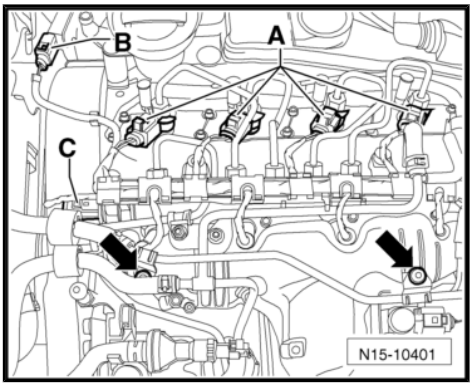


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– Loosen the high pressure line or fuel lines -arrows- on the intake manifold.
– Remove the protective strip, if equipped -item 1- ⇒ Item 1 (page 312) .



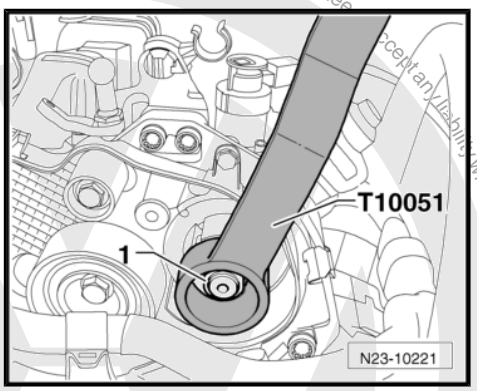
– Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247- -C-.
– Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.
– Unclip the wiring harness from the wiring guide for the glow plugs.



Caution

Always follow the procedure »Glow Plug Connectors, Removing and Installing«.

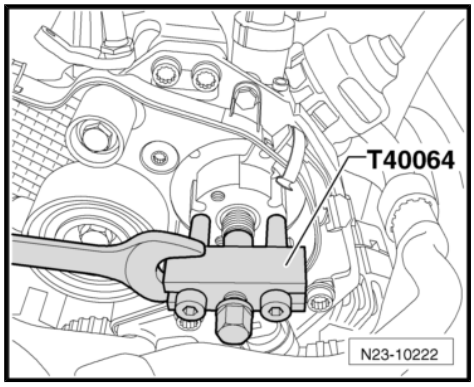
– Remove the glow plug connectors. Refer to ⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 410 .
– Remove the high pressure line -item 21- ⇒ Item 21 (page 314) between the high pressure fuel pump and rail element (high pressure reservoir).
– Remove the toothed belt sprocket from the high pressure fuel pump.
– Hold the high pressure fuel pump hub with the Counterhold - Camshaft Gear - T10051- and remove the nut -1-.



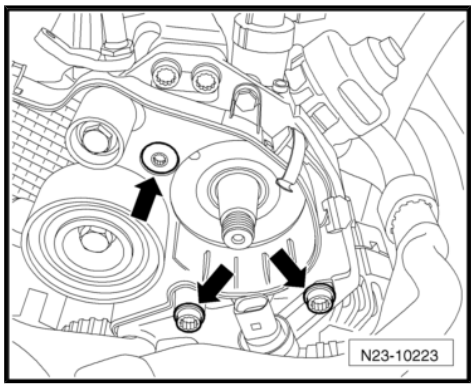
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– Position the Puller - Pulley - T40064- with the Puller - Pulley - Pressure Pad - T40064/1- as shown and remove the hub from the high pressure fuel pump. Counterhold with a 24 mm open-end wrench if necessary.

– Remove the high pressure fuel pump bolts -arrows-.



– Remove the high pressure fuel pump.



Installing:

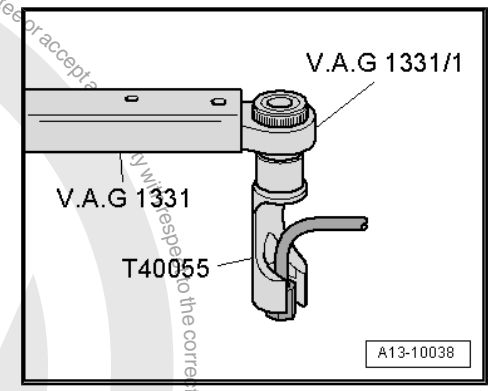
Install in reverse order of removal. Note the following:

- Make sure no contaminants enter the fuel system when installing the high pressure fuel pump.
- Only remove the plugs right before installing the fuel lines.
- Do not change the angles of the high pressure lines
- Make sure the line connections are secure.
- Do not interchange the supply line and the return line.

– First tighten the union nuts for the high pressure lines by hand.

– Make sure the high pressure lines are seated without tension.

– Tighten the high pressure lines using the Torque Wrench 1331 5-50Nm - VAG1331- with Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1- and Union Nut Socket - T40055- .



Tightening Specifications:

- Overview - Toothed Belt Drive. Refer to ⇒ “1.2 Overview - Toothed Belt Drive”, page 43 .
- Refer to ⇒ “3.3 Overview - Fuel System”, page 311 . Overview - Fuel System

– Installing and tensioning the toothed belt. Refer to ⇒ “1.6 Toothed Belt, Removing, Installing and Tensioning”, page 95 .

– Fill the fuel system. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

3.9 Fuel System, Filling/Bleeding

Caution

After installing the high pressure pump, it must be filled with fuel before starting the engine for the first time (never let the pump run dry).

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Note

- *When installing the high pressure pump, make sure that no dirt enters the fuel system.*
- *Only remove the plugs right before installing the fuel lines.*
- *The fuel tank must be filled.*

To Fill the High Pressure Fuel Pump with Fuel, Proceed as Follows:

– Switch the ignition on.

– Connect the Vehicle Diagnostic Tester and perform the “Vent Fuel system” Guided Function.

Note

The fuel pump are activated for 3 minutes.

– Then start the engine.

– After filling the fuel system, let the engine run at a moderate speed for a few minutes and then switch it off.

– Check the fuel system for leaks.

– Scan the DTC memory and delete the DTC memory entry if necessary.

– Test drive the vehicle for at least 20 km/h and test full-throttle acceleration at least once. Then check the high pressure area one more time for leaks.

Note

If there is still air in the fuel system, the engine may switch to emergency mode during the road test. Turn off the engine and erase the DTC memory. Then continue the road test.

– Scan the DTC memory again.

3.10 Fuel System, Performing Leak Test

DANGER!

- ***Follow the safety precautions when working on the diesel direct fuel injection system. Refer to*** ***⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 303 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to*** ***⇒ “2 Guidelines for Clean Working Conditions”, page 305 .***

Always pay attention to these instructions before and during work.

Test Sequence

– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

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– Let the engine run a few minutes at idle without pressing the accelerator pedal and then stop the engine. The fuel system bleeds itself.

– Check the entire fuel supply system for leaks.

If there are leaks despite correct tightening specifications, replace the affected component.

– Perform a road test where the accelerator pedal is fully depressed at least one time. Then check the high pressure area again for leaks.

Note

- *Follow all applicable safety precautions during a road test. Refer to ⇒ page 303 .*
- *If there is still air in the fuel system, the engine may switch to emergency mode during the road test. Stop the engine and delete all DTC entries. Refer to Vehicle Diagnostic Tester "Guided Functions".*

– Install the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

3.11 Pressure Retaining Valve in Fuel Return, Checking

Function

The pressure retaining valve in the fuel return has the function of always maintaining a residual pressure (control quantity) of approximately 10 bar (145.03 psi).

The fuel injectors require this control quantity to function correctly.

Special tools and workshop equipment required

- Fuel Return System Tester - VAS6330- (not illustrated)

Test Sequence

DANGER!

- ***Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .***
- ***Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .***

Always pay attention to these instructions before and during work.

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

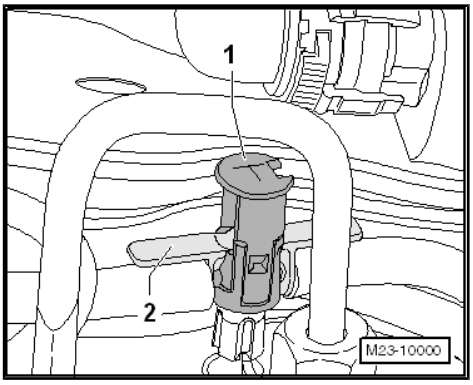
– Remove the protective strip, if equipped -item 1- ⇒ Item 1 (page 312) .

– Before removing, clean the cylinder 1 return line connection using a commercially available detergent, for example.

– Dry the cylinder 1 return line connection.

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– Cover the cylinder 1 return line connection with a cleaning cloth.
– Remove the fuel return line connection from cylinder 1. Press the connection at the tabs -2- downward and pull the center piece -1- upward to release.



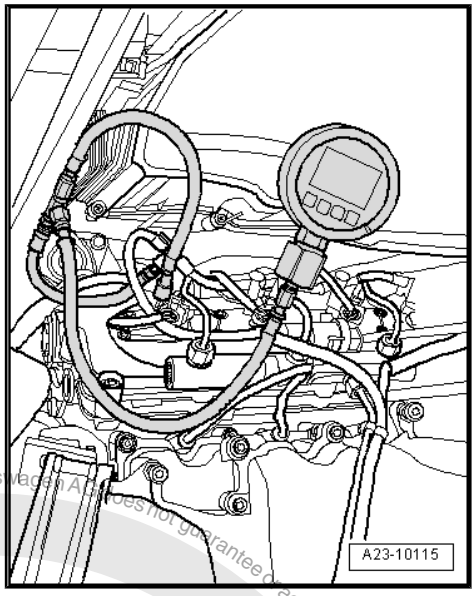
Note

Pay attention to cleanliness. Dirt must not enter the return line and the connection on the fuel injectors.

– Install the Fuel Return System Tester - VAS6330- between the return line connection on the fuel injector and the return line.
– Start the engine and let it run at idle speed.
– Check the pressure on the pressure gauge.
• Specified value: approximately 10 bar (145.03 psi)

If the specified value is not obtained:

– Replace the pressure retaining valve -item 8- ⇒ Item 8 (page 308) .



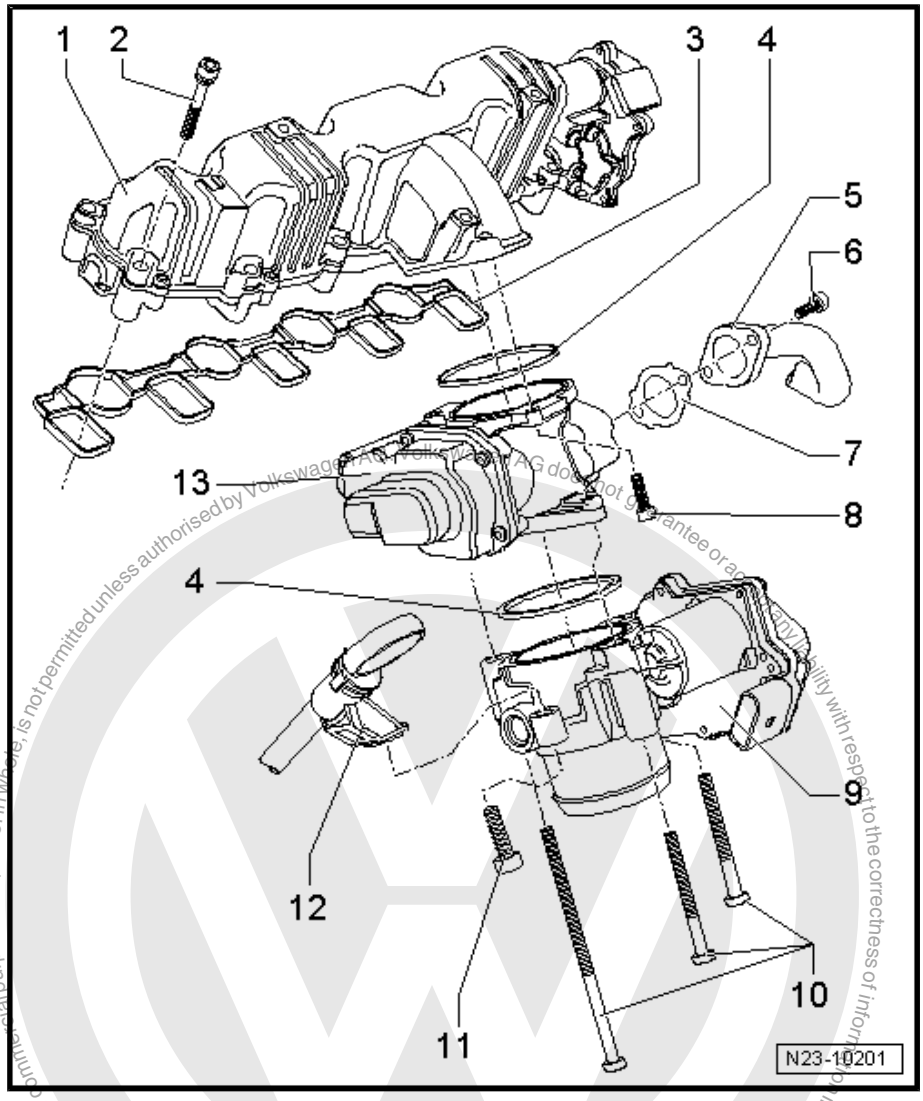
3.12 Overview - Intake Manifold with Attachments

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

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1 - Intake Manifold

- ❑ With Intake Flap Motor - V157-
- ❑ With intake air swirl optimization
- ❑ Must not be disassembled
- ❑ Removing and installing. Refer to ⇒ “3.13 Intake Manifold, Removing and Installing”, page 333

2 - Bolt

- ❑ 8 Nm

3 - Seal

- ❑ Replace

4 - Seal

- ❑ Replace

5 - Connecting Pipe

> **Caution**
> *Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.*

- ❑ Replace
- ❑ Install without tension

6 - Bolt

- ❑ 20 Nm
- ❑ Use the Socket - Xzn 10 - T10385- for loosening and tightening

7 - Seal

- ❑ Replace

8 - Bolt

- ❑ 8 Nm

9 - Throttle Valve Control Module - J338-

- ❑ For removal, remove the intake manifold. Refer to ⇒ “3.13 Intake Manifold, Removing and Installing”, page 333 .

10 - Bolt

- ❑ 8 Nm
- ❑ Refer to ⇒ Fig. “”“” , page 335
- ❑ Removing and installing with the Socket - Xzn 8 - T40159-

11 - Bolt

- ❑ 8 Nm
- ❑ Removing and installing with the Socket - Xzn 8 - T40159-

12 - Oil Dipstick

- ❑ Engine Oil Level, Checking. Refer to ⇒ “1.2 Engine Oil, Checking Level”, page 151 .

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13 - EGR Vacuum Regulator Solenoid Valve - N18-

❑ With the EGR Potentiometer - G212-

3.13 Intake Manifold, Removing and Installing

Special tools and workshop equipment required

- Socket - Xzn 10 - T10385-
- Socket - Xzn 8 - T40159-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-
- Engine Bung Set - VAS6122-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

Removing:

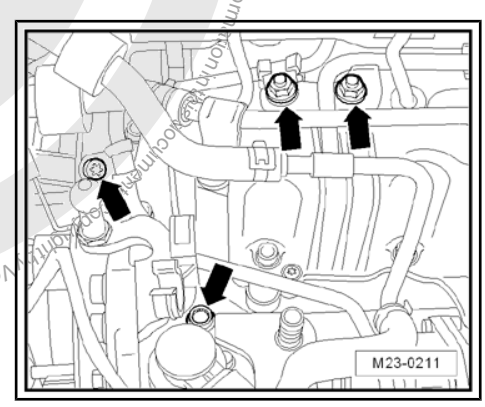
Note

- *Make sure no contaminants enter the fuel system when removing the intake manifold.*
- *Seal off the connections in the fuel system using the plugs from the Engine Bung Set - VAS6122- .*

– Remove the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

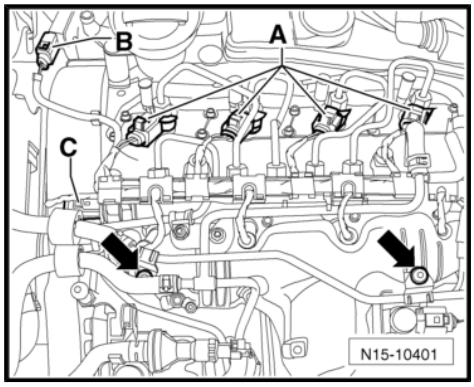
– Remove the protective strip, if equipped -item 1- ⇒ Item 1 (page 312) .

– Loosen the high pressure line or fuel lines -arrows- on the intake manifold.



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– Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247- -C-.
– Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.
– Unclip the wiring harness from the wiring guide for the glow plugs.

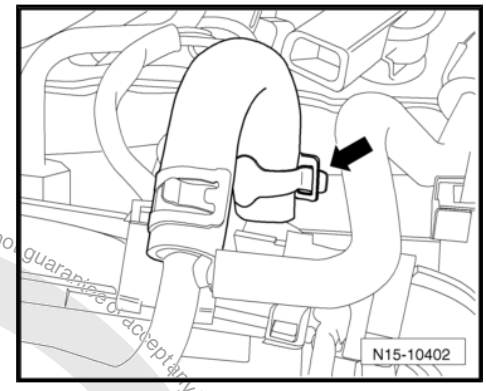


Caution

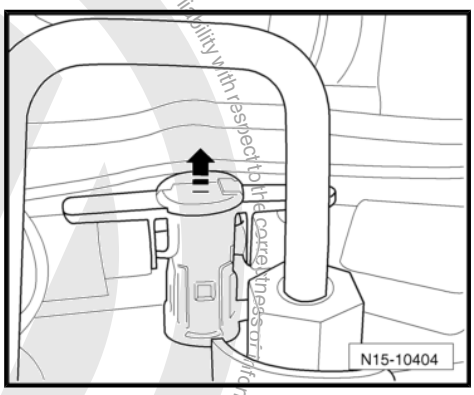
Always follow the procedure »Glow Plug Connectors, Removing and Installing«.

– Remove the glow plug connectors. Refer to ⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 410 .
– Remove the high pressure line -item 21- ⇒ Item 21 (page 314) between the high pressure fuel pump and rail element (high pressure reservoir).

– Loosen the hose clip -arrow- with the Hose Clip Pliers - VAS6362- and remove the line on the rail element (high pressure reservoir).
– Before removing, clean the return line connection on the fuel injectors (for example using a commercially available detergent).
– Dry the return line connections.
– Cover the return line connections with a cleaning cloth.



– Remove the fuel return line connections on the fuel injectors. Pull them upward to release them -arrow-.

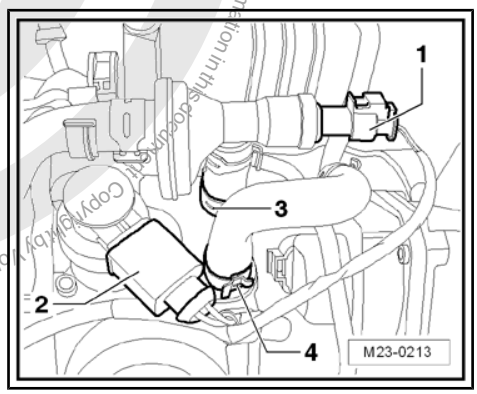


Note

Pay attention to cleanliness. Dirt and contaminants must not enter the return lines and the connections on the fuel injectors.

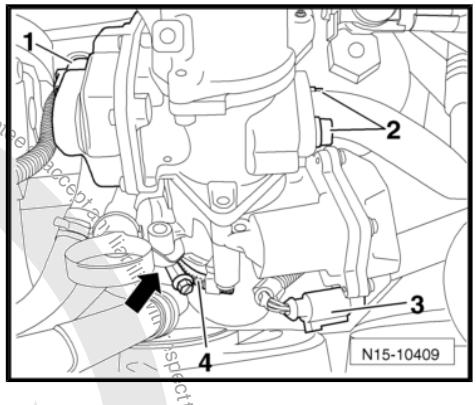
– Loosen the hose clips with the Hose Clip Pliers - VAS6362- and remove the fuel return line -item 4- ⇒ Item 4 (page 312) .

– Loosen the spring clamp -4- with the Hose Clip Pliers - VAS6362- and disconnect the fuel return line at the high pressure fuel pump.
– Seal the lines so that no dirt can enter the fuel system.
– Remove the fuel return lines -item 2- ⇒ Item 2 (page 312) .



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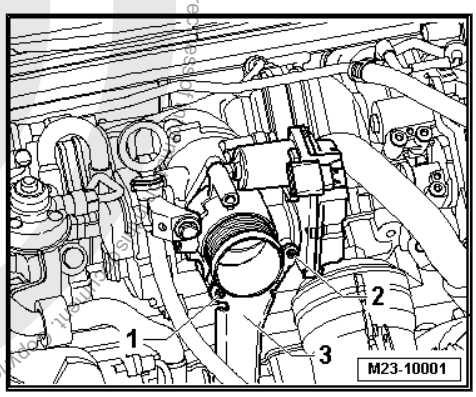
– Disconnect from the Fuel Injector - N18- -1- and from the Throttle Valve Control Module - J338- -3-.
– Loosen the clamp -4- and remove the charge air hose.
– Remove the oil dipstick bracket -arrow-.
– Disconnect the connecting pipe -2-.



Caution

Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.

– Remove the bolts -1 and 2- from the Throttle Valve Control Module - J338- and remove the bracket.



– Remove the intake manifold bolts with a Socket - Xzn 8 - T40159- in a diagonal sequence working from the outside toward the inside.
– Remove intake manifold.

Installing:

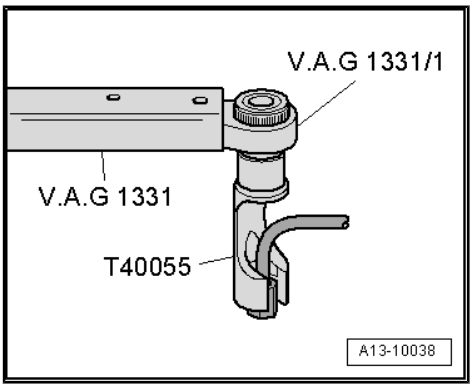
Install in reverse order of removal. Note the following:

- Always replace the seals.
- When installing the high pressure line or fuel lines, make sure no dirt enters the fuel system.
- Only remove the plugs right before installing the fuel lines.
- Do not change the angles of the high pressure lines
- Make sure the line connections are secure.
- Do not interchange the supply line and the return line.

– Tighten the intake manifold bolts in a diagonal sequence starting from the inside toward the outside:

- Tightening specification -item 2- ⇒ Item 2 (page 332) .

– Tighten the high pressure line union nuts hand-tight.
– Make sure the high pressure line is without tension.



– Tighten the high pressure line using the Torque Wrench 1331 5-50Nm - VAG1331- with Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1- and Union Nut Socket - T40055- .

Tightening Specifications:

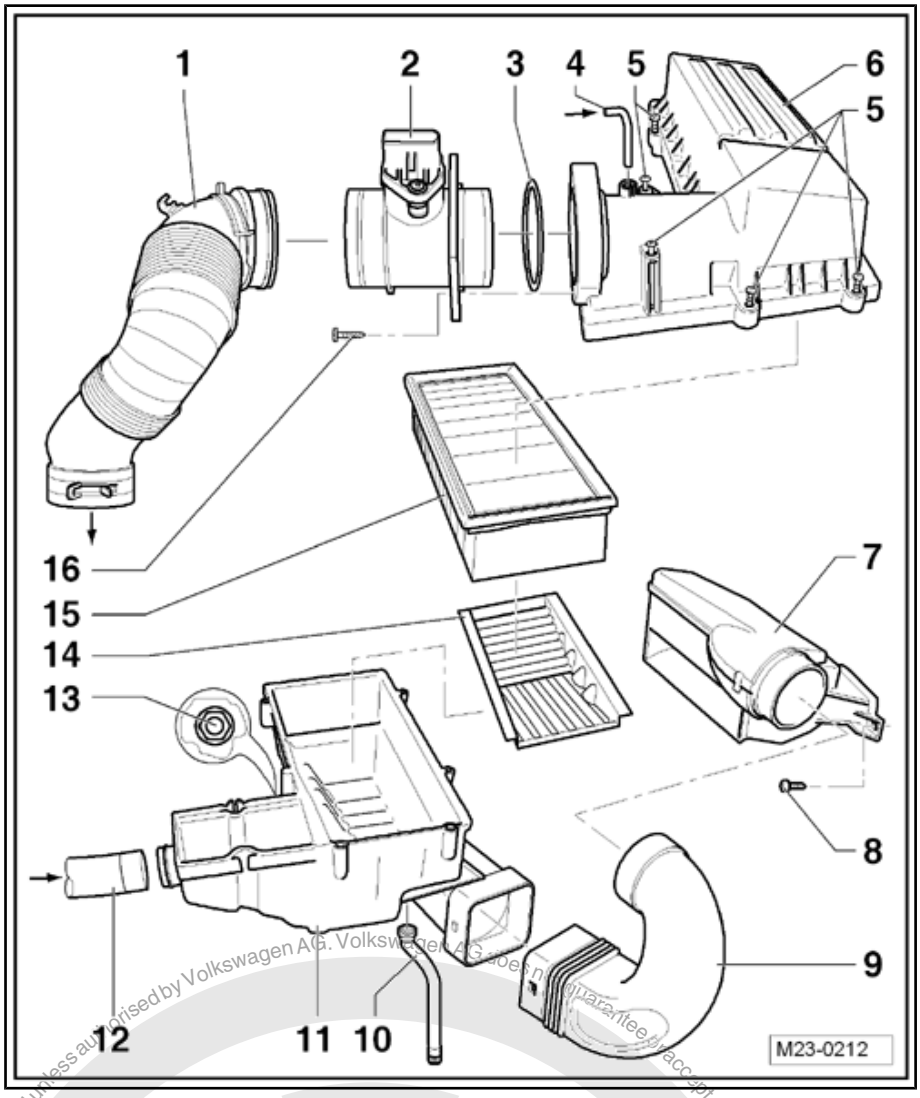
- Refer to ⇒ “3.3 Overview - Fuel System”, page 311 . Overview - Fuel System
- Overview - Intake Manifold with Attachments. Refer to ⇒ “3.12 Overview - Intake Manifold with Attachments”, page 331 .

– Fill the fuel system. Refer to ⇒ “3.9 Fuel System, Filling/Bleeding”, page 328 .

3.14 Overview - Air Filter

⇒ “3.14.1 Overview - Air Filter”, page 335

3.14.1 Overview - Air Filter



1 - Intake Hose

- ❑ Check for secure fit
- ❑ Clean if there is contamination
- ❑ To the intake scoop on the turbocharger -item 35- ⇒ Item 35 (page 273)

2 - Mass Airflow Sensor - G70-

- ❑ Removing and installing. Refer to ⇒ “3.17 Mass Airflow Sensor G70 , Removing and Installing”, page 341 .

3 - O-Ring

- ❑ Replace if damaged

4 - Vacuum Hose

- ❑ Check for secure fit and kink free routing
- ❑ From the muffler
- ❑ Connection diagram for vacuum hoses. Refer to ⇒ “4.5 Vacuum Hose Connection Diagram”, page 295 .

5 - Screw

- ❑ 2 Nm

6 - Air Filter Housing Upper Section

- ❑ Clean salt residue, dirt and leaves from the air filter housing-upper section

7 - Intake Air Duct

- ❑ Bolted to the lock carrier

8 - Screw

- ❑ 5 Nm

9 - Air Duct Hose

- ❑ Check for secure fit
- ❑ Clean if there is contamination

10 - Water Drain Hose

- ❑ Clean if there is contamination

11 - Lower Section of Air Filter Housing

- ❑ Clean salt residue, dirt and leaves from the lower section of the air filter housing.

12 - Connecting Hose

- ❑ For the warm air intake
- ❑ Check for secure fit
- ❑ Clean if there is contamination
- ❑ From the warm air collector plate on the exhaust manifold -item 2- ⇒ Item 2 (page 271) .

13 - Bolt

- ❑ 8 Nm

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- ❑ Permanent bolt

14 - Snow Screen

- ❑ Clean if there is contamination

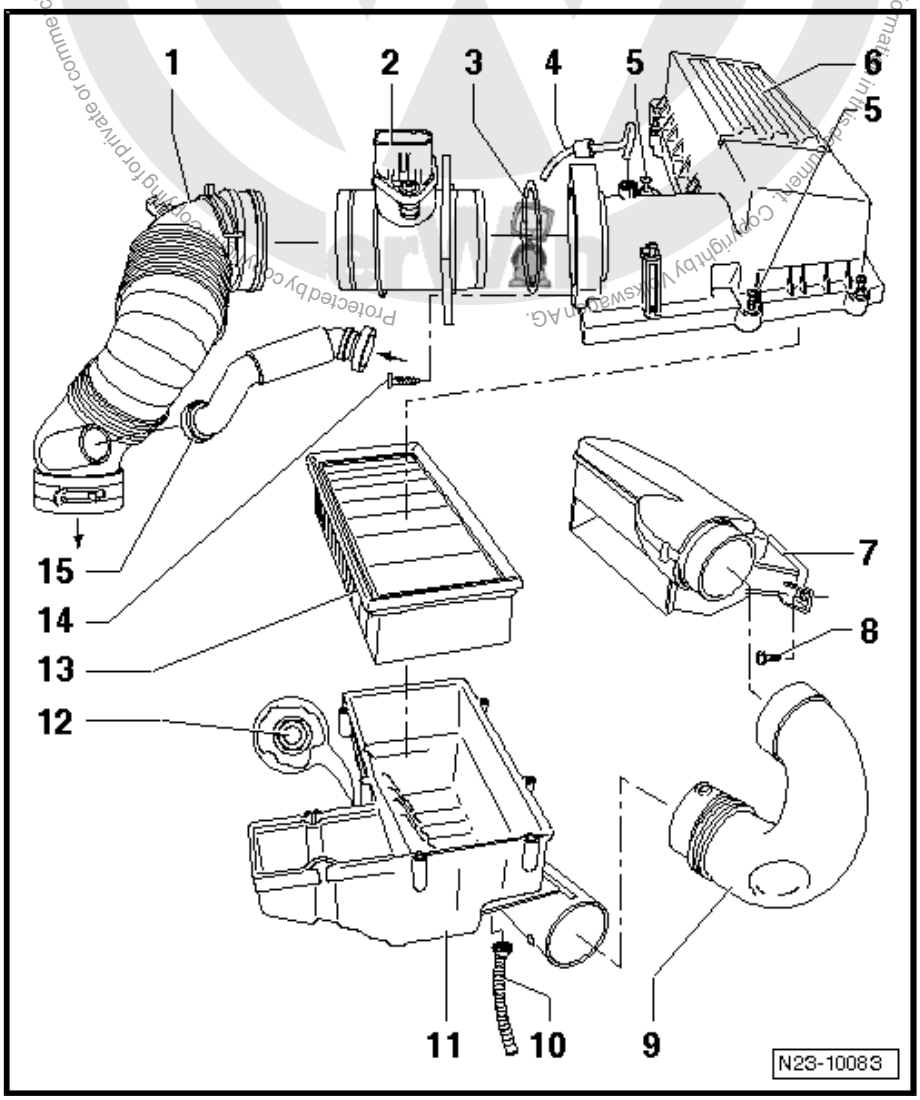
15 - Filter Element

- ❑ Always use Original air filter insert Parts Catalog.
- ❑ Follow the replacement intervals ⇒ Maintenance Intervals; Rep. Gr. 03 “Maintenance Tables”.
- ❑ Removing and installing. Refer to ⇒ “3.16 Air Filter Element, Removing and Installing”, page 339 .

16 - Screw

- ❑ 3.5 Nm

3.14.2 Overview - Air Filter, Engine Codes CBDA, CBDB, CEGA



1 - Intake Hose

- ❑ To the turbocharger

2 - Mass Airflow Sensor - G70-

3 - O-Ring

- ❑ Replace if damaged

4 - Vacuum Hose

- ❑ Check for secure fit and kink free routing
- ❑ To the Wastegate By-pass Regulator Valve - N75-
- ❑ Connection diagram for vacuum hoses. Refer to ⇒ “4.6 Vacuum Hose Connection Diagram, Engine Codes CBDA, CBDB, CEGA”, page 296 .

5 - 2 Nm

6 - Air Filter Housing Upper Section

- ❑ Clean salt residue, dirt and leaves from the air filter housing lower section

7 - Air intake connector

- ❑ Attached to the lock carrier

8 - 2 Nm

9 - Connecting Hose

- ❑ Check for secure fit
- ❑ Clean if there is contamination

10 - Water drain pipe

- ❑ Clean if there is contamination

11 - Lower section of air filter housing

- ❑ Clean salt residue, dirt and leaves from the air filter housing lower section

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12 - 8 Nm

13 - Filter Element

- ❑ Always use Original air filter insert Parts Catalog.
- ❑ Follow the replacement intervals ⇒ Maintenance ; Booklet 20.1 ; Service Work “Maintenance Tables”.
- ❑ Removing and installing. Refer to ⇒ “3.16 Air Filter Element, Removing and Installing”, page 339 .

14 - 3.5 Nm

15 - Connecting Pipe

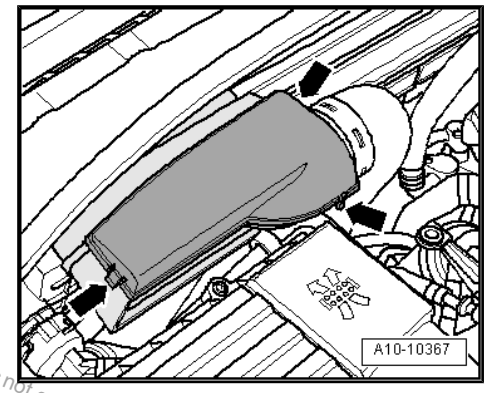
- ❑ From the cylinder head cover
- ❑ For the crankcase ventilation

3.15 Air Filter Housing, Removing and Installing

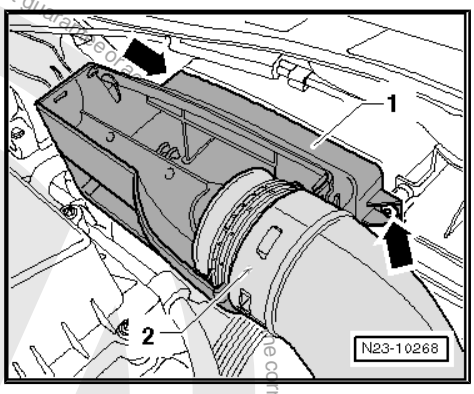
Removing

– Release the tabs -arrows- and open the cover on the air intake.

– Remove the connecting hose for the warm air intake -item 12- ⇒ Item 12 (page 336) .

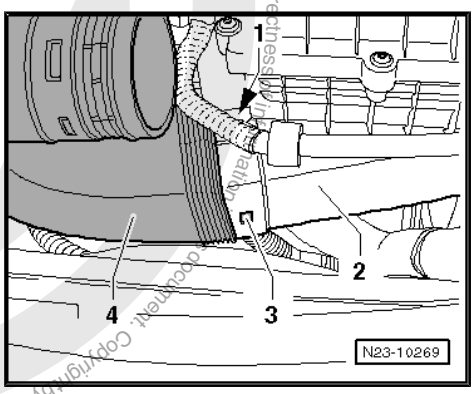


– Remove the screws -arrows- on the air intake -1- and pull the connecting hose -2- off the guide.



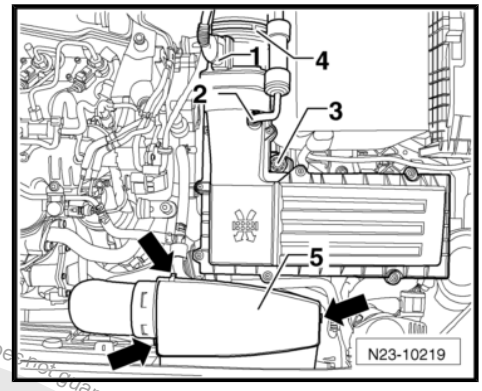
– Press the tab -1 and 3- and remove the connecting hose -4- from the air filter housing -2-.

– Disconnect the connector from the Mass Airflow Sensor - G70- -1- and the vacuum line -2-.



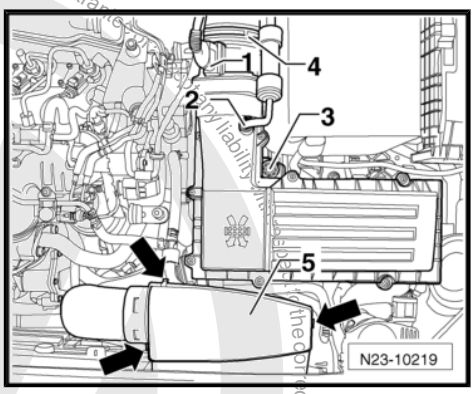
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– Loosen the threaded connector on the air filter housing -3-.



– Open the clamp -4- and remove the hose from the Mass Air-flow Sensor - G70- .

– Remove the entire air filter housing.



Installing

Install in reverse order of removal.

3.16 Air Filter Element, Removing and Installing

Special tools and workshop equipment required

- Torque Wrench 1783 - 2-10Nm - VAG1783-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

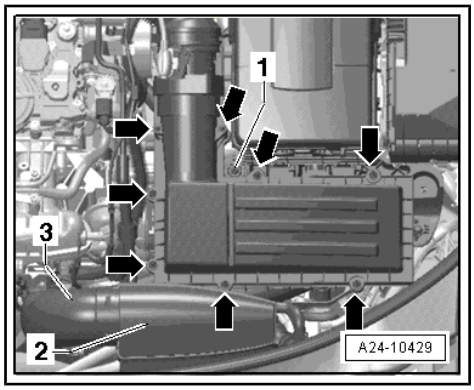
Always pay attention to these instructions before and during work.

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Removing:

– Remove the bolts -arrows- from the air filter housing upper section.

– Lift up the air filter housing upper section and remove the air filter element.



Installing:

Install in reverse order of removal. Note the following:

- If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Airflow Sensor - G70- and may be causing false mass airflow values. This results in reduced performance, since a lower injection quantity is calculated.
- Always use Original air filter insert. Refer to Parts Catalog.
- Follow all waste disposal regulations!
- The air filter housing must be clean.

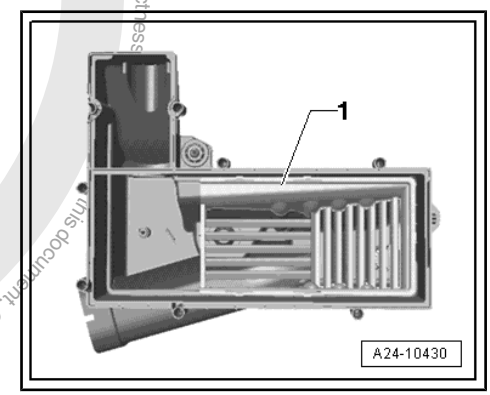
Note the following when cleaning air filter housing with compressed air:

- To prevent malfunctions, cover critical air-flow engine components such as the Mass Airflow Sensor - G70- , air duct pipes etc. with a clean cloth.

– Check the Mass Airflow Sensor - G70- and the intake hose (clean air side) for contamination.

– Check the intake duct up to the air filter insert for contamination. If any contaminants are discovered, clean the air filter housing upper and lower section of salt residue, dirt and leaves. Wash or vacuum if necessary.

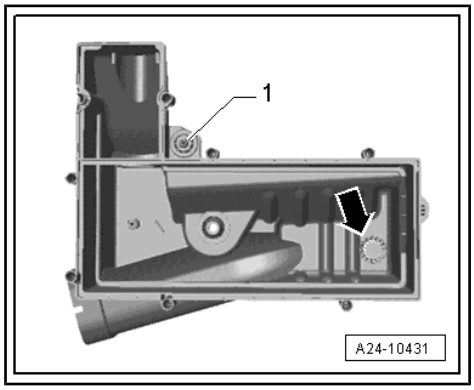
– Remove and clean the snow screen -1-.



– Clean the water drain -arrow- and the lower section of the air filter housing.

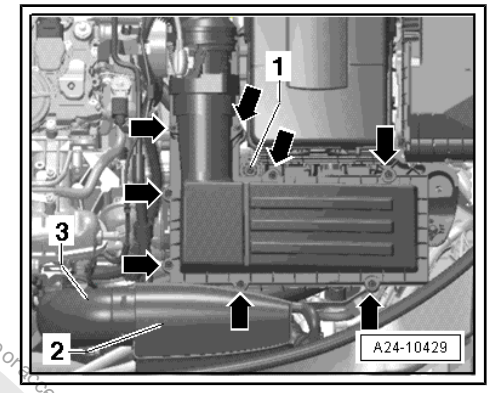
– Make sure that air filter element is properly centered when placed into the mounting of the lower section of the air filter housing.

– Place upper section of air filter housing on to lower section or air filter housing carefully and without using excessive force. When doing this, make sure that upper section of air filter housing is not placed tilted on the air filter element (pay attention to sealing lip of air filter element).



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- Tightening specification for the bolts on the air filter housing upper section -arrows-: 2 Nm.



3.17 Mass Airflow Sensor - G70- , Removing and Installing

Special tools and workshop equipment required

- Torque Wrench 1783 - 2-10Nm - VAG1783-
- Hose Clip Pliers - VAS6362-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ "1 Safety Precautions when Working on Diesel Direct Fuel Injection System", page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ "2 Guidelines for Clean Working Conditions", page 305 .*

Always pay attention to these instructions before and during work.

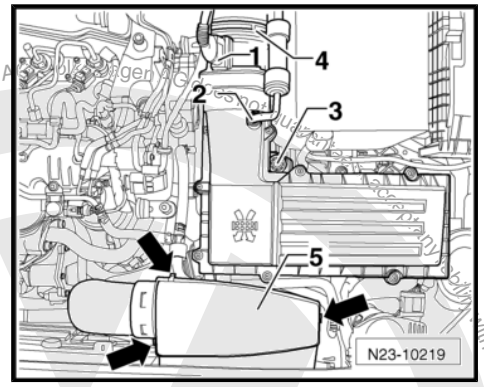
Removing:

– Disconnect the connector -1- from the Mass Airflow Sensor - G70- .

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– Loosen the spring clip -4- with the Hose Clip Pliers - VAS6362- and disconnect the intake hose from the Mass Airflow Sensor - G70- .

– Remove both bolts from the Mass Airflow Sensor - G70- and carefully remove the Mass Airflow Sensor - G70- from the guide on the air filter housing upper section.



Installing:

Install in reverse order of removal. Note the following:

- Replace the O-ring if damaged.
- If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Airflow Sensor - G70- and may be causing false mass airflow values. This results in reduced performance, since a lower injection quantity is calculated.
- Always use Original air filter insert. Refer to Parts Catalog.

– Check the Mass Airflow Sensor - G70- and the intake hose (clean air side) for contamination.

– Check the intake duct up to the air filter insert for contamination. If any contaminants are discovered, clean the air filter housing upper and lower section of salt residue, dirt and leaves. Wash or vacuum if necessary. Air Filter Element, Removing and installing. Refer to ⇒ “3.16 Air Filter Element, Removing and Installing”, page 339 .

- Tightening specification for bolts on the Mass Airflow Sensor - G70- : 3.5 Nm

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4 Engine Control Module

⇒ "4.1 Engine Control Module J623 without Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011", page 343

⇒ "4.2 Engine Control Module J623 with Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011", page 344

⇒ "4.3 Engine Control Module J623 , Removing and Installing, Jetta from MY 2011 Only", page 347

4.1 Engine Control Module - J623- without Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011

Special tools and workshop equipment required

- Vehicle Diagnosis System - VAS5051B-

Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".

Removing:

Conditions

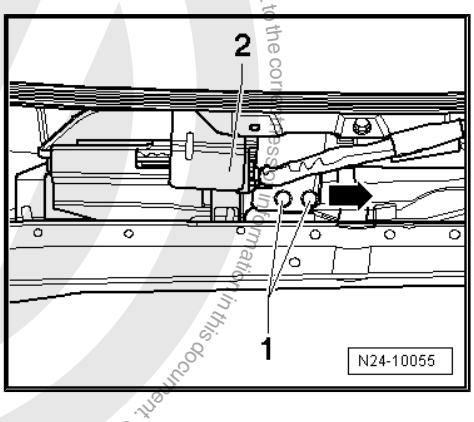
- Ignition switched off.

Procedure

– Remove the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .

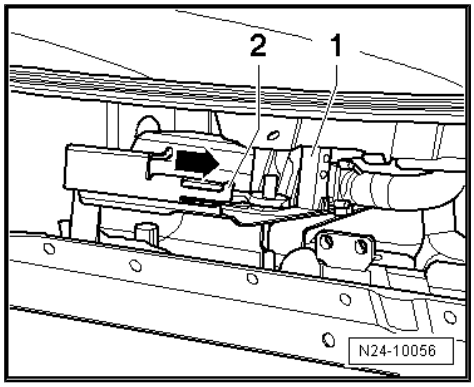
– Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .

– Remove the bolts -1- and remove the cover plate -2-.



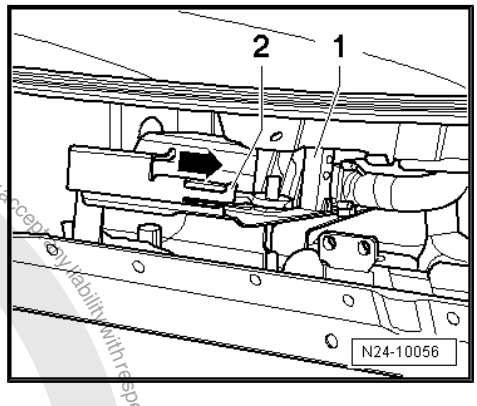
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– Release the front connector -1- from the Engine Control Module - J623- and remove it.
– Pry up locking mechanism -2- slightly.
– Then push the Engine Control Module - J623- in the direction of -arrow- out of the bracket.
– Now release the rear connector from the Engine Control Module - J623- and remove it.



Installing:

– Connect and lock the rear connector to the Engine Control Module - J623- .
– Slide the Engine Control Module - J623- onto the retaining plate.
– Push the locking mechanism -2- against the Engine Control Module - J623- .
– Now connect and lock the front connector -1- to the Engine Control Module - J623- .
– Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .
– Install the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing.
– If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.
– Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester “Guided Functions”.
– Perform a road test.



Note

Follow all applicable safety precautions during a road test. Refer to ⇒ page 303 .

– Check the Engine Control Module - J623- DTC memory again.

4.2 Engine Control Module - J623- with Anti-Theft Protection, Removing and Installing, All Vehicles Except Jetta from MY 2011

Special tools and workshop equipment required

- Window Cutter - VAG1561A- with Blade Set - VAG1561/14-
- Hot Air Blower from Wiring Harness Repair Set - VAS1978B- .
- Vehicle Diagnostic Tester
- Locking pliers
- Safety Gloves

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Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".

Removing:

Conditions

- Ignition switched off.

Procedure

– Remove the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .

– Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .

Note

The threads of the shear bolts are equipped with locking compound. By heating the shear bolts using a Hot Air Blower - VAS1978B- , the adhesive effect of the locking compound is lowered.

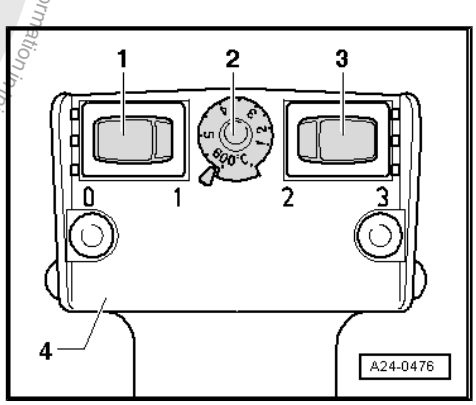
Caution

Cover the wires, connectors and control modules in the area surrounding the Engine Control Module - J623- to prevent any burn damage.

Perform the adjustments on the Hot Air Blower - VAS1978B- -4- as shown:

– Turn potentiometer for temperature adjustment -2- to maximum heat output (600 °C (1,112 °F)).

– Move the two stage switch for air quantity -3- to position 3.



WARNING

By heating the shear bolts, parts of the protective housing are heated intensely. Wear protective gloves to prevent injuries.

– Guide the Hot Air Blower - VAS1978B- nozzle on the shear bolt.

– Turn on the Hot Air Blower - VAS1978B- and warm up the bolts for approximately 20 to 25 seconds.

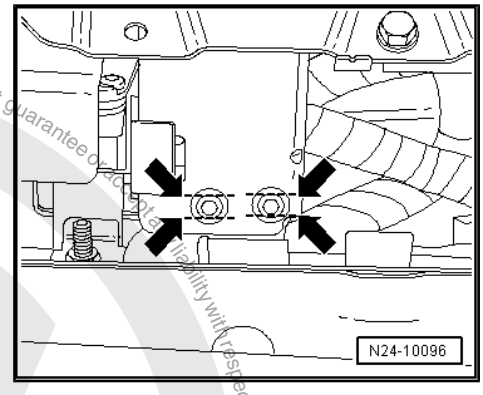
– Remove the shear bolt by the bolt head with pliers.

The procedure for the second shear bolt is exactly the same.

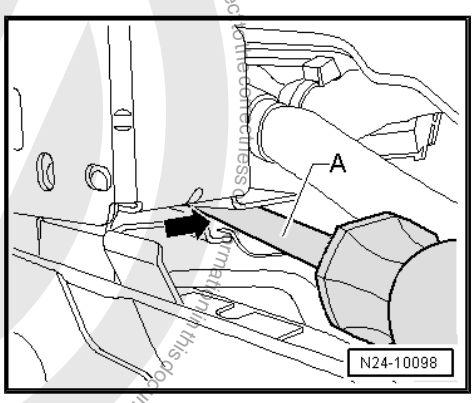
Do not let the bolts unscrew:

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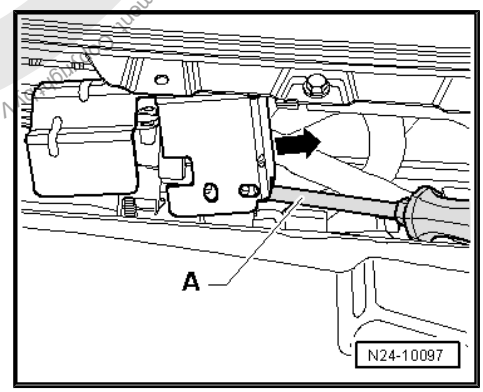
– Saw off the shear bolt heads so that there are two parallel surfaces -arrows- and then remove the bolts.



– Insert a screwdriver -A- between the protective housing and the retaining plate -arrow-.



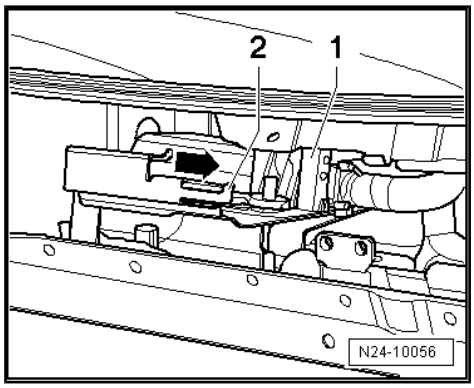
– Pry the protective housing upward using a screwdriver -A- and pull it off sideways from retaining plate -arrow-.
– Release the front connector -1- from the Engine Control Module - J623- and remove it.
– Pry up locking mechanism -2- slightly.



– Then push the Engine Control Module - J623- in the direction of -arrow- out of the bracket.
– Now release the rear connector from the Engine Control Module - J623- and remove it.

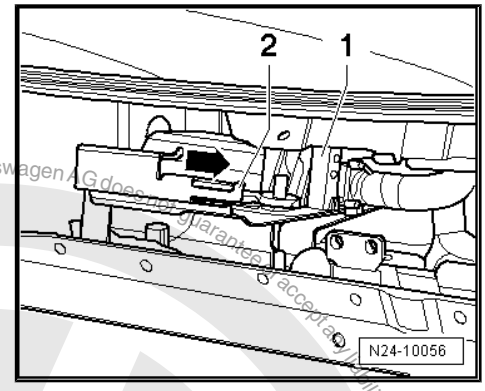
Installing:

– Connect and lock the rear connector to the Engine Control Module - J623- .
– Slide the Engine Control Module - J623- onto the retaining plate.

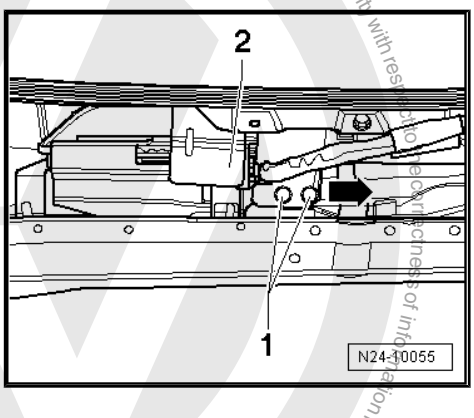


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– Now connect and lock the front connector -1- to the Engine Control Module - J623- .
– Slide the protective housing on to the retaining plate.



– Tighten the shear bolts -1- uniformly until bolt heads shear off.
– Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Overview - Plenum Chamber Cover .
– Install the windshield wiper arms and the plenum chamber cover. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
– If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.
– Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester “Guided Functions”.
– Perform a road test.



Note

Follow all applicable safety precautions during a road test. Refer to ⇒ page 303 .

– Check the Engine Control Module - J623- DTC memory again.

4.3 Engine Control Module - J623- , Removing and Installing, Jetta from MY 2011 Only

Note

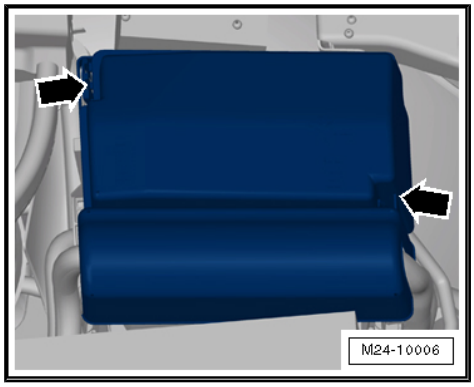
If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.

Removing:

- Ignition switched off.

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– Remove the E-box cover inside the engine compartment -arrows-.



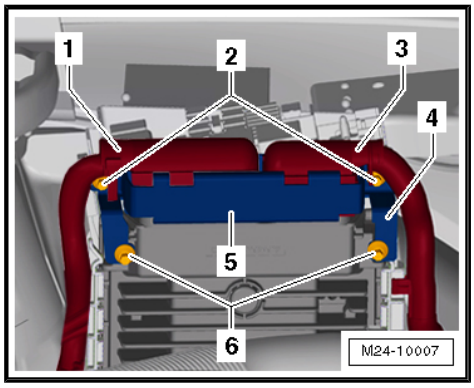
Engine Control Module - J623- with Anti-Theft Protection

– Separate the threaded connection -2-.

– Remove the locking mechanism -5-.

– Disconnect the connectors -1 and 3- from the engine control module.

– Remove bolts -6- and remove the bracket -4-.



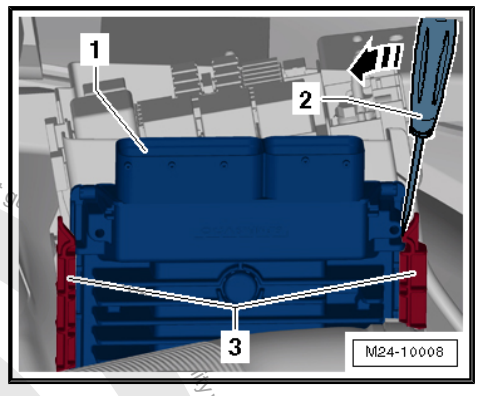
Engine Control Module - J623- without Anti-Theft Protection

– Disconnect the connectors -1 and 3- from the engine control module.

Continuation for All Vehicles

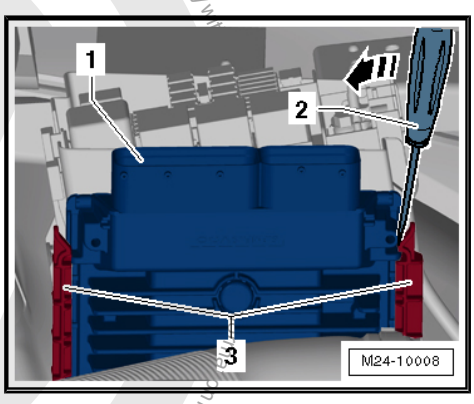
– Push the tabs on the side guides -3- carefully toward the outside with a screwdriver -2-.

– Remove the Engine Control Module -1- upward out of the side guides -3-.



Installing:

– Install the engine control module -1- into the guides -3- until it locks.



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Engine Control Module - J623- with Anti-Theft Protection

– Secure the bracket -5- with bolts -6- to the Engine Control Module.

• Tightening specification: 9 Nm.

– Connect the connectors -1 and 3- to the engine control module.

– Secure the locking mechanism -5- with shear bolts -6-.

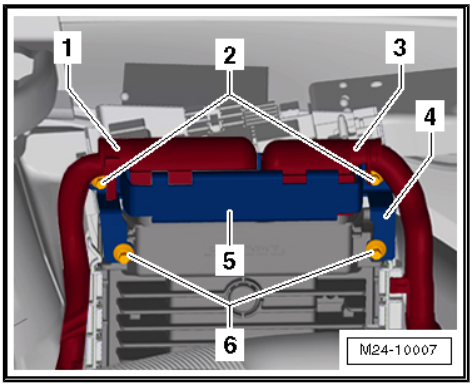
– Tighten the shear bolts until the bolt head breaks off.

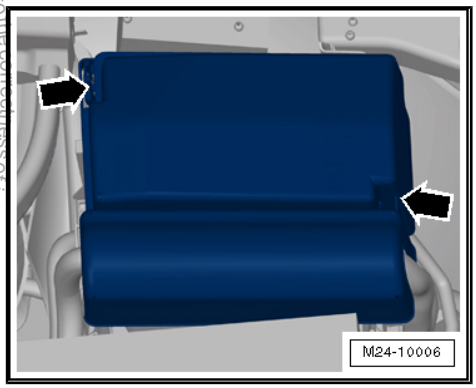
Engine Control Module - J623- without Anti-Theft Protection

– Connect the connectors -1 and 3- to the engine control module.

Continuation for All Vehicles

– Slide on the E-box cover until it is securely locked -arrows-.





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5 Engine Control Module, Engine Codes CBDA, CBDB, CEGA

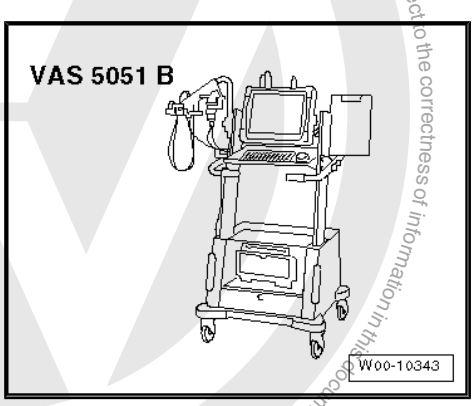
⇒ “5.1 Engine Control Module J623 without Anti-Theft Protection, Removing and Installing”, page 350 .

⇒ “5.2 Engine Control Module J623 with Anti-Theft Protection, Removing and Installing”, page 351 .

5.1 Engine Control Module - J623- without Anti-Theft Protection, Removing and Installing

Special tools and workshop equipment required

- Vehicle Diagnostic Tester



Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.

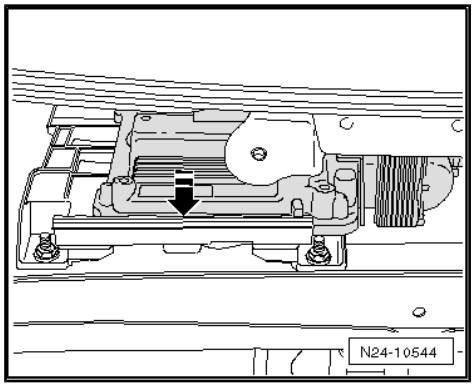
Removing

– Switch off the ignition.

– Remove the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .

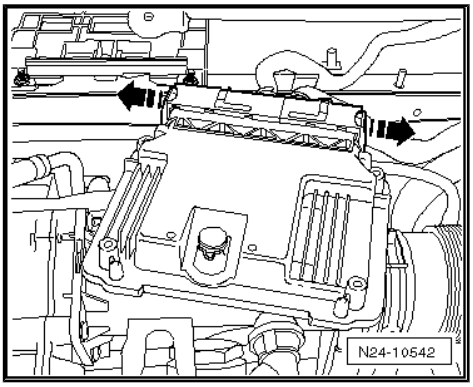
– Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

– Push the retaining frame in -direction of arrow- downward and remove the engine control module.



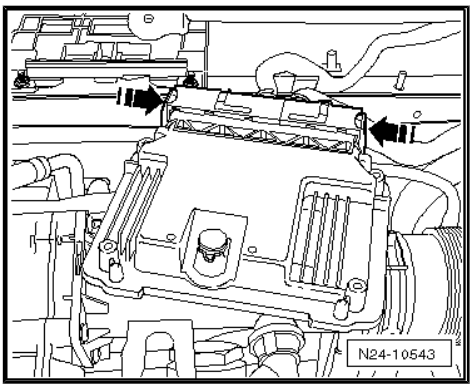
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– Push the retainers in the -direction of the arrow- and disconnect the connector.

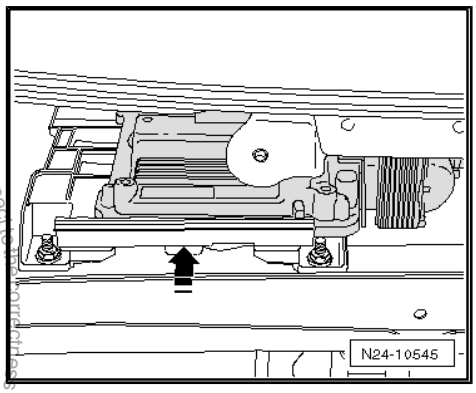


Installing

– Connect the connector on the engine control module and push the retainers all the way in -the direction of the arrow-.



– Mount the engine control module into the retaining frame and push it in the -direction of arrow- upward.



– Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
– Install the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
– If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.
– Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester “Guided Functions”.
– Perform a road test.

Note

Follow all applicable safety precautions during a road test. Refer to ⇒ page 303 .

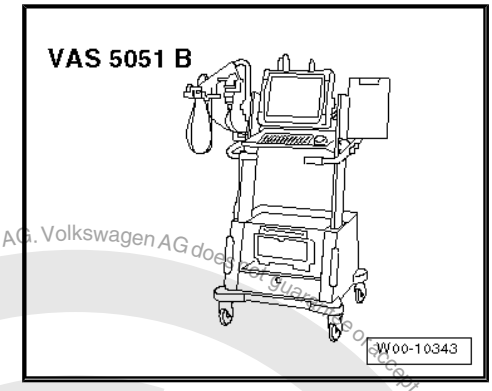
– Check the Engine Control Module - J623- DTC memory again.

5.2 Engine Control Module - J623- with Anti-Theft Protection, Removing and Installing

Special tools and workshop equipment required

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- Vehicle Diagnostic Tester



Not illustrated

- Locking pliers
- Safety Gloves

Note

If the Engine Control Module - J623- is to be replaced, connect the Vehicle Diagnostic Tester and perform the "Guided Functions, Replace Engine Control Module".

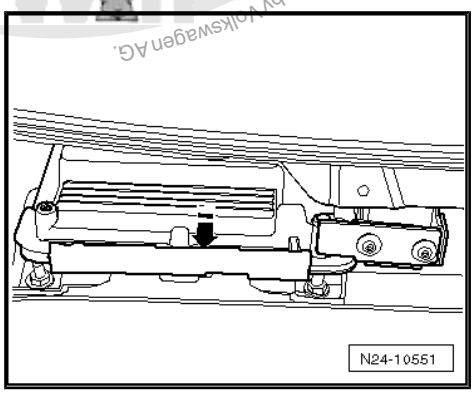
Removing

– Switch off the ignition.

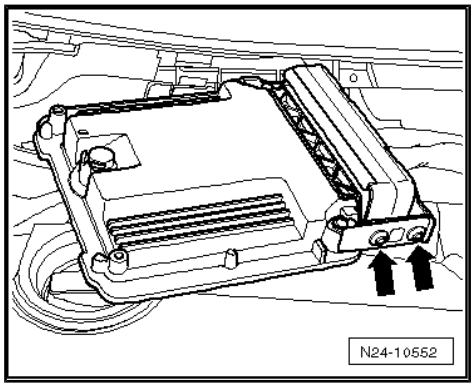
– Remove the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .

– Remove the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .

– Push the retaining frame in -direction of arrow- downward and remove the engine control module.

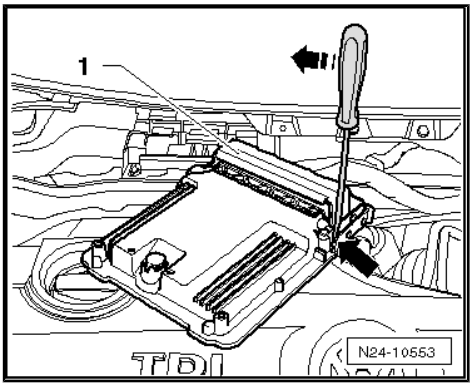


– Remove the shear bolts -arrows- with pliers.

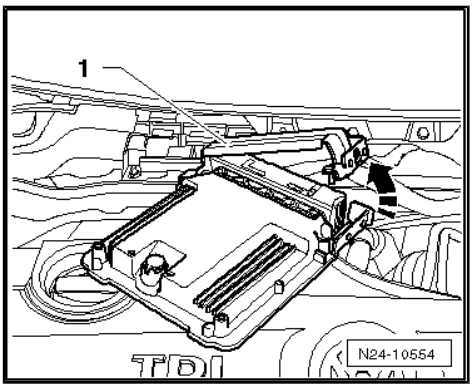


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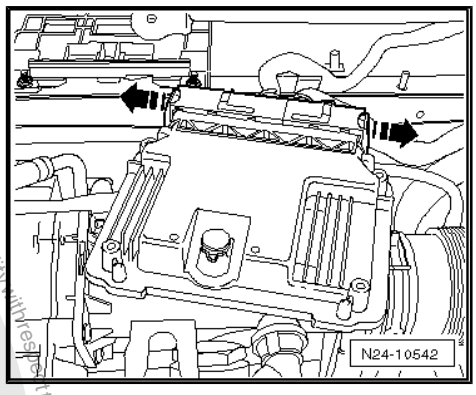
– Slide a screwdriver between both locking plates -arrow-.
– Carefully push the driver in -direction of arrow- and at the same time bend the locking bracket -1- upward.



– Bend the securing bracket -1- in the -direction of the arrow- until it can be removed from the connectors.

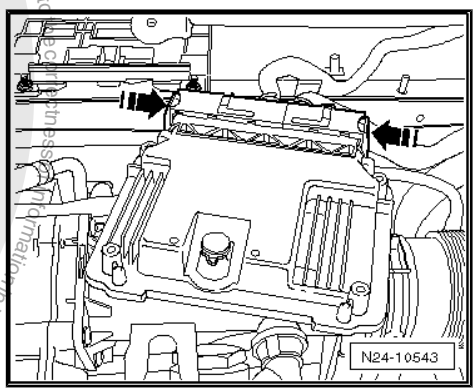


– Push the retainers in the -direction of the arrow- and disconnect the connector.

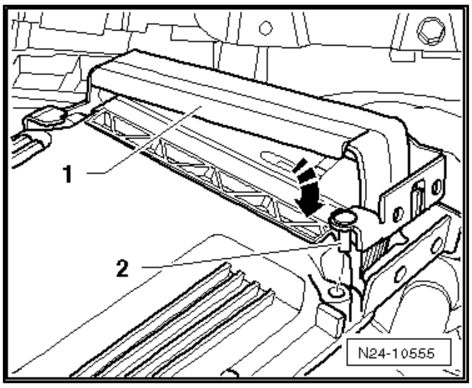


Installing

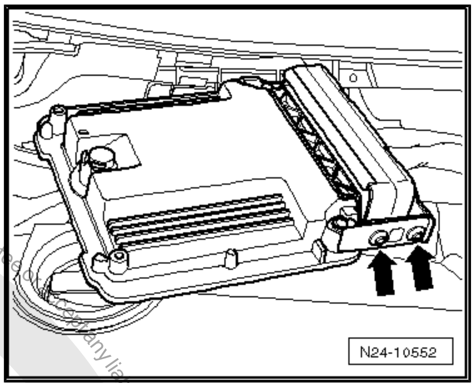
– Connect the connector on the engine control module and push the retainers all the way in -the direction of the arrow-.



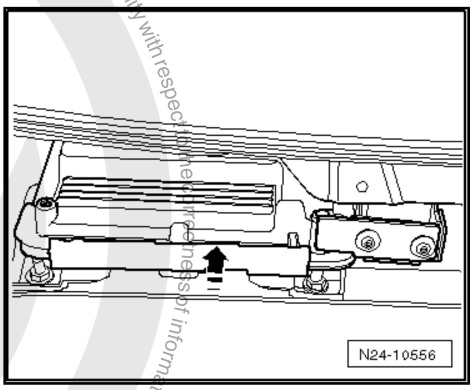
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– Place the locking bracket -1- on the connectors and press it in -the direction of the arrow-.
– Install the bolt -2- all the way into the hole in the engine control module.



– Secure the locking bracket to the Engine Control Module -arrows- with new shear bolts.
– Tighten the shear bolts evenly until the bolt heads break off -arrows-.



– Mount the engine control module into the retaining frame and push it in the -direction of arrow- upward.
– Install the plenum chamber bulkhead. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing .
– Install the windshield wiper arms. Refer to ⇒ Electrical Equipment; Rep. Gr. 92 ; Windshield Wiper System; Windshield Wiper Arms, Removing and Installing .
– If the Engine Control Module - J623- was replaced, connect the Vehicle Diagnostic Tester and perform the “Guided Functions, Replace Engine Control Module”.
– Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester “Guided Functions”.
– Perform a road test.

Note

Follow all applicable safety precautions during a road test. Refer to *⇒ page 303* *.*

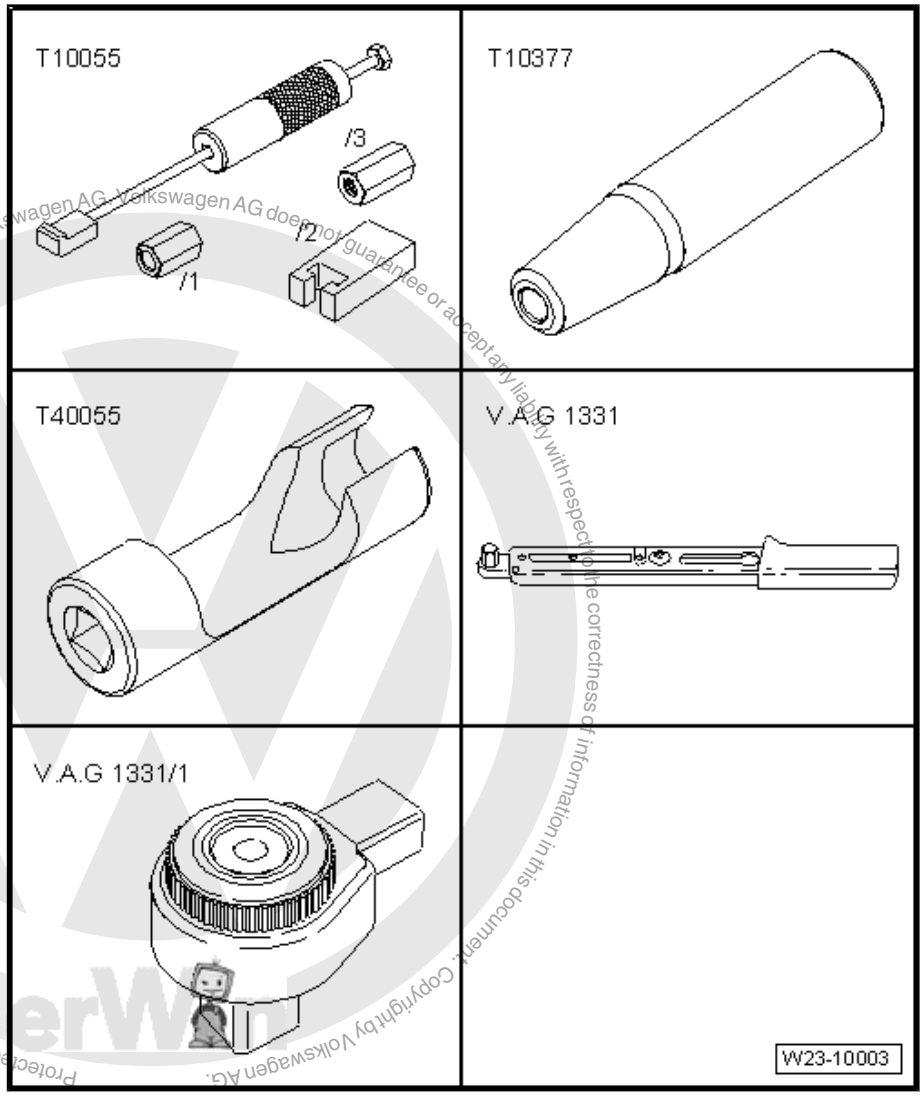
– Check the Engine Control Module - J623- DTC memory again.

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6 Special Tools

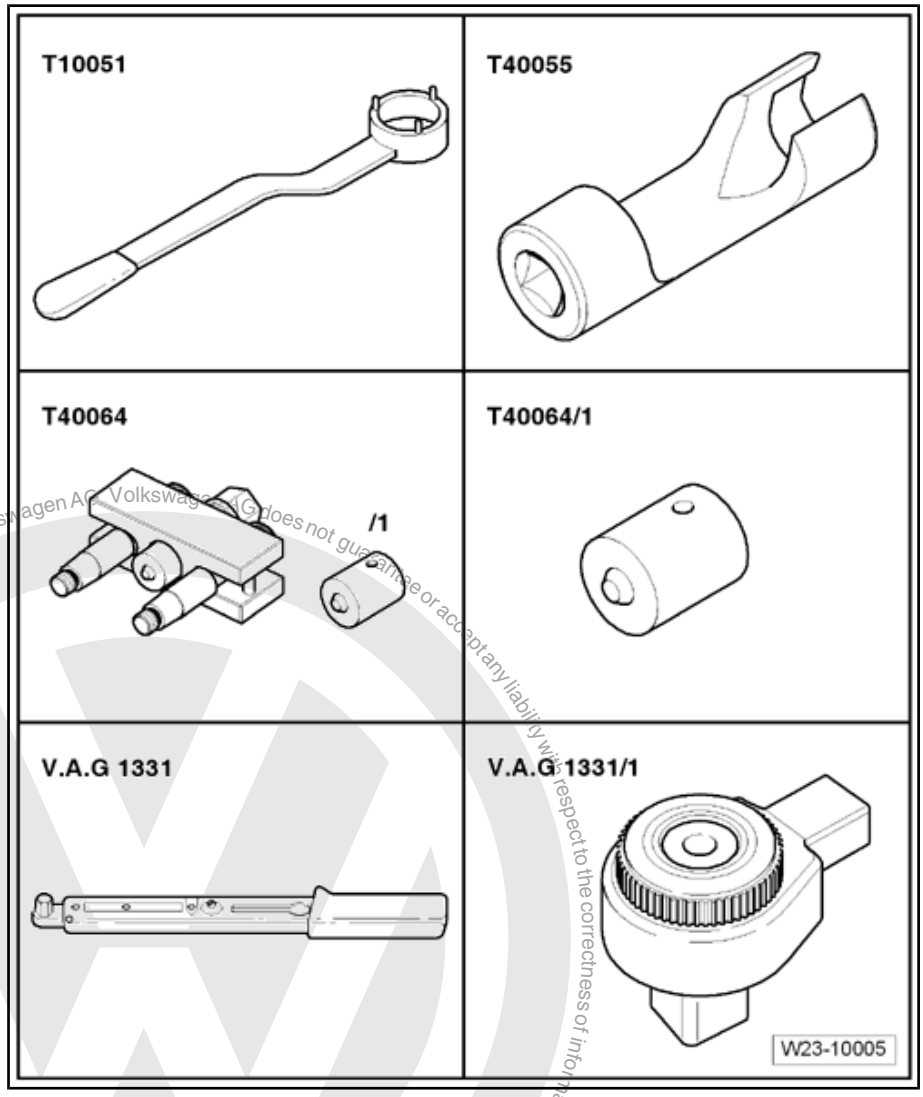
Special tools and workshop equipment required

- Puller - Unit Injector - T10055-
- O-Ring Assembly Sleeve - T10377-
- Union Nut Socket - T40055-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-



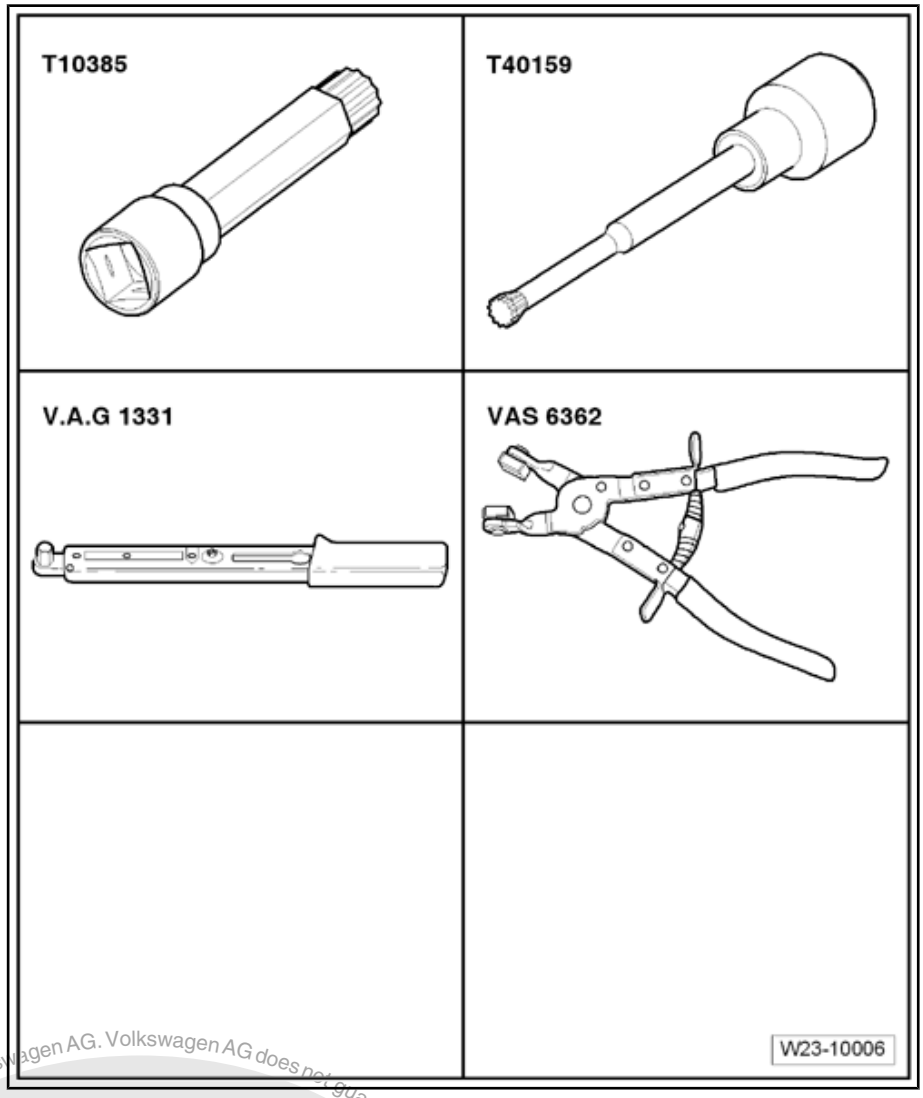
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- Counterhold - Camshaft Gear - T10051-
- Union Nut Socket - T40055-
- Puller - Pulley - T40064-
- Puller - Pulley - Pressure Pad - T40064/1-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1331 Insert - Reversible Ratchet - VAG1331/1-

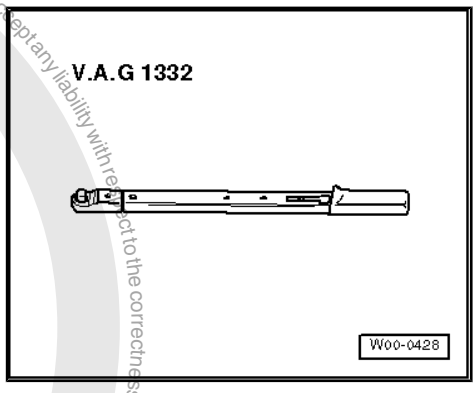


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- Socket - Xzn 10 - T10385-
- Socket - Xzn 8 - T40159-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Hose Clip Pliers - VAS6362-

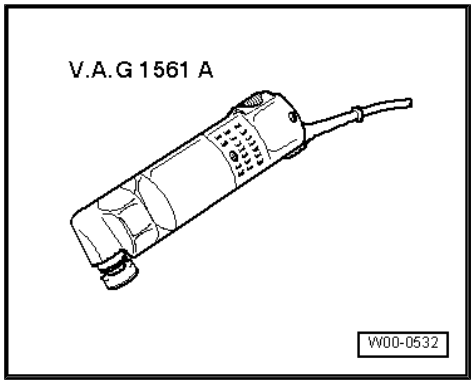


- Torque Wrench 1332 40-200Nm - VAG1332-

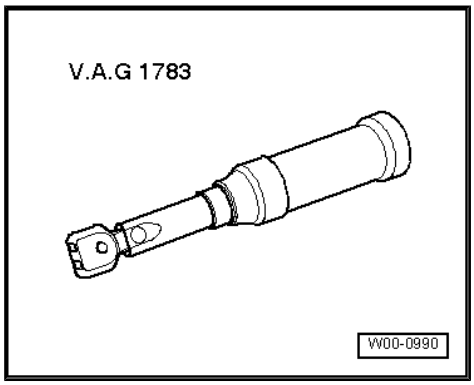


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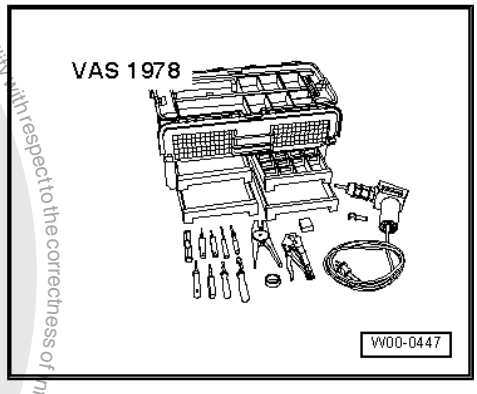
- Window Cutter - VAG1561A-



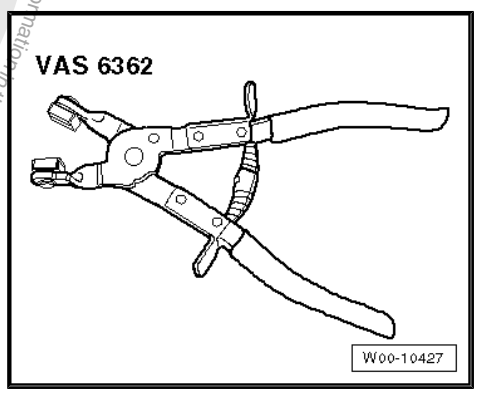
- Torque Wrench 1783 - 2-10Nm - VAG1783-



- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- from Wiring Harness Repair Set - VAS1978B-



- Hose Clip Pliers - VAS6362-



- Not Illustrated:
- Fuel Return System Tester - VAS6330-
- Engine Bung Set - VAS6122-
- Puller - Unit Injector - Adapter 1 - T10055/1-
- Counterhold - Camshaft Gear - T10051-

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- Puller - Pulley - T40064-
- Puller - Pulley - Pressure Pad - T40064/1-

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26 – Exhaust System, Emission Controls

1 Exhaust System

⇒ “1.1 General Information”, page 360

⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360

⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368

⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 369

⇒ “1.5 Overview - Exhaust Flap Control Module J883 with Slip Catalyst”, page 376

⇒ “1.6 Exhaust System Component Line Routing”, page 378

⇒ “1.7 Overview - Muffler”, page 381

⇒ “1.8 Exhaust System, Disconnecting and Connecting”, page 384

⇒ “1.9 Exhaust System, Installing without Tension”, page 385

⇒ “1.10 Exhaust System, Checking for Leaks”, page 387

1.1 General Information

Note

- *Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to ⇒ “3.1 Overview - Turbocharger with Exhaust Manifold and Attachments”, page 270 .*
- *Overview - Exhaust Flap Control Module - J883- with Slip Catalyst. Refer to ⇒ “1.5 Overview - Exhaust Flap Control Module J883 with Slip Catalyst”, page 376*
- *After installing the particulate filter with NOx reduction catalytic converter, make sure it is free of tension.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*
- *Hose connections are secured with either spring or hose clamps.*
- *Always replace clamp-type clips with spring-type clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter

Special tools and workshop equipment required

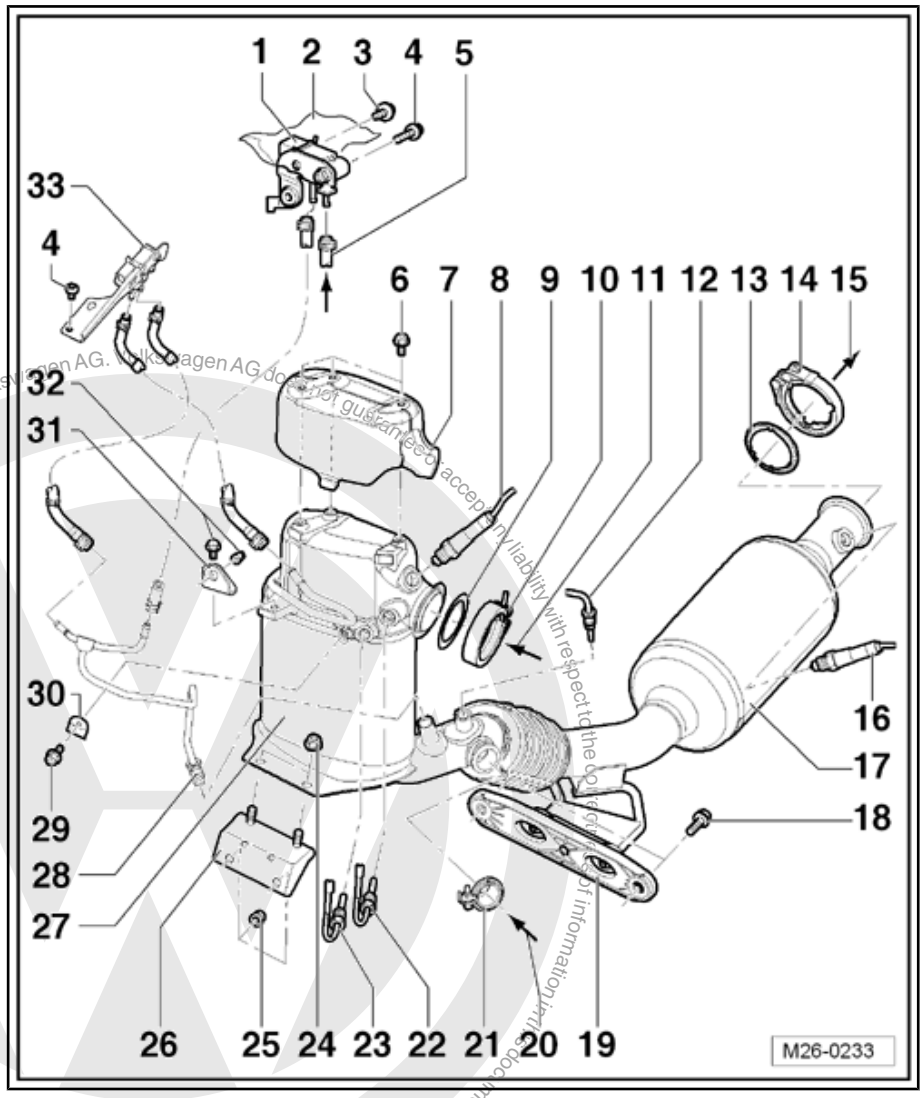
- Hose Clip Pliers - VAS6362-

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⇒ “1.2.1 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Engine Code CBEA”, page 361 .

⇒ “1.2.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Engine Code CJAA”, page 365 .

1.2.1 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Engine Code CBEA



1 - Exhaust Pressure Sensor 1 - G450-

- ❑ Bolted near the oil filler neck

2 - Heat Shield

- ❑ Replace if damaged

3 - Bolt

- ❑ 8 Nm

4 - Bolt

- ❑ 4 Nm

5 - Control Line

- ❑ Check for secure fit
- ❑ From the exhaust gas recirculation housing -item 8- ⇒ Item 8 (page 398)

6 - Bolt

- ❑ 10 Nm

7 - Shield

- ❑ Note the installation position

8 - Heated Oxygen Sensor - G39-

- ❑ 52 Nm
- ❑ Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- ❑ Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body

9 - Seal

- ❑ Replace

10 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

11 - From the Turbocharger

- ❑ -item 14- ⇒ Item 14 (page 272)

12 - Exhaust Gas Temperature Sensor 4 - G648-

- ❑ 45 Nm

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- ❑ Mark the installation position before removal
- ❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .
- ❑ Wire routing. Refer to ⇒ “1.6 Exhaust System Component Line Routing”, page 378 .

13 - Seal

- ❑ Replace
- ❑ Installing. Refer to ⇒ Fig. ““Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst”“ , page 378 .

14 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ Fig. ““Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst.”“ , page 378 .

15 - To Exhaust Door Control Unit - J883-

- ❑ -item 4- ⇒ Item 4 (page 377)

16 - Oxygen Sensor after Three Way Catalytic Converter - G130-

- ❑ 52 Nm
- ❑ Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- ❑ Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body
- ❑ Wire routing. Refer to ⇒ “1.6 Exhaust System Component Line Routing”, page 378 .

17 - NOx Reduction Catalytic Converter

- ❑ Unit with particulate filter -item 27- ⇒ Item 27 (page 363) (cannot be disconnected)

> **Caution**
>
> *There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*
>
> *Do not bend the decoupling element more than 10°.*
>
> *Do not stretch the decoupling element.*
>
> *Do not damage the wire mesh on the decoupling element.*
>
> *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

- ❑ Removing and installing. Refer to ⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 369 .

18 - Bolt

- ❑ 25 Nm

19 - Mount

- ❑ Install without tension

20 - From the EGR filter

- ❑ -Item 9- ⇒ Item 9 (page 399)

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21 - Clamp

- ❑ 3.5 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

22 - Exhaust Gas Temperature Sensor 2 - G448-

- ❑ 45 Nm
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .
- ❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

23 - Exhaust Gas Temperature Sensor 3 - G495-

- ❑ 45 Nm
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .
- ❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

24 - Nut

- ❑ 23 Nm

25 - Nut

- ❑ 23 Nm

26 - Bracket

- ❑ Note the installation position
- ❑ For the particulate filter
- ❑ Fastened to cylinder block
- ❑ Install without tension

27 - Particulate Filter

- ❑ Unit with NOx reduction catalytic converter -item 17- ⇒ Item 17 (page 362) (cannot be disconnected)

Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

Do not bend the decoupling element more than 10°.

Do not stretch the decoupling element.

Do not damage the wire mesh on the decoupling element.

Use the Transportation Lock - T10404- to secure the decoupling element from stretching.

- ❑ Removing and installing. Refer to ⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 369 .
- ❑ After replacing, the ash load comparison adaptation must be set to “0”. Refer to Vehicle Diagnostic Tester “Guided Functions”.

28 - Control Wire

- ❑ 45 Nm

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- ❑ Do not change the angles of the control line
- ❑ Install without tension

29 - Bolt

- ❑ 9 Nm

30 - Bracket

- ❑ For the control line
- ❑ Install without tension

31 - Bracket

- ❑ Note the installation position
- ❑ For the particulate filter
- ❑ Fastened to cylinder head
- ❑ Install without tension

32 - Bolt

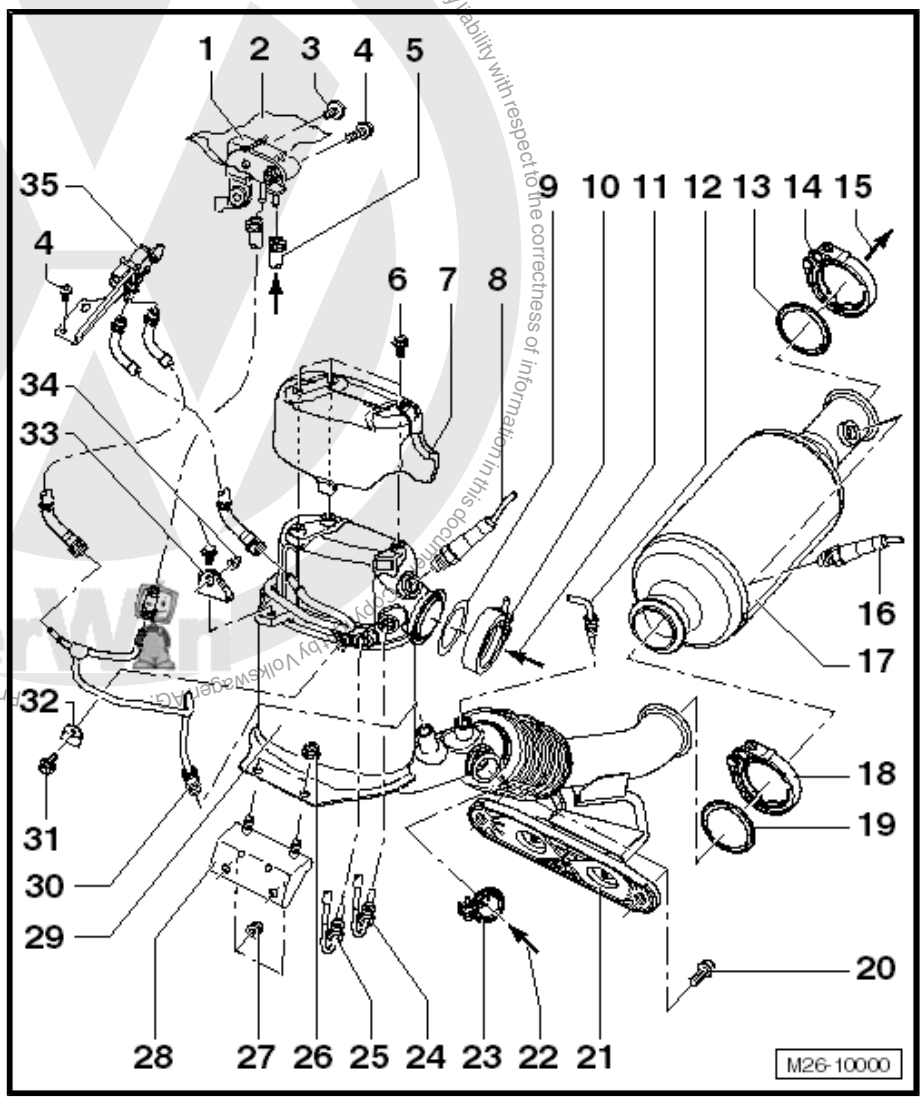
- ❑ 23 Nm

33 - Exhaust Pressure Sensor 2 - G451-

- ❑ Connected to the Auxiliary Fuel Pump - V393- bracket

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1.2.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter, Engine Code CJAA



1 - Exhaust Pressure Sensor 1 - G450-

- ❑ Bolted near the oil filler neck

2 - Heat Shield

- ❑ Replace if damaged

3 - Bolt

- ❑ 8 Nm

4 - Bolt

- ❑ 4 Nm

5 - Control Line

- ❑ Check for secure fit
- ❑ From the exhaust gas recirculation housing -item 8- ⇒ Item 8 (page 398)

6 - Bolt

- ❑ 10 Nm

7 - Shield

- ❑ Note the installation position

8 - Heated Oxygen Sensor - G39-

- ❑ 52 Nm
- ❑ Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- ❑ Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body

9 - Seal

- ❑ Replace

10 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

11 - From the Turbocharger

- ❑ -item 14- ⇒ Item 14 (page 272)

12 - Exhaust Gas Temperature Sensor 4 - G648-

- ❑ 45 Nm
- ❑ Mark the installation position before removal
- ❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .
- ❑ Wire routing. Refer to ⇒ “1.6 Exhaust System Component Line Routing”, page 378 .

13 - Seal

- ❑ Replace
- ❑ Installing. Refer to
  ⇒ Fig. ""Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst"" , page 378 .

14 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to
  ⇒ Fig. ""Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst."" , page 378 .

15 - To Exhaust Door Control Unit - J883-

- ❑ -Item 4- ⇒ Item 4 (page 377)

16 - Oxygen Sensor after Three Way Catalytic Converter - G130-

- ❑ 52 Nm
- ❑ Use the Ring Wrench 7-Piece Set - 3337- to loosen and tighten.
- ❑ Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the sensor body
- ❑ Wire routing. Refer to ⇒ "1.6 Exhaust System Component Line Routing", page 378 .

17 - NOx Reduction Catalytic Converter

Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

- *Do not bend the decoupling element more than 10°.*
- *Do not stretch the decoupling element.*
- *Do not damage the wire mesh on the decoupling element.*
- *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

- ❑ Removing and installing. Refer to
  ⇒ "1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing", page 369 .

18 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to
  ⇒ "1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 368 .

19 - Seal

- ❑ Replace

20 - Bolt

- ❑ 25 Nm

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21 - Mount

- ❑ Install without tension

22 - From the EGR filter

- ❑ -item 9- ⇒ Item 9 (page 399)

23 - Clamp

- ❑ 3.5 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

24 - Exhaust Gas Temperature Sensor 2 - G448-

- ❑ 45 Nm
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .
- ❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

25 - Exhaust Gas Temperature Sensor 3 - G495-

- ❑ 45 Nm
- ❑ Note the installation position Refer to ⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .
- ❑ Only grease the threads with Hot Bolt Paste - G 052 112 A3- .

26 - Nut

- ❑ 23 Nm

27 - Nut

- ❑ 23 Nm

28 - Bracket

- ❑ Note the installation position
- ❑ For the particulate filter
- ❑ Fastened to cylinder block
- ❑ Install without tension

29 - Particulate Filter

Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

Do not bend the decoupling element more than 10°.

Do not stretch the decoupling element.

Do not damage the wire mesh on the decoupling element.

Use the Transportation Lock - T10404- to secure the decoupling element from stretching.

- ❑ Removing and installing. Refer to ⇒ “1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing”, page 369 .

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- ❑ After replacing, the ash load comparison adaptation must be set to “0”. Refer to Vehicle Diagnostic Tester “Guided Functions”.

30 - Control Wire

- ❑ 45 Nm
- ❑ Do not change the angles of the control line
- ❑ Install without tension

31 - Bolt

- ❑ 9 Nm

32 - Bracket

- ❑ For the control line
- ❑ Install without tension

33 - Bracket

- ❑ Note the installation position
- ❑ For the particulate filter
- ❑ Fastened to cylinder head
- ❑ Install without tension

34 - Bolt

- ❑ 23 Nm

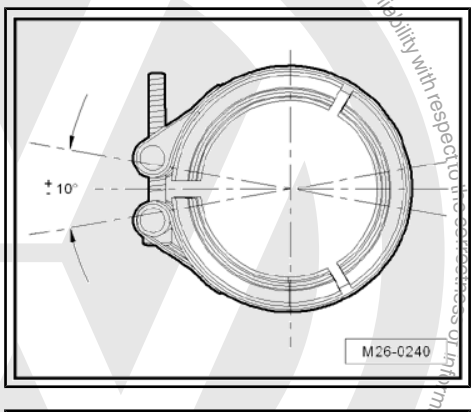
35 - Exhaust Pressure Sensor 2 - G451-

- ❑ Connected to the Auxiliary Fuel Pump - V393- bracket

1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position

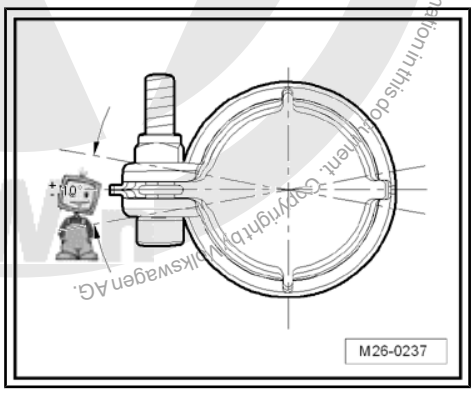
Clamp Installation Position between the Particulate Filter and Turbocharger

– Install the new clamp so the clamping bolt faces down and the -± 10°- angle is maintained.



Clamp Installation Position between the Particulate Filter and Exhaust Gas Recirculation Filter

– Install the new clamp so the clamping bolt faces down and the -± 10°- angle is maintained.



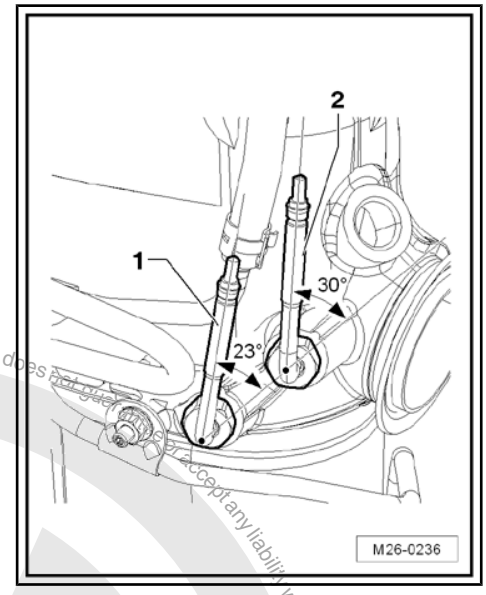
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Exhaust Gas Temperature Sensor Installation Position

– Install the Exhaust gas temperature sensor so the angles are maintained:

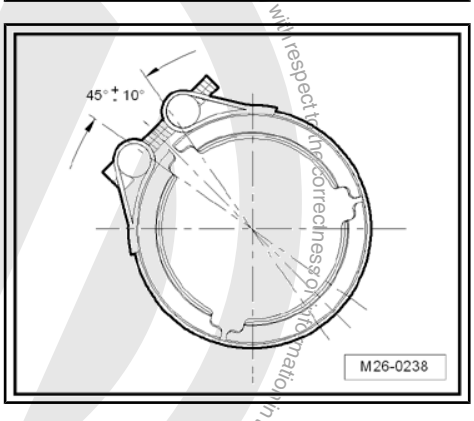
- Exhaust Gas Temperature Sensor 3 - G495- -1-: angle -23°-.
- Exhaust Gas Temperature Sensor 2 - G448- -1-: angle -30°-.

Engine Code CJAA



Installed Position: Clamp between the Particulate Filter and NOx Reduction Catalytic Converter

– Install the new clamp maintaining the -45° ± 10°- angle.



1.4 Particulate Filter with NOx Absorption Catalytic Converter, Removing and Installing

Special tools and workshop equipment required

- Locating Pins - T10096-
- Wrench - Sw13 - T10384-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Engine and Gearbox Jack - VAS6931-
- Hose Clip Pliers - VAS6362-
- Transportation Lock - T10404-

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Note

- *The subframe must be lowered in order to remove and install the particulate filter with NOx reduction catalytic converter. The Locating Pins - T10096- are needed to secure the subframe.*
- *Overview - Turbocharger with Exhaust Manifold and Attachments. Refer to*
  ⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270 .
- *Overview - Particulate Filter with NOx Reduction Catalytic Converter. Refer to*
  ⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 360 .
- *Overview - Exhaust Flap Control Module - J883- with Slip Catalyst. Refer to*
  ⇒ "1.5 Overview - Exhaust Flap Control Module J883 with Slip Catalyst", page 376
- *Hose connections are secured with either spring or hose clamps.*
- *Always replace clamp-type clips with spring-type clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

Removing:

WARNING

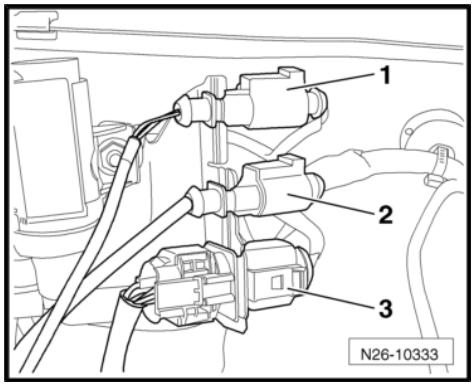
When doing any assembly work, especially in the engine compartment, pay attention to the following due to the limited space.

- ***Route all lines and wires in their original locations.***
- ***For example, for fuel lines, hydraulic lines, EVAP system lines, coolant and refrigerant lines, brake fluid lines and vacuum lines.***
- ***Make sure that there is sufficient clearance to all moving or hot components.***

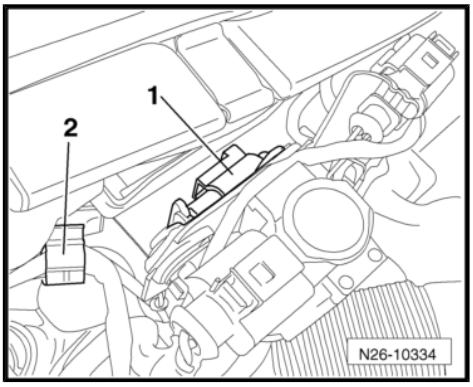
– Remove the engine cover. Refer to
⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

– Remove the intake hose -item 1- ⇒ Item 1 (page 336) between the Mass Airflow Sensor - G70- and the intake scoop. Loosen the spring clamps using the Hose Clip Pliers - VAS6362- .

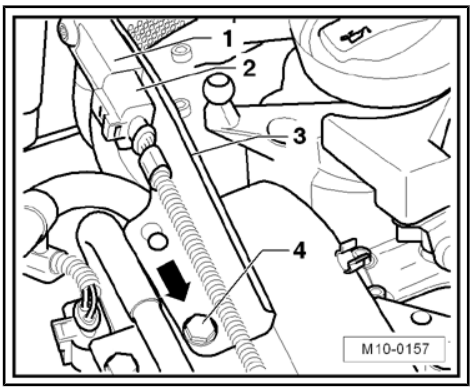
– Disconnect the »orange« connector for the Exhaust Gas Temperature Sensor 2 - G448- -1- as well as the »black« connector for the Heated Oxygen Sensor - G39- -3- on the plenum chamber bulkhead.



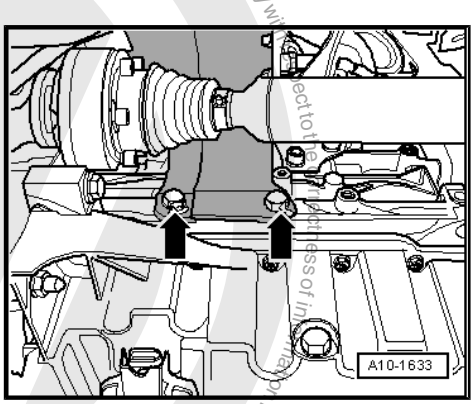
– Disconnect the »brown« connector for the Exhaust Gas Temperature Sensor 3 - G495- -1- (attached behind the bracket).
– Guide the wires out of the mount -2- on the plenum chamber bulkhead and on the turbocharger.
– Disconnect the connector -2- from the Exhaust Pressure Sensor 2 - G451- -1-.



– Remove the bolt -4- and remove the bracket -3- with Exhaust Pressure Sensor 2 - G451- -1- in the direction of -arrow- and set aside (control lines stay attached).
– Unbutton the heat shield and disconnect the connector from the Exhaust Pressure Sensor 1 - G450- . Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
– Disconnect the control wire -item 5- ⇒ Item 5 (page 361) from the Exhaust Pressure Sensor 1 - G450- . Loosen the spring clamp using the Hose Clip Pliers - VAS6362- . Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
– Remove the bolts and bracket with the Exhaust Pressure Sensor 1 - G450- and lay them aside (the control wire to the particulate filter remains connected).
– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .
– Remove the right drive axle heat shield -arrows-.
– Remove the right inner driveshaft from the transmission flange. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 .



– Carefully lay the driveshaft on the subframe.
– Remove the lower bracket for the particulate filter. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .



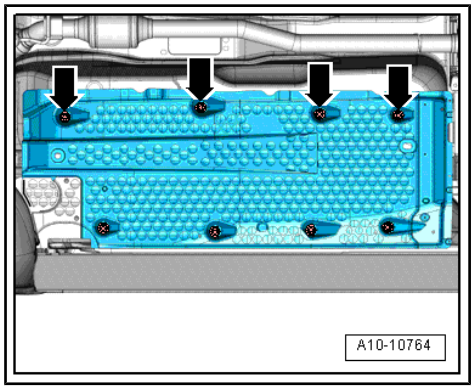
Note

Remove the nuts above the bracket with the Wrench - Sw13 - T10384- .

– Remove the exhaust gas recirculation filter -item 9- ⇒ Item 9 (page 399) .
– Remove the particulate filter from the upper bracket and remove the bracket on the cylinder head. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
– Remove the clamp between the particulate filter and turbocharger. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

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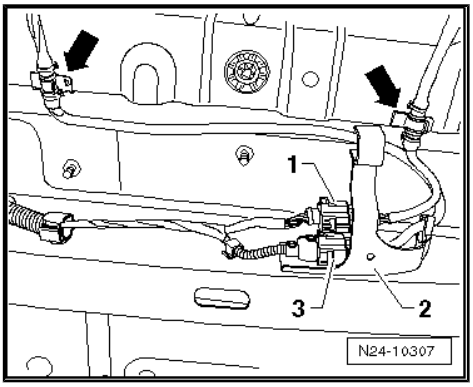
– Remove the nuts -arrows- and slightly pull the underbody cover downward.



Note

Route the cables as indicated. Refer to
⇒ "1.6 Exhaust System Component Line Routing", page 378 .

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– Disconnect the »orange« connector for the Exhaust Gas Temperature Sensor 4 - G648- -1- as well as the »brown« connector for the Oxygen Sensor after Three Way Catalytic Converter - G130- -3-.
– Disconnect from the bracket -2- and guide the lines out on the underbody -arrows-.
– Remove the NOx reduction catalytic converter mounting on the subframe. Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .
– Lower the subframe approximately 6 cm. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Subframe; Subframe, Lowering .
– Remove the tunnel brace. Refer to ⇒ “1.7 Overview - Muffler”, page 381 .
– Remove the clamp between the NOx reduction catalytic converter and the Exhaust Door Control Unit - J883- .

Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

- ***Do not bend the decoupling element more than 10°.***
- ***Do not stretch the decoupling element.***
- ***Do not damage the wire mesh on the decoupling element.***
- ***Use the Transportation Lock - T10404- to secure the decoupling element from stretching.***

Vehicles with Engine Code CJAA

– Disconnect the clamp between the NOx reduction catalytic converter and the particulate filter and remove the NOx reduction catalytic converter.

Continuation for All Engine Codes

– Remove the particulate filter. Be careful of the electrical wires and components.

Installing:

Note

- *After installing the particulate filter with NOx reduction catalytic converter, make sure it is not under stress.*
- *Always replace the self-locking nuts, seals, gaskets and clamps.*

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Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

- ***Do not bend the decoupling element more than 10°.***
- ***Do not stretch the decoupling element.***
- ***Do not damage the wire mesh on the decoupling element.***
- ***Use the Transportation Lock - T10404- to secure the decoupling element from stretching.***

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Vehicles with Engine Code CBEA

– Set the particulate filter with NOx reduction catalytic converter in its installation position. Be careful of the electrical wires and components.

Vehicles with engine code CJAA

– Install the particulate filter. Be careful of the electrical wires and components.

Continuation for All Engine Codes

– Install the subframe. Refer to ⇒ Suspension, Wheels and Steering; Rep. Gr. 40 ; Subframe; Overview - Subframe .

– Install a new gasket between the NOx reduction catalytic converter and the Exhaust Door Control Unit - J883- . Refer to ⇒ Fig. ""Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst"" , page 378 .

– Install the new clamp between the NOx reduction catalytic converter and the Exhaust Flap Control Module - J883- .

Make sure the clamp is in the correct installation position. Refer to ⇒ Fig. ""Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst."" , page 378 .

Tightening specification. Refer to ⇒ "1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter", page 360 .

Vehicles with Engine Code CJAA

– Install the new seal between the NOx reduction catalytic converter and the particulate filter.

– Install the new clamp between the NOx reduction catalytic converter and the particulate filter.

Make sure the clamp is in the correct installation position. Refer to ⇒ "1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position", page 368 .

Tightening specification -item 18- ⇒ Item 18 (page 366) .

Continuation for All Engine Codes

– Install the tunnel brace:

- Tightening specification. Refer to ⇒ "1.7 Overview - Muffler", page 381 .

The Additional Numbered Procedures Must Be Followed to Ensure the Particulate Filter with the NOx Reduction Catalytic Converter Is Installed without Tension:

1. Position the lower bracket with the nuts on the cylinder block and on the particulate filter. (Do not tighten the nuts.)
2. Position the new clamp with a new gasket between the particulate filter and turbocharger (do not tighten the clamp):

- Make sure the clamp is in the correct installation position. Refer to
⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

3. Install the EGR filter -item 9- ⇒ Item 9 (page 399) .
4. Position a new clamp between the particulate filter and EGR filter (do not tighten the clamp):

- Make sure the clamp is in the correct installation position. Refer to
⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

5. Mount the particulate filter on the upper bracket but do not tighten the bolt yet.

– Tighten the mounting elements in the following sequence:

6. NOx reduction catalytic converter mounting on the subframe:
7. Clamp between the particulate filter and turbocharger.
8. Lower bracket to the cylinder block:
9. Lower bracket to the particulate filter:
10. Upper bracket to the particulate filter:
11. Upper bracket to the cylinder head:
12. Clamp between the particulate filter and EGR filter:

- Tightening specification. Refer to
⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

If the particulate filter was replaced:

– Remove the transport and protective packaging on the decoupling element between the particulate filter and NOx reduction catalytic converter.

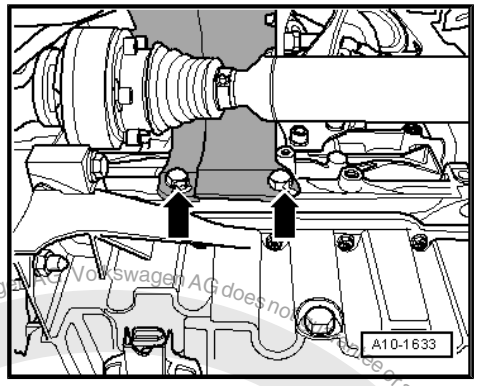
Further installation is the reverse order of removal. Note the following:

- Make sure the line connections are secure.
- Tightening Specifications. Refer to
⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 , Particulate Filter with NOx Absorption Catalyst - Overview

– Install the right drive axle heat shield -arrows-.

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– Install the right inner driveshaft from the transmission flange. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 .



Vehicles with Manual Transmission:

- Tightening specification. Refer to ⇒ 6-speed Manual Transmission 02Q; Rep. Gr. 34 .

Vehicles with DSG® transmission:

- Tightening specification. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34 .

Note

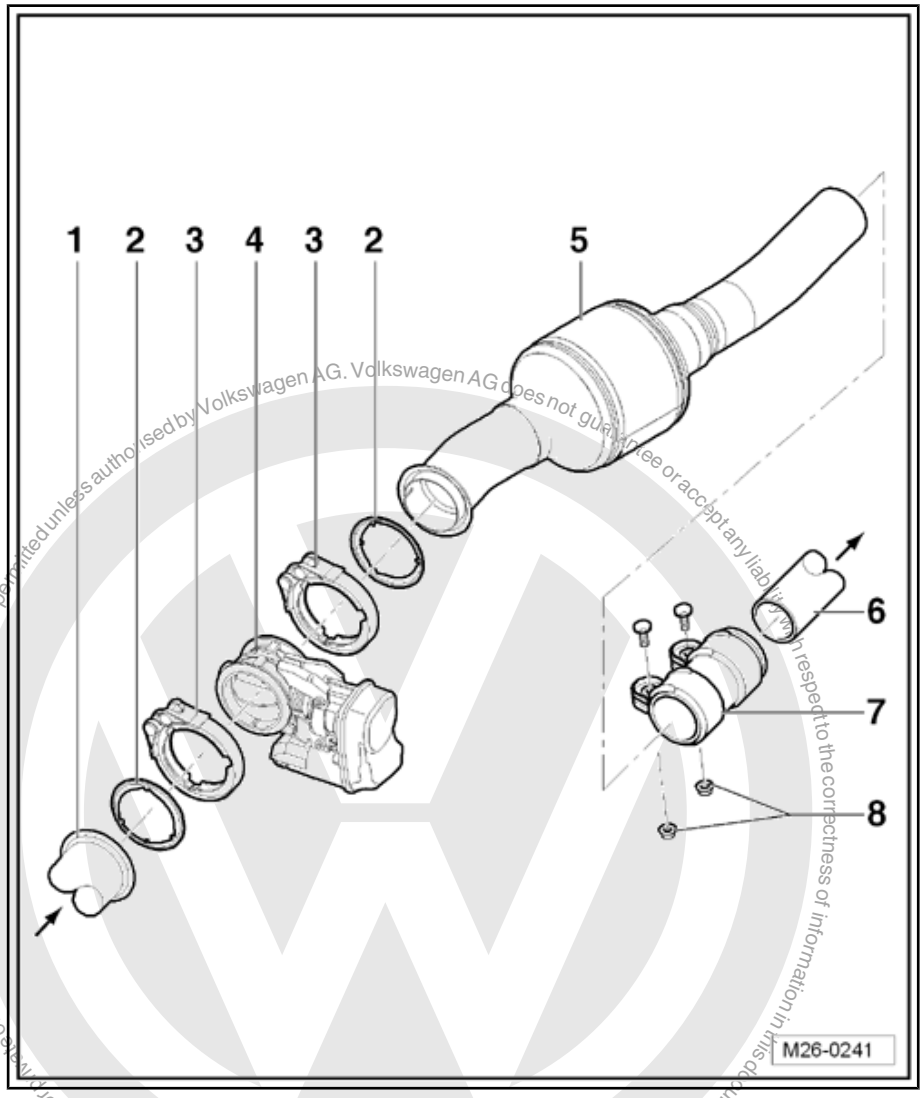
If the particulate filter was replaced, then the adaptation of the soot load measurement must be set to "0". Refer to Vehicle Diagnostic Tester "Guided Functions".

– Perform a road test. The vehicle must be aligned if the steering wheel is »crooked«. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 44 ; Wheel Alignment .

– Install the engine cover. Refer to ⇒ "1.4 Engine Cover, Removing and Installing", page 90 .

1.5 Overview - Exhaust Flap Control Module - J883- with Slip Catalyst

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1 - From the Reduction Catalytic Converter

2 - Seal

- ❑ Replace
- ❑ Installing. Refer to ⇒ Fig. ""Install the Gasket Between Exhaust Door Control Unit -J883- and the NOx Reservoir or Slip Catalyst"" , page 378 .

3 - Clamp

- ❑ 7 Nm
- ❑ Replace
- ❑ Note the installation position Refer to ⇒ Fig. ""Installation Position of the Clamps Between Exhaust Door Control Unit -J883- and NOx Reservoir or Slip Catalyst."" , page 378 .

4 - Exhaust Door Control Unit -J883-

- ❑ Note the installation position
- ❑ Heat shield and connector wire routing. Refer to ⇒ "1.6 Exhaust System Component Line Routing", page 378 .

5 - Slip Catalyst

- ❑ Exhaust System, Checking for Leaks. Refer to ⇒ "1.10 Exhaust System, Checking for Leaks", page 387 .

6 - Front Muffler

7 - Clamping Sleeve

- ❑ Note the installation position Refer to ⇒ Fig. ""Clamping Sleeve Installation Position"" , page 378 .
- ❑ Align the exhaust system free of stress. Refer to ⇒ "1.9 Exhaust System, Installing without Tension", page 385 .
- ❑ Tighten the bolted connections evenly

8 - Nut

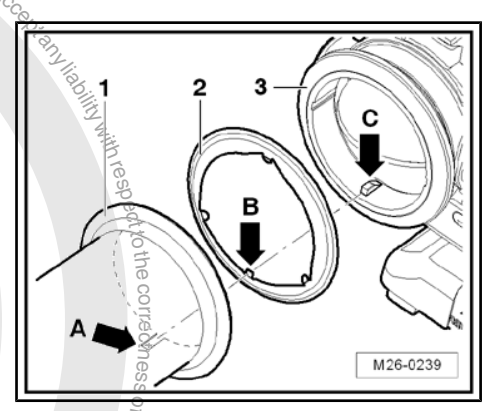
- ❑ 23 Nm

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Install the Gasket Between Exhaust Door Control Unit - J883- and the NOx Reservoir or Slip Catalyst

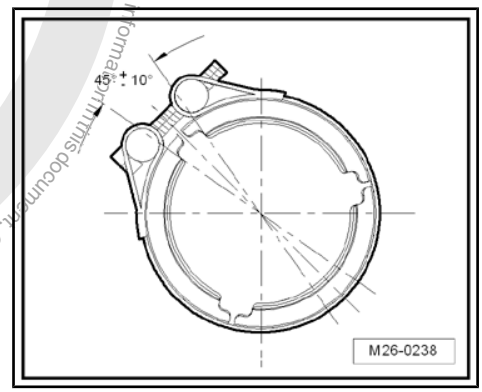
– Insert the gasket -2- with the angled tab -B- in the notch -A- on the NOx reservoir or slip catalyst -1-.

– Insert the Exhaust Door Control Unit - J883- -3- with the retaining tab -C- in the notch -A-.



Installation Position of the Clamps Between Exhaust Door Control Unit - J883- and NOx Reservoir or Slip Catalyst.

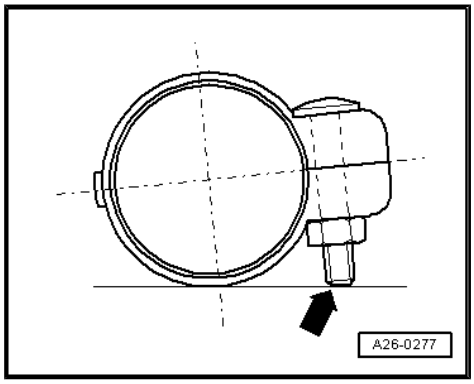
– Install the new clamp so the clamping bolt is opposite the Exhaust Door Control Unit - J883- housing and the -45 ± 10°- angle is maintained.



Clamping Sleeve Installation Position

– When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:

- Threaded connection points toward the right.
- Tighten the threaded connections equally to 23 Nm.



1.6 Exhaust System Component Line Routing

Routing Lines on the Exhaust Flap Control Module -J883-. Refer to ⇒ page 378

Routing Lines for the Oxygen Sensor after Three Way Catalytic Converter -G130- and Exhaust Gas Temperature Sensor 4 - G648-. Refer to ⇒ page 379

Line Routing on the Exhaust Flap Control Module

1 - Slip Catalyst

2 - NOx Reduction Catalytic Converter

3 - Direction of Travel

4 - Line

- ❑ Note the installation position
- ❑ Check for secure fit

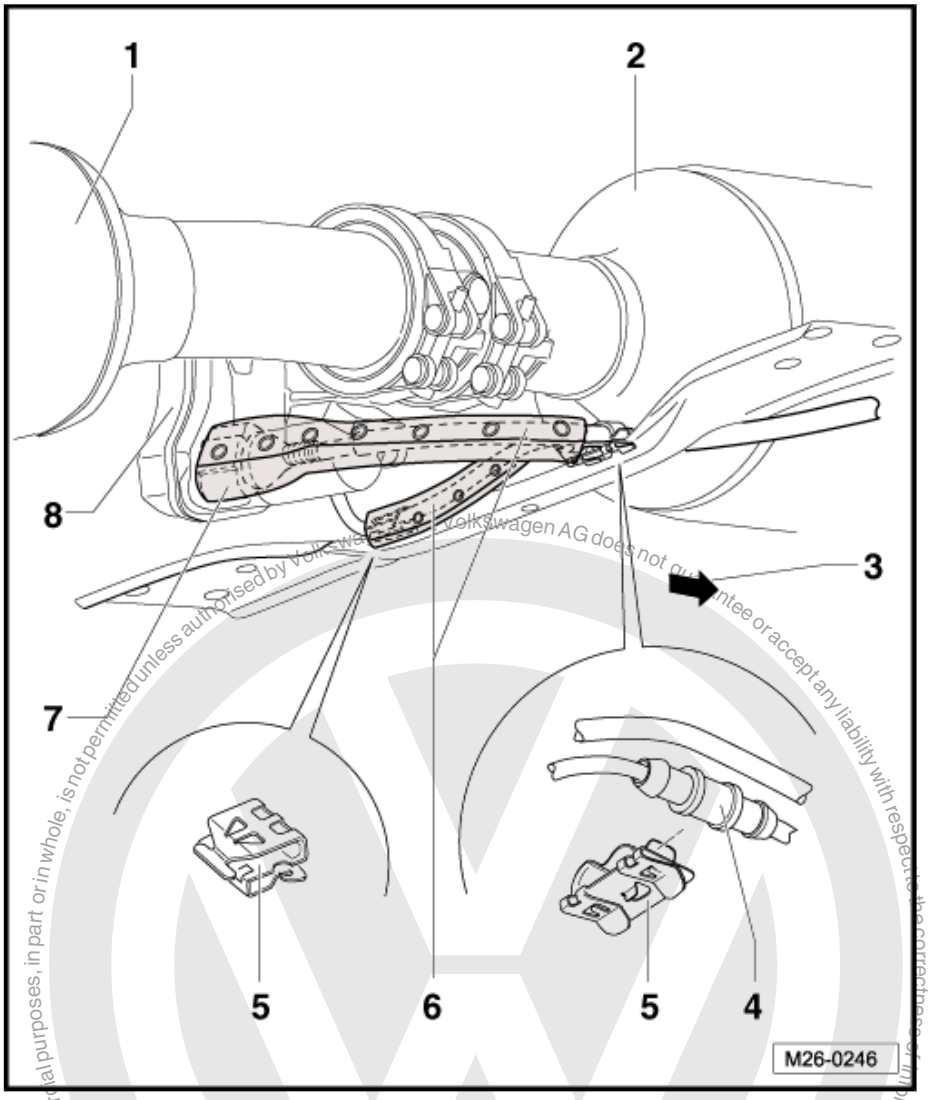
5 - Cable Bracket

6 - Heat Shield

- ❑ Note the installation position
- ❑ Replace if damaged

7 - Exhaust Door Control Unit - J883- Connector

8 - Exhaust Door Control Unit - J883-



Routing Lines for the Oxygen Sensor after Three Way Catalytic Converter -G130- and Exhaust Gas Temperature Sensor 4 - G648-

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1 - Oxygen Sensor after Catalytic Converter - G130-

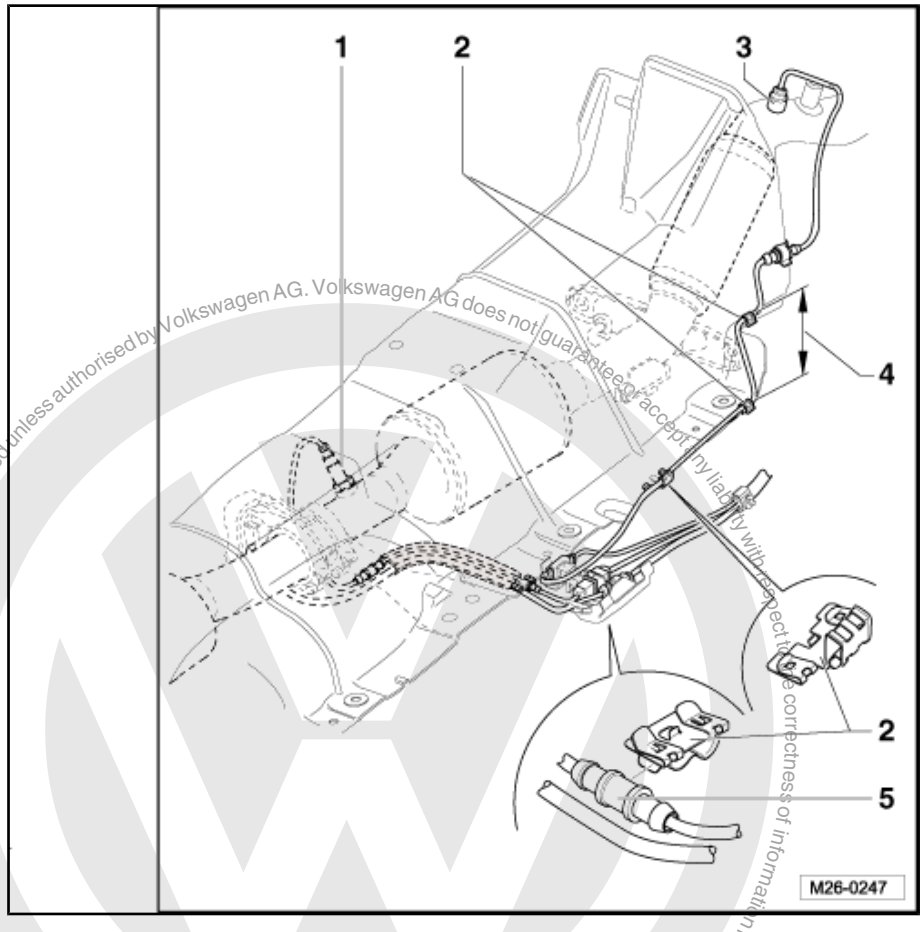
2 - Cable Bracket

3 - Exhaust Gas Temperature Sensor 4 - G648-

4 - Distance: 100 mm

5 - Line

- ❑ Note the installation position
- ❑ Check for secure fit



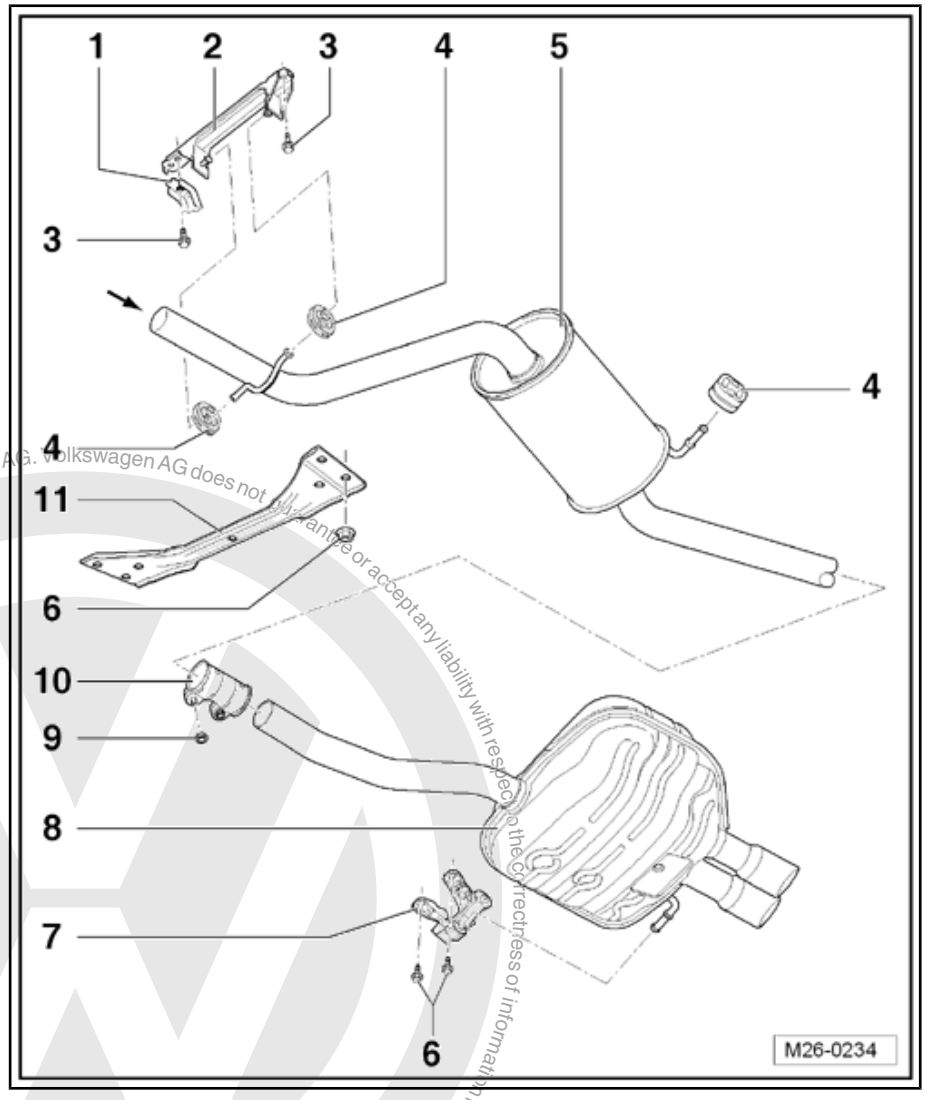
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1.7 Overview - Muffler

⇒ “1.7.1 Vehicles with Engine Code CBEA”, page 381

⇒ “1.7.2 Vehicles with Engine Code CJAA”, page 383

1.7.1 Vehicles with Engine Code CBEA



1 - Mounting Strap

- ❑ For the fuel tank -item 10- ⇒ Item 10 (page 231)

2 - Mount

- ❑ Replace if damaged

3 - Bolt

- ❑ 23 Nm
- ❑ Replace

4 - Retaining Loop

- ❑ Replace if damaged

5 - Center Muffler

- ❑ Original equipment as one unit with the rear muffler
- ❑ For repairs, replace each separately
- ❑ Exhaust System, Separating and Connecting. Refer to ⇒ “1.8 Exhaust System, Disconnecting and Connecting”, page 384 .
- ❑ Align the exhaust system free of stress. Refer to ⇒ “1.9 Exhaust System, Installing without Tension”, page 385 .
- ❑ Exhaust System, Checking for Leaks. Refer to ⇒ “1.10 Exhaust System, Checking for Leaks”, page 387 .

6 - Bolt

- ❑ 23 Nm

7 - Mount

- ❑ Replace if damaged

8 - Rear Muffler

- ❑ Original equipment as one unit with center muffler
- ❑ For repairs, replace each separately
- ❑ Exhaust System, Separating and Connecting. Refer to ⇒ “1.8 Exhaust System, Disconnecting and Connecting”, page 384 .
- ❑ Align the exhaust system free of stress. Refer to ⇒ “1.9 Exhaust System, Installing without Tension”, page 385 .
- ❑ Exhaust System, Checking for Leaks. Refer to ⇒ “1.10 Exhaust System, Checking for Leaks”, page 387 .

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9 - Nut

- ❑ 23 Nm

10 - Repair Clamping Sleeve

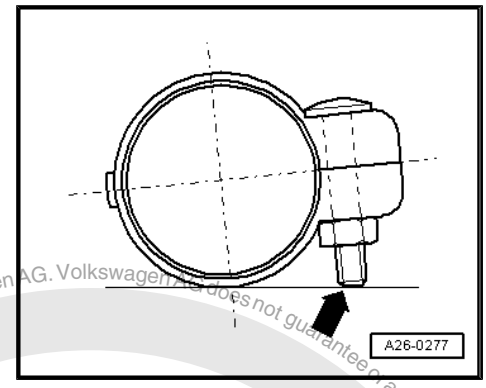
- ❑ For replacing the center and rear muffler and/or exhaust pipe and rear muffler individually
- ❑ Note the installation position Refer to
⇒ Fig. ""Repair Clamping Sleeve Installation Position"" , page 382 .
- ❑ Exhaust System, Separating and Connecting. Refer to
⇒ "1.8 Exhaust System, Disconnecting and Connecting", page 384 .
- ❑ Align the exhaust system free of stress. Refer to
⇒ "1.9 Exhaust System, Installing without Tension", page 385 .
- ❑ Tighten the bolted connections evenly

11 - Tunnel Brace

Repair Clamping Sleeve Installation Position

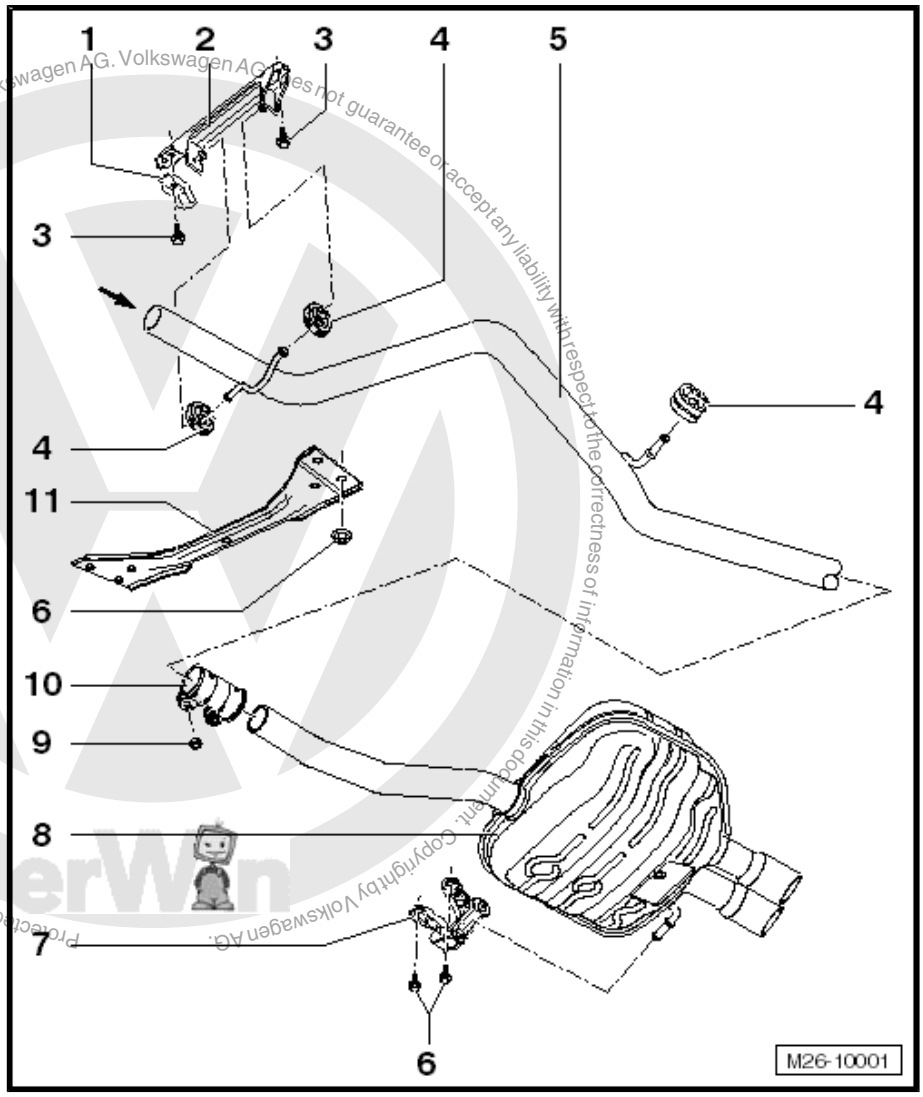
– When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:

- Threaded connection points toward the right.
- Tighten the threaded connections equally to 23 Nm.



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1.7.2 Vehicles with Engine Code CJAA



1 - Mounting Strap

- ❑ For the fuel tank -item 10- ⇒ Item 10 (page 231)

2 - Mount

- ❑ Replace if damaged

3 -

- ❑ 23 Nm
- ❑ Replace

4 - Retaining Loop

- ❑ Replace if damaged

5 - Exhaust Pipe

6 - Bolt

- ❑ 23 Nm

7 - Mount

- ❑ Replace if damaged

8 - Rear Muffler

- ❑ For repairs, replace each separately
- ❑ Exhaust System, Separating and Connecting. Refer to ⇒ “1.8 Exhaust System, Disconnecting and Connecting”, page 384
- ❑ Align the exhaust system free of stress. Refer to ⇒ “1.9 Exhaust System, Installing without Tension”, page 385 .
- ❑ Exhaust System, Checking for Leaks. Refer to ⇒ “1.10 Exhaust System, Checking for Leaks”, page 387 .

9 - Nut

- ❑ 23 Nm

10 - Repair Clamping Sleeve

- ❑ For individual replacement of exhaust pipe and rear mufflers
- ❑ Note the installation position Refer to ⇒ Fig. ““Repair Clamping Sleeve Installation Position”“ , page 384 .
- ❑ Exhaust System, Separating and Connecting. Refer to ⇒ “1.8 Exhaust System, Disconnecting and Connecting”, page 384 .
- ❑ Align the exhaust system free of stress. Refer to ⇒ “1.9 Exhaust System, Installing without Tension”, page 385 .
- ❑ Tighten the bolted connections evenly

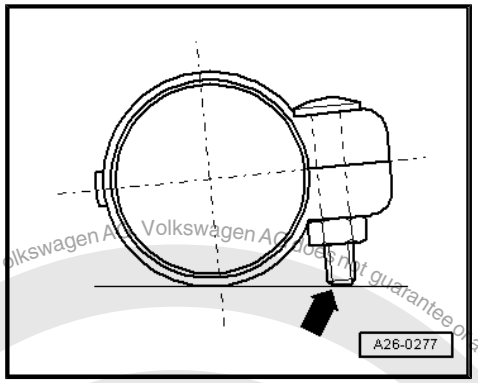
11 - Tunnel Brace

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Repair Clamping Sleeve Installation Position

– When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:

- Threaded connection points toward the right.
- Tighten the threaded connections equally to 23 Nm.



1.8 Exhaust System, Disconnecting and Connecting

Note

- *A separating point has been provided in the connecting pipe for removing, installing and individual replacement of the center or rear muffler.*
- *The separating point is marked an indentation around the circumference of the exhaust pipe.*

Special tools and workshop equipment required

- Pneumatic Body Saw - VAS6780- or
- Chain Pipe Cutter - VAS6254-
- Torque Wrench 1331 5-50Nm - VAG1331- (not illustrated)
- Protective Eyewear
- Protective clothing

Conditions

- Engine must be cold.

Procedure

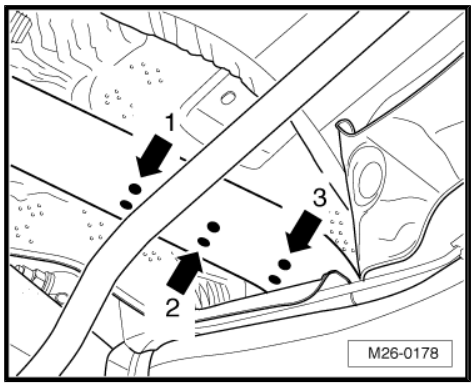
WARNING

To prevent injuries from metal shavings, wear protective goggles and protective clothing.

– Cut the exhaust pipe at a right angle at the separating point -arrow 2-, for example using a Pneumatic Body Saw - VAS6780- or Chain Pipe Cutter - VAS6254- .

Connecting:

– Position the repair clamping sleeve at the side marks -arrow 1 and 3- for installation.



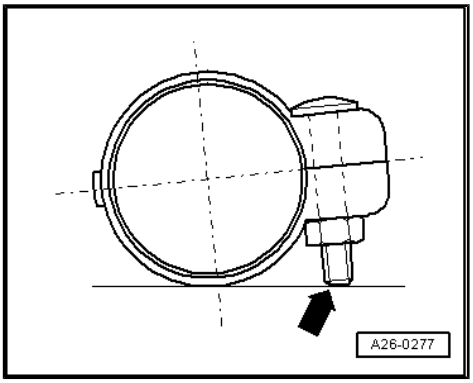
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– When installing clamping sleeve, ensure that the bolt end -arrow- does not project beyond the lower edge of clamping sleeve:

• Threaded connection points toward the right.

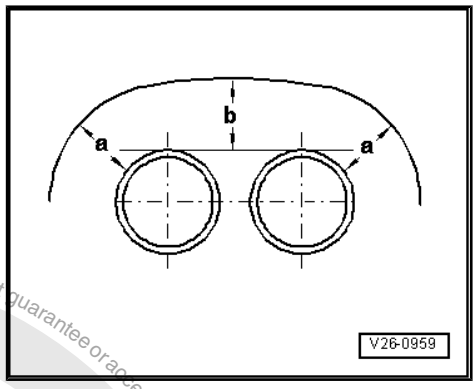
• Tighten the threaded connections evenly.

• Tightening specification: 23 Nm.



Aligning Tail Pipes

– Align rear muffler so that the distance -a- between bumper cut-out and tail pipes is uniform on left and right.



1.9 Exhaust System, Installing without Tension

Special tools and workshop equipment required

♦ Torque Wrench 1331 5-50Nm - VAG1331-

Conditions

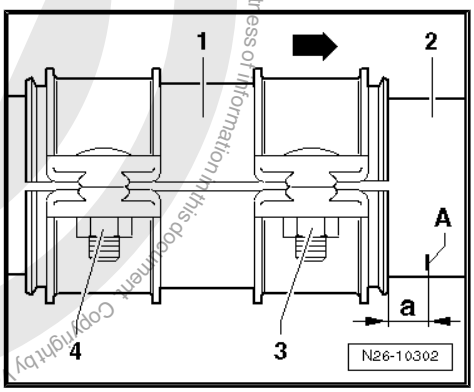
• Engine must be cold.

Procedure

– Loosen the threaded connections -3 and 4- on the clamping sleeve -1- between the slip catalyst -2- and the front muffler (the -arrow- points in the direction of travel).

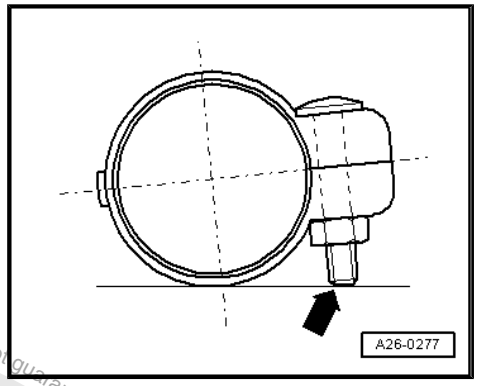
– Align the clamping sleeve -1- to the marking -A- on the slip catalyst -2-.

• Dimension -a- = 5 mm

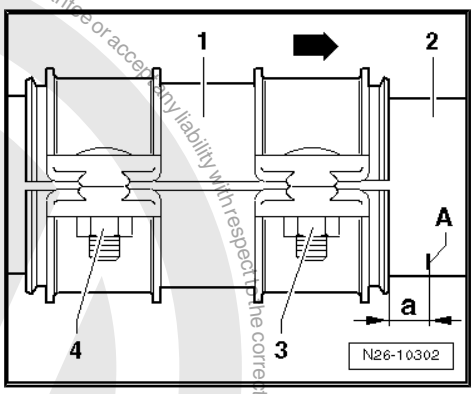


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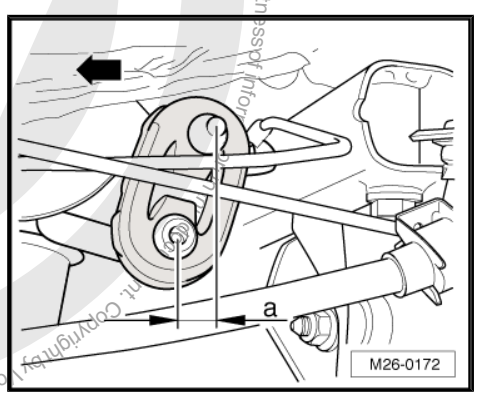
- The connections must be at the right and must not project beyond the lower edge of the clamping sleeve -arrow-.



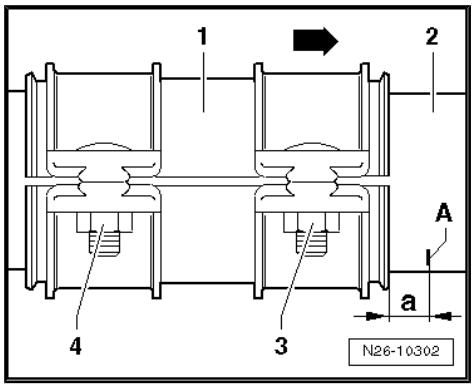
– Tighten the front connection -3- on the clamping sleeve -1- by hand.



– Push the exhaust system as far as possible forward into the double clamp until dimension -a- is reached on the retaining loop (-arrow- points in direction of travel).
- Dimension -a- 15 to 17 mm.

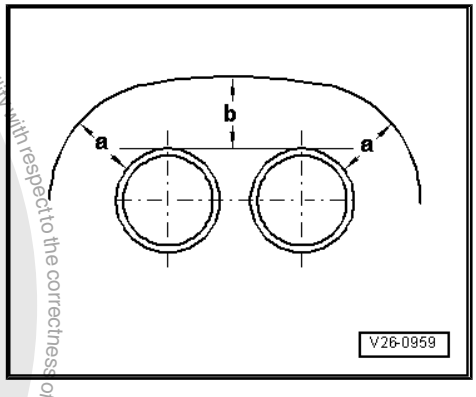


– In this position, tighten the connections -3 and 4- on the clamping sleeve -1- evenly.
- Tightening specification -item 8- ⇒ Item 8 (page 377) .
– After tightening the clamping sleeve, check dimension -a- and correct if necessary.



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Aligning Tail Pipes



– Align rear muffler so that the distance -a- between bumper cut-out and tail pipes is uniform on left and right.

1.10 Exhaust System, Checking for Leaks

Test Sequence

– Start the engine and let it run in idle.

– Seal the tailpipes, for example with cloth or plug, for the duration of the leak test.

– Check the connections in the exhaust system for leaks by listening.

– Repair the determined leaks.

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2 Exhaust System, Engine Codes CBDA, CBDB and CEGA

⇒ “2.1 Overview - Front Exhaust Pipe with Particulate Filter”, page 388

⇒ “2.2 Particulate Filter, Removing and Installing”, page 391

⇒ “2.3 Overview - Muffler”, page 395

⇒ “2.5 Exhaust System, Installing without Tension”, page 397

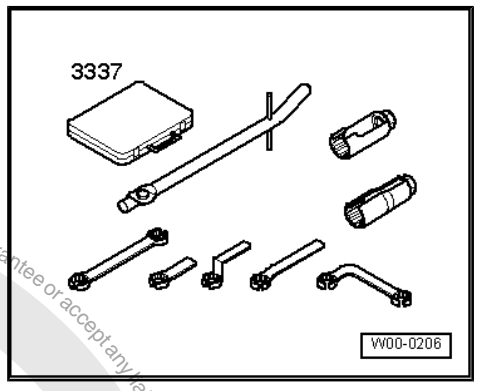
2.1 Overview - Front Exhaust Pipe with Particulate Filter

Note

- *Exhaust Manifold, Removing and installing. Refer to ⇒ “3.1 Overview - Turbocharger with Exhaust Manifold and Attachments”, page 270 .*
- *After exhaust system repairs, make sure exhaust system is not under stress and that it has sufficient clearance from the bodywork. If necessary, loosen the double clamp and align the muffler and exhaust pipe so that sufficient clearance is maintained to the body and the mountings carry even loads.*
- *Replace the self-locking nuts.*

Special tools and workshop equipment required

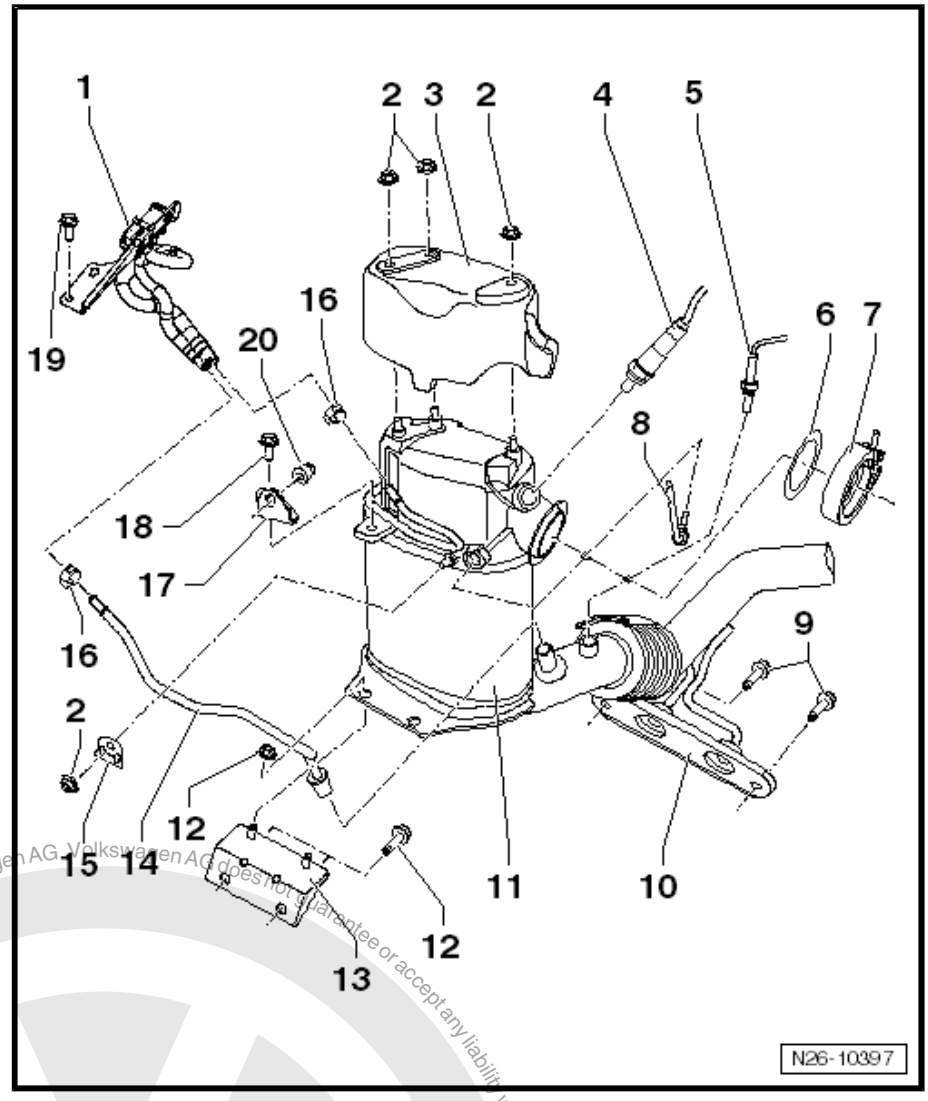
- Ring Wrench 7-Piece Set - 3337-



Note

If the particulate filter of the Exhaust Pressure Sensor 2 - G451- is being replaced, the Exhaust Pressure Sensor 2 - G451- must be adapted using the Vehicle Diagnostic Tester : Guided Functions, Adapt the Exhaust Pressure Sensor 2 - G451- .

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1 - Exhaust Pressure Sensor 2 - G451-

2 - 10 Nm

3 - Shield

4 - Heated Oxygen Sensor - G39-

- ❑ 50 Nm
- ❑ Grease only the threads with Hot Bolt Paste - G 052 112 A3- ; Hot Bolt Paste - G 052 112 A3- must not get into the slots on the probe body
- ❑ To remove, use the Ring Wrench 7-Piece Set - 3337-

5 - Exhaust Gas Temperature Sensor 4 - G648-

- ❑ 45 Nm
- ❑ Coat the thread on the sensor with Hot Bolt Paste - G 052 112 A3-

6 - Seal

- ❑ Replace
- ❑ Note the installation position

7 - Clamp, 7 Nm

8 - Exhaust Gas Temperature Sensor 3 - G495-

- ❑ 45 Nm
- ❑ Coat the thread on the sensor with Hot Bolt Paste - G 052 112 A3-

9 - 25 Nm

10 - Mount

- ❑ Replace if damaged

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11 - Particulate Filter

> **Caution**
> *There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:*
> *Do not bend the decoupling element more than 10°.*
> *Do not stretch the decoupling element.*
> *Do not damage the wire mesh on the decoupling element.*
> *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

- ❑ With oxidation catalytic converter and front exhaust pipe
- ❑ After replacing, the adaptation of the soot load comparison must be set to “0” using the Vehicle Diagnostic Tester “Guided Functions”.
- ❑ Removing and installing. Refer to ⇒ “2.2 Particulate Filter, Removing and Installing”, page 391 .

12 - 25 Nm

13 - Bracket

- ❑ Bolted to the cylinder block

14 - Control wire, 45 Nm

15 - Bracket

- ❑ Attached to the particulate filter

16 - Clamp

- ❑ Replace

17 - Bracket

- ❑ Attached to the cylinder head

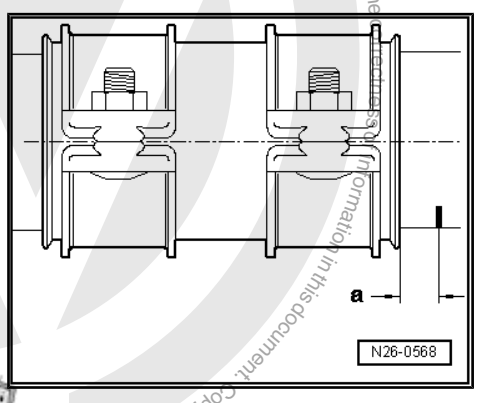
18 - 25 Nm

19 - 8 Nm

20 - 25 Nm

Clamping sleeve installation position

– Position the double clamp at a distance -a- = 5 mm in front of the marking on the front exhaust pipe for the particulate filter.



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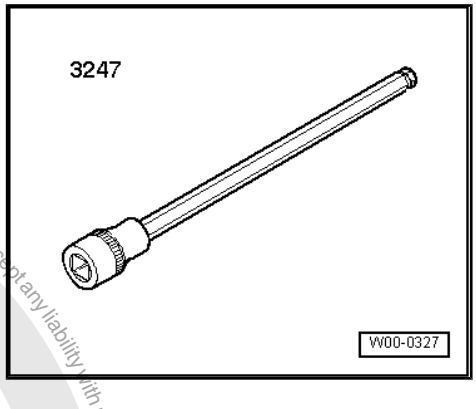
2.2 Particulate Filter, Removing and Installing

Note

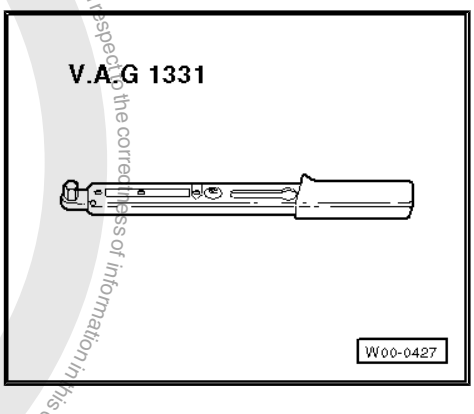
- *Exhaust Manifold, Removing and installing. Refer to* *⇒ "3.1 Overview - Turbocharger with Exhaust Manifold and Attachments", page 270* .
- *After exhaust system repairs, make sure exhaust system is not under stress and that it has sufficient clearance from the bodywork. If necessary, loosen the double clamp and align the muffler and exhaust pipe so that sufficient clearance is maintained to the body and the mountings carry even loads.*
- *Replace the self-locking nuts.*
- *If the particulate filter of the Exhaust Pressure Sensor 2 - G451- is being replaced, the Exhaust Pressure Sensor 2 - G451- must be adapted using the Vehicle Diagnostic Tester : Guided Functions, Adapt the Exhaust Pressure Sensor 2 - G451- .*

Special tools and workshop equipment required

- Hex Ball Socket - 3247-

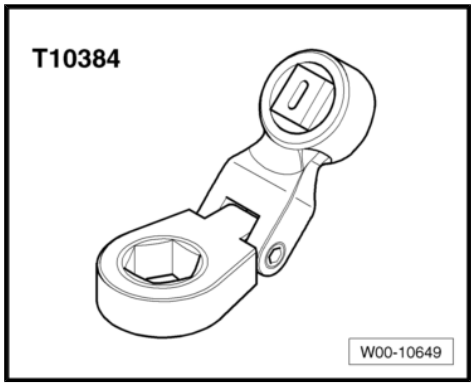


- Torque Wrench 1331 5-50Nm - VAG1331-

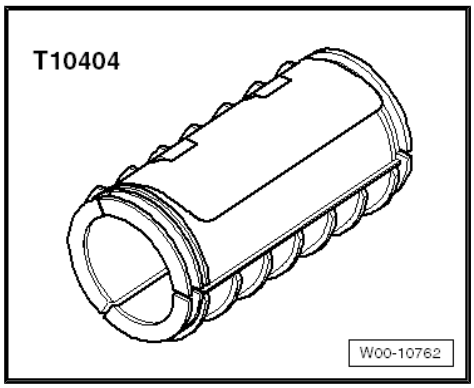


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- Wrench - Sw13 - T10384-



- Transportation Lock - T10404-

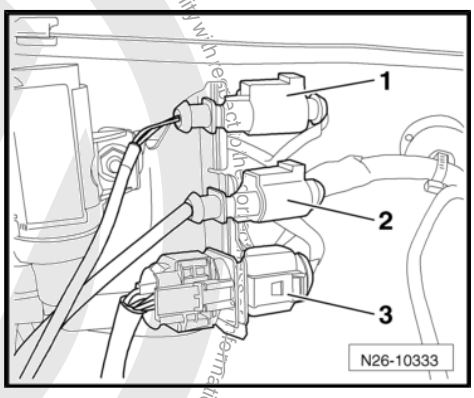


2.2.1 Removing

– Remove the battery and the battery tray. Refer to ⇒ Electrical System; Rep. Gr. 27 ; Battery; Battery Tray, Removing and Installing .

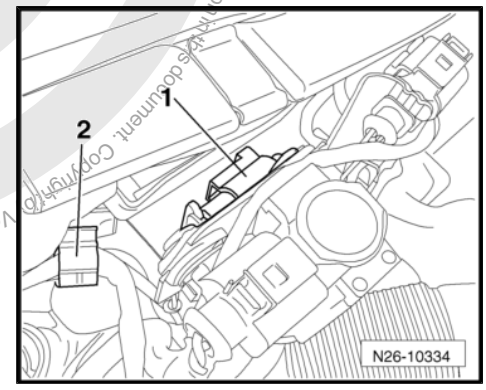
– Remove the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

– Disconnect the connector for the Heated Oxygen Sensor - G39- -3- as well as the connector for the Exhaust Gas Temperature Sensor 4 - G648- -2-.



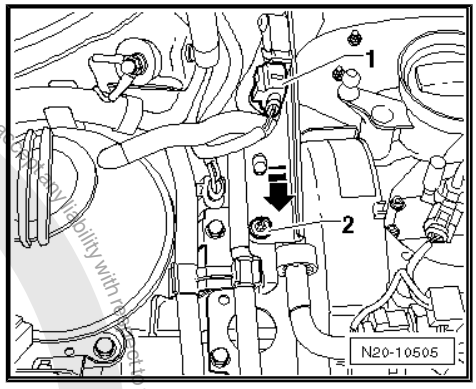
– Disconnect the connector for the Exhaust Gas Temperature Sensor 3 - G495- -1- (attached behind the bracket).

– Disconnects form the retainers and guide the wires out of the retainers on the plenum chamber bulkhead -2- and turbocharger.

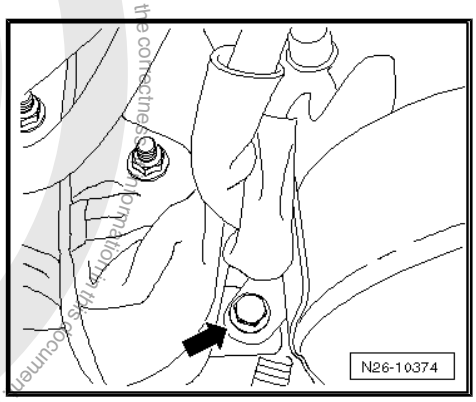


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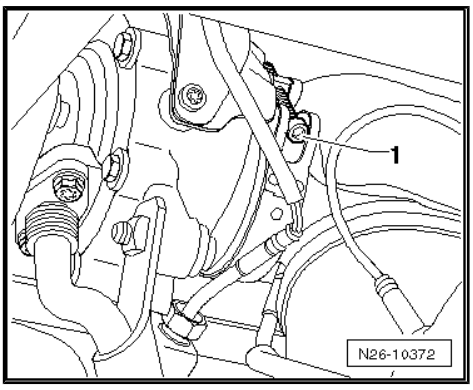
– Disconnect the connector -1-, remove the screw -2- and remove the bracket for Exhaust Pressure Sensor 2 - G451- including the sensor by pushing it in the direction of travel.
– Lay the Exhaust Pressure Sensor 2 - G451- on the particulate filter.



– Remove the screw -arrow- on the top bracket for the particulate filter.
– Remove the noise insulation. Refer to ⇒ Rep. Gr. 50 .
– Remove the subframe with the steering gear. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Subframe; Subframe with Hydraulic Steering Gear, Removing and Installing .

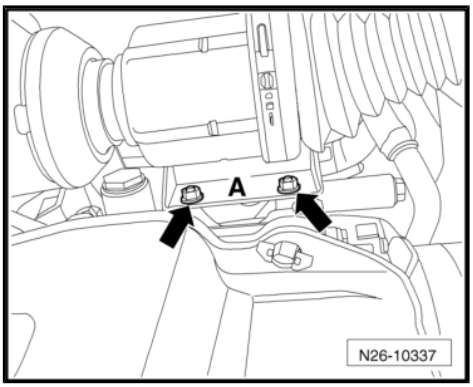


– Loosen the clamp -1- between the particulate filter and the turbocharger.
– Remove the nuts above the particulate filter bracket using the Wrench - Sw13 - T10384-

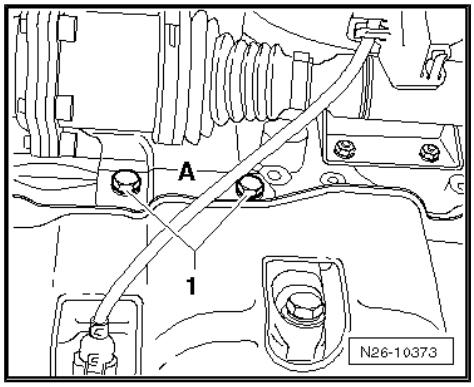


– Remove the nuts -arrows- on the particulate filter bracket -A- from the crankcase. Leave the bracket on the crankcase.

FWD Vehicles:

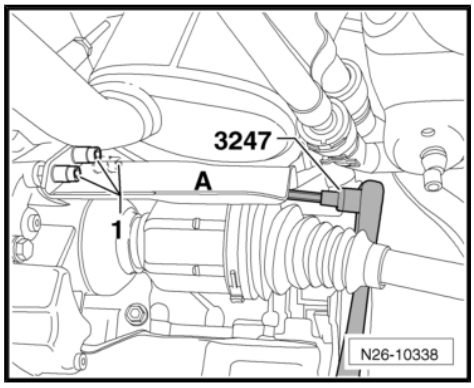


– Remove the bolts -1- from the heat shield -A- above the right axle shaft and remove the heat shield.



AWD vehicles:

– Remove the bolts -1- from the shield -1- above the right axle shaft using a Hex Ball Socket - 3247- . Push the particulate filter upward, if necessary, in order to be able to reach the rear threaded connection.

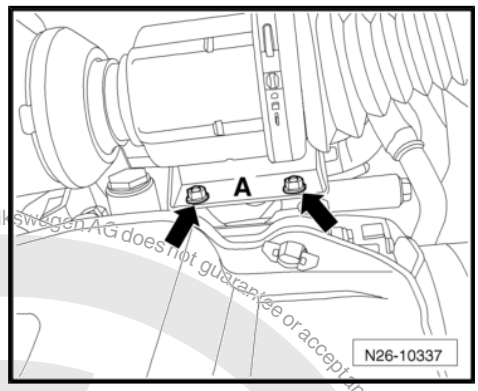


Continuation for All Vehicles:

– Loosen the clamp on the exhaust pipe. Leave it in its position.

– Remove the particulate filter bracket -A-.

– Slide the clamp toward the exhaust pipe.



Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

- *Do not bend the decoupling element more than 10°.*
- *Do not stretch the decoupling element.*
- *Do not damage the wire mesh on the decoupling element.*
- *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

– Remove the particulate filter and exhaust pipe downward. Be careful of the electrical wires and components.

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2.2.2 Installing

Caution

There is a risk of damaging the decoupling element between the particulate filter and NOx reduction catalytic converter. When removing and installing:

- *Do not bend the decoupling element more than 10°.*
- *Do not stretch the decoupling element.*
- *Do not damage the wire mesh on the decoupling element.*
- *Use the Transportation Lock - T10404- to secure the decoupling element from stretching.*

– Mount the particulate filter bracket on the crankcase and install the nuts by hand.

– Mount the particulate filter on the bracket.

– Secure the exhaust pipe to the driveshaft or to the body.

– Install the screw on the particulate filter bracket by hand.

– Slide the double clamp into position on the exhaust pipe.

– Guide the temperature sensor wires upward.

– Position the clamp on the turbocharger and tighten it.

– Tighten the screws in the following sequence:

1. Lower particulate filter bracket to crankcase.
2. Particulate filter to lower particulate filter bracket, use the Wrench - Sw13 - T10384- .
3. Particulate filter to upper particulate filter bracket

– Install the axle shaft heat shield with Hex Ball Socket - 3247- .

– Mount the right axle shaft joint on the bevel box. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 .

– Install the subframe with the steering gear. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40 ; Subframe; Subframe with Hydraulic Steering Gear, Removing and Installing .

– Install the suspended mounting for the exhaust pipe to the subframe.

– Tighten the double clamp on the exhaust system.

2.3 Overview - Muffler

Exhaust Pipe, Disconnecting. Refer to
⇒ “2.4 Exhaust Pipe, Disconnecting”, page 396 .

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1 - 25 Nm
- ❑ Replace

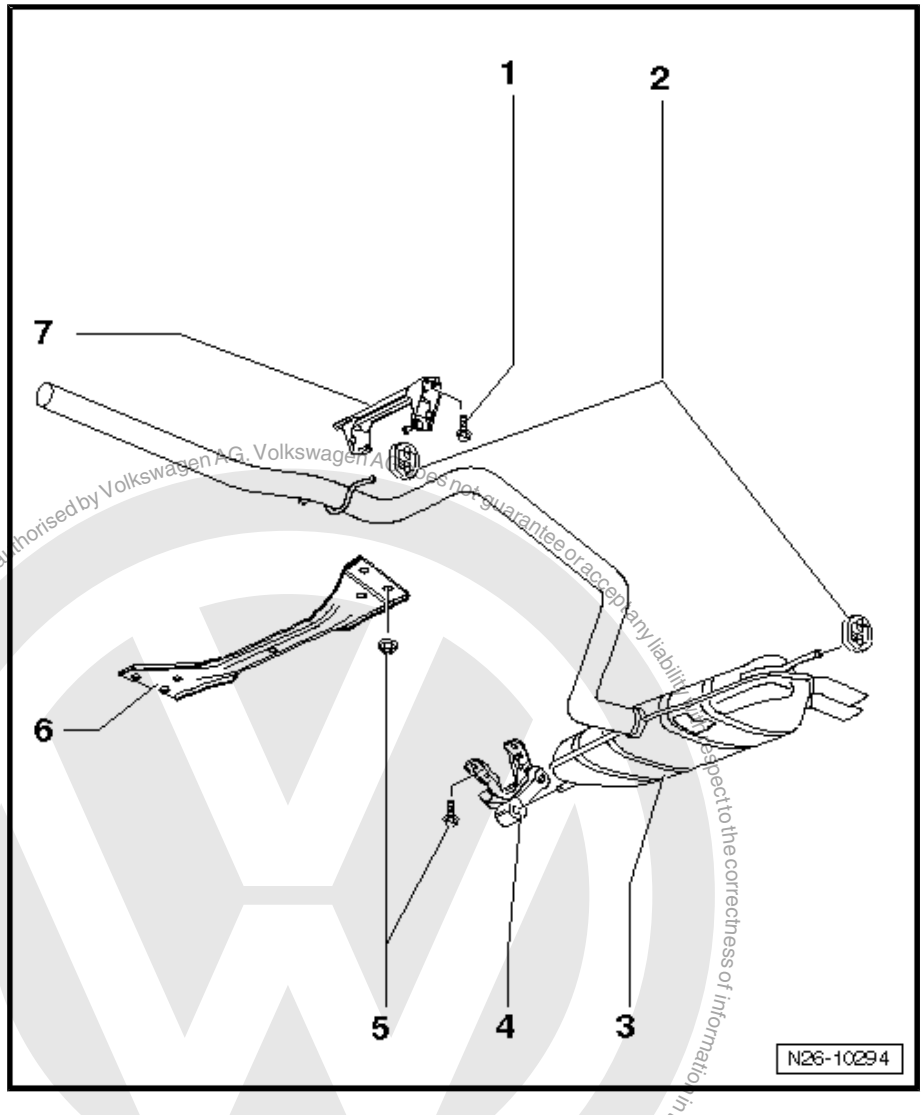
2 - Retaining Ring
- ❑ Replace if damaged

3 - Rear Muffler

4 - Mount
- ❑ Replace if damaged

5 - 25 Nm

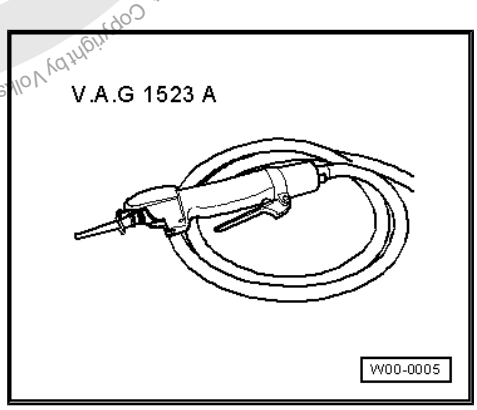
6 - Tunnel Brace



2.4 Exhaust Pipe, Disconnecting

Special tools and workshop equipment required

♦ Pneumatic Body Saw - VAS6780-



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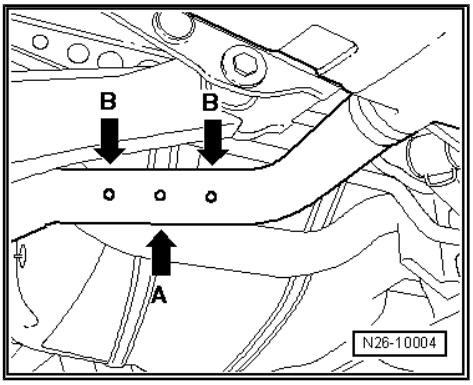
– Disconnect the exhaust pipe at right angle at the separation point -A-.

– During installation, position the repair double clamp at side markings -B- .

Tightening specification:

♦ M8 = 25 Nm

♦ M10 = 40 Nm



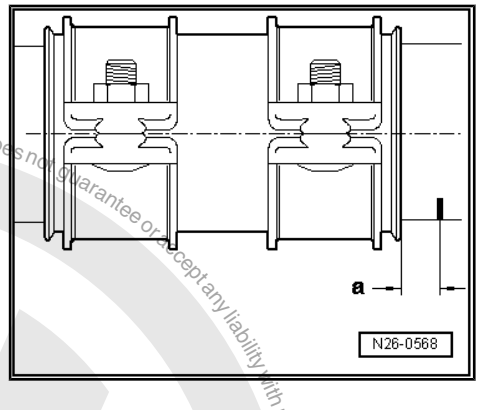
2.5 Exhaust System, Installing without Tension

• Engine must be cold.

– Loosen the double clamp threaded connection between the catalytic converter and the front muffler.

– Position the double clamp at a distance -a- = 5 mm from the marking on the catalytic converter pipe and gently tighten the front threaded connection.

– Push the rear muffler as far forward into the double clamp until dimension -a- reaches 15-17 mm between the suspended mount/body and the suspended mount/rear muffler.

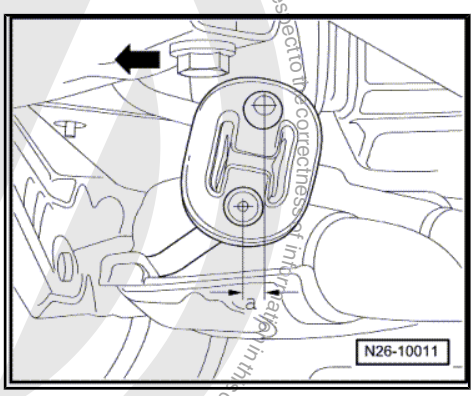


The -arrow- points in the direction of travel.

– Align rear muffler horizontally.

– Tighten the threaded connections of the double clamp in this position. Tightening specification: 25 Nm.

– After tightening the double clamp, check dimension -a- and correct if necessary.



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3 EGR System

⇒ “3.1 Overview - Exhaust Gas Recirculation System Components”, page 398

⇒ “3.2 EGR Temperature Sensor G98 , Removing and Installing”, page 399

3.1 Overview - Exhaust Gas Recirculation System Components

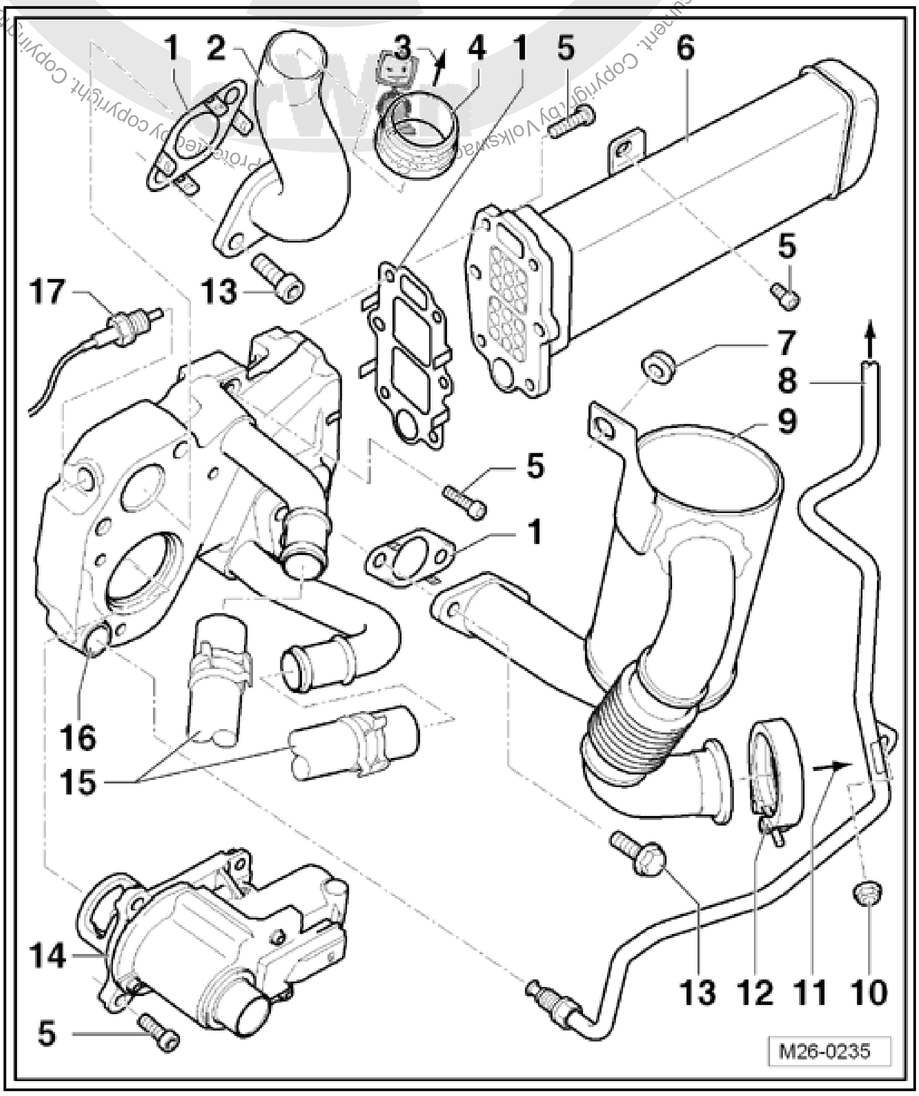
Special tools and workshop equipment required

- Hose Clip Pliers - VAS6362-

Note

- *Always replace the self-locking nuts, seals, gaskets and securing clamps. Refer to Parts Catalog.*
- *Hoses are secured with spring clips.*
- *Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.*

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1 - Seal
- ❑ Replace
- ❑ Note the installation position

2 - Connecting Pipe
- ❑ For removing and installing, also loosen the connections -item 33- ⇒ Item 33 (page 273) on the turbocharger

3 - To the Connection on the Turbocharger
- ❑ -item 33- ⇒ Item 33 (page 273)

4 - Seal
- ❑ Replace if damaged

5 - Bolt
- ❑ 8 Nm

6 - Radiator
- ❑ For the EGR

7 - Nut
- ❑ 23 Nm
- ❑ Installed on the hex stud bolt -item 17- ⇒ Item 17 (page 272) on the turbocharger

8 - Control Line
- ❑ 23 Nm
- ❑ Do not change the angles of the control line
- ❑ To the Exhaust Pres-

sure Sensor 1 - G450- .
Refer to ⇒ “1.2 Overview - Particulate Filter with NOx Reduction Catalytic Converter”, page 360 .

- ❑ To loosen at the housing -item 16- ⇒ Item 16 (page 399) remove the exhaust gas recirculation filter -item 9- ⇒ Item 9 (page 399)
- ❑ Install without tension

9 - Filter

- ❑ For the EGR

10 - Nut

- ❑ 23 Nm
- ❑ Secure on the exhaust manifold with the heat shield -item 16- ⇒ Item 16 (page 272)

11 - To the Particulate Filter

12 - Clamp

- ❑ 3.5 Nm
- ❑ Replace
- ❑ Note the installation position Refer to
⇒ “1.3 Clamps and Exhaust Gas Temperature Sensor Installed Position”, page 368 .

13 - Bolt

- ❑ 23 Nm

14 - Valve 2 for EGR - N213-

- ❑ With Exhaust Gas Recirculation Position Sensor 2 - G466-
- ❑ Mark the installation position before removal
- ❑ Before installing thoroughly clean the fitting area on the valve and housing and lubricate lightly if necessary.

15 - Coolant Hose

- ❑ Check for secure fit
- ❑ Coolant Hose Connection Diagram. Refer to ⇒ “1.3 Coolant Hose Connection Diagram”, page 197 .

16 - Housing

- ❑ For the EGR

17 - EGR Temperature Sensor - G98- , 20 Nm

- ❑ Cut out the gasket and replace if it is damaged or leaks
- ❑ Follow the tightening specification
- ❑ EGR Temperature Sensor - G98- , Removing and installing. Refer to
⇒ “3.2 EGR Temperature Sensor G98 , Removing and Installing”, page 399 .

3.2 EGR Temperature Sensor - G98- , Removing and Installing

Special tools and workshop equipment required

- ♦ Hose Clamps - Up To 25 mm - 3094-
- ♦ Torque Wrench 1331 5-50Nm - VAG1331-
- ♦ Shop Crane - Drip Tray - VAS6208-
- ♦ Hose Clip Pliers - VAS6362-
- ♦ EGR Temp. Sensor Socket - 14mm - T10401- (not illustrated)

Requirements

- Ignition switched off.
- Engine must be cold.

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Procedure

- Overview of vehicle from below:

– Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50 ; Noise Insulation .

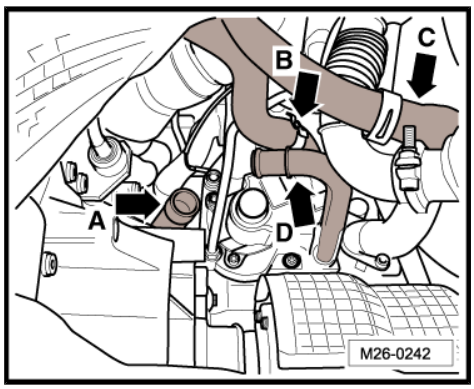
– Drain the coolant. Refer to ⇒ “1.9 Coolant, Draining and Filling”, page 209 .

Note

The coolant hoses indicated must be removed and moved to the side to perform assembly work on the EGR Temperature Sensor - G98- .

– Disconnect the coolant hoses from both connections -arrow A- and -arrow D-.

– Lay aside both coolant hoses -arrows B and C- as illustrated.



- Assembly overview of engine compartment from above:

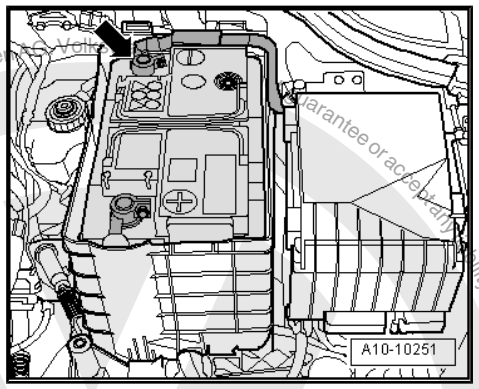
– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .

Caution

Electronic components could be destroyed when the Battery - A- is disconnected:

- ***Complete the steps for disconnecting the Battery - A- .***

– With the ignition switched off, disconnect the ground cable -arrow- on the Battery - A- .

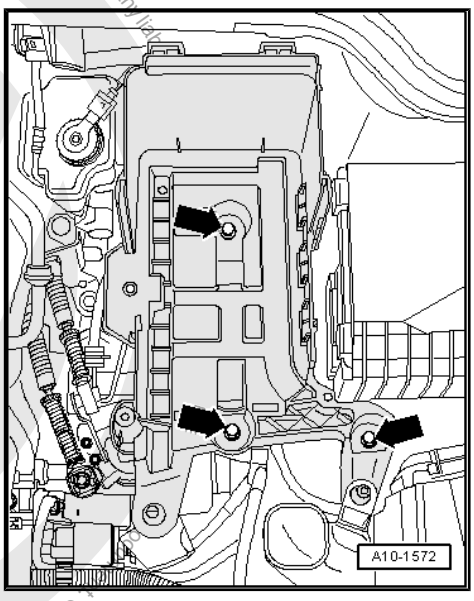


– Remove the air filter housing. Refer to ⇒ “3.14 Overview - Air Filter”, page 335 .

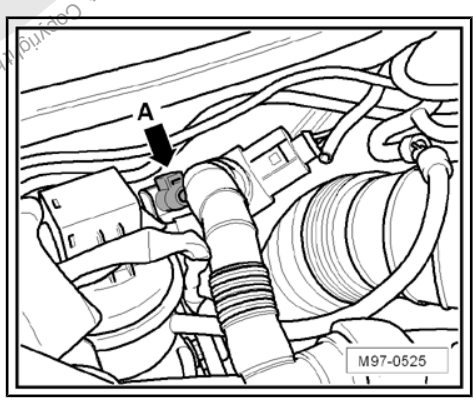
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– Remove the Battery - A- and the battery tray -arrows-.



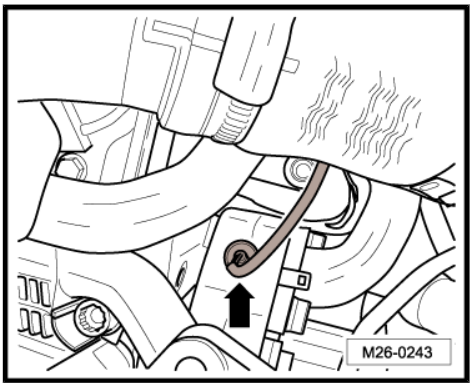
– Disconnect the connector from the EGR Temperature Sensor - G98- -arrow A- and guide the wire out.



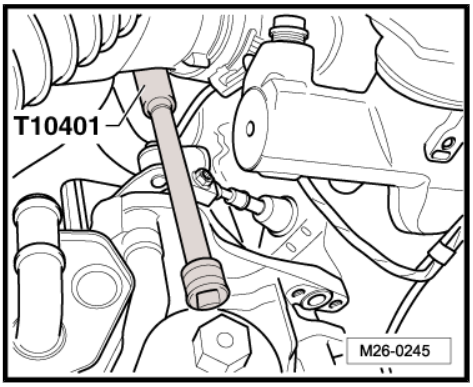
Note

Note the installation location of the lines and heat shield.

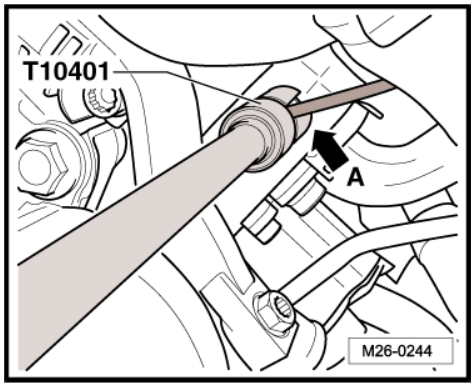
The illustration shows the EGR Temperature Sensor - G98- as seen from the engine compartment looking out from the transmission side -arrow- below the brake master cylinder.



– Carefully guide the EGR Temp. Sensor Socket - 14mm - T10401- onto the EGR Temperature Sensor - G98- with a socket extension.



– Make sure the cable from EGR Temperature Sensor - G98- is guided in the groove of EGR Temp. Sensor Socket - 14mm - T10401- -arrow A-.
– Loosen the EGR Temperature Sensor - G98- and remove it.



Install in Reverse Order of Removal. Note the Following:

Note

- *EGR Temperature Sensor - G98- tightening specification, 20 Nm*
- *Cut out the gasket and replace if it is damaged or leaks*
- *Maintain the tightening specification.*

Caution

Install the heat shield mats in their original locations.

Make sure the entire connection is seated securely.

Always replace the self-locking nuts, seals, gaskets and clamps.

Hoses are secured with spring clips.

Hose Clip Pliers - VAS6362- or the Hose Clip Pliers - VAS6340- are recommended for installing spring clips.

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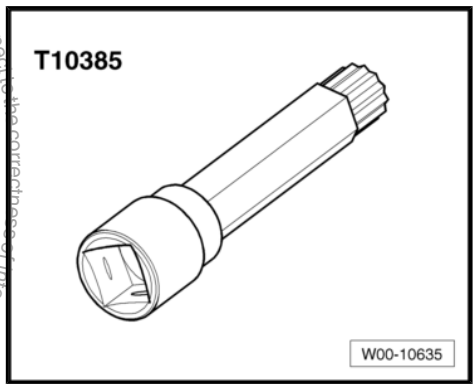
4 EGR System, Engine Codes CBDA, CBDB and CEGA

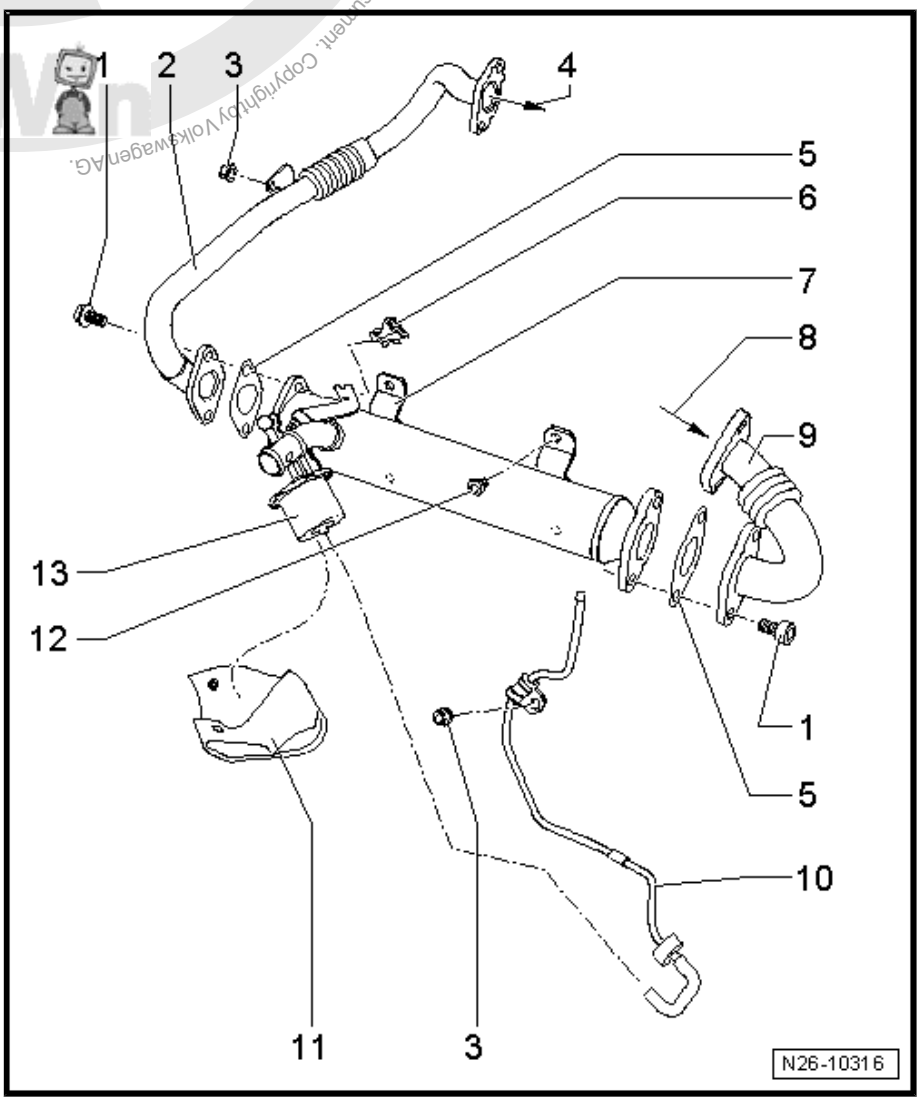
⇒ “4.1 Overview - Exhaust Gas Recirculation System Components”, page 403

4.1 Overview - Exhaust Gas Recirculation System Components

Special tools and workshop equipment required

- Socket - Xzn 10 - T10385-





1 - 20 Nm

2 - Connecting Pipe

- ❑ Removing and installing with the Socket - Xzn 10 - T10385-

> **Caution**
> *Make sure the connecting pipe decoupling element does not bend or stretch. Cracks could develop.*

3 - 10 Nm

4 - To EGR Vacuum Regulator Solenoid Valve - N18-

5 - Seal

- ❑ Replace

6 - Cable Guide

7 - Radiator

- ❑ For the EGR
- ❑ With a by-pass flap

8 - From Exhaust Manifold

9 - Connecting Pipe

10 - Vacuum Line

- ❑ Connection diagram for vacuum hoses. Refer to ⇒ “4.5 Vacuum Hose Connection Diagram”, page 295 .

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11 - Heat Shield

- ❑ Replace if damaged

12 - 10 Nm

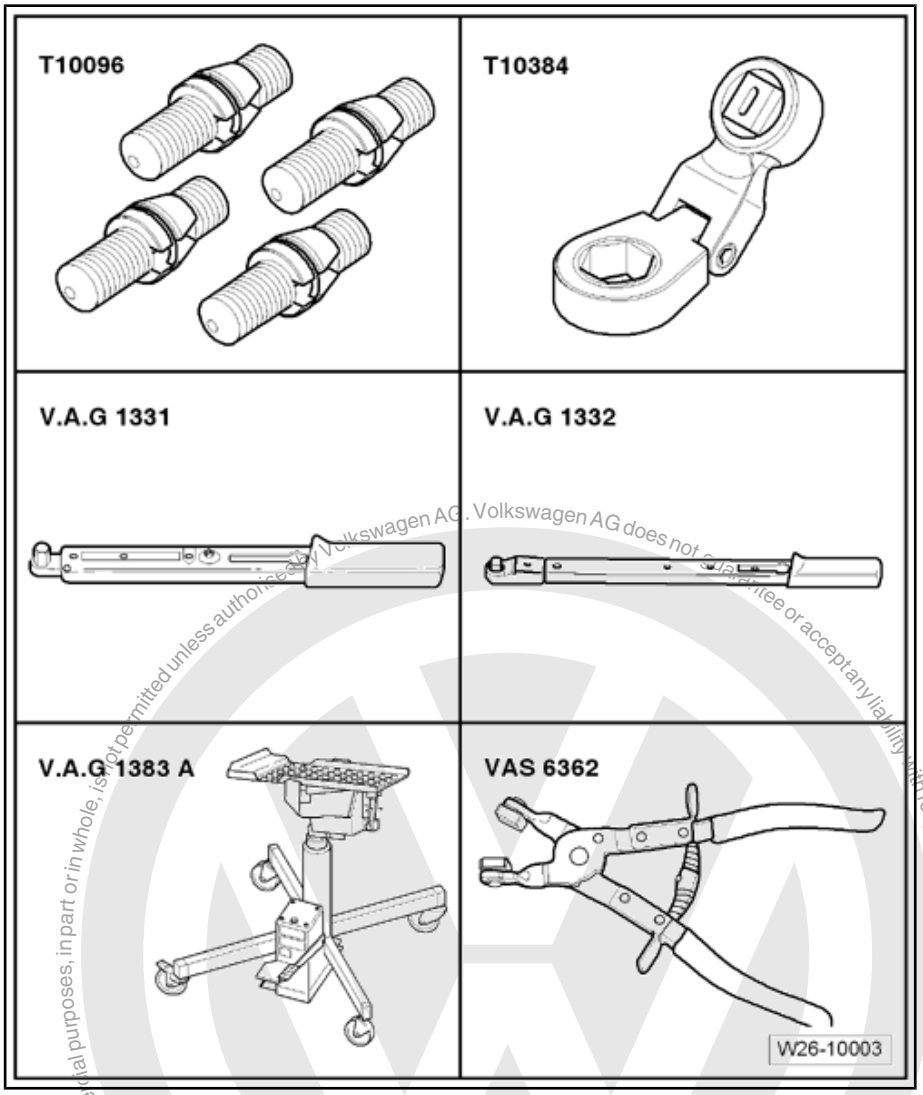
13 - Vacuum Diaphragm

- ❑ To the by-pass flap change over

5 Special Tools

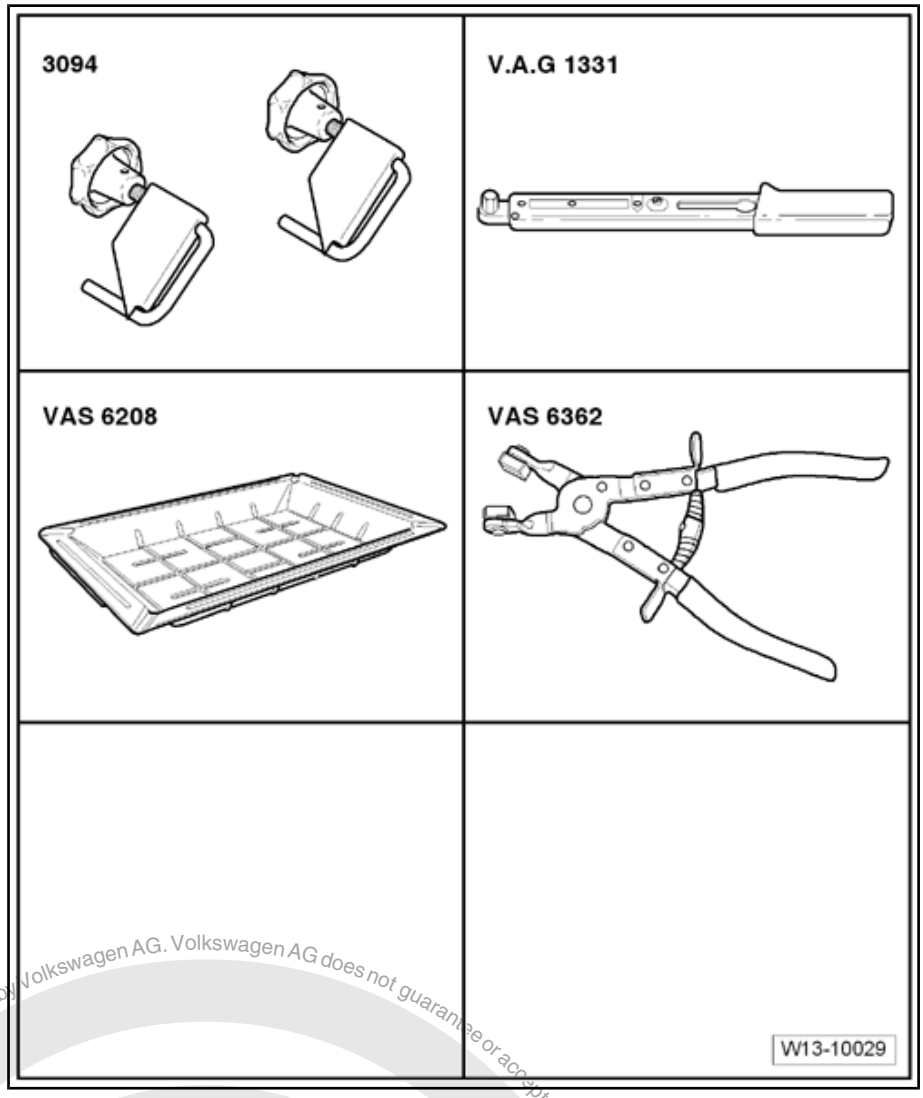
Special tools and workshop equipment required

- Locating Pins - T10096-
- Wrench - Sw13 - T10384-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Torque Wrench 1332 40-200Nm - VAG1332-
- Engine/Gearbox Jack - VAG1383A-
- Hose Clip Pliers - VAS6362-
- Tool Set 17 mm - T10395-
- Ring Spanner 7-Piece Set - 3337-

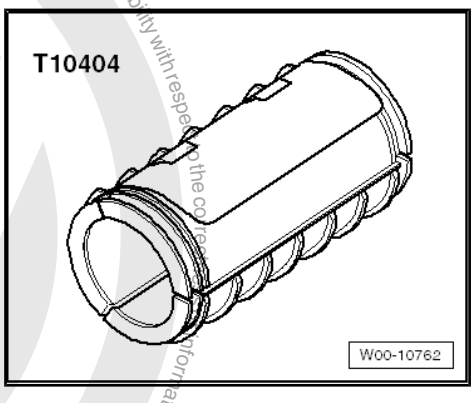


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- Hose Clamps - Up To 25 mm - 3094-
- Torque Wrench 1331 5-50Nm - VAG1331-
- Shop Crane - Drip Tray - VAS6208-
- Hose Clip Pliers - VAS6362-
- EGR Temp. Sensor Socket - 14mm - T10401- (not illustrated)

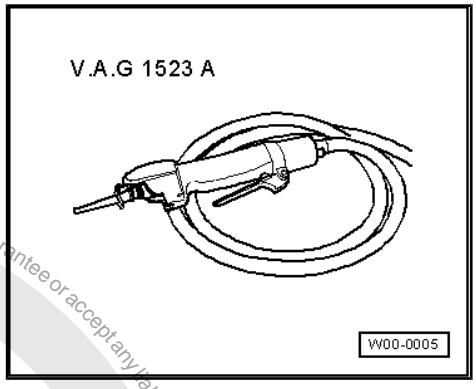


- Transportation Lock - T10404-

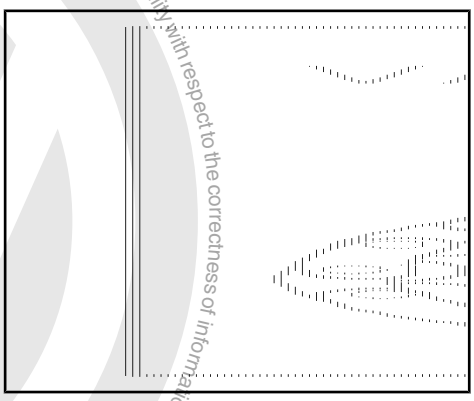


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- Body Saw - VAG1523B-



- Chain Pipe Cutter - VAS6254-



- Not Illustrated:
- EGR Temp. Sensor Socket - 14mm - T10401-

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28 – Ignition/Glow Plug System

1 Glow Plugs

⇒ “1.1 General Information”, page 408

⇒ “1.2 Glow Plug, Removing and Installing”, page 408

⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 410

1.1 General Information

Note

The Engine Control Module - J623- is equipped with a DTC memory. Before and after repairs or adjustments, the DTC memory must be checked. Refer to Vehicle Diagnostic Tester “Guided Fault Finding”.

1.2 Glow Plug, Removing and Installing

Special tools and workshop equipment required

- Torque Wrench 1331 5-50Nm - VAG1331-
- Engine Bung Set - VAS6122- (not illustrated)
- Hose Clip Pliers - VAS6362-
- Glow Plug Socket - VAS6454-

DANGER!

- *Follow the safety precautions when working on the diesel direct fuel injection system. Refer to ⇒ “1 Safety Precautions when Working on Diesel Direct Fuel Injection System”, page 303 .*
- *Pay attention to the guidelines for clean working conditions. Refer to ⇒ “2 Guidelines for Clean Working Conditions”, page 305 .*

Always pay attention to these instructions before and during work.

Removing:

Requirements

- Ignition switched off.
- Engine must be cold.

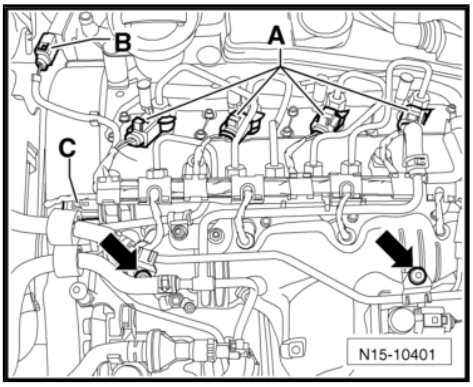
Procedure

Note

- *When removing the glow plugs, make sure no contaminants enter the fuel system and the glow plug duct.*
- *Seal off the connections in the fuel system using the plugs from the Engine Bung Set - VAS6122- .*

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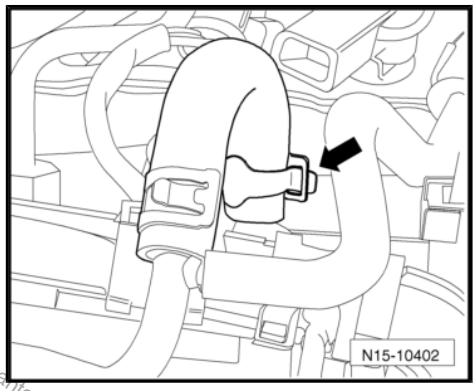
– Remove the engine cover. Refer to ⇒ “1.4 Engine Cover, Removing and Installing”, page 90 .
– Remove the protective strip, if equipped -item 1- ⇒ Item 1 (page 312) .
– Disconnect from the fuel injectors -A-, the Exhaust Pressure Sensor 2 - G451- -B- and the Fuel Pressure Sensor - G247- -C-.
– Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.
– Remove the fuel return line bolt -item 3- ⇒ Item 3 (page 312) on the intake manifold.



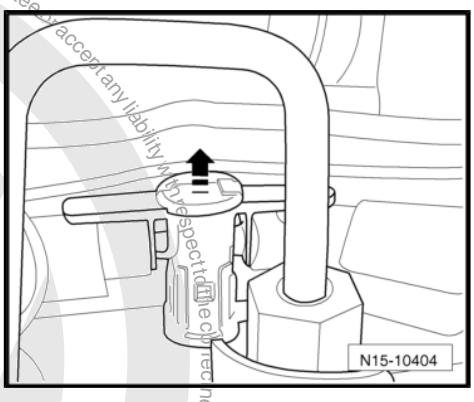
Caution

Always follow the procedure »Glow Plug Connectors, Removing and Installing«.

– Remove the glow plug connectors. Refer to ⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 410 .
– Loosen the hose clip -arrow- with the Hose Clip Pliers - VAS6362- and remove the line on the rail element (high pressure reservoir).
– Before removing, clean the return line connection on the fuel injectors (for example using a commercially available detergent).
– Dry the return line connections.
– Cover the return line connections with a cleaning cloth.



– Remove the fuel return line connections on the fuel injectors. Pull them upward to release them in direction of -arrow-.



Note

Pay attention to cleanliness. Dirt and contaminants must not enter the return lines and the connections on the fuel injectors.

– Loosen the spring clamp with the Hose Clip Pliers - VAS6362- and remove the fuel return line -item 4- ⇒ Item 4 (page 312) .

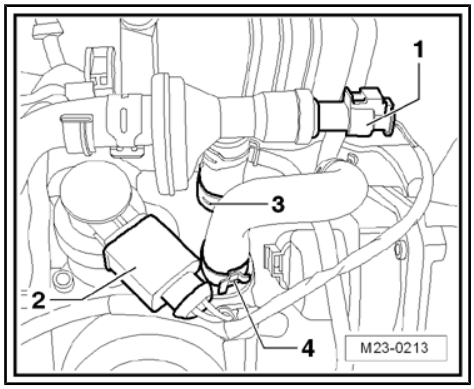
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– Loosen the spring clamp -4- with the Hose Clip Pliers - VAS6362- and disconnect the fuel return line at the high pressure fuel pump.

– Seal the lines so that no dirt can enter the fuel system.

– Remove the fuel return lines -item 2- ⇒ Item 2 (page 312) and lay them in front of the intake manifold.

– Remove the glow plug wiring guide and lay it aside.



Caution

- *When cleaning the glow plug duct, make sure no contaminants or cleaning solutions enter the connector contacts on the glow plugs.*
- *Do not clean the connectors with cleaning solutions or compressed air.*

– Clean the glow plug duct in the cylinder head (contaminants must not fall into the cylinder).

Note

- *Extract large contaminants with a vacuum cleaner.*
- *Clean glow plugs with a commercially available detergent.*
- *Dry the glow plugs with compressed air.*
- *Then clean the glow plug duct with a rag dampened with oil.*

– Remove the glow plugs with the Glow Plug Socket - VAS6454- .

Installing:

Install in reverse order of removal. Note the following:

- When installing the glow plugs, make sure no contaminants enter the fuel system and the glow plug duct.
- Only remove the sealing plugs right before installing the fuel return lines.
- Make sure the line connections are secure.

– Tighten the glow plugs with the Glow Plug Socket - VAS6454- .

- Tightening specification: 12 Nm.

– Secure the fuel return line to the intake manifold.

- Tightening specification -item 3- ⇒ Item 3 (page 312) .

– Install the glow plug connectors. Refer to ⇒ “1.3 Glow Plug Connectors, Removing and Installing”, page 410 .

– Check the DTC memory for the Engine Control Module - J623- and erase all of the DTC entries. Refer to Vehicle Diagnostic Tester “Guided Functions”.

1.3 Glow Plug Connectors, Removing and Installing

Special tools and workshop equipment required

- Wheel Bolt Cap Pliers - 3314-

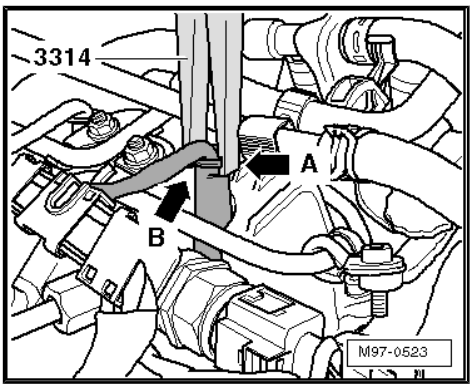
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Removing:

Caution

Before removing the glow plug connectors, note that different installation depths for the glow plugs in their respective cylinders.

– Position the Wheel Bolt Cap Pliers - 3314- with the groove -arrow A- on the upper collar of the connector -arrow B- and press together lightly.



Caution

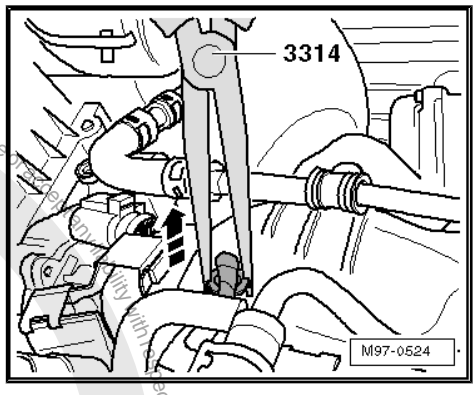
Position the pliers so they do not touch or damage the cable.

Only use suitable tools.

Other unsuitable tools can damage the connector.

If the connector is damaged when removing it, replace the entire wiring harness including the connector (a connector cannot be replaced separately).

– Pull the connector carefully off the glow plug in the direction of the -arrow- using Wheel Bolt Cap Pliers - 3314-.



Caution

Do not pull abruptly on the connector.

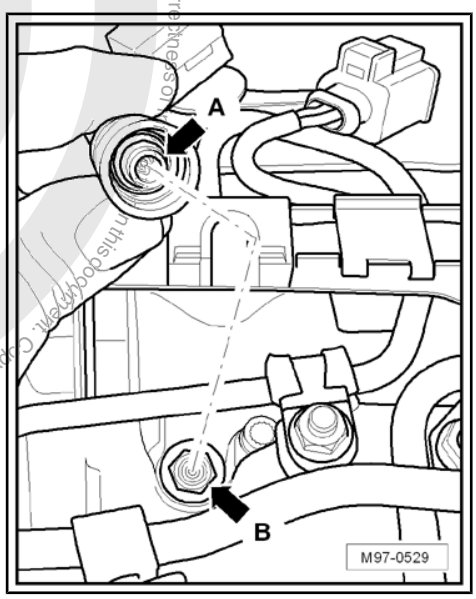
Do not damage the connector wire.

Do not press the pliers together too firmly or the connector will be damaged.

The connector is surrounded by a protective sleeve; if damaged, the protective sleeve can be replaced.

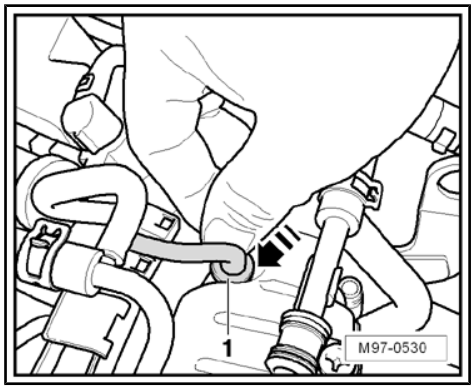
Installing:

– Guide the center terminal on the connector -arrow A- into the glow plug socket -arrow B- by hand.



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– Press the glow plug connector -1- on by hand in direction of -arrow- until it engages.

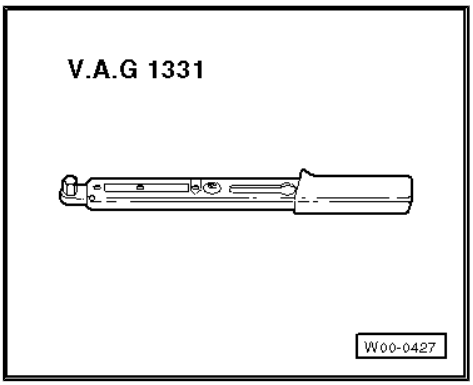


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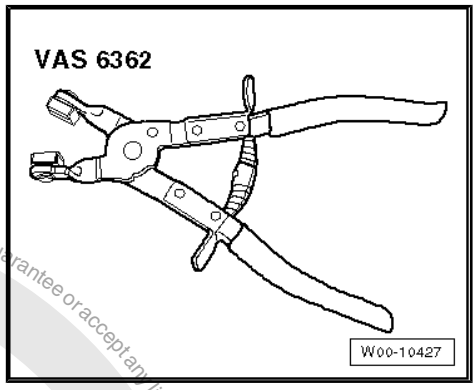
2 Special Tools

Special tools and workshop equipment required

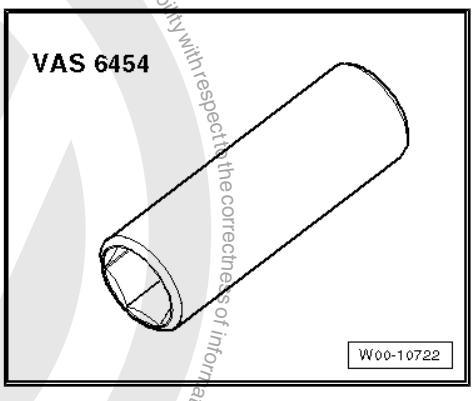
- Torque Wrench 1331 5-50Nm - VAG1331-



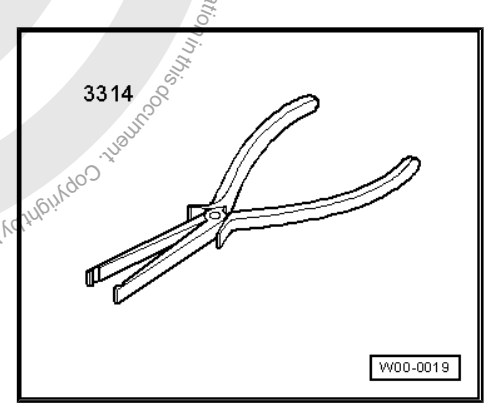
- Hose Clip Pliers - VAS6362-



- Glow Plug Socket - VAS6454-



- Wheel Bolt Cap Pliers - 3314-



- Not Illustrated:
- Engine Bung Set - VAS6122-

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3 Revision History

DRUCK NUMBER: MEX5R009321

Factory Edition	Edit Edition	Job Type	Feedback	Notes	Quality Checked By
04.2015	02/05/2016	Local Feedbacks	1138155, 1142877	Feedback # 1138155 - For CJAA/CBEA added T10395A to remove G235. Feedback 1142877 - added steps to R&I right drive axle in Particulate Filter with NOx Absorption Catalytic Converter R&I	Eric P.
04.2015	01/15/2015	Local Feedback	1146258	Added procedure for CJAA Oil pump R&I. Factory sent (R&I.)	Eric P.
04.2015	12/03/2015	Local Feedback	1138158	Hiden Turbocharger with exhaust manifold R&I not for NAR	Eric P.
04.2015	10/26/2015	Local Feedback	1121654, 1123551	Changed G505 to G451 to match wiring diagrams.	Eric P.
04.2015	09/22/2015	Local Feedback	1120403	Changed special tool p/n from VAG1318 to VAS6551 in: 20, Fuel Supply System, Servicing, Auxiliary Fuel Pump V393 (Inline Fuel Pump), Checking	Eric P.
04.2015	08/20/2015	Local Feedback	1118107 & 1181108	Change torque valve from 40 to 15 Nm on water pump bolts	Eric P.
04.2015	07/08/2015	Local Feedback	1099448	Removed special tool T40055 in chapter 17- Oil Supply Line to Turbocharger R&I	Eric P.
04.2015	07/01/2015	Local Feedback	1108467& 1108564	Add specs: Target value in 30 seconds: 90 to 110 ml (3.0 to 3.7 ounces). to 23-Diesel Direct Injection System - Fuel Pressure Regulator Valve N276, Checking	Eric P.
04.2015	06/12/2015	Reformat	N/A	Reformat book to current structure standards	Eric P.
04.2015	05/11/2015	Factory Update	N/A	Factory Update	Eric P.

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Factory Edition	Edit Edition	Job Type	Feedback	Notes	Quality Checked By
02.2014	04/17/2015	LF	1090442	Updated Cylinder Head Gasket ID (2 places) w/ info from 5K1 CJAA engine per factory.	Eric P.
02.2014	12/18/2014	LF	1066680	20 Fuel Supply, current draw checking, changed G6 to V393 disconnecting connector.	Eric P.
02.2014	11/07/2014	Correction		Removed fluid capacities and replaced with link to fluid capacity Table	Eric P.
02.2014	10/22/2014	LF	1052401	Added new step and Illustration/graphic.	Eric P.
02.2014	10/10/2014	LF	1035451	Deleted steps using .5 bar when checking fuel volume	Eric P.
02.2014	09/09/2014	LF	1037605	Changed sensor G451 to G505	Eric P.
02.2014	04/11/2014	LF	1008050	Added steps for FB 1008050, per new procedure sent from the Factory for the 4/2-Way Valve R&I.	Gary R.
02.2014	3/13/2014	LF	1002369	Fixed Note (Grp 15, D&T) to delete repetitive text of Vehicle Diagnosis Tester.	Gary R.
02.2014	03/13/2014	LF, FU	990399, 992022	FU-Incorrect fueling update to six steps and fuel sending unit illustration update (wrong style).	Gary R.
	12/09/2013	LF	975390	To add six bolt BSM from Golf, but CBEA engine not used in Golf, could only find information in Audi A3 CBEA book.	Gary R.
	07/09/2013	LF	948755	Added G466 bullet point to item 14; for illustration M26-0235.	Gary R.
	06/05/2013	LF	933819	Fuel Delivery Checking specifications.	Gary R.
	05/21/2013	LF	897747, 805726	Missing R&I for Exhaust Gas Temperature Sensors 2-G448 and 3-G495, never added by factory for Jetta as shown in the Passat K0059174321 Book.	Gary R.
	04/17/2013	LF	931643		Gary R.
	03/21/2013	LF	684447, 568943		Joe Y.

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Factory Edition	Edit Edition	Job Type	Feedback	Notes	Quality Checked By
	03/05/2013	LF	831915, 722096		Gary R.
	11/14/2012	LF	656677		Joe Y.
	10/02/2012	LF	618138		Joe Y.
	09/21/2012	LF	616696		Joe Y.
	09/19/2012	LF	584704		Joe Y.
	07/31/2012	LF	767731		Joe Y.

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Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.

- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.

- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.

- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the VAG 1551 Scan Tool (ST).

- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.

- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.

- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.

- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.

- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.

- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.

- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

next

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Version 1.0

Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.

- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.

- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.

- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.

- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.

- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.

- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.

- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.

- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.

- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).

- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

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Version 1.0

Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.

- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the VAG 1551 Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.

- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.

- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.

back OK

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