21 – Turbocharging

21-1 Charge-air system with exhaust turbocharger - Part 1

Removing and installing exhaust turbocharger with component parts

Observe the rules for cleanliness ⇒ Chapter 21-2.

Note

- *The hose connections are secured with clamps.*
- *The charge-air system must be tight.*
- *Always replace self-locking nuts.*

1 - Exhaust manifold
- ❑ with exhaust turbocharger
- ❑ must be replaced completely

2 - Intake manifold

3 - From charge air cooler

4 - Gasket
- ❑ replace

5 - 25 Nm

6 - Gasket
- ❑ Check fitting position

7 - Washer

8 - 25 Nm
- ❑ replace
- ❑ Coat stud bolts with G 052 112 A3

9 - From air filter

10 - To charge air cooler

11 - Pressure box
- ❑ For charge pressure control
- ❑ Components of the exhaust gas turbocharger cannot be replaced individually

12 - Shield

13 - Support
- ❑ Exhaust turbocharger - cylinder block

14 - 40 Nm

15 - 25 Nm

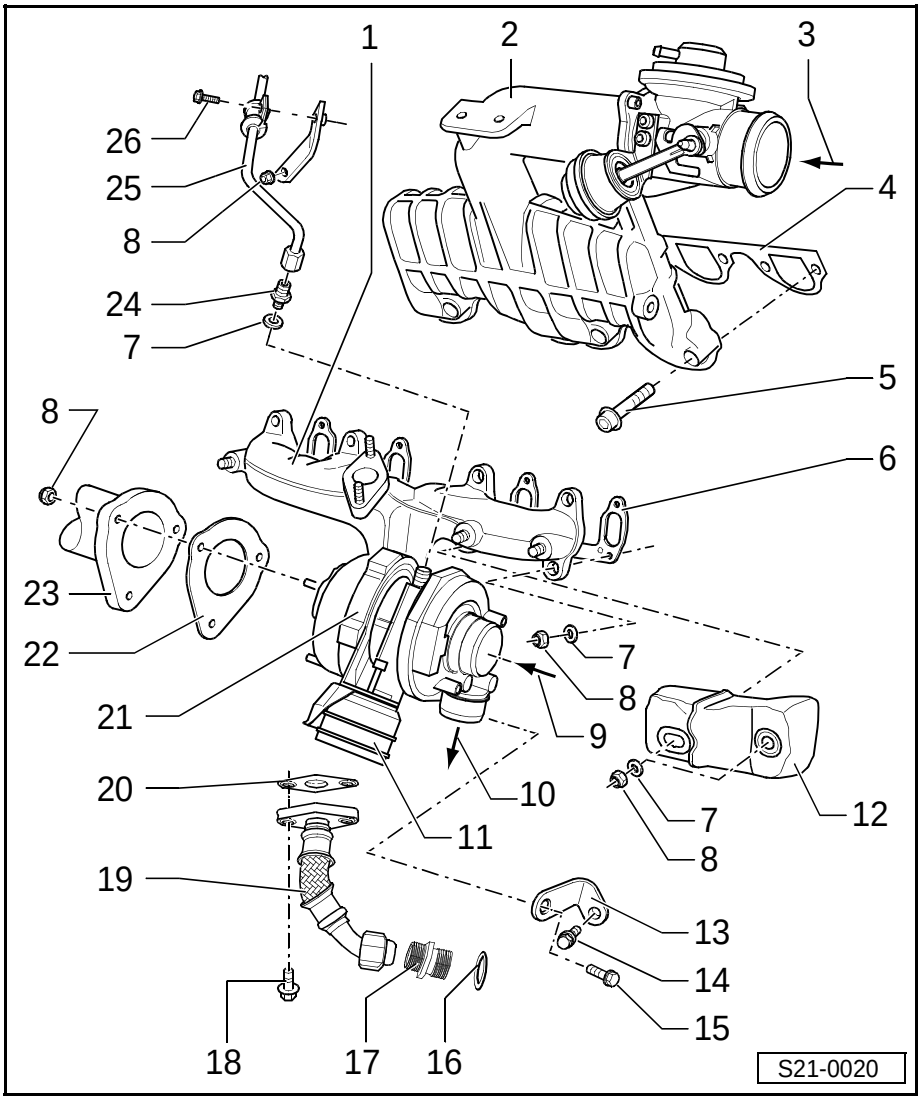
16 - Gasket ring
- ❑ replace

17 - Connection fitting, 40 Nm

18 - 17 Nm

19 - Oil return line
- ❑ To cylinder block
- ❑ Tighten to 35 Nm

20 - Gasket ring for oil return line
- ❑ replace



21 - Exhaust turbocharger

- ❑ Can only be replaced complete with exhaust manifold
- ❑ removing and installing ⇒ Chapter 21-2
- ❑ Inspecting charge pressure control ⇒ Chapter 21-2
- ❑ charge pressure regulating valve and pressure box for charge pressure regulating valve are component parts of the exhaust turbocharger and cannot be replaced individually.
- ❑ before connecting the oil feed line fill the exhaust turbocharger on the connection fitting with engine oil.
- ❑ After installing the turbocharger, run engine at idling speed for about 1 minute to ensure that oil is supplied to the turbocharger.

22 - Gasket

- ❑ replace

23 - Front exhaust pipe with catalytic converter

24 - Connection fitting, 30 Nm

25 - Oil feed line

- ❑ Tighten to 22 Nm

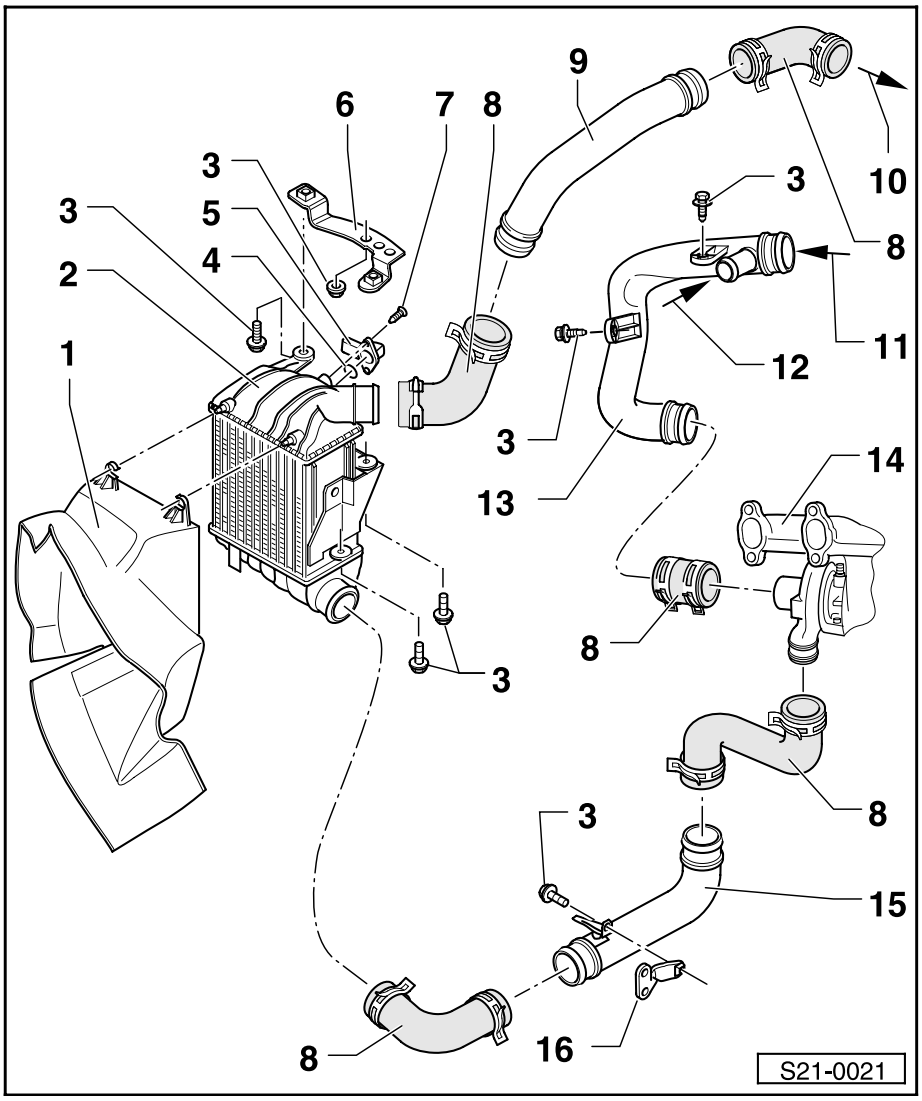
26 - 10 Nm

Removing and installing parts of the charge air cooling

Note

- *The hose connections are secured with clamps.*
- *The charge-air system must be tight.*
- *Remove oil and grease from the charge pressure hoses and charge pressure pipes and from their connections before installing.*

1 - Air deflector
2 - Charge air cooler
❑ removing and installing ⇒ **21-1** page 3
3 - 8 Nm
4 - O-ring
❑ replace if damaged
5 - Intake manifold pressure sender -G71- with intake manifold temperature sender -G72-
6 - Bracket
7 - 5 Nm
8 - Connecting hose
9 - Top charge-air pipe
10 - To induction pipe
11 - From air filter
12 - From valve cover
❑ Crankcase ventilation
13 - Rear charge-air pipe
14 - Exhaust turbocharger
15 - Bottom charge air pipe
16 - Bracket
❑ screwed onto the V-ribbed belt holder ⇒ Chapter 13-1



Removing and installing charge-air cooler

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Pliers for spring strap clips

Removing

– Removing right headlights ⇒ Electrical System; Rep. Gr. 94.

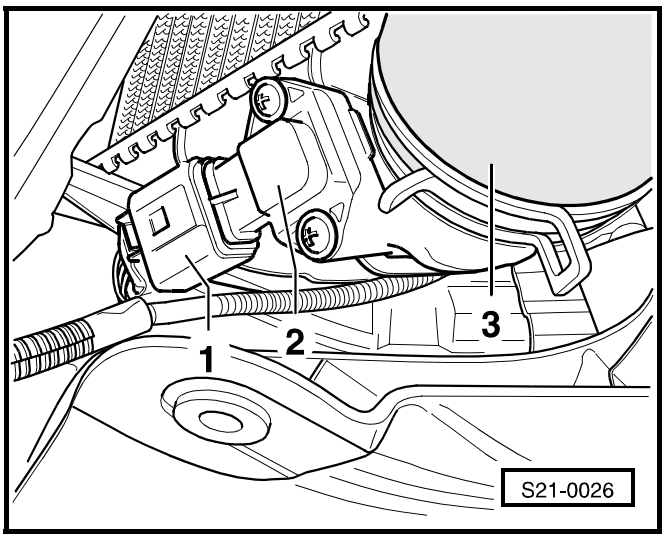
– Remove plug -1- from the intake manifold pressure sender -G71- with intake manifold temperature sender -G72- (-2-).

– Remove the connecting hose -3- from the supports.

– Remove front bumper ⇒ Body Work; Rep. Gr. 63.

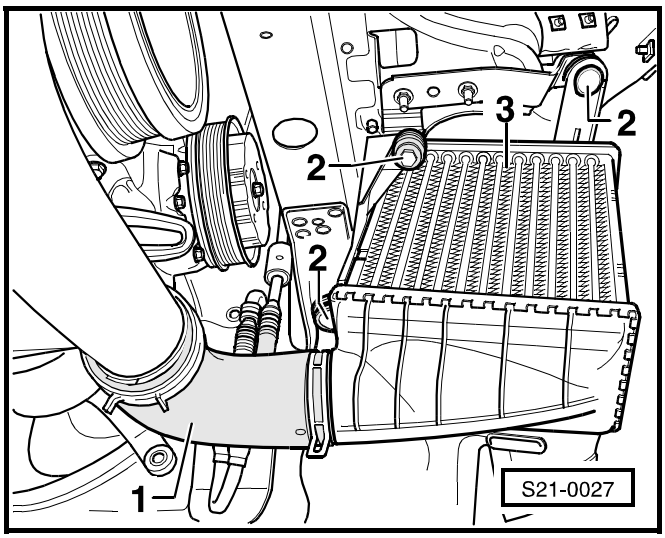
– Remove the front right wheelhouse liner ⇒ Body Work; Rep. Gr. 66.

– Unclip front charge-air routing.



– Remove the connecting hose -1- from the charge-air cooler -3-.

– Release screws -2- and remove charge-air cooler -3-.



Installing

Installation is carried out in the reverse order.

Connection diagram for vacuum hoses for vehicles ➢ 10.01

1 - Vacuum unit
- ❑ For intake manifold flap

2 - Changeover valve for intake manifold flap -N239-

3 - Distributor part

4 - Non-return valve
- ❑ white connection points to charge pressure control solenoid valve / vacuum reservoir / switchover valve

5 - Distributor part

6 - To air filter

7 - Exhaust gas recirculation solenoid valve -N18-

8 - Brake servo unit

9 - Distributor part
- ❑ With non-return valve for brake servo unit

10 - Tandem pump

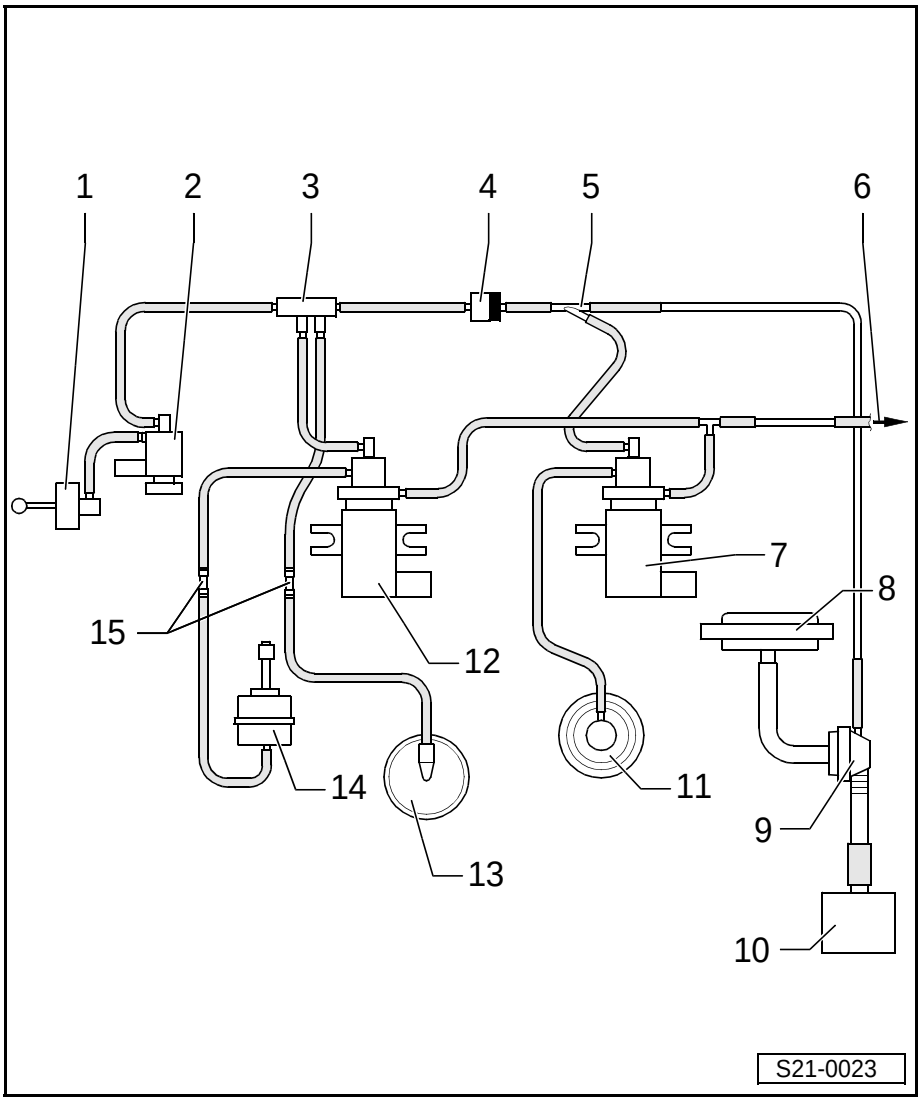
11 - Mechanical exhaust gas recirculation valve

12 - Solenoid valve for charge pressure control -N75-
- ❑ Inspecting charge pressure control ⇒ Chapter 21-2

13 - Vacuum reservoir

14 - Vacuum unit
- ❑ For charge pressure control
- ❑ Components of the exhaust gas turbocharger cannot be replaced individually

15 - Connecting piece



Connection diagram for vacuum hoses for vehicles 11.01 ➢

1 - Valve block
- ❑ Component parts of the valve block are:
- ♦ Changeover valve for intake manifold flap -N239-
- ♦ Exhaust gas recirculation solenoid valve -N18-
- ♦ Solenoid valve for charge pressure control -N75-

2 - Connecting strip
- ❑ Pay attention to the coding when connecting the vacuum hoses

3 - Connecting piece

4 - Vacuum unit
- ❑ For charge pressure control
- ❑ Components of the exhaust gas turbocharger cannot be replaced individually

5 - Vacuum reservoir

6 - To air filter

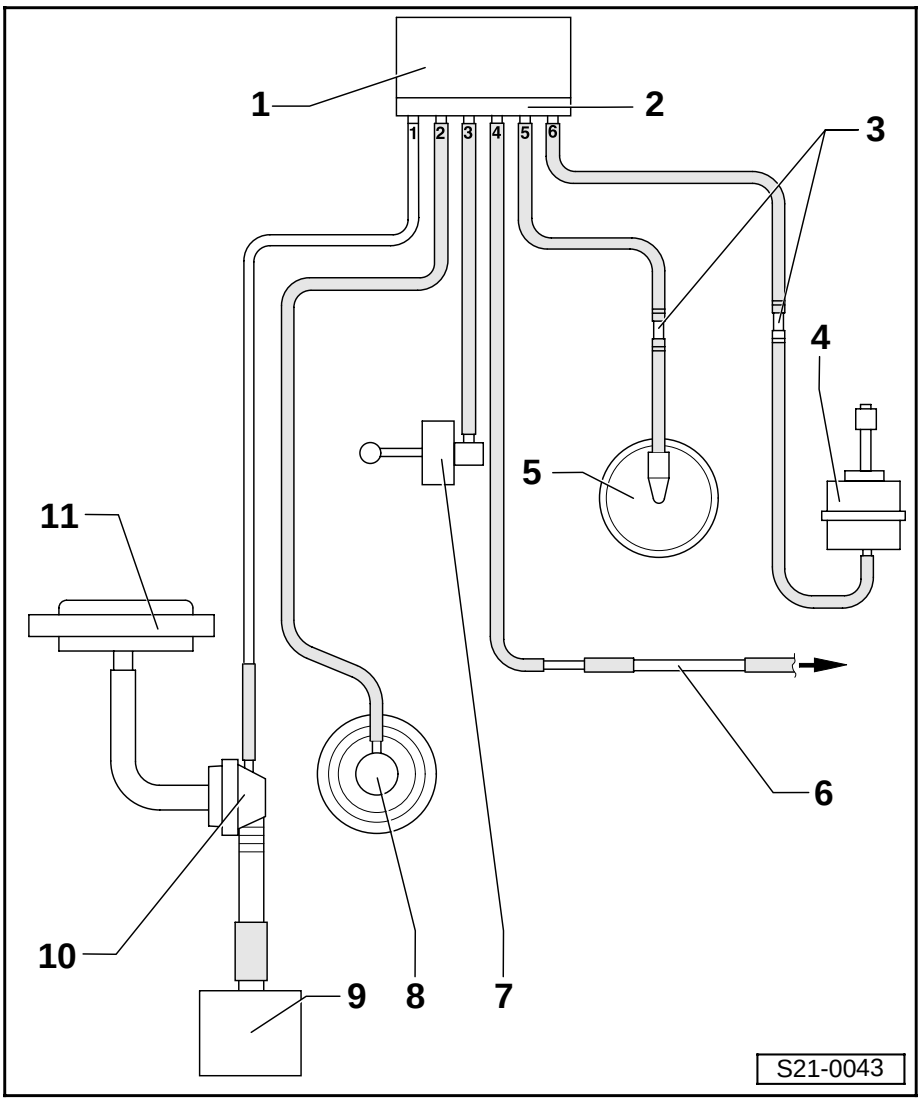
7 - Vacuum unit
- ❑ For intake manifold flap

8 - Mechanical exhaust gas recirculation valve

9 - Tandem pump

10 - Distributor part
- ❑ With non-return valve for brake servo unit

11 - Brake servo unit



21-2 Charge-air system with exhaust turbocharger - Part 2

Rules of cleanliness

Carefully observe the following »5 rules« for cleanliness when working on the exhaust turbocharger:

- Thoroughly clean the connection points and their surroundings before releasing.
- Place removed parts on a clean surface and cover. Do not use fuzzy cloths!
- Carefully cover or close opened components if the repair is not completed immediately.
- Only install clean parts.

  Remove spare parts from their wrapping immediately before fitting.

  Do not use any parts which have been stored unwrapped (e.g. in tool boxes).
- When the system is open:

  Avoid using compressed air.

  Avoid moving the vehicle.

Remove exhaust turbocharger

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Pliers for spring strap clips

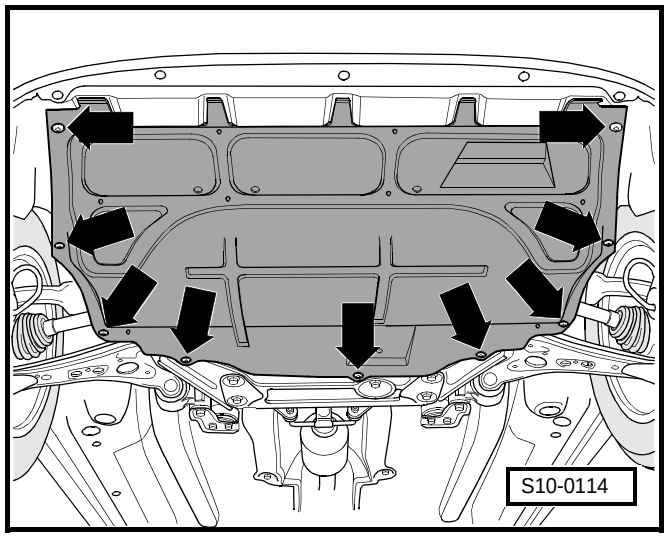
Removing

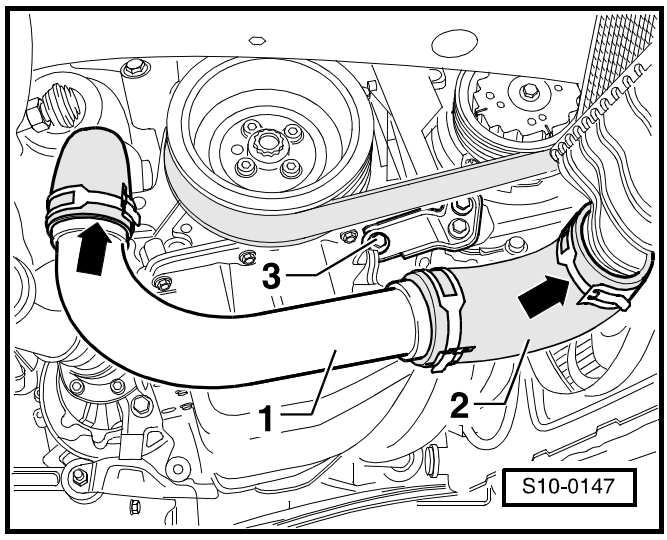
– Remove noise insulation -arrows-. ►

– Remove drive shaft to the right ⇒ Running gear; Rep. Gr. 40.

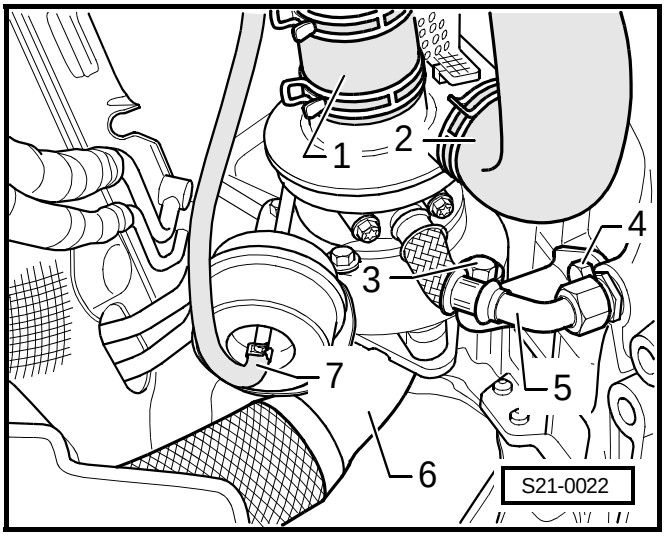
– Unscrew the propeller-shaft guard from the cylinder block.

– Remove screws -3- and disconnect connecting hose -2- on the charge-air cooler -right arrow-. ►





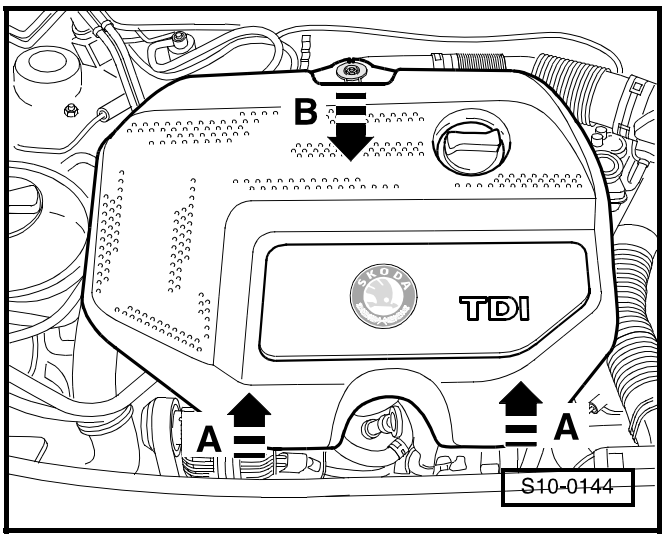
– Remove connecting hoses -1- and -2-.
– Unscrew the oil return line -5- from the cylinder block.
– Unscrew bolts -3- and -4- from support and remove support.
– Remove the vacuum hose -7- from the vacuum unit for charge pressure control.
– Remove front exhaust pipe with catalyst -6- ⇒ Chapter 26-1.



– Remove engine cover:

  Pull the front engine cover upwards with a sudden motion -arrow A- and pull the cover out of the rear attachment -arrow B-.

– Removing charge air pipe at top rear ⇒ Chapter 21-1.
– Remove connection pipes for inlet connection - exhaust manifold for exhaust gas recirculation ⇒ Chapter 26-2.
– Unscrew the oil feed line for the exhaust turbocharger ⇒ Chapter 21-1.
– Removing and installing exhaust manifold from the cylinder head ⇒ Chapter 21-1.
– Remove exhaust turbocharger downwards.



Installing

Installation occurs in reverse order. Pay attention to the following:

Note

- *Tightening torques ⇒ Chapter 21-1*
- *Always replace self-locking nuts.*
- *Before connecting the oil feed line, fill the exhaust turbocharger on the connection fitting with engine oil.*
- *After installing the exhaust turbocharger, run engine at idling speed for about 1 minute to ensure that oil is supplied to the exhaust turbocharger.*

Checking charge pressure control

Special tools, test and measuring equipment and auxiliary items required

- Hand vacuum pump (e.g. -V.A.G 1390-)
- Hand multimeter (e.g. -V.A.G 1715 -)
- Vehicle system tester -V.A.G 1552-
- Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-

- Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- Test box -V.A.G 1598/31-

Test conditions

- No fault stored in fault memory ⇒ 1.9/74 TDI Engine - Fuel Injection; Rep. Gr. 01
- No leaks on the intake and exhaust side
- No fault on the engine/fuel injection system
- Engine oil temperature at least 80 °C

Test sequence

If test and measuring devices are required during test drives observe the following:

- Always secure the test and measuring devices on the rear seat and have a second person operate them there.
- If the test and measuring equipment is operated from the front passenger seat, this can result in injuries to the persons sitting on that seat in the event of an accident which involves the front passenger airbag being deployed.

– The charge pressure is measured with vehicle system tester -V.A.G 1552- when the engine is idling and during a road test.

– Connect vehicle system tester -V.A.G 1552- and select address word 01„Engine electronics“. (the engine must be idling at the time) ⇒ 1.9/74 TDI Engine - Fuel Injection; Rep. Gr. 01.

– Select function 0 4 „Initiate basic setting“ and display group 0 1 1.

Readout on display:

Note

After selecting display group number 011, the idling speed is increased by the engine control unit in display block 1 to 1380…1420 rpm.

The display in display field 2 must switch between „off“ and „on“ every 10 seconds.

The following readouts must fluctuate in display fields 3 and 4:

Display field 2: off.

- Specified value display field 3: Atmospheric pressure in mbar
- Specified value display field 4: 98…100 %

Display field 2: on.

- Specified value display field 3: Atmospheric pressure in mbar +80…250 mbar
- Specified value display field 4: 0…2 %

Continue the test as follows:

(→) Press.

– Read function 0 8 „Read measured value block“ and select display group 0 1 1.
– Accelerate vehicle in 3rd gear at full throttle from about 1500 rpm.
– At about 3000 rpm read off value indicated in display block.

```
Reading measured value block     11   ->
3090 rpm   1866 mbar   1917 mbar    62 %
```

Specified value display field 3: 1850…2250 mbar

If the specified value is not reached:

– Conduct actuator diagnosis for charge pressure control solenoid valve ⇒ 1.9 litre/74 kW TDI Engine - Fuel Injection; Rep. Gr. 01.

Charge pressure control solenoid valve must operate for this test. While doing so the linkage of the charge pressure control vacuum unit at the bottom of the turbocharger must move back and forward. This linkage must move at least 3…4 times as long as a vacuum is present in the vacuum system.

If the linkage moves and the nominal charge pressure is not reached:

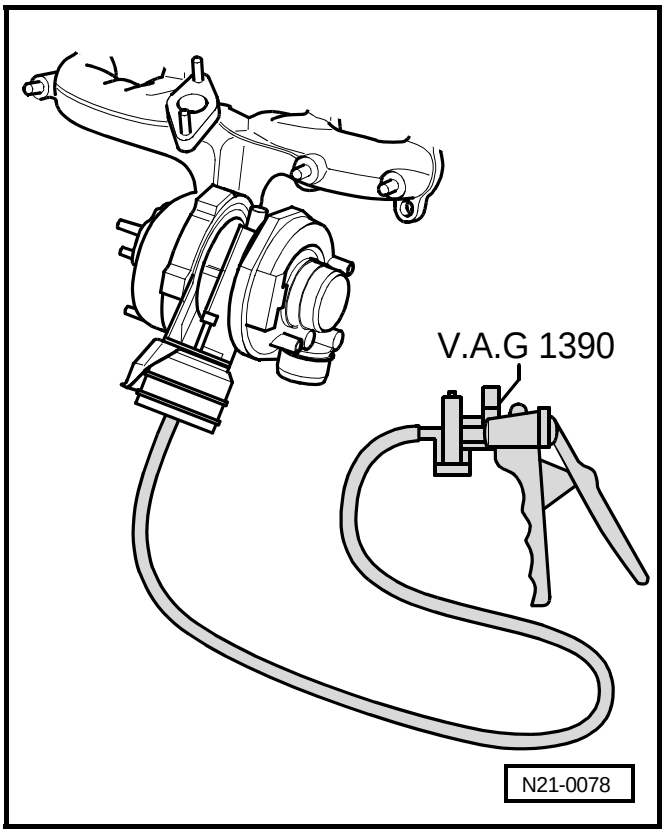
– Replace exhaust turbocharger ⇒ **21-2** page 1.

If the linkage does not move because the charge pressure control solenoid valve is not operating:

– Inspecting charge pressure control solenoid valve -N75- ⇒ **21-2** page 4.
– Inspect vacuum hoses ⇒ Chapter 21-1 .

If the linkage does not move although the charge pressure control solenoid valve is operating:

– Connect hand vacuum pump to charge pressure control valve and inspect linkage for unobstructed movement.



If the linkage only moves with difficulty or does not move at all:

– Replace exhaust turbocharger ⇒ **21-2** page 1.

Inspecting charge pressure control solenoid valve -N75-

Note

On vehicles 11.01 ➢ the charge pressure control solenoid valve -N75- is a component element of the valve block.

– Switch off ignition.
– Remove plug from charge pressure control solenoid valve -N75- or from the valve block.

– Measure the resistance between the contacts of the charge pressure control solenoid valve -N75- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

  Specified value: 14…20 Ω

If the specified value is not reached:

– Replace the charge pressure control solenoid valve -N75- or valve block ⇒ Chapter 21-1.

If the specified value is reached:

– Check wiring between the charge pressure control solenoid valve -N75- and the engine control unit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the lines are not found to be faulty:

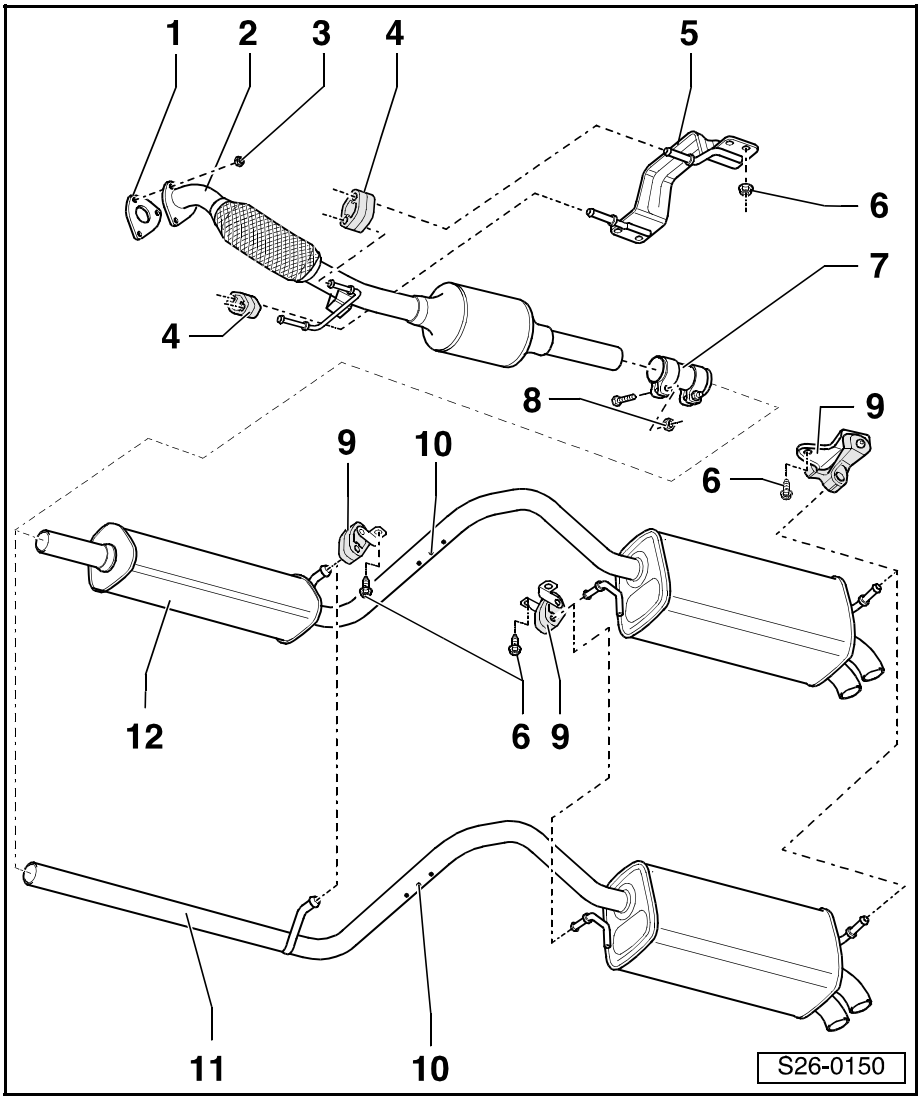
– Replace diesel direct injection system control unit - J248- ⇒ 1.9/74 TDI Engine - Fuel Injection; Rep. Gr. 23.

26 – Exhaust System

26-1 Removing and installing parts of the exhaust system

Note

- *The exhaust turbocharger is a component part of the exhaust manifold and therefore must not be replaced individually; removing and installing ⇒ Chap. 21-2.*
- *Always replace gaskets and self-locking nuts.*



1 - Gasket
- ❑ replace

2 - Front exhaust pipe with catalytic converter

3 - 25 Nm
- ❑ replace
- ❑ before installing, coat stud bolts with hot bolt paste G 052 112 A3

4 - Spring loop
- ❑ Press off from cross member ⇒ item 5 when removing middle silencer with catalytic converter

5 - Cross member

6 - 25 Nm

7 - Double clamp
- ❑ Align exhaust system free of stress before tightening ⇒ **26-1** page 2
- ❑ Fitting position: bolts at bottom and horizontal
- ❑ Tighten bolted connections evenly

8 - 40 Nm
- ❑ replace

9 - Hanger

10 - Separation point
- ❑ For repairs ⇒ **26-1** page 2

11 - Middle and rear silencer 07.03 ➤
- ❑ replace individually when carrying out repairs ⇒ **26-1** page 2
- ❑ Align exhaust system free of stress ⇒ **26-1** page 2

12 - Middle and rear silencer ➤ 06.03
- ❑ replace individually when carrying out repairs ⇒ **26-1** page 2
- ❑ Align exhaust system free of stress ⇒ **26-1** page 2

Aligning exhaust system free of stress

Special tools, test and measuring equipment and auxiliary items required

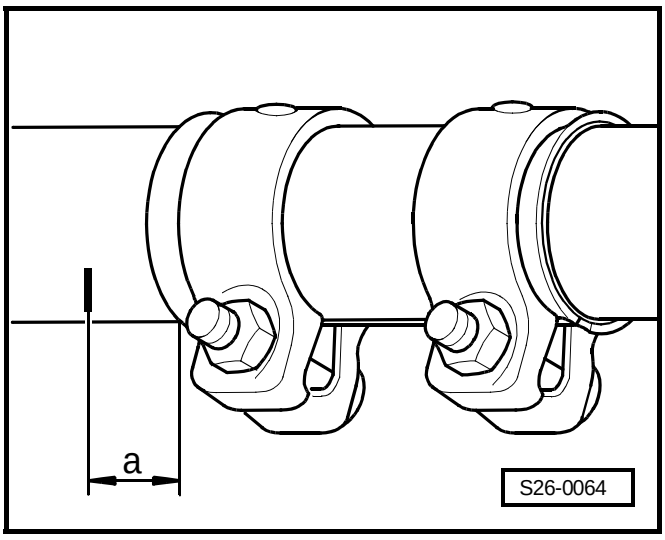
- Torque wrench

Procedure

- The exhaust system is aligned when cold.

– Slacken bolted connections of double clamp between catalytic converter and front silencer and replace nuts.

– Position double clamp at the distance -a- = 5 mm in front of the marking on the pipe of the catalytic converter and tighten front bolted connection slightly (bolts at bottom and horizontal).

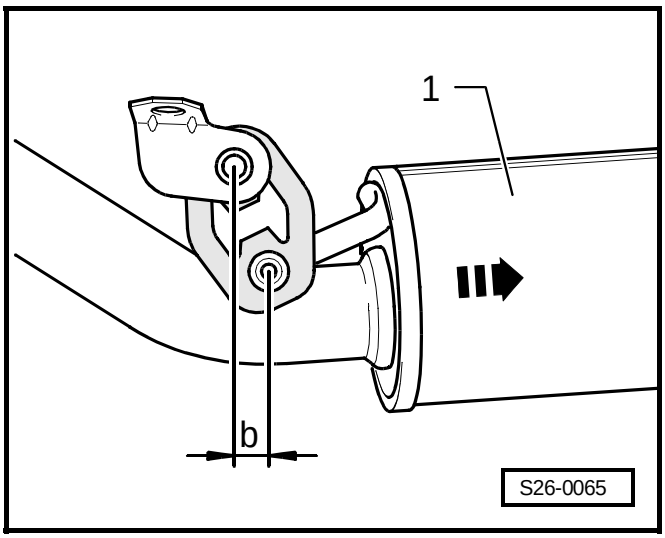


– Push front silencer -1- sufficiently far forward into the double clamp until the dimension -b- of 3…7 mm is achieved between hanger/body and hanger/front silencer.

-Arrow- points in direction of travel.

– Tighten bolted connections on the double clamp in this position.

Tightening torque: 40 Nm



Note

After tightening the double clamp, inspect dimension -b- and adjust if necessary.

Replacing front or rear silencer

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Body saw (e.g. -V.A.G 1523 -)

A separation point is provided for repair purposes for replacing the front or rear silencer.

– Separate exhaust pipe at right angles at the separation point -arrow 1- with body saw.

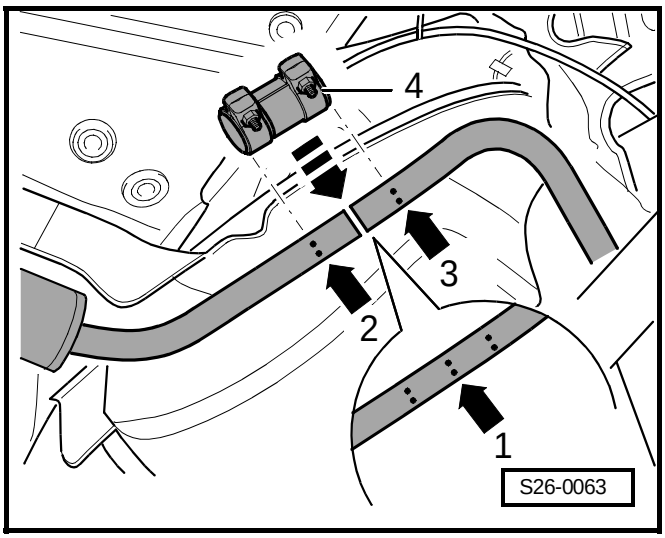
– When installing double clamp -4- position on the outer markings -arrows 2 and 3-.

– Align exhaust system free of stress ⇒ **26-1** page 2.

– Align rear silencer horizontally.

– Tighten bolted connections of the double clamp evenly to 40 Nm.

Installation position of double clamp: Bolts positioned vertically at front of exhaust pipe.



Checking the exhaust system for leaks

– Start engine and run in idle.

– Block tail pipe for the duration of the leak check (e.g. with cloth or plug).
– Check the connection points for leaks by listening: Cylinderhead/exhaust manifold, exhaust manifold/exhaust pipe with catalytic converter, etc.
– Eliminate any leak found.

26-2 Exhaust gas recirculation system

Note

- *The exhaust gas recirculation system is operated by the diesel direct injection system control unit -J248 - via the EGR valve -N18- to the mechanical exhaust gas recirculation valve.*
- *Inspecting exhaust gas recirculation and exhaust gas recirculation valve -N18-: ⇒ 1.9/74 TDI Engine, Fuel Injection; Rep. Gr. 23*
- *The mechanical exhaust gas recirculation valve with conically shaped valve tappet makes it possible to achieve different opening cross-sections at different valve strokes.*
- *Any desired valve position is possible as a result of the pulsed operation.*
- *Connection diagram for vacuum hoses ⇒ Chap. 21-1.*
- *Always replace self-locking nuts.*

Removing and installing parts of the exhaust gas recirculation system

1 - Intake manifold
2 - O-ring
- ❑ replace

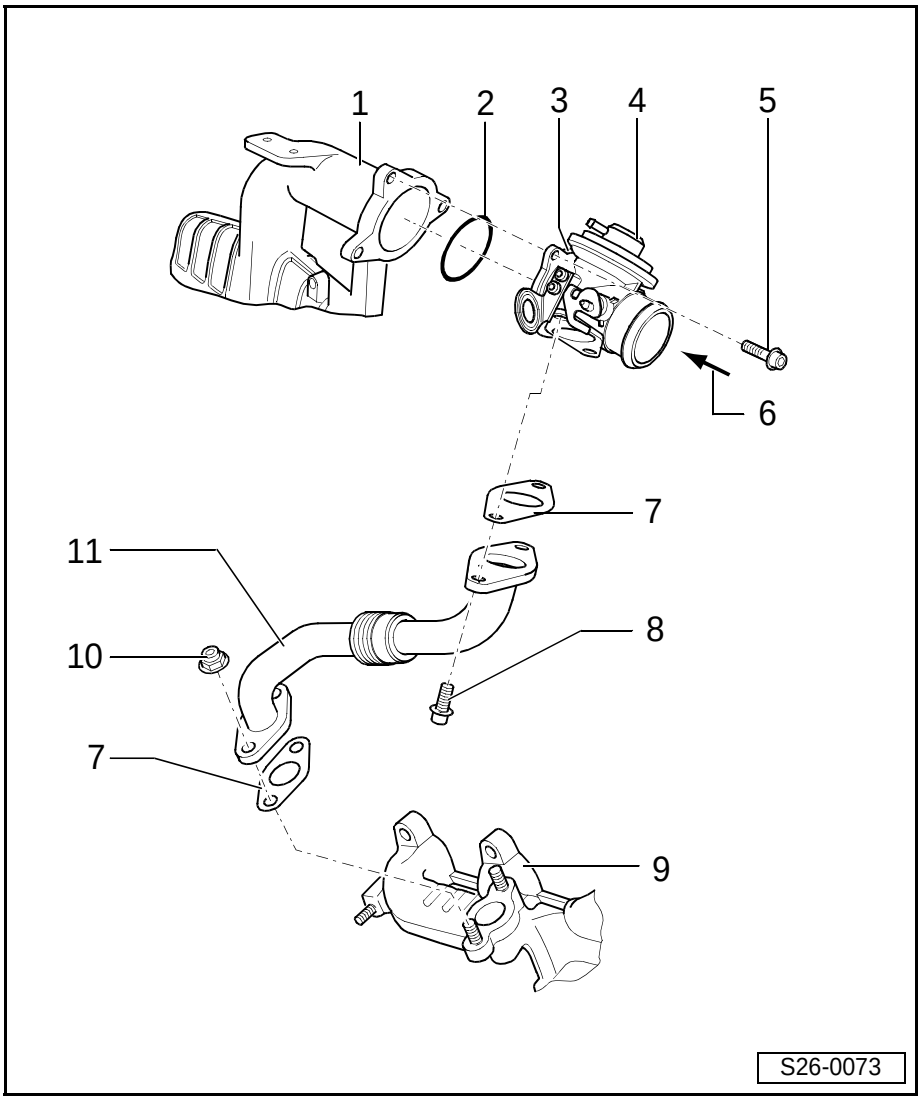
3 - Induction pipe
- ❑ with mechanical exhaust gas recirculation valve and control flap

4 - Mechanical exhaust gas recirculation valve
- ❑ Component part of the induction pipe
- ❑ Must be replaced together with the induction pipe
- ❑ check ⇒ **26-2** page 2

5 - 10 Nm
6 - from charge-air cooler
7 - Gasket
- ❑ replace

8 - 25 Nm
9 - Exhaust manifold
10 - 25 Nm
- ❑ replace
- ❑ Coat stud bolts with G 052 112 A3

11 - Connecting tube



Test mechanical exhaust gas recirculation valve

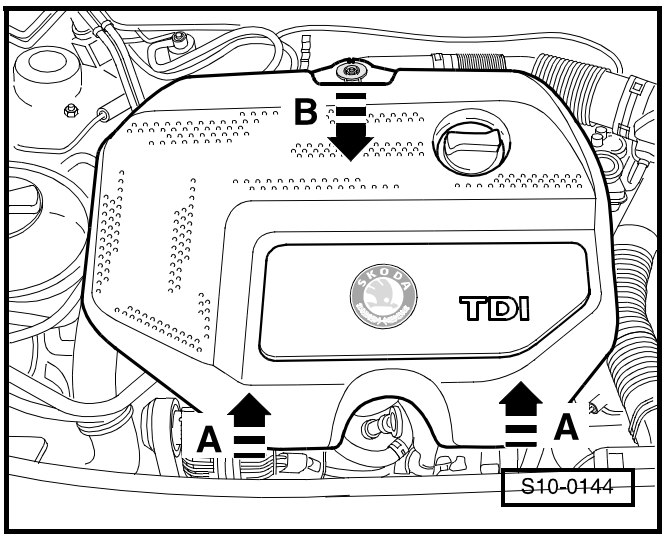
Special tools, test and measuring equipment and auxiliary items required

- Hand vacuum pump (e.g. -V.A.G 1390 -)

Test sequence

– Removing engine cover ⇒ Chapter 10-1.

– Disconnect the vacuum hose at the mechanical exhaust gas recirculation valve.



– Connect hand vacuum pump to valve.

– Operate pump and observe.

The diaphragm must move in the direction of the vacuum connection.

– Detach hose of hand vacuum pump from mechanical exhaust gas recirculation valve.

The diaphragm must move back to its original position against the direction of the arrow.