Charge air system with turbocharger (engine code ATW)

Checking mechanical recirculation valve

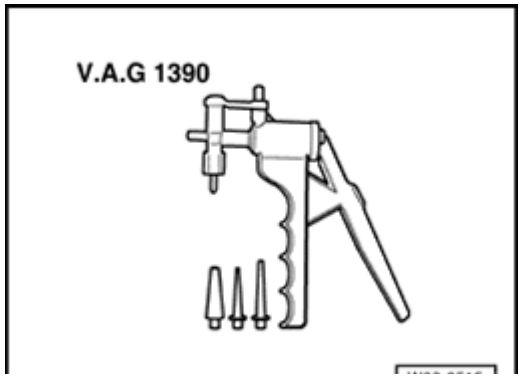
Notes:

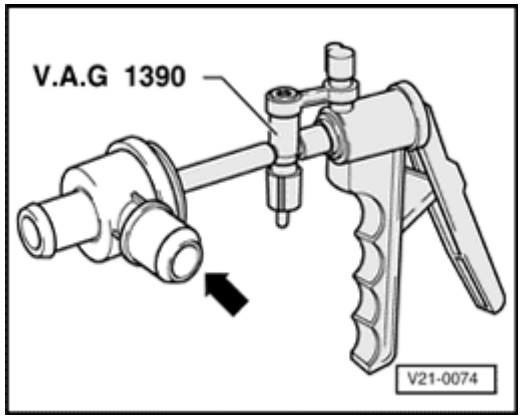
- *The mechanical recirculation valve is located in front of the turbocharger. It is opened by vacuum via the recirculating valve for turbocharger -N249- during deceleration, idle and part throttle. This produces a reduction of the charge air pressure in front of the throttle valve which keeps the turbocharger spinning at a higher RPM.*

- *Check the recirculation valve in case of reduced performance or part throttle hesitation.*

Special tools and equipment

- VAG1390





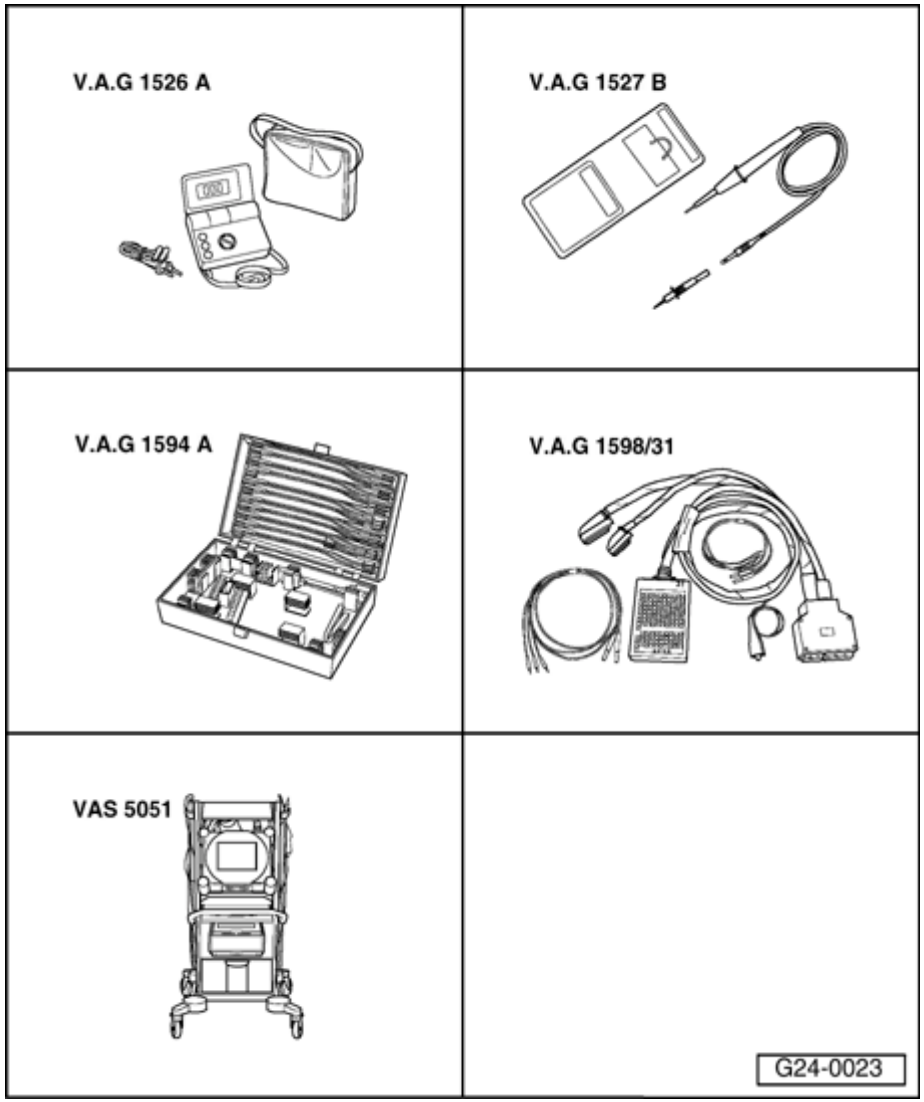
Test sequence

- Attach VAG1390 vacuum pump to recirculation valve.
- Operate vacuum pump.
  - Recirculation valve must open (arrow)
- After approx. 30 seconds, operate vent valve on vacuum pump.
  - Recirculation valve must close (arrow)

If recirculation valve does not open or close or valve plate does not seal correctly when valve is closed:

- Replace recirculation valve. Secure connections of recirculation valve using screw type clamps.

21-48



Recirculating valve for turbocharger - N249-, checking

Special tools and equipment

- VAG1526A
- VAG1527B
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

- or

- VAG1551 with VAG1551/3A

21-49

Note:

The recirculating valve for turbocharger -N249- and wire connections are monitored by the Engine Control Module (ECM).

- Connect VAS5051 tester or VAG1551 scan tool and select control module for engine electronics using "address word 01". Engine must run at idle for this:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

If a malfunction relating to the recirculating valve for turbocharger -N249- is displayed:

- Disconnect hoses from valve; harness connector remains connected.

- Attach assisting hose to one connection of valve.

- Initiate output Diagnostic Test Mode (DTM) and activate the recirculating valve for turbocharger -N249-:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

Output Diagnostic Test Mode →

Recirc. valve for turbocharger -N249

➢ Indicated on display

Valve must click...

...and must open and close (can be tested by blowing into assisting hose).

If valve does not click:

- Check internal resistance of valve.

If valve does not open and close properly:

- Replace recirculating valve for turbocharger -N249-.

Checking internal resistance

- Disconnect harness connector at valve.

➢

- Connect multimeter at valve for resistance measurement.
  - ♦ Specified value: 27-30 Ω

If specified value is not obtained:

- Replace recirculating valve for turbocharger -N249-.

21-51

If the specified value is attained:

- Check voltage supply

Checking voltage supply

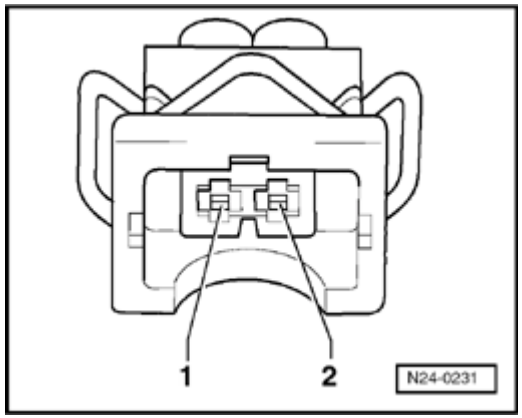
Note:

Voltage is supplied to the recirculation valve via the Fuel Pump (FP) relay.

Test requirement

- Fuse for recirculation valve OK

- Disconnect harness connector at valve.



- Connect VAG1527B voltage tester as follows:

Harness connector terminal	Measure to
1	Engine Ground (GND)

- Operate starter briefly.
  - ♦ LED must light.

If LED does not light:

- Check wire connection from terminal 1 to Fuel Pump (FP) relay via fuse for an open circuit":

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

- Repair open circuit if necessary.

If wire connection is OK:

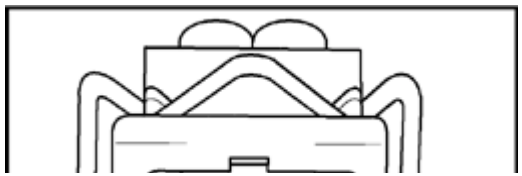
- Check Fuel Pump (FP) relay:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*

If LED lights:

- Check activation:

Checking activation



- Connect VAG1527B voltage tester to connector terminals 1 (B+) and 2.
- Initiate output Diagnostic Test Mode (DTM) and activate the

recirculating valve for turbocharger -N249-:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

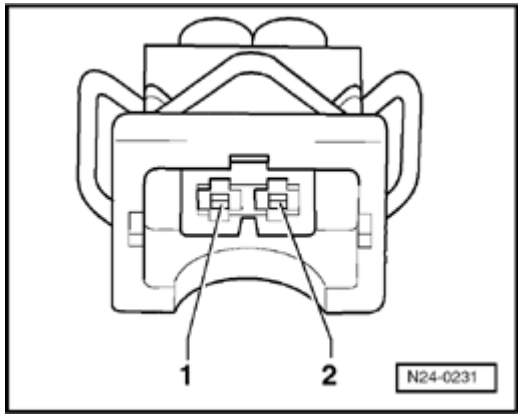
- LED must blink.

21-53

If LED does not blink or if it remains constantly lit:

- Connect VAG1598/31 test box at wiring harness to ECM, do not connect ECM:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*



- Check the following wire connection for open circuit and short circuit to Ground (GND) and B+:

Harness connector terminal	VAG1598/31 test box socket
2	105

- Repair open circuit or short circuit if necessary.

If wire connection is OK:

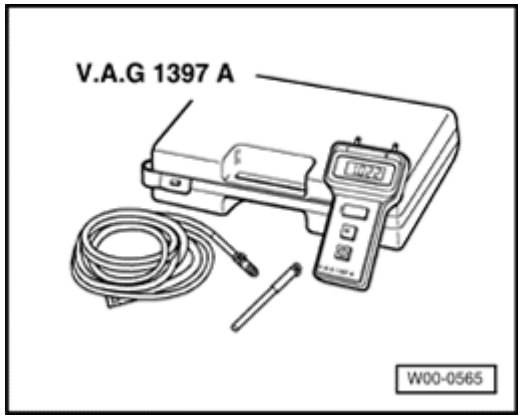
- Replace Engine Control Module (ECM):

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*

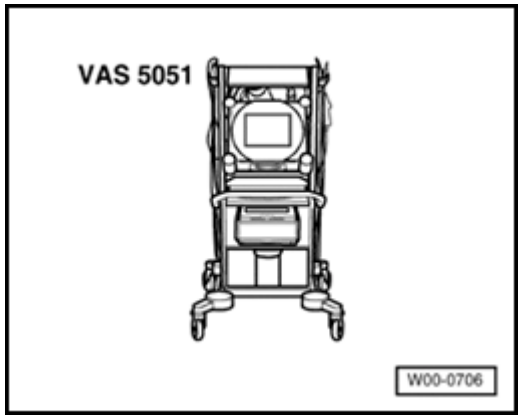
21-54

Turbocharger and charge air pressure regulator valve, checking

Special tools and equipment



- VAG1397A



- VAS5051 with VAG5051/1

or

- VAG1551 with VAG1551/3A

21-55

Test requirements

- All hoses and wires have been checked for proper seating and seal.
- DTC memory checked

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

- Output Diagnostic Test Mode (DTM) performed

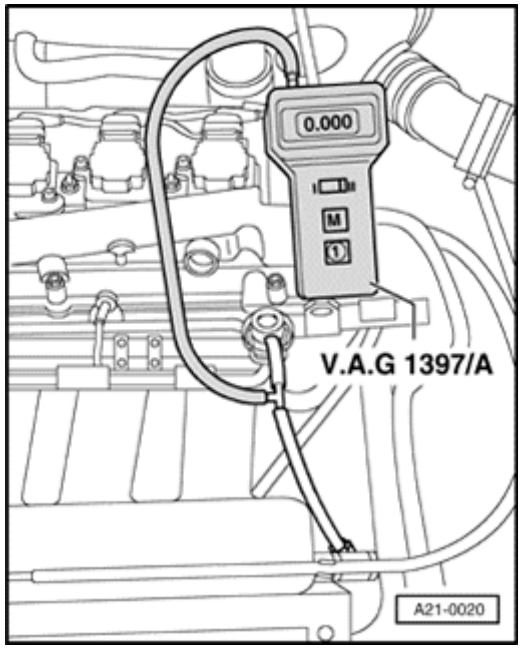
⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

- Vehicle tester VAS 5051 or VAG 1551 connected.

Test sequence

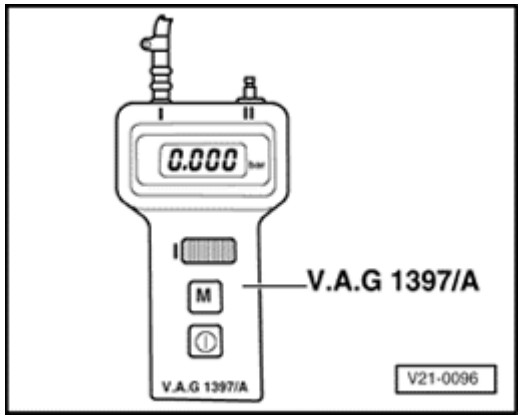
WARNING!

To reduce the risk of accident or injury while carrying out tests and measurements during a road test, observe safety precautions ⇒ ***Page 21-40*** ***.***



- Using T-piece connect test hose from VAG1397A Turbocharger Tester between intake manifold and fuel pressure regulator.
- Guide test hose over rear corner of hood, through passenger side window and into vehicle interior.

21-56

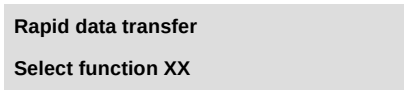


- Turn turbocharger tester on and select measuring range -I- (absolute pressure).
- Connect test hose to connection barb -I-.

Notes:

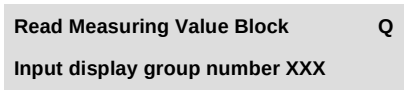
- *Hoses must be properly connected and there must be no possibility of leaks, otherwise incorrect readings may result.*
- *Make sure that the test hose is not pinched at the hood or at the side window.*
- *By pressing memory button "M" on turbocharger tester, the last test value is saved until either memory button "M" is pressed again or the turbocharger tester is shut-off.*
- *A blinking comma in the display field indicates that a value has been saved.*
- *An arrow appears in the top left corner of the display field if the turbocharger tester battery voltage drops below the permitted threshold.*
- *Before testing, drive vehicle rapidly for at least 3 km on a road that does not require stopping (i.e. traffic lights or similar).*
- *A second technician is required because the indicated values must be read out while the vehicle is being driven.*

21-57



When indicated on display:

- Press buttons -0- and -8- to select "Read Measuring Value Block" and press -Q- button to confirm input.



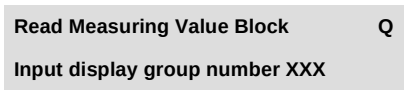
When indicated on display:

- Press buttons -0-, -0- and -4- to select "display group number 004" and press -Q- button to confirm input.

Indicated on display

Do not continue with test until intake air temperature in display field 4 is 20-50 °C if necessary, warm up vehicle by driving.

- Press -C- button.



When indicated on display:

- Press buttons -1-, -1- and -5- to select "display group number 115" and press -Q- button to confirm input.

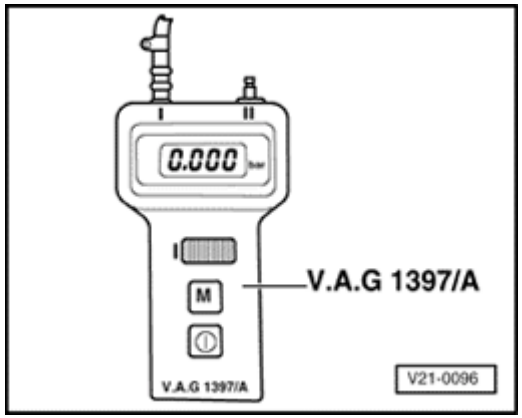
Indicated on display (1-4 = display fields)

- Accelerate vehicle in 3rd gear at full throttle from 2000 RPM and observe tachometer.
- At approx. 3000 RPM, press the print button on the VAS5051 or VAG1551 and simultaneously press the memory button -M- on the VAG1397A.

21-58

Note:

The height of the charge air pressure should be determined using the VAG1397/A turbocharger test tool, the VAS5051 tester or the VAG1551 Scan Tool is used to determine whether the charge air pressure is also being recognized in the control module.



➢ ♦ Specification on VAG1397A: 1.450-1.700 bar

Read Measuring Value Block 115 →

3000 RPM 42% 1770 mbar 1770 mbar

➢ ♦ Specified value on VAS 5051 or VAG 1551 Display field 4: 1450-1700 mbar

If the specification is exceeded or not met:

- Check DTC memory of Engine Control Module (ECM):

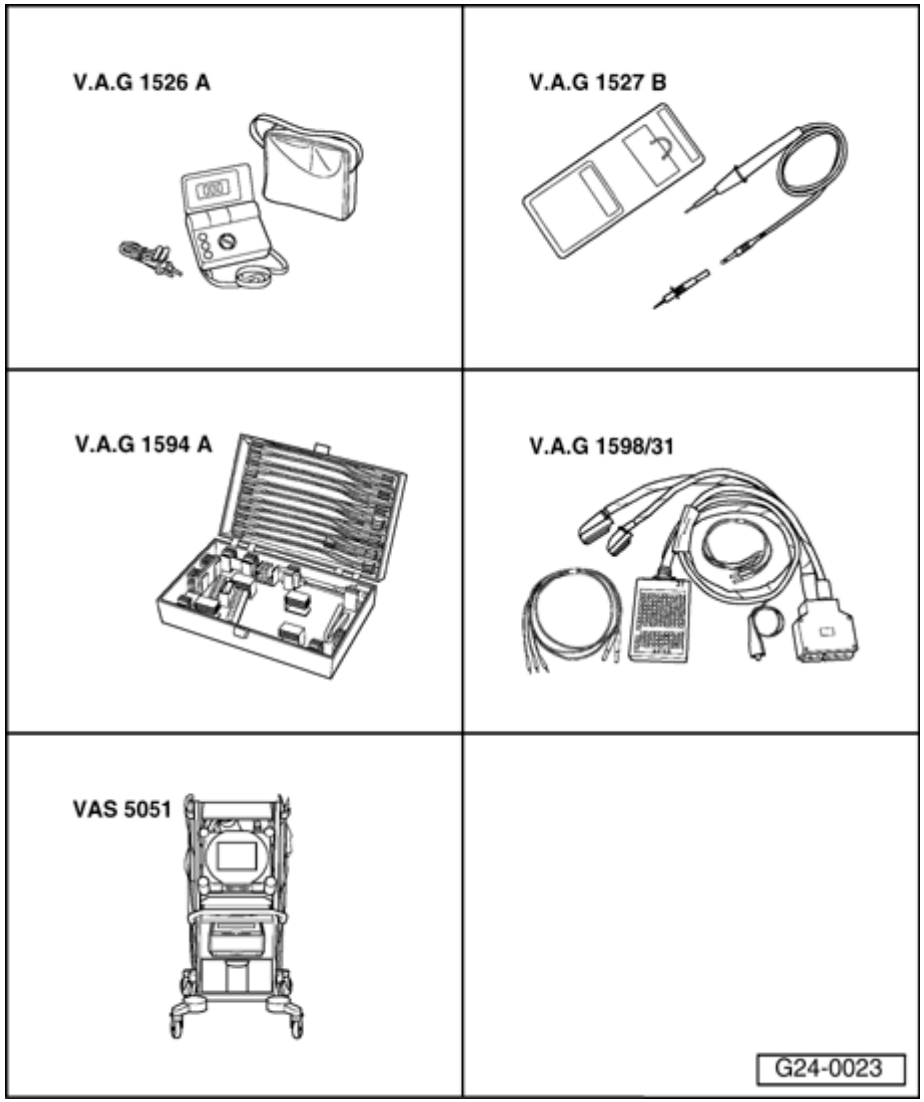
⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

charge air pressure regulation Diagnostic Trouble Codes (DTC)

Diagnostic Trouble Code (DTC)	Charge air pressure	Possible causes
Charge air pressure too low	• Measured value below 1.450 bar or 1450 mbar	♦ Wastegate bypass regulator valve -N75- faulty ♦ Wire to wastegate bypass regulator valve -N75- faulty ♦ Charge air pressure regulator valve in turbocharger is stuck in open position ♦ Leak between turbocharger and intake manifold ♦ Mechanical recirculation valve faulty ♦ Turbocharger malfunctioning
Charge air pressure too high [1)]	• Measured value above 1.700 bar or 1700 mbar	♦ Vacuum diaphragm for charge air pressure regulator valve faulty ♦ Hoses to vacuum diaphragm for charge air pressure regulation valve (via wastegate bypass regulator valve -N75-) leaky ♦ Charge air pressure regulator valve in turbocharger is stuck in closed position

1) If charge air pressure is too high, the fuel supply is shutoff to protect the engine. The engine misfires at high engine speeds.

21-60



Wastegate bypass regulator valve -N75-, checking

Special tools and equipment

- VAG1526A
- VAG1527B
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

- or

- VAG1551 with VAG1551/3A

21-61

Note:

The wastegate bypass regulator valve -N75- and wire connections are monitored by the Engine Control Module (ECM).

- Connect VAS5051 tester or VAG1551 scan tool and select control module for engine electronics using "address word 01". Engine must run at idle for this:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

- Check DTC memory of Engine Control Module (ECM):

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

If a malfunction relating to the wastegate bypass regulator valve -N75- is indicated:

- Disconnect hoses from valve; harness connector remains connected.

- Attach assisting hose to one connection of

valve.

- Initiate output Diagnostic Test Mode (DTM) and activate the wastegate bypass regulator valve -N75-.

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

Output Diagnostic Test Mode →

Wastegate Bypass Regulator Valve -N75

➢ Indicated on display

Valve must click...

...and must open and close (can be tested by blowing into assisting hose).

If valve does not click:

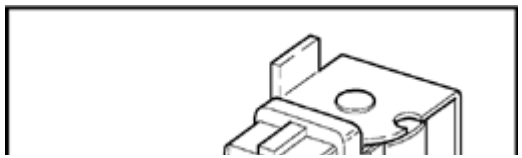
- Check internal resistance of valve.

If valve does not open and close properly:

- Replace wastegate bypass regulator valve -N75-.

Checking internal resistance

- Disconnect harness connector at valve.



➢

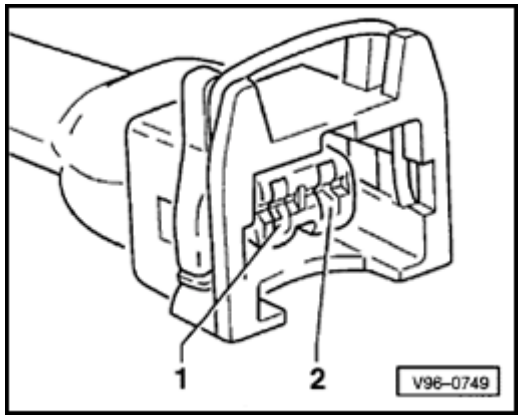
- Connect multimeter at valve for resistance measurement.
  - ♦ Specified value: 25-35 Ω

If specified value is not obtained:

- Replace wastegate bypass regulator valve -N75- .

If the specified value is met:

Checking voltage supply



- Connect VAG1527B voltage tester as follows:

Harness connector terminal	Measure to
1	Engine Ground (GND)

- Operate starter briefly.
  - ♦ LED must light.

If LED does not light:

- Check wire connection from terminal 1 to Fuel Pump (FP) relay via fuse for open circuit:

⇒ *Electrical Wiring Diagrams, Troubleshooting & Component Locations*

- Repair open circuit if necessary.

21-64

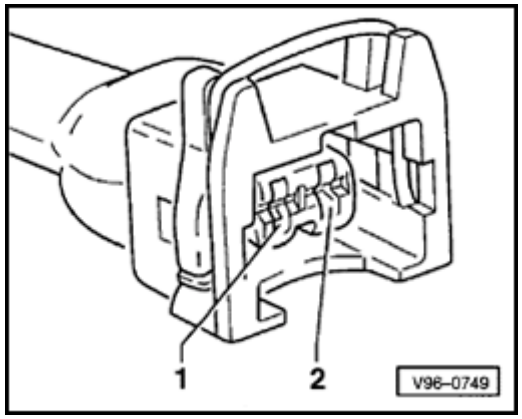
If wire connection is OK:

- Check Fuel Pump (FP) relay:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*

If LED lights:

Checking activation



- Connect VAG1527B voltage tester to harness connector terminals 1 (B+) and 2.
- Initiate output Diagnostic Test Mode (DTM) and activate the wastegate bypass regulator valve -N75-.

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

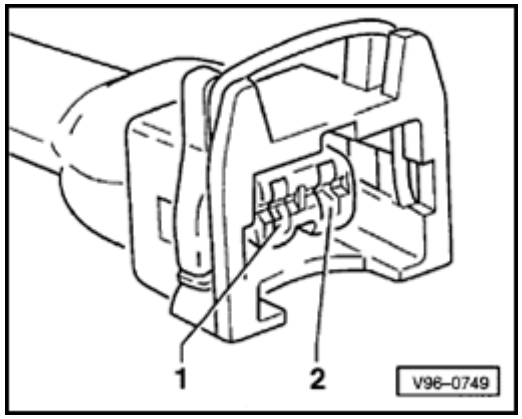
- ♦ LED must blink.

If LED does not blink or if it remains constantly lit:

- Connect VAG1598/31 test box at wiring harness to ECM, do not connect ECM:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*

21-65



- Check the following wire connection for open circuit and short circuit to Ground (GND) and B+:

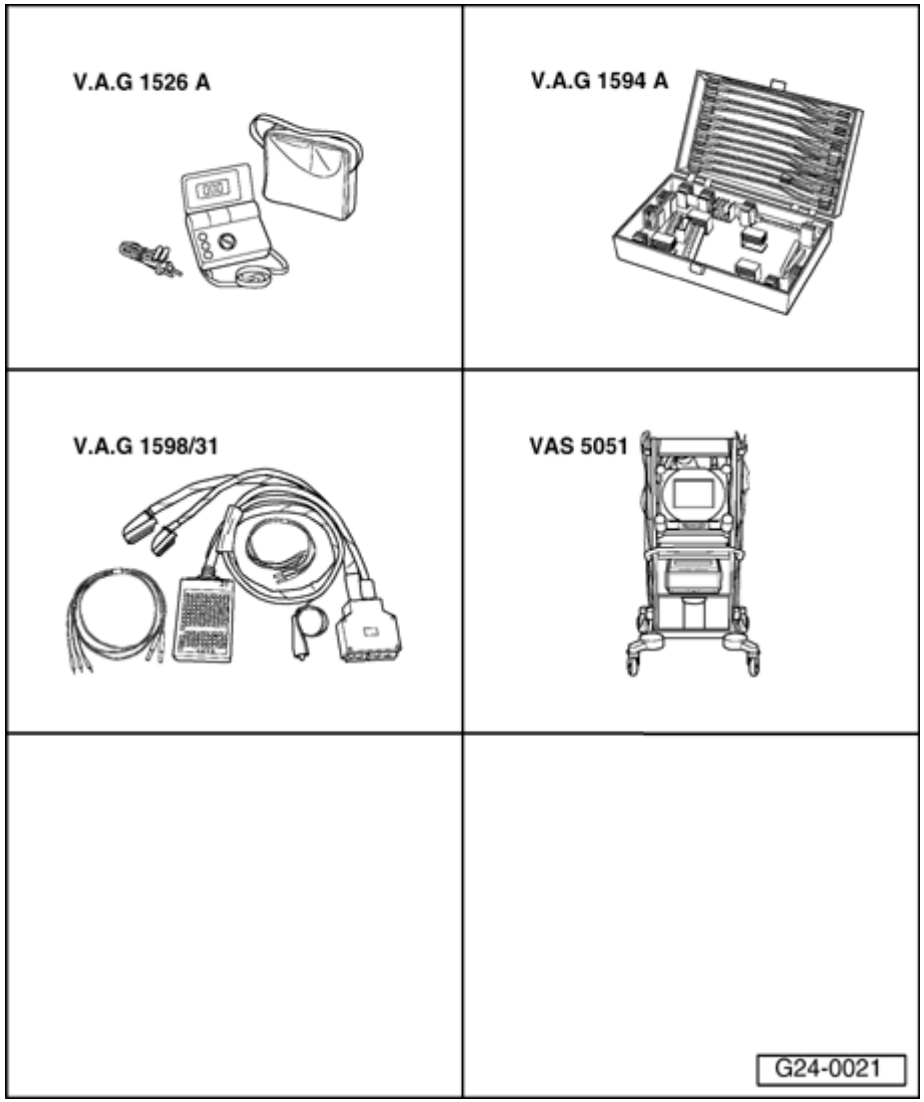
Harness connector terminal	VAG1598/31 test box socket
2	104

- Repair open circuit or short circuit if necessary.

If wire connection is OK:

- Replace Engine Control Module (ECM):

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*



Charge air pressure sensor -G31-, checking

Special tools and equipment

- VAG1526A
- VAG1594A
- VAG1598/31
- VAS5051 with VAG5051/1

- or

- VAG1551 with VAG1551/3A

21-67

Note:

The charge air pressure sensor -G31- and wire connections are monitored by the Engine Control Module (ECM).

- Connect VAS5051 tester or VAG1551 scan tool and select control module for engine electronics using "address word 01". Engine must run at idle for this:

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

- Check DTC memory of Engine Control Module (ECM):

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 01*

If a malfunction relating to the charge air pressure sensor -G31- is indicated:

Checking voltage supply

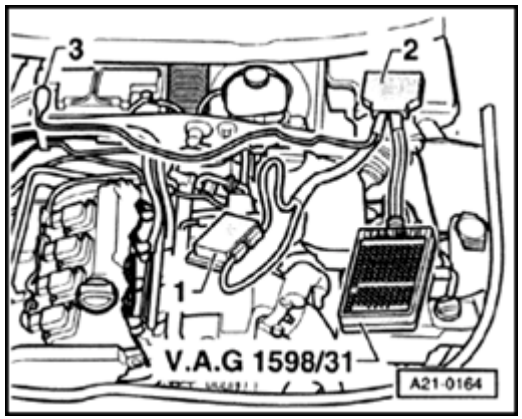
- Disconnect harness connector at charge air pressure sensor.

- Connect multimeter between terminals 1 and 3 of harness connector for voltage measurement.

- Switch ignition on.

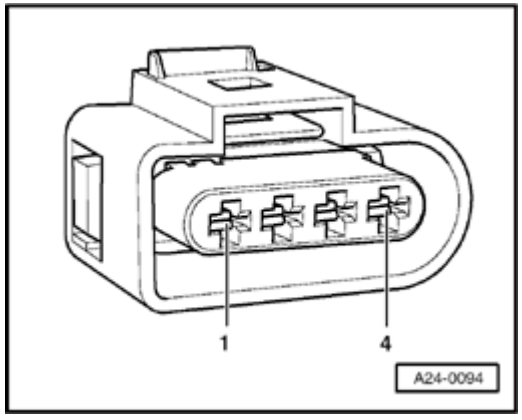
♦ Specified value: approx. 5 V

If specified value is not obtained:



- Connect VAG1598/31 test box to wiring harness -2- for Engine Control Module (ECM), also connect ECM -1-. Connect Ground (GND) clamp -3- to negative battery post.

⇒ *Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Repair Group 24*



- Check the following wire connections for open circuit and short circuit to Ground (GND) and B+:

Harness connector terminal	VAG1598/31 test box socket
1	108
3	98

- Repair open circuit or short circuit if necessary.

If the specified value is met:

21-69

Checking signal wire

- Connect harness connector at charge air pressure sensor.

- Connect multimeter to socket 101 and socket 108 of test box for voltage measurement.

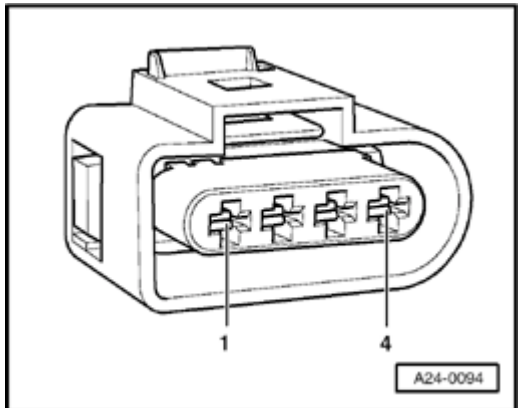
- Start engine and run at idle.

  - Specified value: approx. 1.90 V

- Bring up engine RPM by suddenly depressing pedal.

  - Specified value: 2.00-3.00 V

If specified values are not obtained:



- Check the following wire connection for open circuit and short circuit to Ground (GND) and B+:

Harness connector terminal	VAG1598/31 test box socket
4	101

- Repair open circuit or short circuit if necessary.

If wire connection is OK:

- Replace charge air pressure sensor -G31-.

Charge pressure leak test with VAG 1687

Intake system, checking for leaks using VAG 1687 Diagnostic Tool

Diagnostic trouble codes (DTCs) related to fuel trim, charge pressure or mass air flow (MAF) may be caused by:

- Leaking (worn/torn) intake hoses during charge conditions
- Incorrectly torqued or improperly placed clamps on intake hoses etc. causing leaks during charge conditions

Check the charge air pressure system using the VAG 1687 Charge air system tester.

Special tool VAG 1687 Charge air system tester preliminary set-up

- Back off pressure regulator knob -2- of VAG 1687 fully to protect gauge when shop air supply is applied to assembly.

- Close valve -3- before gauge.
- Close valve -4- after gauge.

The shop air supply line will later be attached to the inlet of VAG 1687.

- Remove female fitting from tester (arrow) and install an appropriate "male" air fitting that will connect to your shop air supply line (⇒WARNING!).

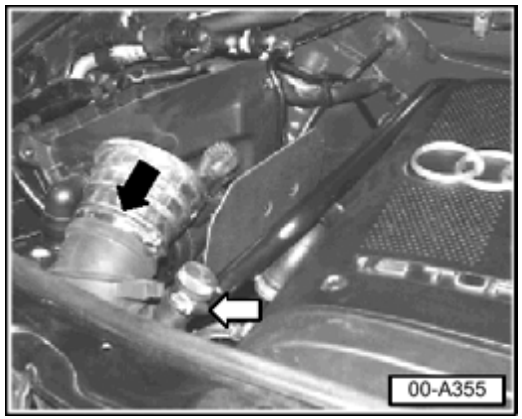
21-71

WARNING!

Use only approved air fittings to adapt shop air supply line to VAG 1687 tester.

Special tool VAG 1687/1 pressure adapter, installing (1.8L Turbo)

- Separate intake hose from Mass Air Flow (MAF) sensor assembly.

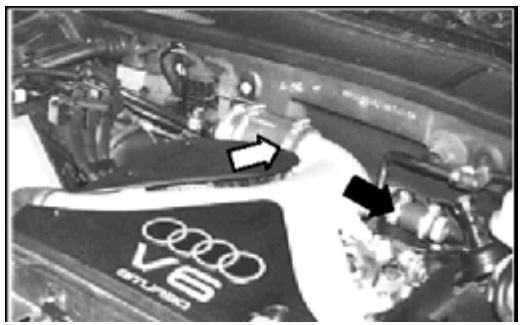


- Insert VAG 1687/1 pressure adapter in intake hose -black arrow- using existing clamp (as shown).
- Remove crankcase ventilation tube from intake hose at -white arrow-.

Special tool VAG 1687/1 pressure adapter, installing (2.7L BiTurbo)

- Remove upper air cleaner housing and hoses to intake manifold as necessary

⇒ *Repair Manual, Maintenance; Air cleaner housing, cleaning; Air cleaner element, replacing*



- Insert VAG 1687/1 pressure adapter in intake hose -white arrow- using existing clamp (as shown).
- Disconnect engine crankcase ventilation hose from intake manifold - black arrow-.
- Plug intake manifold fitting (for crankcase ventilation hose) with appropriate hose and metal plug using clamps supplied with VAG

1687/1 special tool kit.

21-72

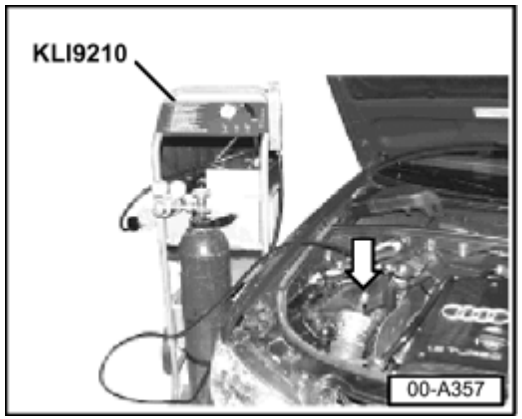
Note:

- *To help find small leaks, BEFORE pressurizing the system fill system with smoke using special tool KLI9210 and adapter KLI9210/50 as described on ⇒ Page 21-72 .*

- *An ultrasonic detector may also be used to detect extremely small leaks where smoke may not be visible.*

Special tool KLI9210 (Evaporative system leak detector), connecting to 1.8L Turbo

- Install optional fitting LKI9210/50 on hose of special tool KLI9210.



- Connect KLI9210 to VAG 1687/1 adapter (KLI9210 is shown attached to VAG 1687/1 at arrow on 1.8L Turbo).

Special tool KLI9210 (Evaporative system leak detector), connecting to 2.7L BiTurbo

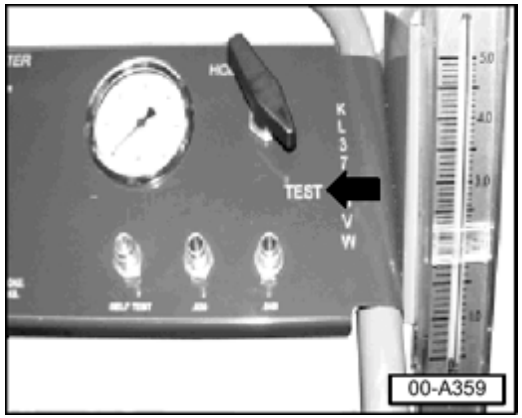
- Install optional fitting LKI9210/50 on hose of special tool KLI9210.

- Connect KLI9210 to VAG 1687/1 adapter (KLI9210 is shown attached

to VAG 1687/1 at arrow on 2.7L BiTurbo).

Special tool LKI9210 (Evaporative system leak detector), preliminary set-up

- Connect smoke generator leads to vehicle battery.



- Turn valve to test -black arrow-.
- Press smoke generator button to fill system with smoke (see instructions printed on tester).

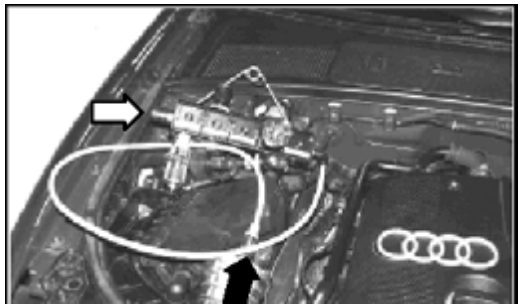
With system filled with smoke:

- Remove smoke generator hose and connect VAG1687 quickly to prevent smoke from leaking out ⇒ Page 21-73 .

Special tool VAG 1687, connecting to pressure adapter VAG 1687/1 (1.8L Turbo)

For illustrations purposes VAG is shown lying in the engine compartment. In practice the tool should be hung from the hood.

- Connect VAG 1687 quickly to prevent smoke from leaking out.



VAG 1687 is shown connected to VAG 1687/1 -black arrow-

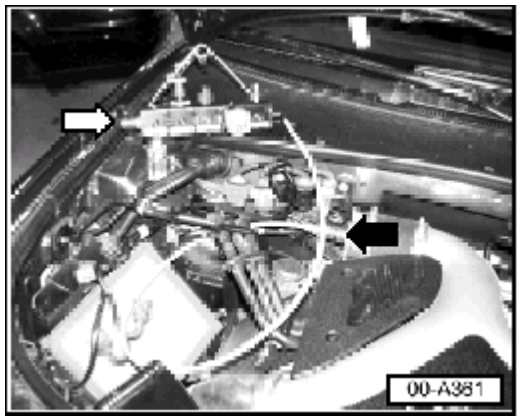
Shop air supply will be connected to VAG 1687 -at white arrow-

- Perform pressure test ⇒ Page 21-75 .

Special tool VAG 1687, connecting to pressure adapter VAG 1687/1 (2.7L BiTurbo)

For illustrations purposes VAG is shown lying in the engine compartment. In practice the tool should be hung from the hood.

- Connect VAG 1687 quickly to prevent smoke from leaking out.



VAG 1687 is shown connected to VAG 1687/1 -black arrow-

Shop air supply will be connected to VAG 1687 -at white arrow-

- Perform pressure test ⇒ Page 21-75 .

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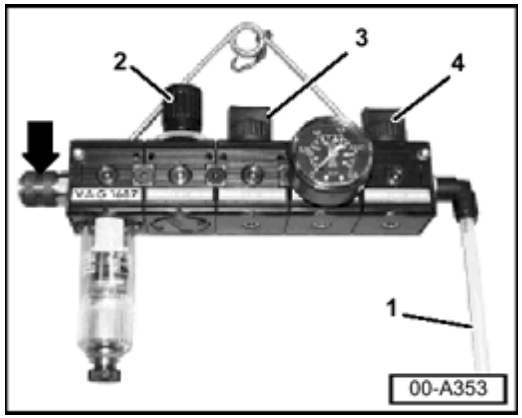
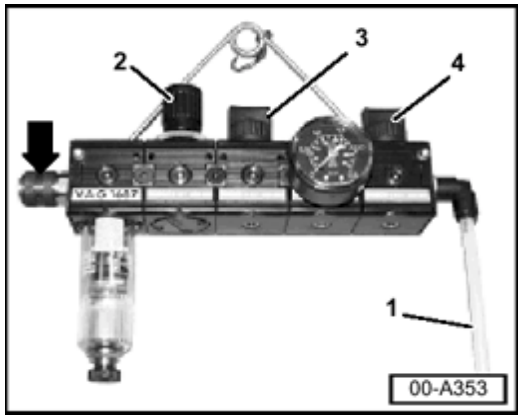
Performing pressure test:



- With outlet hose -1- of VAG 1687 connected to air pressure adapter:
- Attach shop air supply line to previously installed male fitting ⇒ Page 21-70 .



- Open valve -3- between regulator valve and gauge.
- Adjust test pressure up to 0.5 bar (⇒CAUTION below) by turning regulator valve -2-.

CAUTION!

- ***DO NOT pressurize the system above 0.5 bar!***
- ***Doing so may force oil into the intake system which can damage the engine.***

- Slowly open outlet valve -4- (after gauge) to test hose connections.
- Observe pressure gauge for a drop in pressure.

Note:

Some pressure will be lost past the throttle plate.

- Readjust test pressure to 0.5 bar (⇒CAUTION above) by turning regulator valve -2-.

- Listen for any very large intake leaks.

If smoke generator was used to fill the system with smoke:

- Inspect intake system connections for smoke at leaks.

Note:

An ultrasonic detector may also be used to detect extremely small leaks where smoke may not be visible.

- Repair any leaks found.

- Remove tester.

- Remove plug from crankcase ventilation hose.

- Remove air pressure adapter.

With VAS 5051 diagnostic tool connected:

- Erase DTC memory.

If smoke generator was not used to fill the system with smoke:

- Apply soapy water solution or equivalent to intake system connections.

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Note:

An ultrasonic detector may also be used to detect extremely small leaks.

- Inspect intake system connections for leaks.
- Repair any leaks found.
- Remove tester.
- Remove plug from crankcase ventilation hose.
- Remove air pressure adapter.

With VAS 5051 diagnostic tool connected:

- Erase DTC memory.