

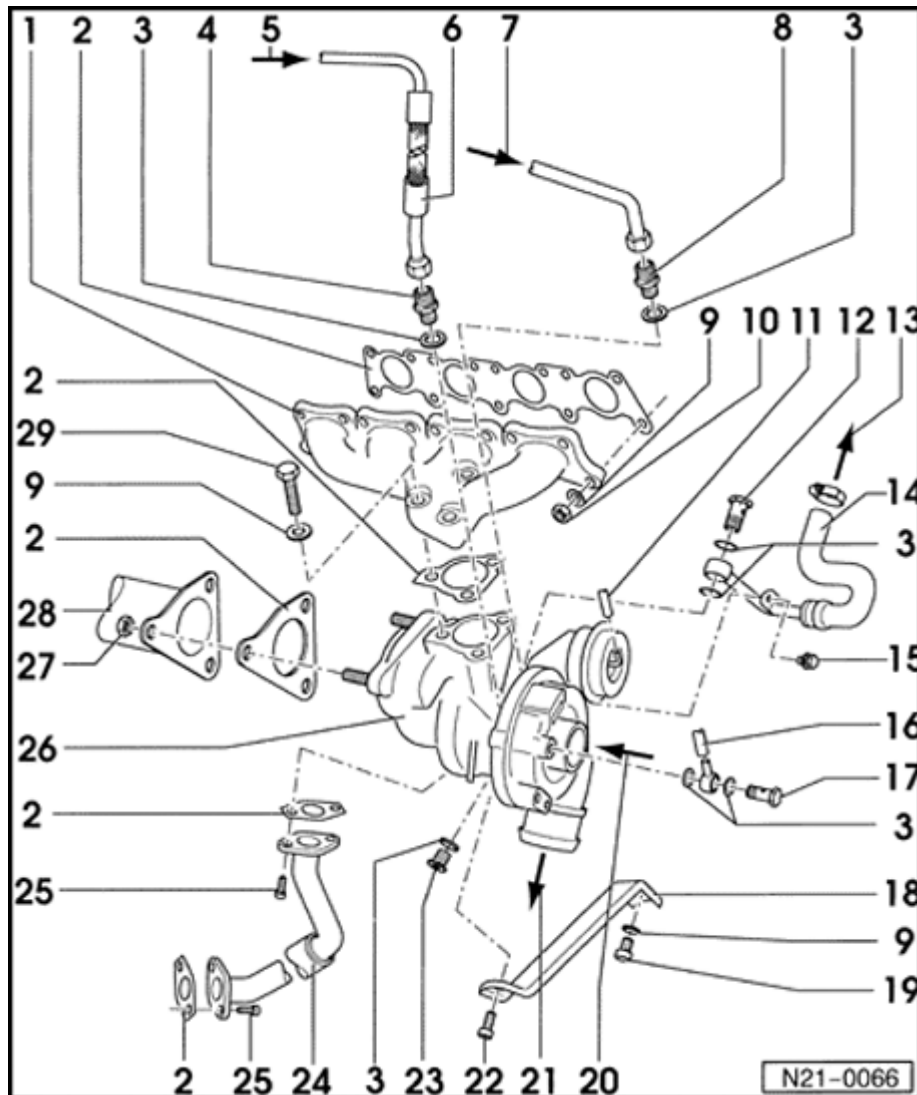
Charge air system

Turbocharger & components, removing and installing

Observe rules for cleanliness ⇒ [Page 21-16](#) .

Note:

- ◆ *All hose connections are secured with clips.*
- ◆ *Charge air system must be free of leaks.*
- ◆ *Replace self-locking nuts.*



1 - Exhaust manifold

2 - Gasket

◆ Note installation position

3 - Seal

◆ Always replace

4 - Connection, 30 Nm

5 - From oil filter bracket

6 - Oil supply line

◆ Tighten to 25 Nm

7 - From coolant pipe on intake manifold

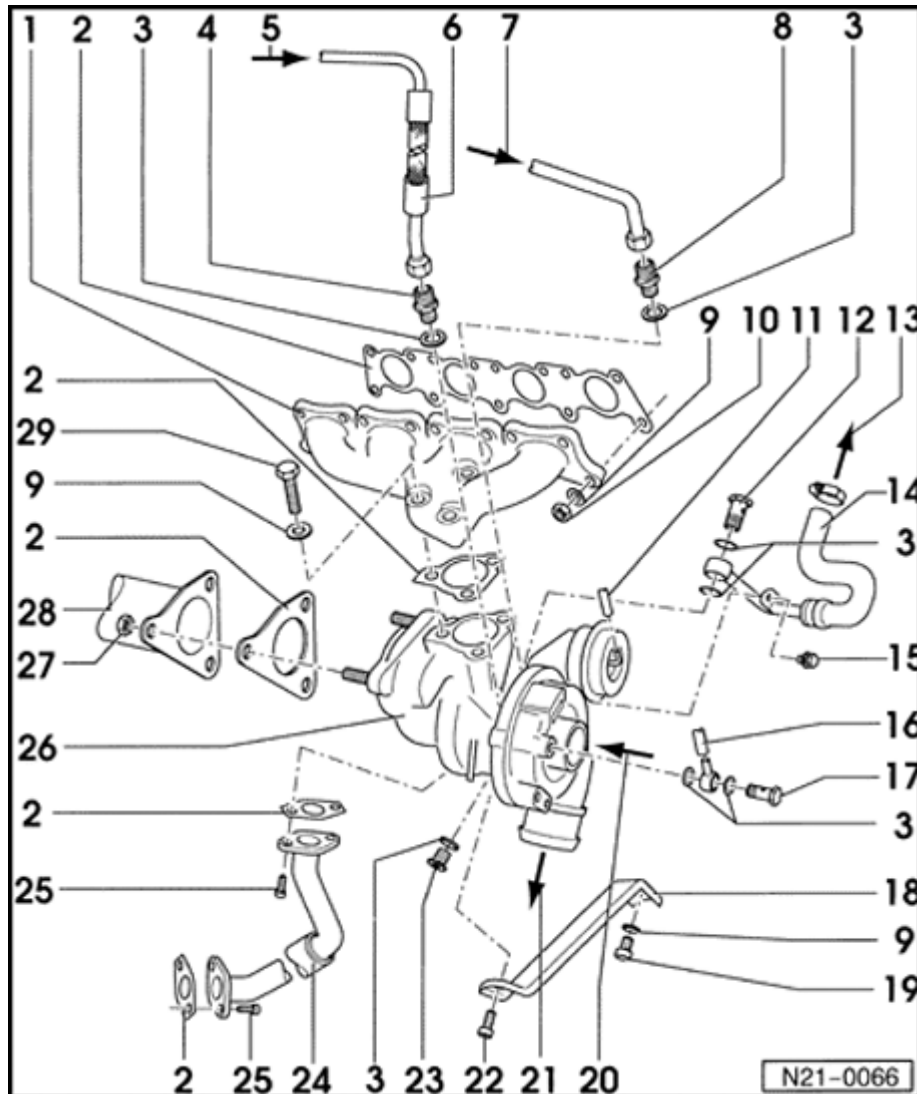
◆ Tighten to 30 Nm

8 - Connection, 35 Nm

9 - Washer

10 - 25 Nm

◆ Coat threads with G 052 112 A3



11 - Hose

- ◆ To Wastegate Bypass Regulator valve - N75- ⇒ [Page 21-10](#) , item 13

12 - Banjo bolt, 25 Nm

13 - To cylinder block

14 - Coolant supply pipe

15 - 10 Nm

16 - Hose

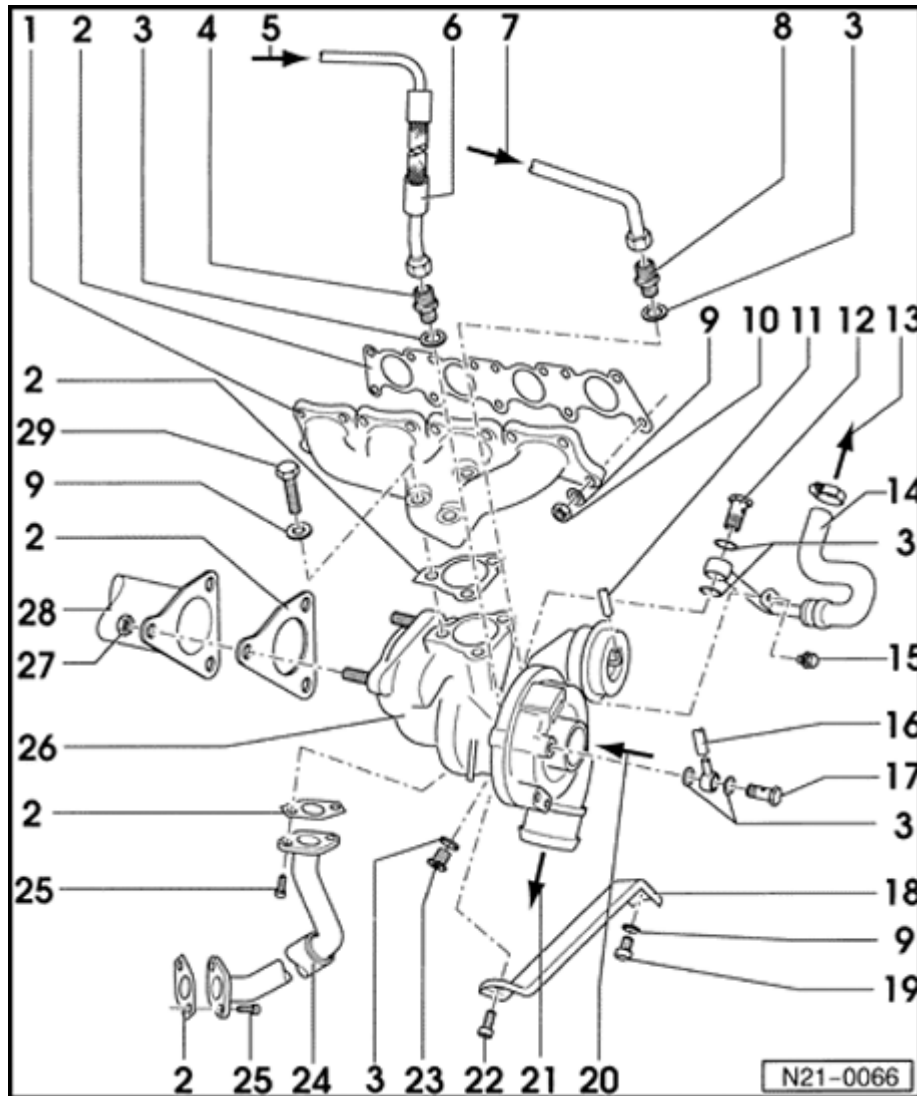
- ◆ To Wastegate Bypass Regulator valve - N75- ⇒ [Page 21-10](#) , item 13

17 - Banjo bolt, 15 Nm

18 - Retainer

- ◆ Between turbocharger and cylinder block

19 - 40 Nm



20 - From air cleaner

21 - To charge air cooler

22 - 10 Nm

23 - Plug, 15 Nm

24 - Oil return line

◆ To oil pan

25 - 10 Nm

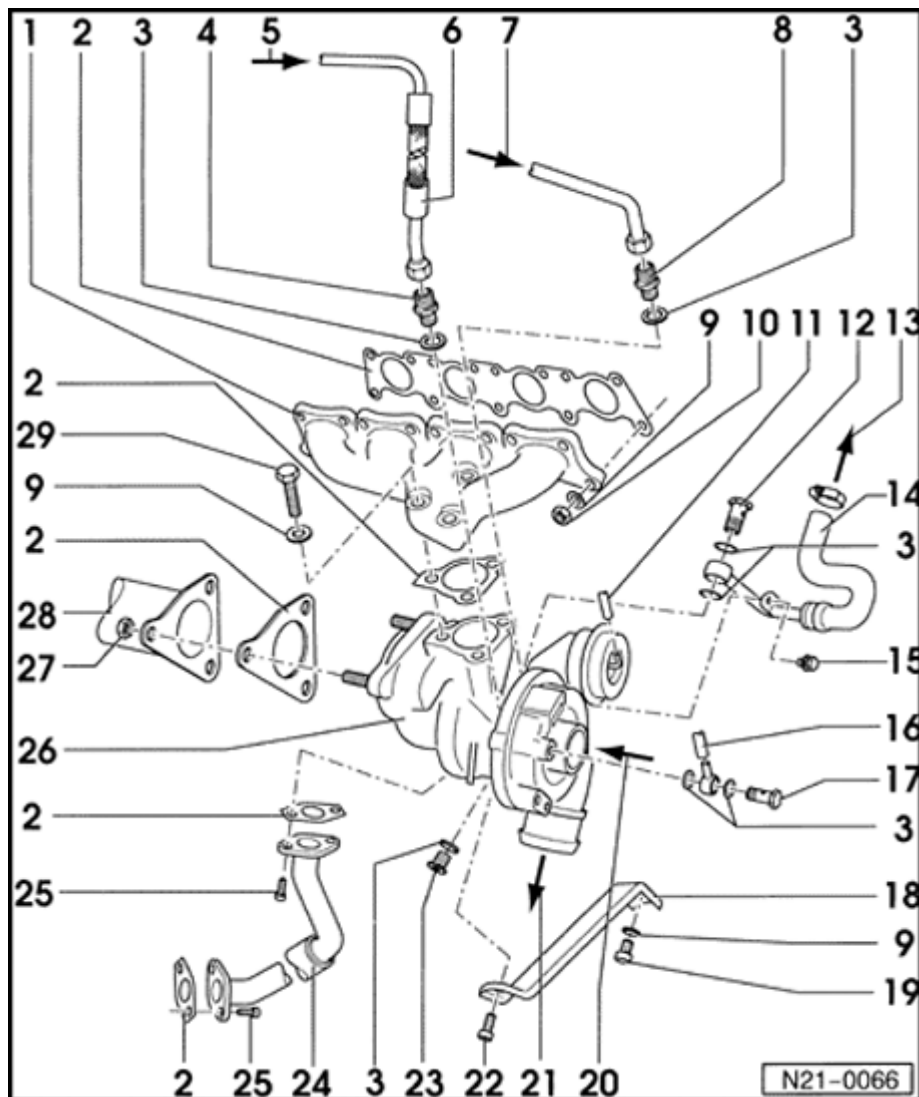
26 - Turbocharger

◆ Checking charge air pressure regulation ⇒ [Page 21-18](#)

◆ Charge pressure regulator valve and pressure unit are components of the turbocharger and cannot be replaced individually

27 - 25 Nm

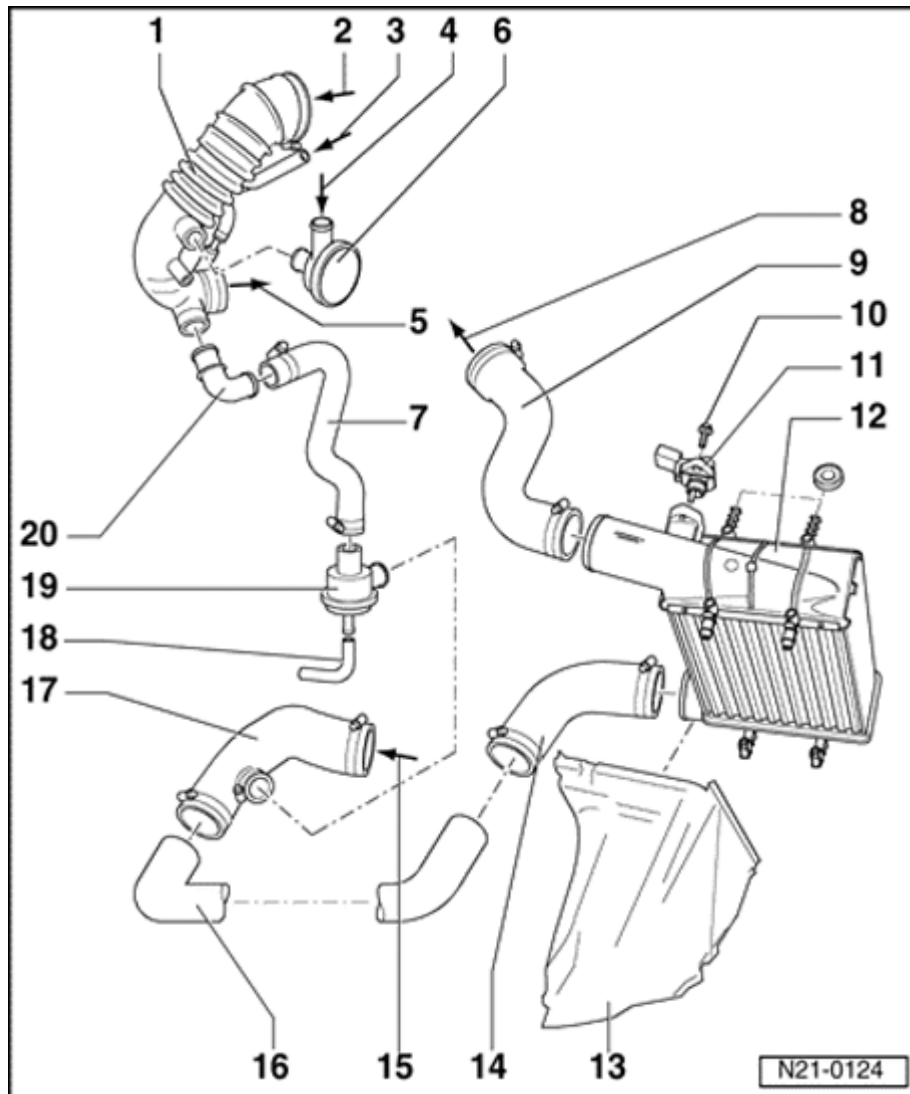
◆ Coat threads with G 052 112 A3



28 - Three-Way Catalytic Converter

29 - 35 Nm

- ◆ Always replace
- ◆ Coat threads and bolt head seating surface with G 052 112 A3



Charge air system cooling components, removing and installing

Note:

- ◆ All hose connections secured by clips.
- ◆ Charge air system must be free of leaks.
- ◆ When installing, note the assembly markings on the hoses and components.

1 - Intake hose

2 - From air cleaner

3 - From EVAP canister

4 - From crankcase breather

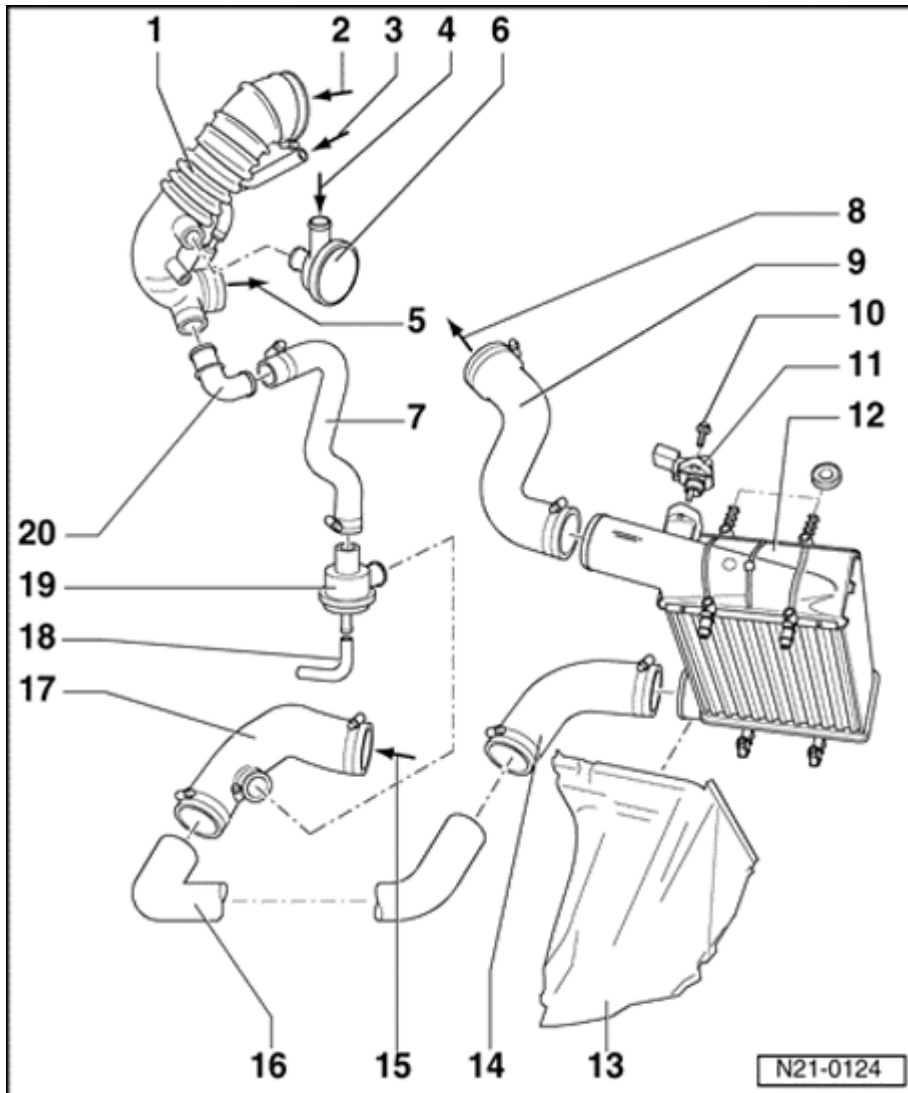
5 - To turbocharger

6 - Pressure regulator valve

- ◆ For Positive Crankcase Ventilation valve

7 - Connecting line/hose

- ◆ Note assembly markings



8 - To throttle valve control module

9 - Connecting pipe/hose

- ◆ Charge air cooler/throttle valve control module
- ◆ Note assembly markings

10 - 10 Nm

11 - Charge air pressure sensor -G31-*

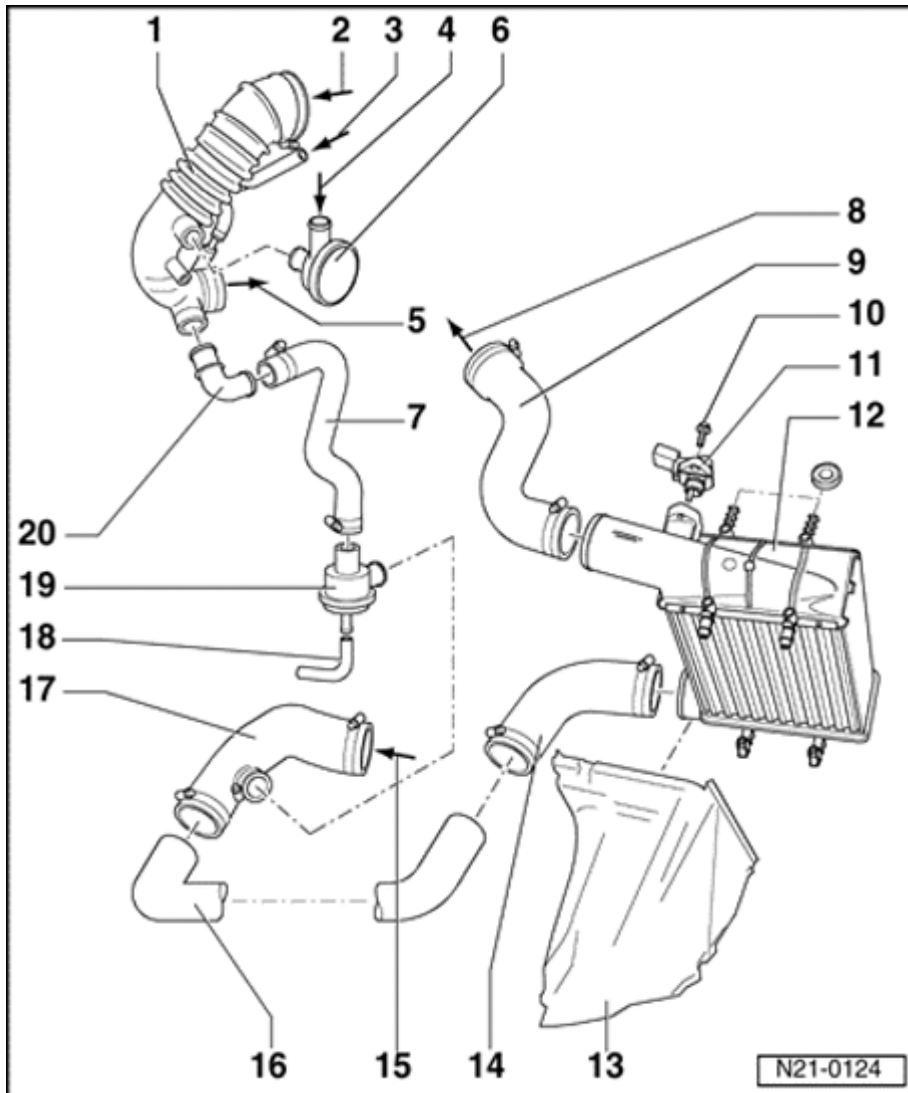
- ◆ Only for engine code ATW
- ◆ Replace O-ring if damaged
- ◆ Checking ⇒ [Page 21-33](#)

12 - Charge air cooler

13 - Air duct

14 - Connecting pipe/hose

- ◆ Cross tube/charge air cooler
- ◆ Note assembly markings



15 - From turbocharger

16 - Cross tube

17 - Connecting pipe/hose

◆ Turbocharger/cross tube

◆ Note assembly markings

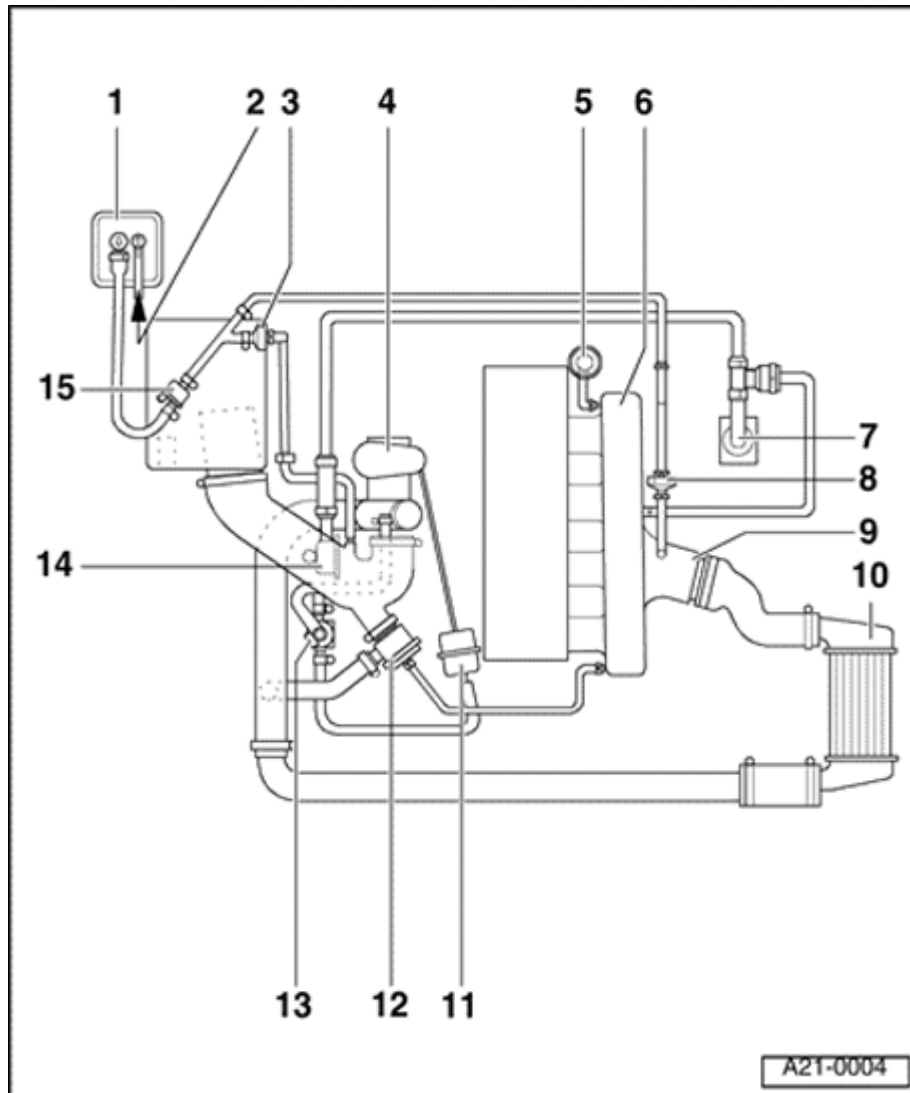
18 - Vacuum hose/line

19 - Recirculating valve for turbocharger - N249-

◆ Checking ⇒ [Page 21-31](#)

20 - Angle piece

N21-0124



8 - Check valve

- ◆ For EVAP canister

9 - Throttle valve control module

10 - Charge air cooler

11 - Pressure unit

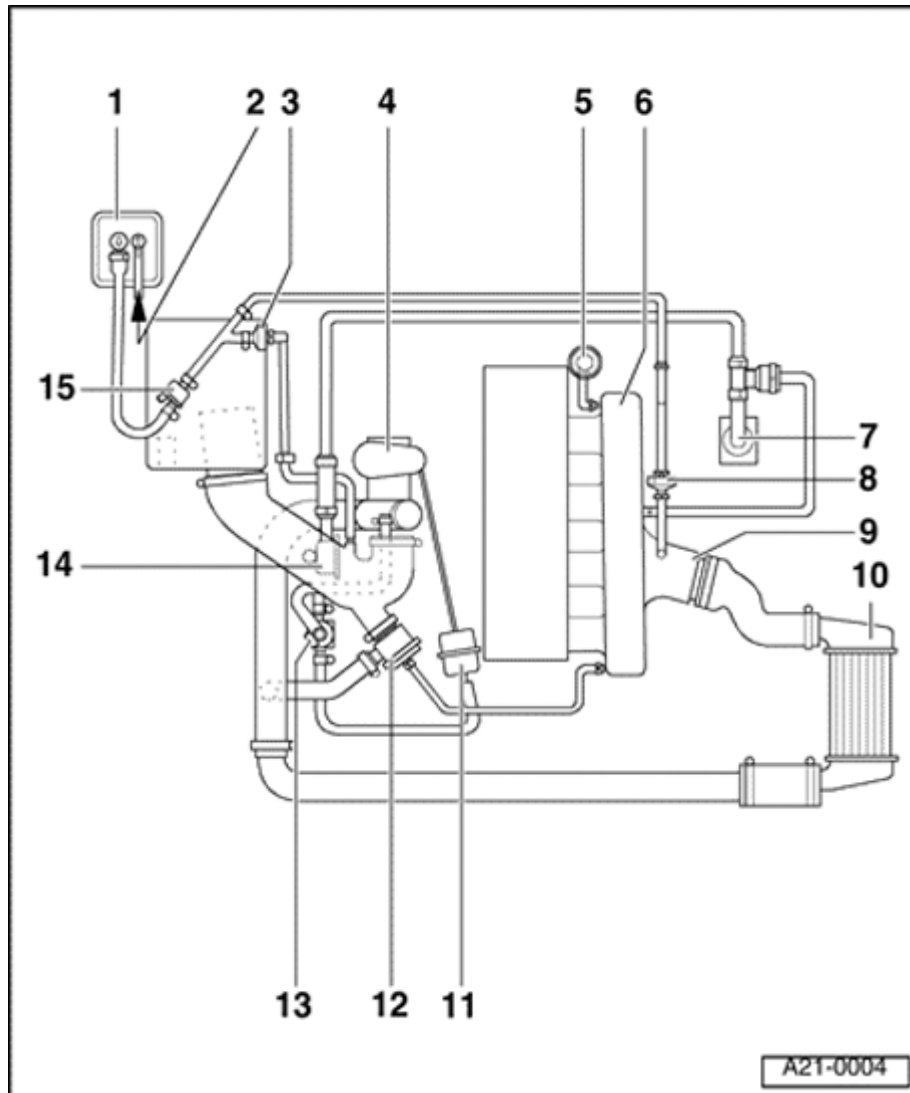
- ◆ For wastegate
- ◆ Integral part of turbocharger; cannot be replaced

12 - Recirculating valve for turbocharger - N249-

13 - Wastegate Bypass Regulator valve -N75-

- ◆ The valve will be activated from the Engine Control Module (pulsed)
- ◆ Closed with no current, charge pressure limited
- ◆ Checking activation:

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



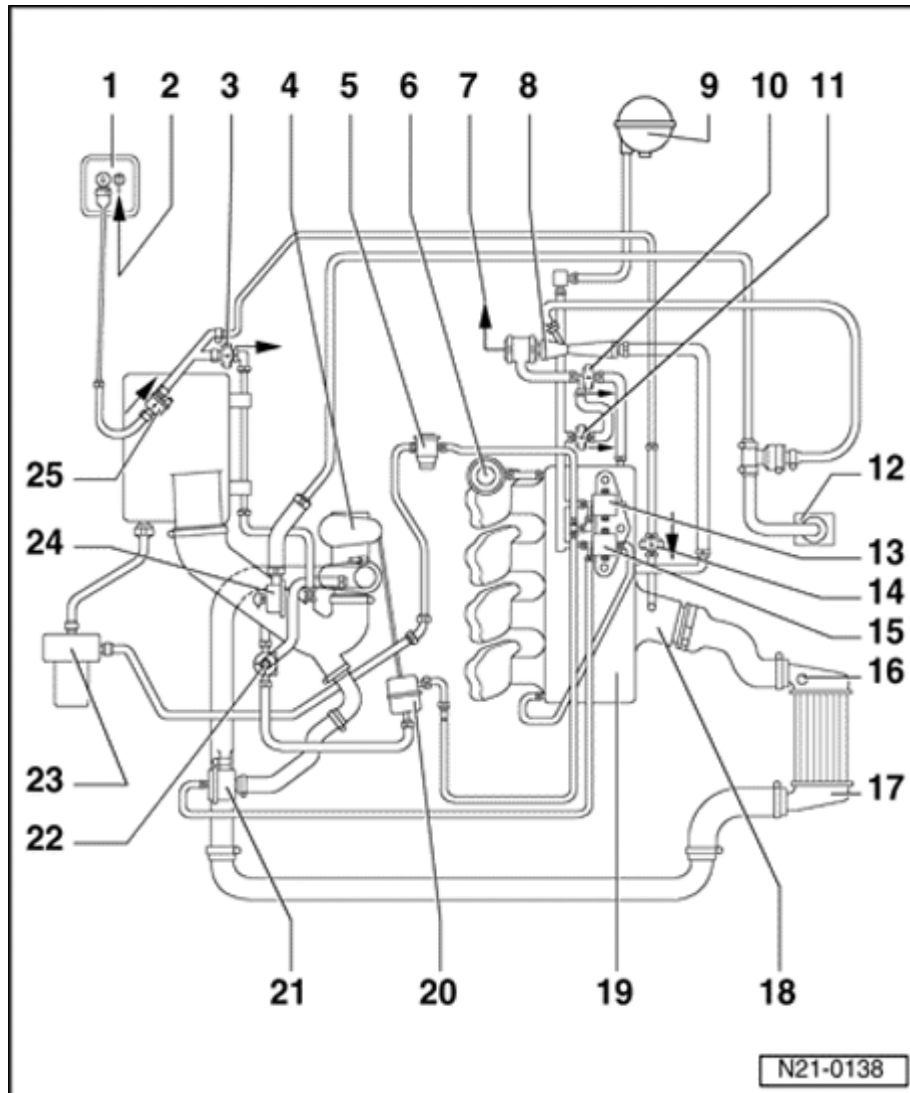
14 - Pressure regulator valve

- ◆ For Positive Crankcase Ventilation

15 - EVAP Canister Purge Regulator valve - N80-

- ◆ Checking:

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



Engine code ATW

1 - EVAP canister

2 - Vent pipe

- ◆ From gravity valve on fuel tank ⇒ [Page 20-2](#), Item 5

3 - Check valve

- ◆ For EVAP canister

4 - Turbocharger

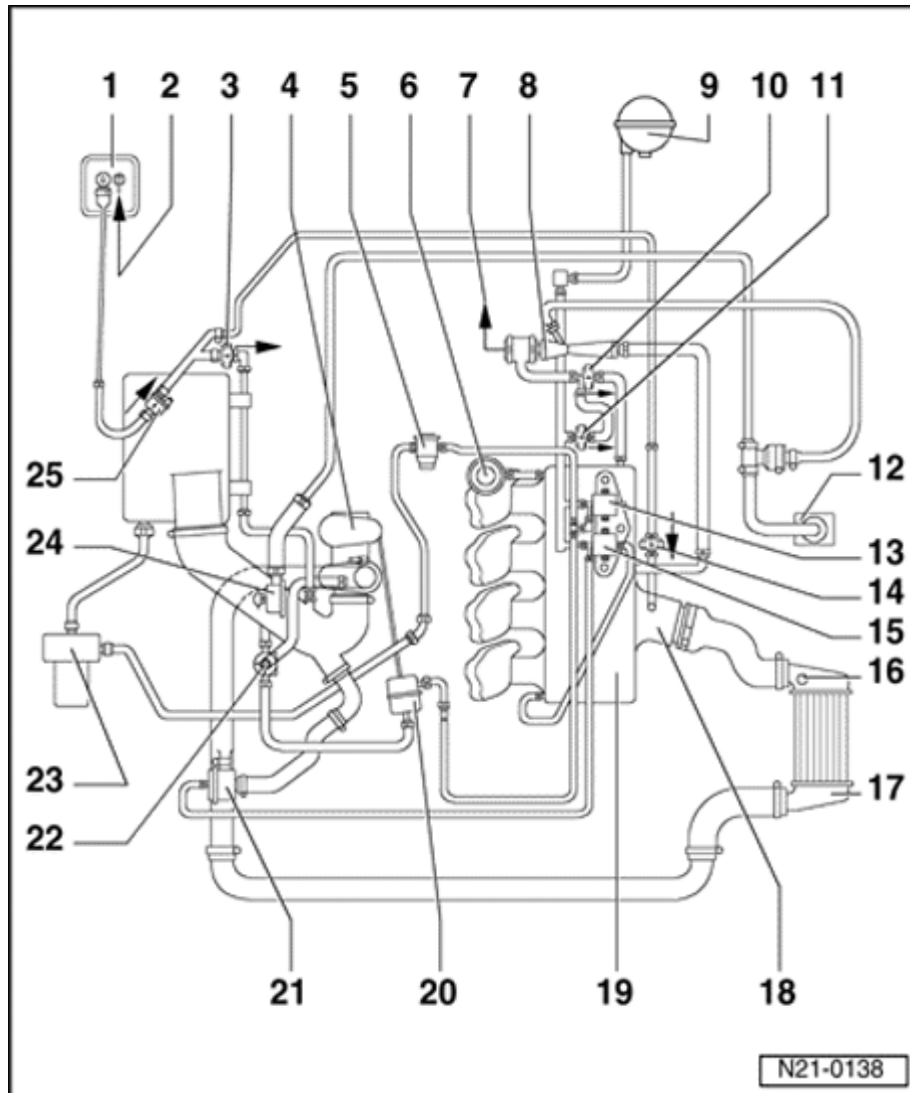
- ◆ Charge pressure regulator valve and pressure unit are components of the turbocharger and cannot be replaced individually

5 - Combination valve

- ◆ For secondary air system
- ◆ Checking ⇒ Page ⇒ [Page 26-17](#)

6 - Fuel pressure regulator

7 - To brake servo



8 - Vacuum booster

9 - Vacuum reservoir

- ◆ Secured in wheel housing, front left

10 - Check valve

11 - Check valve

12 - Crankcase ventilation

13 - Secondary Air Injection (AIR) solenoid valve -N112-

- ◆ Checking ⇒ [Page 26-21](#)

14 - Check valve

- ◆ For EVAP canister

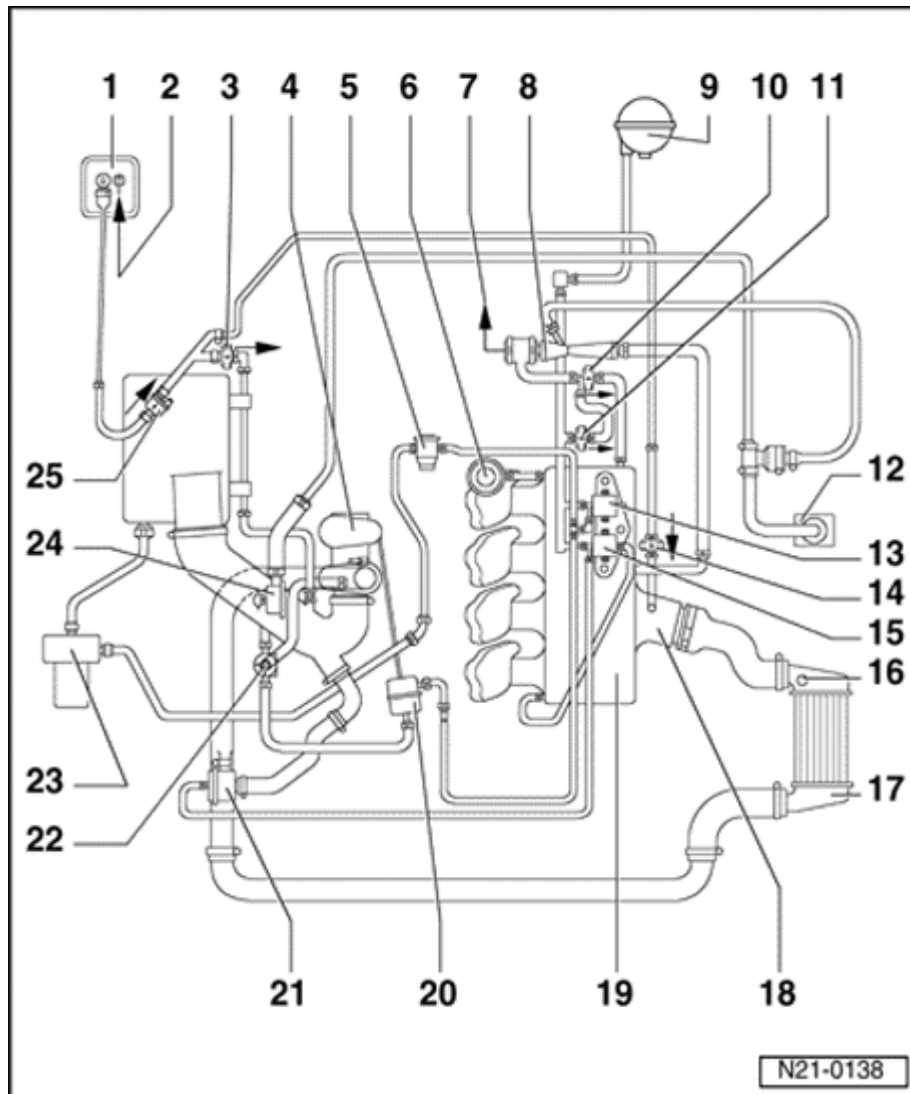
15 - Recirculating valve for turbocharger - N249-

- ◆ Checking ⇒ [Page 21-38](#)

16 - Charge air pressure sensor -G31-*

- ◆ Checking ⇒ [Page 21-33](#)

17 - Charge air cooler



18 - Throttle valve control module

19 - Intake manifold

20 - Pressure unit

- ◆ For wastegate
- ◆ Integral part of turbocharger; cannot be replaced

21 - Recirculating valve for turbocharger - N249-

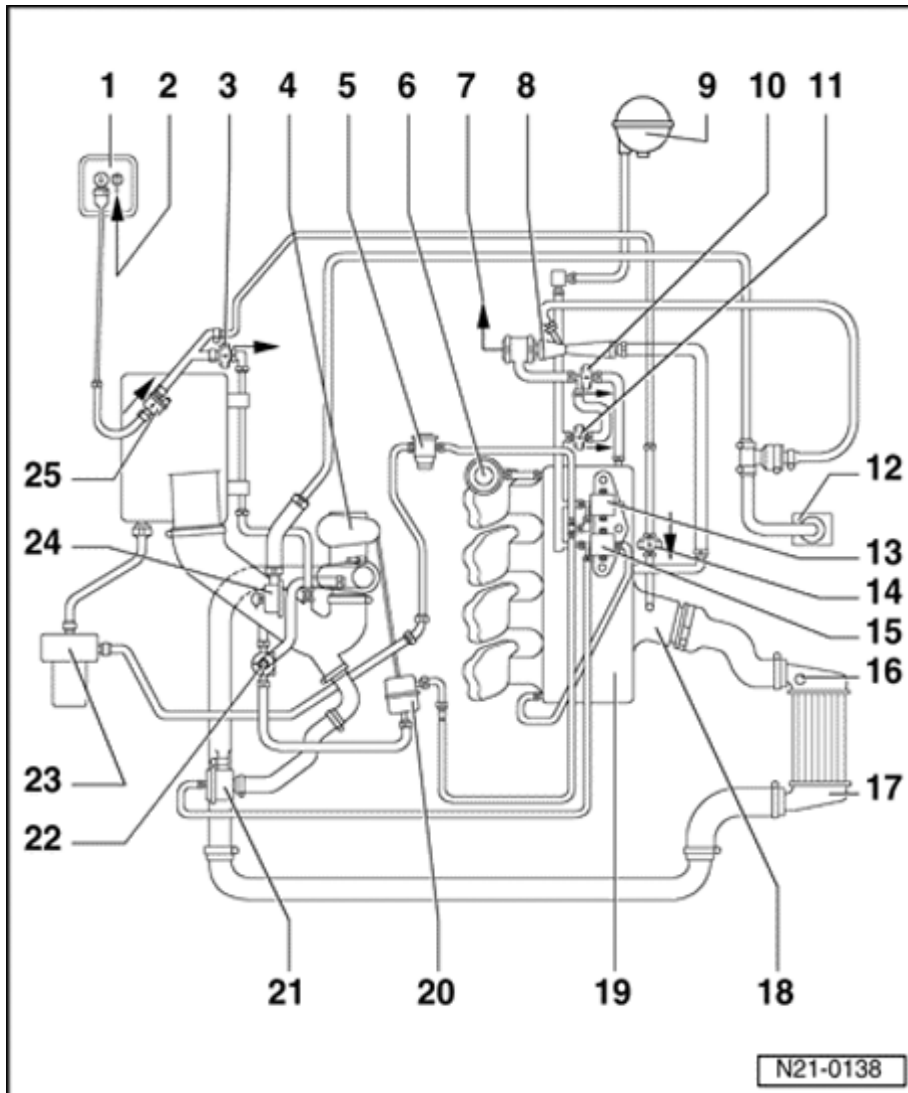
22 - Wastegate Bypass Regulator valve -N75)

- ◆ The valve will be activated from the engine control module (pulsed)
- ◆ Closed with no current, charge pressure limited
- ◆ Checking activation:

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

23 - Secondary Air Injection (AIR) pump motor -V101-*

- ◆ Checking function ⇒ [Page 26-19](#)



24 - Pressure regulator valve

- ◆ For Positive Crankcase Ventilation

25 - EVAP Canister Purge Regulator valve - N80-

- ◆ Checking:

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



Rules for cleanliness

When working on the exhaust gas turbocharger, pay careful attention to the following 5 rules:

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover opened components or seal, if the repair cannot be carried out immediately.
- ◆ Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.



Safety precautions

Observe the following if test and measuring instruments are required during a test drive:

- ◆ Test and measuring instruments must be secured to the rear seat and operated by a 2nd person from this location.

CAUTION!

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



Charge air pressure regulation, checking

Vehicles with E-Gas system ⇒ [Page 21-24](#)

Special tools and equipment

- ◆ V.A.G 1551 Scan Tool or vehicle system tester
V.A.G 1552 with cable V.A.G 1551/3

Engine code AEB

- ◆ V.A.G 1397 A Turbocharger tester

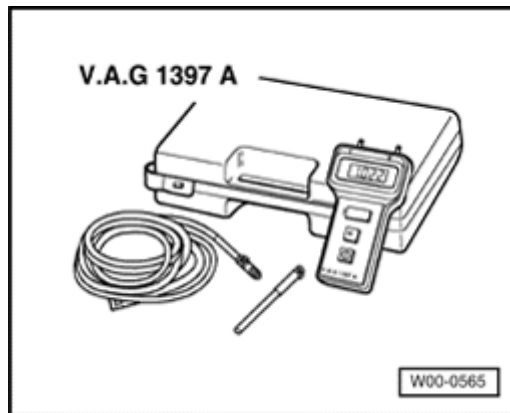
Checking conditions

- ◆ No leaks on intake and exhaust systems.
- ◆ Engine oil temperature min. 80 °C

Test sequence

- Connect V.A.G 1551 (V.A.G 1552). Start engine and select engine electronics control module with "Address word" 01.

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



- ◆ V.A.G 1397 A Turbocharger tester



Indicated on display

Select function XX

- Press -0- and -8- buttons to select "Read measured value block" and confirm entry with -Q- button.

Read measured value block HELP



Indicated on display

Input display group number XXX



Read Measured value block 114 →

1	2	3	4
---	---	---	---

- Press -1-, -1- and -4- buttons for "Display group number 114" and confirm entry with -Q- button.



Indicated on Display

- Check on/off ratio of Wastegate Bypass Regulator valve -N75- during a test drive or on a rolling test stand (at Wide Open Throttle 1800 to 2300 rpm) in display field 4.
 - Specification: 5 to 95 %

If the specification is obtained:

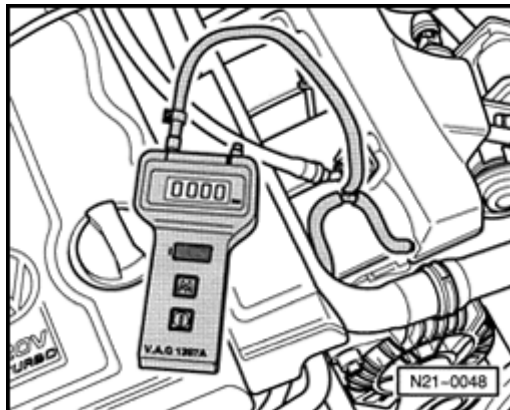
⇒ [Page 21-21](#) (Engine code ATW)

Engine code AEB

The charge pressure is measured under full load while driving or on a rolling test stand. Test period per measurement = max. 10 seconds.



- Disconnect hose between intake manifold and charge pressure bypass valve at intake manifold and connect turbocharger tester V.A.G 1397 A using T piece.
- Select measuring range I.



**Note:**

- ◆ *To operate turbocharger tester see operating instructions.*
 - ◆ *The hoses must be connected so that there is no possibility of leaks.*
 - ◆ *If charge pressure is measured while driving, for safety reasons a second person must operate the turbocharger tester.*
 - ◆ *Ensure that the pressure hose is not trapped between the hood and the body.*
- Measure charge pressure at Wide Open Throttle.

On a rolling test stand

Test in 3rd gear (manual transmission), 2nd gear (automatic transmission).

During test drive

Vehicles with manual transmission

- Accelerate vehicle in 2nd gear at Wide Open Throttle.

Vehicles with automatic transmission

- Manually select 4th gear range and begin accelerating from low speed at Wide Open Throttle (avoid kickdown; transmission must not shift into a lower gear).
- At engine speed of 1800 to 2300 rpm press memory button "M" on turbocharger tester (V.A.G. 1397 A) and read display.
- Specification: (absolute pressure) 1.350 to 1.750 bar

**Note:**

If the full charge pressure was not attained, repeat the test.

If the charge pressure is exceeded:

- Test Wastegate Bypass Regulator valve -N75-
 - Hose from turbocharger via valve to pressure unit not blocked when connector is pulled off
- Check that pressure unit for charge pressure regulator valve is securely mounted on turbocharger.
- Check pressure unit, Page ⇒ [Page 21-29](#)
- Check charge pressure regulator valve shaft mounting in turbocharger for ease of movement.

If corroded together:

- Replace turbocharger.

If the charge pressure is not attained:

- Replace turbocharger assembly.

Engine code ATW

- Press -C- button.
- Press -0-, -7- and -7- buttons to select "Display group number 77" and confirm entry with -Q- button.



Read Measured value block 115 →

1 2 3 4



Indicated on Display

- Check actual charge pressure value at Wide Open Throttle in display group 4.

On a rolling test stand

Test in 3rd gear (manual transmission), 2nd gear (automatic transmission).

During test drive

Vehicles with manual transmission

- Accelerate vehicle at Wide Open Throttle in 2nd gear.

Vehicles with automatic transmission

- Manually select 4th gear range and begin accelerating from low speed at Wide Open Throttle (avoid kickdown; transmission must not shift into a lower gear).
- Press memory button "M" on turbocharger tester and read display.
 - Specification: (Relative pressure) 1.350 to 1.650 bar
- Compare actual charge pressure value with value shown in display field 3.
 - Difference: max. 100 mbar

**Note:**

Repeat the test if the full charge pressure was not attained or if the difference between the actual value and the displayed value is exceeded.

If the charge pressure is exceeded:

- Check Charge air pressure sensor -G31- ⇒ [Page 21-33](#) .
- Test Wastegate Bypass Regulator valve -N75-
 - Hose from turbocharger via valve to pressure unit not blocked when connector is pulled off
- Check pressure unit for charge pressure regulator valve is securely mounted on turbocharger.
- Check wastegate bypass regulator valve pressure unit, Page ⇒ [Page 21-29](#)
- Check charge pressure regulator valve shaft mounting in turbocharger for ease of movement.

If corroded together:

- Replace turbocharger.

If the charge pressure is not attained:

- Replace turbocharger.



Charge pressure regulation, checking (vehicles with E-Gas system)

Special tools and equipment

- ◆ VAG1551 Scan Tool (ST) or VAG1552 mobile scan tool with VAG1551/3 adapter cable.

Test requirements

- No leaks on intake and exhaust side.
- Engine oil temperature at least 80 °C.



Test sequence

- Connect VAG1551 (VAG1552) scan tool. Start engine and select Engine Control Module (ECM) via "address word" 01.

⇒ [Repair Manual, 1.8 Liter 4-Cyl. 5V Turbo Fuel Injection & Ignition, Engine Code\(s\) AEB, Repair Group 01; Connecting VAG1551 Scan Tool \(ST\) and selecting Engine Control Module \(ECM\).](#)

Rapid data transfer HELP
Select function XX



Indicated on display:

- Press buttons -0- and -8- to select function "Read measuring value block" and press -Q- button to confirm input.

Read measuring value block HELP
Enter display group number XXX



Indicated on display:

- Press buttons -1-, -1- and -4- to select "display group number 114" and press -Q- button to confirm input.

Read measuring value block 114 →
1 2 3 4



Indicated on display

- During a road test or on a dynamometer (at Wide Open Throttle between 1800 and 2300 RPM), check the duty cycle of Wastegate Bypass Regulator valve in display field 4

Specified value: 5 to 95%

If specified value is obtained:

- Press -C- button



Read measuring value block 115 →

1 2 3 4



Indicated on display

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

- Check actual charge pressure value in display field 4 at Wide Open Throttle (WOT):

On dynamometer

In 3rd gear or in 2nd drive mode

While driving

Vehicles with manual transmission

- Accelerate vehicle in 2nd gear at Wide Open Throttle (WOT).

Vehicles with automatic transmission

- Manually select (Tiptronic) 4th gear and accelerate vehicle from low speed at Wide Open Throttle (WOT) (without kick down, transmission will not downshift).
- Press print button between 1800 and 2300 RPM and read actual charge pressure value in display field 4.

Specified value: 1350 to 1750 mbar

- Compare actual charge pressure value to specified value in display field 3.

Deviation: max. 100 mbar

**Note:**

Repeat measurement if the full charge pressure has not yet built up or if the deviation between specified and actual value is too large.

If charge pressure is exceeded:

- Check Charge air pressure sensor -G31- ⇒ [Page 21-33](#)
- Check Wastegate bypass regulator valve -N75-. (throughput in hose from turbocharger via valve to vacuum diaphragm with connector disconnected)
- Check vacuum diaphragm for for proper seating at turbocharger.
- Check Recirculating valve for turbocharger - N249- ⇒ [Page 21-31](#) .
- Check bearing for shaft of charge pressure regulator valve in turbocharger for ease of movement. If rusted solid, replace turbocharger.

If lower limit for charge pressure is not met:

- Check Charge air pressure sensor -G31- ⇒ [Page 21-33](#)
- Check Wastegate bypass regulator valve - N75-.
- Check bearing for shaft of charge pressure regulator valve in turbocharger for ease of movement. If rusted solid, replace turbocharger.



Wastegate Bypass Regulator valve -N75- , checking

Special tools and equipment

- ◆ Multimeter V.A.G 1526, V.A.G 1715 or Fluke 83
- ◆ Adapter set V.A.G 1594

Checking conditions

- ◆ Output Diagnostic Test Mode (DTM) must be performed.

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

Checking sequence

- Switch ignition off.
- Disconnect connector from wastegate bypass regulator valve.
- Measure resistance between valve contacts.



- Specification: 25 to 35 Ω

If the specification is not obtained:

- Replace Wastegate Bypass Regulator valve -N75-.



Pressure unit for charge pressure regulator valve, checking

Special tools and equipment

- ◆ V.A.G 1551 Scan Tool or vehicle system tester
V.A.G 1552 with cable V.A.G 1551/3

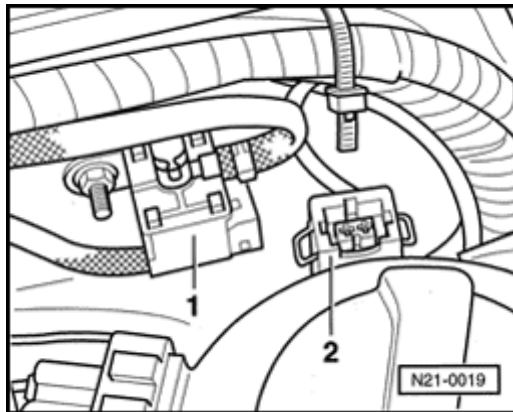
Checking conditions

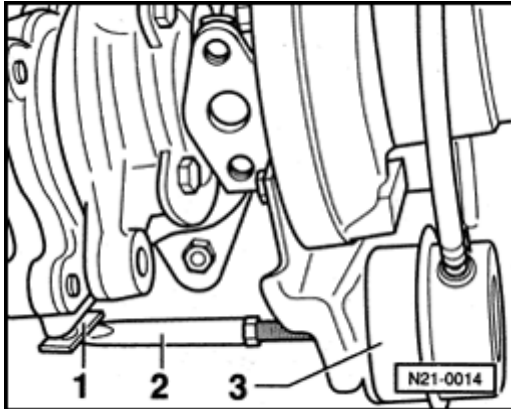
- ◆ Engine oil temperature min. 80 ° C

Checking sequence

A

- Disconnect connector -2- from Wastegate Bypass Regulator valve - N75- -1-.





A

- Start engine and raise to maximum rpm briefly using throttle.
- Operating rod -2- must move.

If the operating rod does not move:

- Check valve lever -1- for ease of movement.

If corroded together:

- Replace turbocharger.

If the operating rod does not move, even though the lever is free to move:

- Test Wastegate Bypass Regulator valve -N75-.
- Hose from turbocharger via valve to pressure unit not blocked when connector is pulled off

If the valve -N75- is OK:

- Replace turbocharger ⇒ [Page 21-4](#) , item 26 .



Charge pressure bypass valve, checking

Engine code AEB

Charge pressure bypass valve, Engine code ATW, ⇒ [Page 21-38](#)

Special tools and equipment



- ◆ V.A.G 1390 Hand vacuum pump

Checking conditions

- ◆ Noticeable reduced performance or load change judders

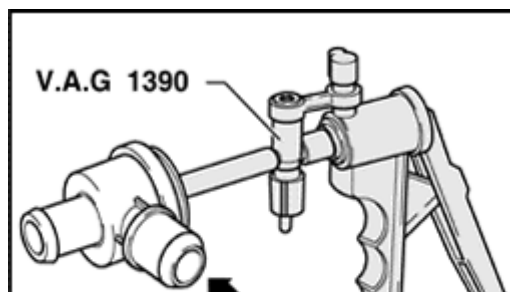
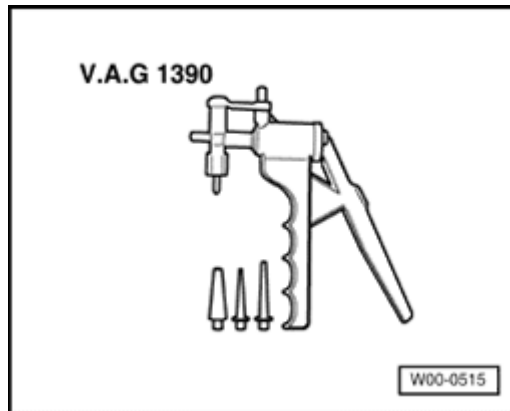
Checking sequence

Note:

The charge pressure bypass valve is located in front of the turbocharger. It is opened by vacuum pressure during the overrun phase and at idling speed.



- Connect hand vacuum pump V.A.G 1390 to vacuum connection on valve.





- Operate hand vacuum pump.
 - Valve must open (arrow).
- Operate vent valve on hand vacuum pump.
 - Valve must close (arrow).

If valve does not open or close:

- Replace charge pressure bypass valve.

Note:

The charge pressure bypass valve connections are secured with screw-type clips.

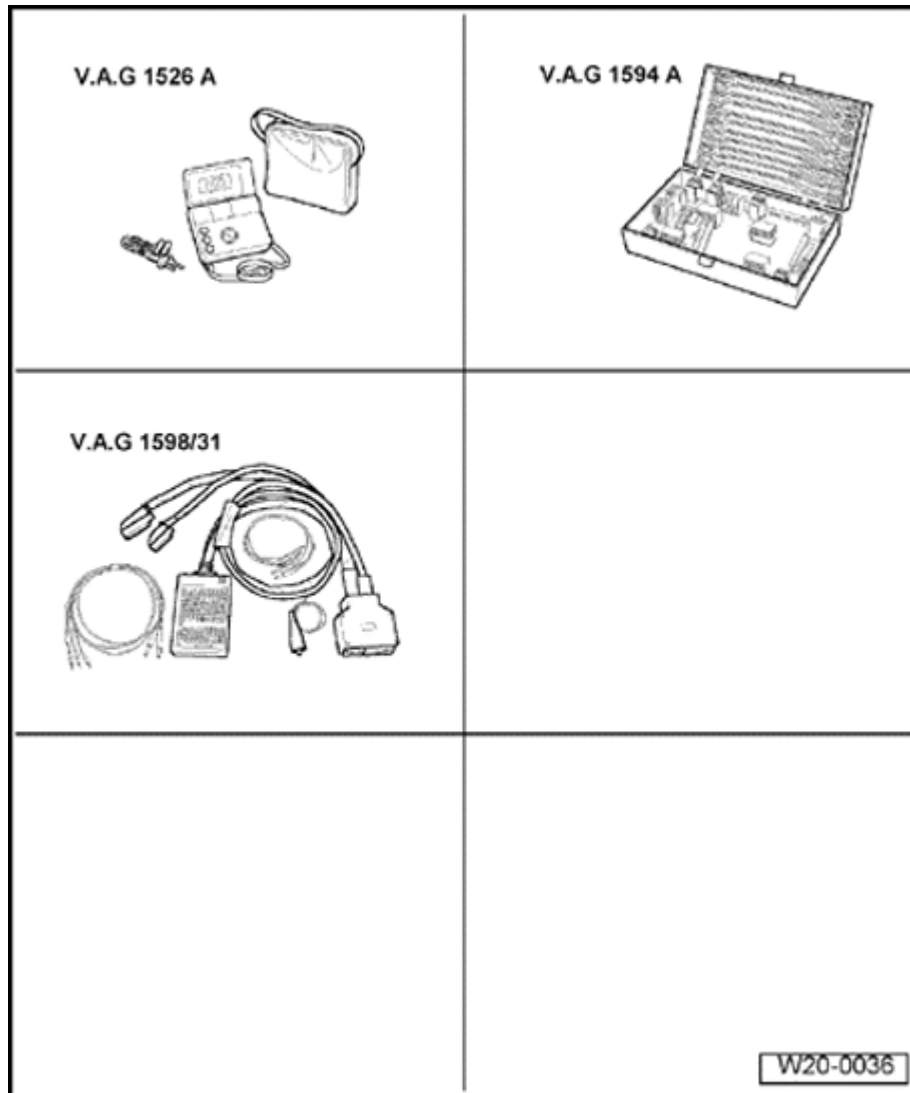


Charge air pressure sensor -G31-, checking

Only for engine code ATW

Checking conditions

- ◆ A code has been recognized by the On Board Diagnostic and stored in the Diagnostic Trouble Code (DTC) memory



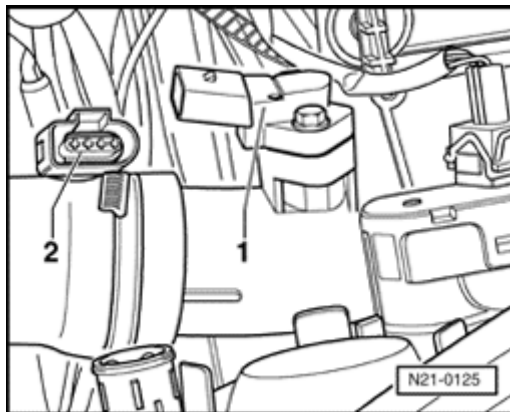
Special tools and equipment

- ◆ V.A.G 1526 or Fluke 83 multimeter
- ◆ V.A.G 1594 A Adapter set
- ◆ V.A.G 1598/31 Test box
- ◆ Wiring diagram

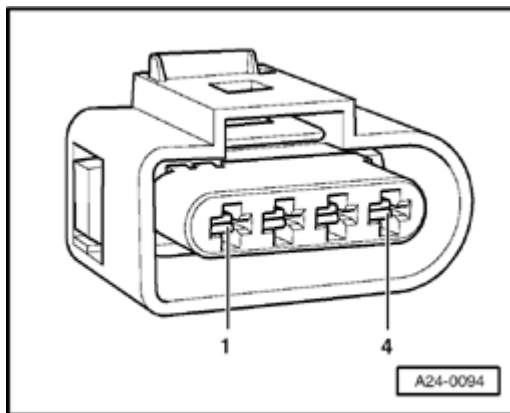


Checking voltage supply and wiring to control module

- Switch ignition off.
- Disconnect 4-pin connector -2- from Charge air pressure sensor -G31-, -1-.



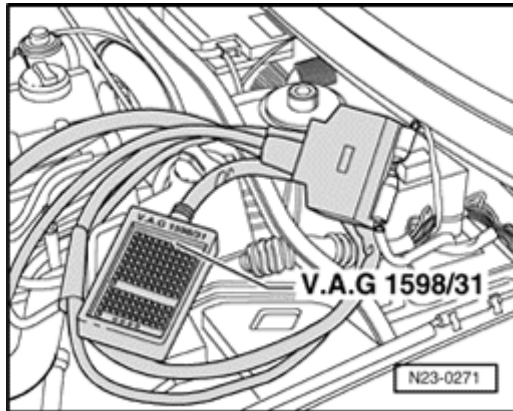
A



A

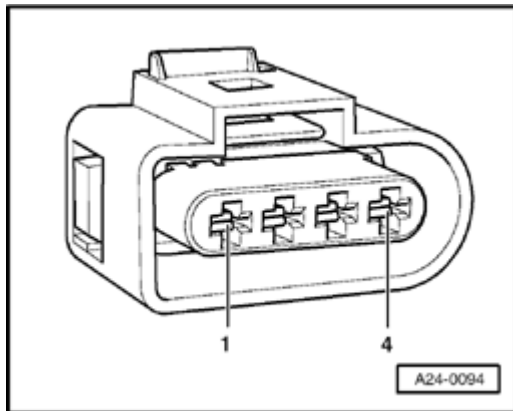
- Connect multimeter to measure voltage using auxiliary cables from V.A.G 1594 to connector contacts 1 + 3.
- Switch ignition on.
 - Specification: min. 4.5 V
- Switch ignition off.

If the specification is not obtained:



A

- Connect test box V.A.G 1598/31 to control module wiring harness (Engine control module remains disconnected).



A

- Check wiring between test box and connector for open circuit according to wiring diagram.

Contact 1 + socket 108

Contact 2 + socket 98

Contact 3 + socket 101

- Wire resistance: Max. 1.5 Ω

- Additionally check wires for short to one another.

If no faulty wiring is detected and voltage was present between contacts 1 + 3:

- Check function, \Rightarrow [Page 21-37](#) .

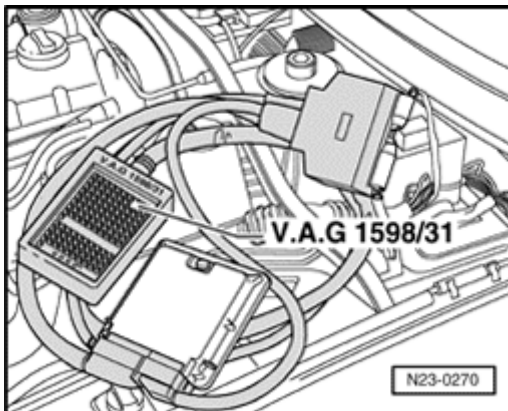


If no faulty wiring is detected and no voltage was present between contacts 1 + 3:

- Replace engine control module.

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

Checking function



A

- Connect test box V.A.G 1598/31 to engine control module wiring harness and to engine control module.
- Reconnect connector to Charge air pressure sensor -G31-.
- Connect multimeter to sockets 101 and 108.
- Start engine and measure basic voltage.
 - Specification: 1.80 to 2.00 V
- Raise engine revs by pressing accelerator to:
 - Specification: 2.00 to 3.00 V

If the specifications are not attained:

- Replace Charge air pressure sensor -G31-.



Recirculating valve for turbocharger - N249-, checking

Only for engine code ATW

The valve in the hose between the intake manifold and the recirculating valve is open if it is without current. The hose to the vacuum reservoir is closed.

Checking conditions

- ◆ Output Diagnostic Test Mode (DTM) must be performed.

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

Checking sequence

- Switch off ignition.
- Disconnect connector from Recirculating valve for turbocharger -N249-.
- Measure resistance between valve contacts.

**A**

- Specification: 25 to 35 Ω

If the specification is not obtained:

- Replace Recirculating valve for turbocharger -N249-.