PIERBURG

Service information

si

Exhaust gas recirculation components

si 0002/A GB

MSI-PG 11.02

Vehicle:
all vehicles with exhaust gas recirculation (EGR)

Product order number:
various order numbers: see catalogue „Aftersales components“

Function tests for exhaust gas recirculation components

Exhaust gas recirculation system - general

This system serves for the reduction of nitrogen oxides (NOx) in the exhaust gas by lowering the combustion temperature, whereby a part of the exhaust gases taken from the exhaust manifold are returned via an exhaust gas recirculation valve to the intake manifold.
The permissible exhaust gas recirculation limit depends on the particular type of engine; control and regulation vary in the individual case.

1431

Fig. 1
Exhaust gas recirculation valve (EGR valve)
Single-diaphragm type
(Gasoline and Diesel engines)

1433

Fig. 3
Exhaust gas recirculation valve with potentiometer position feedback
Single-diaphragm type
(Diesel engine)

Note
A defective part in the EGR system has a very detrimental effect on the exhaust gas composition and additionally the vehicle driveability may deteriorate. Therefore in case of complaint or during exhaust gas measurement, the EGR system should be thoroughly inspected.

In this Service Information various components are shown as examples in figures 1 to 11.
For a schematical view of the connections see figures 21 to 24.

1432

Fig. 2
Exhaust gas recirculation valve with temperature probe
Single-diaphragm type
(Gasoline engine)

1434

Fig. 4
Exhaust gas recirculation valve
Single-diaphragm type
(Diesel engine)

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Fig. 5
Exhaust gas recirculation valve double-diaphragm type (Gasoline engine)

Fig. 6
Exhaust gas recirculation valve 2-stage double-diaphragm type (Gasoline engine)

Fig. 7
Mechanical vacuum modulator with damper

Fig. 8
Electro-pneumatic vacuum modulator

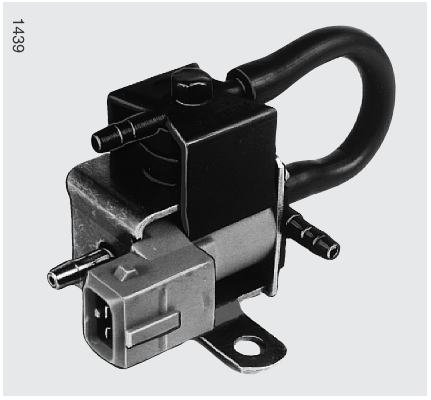


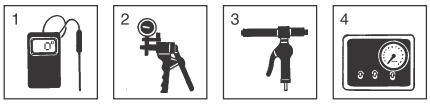
Fig. 9
Electrical vacuum modulator

Fig. 10
Vacuum solenoid valve

Fig. 11
Thermo-valve

Test

The following procedure describes the simple tests which are necessary to check the EGR valve for function and leakage:
The following Pierburg test and measuring instruments are required for this test:



1. digital thermometer
2. manual vacuum pump
3. thermal pistol
4. electrical vacuum tester

Note:
If the test results are unfavourable, the respective component should be replaced.

When fitted to a Gasoline engine, leakage of the EGR valve seat will often cause poor idling. In this case the EGR valve should be replaced.

1. EGR valve for gasoline engines

1.1 Single-diaphragm type
(fig. 1 & 2)

Engine off:

- Use the manual vacuum pump according to fig. 12 in order to generate a pressure difference (approximately 300 mbar). This pressure differential should not reduce within a period of 5 minutes.

Engine idling
and warm:

- Generate a pressure difference (approximately 300 mbar) according to fig. 12. Idling should deteriorate considerably or the engine should stall.

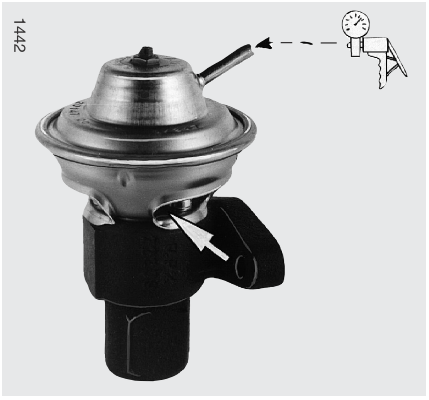


Fig. 12

1.2 Single-diaphragm types with temperature probe
(fig. 2 and 13)

- check according to paragraph 1.1

Temperature probe:

The signal of the temperature probe is used only for the diagnosis of the exhaust gas recirculation system. On the basis of this signal the self-diagnosis system detects malfunctions in the EGR system. Normally an error code is set here.

- Unscrew the temperature probe from the EGR valve and turn the temperature probe out of the EGR valve and measure the resistance according to fig. 13.

  Nominal values:

  at 20°C > 1000 kΩ
  70°C 160 - 280 kΩ
  100°C 60 - 120 kΩ

Fig. 13

Use a thermo-pistol or immerse in hot water (80-100°C) to heat the probe.

1.3 Double-diaphragm type
(fig. 5 & 6)

Note
ad fig. 5: the vacuum connections are provided with colour rings that may have various combinations depending on the vehicle.

E.g. red and brown
red and blue
black an brown.

Red and black are connected to the vacuum source that opens the EGR valve. If in doubt, try it out.

Ad fig. 6: The valve is fully opened by applying vacuum to the lower hose connection and only partially open when vacuum is applied to the upper connection.

Engine off:

- Use the manual vacuum pump on each of the two connections in order to generate a pressure differential (approximately 300 mbar) according to fig. 14. This pressure differential should not reduce within a period of 5 minutes.

Engine idling and warm:

- Generate a pressure difference (approximately 300 mbar) according to fig. 14 on the red or black connection. In case of an EGR valve according to fig. 6 use the lower connection. The idling should deteriorate noticeably or the engine should stall.

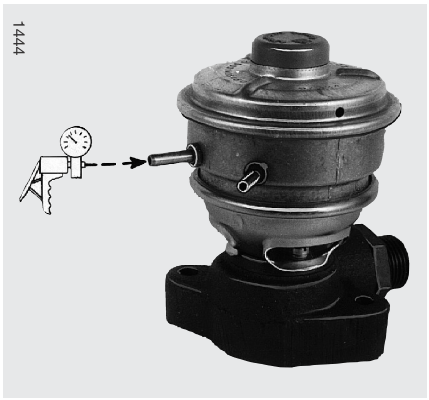


Fig. 14

2. EGR valve for Diesel engines

2.1 Single-diaphragm type
(fig. 1, 3, & 4)

- shut down the engine
- use the manual vacuum pump according to fig. 15 in order to generate a pressure difference (approximately 500 mbar). This pressure differential should not reduce within a period of 5 minutes.

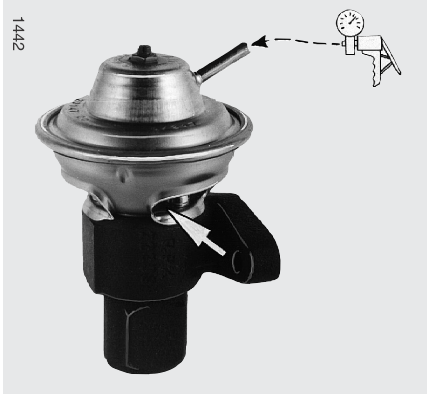


Fig. 15

- Operate the manual vacuum pump several times and looking through the observation window, (arrowed, fig. 15) check that the diaphragm rod moves smoothly through its full stroke; dismount the EGR valve, if necessary.

Note for the EGR valve of fig. 4:
In this case the manual vacuum pump should be connected to the upper connection only.

2.2 Single-diaphragm types with potentiometer position feedback
(fig. 3 & 16)

- check according to paragraph 2.1

Potentiometer:

- measure the overall resistance on pins 2 and 3 according to fig. 16.

  Nominal value: 1.5 kΩ - 2.5 kΩ.

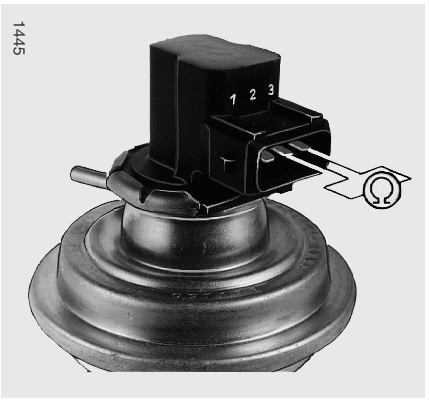


Fig. 16

- measure the brush resistance on pins 1 and 2; at the same time open the EGR valve slowly with the manual vacuum pump; the resistance should climb constantly.

  Nominal value: from < 700 Ω
  to 1.5 kΩ - 2.5 kΩ

3. Vacuum modulators

3.1 Mechanical vacuum modulator (fig. 7 & 17)

- Connect the manual vacuum pump according to fig. 17; it is used as a manometer here. The other hoses remain connected.
- Start the engine and move the actuating rods on the pressure transducer. The manometer display should change with the rod movement.

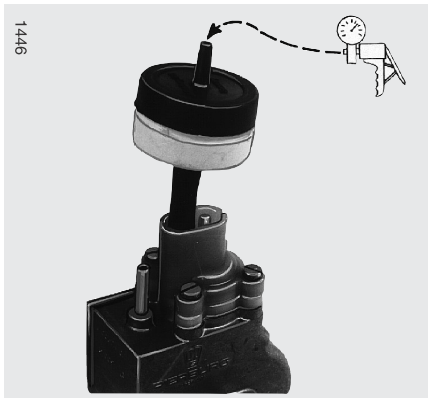


Fig. 17

3.2 Electro-pneumatic vacuum modulator (Fig. 8 & 18)

- Connect the manual vacuum pump according to fig. 18 with the control pressure connection; it is used as a manometer here. The other hoses remain connected.

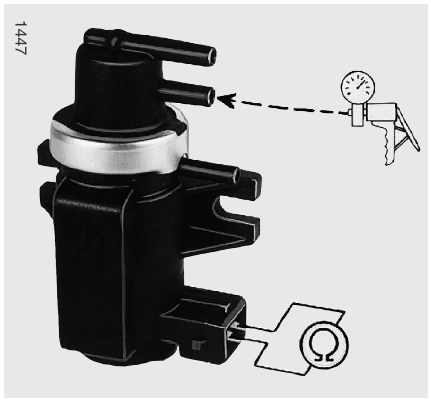


Fig 20

- Start the engine
- Remove the plug from the electro-pneumatic pressure transducer. The pressure difference should not exceed a maximum of 60 mbar.
- Plug in the connector and accelerate. The pressure difference should change (climb).
- If it does not change, check the coil resistance according to fig. 18.

  Nominal value: 4 to 20Ω

3.3 Electrical vacuum modulator (fig. 9)

- Check according to paragraph 4.

4. Vacuum solenoid valve (VSV)

(fig. 10 & 19)

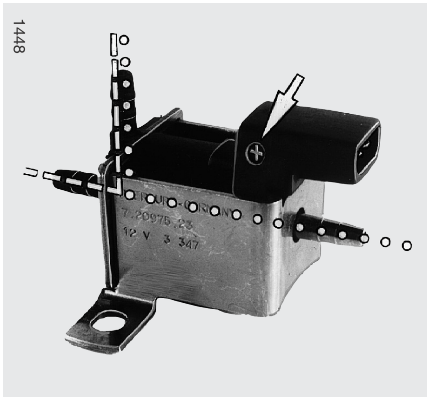


Fig. 18

If only two hoses are connected, the third connection should have a protective filter/vent cap fitted.

Important: If the VSV has a polarity indication arrow, (fig. 19), the polarity must be strictly observed if power is applied from an external source, e.g. a battery.

- Use the vacuum pump to check for free passage.

no current: in the direction o o o o o
passage
current: in the direction - - - - -
passage

5. Thermo-valve (fig. 11 & 20)

Note: All thermo-valves whose switch point is within a range of 10°C and 70°C are checked here.

- Dismount the thermo-valve
- Use the manual vacuum pump according to fig. 20 to check for free passage on the center connection. At the same time cool down the thermo-valve to approximately 10°C and check. Then heat to approximately 70°C and check.

Nominal values:

below approximately
10°C = no passage

above approximately
70°C = passage

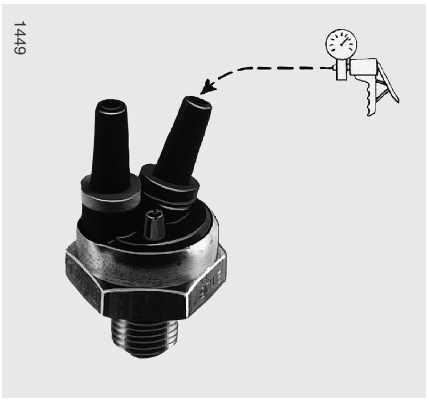


Fig. 19

Connection examples

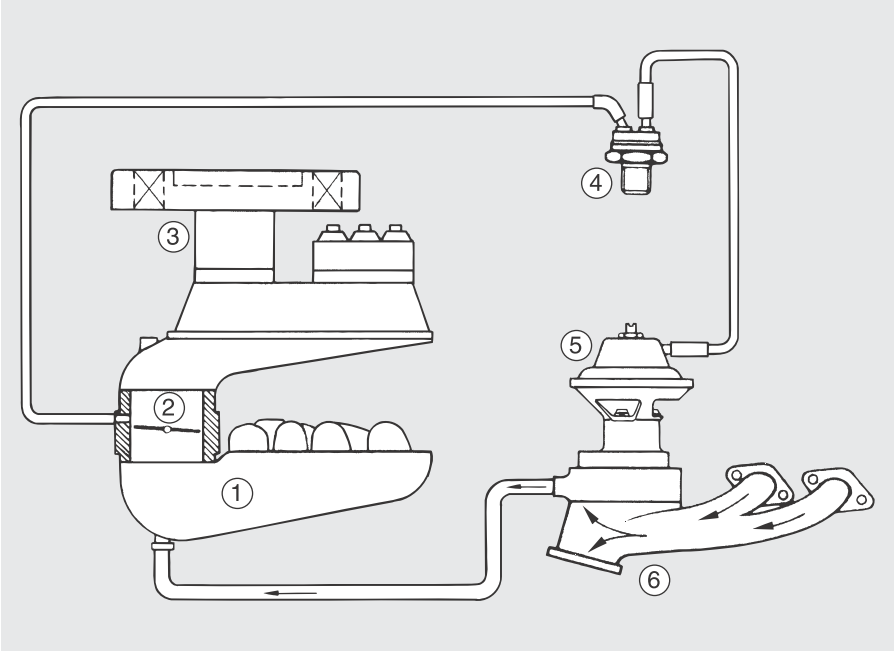


fig. 21

1 intake manifold
2 throttle body
3 injection unit with air filter
4 thermo-valve
5 EGR valve
6 exhaust gas manifold

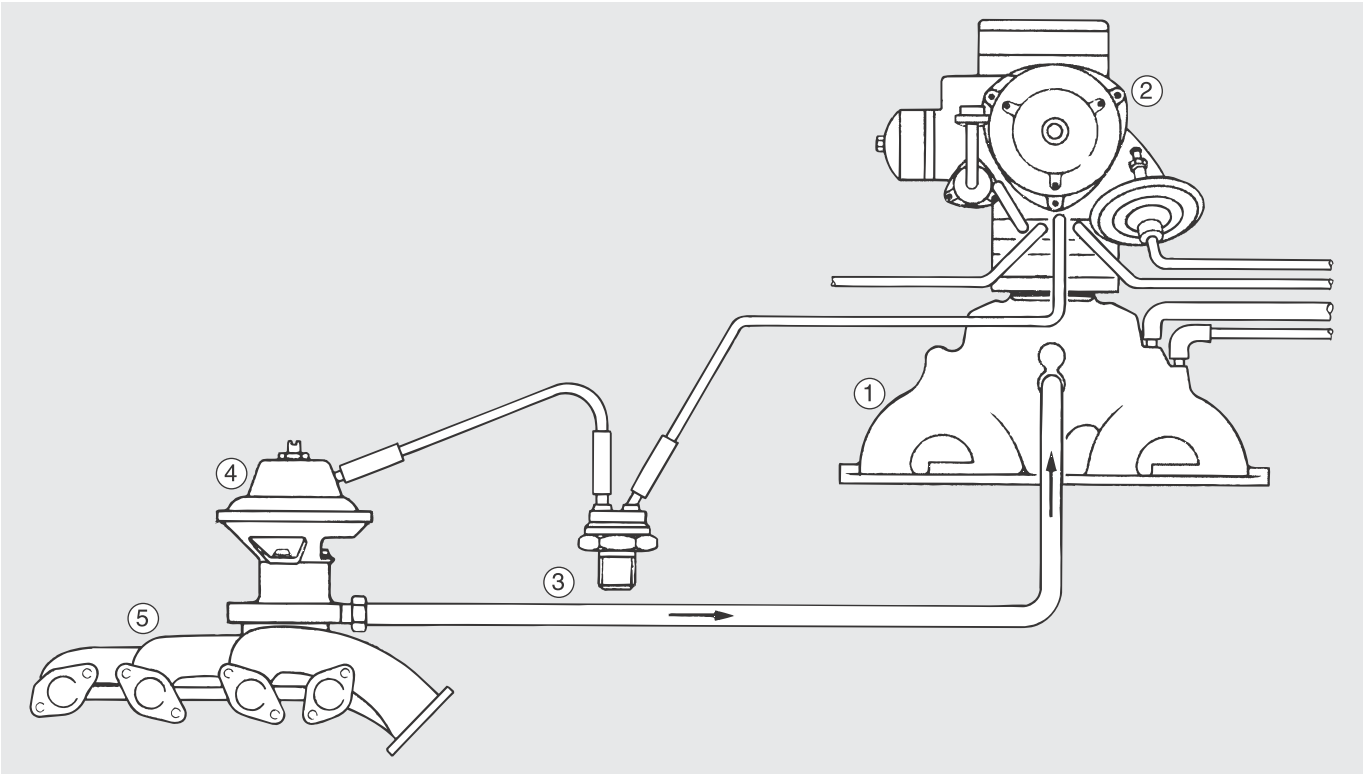


fig. 22

1 intake manifold
2 carburetter
3 thermo-valve
4 EGR valve
5 exhaust gas manifold

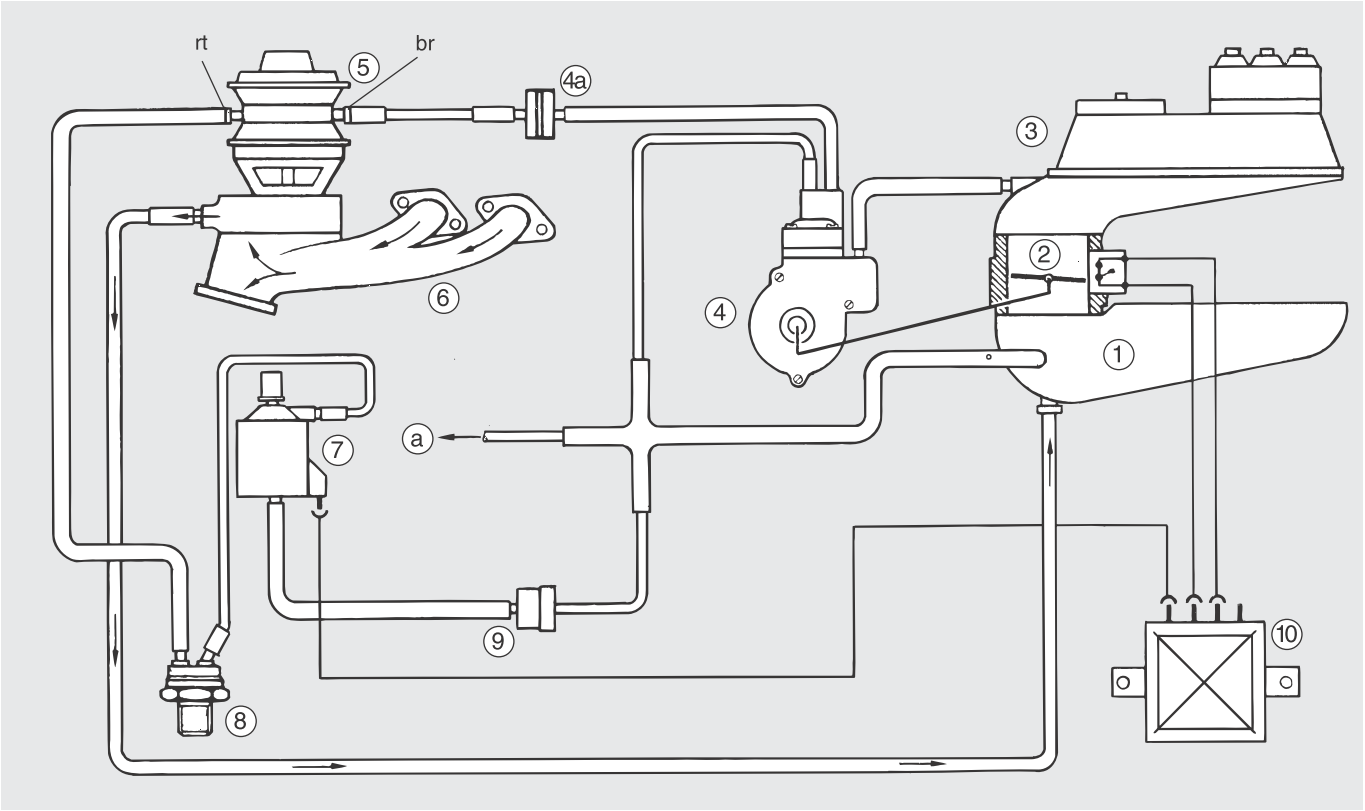


Fig. 23

1 intake manifold
2 throttle body with throttle valve switch
3 injection unit
4 mechanical vacuum modulator
4a damper
5 EGR valve
6 exhaust gas manifold
7 vacuum solenoid valve
8 thermo-valve
9 check valve
10 relay box
a vacuum line for air blow-in

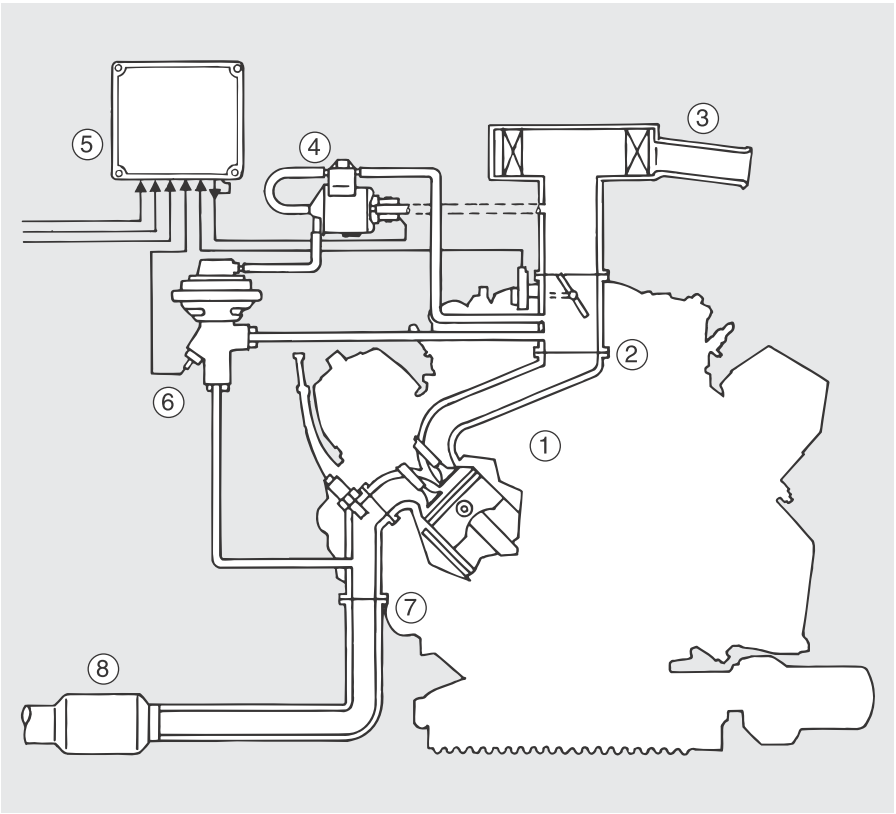


Fig. 24

1 intake manifold
2 throttle body
3 air filter
4 electrical vacuum modulator
5 control unit
6 EGR valve with temperature probe
7 exhaust gas manifold
8 catalytic converter