Intake and exhaust, manifolds, emission control system 14

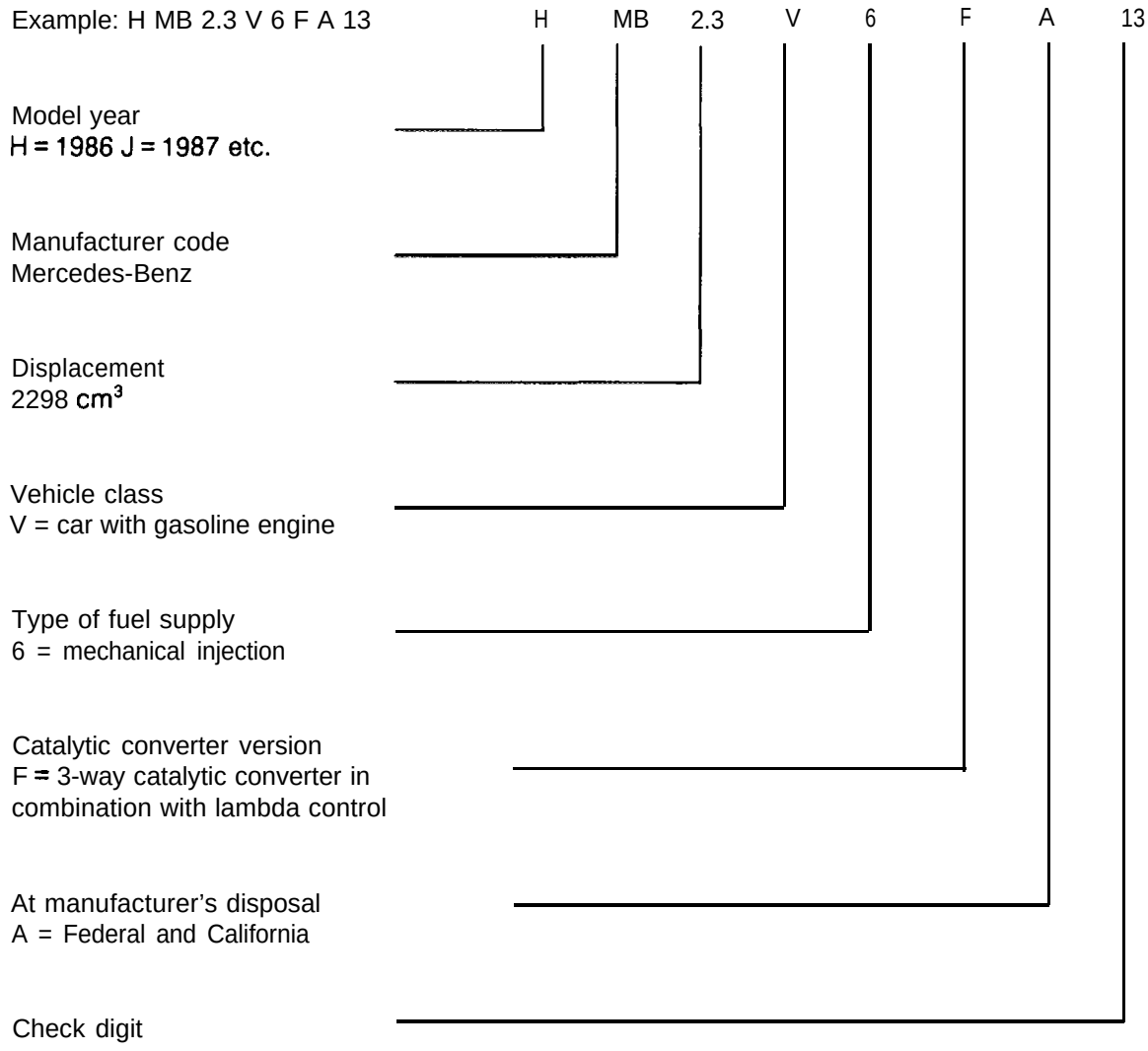
Job No.

Recognition features of vehicles in national version USA

USA

Information plate for emissions control system on cross member in front of radiator. This plate lists the engine code data as well as the principal engine setting data.

The engine code data are given in a lo-position code.

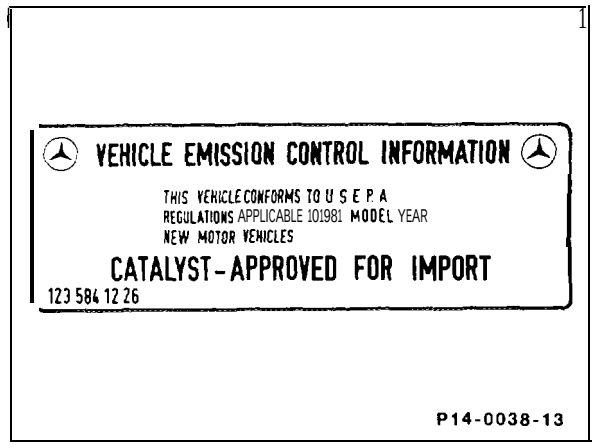


Tourist version

Vehicles in tourist version are equipped with a factory installed catalytic converter as of approximately 05 88.

Color code of information plate:
Background color red. lettering silver.

Vehicles must be equipped with catalytic converters for Importation into the USA.



14-050 Function of emission control system

A. National version (USA) with catalytic converter

a) General
b) Function dlagrams
c) CFI control module
d) Lambda control
e) Oxygen sensor
9 Catalytic converters

a) General

The function of the emissions control system for the basic and national versions is described in the sections below (b to f). Specific national variations are listed in the respective section. The vehicle features are listed in the Op. No. 07.3-004 .

Note

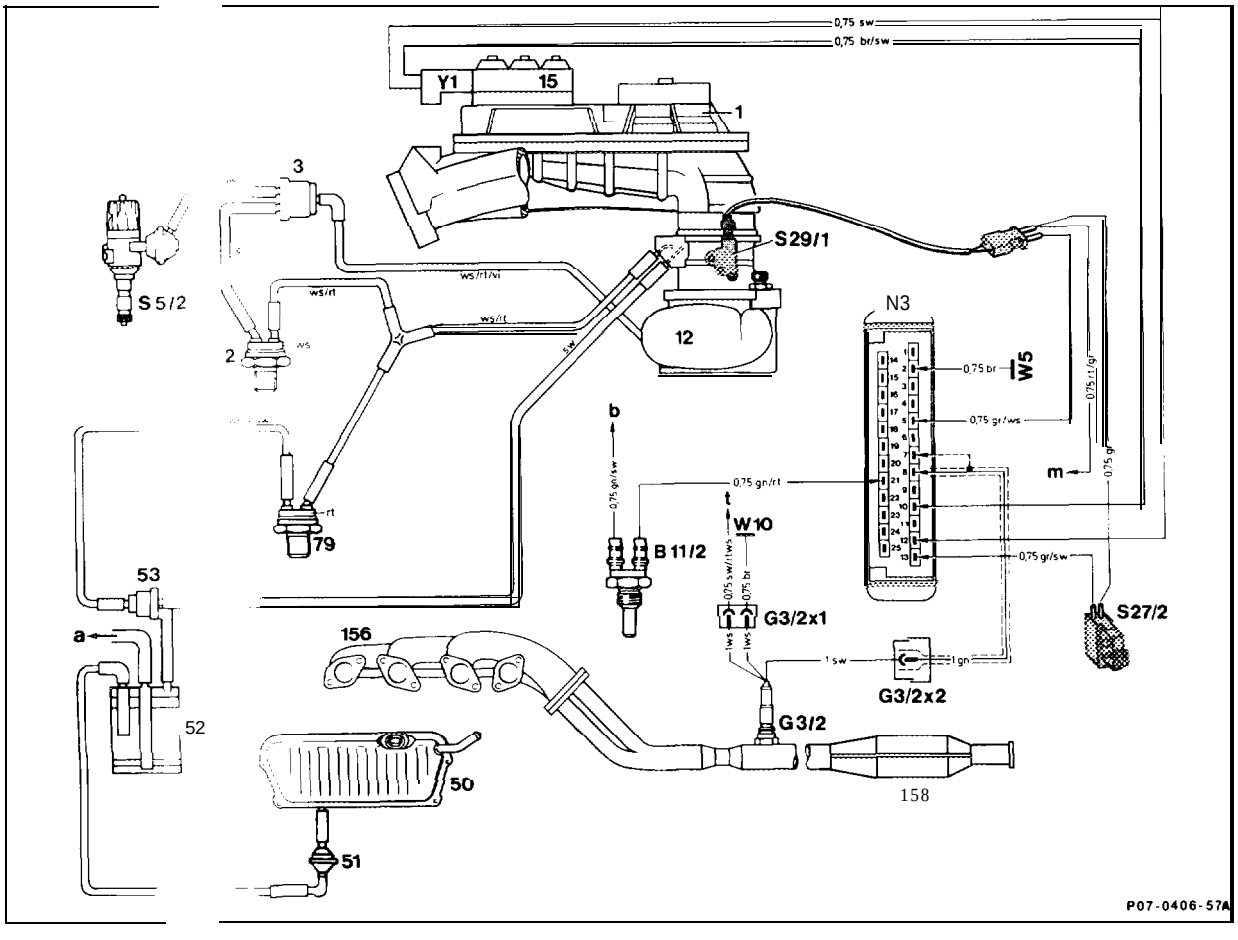
- Vehicles with engines in Standard version can be converted to open-loop catalytic converter (Op No. 14480). An exception to this are vehicles with engine 102.983 Standard.
- Vehicles in the basic version RÜF can be converted to KAT (closed-loop). See installation instructions for optional equipment for conversion measures.

Model 201 Volume 2 Group 14

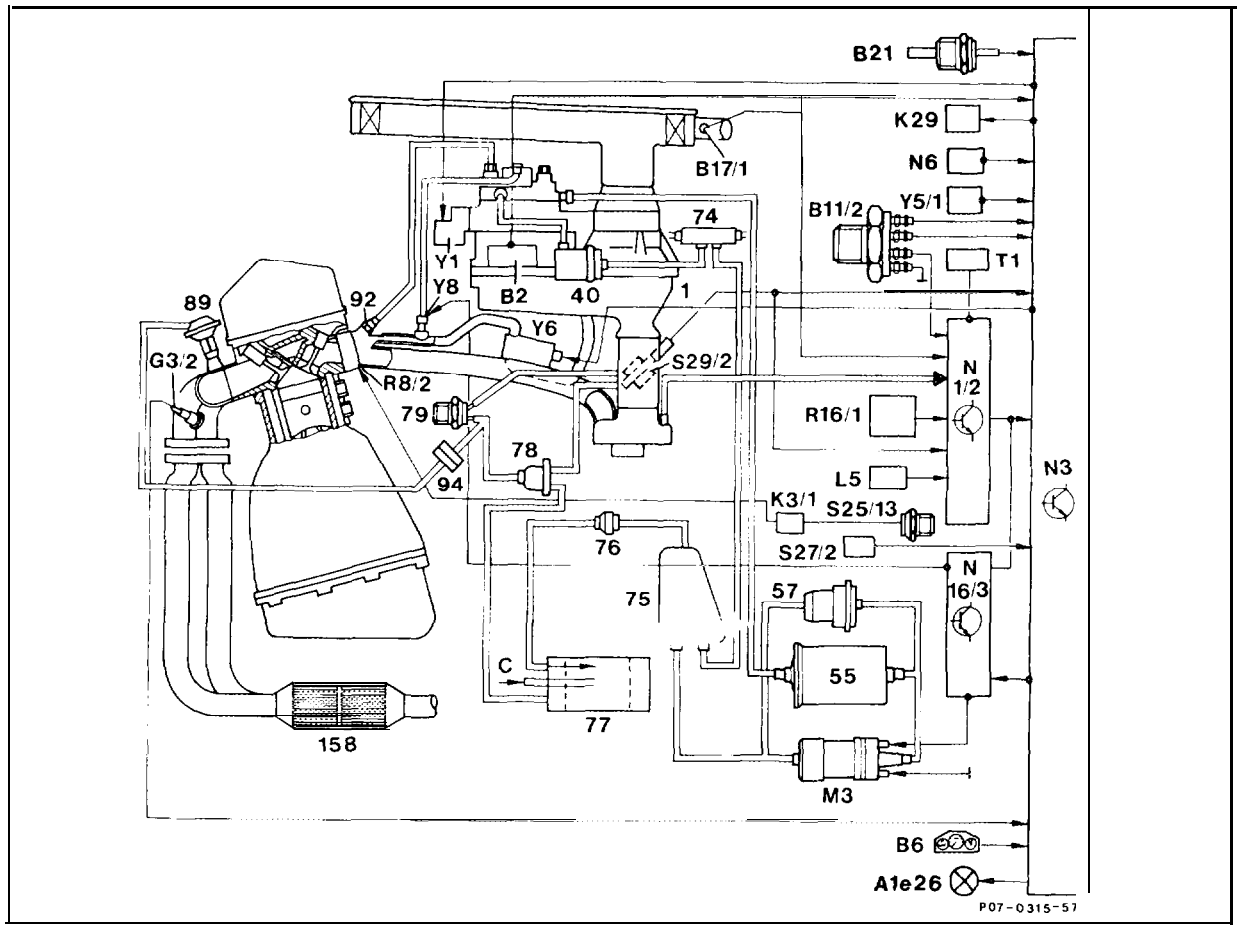
- In the case of vehicles in the basic version KAT with engines 102.96198 as of 09/89, RÜF mode is no longer possible.

b) Function diagrams

Engines 102 962 NV KAT RÜF 09/83–09/85
@engine 102.961 (2.3) (USA) 1985/86 engine 102.985



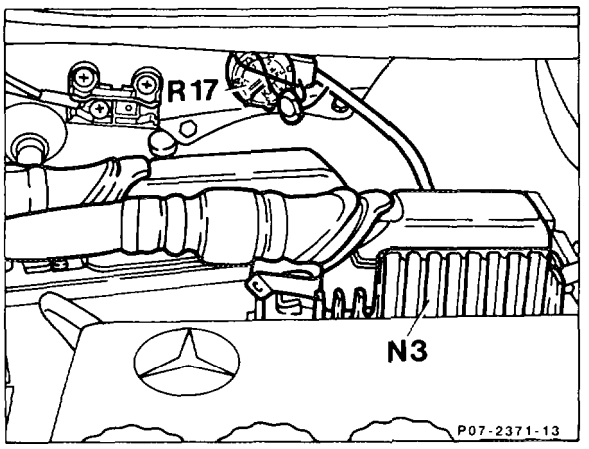
1	Mixture control unit
2	60 °C thermal valve (white)
3	Check valve with integrated restrictor
12	Intake manifold
15	Fuel distributor
50	Fuel tank
51	Vent valve
52	Charcoal canister
53	Regeneration valve
79	50 °C thermovalve (red)
156	Exhaust manifold
156	Underfloor catalytic converter
B11/3	Coolant temperature sensor
G3/2	Heated oxygen sensor
G3/2x1	Ox. generating coil plug connection
G3/2x2	Oxygen sensor signal plug connection
N3	CFI control module
S5/2	Distributor (breakerless)
S27/2	Deceleration fuel shutoff microswitch
S29/1	Full load detection throttle valve switch
W5	Engine ground
W10	Battery ground
Y1	Electrohydraulic actuator
a	Air admission line (engine compartment)
b	Fuel pump relay, contact 2
m	Idle speed air valve, contact 2
t	Fuel pump relay, contact 7, terminal 87



1	Mixture control unit
40	Diaphragm pressure regulator
55	Fuel filter
57	Fuel accumulator
75	Fuel tank
76	Vent valve
77	Charcoal canister
78	Regeneration valve
79	70°C thermovalve
89	Exhaust gas recirculation valve
92	Injection valve
94	Deceleration valve (only with manual transmission)
158	Underfloor catalytic converter
A1e26	CHECK ENGINE malfunction Indicator lamp
B2	Air flow sensor potentiometer
B6	Hall-effect speed sensor
B11/2	Engine coolant temperature sensor (DI/CFI/2 E-E), 4-pin
B17/1	Intake air temperature sensor
B21	Exhaust gas recirculation (EGR) temperature sensor (California only)
G3/2	Heated oxygen sensor
K3/1	Intake air preheating (PMP) relay
K29	Transmission shift point retard relay
L5	Crankshaft position sensor
M3	Fuel pump
N1/2	Ignition control module
N3	CFI injection system control module
N6	Compressor shutoff control module
N16/3	Fuel pump relay module
R8/2	intake manifold preheating (PMP)
R16/1	Reference resistor
S25/13	60°C temperature switch (PMP)
S27'2	Deceleratron fuel shutoff microswitch
S29/2	Full load/idle speed detection throttle valve switch
T1	Ignition coil
Y1	Electrohydraulrc actuator
Y5/1	Air conditioning compressor electromagnetic clutch
Y6	Idle speed arr valve
Y8	Start valve
C	Air admission

c) CFI control module (N3)

The CFI control module is installed on the right of the component compartment behind the battery.



Caution!
When ignition is on or when the engine is running, do not detach coupling at CFI control module as the CFI control module may be damaged by voltage or current peaks.

N3 CFI control module
R 17 Reference resistor

Note
Survey of CFI control modules, see 07.3-250 and 07.3–004.

CFI control module version
When the ignition is switched on, a certain current exists at the electrohydraulic actuator and a certain on off ratio is output at the lambda test output (see 07.3–121). The CFI control module has two injection programs (with/without lambda control). The respective program is activated by the resistance trimming plug. For (USA) reference resistors are installed . For (USA) 1988 and 199 1 the reference resistor is integrated in the CFI control module.

Version	Injection program	Resistance trimming plug
KAT	With lambda control	KAT

CFI control module KAT/RÜF version with diagnosis by measuring on/off ratio

The CFI control module detects faulty input signals and passes a fault message to the lambda test output. The fault message can be read at the diagnostic connector with the lambda tester. The faults detected are short circuit and open circuit.

A certain on/off ratio is assigned to each fault. The output of fault messages has priority over output of the lambda control signal. If the lambda control is not operational (e.g. heated oxygen sensor temperature too low), the readout is 50% (control mode/constant readout). If the lambda is switched on, the readout fluctuates around a mean value. If several faults occur simultaneously, the fault which corresponds to the lowest on/off ratio is always displayed. This continues until all the faults have been rectified. An assignment of on/off ratio and possible cause of fault is summarized in the respective test program (07.3-I 21).

Plausibility circuitry

The signals which the peripheral components feed into the CFI control module are continuously monitored. If the composition of the signals is not longer logical, the electronic control automatically forms a substitute value (emergency running property) for the implausible signal.

CFI control module KAT **version with fault diagnosis by** measuring **on/off ratio and fault storage**
The injection program for the RÜF mode is no longer provided in the CFI control module.

Two possibilities exist in the CFI control unit for detecting and outputting faults which occur in the system.

The fault tables with the listing of the individual faults are described in the test program 07.3-121, Section "E" and "F" respectively.

On/off ratio with engine running
The faults which exist at that moment and are detected are displayed by measuring the on/off ratio. The faults are not stored and can only be displayed immediately by measuring the on/off ratio at the diagnosis socket (Xl 1).

Diagnostic trouble code (DTC) memory
Faults which occur and are detected when driving are stored in the CFI control module and **can be** output at the diagnostic connector (Xl 1/4) with the impulse counter scan tool.

The battery must not be disconnected in the meantime, otherwise the stored DTCs are erased. Loose contacts are also recognized as codes and stored. The CFI control module cannot be replaced by other versions.

Note (USA) 1988/1 991 California
On Board diagnosis system (see 07.3-121, Section "F").

d) Lambda control

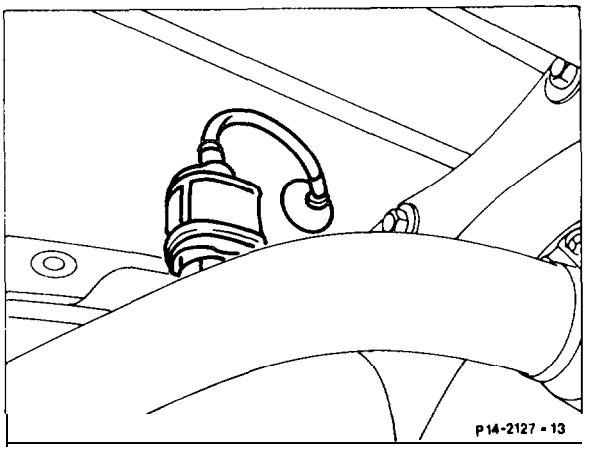
The CFI control module performs the following functions: monitoring heated oxygen sensor, signal amplification and calculation from the input signals the output signal for the electrohydraulic actuator. The current level with lambda control fluctuates between approx. -10 to + 10 mA.

The lambda control is not operative during the following operating conditions, i.e. control mode:

- heated oxygen sensor not operational or defective
- deceleration with decel fuel shutoff
- wide open throttle operation
- acceleration enrichment
- starting at below + 15 °C up to approx. + 40°C – 70°C engine coolant temperature (depending on version).

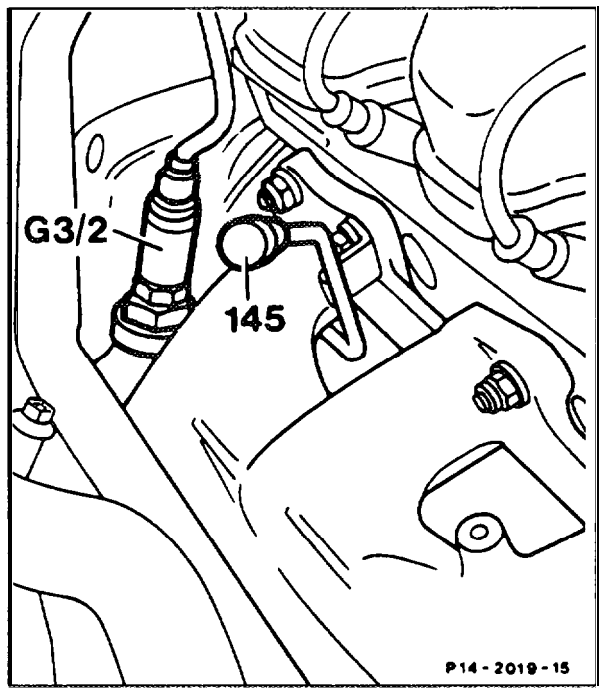
e) Heated oxygen sensor (G3/2)

The heated oxygen sensor is installed in the front exhaust pipe or in the exhaust manifold (engine 102.96/98 as of 09/89). The oxygen sensor is heated in order to create a constant operating temperature. The heating element of the oxygen sensor is energized via terminal 87 of the fuel pump relay module and is heated so long as the fuel pump is running.



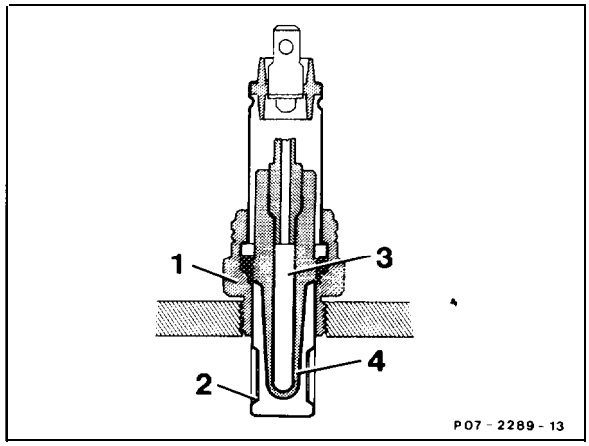
Arrangement in front exhaust pipe

Note: **fuel** pump relay **module as of 01/90**
Fuel pump and kick-down shutoff relay (N16/4) with additional connector for oxygen sensor heater. Oxygen sensor (G3/2) is heated only from +20°C engine coolant temperature (07.3–165).



Arrangement in exhaust manifold

The outer electrode is exposed to the exhaust emissions, the inner electrode is exposed to atmosphere. The active part of the heated oxygen sensor is a ceramic body which consists primarily of zirconium dioxide. It is coated on the surface with a gas-permeable platinum layer, as well as with an additional protective layer on the exhaust side.

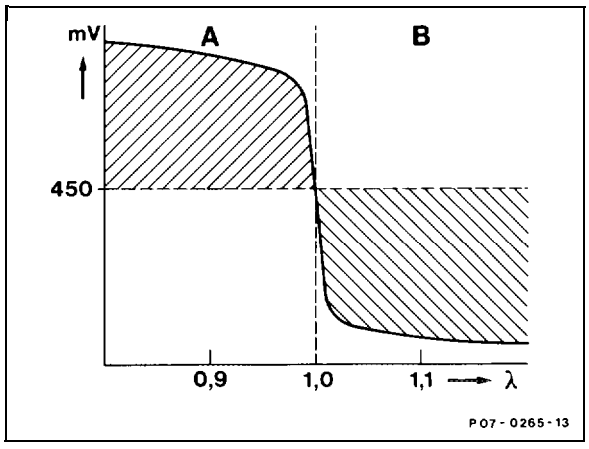


1 Sensor housing
2 Protective tube slot
3 Heating element
4 Sensor ceramic

At operating temperature the ceramic material conducts the oxygen ions. The different oxygen portion between exhaust gas and atmosphere produces a voltage in the heated oxygen sensor.

At operating temperature (>300°C) the oxygen sensor supplies a voltage signal to the control module.
Voltage >450 mV rich mixture
Voltage <450 mV lean mixture

As a result of the rapid voltage jump with lambda (A) = 1, the exhaust composition can be rapidly monitored and the fuel/air mixture corrected within a narrow control range.



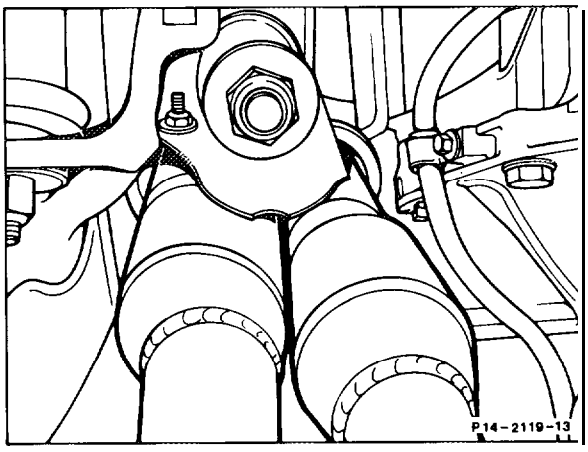
A Rich fuel/air mixture
B Lean fuel/air mixture

e) Catalytic converters

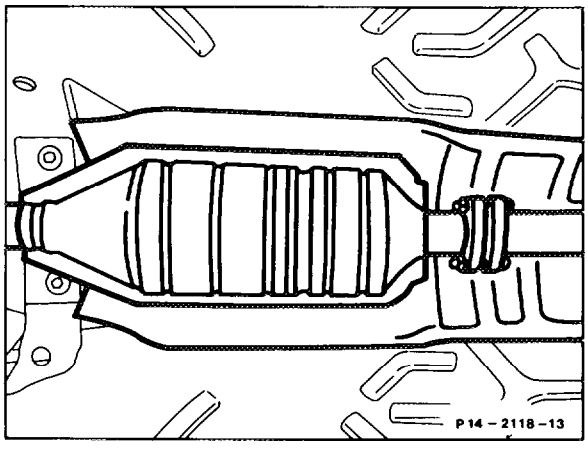
The 3-way catalytic converters are installed in the exhaust system upstream of the mufflers. The following versions are installed:

Up to 08189
Pre- and underfloor catalytic converter.

As of 09189 underfloor catalytic converter (pre-catalytic converters no longer installed).

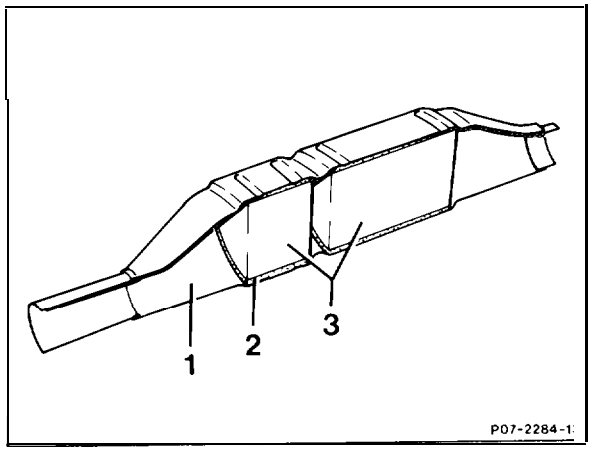


Pre-catalytic converter



Underfloor catalytic converter

The catalytic converters consist primarily of three main parts:
Carrier material of high-strength ceramic or high temperature-resistant stainless steel, also known as the monolith (ceramic flexibly mounted on wire mesh). Intermediate layer for enlarging the surface. Catalytically active layer of platinum/rhodium.



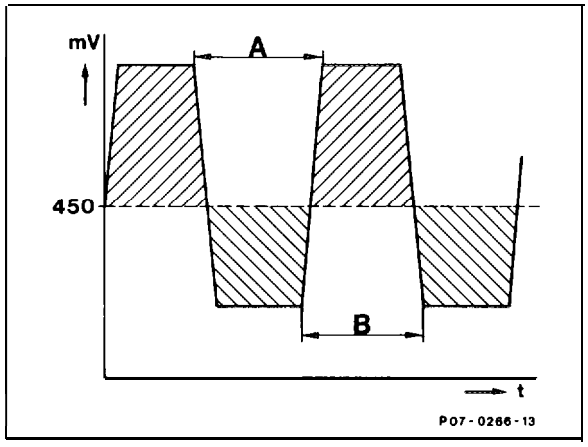
1 Fabric
2 Wire mesh
3 Monolith

Function

The exhaust gases flow through the catalytic converter and come into contact with the noble metals. Oxidation converts carbon monoxide (CO) into carbon dioxide (CO_2) and hydrocarbons (HC) into water (H_2O) and reduction converts the oxides of nitrogen (NO,) into nitrogen (N_2). The critical factors for this process are the temperature and the residual oxygen content in the exhaust gas. The catalytic process, i.e. the chemical reaction, commences from approx. 250 °C. Excessively high temperatures result in thermal overload.

Oxygen is required for the oxidation of CO and HC. The reduction of the oxides of nitrogen occurs in an oxygen-deficient atmosphere.

The fluctuation between oxygen-low and oxygen-rich exhaust gas is achieved by altering the fuel/air mixture. The ratio of the fuel/air mixture is designated with lambda (A), in which $\lambda < 1$ indicates a rich mixture, $A > 1$ a lean mixture.



A Rich fuel/air mixture
B Lean fuel/air mixture

The fluctuation of the oxygen portion of the exhaust gas is controlled by the oxygen sensor. The three exhaust elements stated can only be chemically converted in the catalytic converter by means of these oxygen fluctuations.

Vehicles fitted with the catalytic converter and oxygen sensor must only be operated with unleaded fuel. Lead additives in the fuel are deposited on the chemically reacting surface of the catalyst and the oxygen sensor, rendering the system ineffective.

B. National version (USA) with exhaust gas recirculation

a) General
b) Function diagrams
- **Engine 102.961**
  - (AUS) **1984/85**
- **Engine 102.96**
  - (CH) **1984-1986**
  - (S) **1984-1987**
- **Engine 102.982**
  - (CH) **1985/86**
  - (S) **1985-1987**

c) Function of exhaust gas recirculation
d) Function of components
h) (USA) 1991

a) General

Exhaust gas recirculation (EGR) reduces the oxides of nitrogen (NOx).

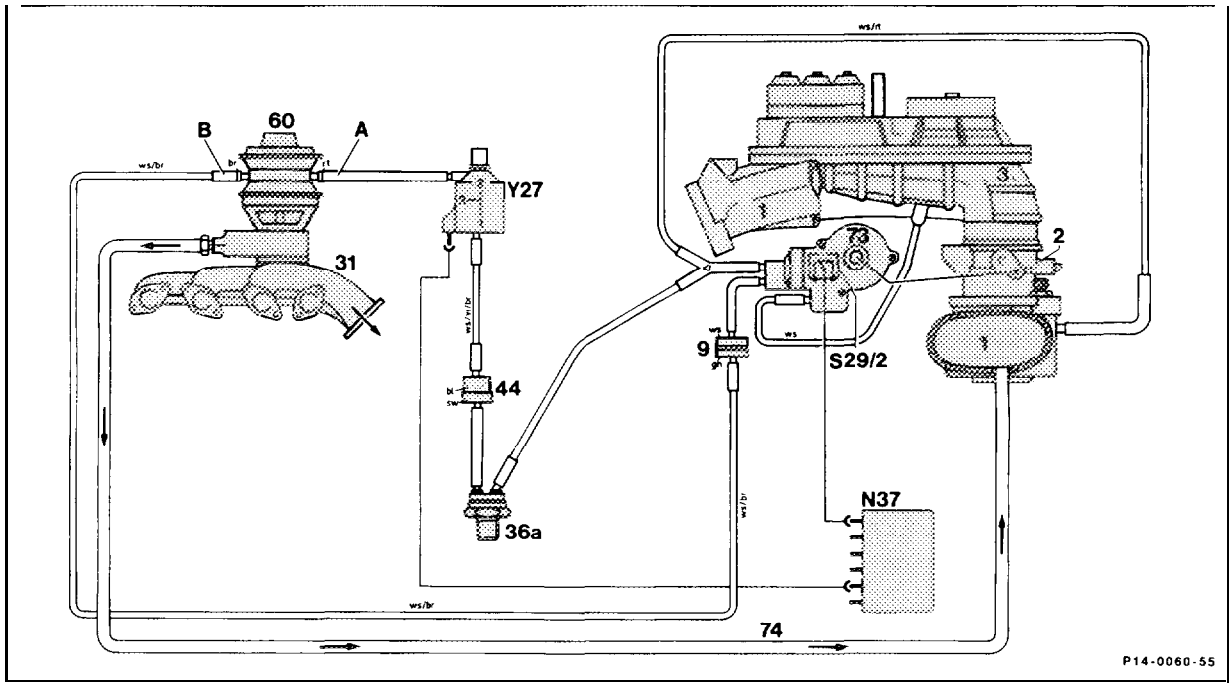
Fuel evaporation control system (USA) reduces the emission of fuel vapors to atmosphere (47-200).

Exhaust gas recirculation
Part of the exhaust gases is returned through the exhaust gas recirculation valve to the intake manifold during certain engine operating states in order to reduce the oxides of nitrogen in the exhaust gas.

The low-oxygen exhaust gases are mixed in the intake manifold with the fresh, oxygen-rich mixture. The portion of fresh mixture is reduced as a consequence and less oxygen is thus available in the combustion process. The quantity of recirculated exhaust gases is dependent on the throttle position and on the engine coolant temperature. The driving characteristics of the vehicles are not influenced by exhaust gas recirculation.

(USA) 1991 engine 102.985: testing exhaust gas recirculation, see 14-475.

c) Function of exhaust gas recirculation (EGR)



The exhaust gases are recirculated at an engine coolant temperature above approx. 40°C and with the throttle contacting the closed throttle position stop or wide open throttle stop.

When the throttle is contacting the closed throttle or wide open throttle position stop, the control module (N37) switches voltage to the switchover valve (Y27). The signal for this is passed to the control module (N37) by the WOT/CTP switch (S29/2).

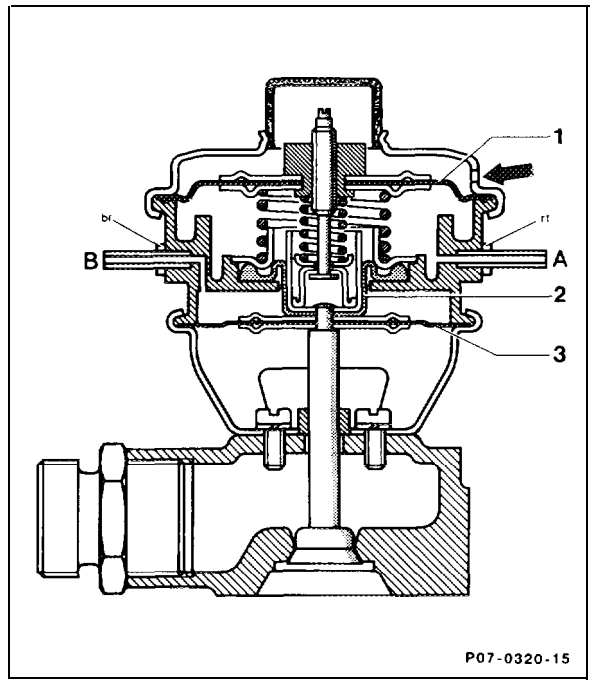
The switchover valve (Y27) switches over and admits air to the EGR valve (60, connection A), which causes the latter to close.

If the throttle is moved into a position between closed and wide open throttle, the signal from the WOT/CTP (S29/2) to the control module (N37) is switched off. This interrupts the voltage supplied to the switchover valve (Y27).

As a result, the switchover valve (Y27) switches intake manifold vacuum to the EGR valve (60, connection A). At the same time, more or less air is admitted through the vacuum control valve (73) to the EGR valve (60, connection B), depending on the throttle position. The EGR valve (60) opens partially or fully.

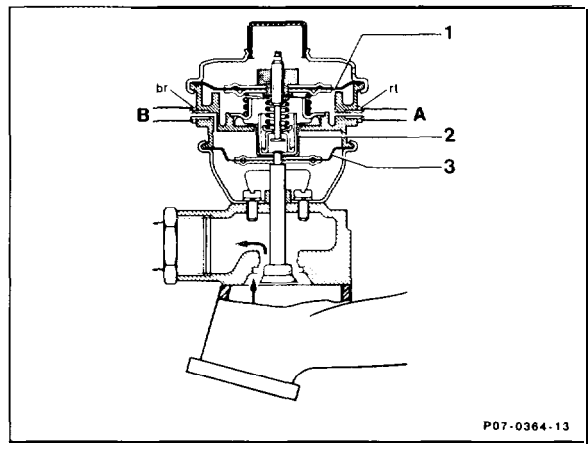
d) Function of components

Exhaust gas recirculation valve (60)
Atmospheric pressure which is admitted through a orifice (arrow) constantly acts via the shutoff diaphragm (1 j in the diaphragm chamber.



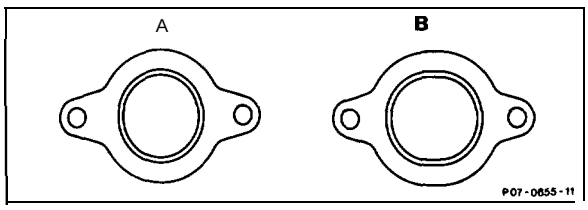
1 Shutoff diaphragm
2 Pc? diaphragm
3 Work ng diaphragm
A Connection (red), to switchover valve
B Connection (brown), to switchover valve

If intake manifold vacuum is acting through connection A (red) in the diaphragm chamber below the shutoff diaphragm (1), the latter is pressed down against the spring force. The EGR valve opens if air is admitted at the same time to the diaphragm chamber through the working diaphragm (3).



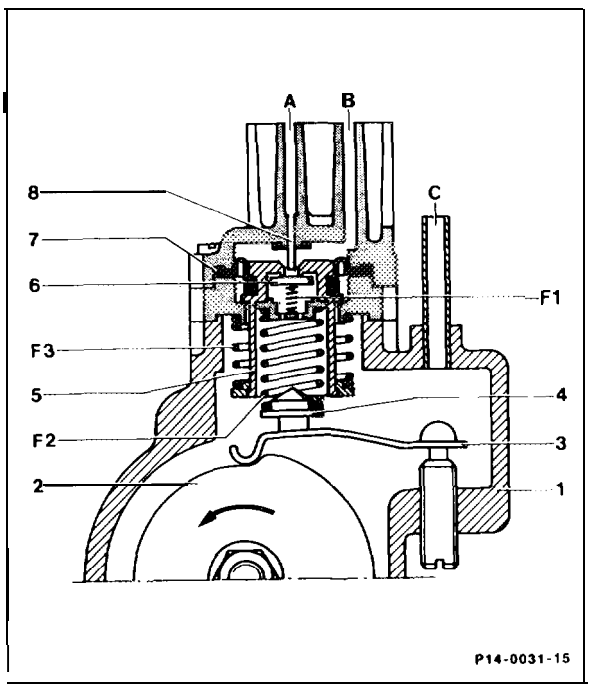
Note
inner diameter of gasket for exhaust gas recirculation valve **at** exhaust manifold enlarged as a result of modification of shape.

A Previous version
B Present version



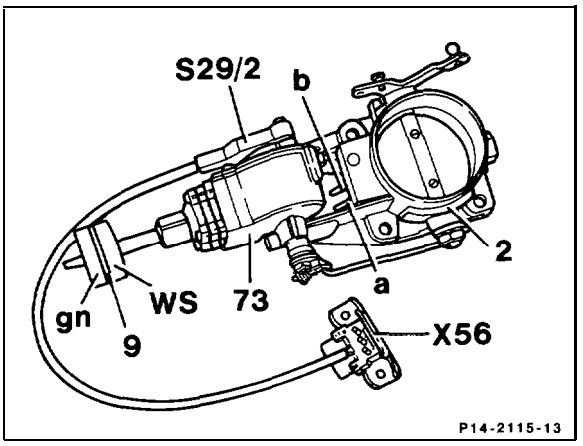
Vacuum control valve (73)
When the engine is at idle, the vacuum control valve reduces the intake manifold vacuum to a constant level. If the throttle is opened, the cam disk (2) is moved in the direction of the arrow. The reduced vacuum at connection (B) is further reduced, as a result of which the EGR valve opens.

1 Housing
2 Cam disk
3 Lever
4 Spring retainer
5 Sleeve
6 Sealing disks
7 Diaphragm
8 Tube
A Intake manifold connection
B Damper connection, exhaust gas recirculation valve
C Air guide housing connection
F1 Conical spring
F2 Pre-tensioning spring
F3 Compression spring



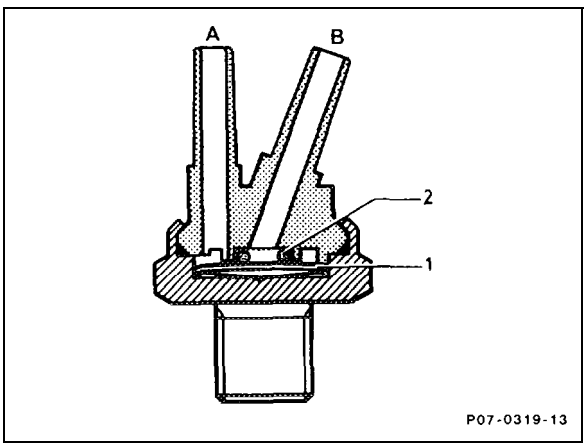
Vacuum damper (9) with restrictor
This prevents the EGR valve opening or closing suddenly. A restrictor is fitted in the connection (gn).

Wide open throttle/closed throttle position switch (WOT/CTP) (S29/2)
It **switches** the control **signal for switching off the EGR** when the throttle is **in the closed throttle and wide** open throttle position.



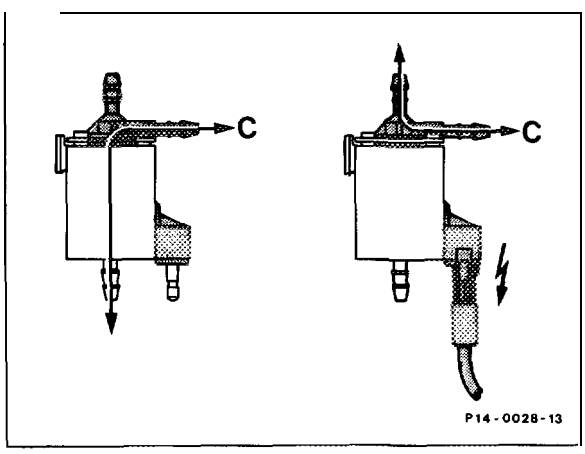
X56 Throttle **body switch plug connection**
gn = green
ws = white

40°C thermovalve (36a, color code black)
It opens from a coolant temperature of approx 40°C and then allows the intake manifold vacuum to pass.



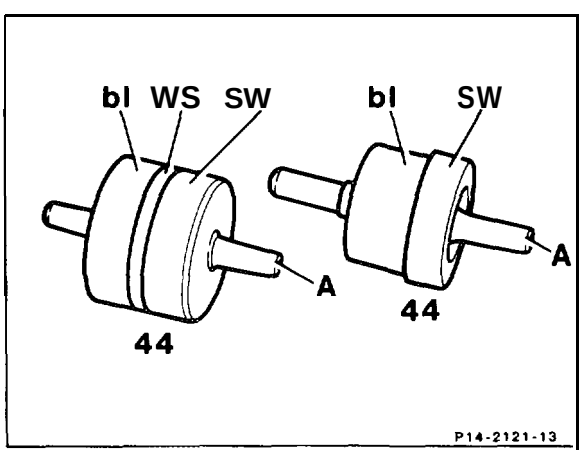
1 Bimetal **plate**
2 O-ring
A to check **valve**
B to intake manifold

Switchover valve (Y27)
Fitted to the bulkhead in the engine compartment. The swttchover valve is energized when the throttle valve **is** in the idle and full throttle position and switches over to atmospheric air admission.



Check valve (44)
It prevents the intake manifold vacuum at the exhaust gas recirculation **valve** dropping as the throttle valve increasingly **opens further.**

Cylindrical or stepped version possible.



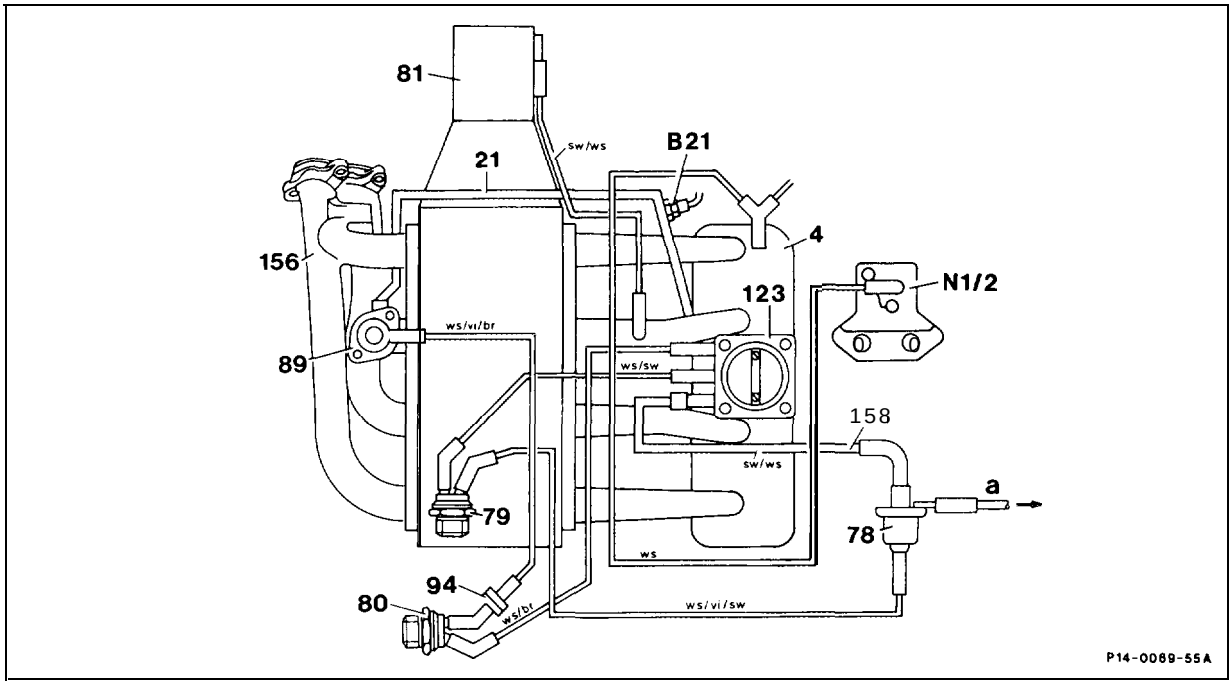
A = **Vacuum inlet**

Control module (N37)

It switches through or switches off the voltage for the switchover valve depending on the control signal from the throttle valve switch.

Model 124

h) (USA) 1991 engine 102.985



Function diagram of exhaust gas recirculation

4	Intake manifold	156	Exhaust manifold
21	Exhaust gas recirculation line	158	Purge line
78	Purge valve for fuel evaporatron control system	a	Purge line to charcoal canister
79	Thermovalve for fuel evaporation control system, opens at 70°C, closes at 35°C	B21	Exhaust gas recirculation temperature sensor
		N1/2	ignition control module
80	Thermovalve for exhaust gas recirculation, opens at 70°C, closes at 60°C		Line color code
81	Automatic transmission		br brown
89	Exhaust gas recirculation valve		sw black
94	Time-delay valve (manual transmission only)		ws white
123	Throttle body assembly		vi violet

Note
Testing exhaust gas recirculation, see 14-475.

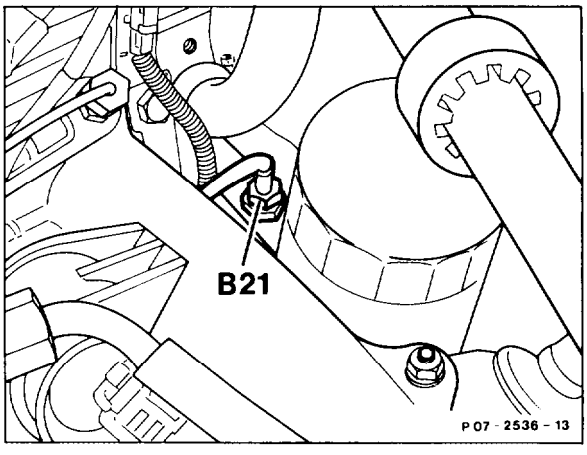
The vacuum which exists at the exhaust gas recirculation valve (89) differs according to the throttle position.
With the thermovalve (80) open, the vacuum controls the exhaust gas recirculation valve (89), as a result of which the exhaust gas recirculation valve opens partially or fully and exhaust gases are thus passed through the exhaust **gas** recirculation line (21) into the intake manifold (4).

The time-delay valve (94) on vehicles with manual transmission prevents the exhaust gas recirculation valve (89) opening too rapidly.

Exhaust gas recirculation is performed
- in partial load mode:
  a) with rising engine coolant temperature above +70° C
  b) with dropping engine coolant temperature up to +60°C

No exhaust gas recirculation is performed
- when idling and at wide open throttle
- at engine coolant temperature below + 60°C

Exhaust gas recirculation temperature **sensor (B21), California only**
Installed in the exhaust gas recirculation only. Tightening torque 23-28 Nm. The temperature of the recirculated exhaust gases is registered by the temperature sensor. See diagram for resistances.



If the exhaust temperature drops below approx. 120°C during operation, no exhaust gas recirculation is performed. This is detected as a fault by the CFI control module and stored.
In addition, the CHECK ENGINE malfunction indicator lamp lights up
(see 07.3-121, Section F).

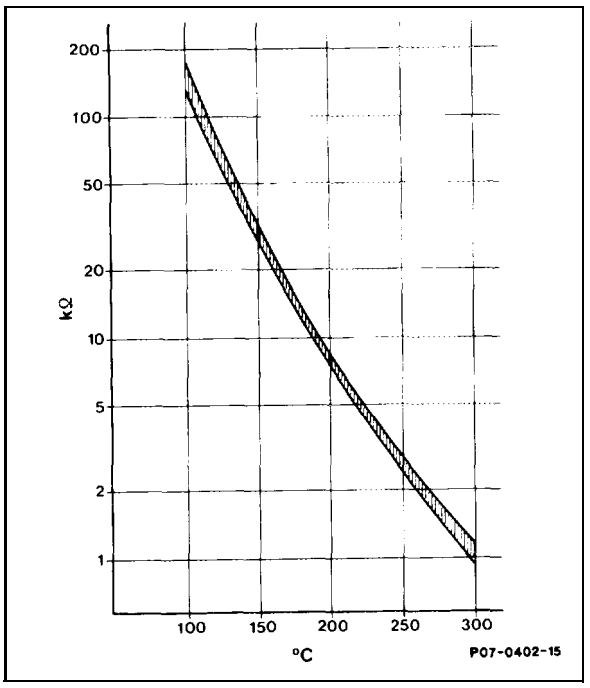
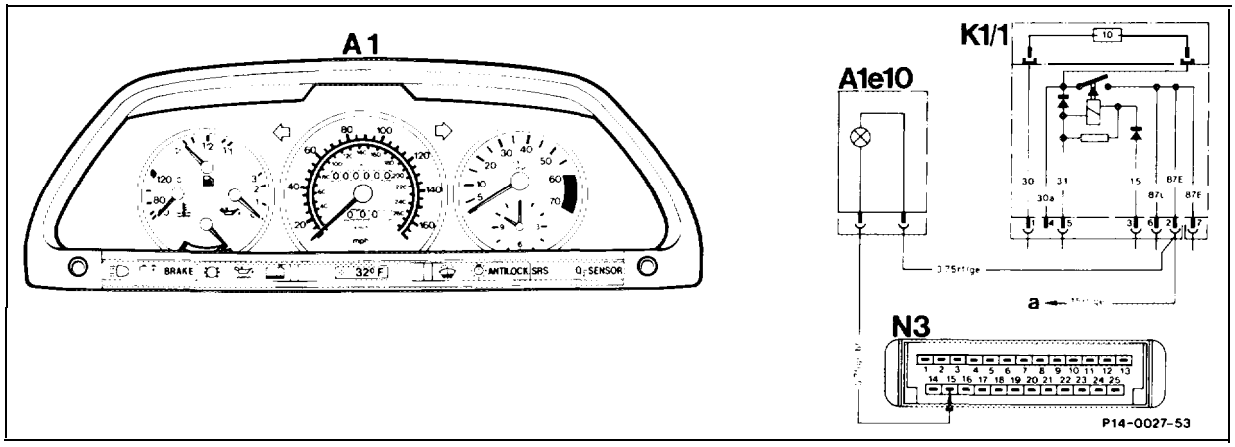


Diagram
Exhaust gas temperature resistance
at exhaust gas recirculation temperature sensor

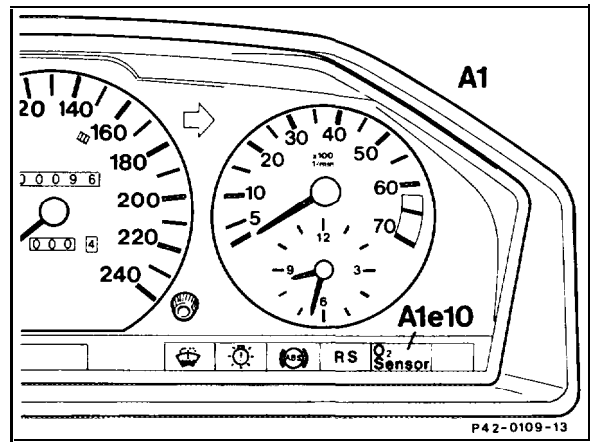
14-116 Testing heated oxygen sensor malfunction indicator lamp (USA)



A1	Instrument cluster	N3	CFI control module
A1e10	Heated oxygen sensor malfunction indicator lamp	a	To CFI control module (N3)
A1e26	CHECK ENGINE malfunction indicator lamp		contact 1
K1/1	Overvoltage protection relay		

Oxygen sensor change malfunction indicator lamp, model 201.024, model year 1984/85

Legislation prescribes that the oxygen sensor must be replaced once after 30 000 miles or, in the case of Canada vehicles, after 50 000 km. This is indicated by an "O_2 sensor" malfunction indicator lamp (A1e10) in the instrument cluster (A1) lighting up.



Description of function

The odometer of the speedometer produces a voltage via a magnetic field when 30 000 miles or 50 000 km, respectively, is reached. The downstream electronics detects this voltage and switches on the malfunction indicator lamp in the instrument cluster.

After the heated oxygen sensor has been replaced, the malfunction indication device should be deactivated by removing the bulb. Partially remove instrument cluster and install for this purpose.

Heated oxygen **sensor malfunction indicator lamp, model years 1986, 1967, 1968 and 1991 Federal version**

A failure of the oxygen sensor is indicated by the "O_2 sensor" malfunction indicator lamp (Al) in the instrument cluster (A1e10) lighting up (1988 and 1991 Federal: Inscription: "CHECK ENGINE" (Ale26).

The malfunction indicator lamp is actuated by the CFI control module, contact 15 (1991 Federal : **CFI** control module, contact 23).

"CHECK ENGINE" malfunction indicator lamp Model year 1988, 1991 California version

The "CHECK ENGINE" malfunction indicator lamp (Ale26) lights up if an exhaust component fails (On Board Diagnostic System, see 07.3-121, Section F). The malfunction indicator lamp is actuated by the CFI control module, contact 23.

Test condition

- Battery voltage 11-14 **V**

Wiring diagrams (07.3-I 28).

Key to symbols


Multimeter

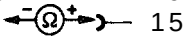
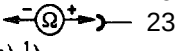

Contact

Connector


Ground


Multimeter direct voltage measuring mode


Multimeter **resistance measuring** mode

Test step/ Test scope	Tester/ Test connection	Operation Requirement	Specification	Possible cause/Remedy
1.0 Test malfunction indicator lamp (A1e10) (Al e26)	Visual inspection	Ignition: ON Engine: **start**	Malfunction indicator lamp (A1e10) or (Al e26) lights up **briefly**	Malfunction indicator lamp defective. Remove malfunction indicator lamp, test, replace if necessary Open circuit malfunction indicator lamp lover-voltage protection relay (K1/1) Open circuit malfunction indicator lamp I CFI control module (N3)
2.0 Voltage supply of malfunction indicator lamp				
A. 1986/87/88 Federal	A1e10 A1e26 cable rt/ge 	Ignition: ON Cable disconnected	11-14 v	Open circuit cable (A1e10) → (K1/1) contact 2. Open circuit cable (K1/1) contact 2 → (N3) contact 1
B. 1988 California 1991	A1e26 cable rt/bl  rt/ge) [1]	Ignition: ON Cable disconnected	11-14 v	Open circuit cable (Ale26) → (K1/1) contact 6. cable (Ale26) → CFI control module (N3) contact1
3.0 CFI control module (N3) cable to malfunction indicator lamp				
A. 1986/87/88 Federal	A1e10 cable N3 gr/bl  15	Ignition: **OFF** Cable disconnected	< 1 a	Open circuit
B. 1988 California 1991	Al e26 cable N3 bl/ws  23 (gr/gn) [1]	Ignition: **OFF** Cable disconnected	< 1 Ω	Open circuit

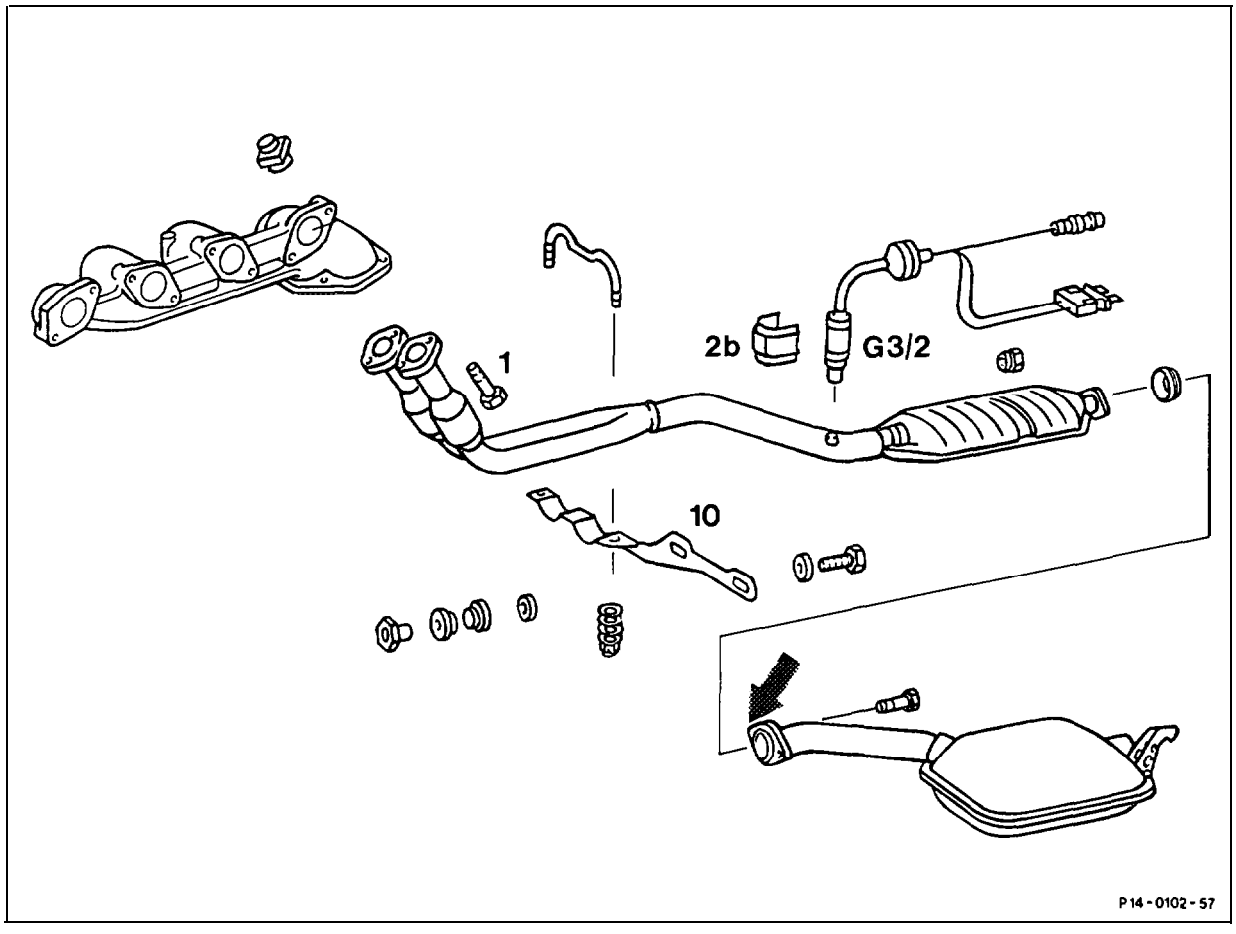
[1]) 1988 California

Special tool

Commercially available tester

Multimeter	e.g.	**Sun, DMM-5**

14–200 Removal and installation of catalytic converter



Cover (2b)	remove, install. Pay attention to install position.
Heated oxygen sensor (G3/2)	remove, install (07.3–258), not on vehicles with heated oxygen sensor in exhaust manifold.

Note

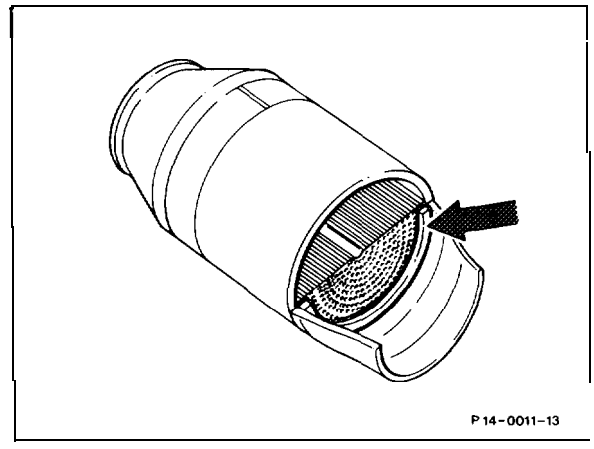
Before installing oxygen sensor, the thread must be coated with hot lubricating paste, Part No. 000 989 88 51.

Bolts (1) of flanged joint at exhaust manifolds	unscrew, screw on.
Side support (10) at transmission	remove, install.
Rubber rings for exhaust system	detach, attach.
Exhaust system	remove, install complete (49-l 00).
Flanged joints (arrow)	detach and remove catalytic converter.

Note

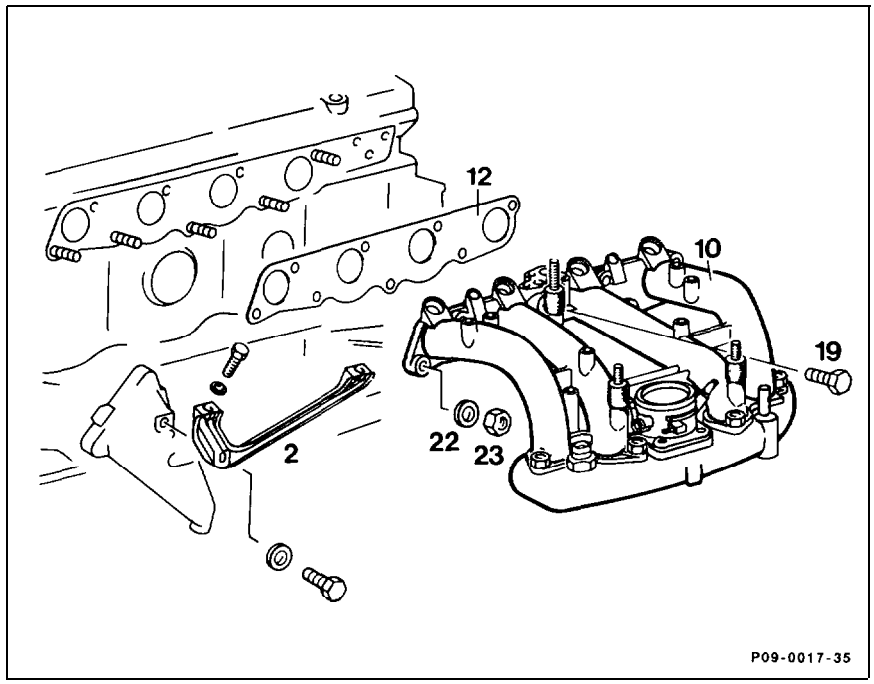
Engine 102.96 985: A deflector ring (arrow) has been installed for Improved support of the pre-catalytic converter (monolith) (noise reduction).

Production breakpoint: 05/86



14-450 Removal and installation of intake manifold and replacing gasket

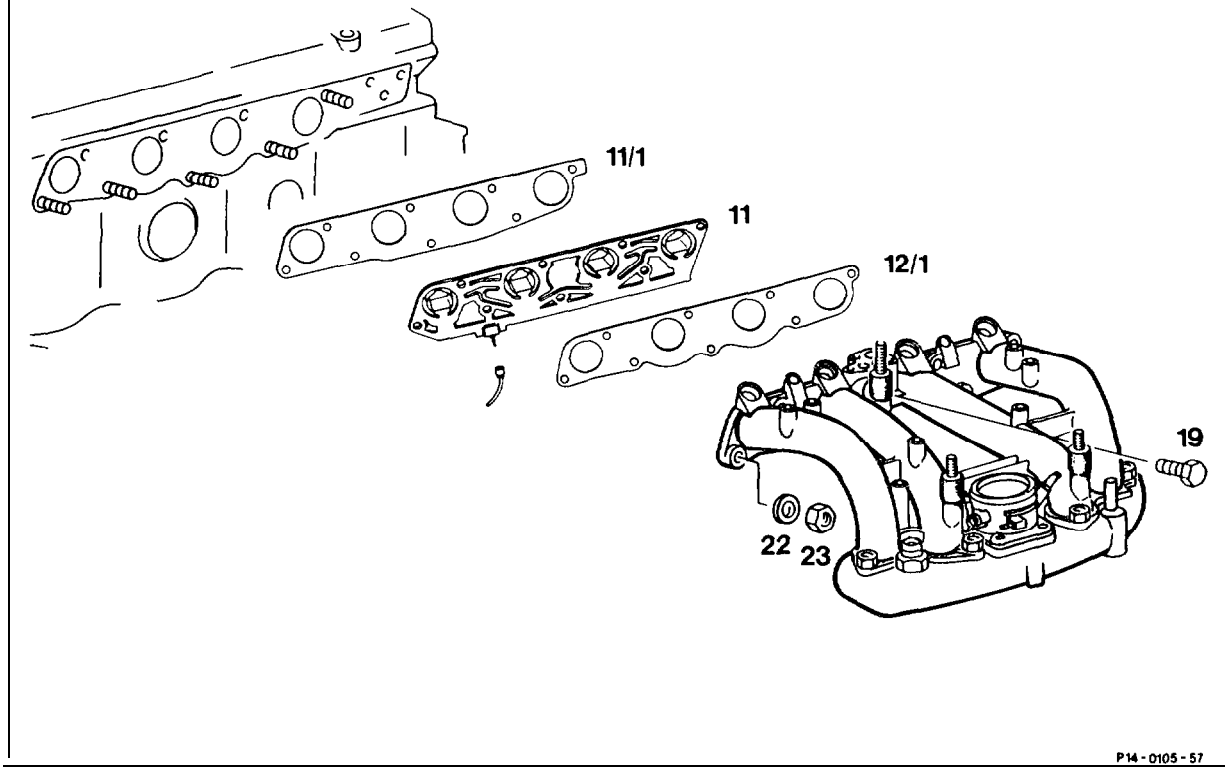
Preceding work:
Removal and installation of mixture control unit with air guide housing (07.3-225).



Fuel lines	unscrew, screw on.
Bracket for starter cable	unscrew, screw on.
Electric wiring, vacuum lines	take off, fit on.
Supporting bracket (2) for intake manifold	unscrew, screw on.
Engine lifting lug	unscrew, screw on.
Fastening nuts (23) and bolt (19)	unscrew, screw on. Use washer (22).
Intake manifold (10)	take off, clean. Check flange surfaces with straightedge; dress on dressing plate if necessary.
Intake manifold gasket (12)	replace. Replace light alloy gasket for preheating flange on engines with partial intake manifold preheating (14-452).
Throttle control linkage	install, check, adjust if necessary (30-300).
Idlespeed	set (07.3-I 00).

14-452 Replacement of preheating flange

Preceding work:
Removal and installation of intake manifold and replacing gasket (14450).



Intake manifold gasket (12/1)	replace.
Electric coupling for intake manifold preheating	unplug, plug in.
Preheating flange (11)	take off, replace.
Light alloy gasket (11/1)	replace.

14–455 Replacement of intake manifold

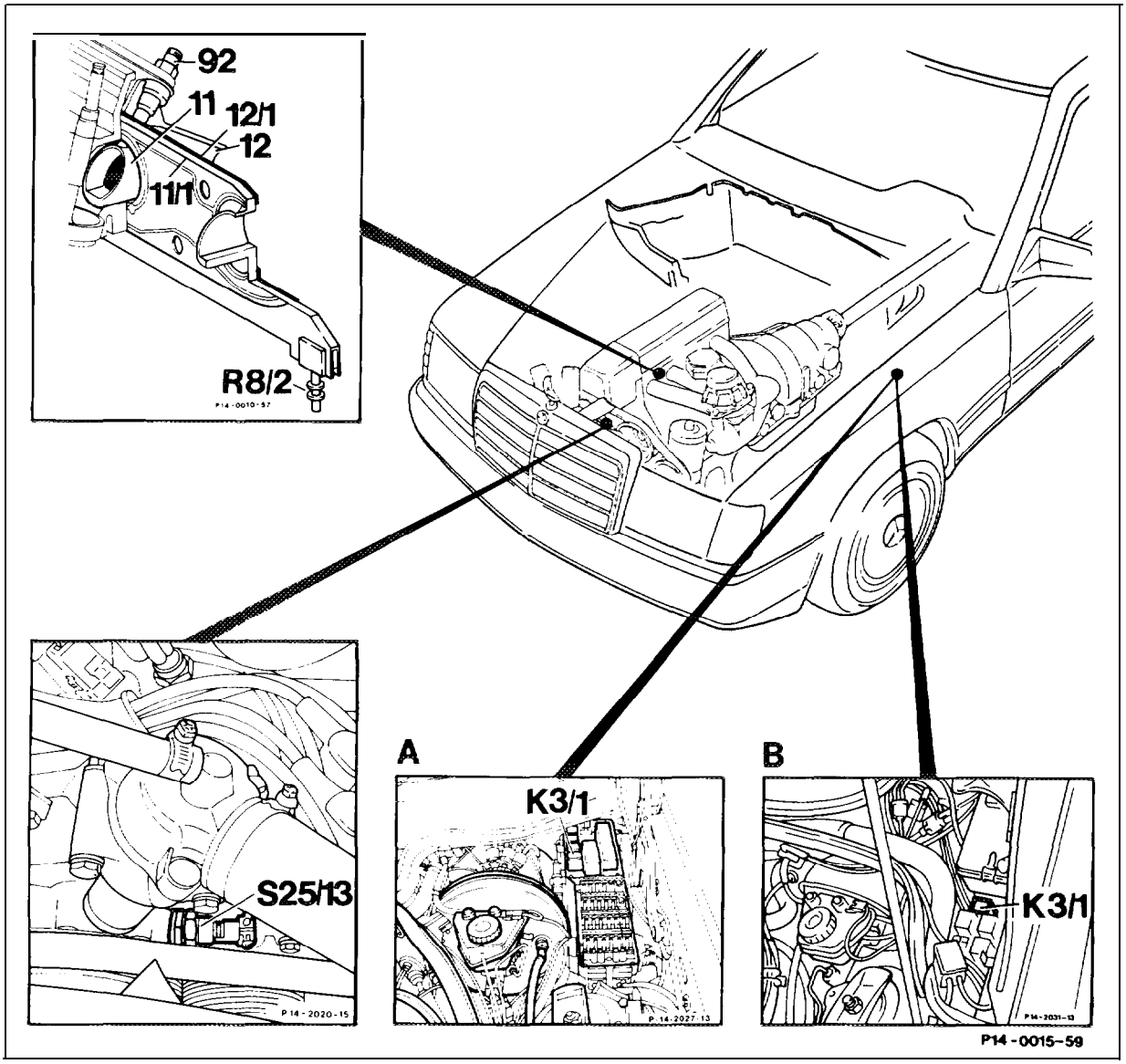
Preceding work:
Removal and installation of intake manifold (14450)

Replacement

Unbolt all parts on the removed intake manifold which are able to be unbolted and install onto new intake manifold with new gasket.

14-456 Testing partial intake manifold preheating (PMP)

Engine 102.96/98 KAT as of 09/89

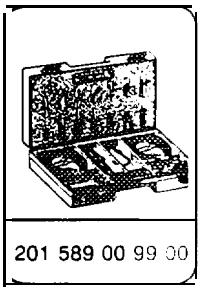


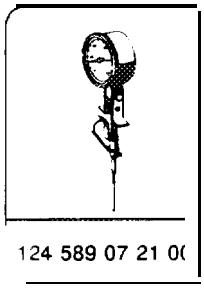
K3/1	Intake mamfold preheater relay module	12	Intake manifold
R8/2	Intake mamfold preheater	12/1	PSV-Intake mamfold gasket
S25/13	60 °C temperature switch	92	injector
11	Preheating flange	A	Model 124 (non-USA)
11/1	Cylinder head-PMP gasket	B	Model 201

Test . . . . . perform only in the case of engine running faults, e.g. engine bucks up to 60°C engine coolant temperature.

All electrical accessories	switched off.
Battery voltage	11-14 v.
Multimeter (range “A”)	connect with current clamp to intake manifold preheating cable (R8/2) at preheating flange.

Special tool


201 589 00 99 00


124 589 07 21 0(

Commercially available tester

Multimeter	e.g. Sun, DMM-5

Key to symbols

- Multimeter
- Contact
- Connector
- Ground
- Multimeter direct voltage measuring mode
- Multimeter resistance measuring mode

Note

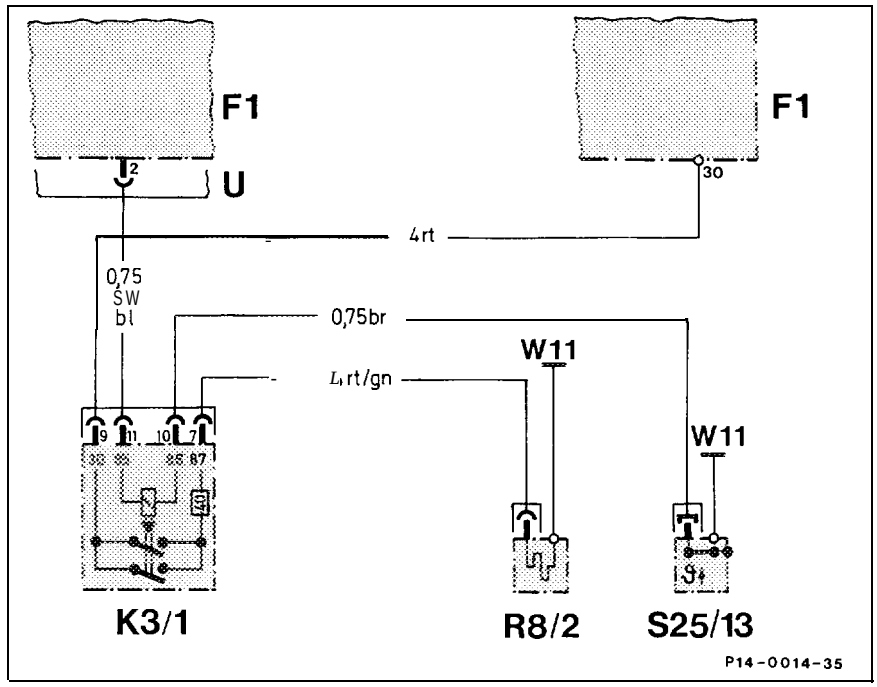
If the specified value of a test step, e.g. step 2, is in order, it is not necessary to perform test step 2.1.

Test step: Test scope	Tester/ Test connection	Operation Requirement	Specification	Possible cause/Remedy
1.0 Cable	Connect multimeter (range “A”) with current clamp to intake manifold preheater cable (R8/2) at preheating flange	Detach connector at engine coolant temperature sensor (S25/13) and connect to ground. Start engine.	I-2 s after end of start >21 A	1. Current consumption >5<21 A: replace preheating flange (11) (14-452) 2. Current consumption <5 A: intake manifold preheater relay module (K3/1), wiring

Test step/ Test scope	Tester/ Test connection	Operation Requirement	Specification	Possible cause/Remedy
1.1	W11 ⊥ — (V) — K3/1 3 (9) [1]	Ignition: ON Relay module (K3/1) disconnected	11-14 v	Model 201: Open circuit from (F1) terminal 30 → (K3/1) contact 3
1.2	W11 ⊥ — (V) — K3/1 4 (10) [1]	ignition: ON Relay (K3/1) disconnected	11-14 v	Model 201: Open circuit from (F1) coupling U, contact 2 → (K3/1) contact 4
1.3	K3/1 1 (7) [1] — (Ω) — R8/2	Ignition: OFF Relay module (K3/1) disconnected, coupling at (R8/2) disconnected	< 1 Ω	Open circuit
1.4	K3/1 5 (11) [1] — (Ω) — S25/13	Ignition: OFF Relay module (K3/1) disconnected, coupling at (S25/13) disconnected	< 1 Ω	Open circuit

[1]) Contact assignment for engine 102.96/98

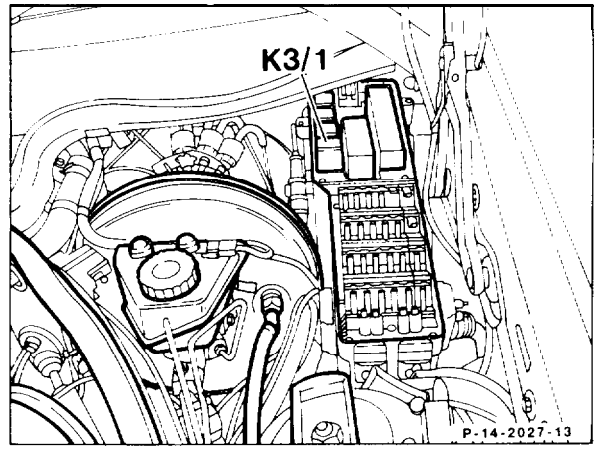
Model 201
Engine 102.96 98



F1 Electrical centre
K3/1 Intake manifold preheating (PMP) relay
R8/2 Intake manifold preheating (PMP)
S25/13 60°C temperature switch
W11 Engine ground

Operating principle

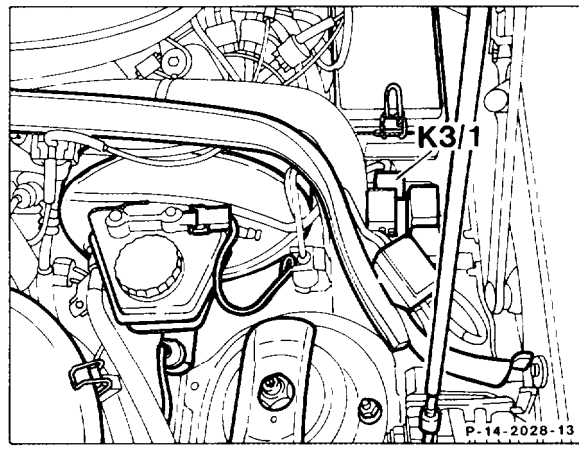
A preheating flange (PTC element) is fitted between intake manifold and cylinder head in order to achieve preheating of the mixture during the warming-tip phase. A relay module (K3/1) and a 60°C engine coolant temperature switch (S25/13) are required for heating the preheating flange.



Model 124 shown

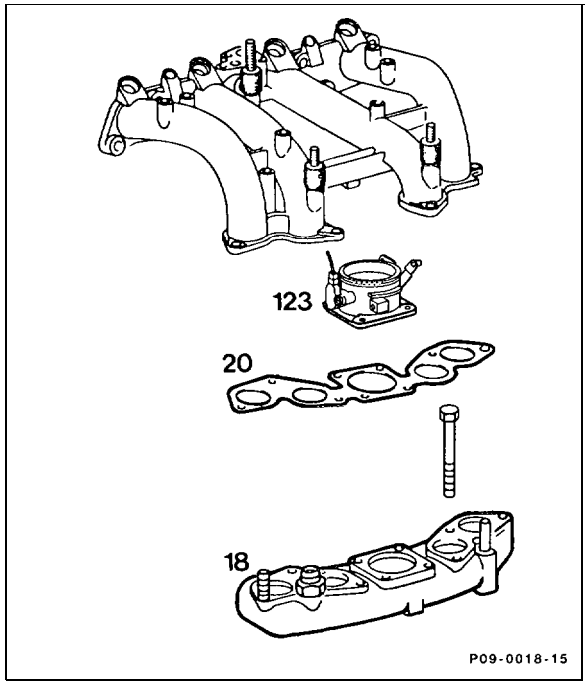
If the engine is started at an engine coolant temperature <60°C, the preheating flange is energized by the relay module (K3/1).

As the temperature at the preheating flange rises, the current flow is reduced constantly (PTC element) until the temperature switch (S25/13) interrupts the ground connection to the relay module (K3/1) at an engine coolant temperature of approx. 60°C.



Model 201

1 4–460 Removal and installation of intake manifold bottom section, replacing gasket

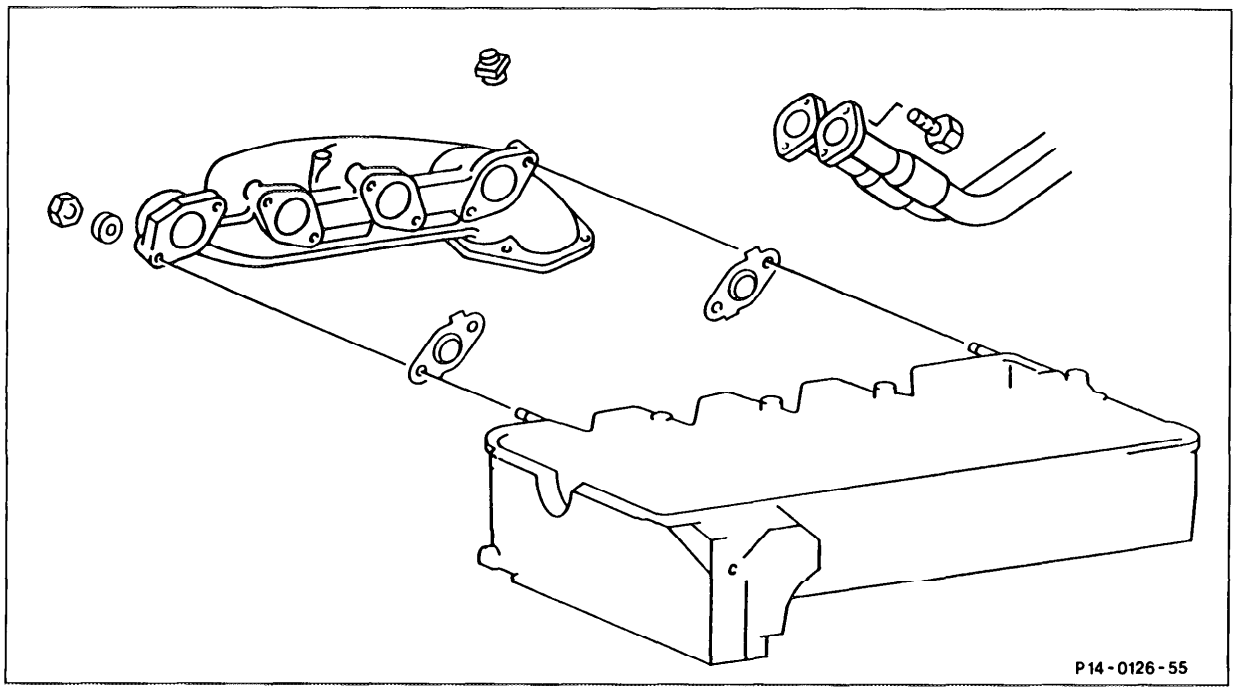


Throttle control linkage	unbolt, bolt on, adjust (30-300).
Vacuum lines	take off, refit.
Return hose for power steering	model 201, loosen, tighten.
Coolant hose for thermostat housing	model 201, remove, fit on. Check coolant level.
Throttle body assembly (123)	unscrew fastening nuts, screw on.
Engine mounts	loosen both and raise engine with inspection pit lift.
Intake manifold bottom section (18)	unscrew fastening nuts, screw on, press down and remove.
Intake manifold gasket (20)	replace.

Caution!
When replacing the intake manifold bottom section, unscrew all the parts which can be unscrewed on the removed bottom section and fit to the new bottom section. The M8 × 22 stud bolts in the intake manifold bottom section as well as the two M8 × 85 hexagon bolts must be installed with sealing compound.

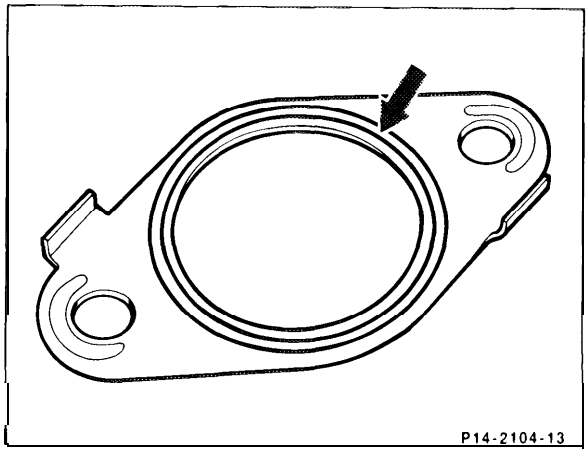
Idle speed	set (07.3-I 00).

14–470 Removal and installation of exhaust manifold



Exhaust system	. . . . .	partially remove, install (49-l 00).
Exhaust nuts	. . . . .	at exhaust manifold, unbolt, bolt on.
Exhaust manifold	. . . . .	take out.
Exhaust manifold	. . . . .	install with new gaskets.

Caution!
The angled metal tabs or the beads (arrow) must be facing the exhaust manifold.



Notes

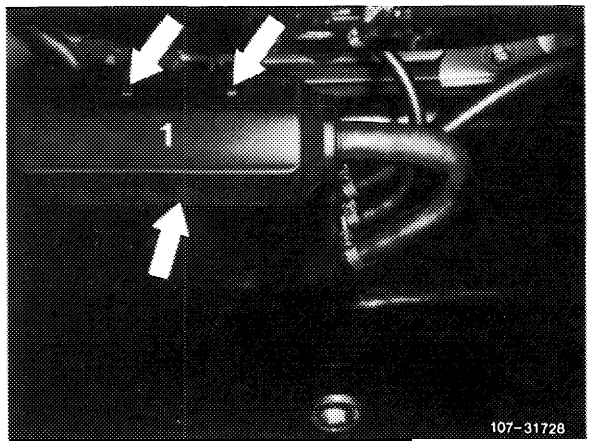
Exhaust manifold studs
Studs of a higher quality (10.9) (previously 8.8) are used for attaching the exhaust manifold to the cylinder head.

Identification: black bonderized (was yellow chromatized).

Production breakpoint: 04/84

Model	Engine	Engine end No. manual transmission	Engine end No. automatic transmission
201.024	102.961	068090	040901

Engine 102.96/98
Stability increased by strengthening ribs (arrows) on exhaust manifold between cylinders 2 and 3, 3 and 4.



Production breakpoint:
Engine 102.985 approx. 05/86

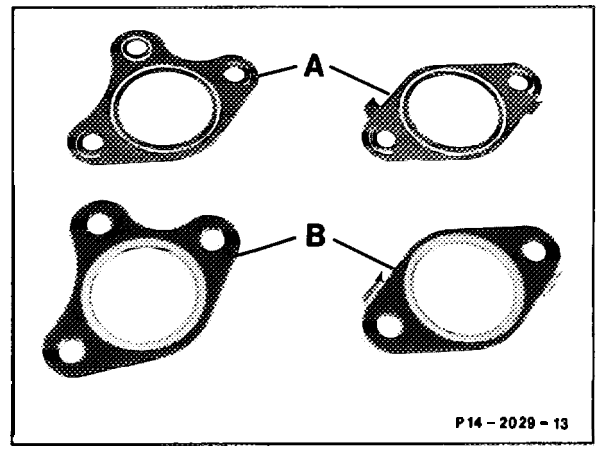
Model	Engine	Engine end No. manual transmission	Engine end No. automatic transmission
201.024 (USA)	102.985	003769	034688

Engine 102.985
Exhaust manifold made of modified material
Reason: crack prevention

Production breakpoint: 09/88

Model	Engine	Engine end No. manual transmission	Engine end No. automatic transmission
201.028	102.985	027063	076715

Exhaust manifold gaskets at cylinder head
Engine 102.985
Installation of asbestos-free soft material gasket to provide better sealing.



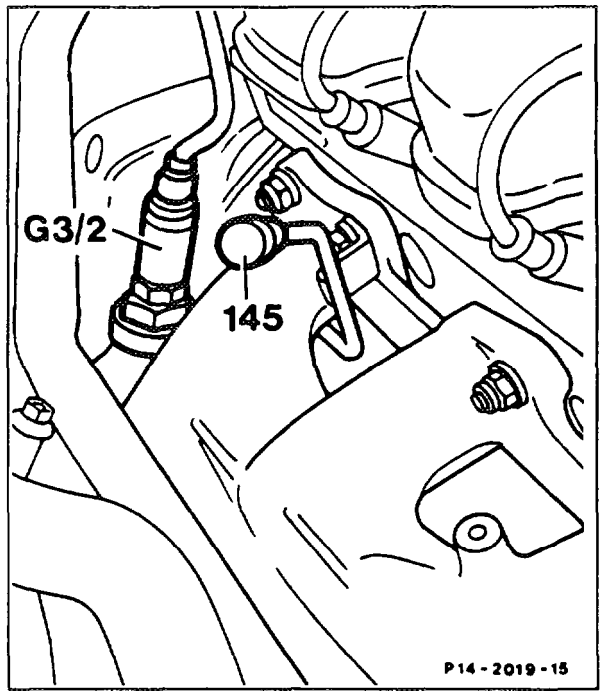
Exhaust manifold/cylinder head gasket
A Previous version
B Modified version (soft material)

Production breakpoint: 05/89

Model	Engine	Engine end No. manual transmission	Engine end No. automatic transmission
201.028	102.985	031907	079148

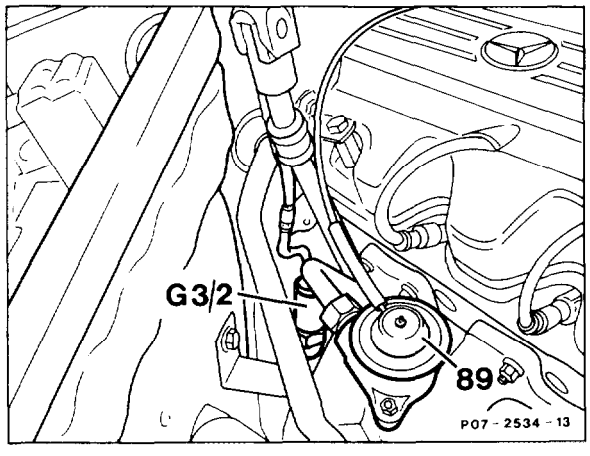
Engine 102.96/98 KAT as of 09/89
Heated oxygen sensor (G3/2) installed in rear section of exhaust manifold.

Remove, install heated oxygen sensor (see 07.3–258).

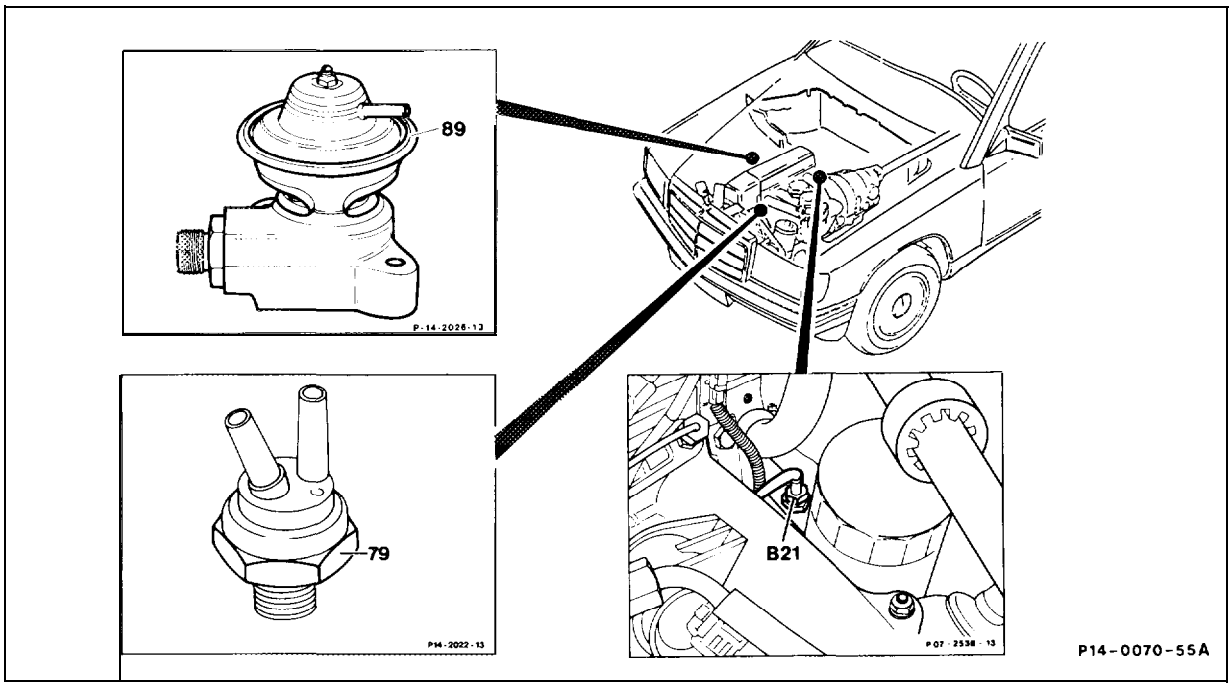


G3/2 Heated oxygen sensor

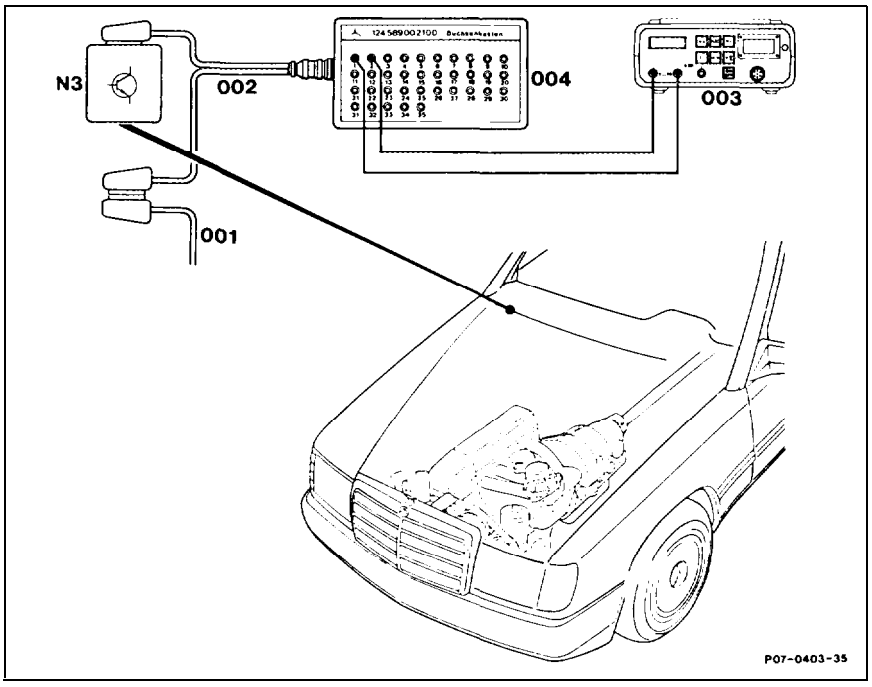
(USA) 1991 engine 102.985
The heated oxygen sensor (G3/2) is located close to the engine in the exhaust manifold. This enables it to reach its operating temperature sooner.
The exhaust gas recirculation valve (89) is positioned at the rear part of the exhaust manifold.



14-475 Testing exhaust gas recirculation (EGR) (USA) 1991



79	Thermovalve, opens at + 70°C, closes at + 60°C	B21	Exhaust gas recirculation temperature sensor (California only)
89	Exhaust gas recirculation valve		

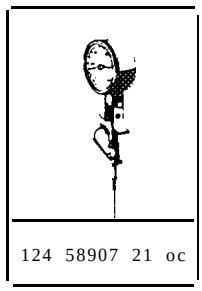


Connection diagram (California only)

001 CFI control module connector
002 Test cable
003 Multimeter
004 Contact box
N3 CFI control module

Test step	Test scope	Tester/ Test connection	Operation/ Requirement	Specification	Possible cause/Remedy
1.0	Function of monitoring signal **(California only)**	N3 7  22	Engine at operating temperature, 4000/min approx. 1 minute	< 4,7 V	No exhaust gas recirculation Temperature sensor faulty Wiring.
2.0	EGR valve (69) (static)	Ignition: **OFF** Vacuum tester connected to EGR valve	Apply 500 mbar vacuum Detach vacuum tester at EGR valve	 EGR valve should close audibly	 Replace EGR valve.
2.1	EGR valve (69) (dynamic)	Engine idling	Apply 500 mbar vacuum at EGR valve	Engine should run roughly	Replace EGR valve.
2.2	Vacuum supply for EGR valve	Vacuum tester connected to detached vacuum line	Engine sppeed > 4000/min	approx. 500 mbar	Check arrangement of vacuum lines (see function diagram), replace thermovalve.
3.0	Thermo-valve (79) a) shift points	Connect vacuum tester to angle connection, apply vacuum	Engine coolant temperature > 70 °C < 60 °C	 Passage **No** passage	 Replace thermovalve. Replace thermovalve.
	b) Leak-tightness	Connect vacuum tester straight connection	Apply 500 mbar vacuum	Vacuum must not drop	Replace thermovalve.

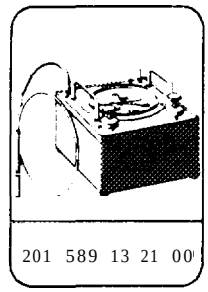
Special tools



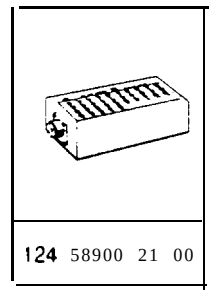
124 58907 21 oc

Hand vacuum pump
0 -1000 mbar

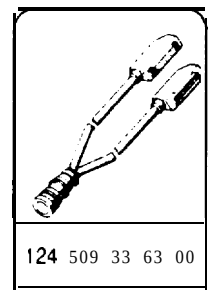
001 589 73 21 00



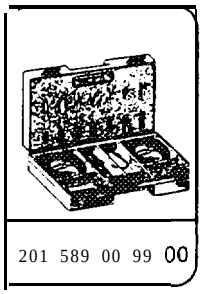
201 589 13 21 00



124 58900 21 00



124 509 33 63 00



201 589 00 99 00

Commercially available tools or testers

Designation	e.g., Make, Order No.
Multimeter	Sun, DMM-5
Engine tester	Bosch, MOT 002.02

14-487 General instructions for vehicles with catalytic converter (KAT)

Tow-starting or jump-starting

Tow-starting or jump-starting with another battery can be performed when the engine is cold and the catalytic converter system has cooled down. Repeated attempts at starting should be avoided, however. If the engine is at normal operating temperature and does not start **immediately,** do not make any further attempts to start the engine in order to protect the catalytic converter system.

Misfiring

If misfiring occurs, the pre-catalytic converters are particularly at risk as fuel/air mixture is converted in the hot catalytic converter. The pre-catalytic converters may thus be subjected to excessive thermal stresses. If misfiring occurs frequently, the engine may only be operated for a short time at low load. The cause of the problem should be immediately repaired. In cases of doubt, the catalytic converter should be examined for thermal damage after rectifying the problem at the ignition system.

Checking the catalytic converter system for thermal damage

If excessive thermal stresses occur, the pre-catalytic converters sustain damage first. This can be checked by visual inspection with the exhaust system removed. Complaints regarding performance after engine running problems indicate excessive thermal stress of the catalytic converter. Residues of the molten catalytic **converter** block the exhaust pipe.

Driving on the roller dynamometer

The pre-catalytic converter becomes red-hot more rapidly at high loads because of the greater heat dissipation. This is no reason for concern.

Fuel additives

These are not recommended for vehicles fitted with catalytic converters. Only the specified quality of fuel may be used.

Use of leaded fuel

If leaded fuel has been inadvertently used, the function of the lambda control should be checked. If the sensor is damaged, it must be replaced. If the emission level exceeds **< 0,5%** CO, the complete catalytic converter system should be replaced.

Engins oils

The same oil recommendations (approved products, oil change intervals, etc.) as for vehicles without catalytic converter apply to vehicles fitted with catalytic converter.

Obnoxious odors

Deposits of sulfur elements from the fuel in the catalytic converter **may** result in the formation of hydrogen sulfide. Even minute concentrations of hydrogen sulfide are extremely obnoxious, although not harmful to health.

Risk of fire (parking on premises)

The surfaces of the under-floor catalytic converters in our vehicles fitted with closed-loop catalysts are thermally insulated to ensure effective cleaning of the exhaust gases in all operating conditions. Provided the engine is operating correctly, no higher temperatures therefore occur than with conventional muffler systems. Excessive temperatures occur only if (e.g. as a result of faults in the ignition or injection system) uncombusted fuel/air mixture passes into the catalytic converter.

Disposlng of catalytic converters

Catalytic converters must not be disposed of as scrap. The catalytic converter contains valuable noble metals which can be recycled.

Details regarding return addresses and exchange prices are available at an authorized Mercedes-Benz dealer.