

09-050 Function of turbocharger

Turbocharger survey

Engine	Designation	Boost pressure at full load, 4000 rpm, gear lever position 3
602.96	Garrett TB 025 1990 or T 025 KKK K14 ²⁾	0.85-0.95 bar (13.75 - 14.25 psi)
603.96	Garrett TB 03 ¹⁾ ³⁾ or T 03 ¹⁾ ³⁾ KKK K24 ¹⁾ ³⁾	0.85-0.95 bar (13.75 - 14.25 psi)

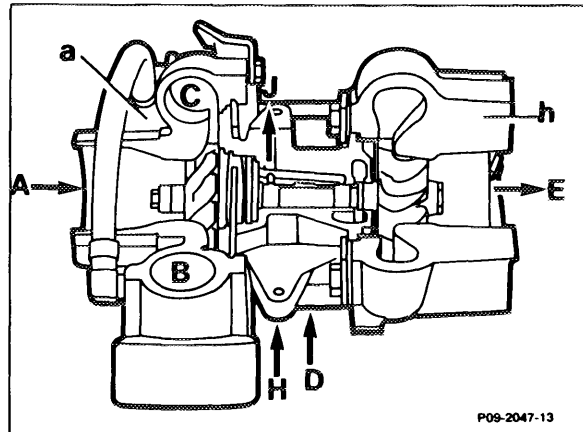
1) Optional

2) Production breakpoint at a later point in time
KKK = Kühnle, Kopp und Kausch.

3) For California with air recirculation valve.

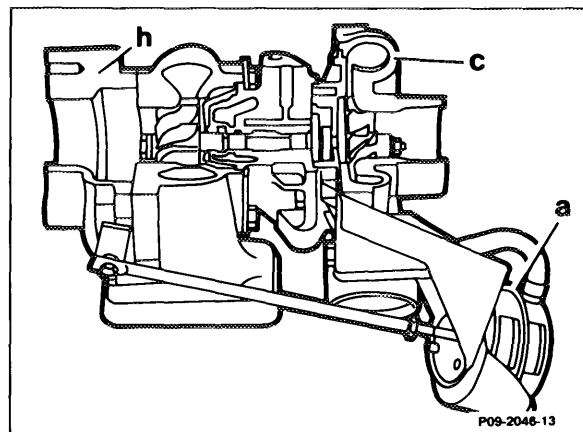
Engine 602.961, Garrett TB 025

- a Boost pressure control
- h Turbine housing valve
- A Fresh air inlet
- B Compressed air
- C Bypass passage
- D Exhaust inlet
- E Exhaust outlet
- H Oil feed
- J Oil discharge



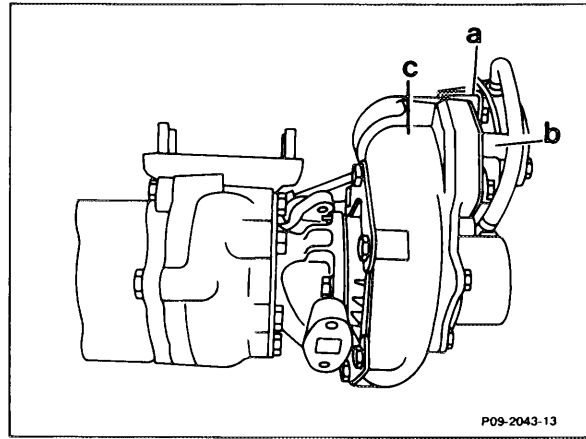
Engine 603.96, Garrett TB 03

- a Boost pressure control valve
- c Compressor housing
- h Turbine housing



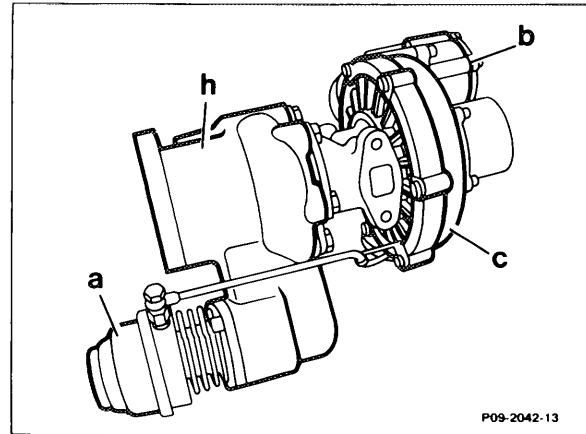
Garrett TB 03 with air recirculation valve

- a Boost pressure control valve
- b Air recirculation valve
- c Compressor housing



KKK-K24 with air recirculation valve

- a Boost pressure control valve
- b Air recirculation valve
- c Compressor housing
- h Turbine housing



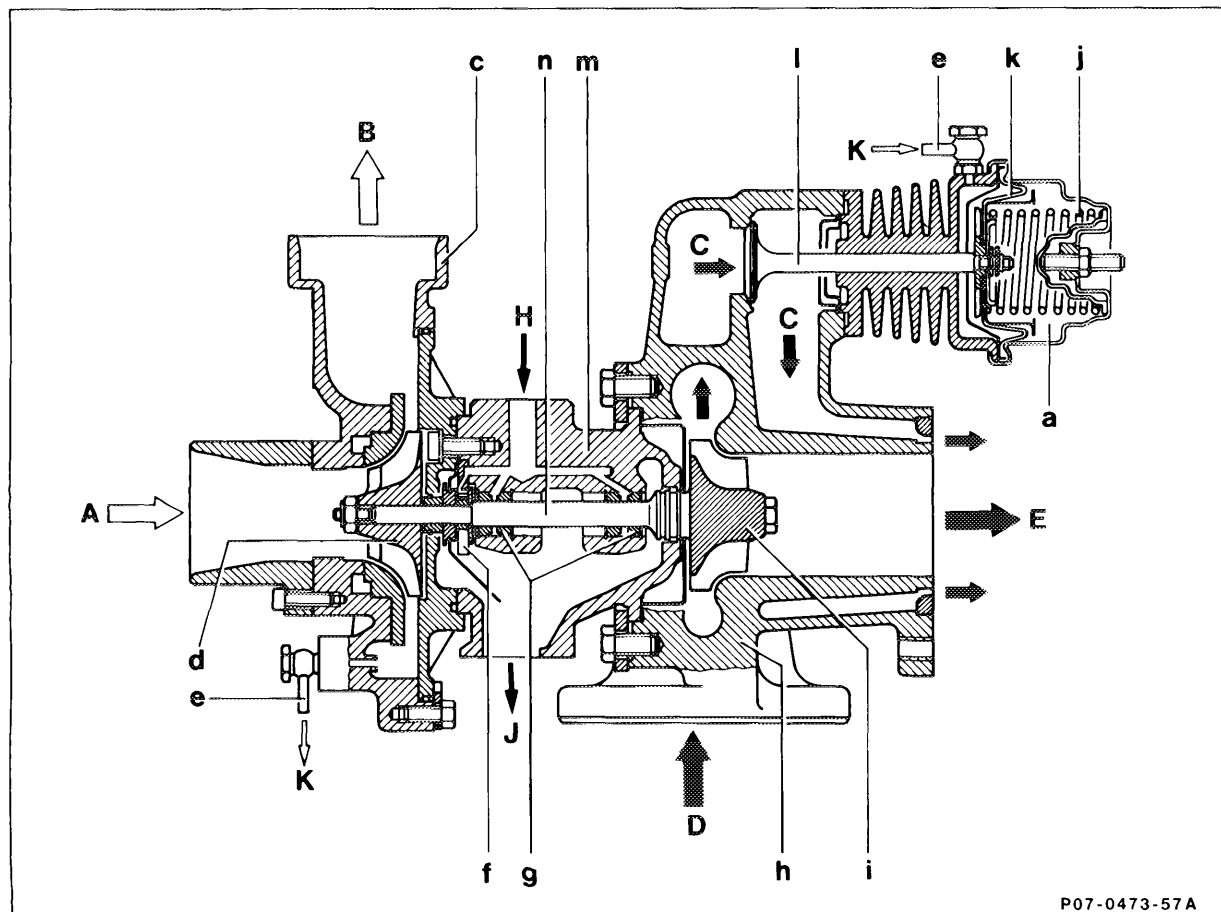
General

The exhaust gas turbocharger (EGT) is a flow machine. The energy of the engine exhaust gas is used for driving a turbine, which in turn drives a compressor through a shaft. The EGT is installed between the exhaust manifold and the exhaust pipe. It is connected to the engine oil circuit for lubrication and cooling.

A boost pressure control valve, fitted to the turbine housing or separately, ensures that a boost pressure of 0.95 bar is not exceeded. If a problem develops in the boost pressure control valve, engine failure is prevented by means of an engine overload protection system.

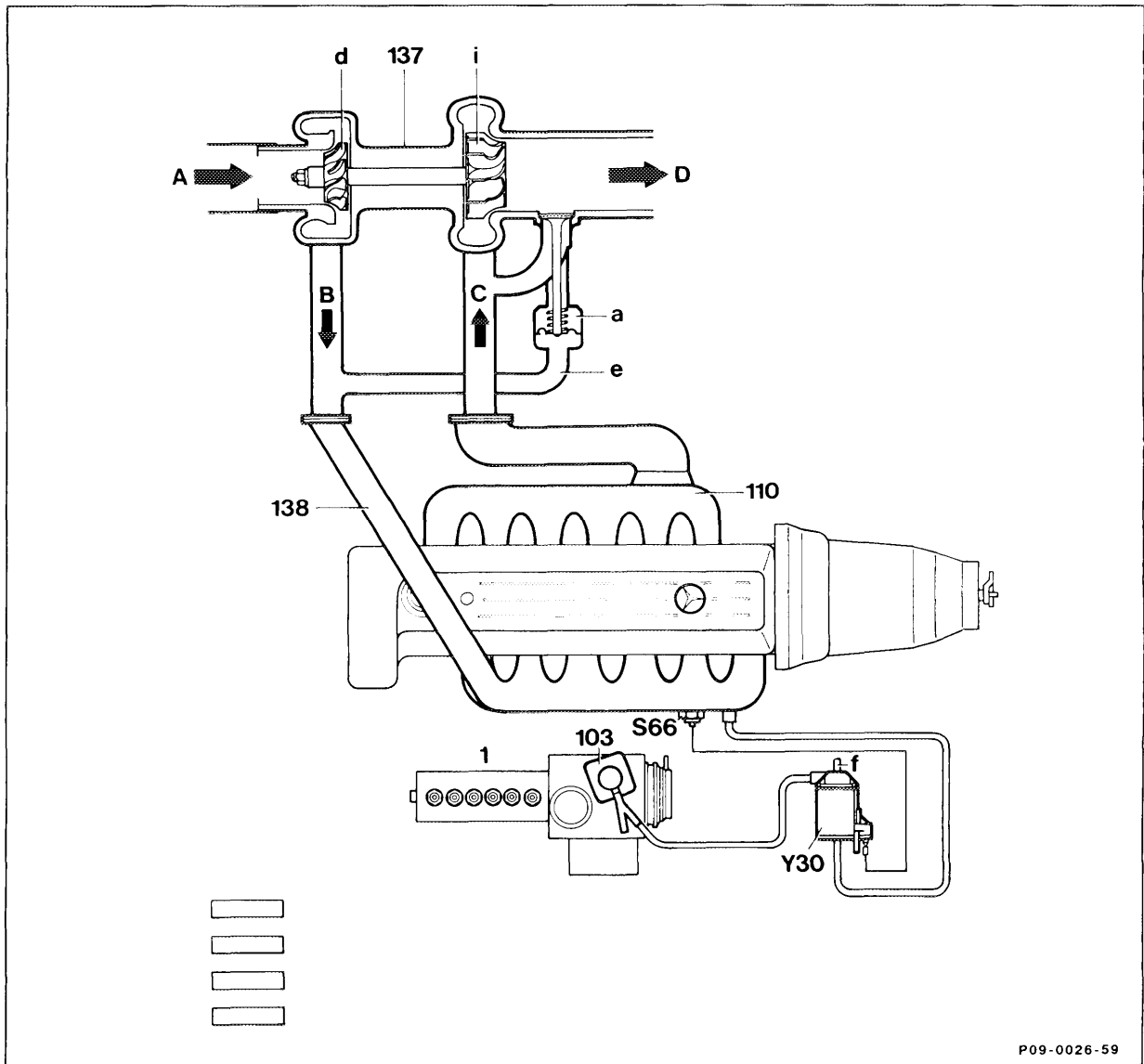
The exhaust gases of the engine are passed through the exhaust manifold into the turbine housing (h) and flow onto the turbine wheel (i). The flow energy of the exhaust gases starts the turbine wheel (i) rotating. This causes the compressor wheel (d) which is connected

through the shaft (n) to the turbine wheel (i) to be driven at the same speed. The maximum rotation speed is approx. 135,000 rpm. The fresh air drawn in by the compressor wheel (d) is compressed and sent to the engine.



Functional diagram turbocharger KKK K24 (Engine 603.96)

a	Boost pressure control valve	m	Charge housing
c	Compressor housing	n	Shaft
d	Compressor wheel	A	Fresh air inlet
e	Control line	B	Compressed air (to engine)
f	Axial bearing	C	Bypass passage/boost pressure control valve
g	Bearing bushing	D	Exhaust inlet
h	Turbine housing	E	Exhaust outlet
i	Turbine wheel	H	Oil feed
j	Spring	J	Oil discharge
k	Diaphragm	K	Control pressure
l	Valve		



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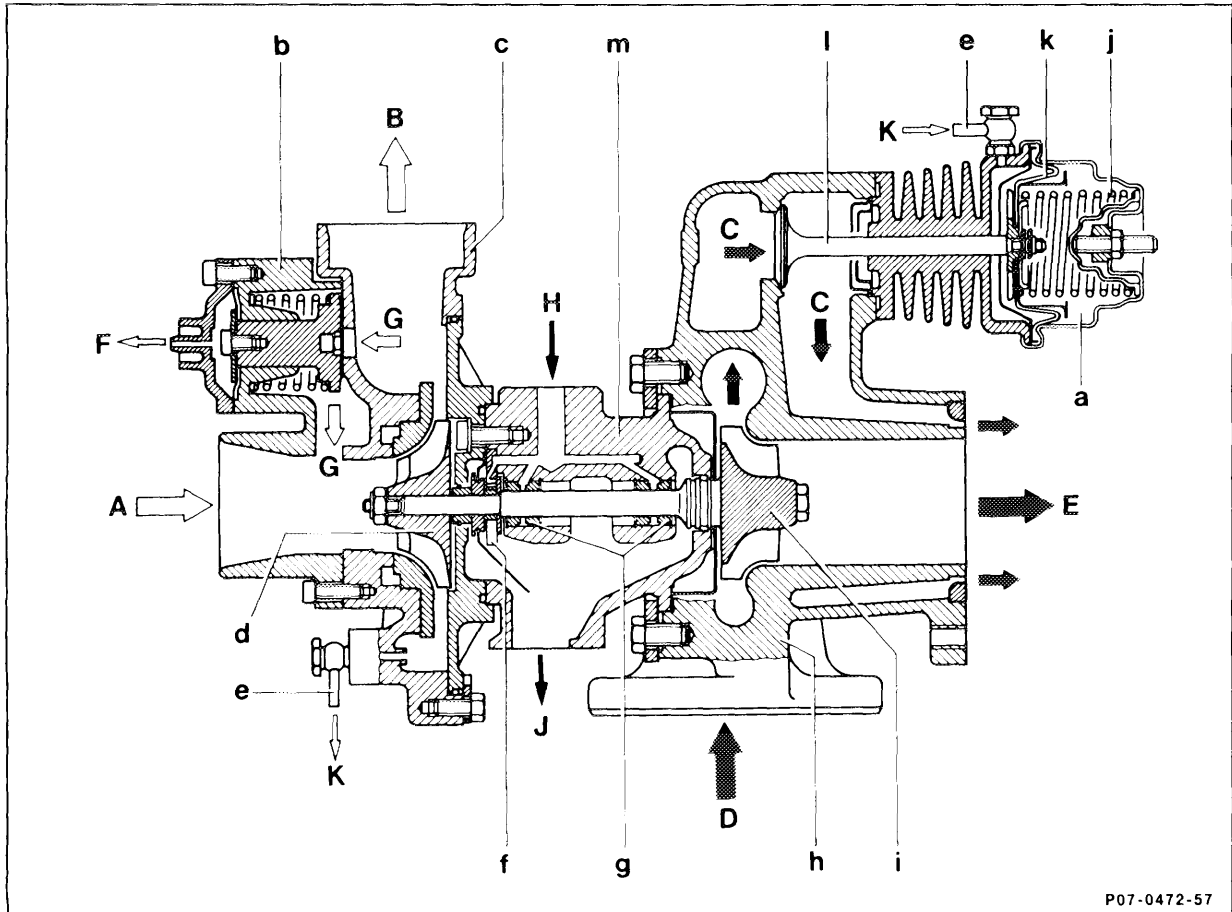
Function diagram

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|-----|---|---|------------------------------------|
| 1 | Injection pump | a | Boost pressure control valve |
| 103 | ALDA unit | d | Compressor wheel |
| 110 | Exhaust manifold | e | Control line |
| 137 | Turbocharger | f | Air admission |
| 138 | Charge air pipe | i | Turbine wheel |
| S66 | Pressure switch, engine overload protection | A | Compressor inlet (fresh air) |
| Y30 | Switch-over valve, engine overload protection | B | Compressor outlet (compressed air) |
| | | C | Exhaust gases to turbine wheel |
| | | D | Exhaust outlet |

Air Recirculation Valve

(refer also to EDS Operation No. 07.1-010)
 In order to create more favorable combustion conditions for the trap oxidizer, the air recirculation valve is continuously opened or closed in accordance with the performance

characteristic map.
 After the closing operation, a residual vacuum of approx. 30 mbar is retained at the air circulation valve.

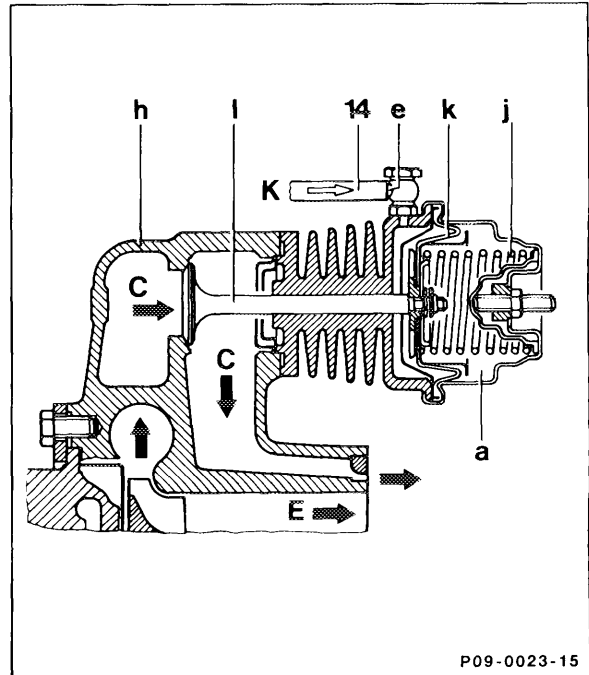


Function diagram turbocharger KKK with air recirculation valve California
 Model year 1986/87

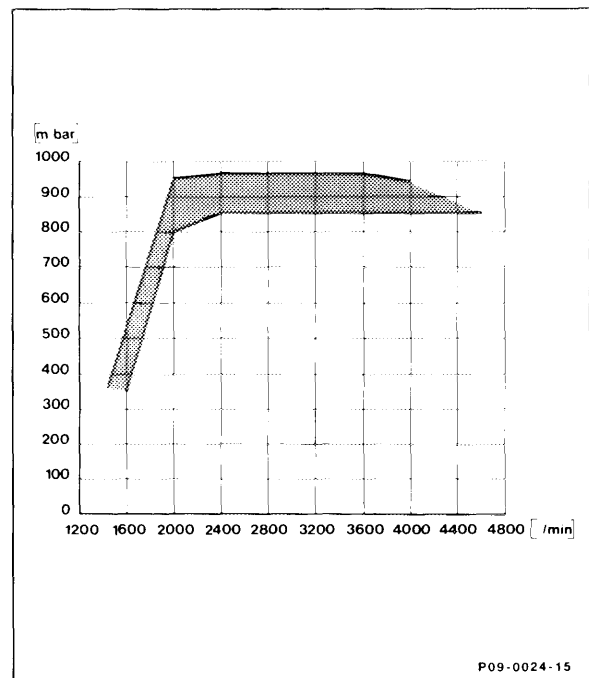
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|---|---|---|---|
| a | Control valve, exhaust gas control flap | A | Compressor inlet (fresh air) |
| b | Air recirculation valve | B | Compressor outlet (compressor air) |
| c | Compressor housing | C | Bypass passage, boost pressure control valve |
| d | Compressor wheel | D | Exhaust gas to turbine wheel |
| e | Connector hose | E | Exhaust gas outlet |
| f | Axial bearing | F | Vacuum connection to vacuum transducer |
| g | Bearing bush | G | Recirculated air |
| h | Turbine housing | H | Lubrication oil inlet |
| i | Turbine wheel | J | Lubrication oil outlet |
| j | Compression spring | K | Boost pressure (control valve exhaust gas control flap) |
| k | Diaphragm | | |
| l | Boost pressure control valve | | |
| m | Intermediate housing | | |

Boost pressure Control Valve (KKK)

To prevent the boost pressure from rising above a certain level, a boost pressure control valve (a) is attached to the turbine housing (h). The boost pressure is taken from the compressor housing and passed through the connecting hose (14) to the boost pressure control valve. When maximum boost pressure is reached, the boost pressure control valve begins to open and allows the exhaust gas to flow along the bypass passage (c). Part of the exhaust gas flows directly into the exhaust system, resulting in a constant boost pressure level.



- 14 Connecting hose
- a Boost pressure control valve
- e Control line
- h Turbine housing
- j Spring
- k Diaphragm
- l Valve
- C Bypass passage
- E Exhaust gas outlet



Boost pressure diagram - full load

Idle and Lower Part Load

No boost pressure occurs during idling and in the lower part load range; therefore, the engine operates as a naturally aspirated engine.

Upper Part Load and Full Load

As the engine load and speed increase, e.g. with an increase in the exhaust gas flow, the turbine wheel (i) is accelerated producing a boost pressure up to a certain value via the compressor wheel (d). The compressed charge air is passed through the charge air pipe to the individual cylinders. The boost pressure allows an increased quantity of fuel to flow through the ALDA unit at the injection pump.

Although boost pressure exists in the deceleration mode, fuel injection is stopped as a result of the control rod position (deceleration fuel cutoff).