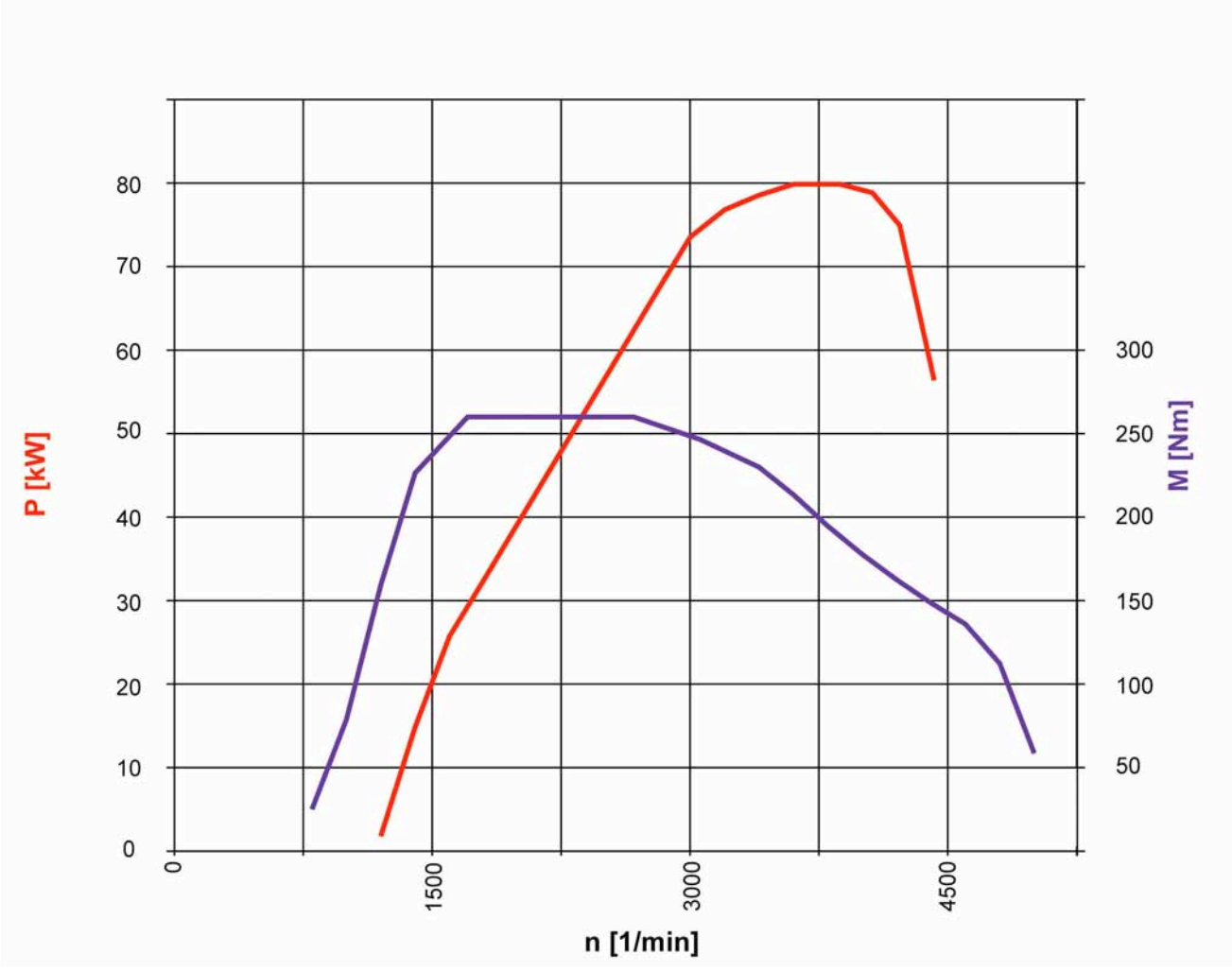
Description of engine OM 607

Engine data	Unit	OM 607.951 A 180 CDI
Rated output at engine speed	kW rpm	80 4000
Rated torque at engine speed	Nm rpm	260 1750-2500
Compression ratio ε		15.4:1



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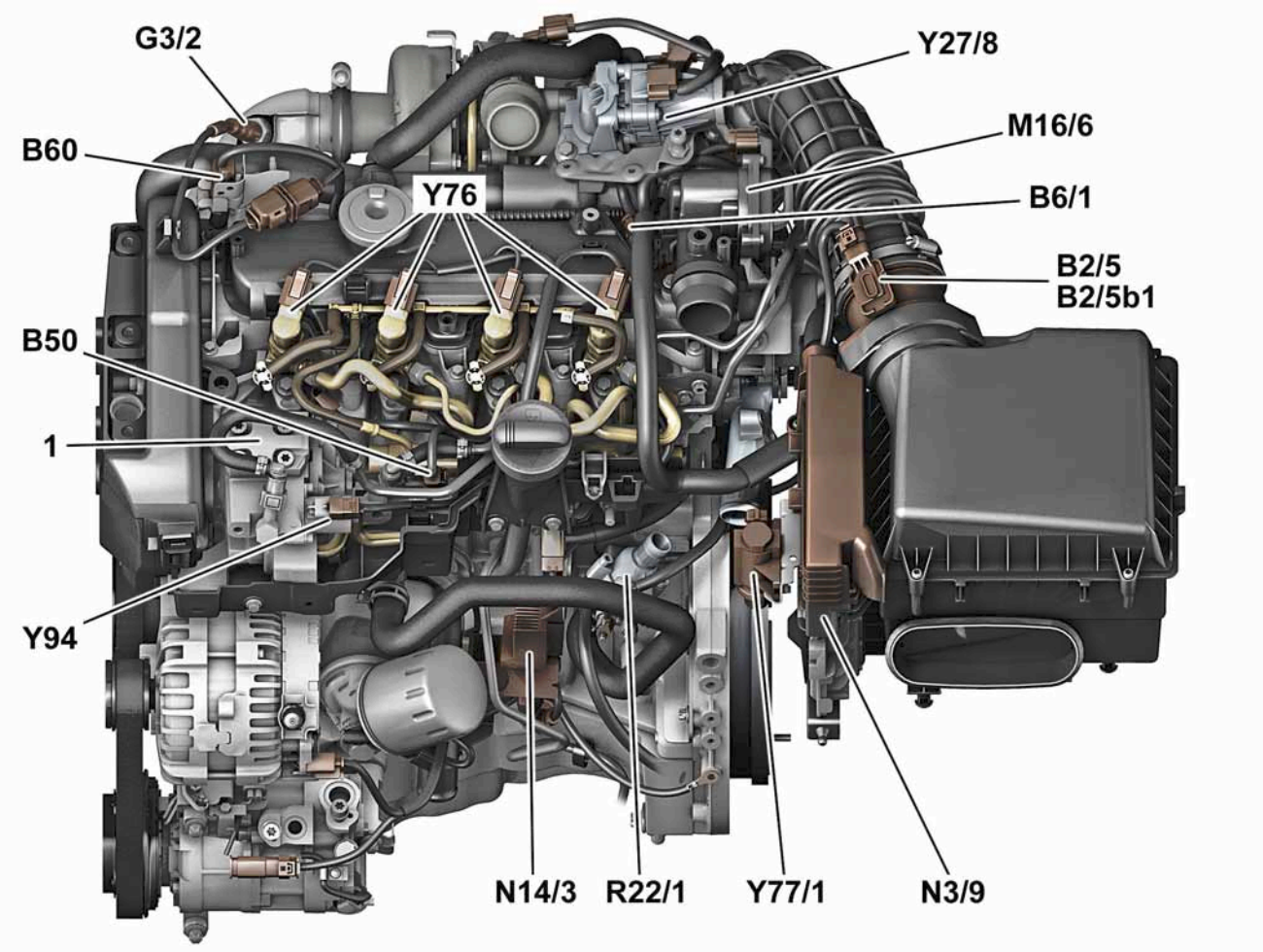
Performance graph

OM 607.951 (80 kW)

M *Torque*
P *Power output*
n *Rpm*

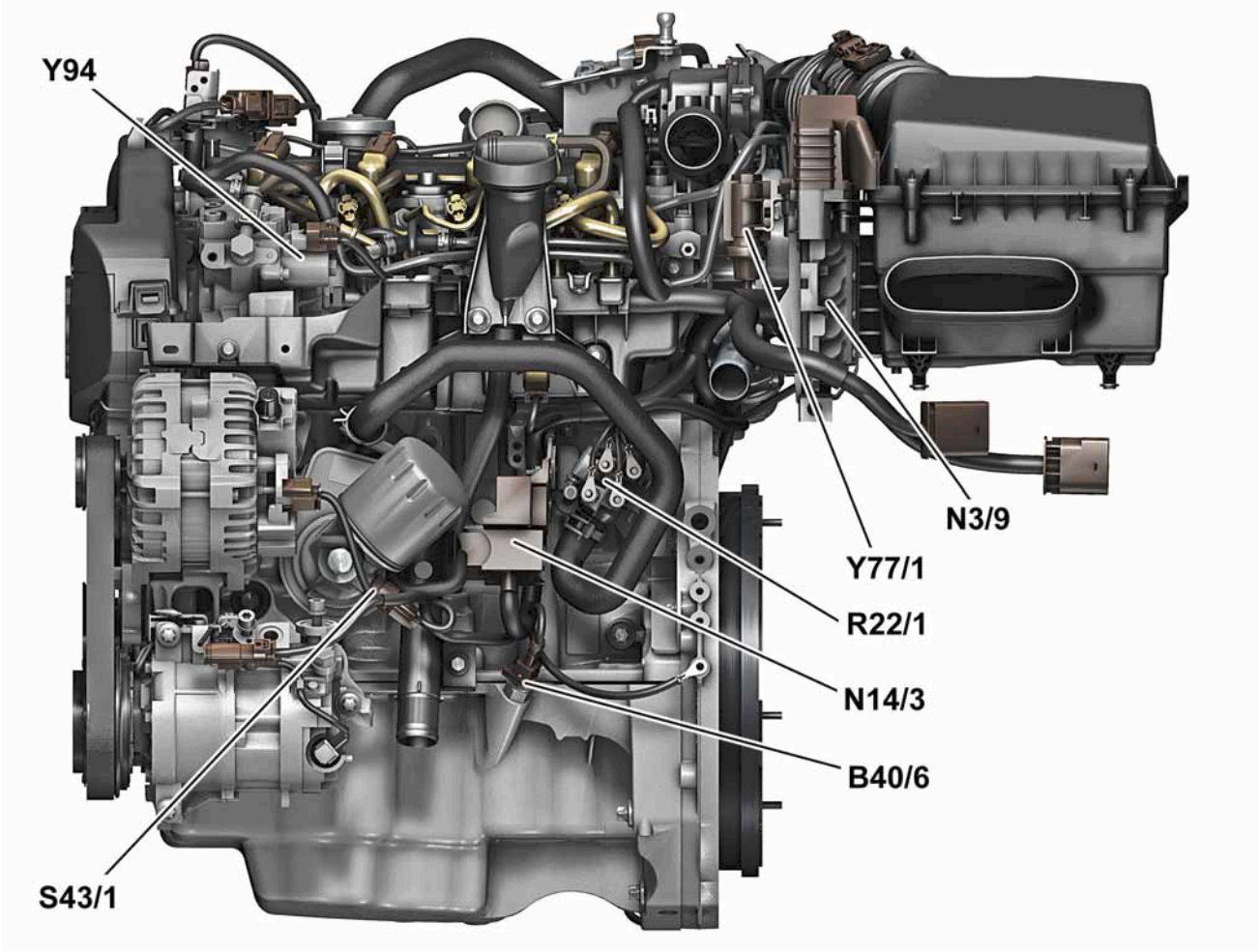


P07.16-3826-00

Top view of engine

1	*High-pressure pump*
B2/5	*Hot film MAF sensor*
B2/5b1	*Intake air temperature sensor*
B6/1	*Camshaft Hall sensor*
B50	*Fuel temperature sensor*
B60	*Exhaust pressure sensor*
G3/2	*Oxygen sensor upstream of CAT*
M16/6	*Throttle valve actuator*
N3/9	*CDI control unit*
N14/3	*Glow output stage*
R22/1	*DPF heater booster regeneration*
Y27/8	*High-pressure exhaust gas recirculation actuator*
Y76	*Fuel injectors*
Y77/1	*Boost pressure positioner*
Y94	*Quantity control valve*

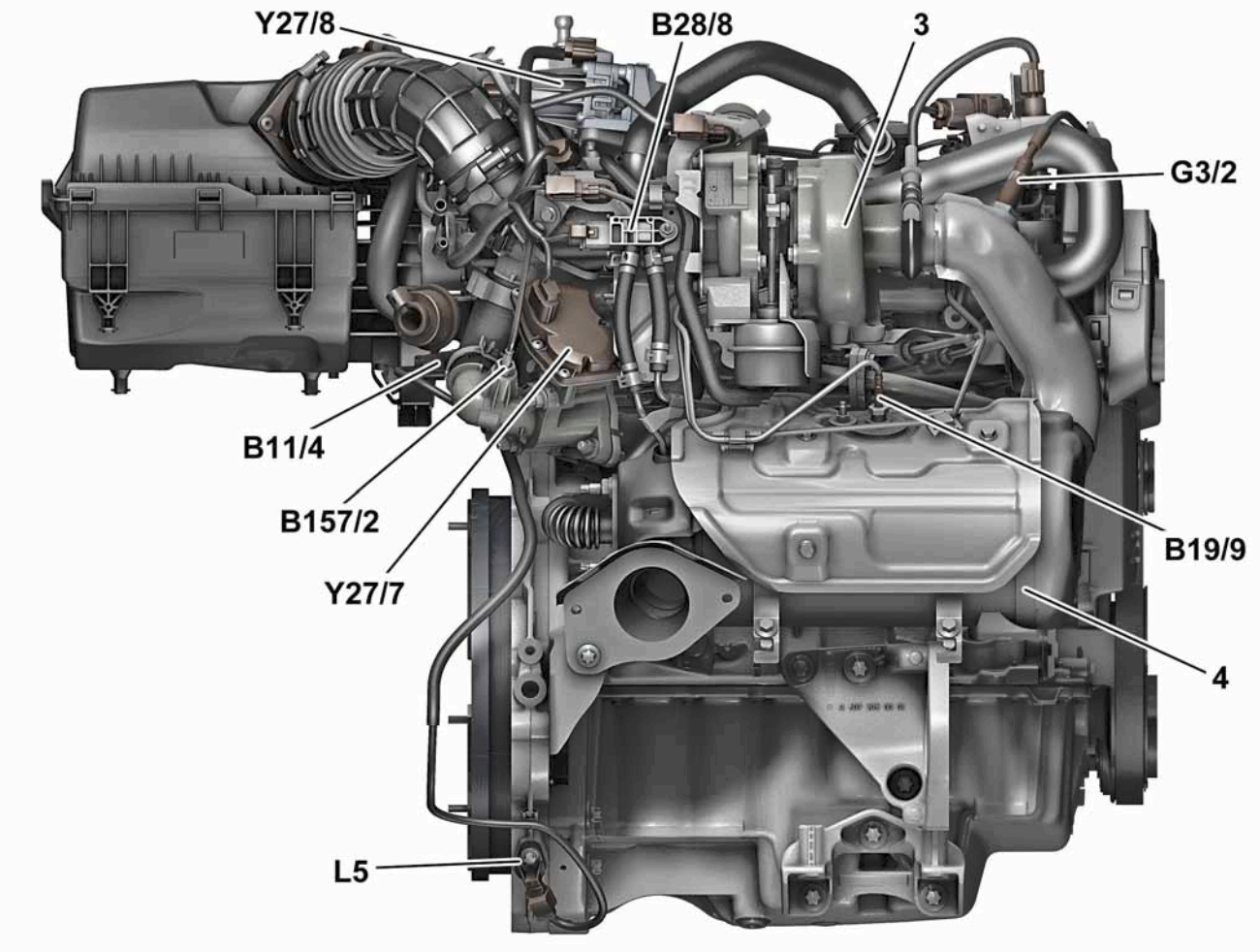
Description of engine OM 607



P07.16-3827-00

View of engine from front

B40/6 Engine oil fill level sensor
N3/9 CDI control unit
N14/3 Glow output stage
R22/1 DPF heater booster regeneration
S43/1 Oil pressure switch
Y77/1 Boost pressure positioner
Y94 Quantity control valve



P07.16-3828-00

View of engine from rear

3	*Turbocharger*
4	*Diesel particulate filter with oxidation catalytic converter*
B11/4	*Coolant temperature sensor*
B19/9	*Temperature sensor upstream of diesel particulate filter*
B28/8	*DPF differential pressure sensor*
B157/2	*EGR temperature sensor, low pressure*
G3/2	*Oxygen sensor upstream of CAT*
L5	*Crankshaft position sensor*
Y27/7	*Low-pressure exhaust gas recirculation actuator*
Y27/8	*High-pressure exhaust gas recirculation actuator*

Description of engine OM 607

Belt drive

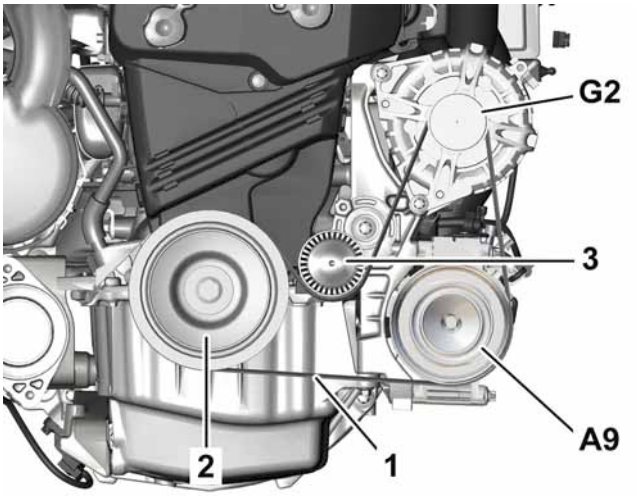
The alternator and the A/C compressor (when equipped with THERMATIC and THERMOTRONIC) are driven by a poly-V belt with six grooves.

Timing belt drive

New here is the use of a timing belt drive instead of a chain drive. The camshaft, coolant pump and the high-pressure pump are all driven by a toothed belt.

Note

Repair instructions for changing the toothed belt are available in the Workshop Information System (WIS).



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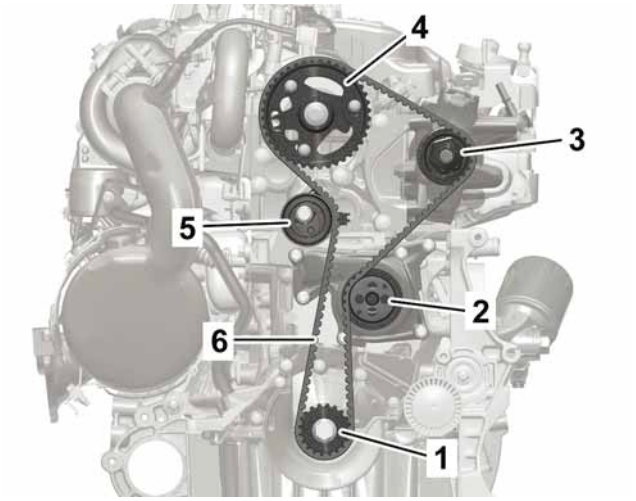
1 Poly-V belt
2 Vibration damper
3 Belt tensioner

A9 A/C compressor
G2 Alternator



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1 Crankshaft
2 Coolant pump
3 High-pressure pump
4 Camshaft
5 Belt tensioning pulley
6 Toothed belt

Turbocharging

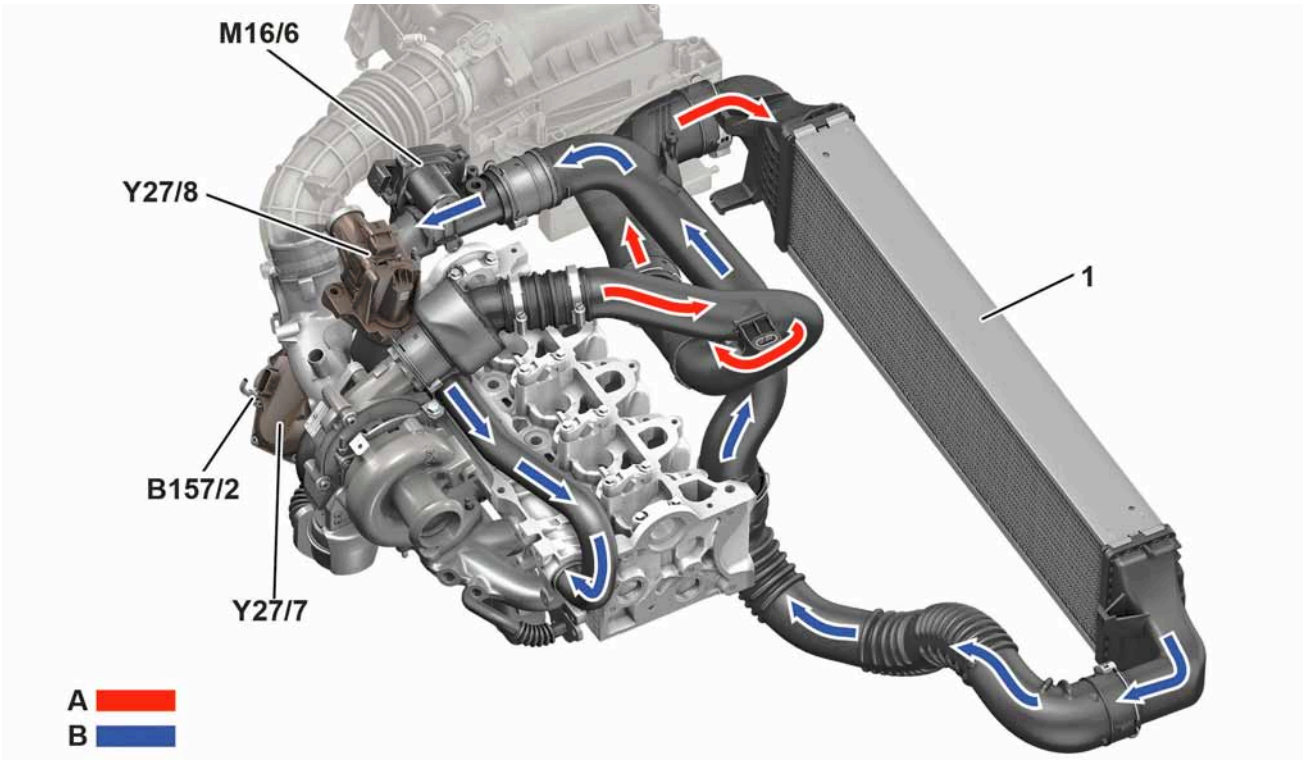
The charging improves the degree of cylinder charge. This in turn increases the engine torque and output.

In a supercharged engine the low pressure compression and expansion are undertaken by an upstream turbocharger. As a result the piston driving mechanism can be smaller with the same performance data, and this is coupled with fewer mechanical losses. The turbocharger sucks in fresh air through the air filter at the compressor inlet and routes it by way of the compressor outlet into the charge air pipe upstream of the charge air cooler. The high speed of the compressor impeller and the resulting high volumetric flow rate compresses the air in the charge air pipe.

The compressed and thereby heated air flows over the charge air pipe to the charge air cooler. This cools down the charge air and routes it over the charge air pipe to the cylinder head.

The boost pressure is regulated by the CDI control unit to match the following values and the relevant components:

- Charge air pressure and temperature sensor
- Coolant temperature sensor
- Temperature sensor upstream of turbocharger
- Crankshaft position sensor for engine rpm
- Injection quantity, dependent on injection period and fuel pressure
- Exhaust back pressure sensor
- Atmospheric pressure sensor



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Charging layout

M16/6 *Throttle valve actuator*
B157/2 *EGR temperature sensor, low pressure*
Y27/7 *Low-pressure exhaust gas recirculation actuator*
Y27/8 *High-pressure exhaust gas recirculation actuator*

1 *Charge air cooler*

A *Charge air (uncooled)*
B *Charge air (cooled)*

Description of engine OM 607

Boost pressure control

The boost pressure positioner is actuated for boost pressure control by the CDI control unit using a pulse width modulated signal (5 to 95%). This then continuously actuates the vacuum unit for boost pressure control with vacuum to match the duty cycle.

The adjustable guide vanes alter the flow cross-sectional area through which the exhaust flows onto the turbine. They adapt the gas pressure applied to the turbine to match the required boost pressure. The speed of the turbocharger determines the volume of pre-compressed air and therefore the boost pressure.

To act as protection against any thermal and mechanical overloading of the turbocharger, the exhaust temperature is monitored by the CDI control unit using the temperature sensor upstream of the turbocharger and the exhaust back pressure by the exhaust back pressure sensor. If a possible thermal or mechanical overload is recognized, the boost pressure is reduced.

Note

A bypass bore (0.24 mm) ensures that there is a constant opening in the ventilation (atmosphere) to the control pressure. This is why it is not possible to define a leak test for the boost pressure positioner. The boost pressure positioner function may be impaired by soiling of the integrated filter.

P07.16-3812-00

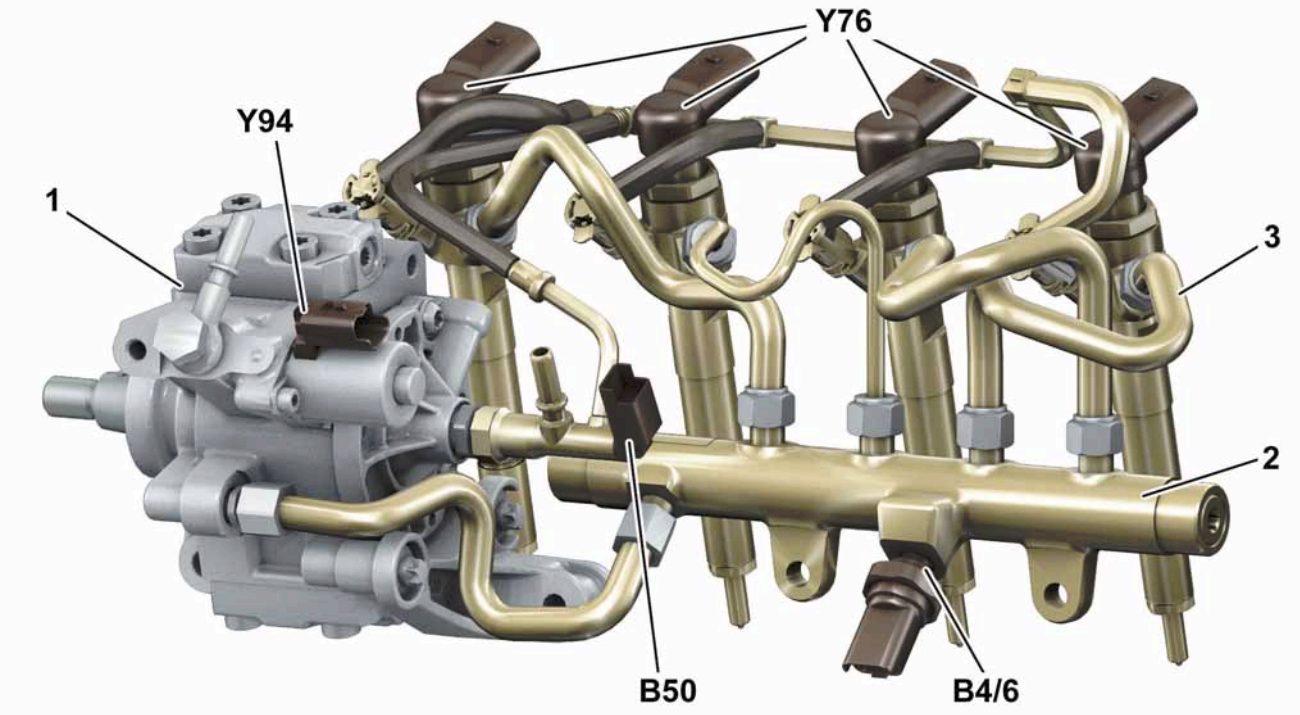
Y77/1 Boost pressure positioner

Injection system

The fuel injectors spray the fuel at high pressure into the respective cylinder. Each injected fuel quantity is dependent on the fuel pressure in the rail and the actuation period for the corresponding injection nozzle. The quantity control valve regulates the fuel quantity in the high-pressure pump.

Note

On engine 607 the fuel injectors are all coded with the IIC code from Continental, which is located on the head of the injection nozzle. This coding specifies the quantity characterization for each injection nozzle. If an injection nozzle is replaced, then this coding must be notified to the CDI control unit using Xentry Diagnostics.



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Fuel high-pressure circuit

1 High-pressure pump
2 Rail
3 High-pressure line
B4/6 Rail pressure sensor
B50 Fuel temperature sensor
Y76 Fuel injectors
Y94 Quantity control valve

Description of engine OM 607

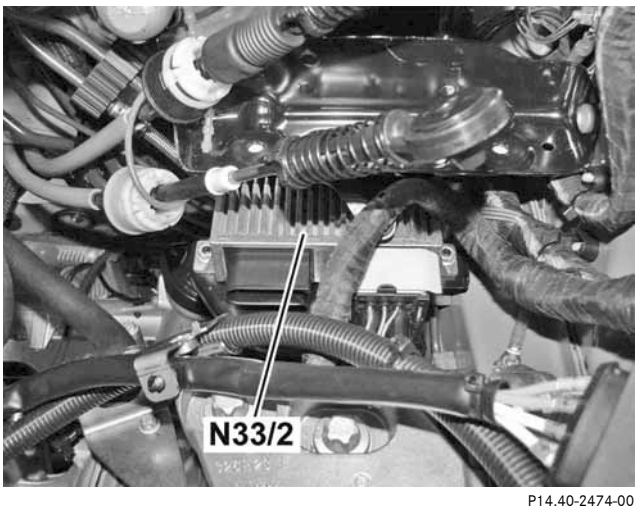
Post injection

Post injection is used to increase the exhaust temperature and to support the conversion process for the exhaust components in the oxicat and the regeneration of the diesel particulate filter (DPF). To do so the load condition of the diesel particulate filter is recorded with the aid of the differential pressure sensor (DPF).

New to the OM 607 are the heater booster DPF regeneration control unit and the heater booster DPF regeneration. Increasing the engine load through the heater booster diesel particulate filter boosts the post injection volume far enough to increase the exhaust temperature, and to ultimately trigger the diesel particulate filter's regeneration process. The soot particles in the exhaust are subsequently burnt off.

Heater booster DPF regeneration control unit

The heater booster DPF regeneration control unit is located under the battery box and actuates the heating elements of the heater booster DPF regeneration. It supports the thermal management as and when required, e.g. to enable the optimum operating temperature of the diesel particulate filter to be reached quicker so that the regeneration process can be executed.



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N33/2 Heater booster DPF regeneration control unit

Heater booster DPF regeneration

The heater booster DPF regeneration is located at the front right on the engine.

The coolant flowing through is heated by four heating elements and it is then routed to the coolant pump feed line.

Fuel preheating

To ensure that the fluidity of the diesel fuel is retained even at low outside temperatures, a heating element is installed for fuel preheating in the fuel filter housing.

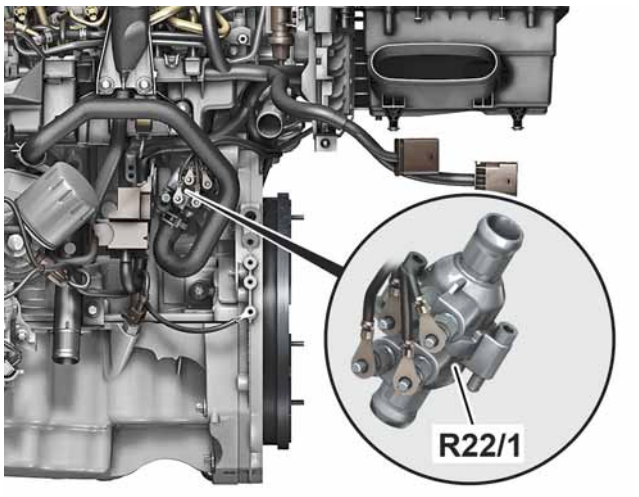
The fuel preheating control unit is located under the battery box.

The fuel preheating control unit actuates the heating element for the fuel filter heater as and when required, and it indicates the condensation level in the fuel filter.

The fuel heater control unit is actuated when a request is received from the CDI control unit over the battery sensor LIN (LIN B15) by the drivetrain control unit, and it activates the heating element for the fuel filter heater in the fuel filter module.

Note

The heating elements are integrated at the front of the engine in the cooling circuit.



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R22/1 DPF heater booster regeneration

Description of engine OM 607

Exhaust gas recirculation (EGR)

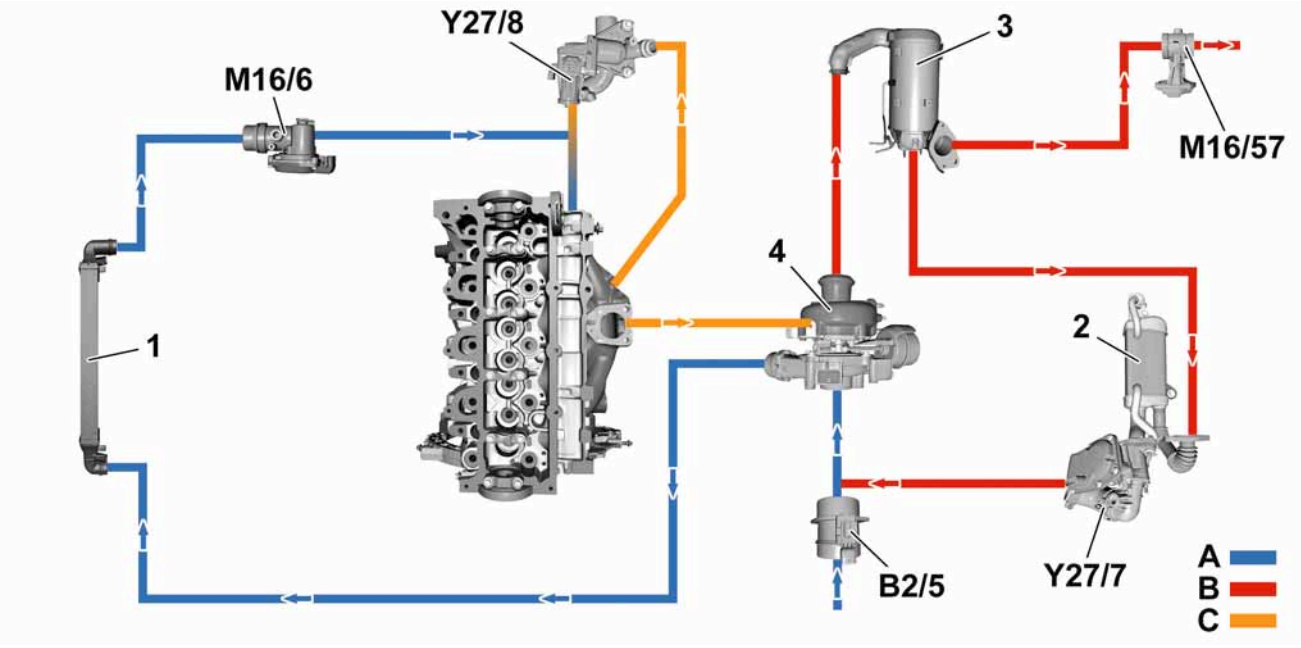
The EGR reduces the nitrogen oxide (NO_x) level in the exhaust.

The oxygen (O_2) concentration in the combustion chamber is reduced here. The combustion temperature is lowered due to reduction in the combustion speed and through the higher heat capacity of the recirculated exhaust in comparison to the intake air.

The EGR is active from idle speed up to the upper partial-load range. The EGR rate is determined relative to the engine load and engine rpm. The intake and air temperature, exhaust temperature and exhaust back pressure are also considered.

To do so, the CDI control unit in combination with the drivetrain control unit reads in signals from the following components:

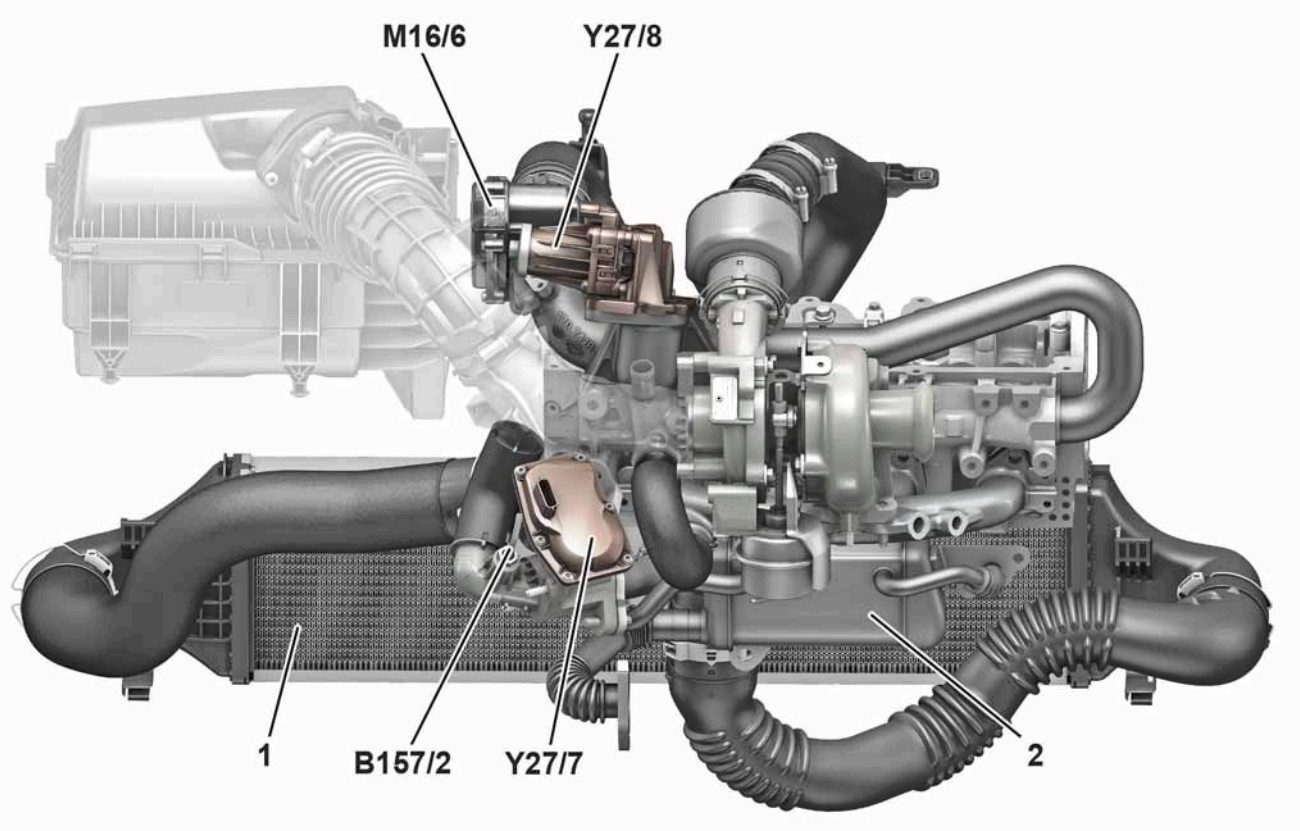
- B2/5 Hot film MAF sensor
- Intake air temperature sensor
- Charge air pressure and temperature sensor
- Temperature sensor upstream of turbocharger
- Accelerator pedal sensor
- Exhaust back pressure sensor
- Crankshaft position sensor
- Exhaust flap controller actuator motor
- High-pressure exhaust gas recirculation actuator
- Low-pressure exhaust gas recirculation actuator



Exhaust gas recirculation system, schematic

1 Charge air cooler
2 Exhaust gas recirculation cooler
3 Diesel particulate filter with oxidation catalytic converter
4 Turbocharger
A Intake air (fresh air)
B Exhaust (low pressure)
C Exhaust (high pressure)

B2/5 Hot film MAF sensor
M16/6 Throttle valve actuator
M16/57 Exhaust flap controller
Y27/7 Low-pressure exhaust gas recirculation actuator
Y27/8 High-pressure exhaust gas recirculation actuator



P14.20-2328-00

EGR layout

1 Charge air cooler
2 Low-pressure exhaust gas recirculation cooler

B157/2 EGR temperature sensor, low pressure
M16/6 Throttle valve actuator
Y27/7 Low-pressure exhaust gas recirculation actuator
Y27/8 High-pressure exhaust gas recirculation actuator

Description of engine OM 607

High-pressure circuit exhaust gas recirculation

The CDI control unit evaluates the input signals of the components involved. The stored characteristics map is then used as the basis for actuating the engine high-pressure exhaust gas recirculation actuator. The different ways of actuating the exhaust gas recirculation valves serve to regulate the untreated, recirculated exhaust gases.

The recirculated exhaust gases are routed into the charge air manifold on the cylinder head.

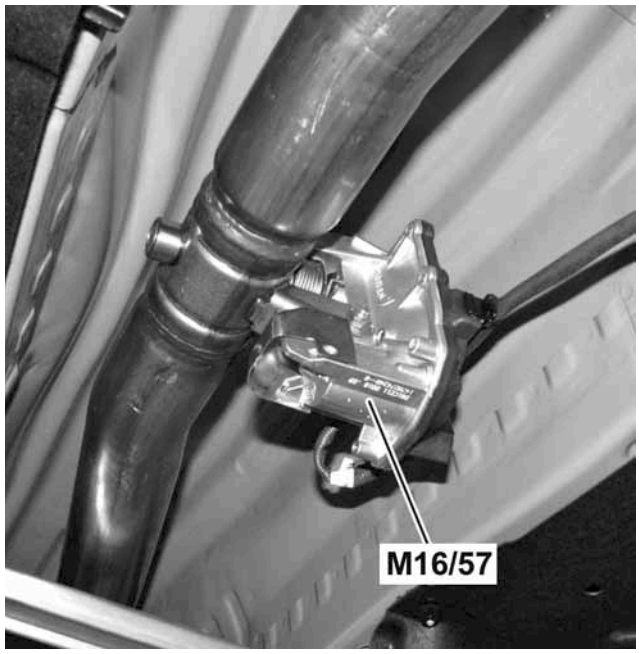
Low-pressure circuit exhaust gas recirculation

The exhaust gas recirculation actuator increases or reduces the volume of recirculated exhaust gas to match the degree of actuation by the CDI control unit.

The exhaust gas **cleaned** by the diesel particulate filter with oxidation catalytic converter is routed through the drivetrain control unit into the EGR cooler to match the actuation of the exhaust flap controller. The cooled gas is routed over the exhaust gas recirculation actuator downstream of the hot film MAF sensor into the air intake pipe.

Note

The exhaust gas recirculation actuators and the exhaust flap controller are monitored through their actual value potentiometers.



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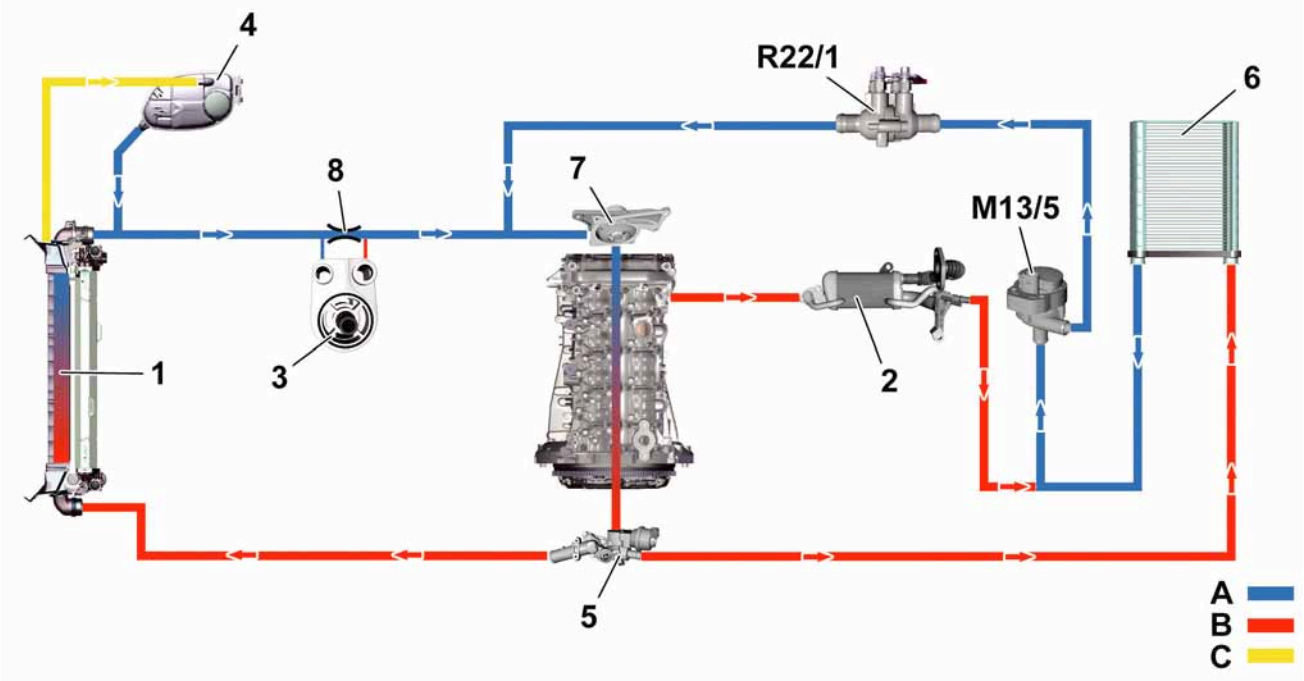
M16/57 Exhaust flap controller

Cooling system and coolant circuit

In diesel engine OM 607 a toothed belt is used to drive the coolant pump.

The coolant circuit cools the engine, engine oil – coolant heat exchanger and exhaust heat exchanger.



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Coolant circuit, schematic

1 Engine radiator
2 Exhaust gas recirculation cooler
3 Engine oil – Coolant heat exchanger
4 Coolant expansion reservoir
5 Thermostat
6 Heater heat exchanger
7 Coolant pump
8 Restrictor

M13/5 Residual heat pump (with code (581) Comfort automatic air conditioning and code (228) Stationary heater)
R22/1 DPF heater booster regeneration

A Low temperature cooling circuit
B High-temperature cooling circuit
C Coolant circuit ventilation

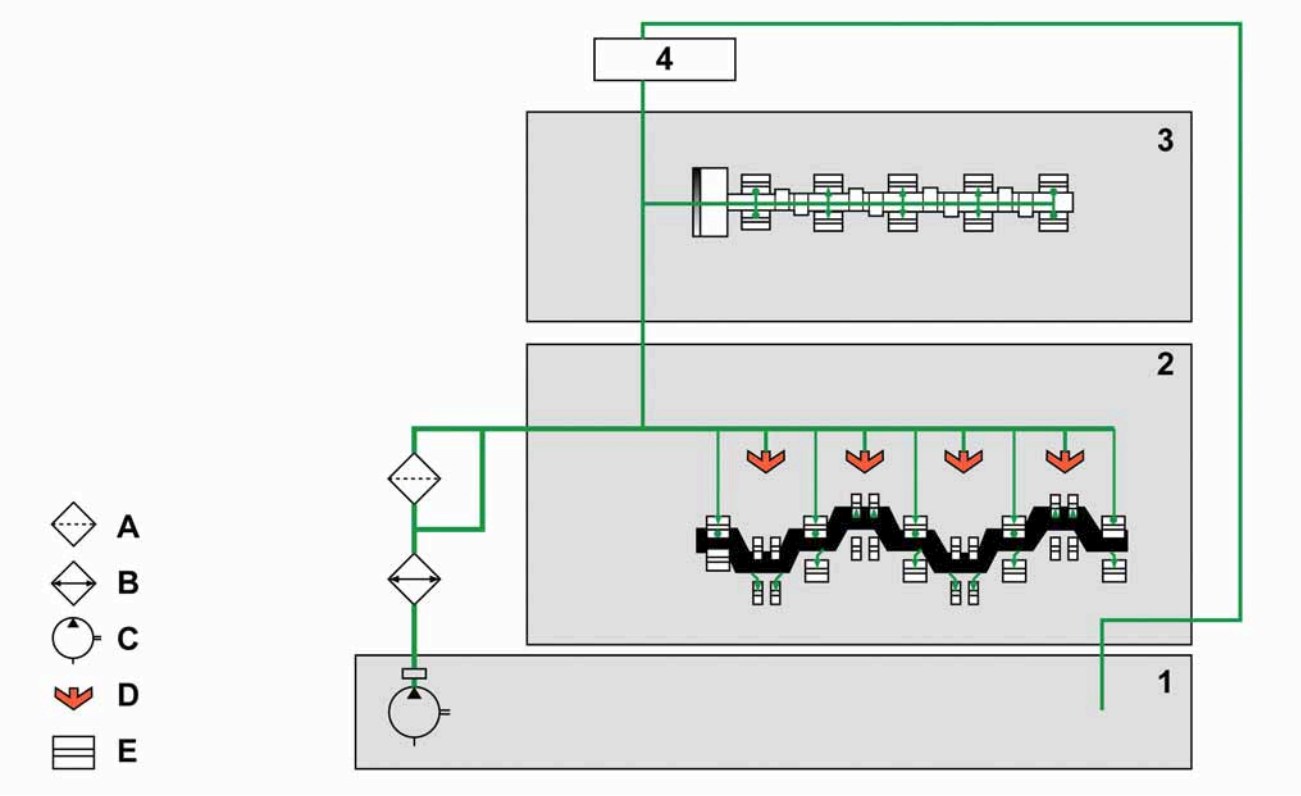
Description of engine OM 607

Oil circuit

A volume-controlled oil pump supplies the oil circuit with engine oil as and when required.

This configuration enables a lower amount of energy to be used for the oil supply and it also reduces consumption/CO_2 levels.

The oil pan is made of an aluminum alloy to save weight.



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Oil circuit diagram

1 Oil pan
2 Crankcase
3 Cylinder head
4 Turbocharger

A Oil filter
B Engine oil – Coolant heat exchanger
C Oil pump
D Oil spray nozzle
E Plain bearing

Engine oil fill level sensor

The OM 607 engine is equipped with an engine oil fill level sensor in the front of the engine oil pan. It measures the current oil level in the oil pan using a hot wire.

The measuring principle of the fill level sensor is based on measuring the voltage U_1 and U_2 at the terminals of the sensor within a specified period of time. The sensor consists of a hot wire which is immersed in the oil. The oil level can be calculated from voltage U_1 and U_2 and the battery voltage V_{bat}. Current only flows through the sensor for the duration of the measurement.

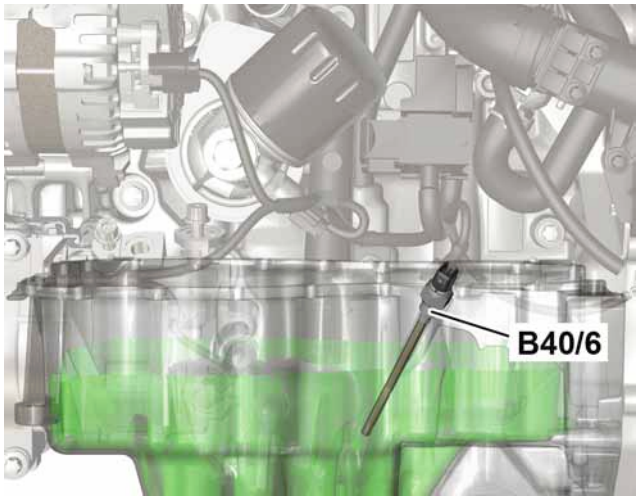
For a time period of t_1=0.875 s a constant current of I_TP=210.5 mA passes through a hot wire thereby heating it up.

The voltage applied to the connections is measured at the start of current flow (U_1) and after a time period of t_1 (U_2). To ensure that the current flow is constant the measuring points have to be adapted accordingly, cf. dotted lines.

The difference in the two voltage values determines how much of the hot wire is immersed in oil.

To ensure that conditions are stable, the supply voltage (V_{bat}) is recorded at each of the measuring points, it will not be directly incorporated into the calculation however.

The measurement will be conducted once as of circuit 15 (ignition ON) and at engine OFF. If the engine is started before the measurement has run its course, the measurement will be aborted.



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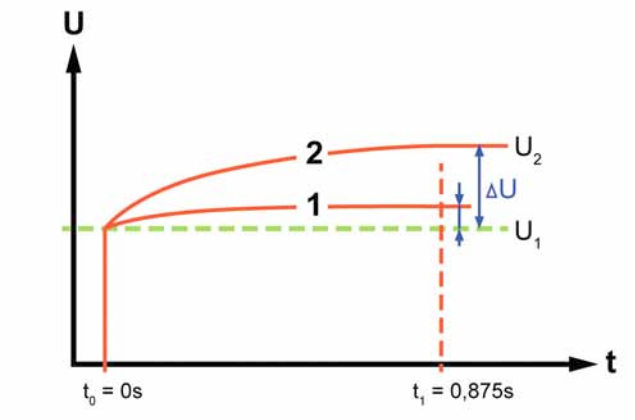
B40/6 Engine oil fill level sensor



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Fill level sensor measuring principle

1 Higher oil level
2 Lower oil level
t Time
U Voltage
U_1 Start of voltage measurement
U_2 End of voltage measurement
U Voltage difference

Description of engine OM 607

CDI control unit

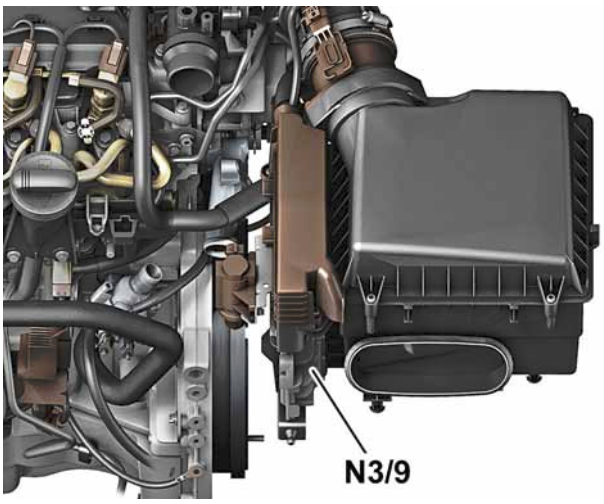
The CDI control unit and the drivetrain control unit in combination with the OM 607 engine's sensors and actuators forms the "CONTINENTAL SID 307" engine control system.

The CDI control unit actuates and coordinates the input signals for the following system and functions accordingly:

- Fuel supply
- Glue system control
- Injection quantity control
- Diagnosis and fault storage
- Drive authorization system (DAS) and immobilizer
- Thermal management
- Torque harmonization interface
- Exhaust gas recirculation
- Exhaust treatment

Note

The CDI control unit is mounted to the air filter housing and it is equipped with an internal atmospheric pressure sensor.



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N3/9 CDI control unit

Drivetrain control unit

The drivetrain control unit is located at the front left behind the instrument panel.

The drivetrain control unit on the OM 607 engine acts as an interface between the CDI engine control unit and the CAN network.

The following components, functions and systems are controlled and coordinated:

- Alternator control
- Fuel preheating
- Radiator shutters
- Fan motor
- Manual transmission position sensor
- ECO start/stop function
- Engine start

P54.21–3317-00

N 127 Drivetrain control unit

General

The exhaust system in all the engine variants consists of high-quality, corrosion-resistant chromium and chromium-nickel steels which ensure a long service life.

On the gasoline engine the exhaust system is equipped with a standard connecting point between the decoupling element and front muffler as well as a replacement-part connecting point between the front and rear muffler.

On the diesel engine the standard connecting point is located between the oxidation catalytic converter and the decoupling element.

Gasoline engine M 270 DEH

The exhaust system of gasoline engine M 270 consists of:

- Catalytic converter
- Decoupling element
- Front muffler
- Rear muffler

On the basic model, the exhaust flows out of the rear muffler, which has a shell design, through a tailpipe which is located in a concealed position behind the bumper. Depending on the equipment package involved, a twin-pipe exhaust system with two visible exhaust tips is installed.

Diesel engine OM 651

The exhaust system of the 4-cylinder OM 651 diesel engine consists of:

- Decoupling element
- Oxidation catalytic converter
- Diesel particulate filter
- Rear muffler

All diesel models feature a diesel particulate filter (DPF) as standard. Some national versions may deviate from this due to different emissions standards.

Catalytic converter system with particulate filter

The catalytic converter system includes a shared housing in the underfloor, which contains an oxidation catalytic converter with a particulate filter behind it. The particulate filter is made of silicone carbide and is able to filter solid particles out of the exhaust gas at separation rates of over 98% relative to the particulate mass.

Exhaust system

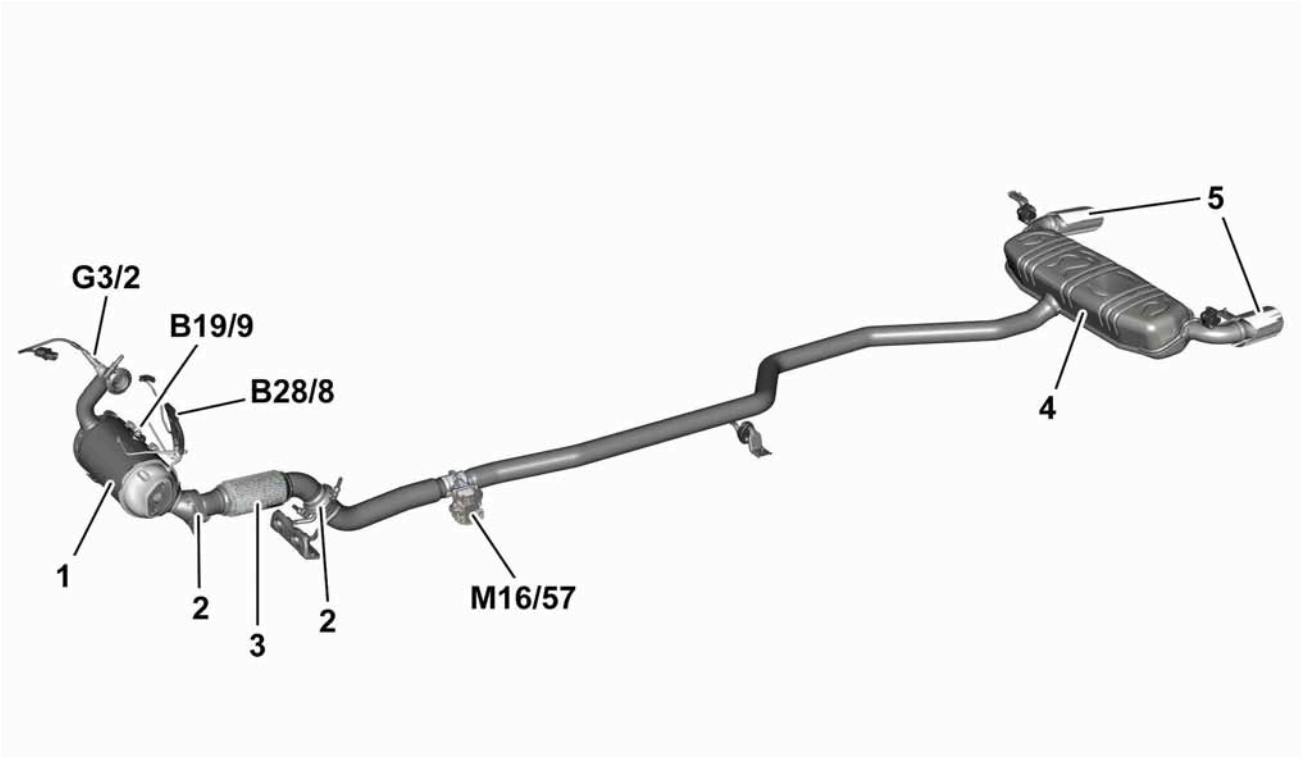
Diesel engine OM 607

The OM 607 engine in the new A-Class is equipped with a newly-developed exhaust system to fulfill the EU 5 emissions standard.

The exhaust system consists of:

- Decoupling element
- Oxidation catalytic converter
- Diesel particulate filter
- Exhaust gas recirculation cooler
- EGR line
- Exhaust flap with exhaust flap controller
- Rear muffler

The rear end piece is formed by an invisible single-pipe tailpipe (basic model) or two visible tailpipes with oval tip (depending on equipment package).



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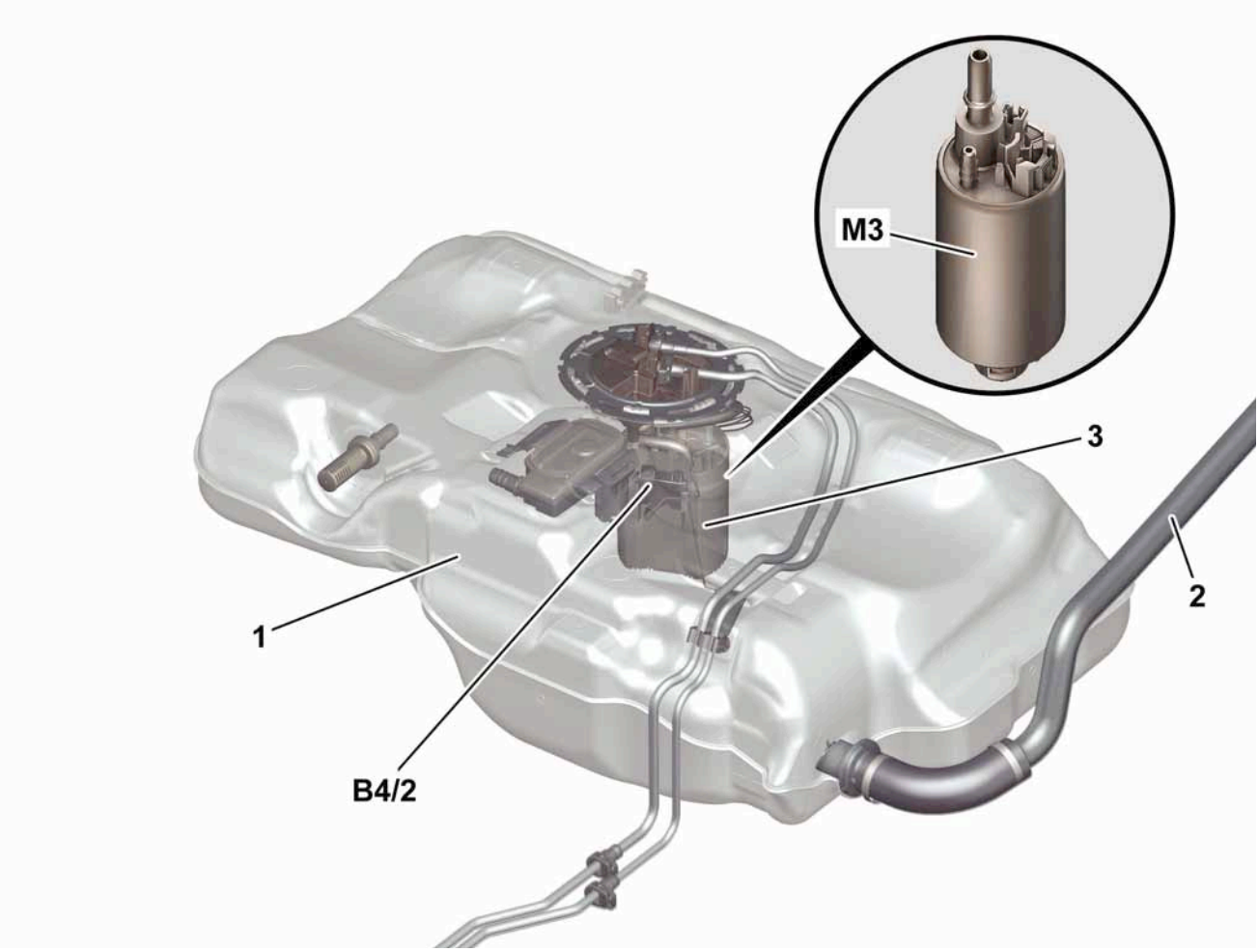
Exhaust system for diesel engine OM 607, EU 5 version

1 Oxidation catalytic converter/diesel particulate filter
2 Standard connecting point
3 Decoupling element
4 Rear muffler
5 Exhaust tip

B19/9 Temperature sensor upstream of diesel particulate filter
B28/8 Diesel particulate filter differential pressure sensor
G3/2 Oxygen sensor upstream of CAT
M16/57 Exhaust flap controller

The fuel tank is located in front of the rear axle under the rear bench seat. A blown High Density Polyethylene (HDPE) fuel tank is used. The tank has multilayered wall structure (seven layers of plastic) as protection against hydrocarbon vapors.

The filling capacity of the fuel tank is 50 liters. This includes a reserve of roughly 6 liters. The fuel filler flap is located at the left rear. No expansion reservoir is required because the expansion volume is in the tank itself.



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Fuel tank for OM 607 diesel engine

1 Fuel tank
2 Filler neck
3 Fuel feed module
B4/2 Fuel tank fill level sensor fuel level indicator, right
M3 Fuel pump