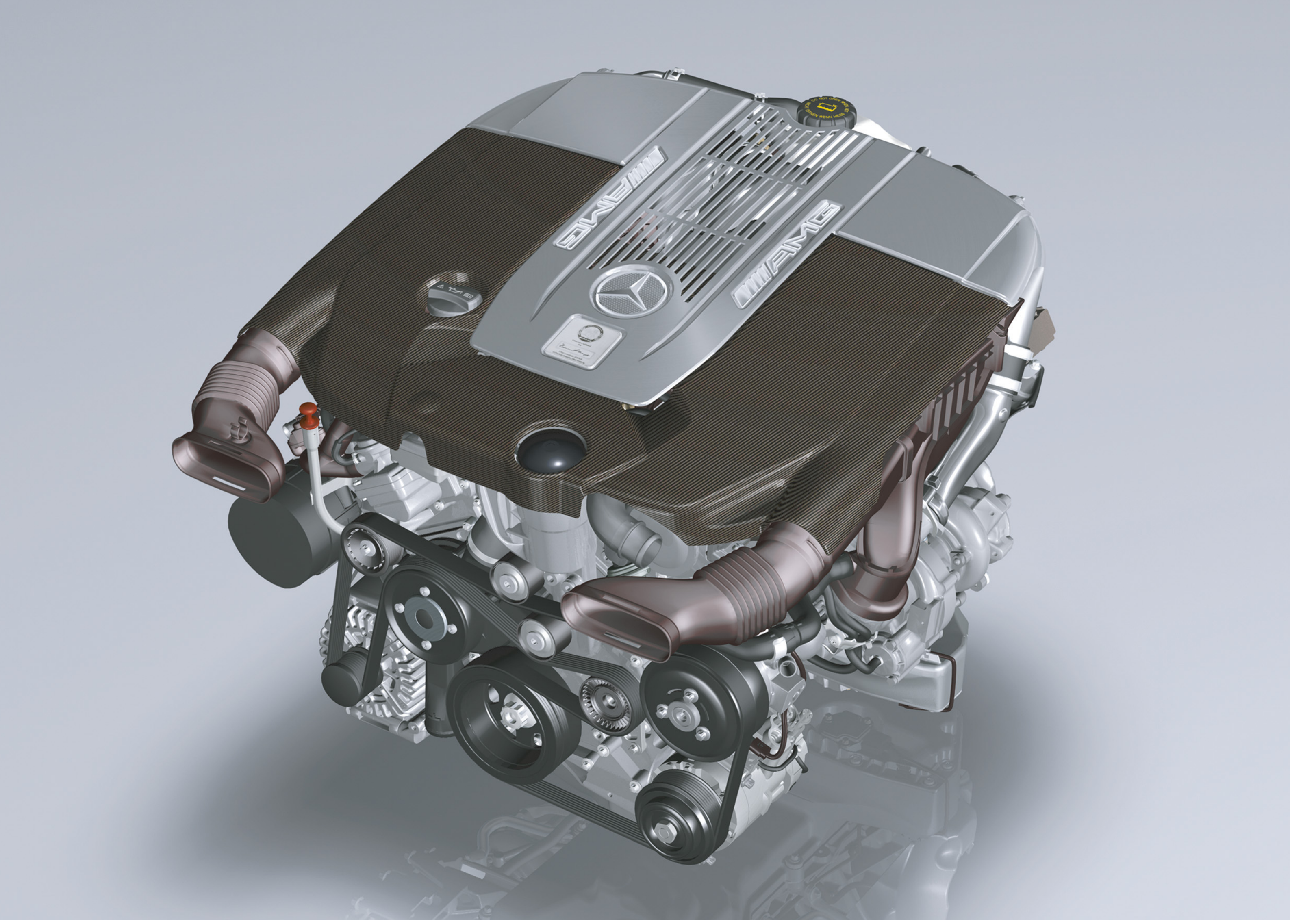

Introduction of the New V12 Biturbo Engine M 279 AMG

Introduction into Service Manual

AMG

Mercedes-Benz

Introduction of the New V12 Biturbo Engine
M 279 AMG

Daimler AG · Technical Information and Workshop Equipment (GSP/OR) · D-70546 Stuttgart

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Dear reader,

This Introduction into Service manual presents the new V12 biturbo engine M 279 from Mercedes-AMG in the vehicle model series 231.

The purpose of this brochure is to acquaint you with the technical highlights of this new engine in advance of their market launch. This brochure is intended to provide information for people employed in service or maintenance/repair as well as for aftersales staff. It is assumed that the reader is already familiar with the engines in the various Mercedes-Benz models currently on the market.

This Introduction into Service manual is not intended as an aid for repairs or for the diagnosis of technical problems. For such needs, more extensive information is available in the Workshop Information System (WIS) and Xentry Diagnostics.

WIS is updated continuously. Therefore, the information available there reflects the latest technical status of our vehicles.

This Introduction into Service manual presents initial information relating to the new engine and, as such, is not stored in WIS. The contents of this brochure are not updated. No provision is made for supplements.

We will publicize modifications and new features in the relevant WIS documents. The information presented in this Introduction into Service Manual may therefore differ from the more up-to-date information found in WIS.

While this brochure's technical content is valid as of our publication date in April 2012, actual production vehicles may incorporate revisions and design changes based on differing technical specifications.

Daimler AG

Technical Information
and Workshop Equipment (GSP/OR)

Highlights

In September 2012 Mercedes-AMG will introduce the new 12-cylinder V-engine M 279 AMG in the new SL-Class (model series 231).

This advanced V12 engine with the model designation M 279 focuses rigorously on performance and fuel efficiency in equal measure. It replaces the successful unit of engine model M 275.

Numerous combustion-related and applicational optimizations have significantly reduced fuel consumption and emissions while simultaneously increasing engine performance. Also helping to improve emission levels and fuel economy is the new AMG SPEEDSHIFT PLUS 7G-TRONIC with second-generation "Controlled Efficiency" start/stop function including alternator management, which has been modified to cope with the high torque of the M 279 AMG.

The main features of the V12 biturbo engine M 279 AMG in brief:

- Two modified turbochargers with air/water intercooling and wastegate valve
- New engine control unit
- New dedicated ignition coils (dual ignition) with multispark ignition process
- Full-aluminum crankcase with pulsation bores
- One-piece chain drive
- Forged crankshaft made of high-quality alloy steel
- Re-engineered forged pistons
- Roller-type cam followers
- Two intake valves and one exhaust valve per cylinder
- Hollow-stemmed exhaust valves with sodium filling
- Low-temperature circuit with expansion reservoir

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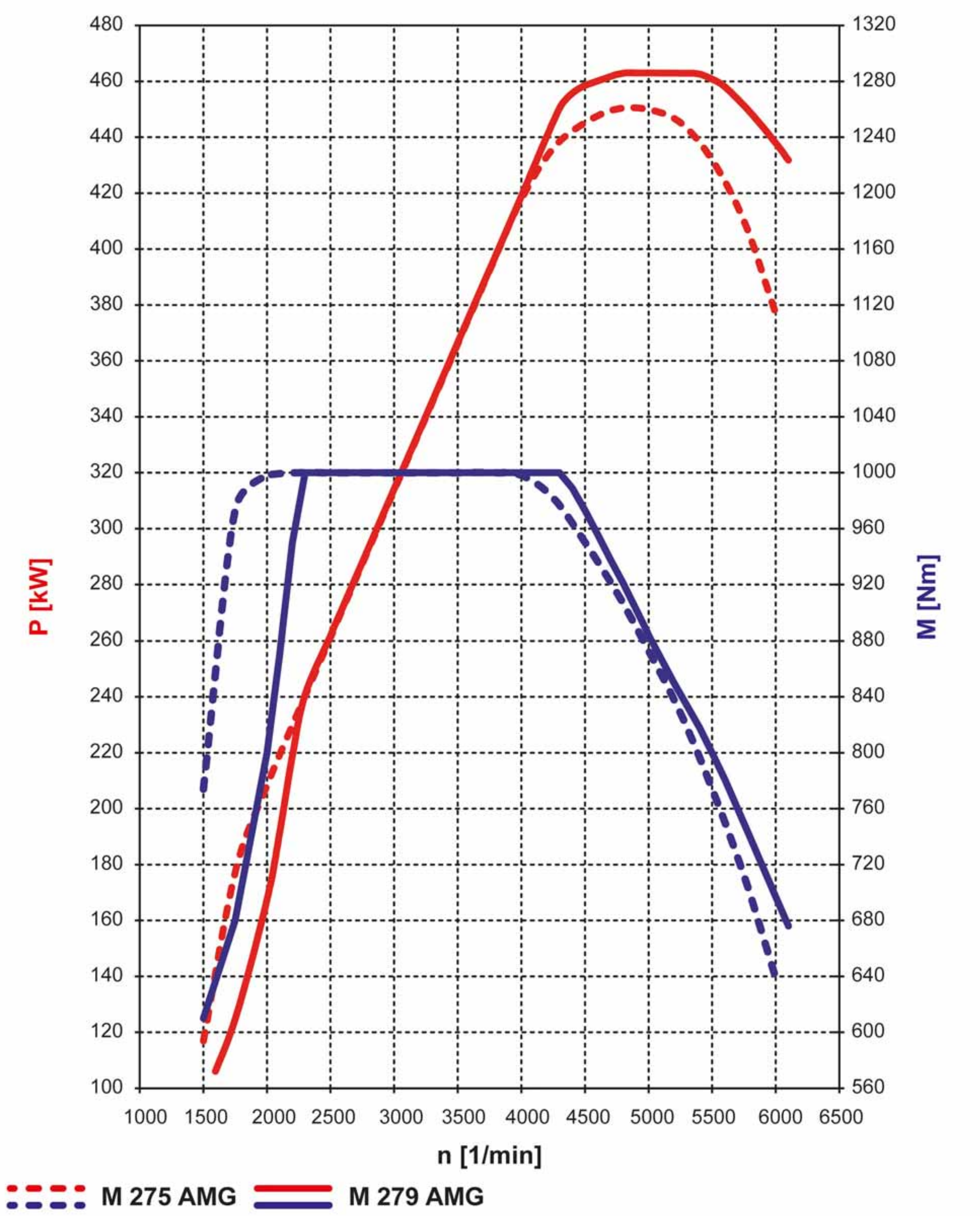
M 279 AMG, V12-cylinder with 6.0 l displacement and biturbo charging

Engine data comparison: M 275 AMG - M 279 AMG

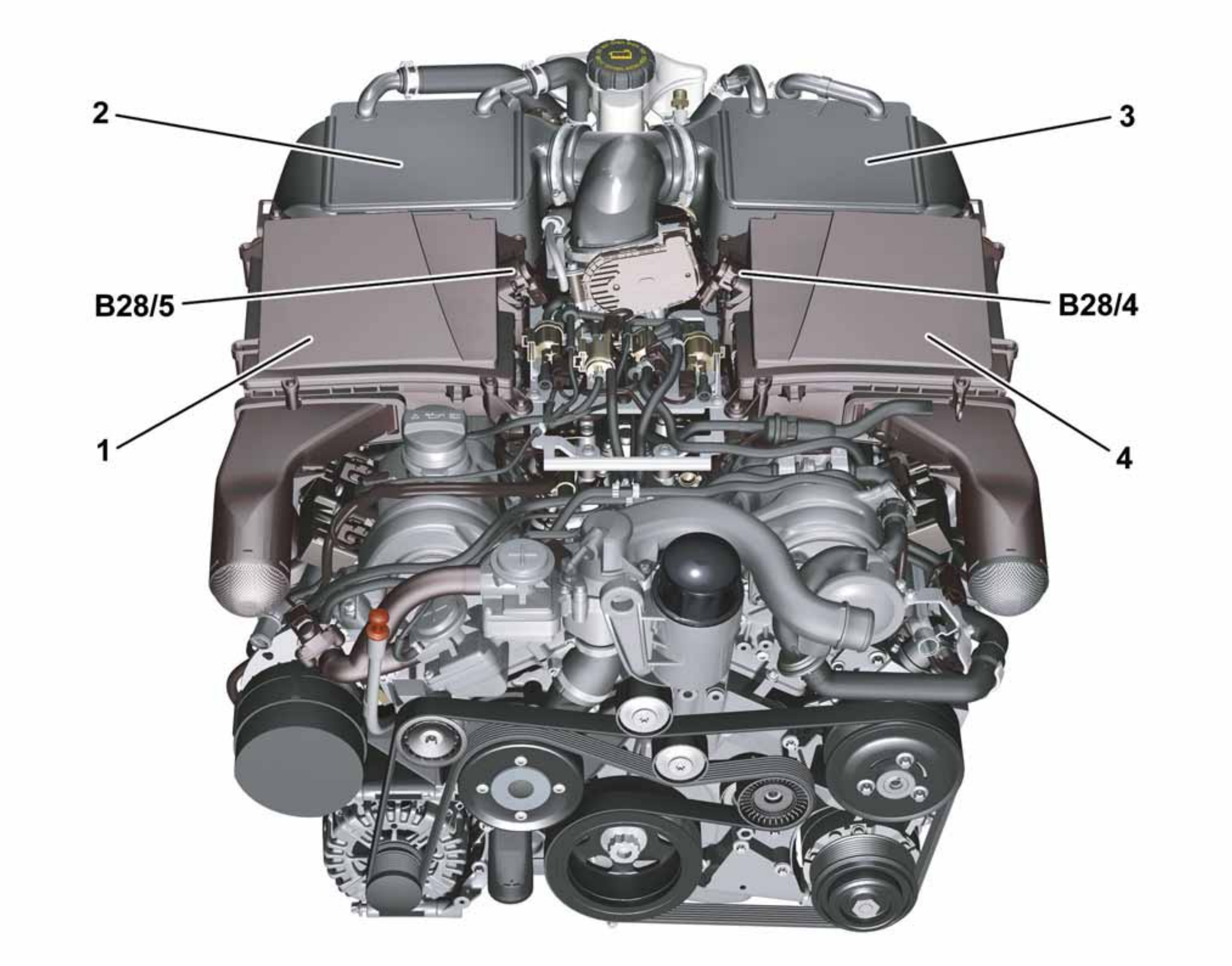
		M 275 KE60 LA AMG M 275.981	M 279 KE60 LA AMG M 279.981
Cylinder configuration/angle		V12/60°	
Rated output at engine speed	kW rpm	450 4800-5100	463 4800-5400
Rated torque at engine speed	Nm rpm	1000 2000-4000	1000 2300-4300
Displacement	cm^3	5980	5980
Bore	mm	82.6	
Stroke	mm	93	
Cylinder spacing	mm	90	
Compression ratio ε		9.0	
Connecting rod length	mm	142.3	
Forced induction		2 turbochargers	
Turbocharger control		Wastegate	
Boost pressure (max.)	bar	1.5	
Oil change quantity (with filter)	l	9.5	
Coolant filling capacity (with heater circuit) Main circuit Low-temperature circuit	 l l	 11.8 3.2	 11.8 3.5
Fuel type		Super Plus 98 RON	
Engine weight DIN 70020 GZ	kg	246	248
Emissions regulation ECE/USA		EU5/ULEV	EU5+/ULEV II

Engine data comparison: M 275 AMG - M 279 AMG



Torque and power curve, M 275 AMG and M 279 AMG

(blue)	*M*	*Torque*
(red)	*P*	*Power*
	n	*Engine speed*



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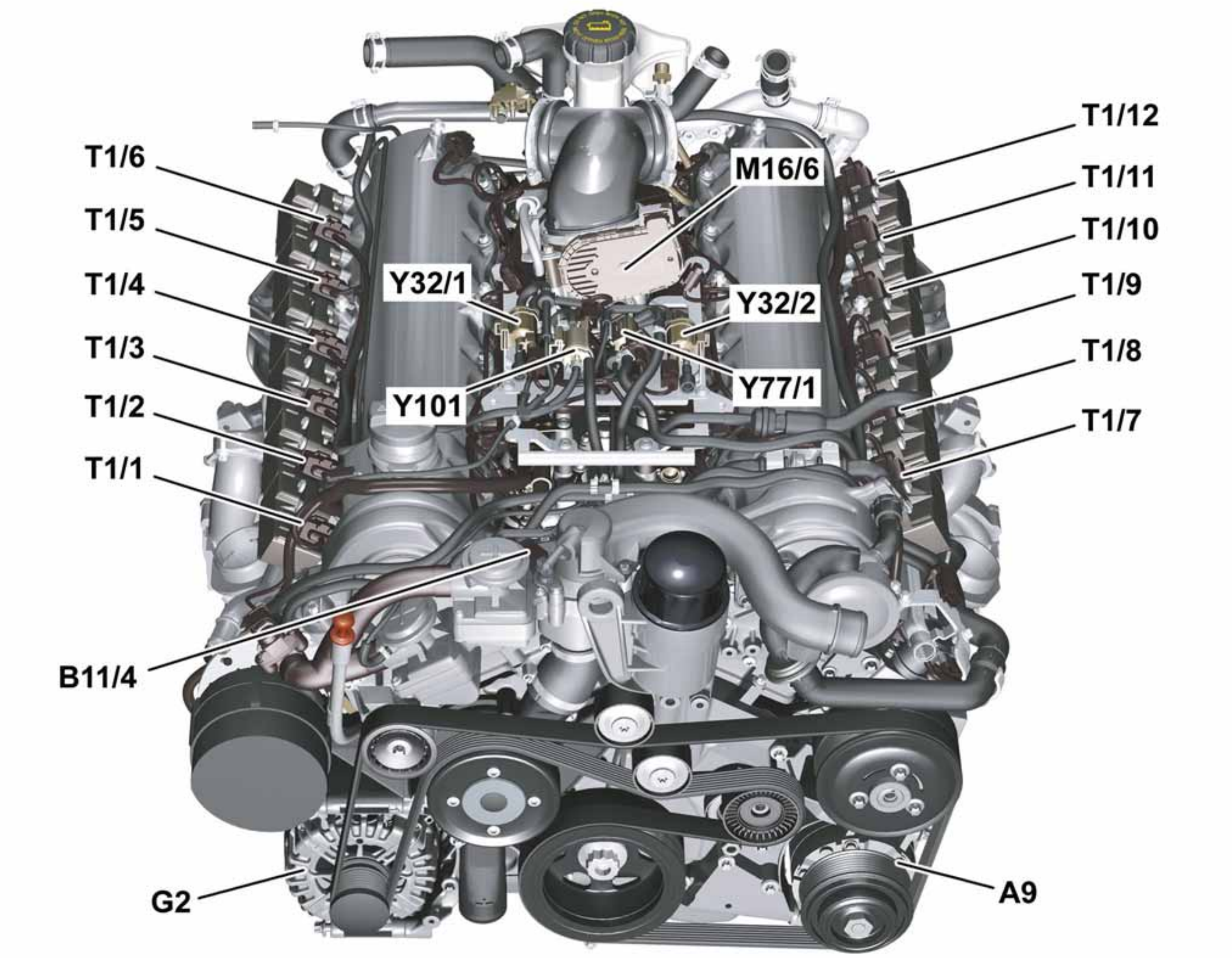
View of engine from above

1	*Air filter housing, right cylinder bank*
2	*Charge air cooler, right cylinder bank*
3	*Charge air cooler, left cylinder bank*
4	*Air filter housing, left cylinder bank*
B28/4	*Pressure sensor downstream of air filter, left cylinder bank*
B28/5	*Pressure sensor downstream of air filter, right cylinder bank*

Engine views



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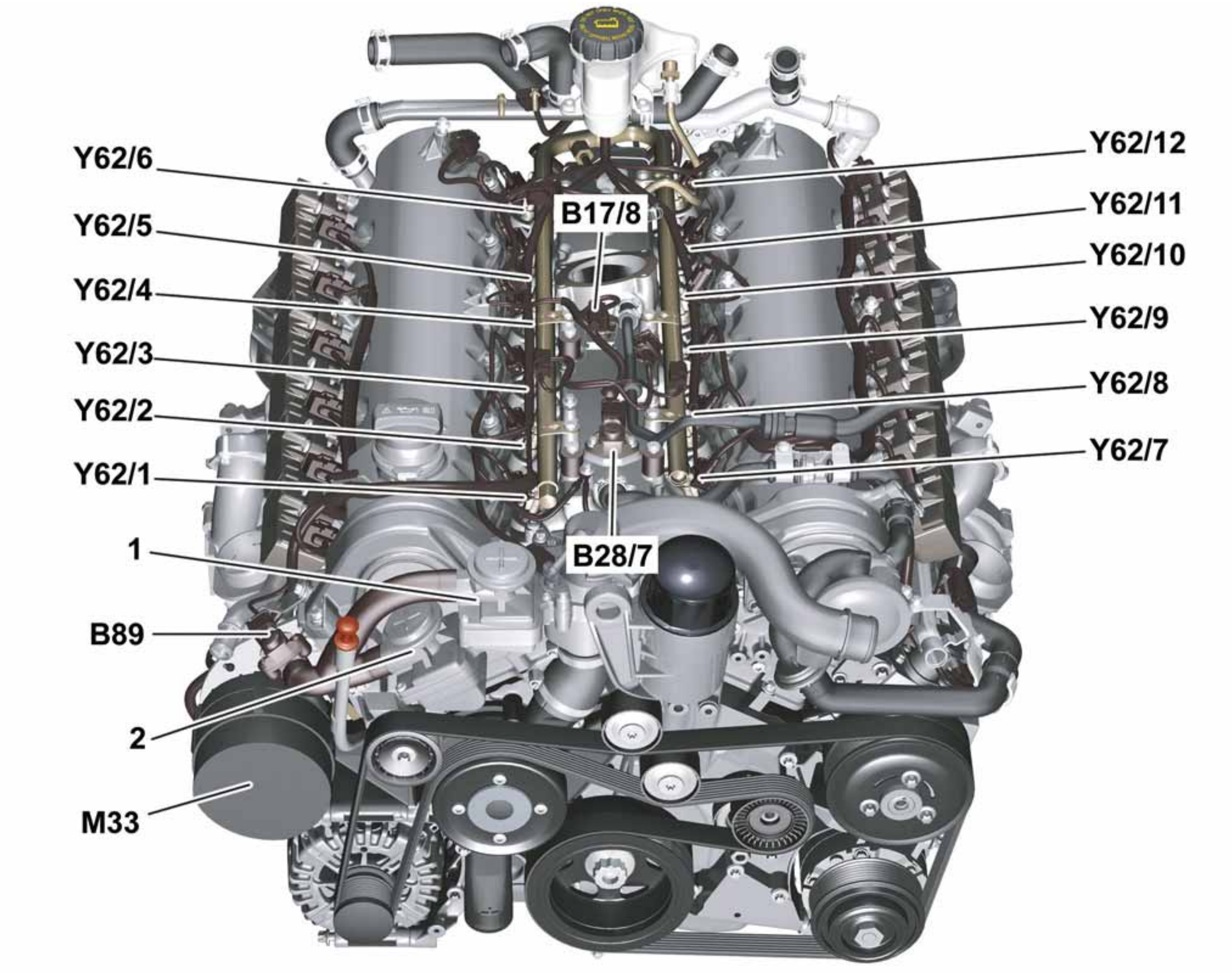
View of engine from above

A9	*Refrigerant compressor*
B11/4	*Coolant temperature sensor*
G2	*Alternator*
M16/6	*Throttle valve actuator*
T1/1	*Cylinder 1 ignition coil*
T1/2	*Cylinder 2 ignition coil*
T1/3	*Cylinder 3 ignition coil*
T1/4	*Cylinder 4 ignition coil*
T1/5	*Cylinder 5 ignition coil*
T1/6	*Cylinder 6 ignition coil*
T1/7	*Cylinder 7 ignition coil*
T1/8	*Cylinder 8 ignition coil*
T1/9	*Cylinder 9 ignition coil*
T1/10	*Cylinder 10 ignition coil*
T1/11	*Cylinder 11 ignition coil*
T1/12	*Cylinder 12 ignition coil*
Y32/1	*Air pump 1 switchover valve*
Y32/2	*Air pump 2 switchover valve*
Y77/1	*Boost pressure control pressure transducer*
Y101	*Bypass air switchover valve*

Engine views



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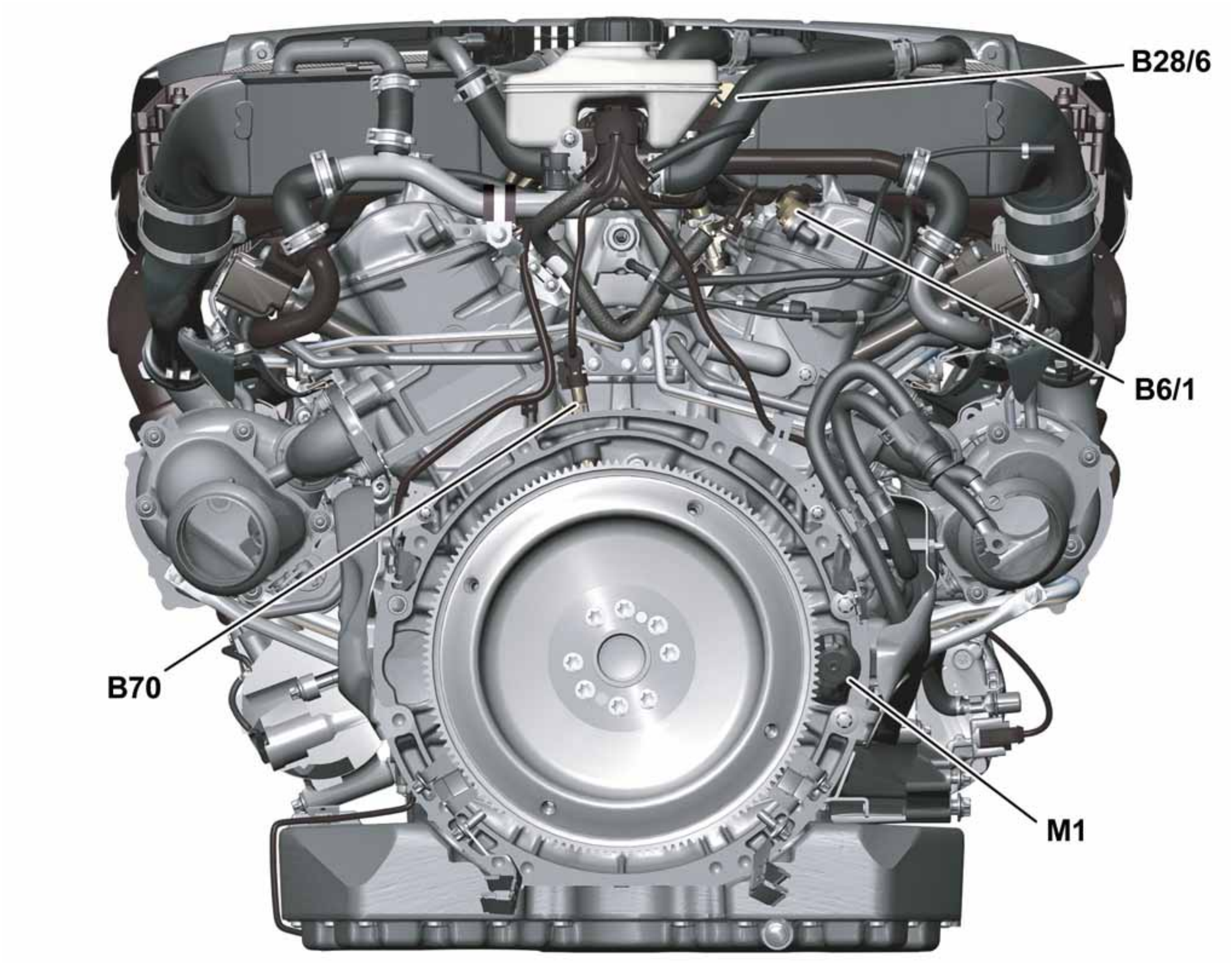
View of engine from above

1	*Left air shutoff valve*
2	*Right air shutoff valve*
B17/8	*Charge air temperature sensor*
B28/7	*Pressure sensor downstream of throttle valve*
B89	*Secondary air pressure sensor*
M33	*Electric air pump*
Y62/1	*Cylinder 1 injection valve*
Y62/2	*Cylinder 2 injection valve*
Y62/3	*Cylinder 3 injection valve*
Y62/4	*Cylinder 4 injection valve*
Y62/5	*Cylinder 5 injection valve*
Y62/6	*Cylinder 6 injection valve*
Y62/7	*Cylinder 7 injection valve*
Y62/8	*Cylinder 8 injection valve*
Y62/9	*Cylinder 9 injection valve*
Y62/10	*Cylinder 10 injection valve*
Y62/11	*Cylinder 11 injection valve*
Y62/12	*Cylinder 12 injection valve*

Engine views



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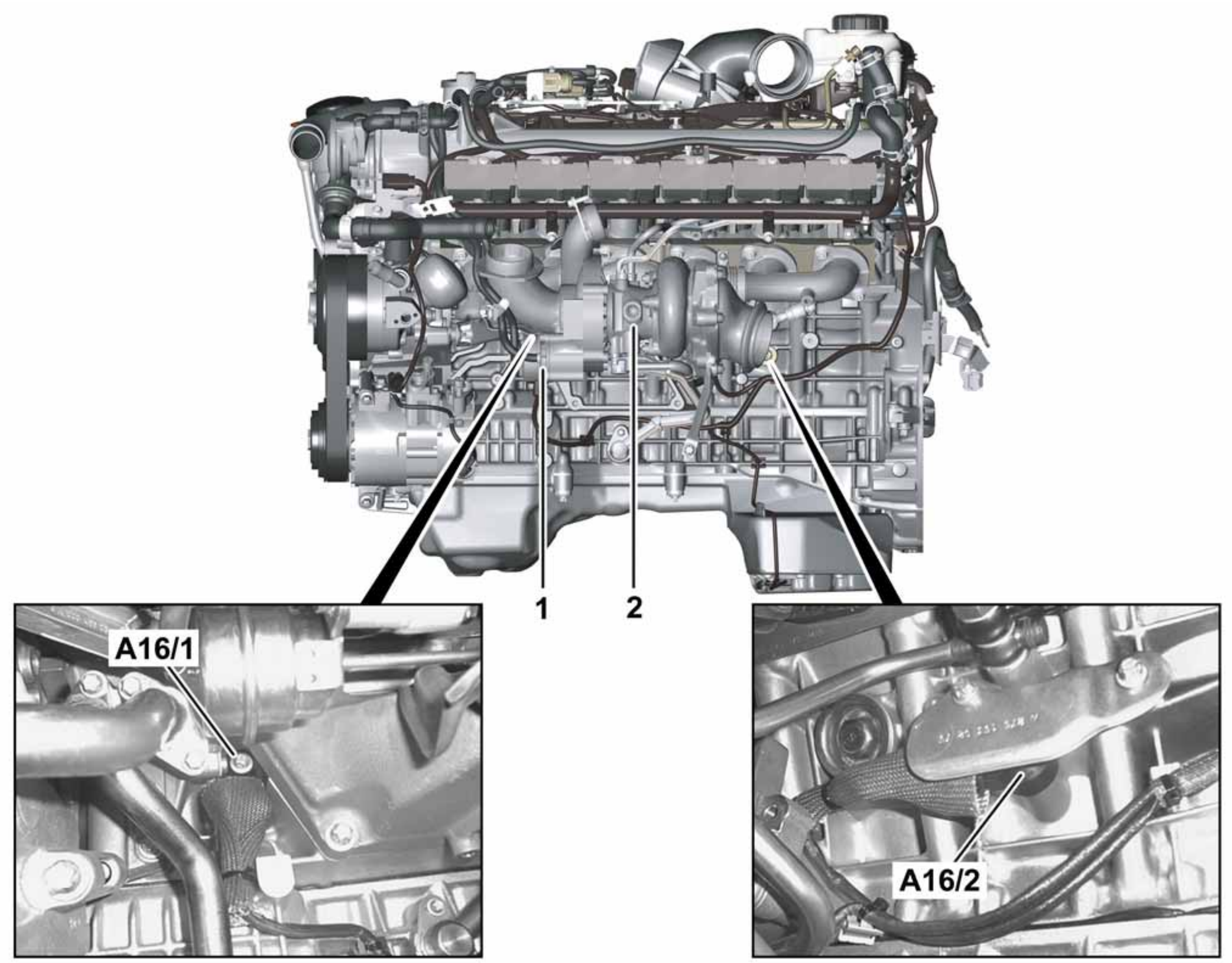
View of engine from rear

B6/1	*Camshaft Hall sensor*	*B70*	*Crankshaft Hall sensor*
28/6	*Pressure sensor upstream of throttle valve*	*M1*	*Starter*



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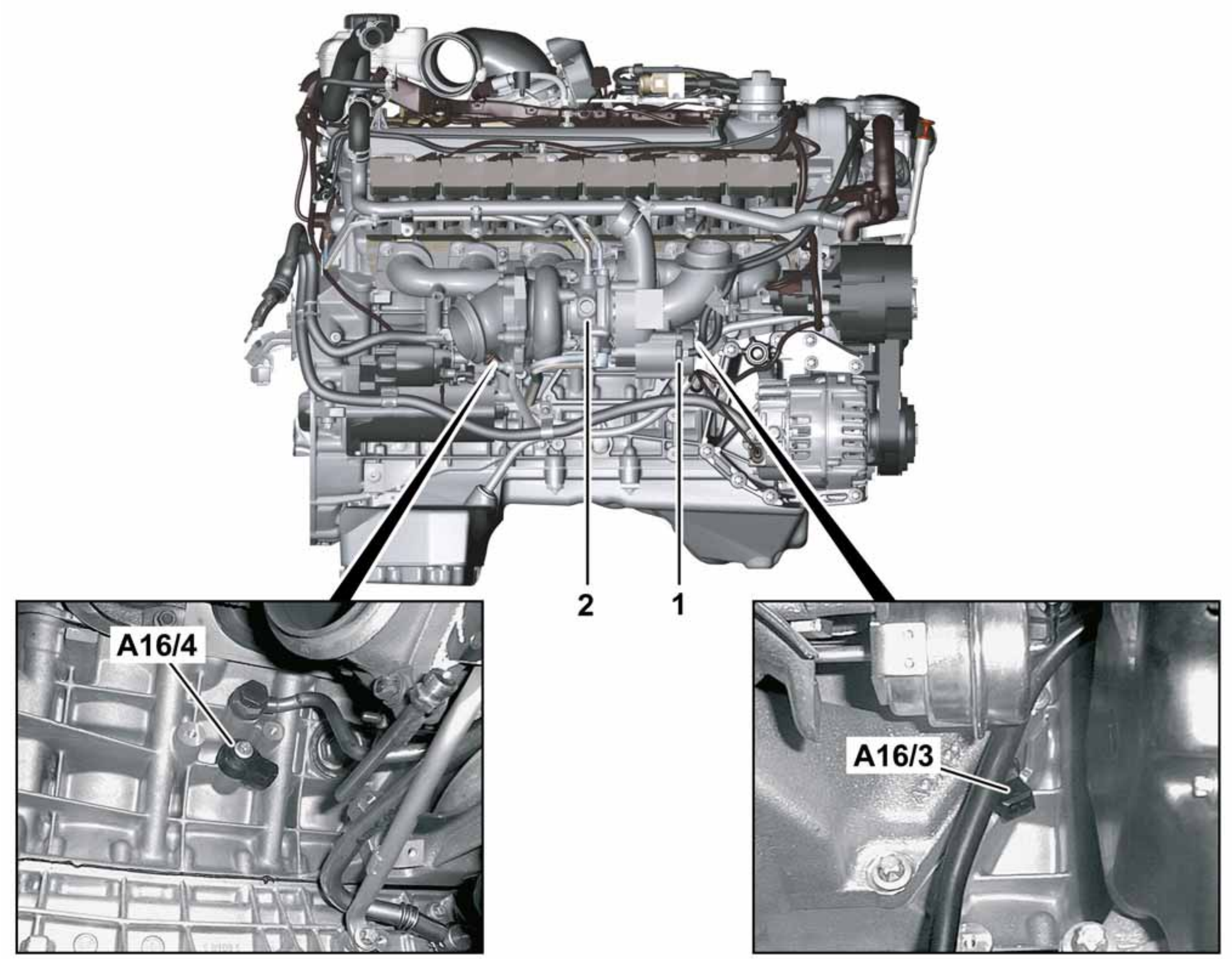
View of engine from left

1 Blow-off valve
2 Left turbocharger

A16/1 Knock sensor 1
A16/2 Knock sensor 2

Engine views



View of engine from right

1 Blow-off valve
2 Right turbocharger

A16/3 Knock sensor 3
A16/4 Knock sensor 4

New technical features

The new engine M 279 AMG is being introduced in the SL-Class. The maintenance intervals remain the same as for its predecessor engine M 275.

When it is launched in model series 231, two coolant circuits will be installed, each with one expansion reservoir.

The interval for the low-temperature circuit is "every 200,000 km/10 years", and for the main circuit it is "every 50,000 km/3 years".

The oil change interval for the 7-speed automatic transmission AMG SPEEDSHIFT PLUS 7G-TRONIC is "every 125,000 km/5 years".

Crankcase

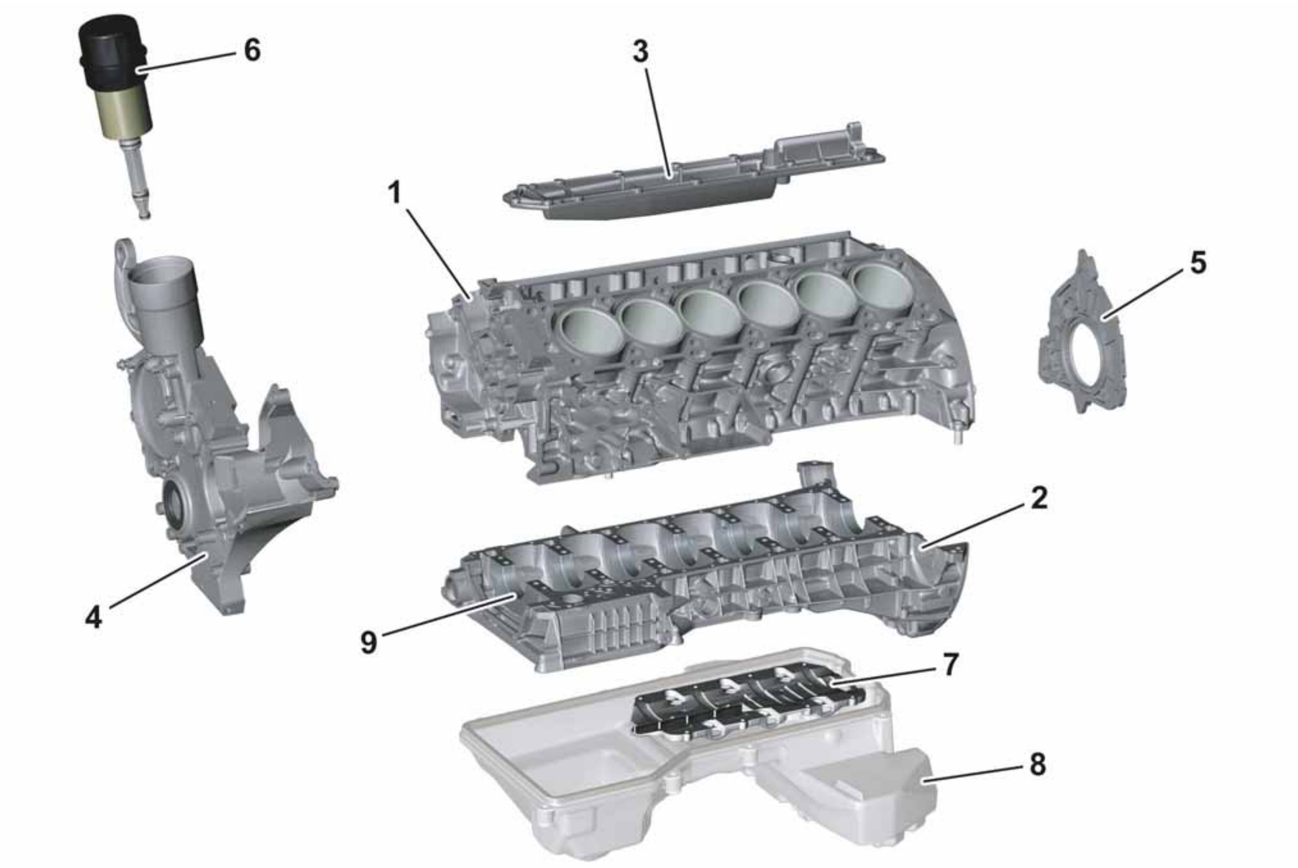
A die-cast aluminum crankcase with Silitec cylinder liners is used in the new M 279 AMG.

The bore and cylinder spacing of the M 275 AMG have been preserved. The compression ratio ε is 9.0.

The crankcase and the timing case contain a number of ducts and lines for carrying the various media (pressurized oil, coolant, air, oil return ducts). The crankcase is a bedplate design with individual bolt-on main bearing caps made of cast steel.

Note

The engine number is impressed in the center of the bottom of the crankcase (bedplate).



1 Crankcase upper section
2 Crankcase lower section (bedplate)
3 Crankcase cover
4 Timing case
5 Rear crankcase cover
6 Oil filter
7 Oil deflector
8 Oil pan
9 Crankshaft bearing cap

Ventilation

The engine crankcase is ventilated via a centrifugal oil separator driven by the left camshaft. An integral pressure regulating valve provides the necessary pressures inside the crankcase according to the operating state (partial load or wide open throttle, natural aspiration or forced induction) and prevents the occurrence of excessive vacuum in the crankcase.

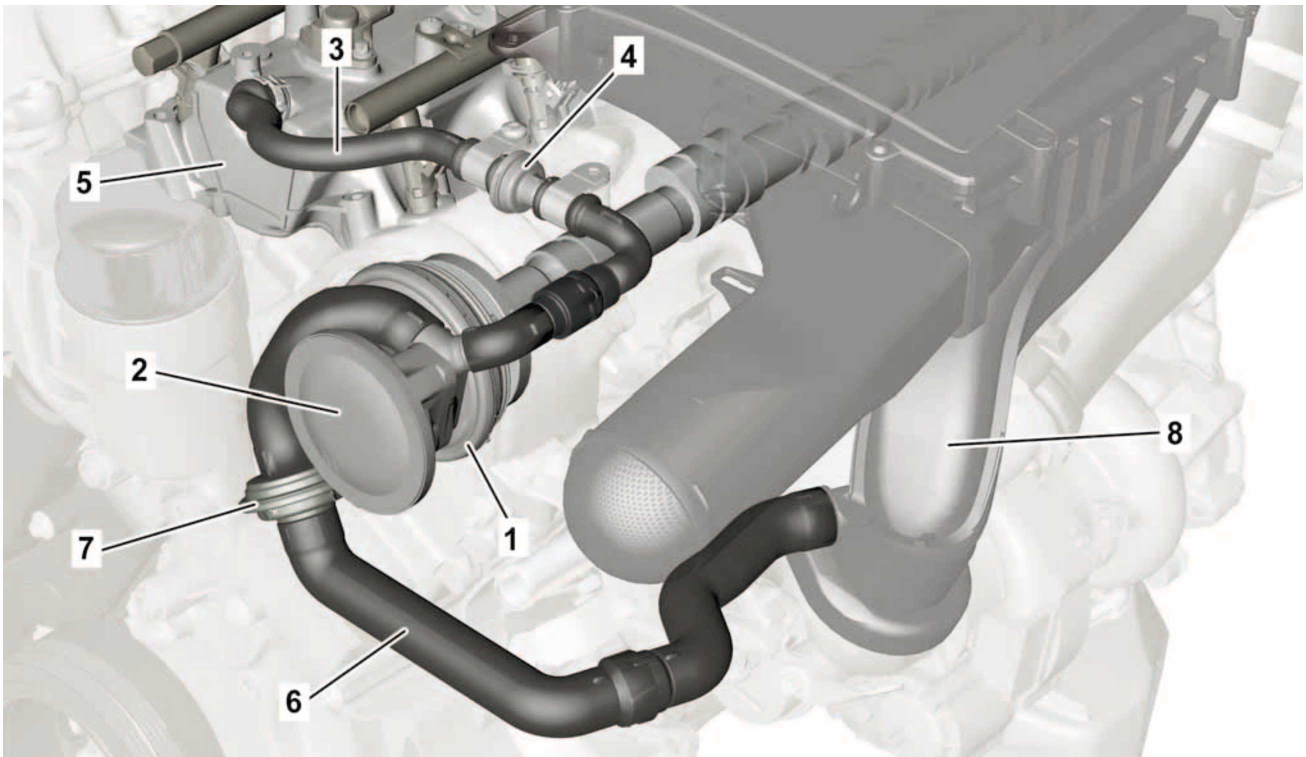
The centrifugal separator is necessary because of the high proportion of blow-by gases that occurs in a turbocharged engine. In addition, this system guarantees reliable oil separation under all operating conditions, even under strong acceleration or braking, as well as during fast cornering.

Check valves in the partial-load vent line and in the full-load vent line ensure that the gases flow in the correct direction out of the crankcase.

The partial-load vent line opens into the charge air distributor; the full-load vent line ends in the intake line (damper filter) of the left turbocharger.

Note

The connection between the full-load vent line and the left damper filter is a plug-in connection on the ECE version and a permanent (bonded) joint on the USA variant.



Crankcase ventilation system

1 Centrifugal oil separator
2 Pressure regulating valve
3 Partial-load vent line
4 Partial-load ventilation check valve
5 Charge air distributor
6 Full-load vent line
7 Full-load ventilation check valve
8 Left damper filter

Crankcase

CARB – California Air Resources Board

CARB is the clean-air agency of the state of California, which proposes legislation aimed at preventing air pollution.

According to the guidelines of this authority, published in the California Code of Regulation (CCR), even the crankcase ventilation system of an internal combustion engine must satisfy special requirements because any break in the hose or pipe connections of the crankcase ventilation system could result in increased hydrocarbon emissions.

For this reason all the components of the crankcase ventilation system must be monitored electronically by the on-board diagnosis (OBD) in order to detect any break in the hose connections between the crankcase, the pressure regulating valve and the damper filter, and to log an appropriate fault code in the fault memory.

In addition, the driver is alerted by the lighting of the engine diagnosis indicator lamp in the instrument cluster.

Monitoring by the OBD is not required for inseparable connections and for so-called closed crankcase ventilation systems which contain no hose or pipe connections.

Engine M 279 AMG satisfies these requirements with the following measures:

- The partial-load vent line (items 3 and 4) is safeguarded by the OBD which detects any pressure changes
- Inseparable connections are used for the full-load vent line (items 6 and 7)
- The left damper filter (item 8) is inseparable connected to the full-load vent line and is also monitored by the OBD

The item numbers above refer to the illustration on the preceding page.

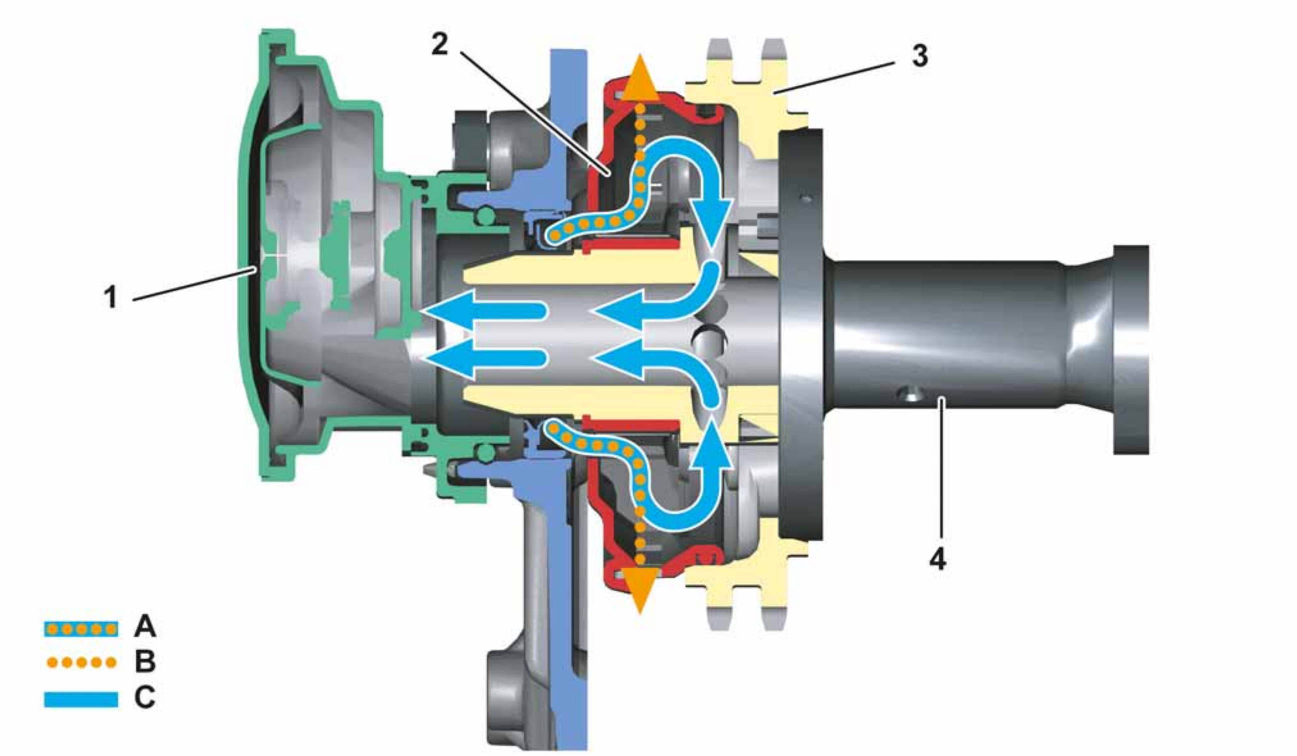
Vapors loaded with oil mist coming from the crankcase enter the centrifuge, which rotates at the same speed as the camshaft. Here the vapors are made to rotate, and the oil particles separate from the gases and drip back into the crankcase. The cleaned air flows into the pressure regulator and depending on the operating state of the engine is fed either directly into the charge air manifold or into the intake line of the left turbocharger.

Note

Even with such efficient oil separation, minute residual quantities of oil mist pass through the separator.

In the case of full-load ventilation, the filtered gases are fed into the intake tract upstream of the left turbocharger. Minute quantities of oil can cause the compressor impeller of the turbocharger to turn black over time.

This is not a shortcoming or a fault!



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Centrifugal oil separator (radial oil separator)

A Contaminated vapors
B Oil droplets
C Cleaned air

1 Pressure regulating valve
2 Centrifugal oil separator
3 Camshaft sprocket
4 Camshaft

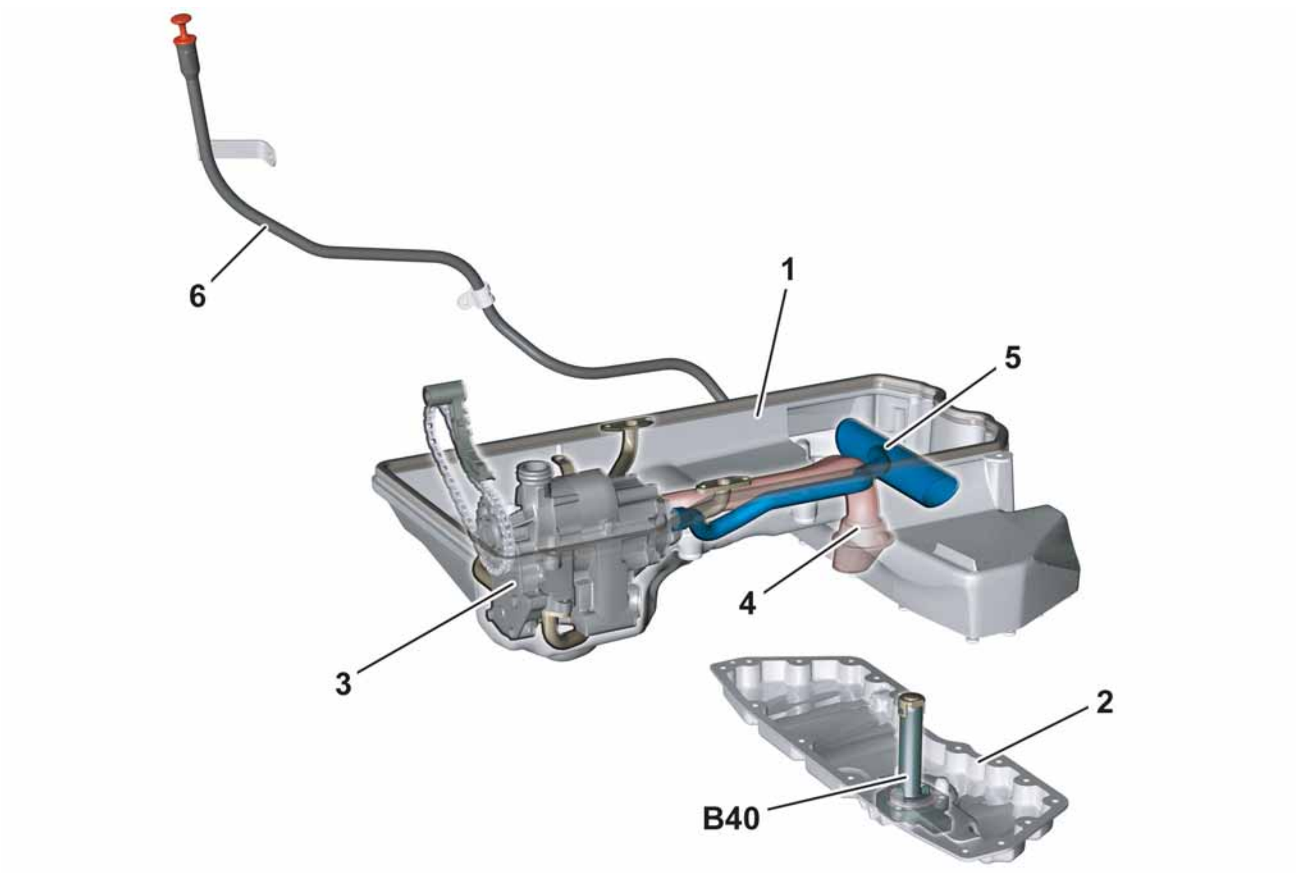
Oil pan

The oil pan in model series 231 is a rear sump. The upper and lower sections of the oil pan are aluminum sand castings. To minimize noise, the oil pan is decoupled from the crankcase by a vibration-damping rubber seal.

The engine is supplied with oil by a 2-stage gear pump, which is driven by the crankshaft via a single bush chain.

The oil sensor for measuring the oil level, temperature and quality is located in the rear of the oil sump.

The oil sensor registers the oil level (capacitively) and the oil temperature (by means of a temperature sensor). The quality is determined by measuring the electrical parameters of the oil between two electrodes. The measured values are digitally conditioned and transmitted to the engine control unit.



Oil pan

1 Oil pan top section
2 Oil pan bottom section
3 Oil pump
4 Oil suction pipe
5 Oil return pipe
6 Oil dipstick guide tube

B40 Oil sensor (oil level, temperature and quality)

Crankshaft

The crankshaft has been modified with regard to the threaded connection of the flywheel.

With its precision-turned counterweights the crankshaft is designed for minimal bearing load and has a high balancing rate (> 50% rotating).

The secondary mass which drives the single-belt system is vulcanized onto the vibration damper via an elastomer ring. This allows the driven units to act as additional damping masses. The hub of the vibration damper has 6 cutouts to reduce noise emissions.

Connecting rods

The connecting rods are forged from a high-strength steel alloy and are therefore capable of withstanding the high loads caused by the turbocharging with no increase in weight.

Pistons

The pistons are manufactured from a high-grade aluminum alloy by an optimized production process.

Good emergency running characteristics are achieved by means of an electroplated iron coating (FerroTec).

Crank assembly

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Cylinder head

Each cylinder head has an overhead camshaft (OHC). The camshafts are forged. They consist of an internal high-pressure formed steel tube with joined cams.

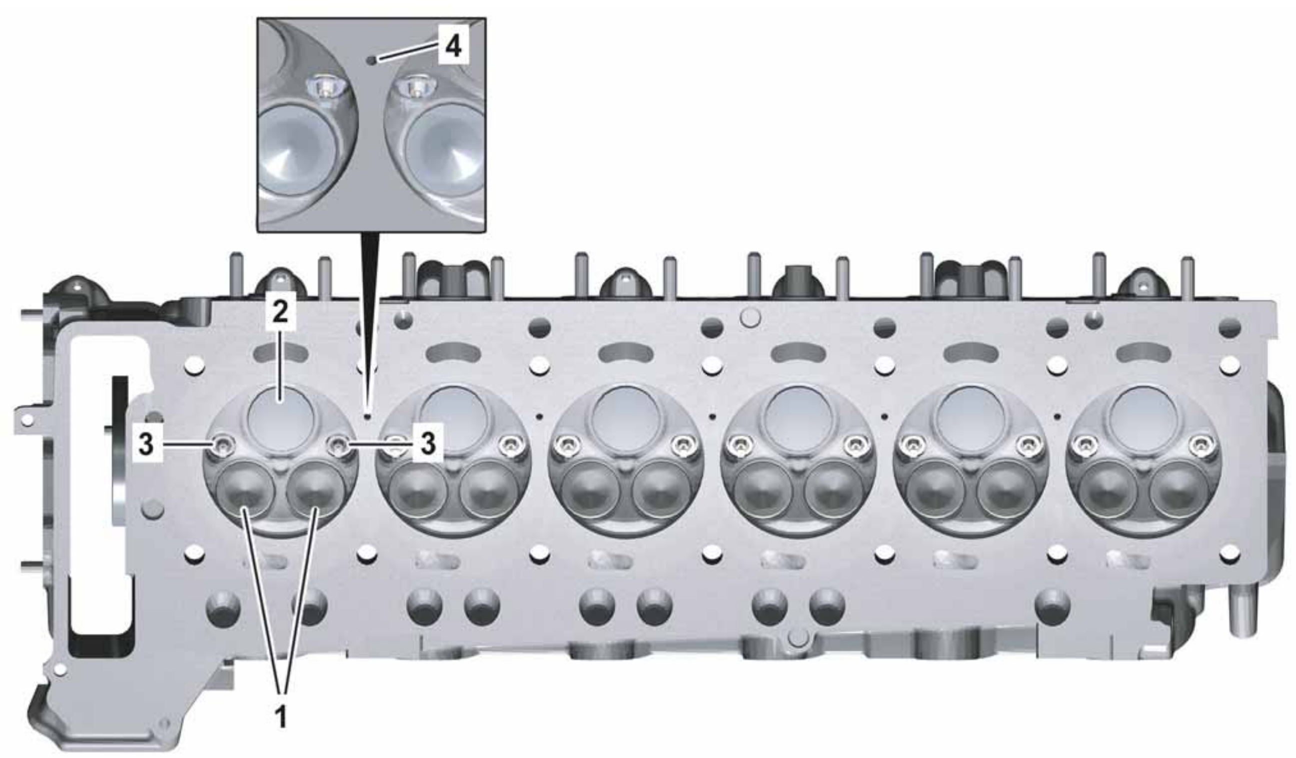
Each cylinder has two intake valves, one sodium-cooled exhaust valve and two spark plugs.

Note

In the M 279 AMG aluminum bolts are used on the two valve covers and on the charge air distributor.

New aluminum bolts must be used when installing the valve covers and charge air distributor!

The tightening torque of the aluminum bolts is listed in the relevant AR document in the Workshop Information System (WIS).



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Cylinder head

1 Intake valves
2 Exhaust valve
3 Spark plugs
4 Coolant feed bore

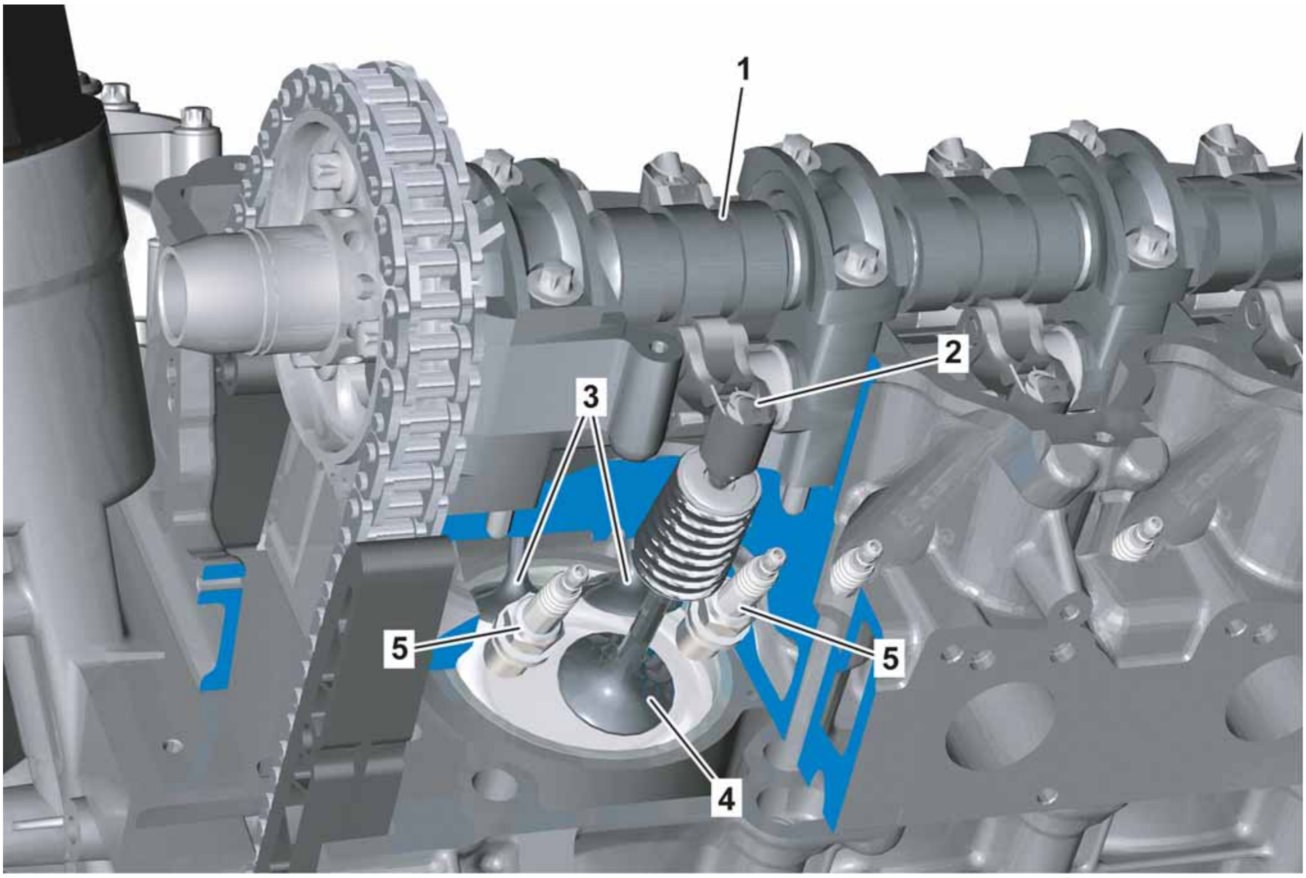
Valve assembly

The valve timing with hydraulic valve clearance compensation is performed by roller-type cam followers.

The valve springs are identical on the intake and exhaust sides, and are modified to cope with the higher exhaust back pressure prevalent in turbo-charged engines.

The left camshaft drives the centrifugal oil separator of the crankcase ventilation system.

The crankshaft sprocket is lined with rubber to reduce noise.



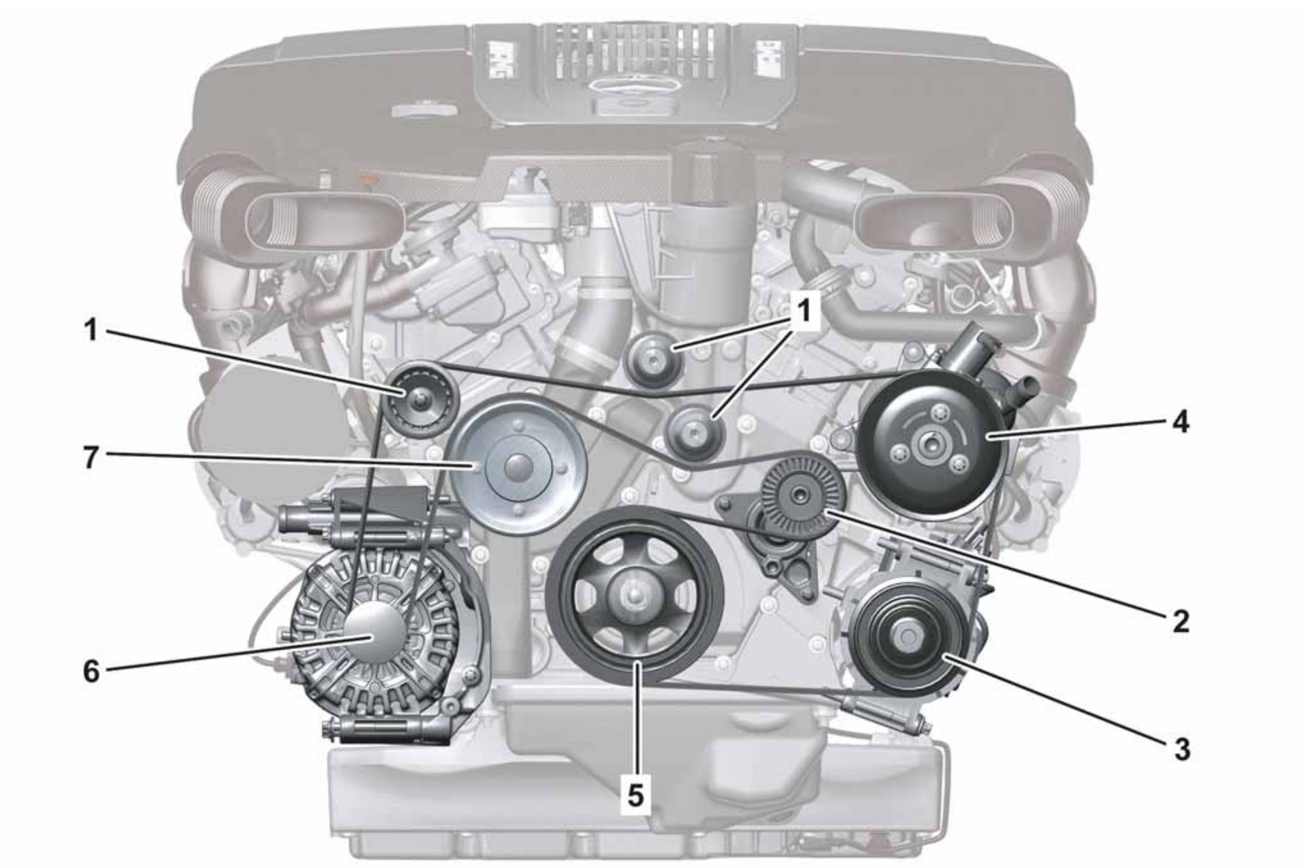
Valve assembly, shown on left cylinder head (detail)

1 Camshaft
2 Roller cam follower
3 Intake valve
4 Exhaust valve
5 Spark plug

Belt drive

The belt drive is a single-belt system and drives the ancillaries coolant pump, alternator, ABC pump and refrigerant compressor.

Due to the high dynamic requirements of the AMG SPEEDSHIFT PLUS 7G-TRONIC with very short response times, the belt pulley of the alternator is fitted with a freewheel.



Single-belt drive

1 Guide pulley
2 Belt tensioner
3 Refrigerant compressor
4 ABC pump
5 Belt pulley
6 Alternator
7 Coolant pump

Turbocharging

The volumetric efficiency of the cylinders is improved as a result of charging. This increases the torque and the power output of the engine.

A fluid-cooled turbocharger is installed in each cylinder bank. An optimal response characteristic and a resulting high boost pressure are achieved even at low rpm speeds by installing the turbocharger immediately next to the exhaust manifold.

The turbochargers start to produce boost pressure at approx. 1000 rpm. The maximum boost pressure is 1.5 bar and is achieved at approx. 2300 rpm.

Boost pressure control

The boost pressure is controlled electropneumatically by the boost pressure control pressure transducer. The ME-SFI control unit uses a characteristics map and the load to actuate the pressure transducer via a pulse width modulated signal (PWM signal) with an on/off ratio of 5 to 95%. To do this, the ME-SFI control unit evaluates the following sensors and functions of the engine control:

- One charge air temperature sensor
- Pressure sensor downstream of air filter, left cylinder bank, intake manifold pressure
- Pressure sensor downstream of air filter, right cylinder bank, intake manifold pressure
- Pressure sensors upstream and downstream of the throttle valve, boost pressure
- Accelerator pedal sensor, load request from driver
- Crankshaft Hall sensor, engine speed
- Knock control, transmission overload protection, overheating protection
- Atmospheric air pressure sensor in ME-SFI control unit, altitude adaptation
- Exhaust temperature
- Fuel quality

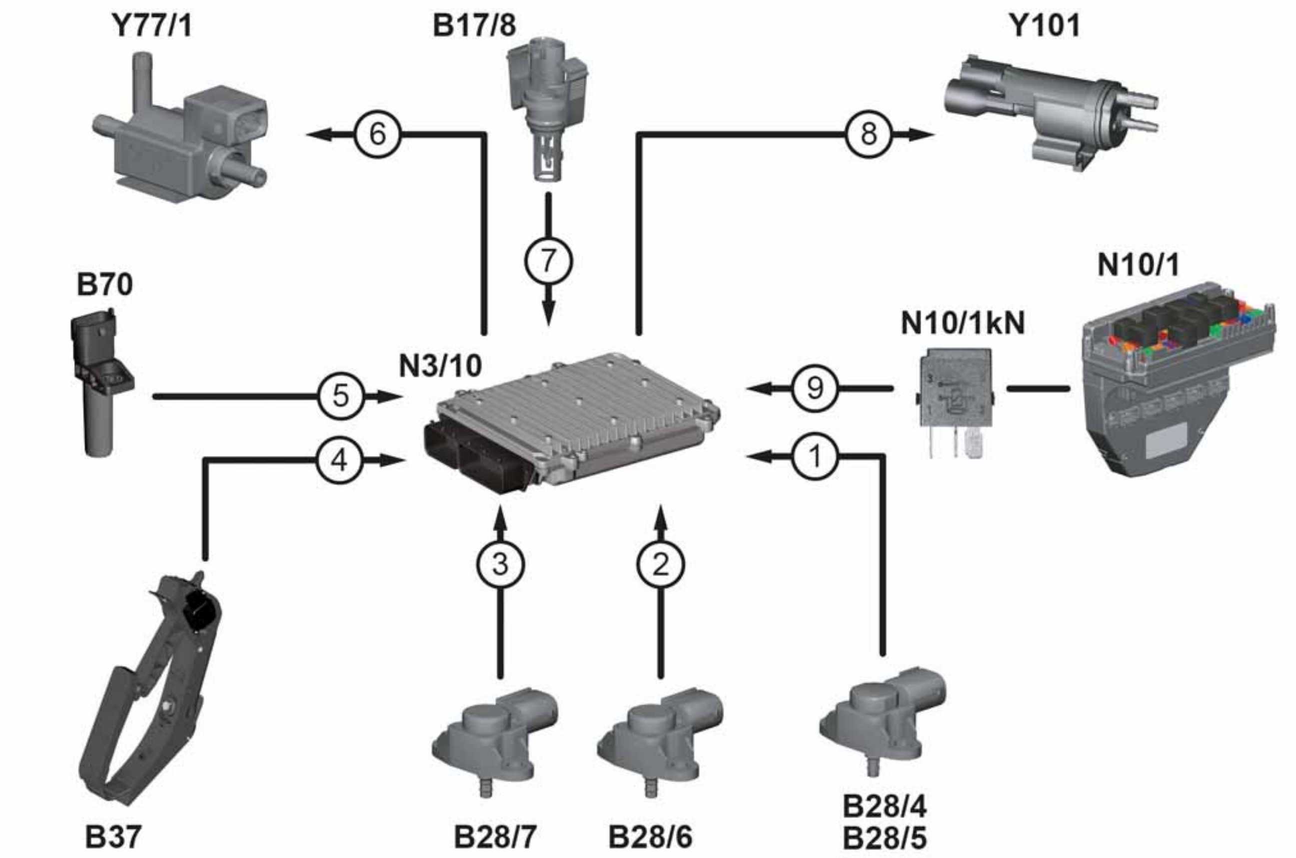
According to the on/off ratio either some or all of the boost pressure from the charge air cooler of the right cylinder bank acts in the vacuum cells. Via linkages these open the wastegate flaps which open the bypasses. The wastegate flaps thus enable the exhaust stream to bypass the turbine wheels, which limits the turbine speed and allows the boost pressure to be regulated.

To monitor the current boost pressure, the pressure sensor upstream of the throttle valve transmits an appropriate voltage signal to the ME-SFI control unit. The pressure sensors downstream of the air filters for the left and right cylinder banks, which are located in the intake lines upstream of the turbochargers, are used by the ME-SFI control unit to monitor the charging (pressure drop via the air filters).

The charge air temperature is registered in the intake manifold by the charge air temperature sensor and is sent to the ME-SFI control unit with a voltage signal. The maximum boost pressure of 1.5 bar is only allowed at a charge air temperature < 65 °C.

The engine load (in relation to the throttle valve angle) is detected by the voltage signal from the pressure sensor downstream of the throttle valve.

Charging



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Function schematic of forced induction

B17/8	*Charge air temperature sensor*
B28/4	*Pressure sensor downstream of air filter, left cylinder bank*
B28/5	*Pressure sensor downstream of air filter, right cylinder bank*
B28/6	*Pressure sensor upstream of throttle valve*
B28/7	*Pressure sensor downstream of throttle valve*
B37	*Accelerator pedal sensor*
B70	*Crankshaft Hall sensor*
N3/10	*ME-SFI [ME] control unit*
N10/1	*Front SAM control unit with fuse and relay module*
N10/1kN	*Engine circuit 87 relay*
Y77/1	*Boost pressure control pressure transducer*
Y101	*Bypass air switchover valve*

1	*Pressure sensors downstream of air filter, signal*
2	*Boost pressure, signal*
3	*Intake manifold pressure, signal*
4	*Accelerator pedal sensor, signal*
5	*Engine speed, signal*
6	*Boost pressure control pressure transducer, actuation*
7	*Charge air temperature sensor, signal*
8	*Bypass air switchover valve, actuation*
9	*Circuit 87, status*

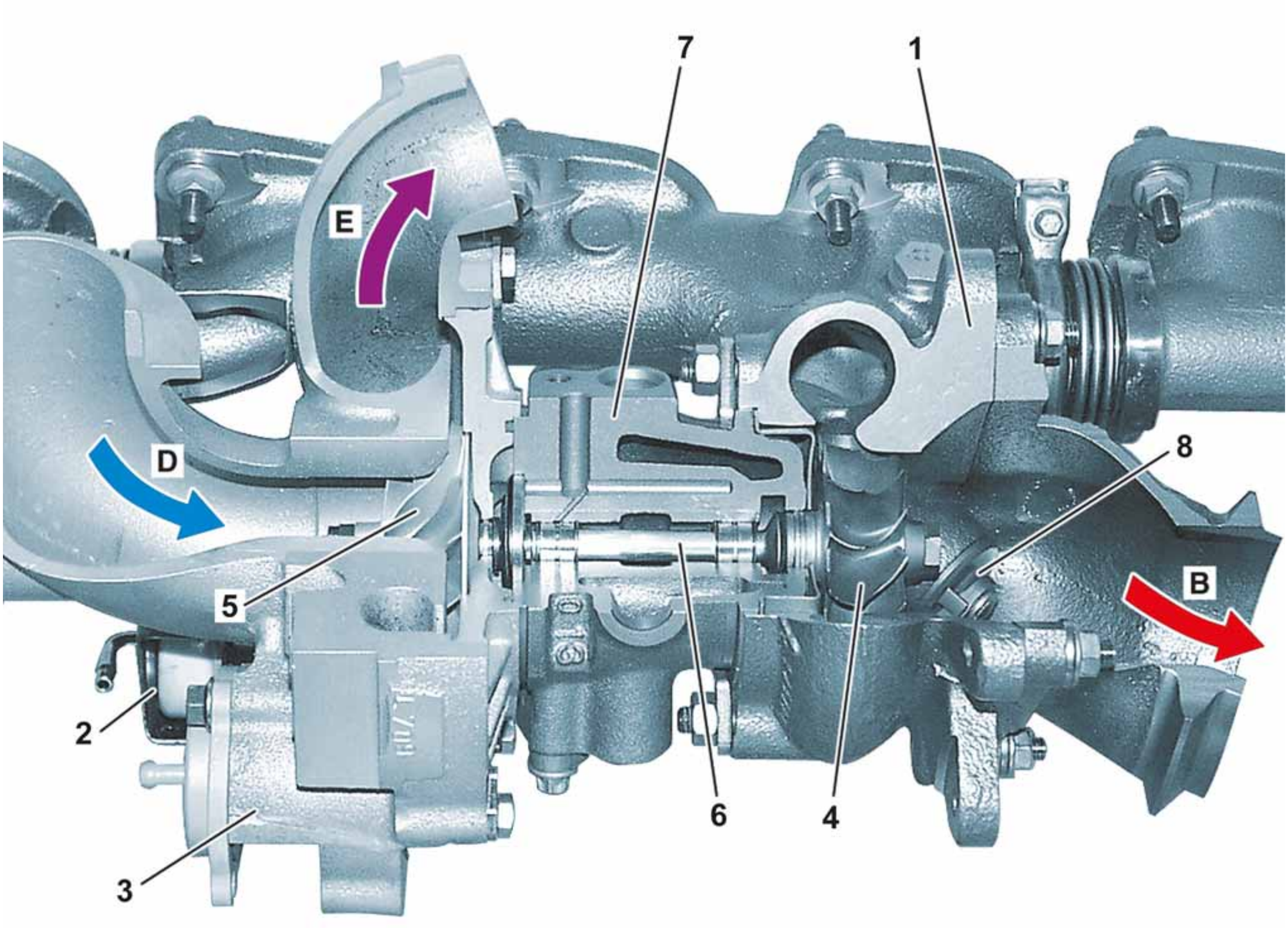
Turbocharger

The turbochargers are made of cast steel. The turbine housings are integrated in the exhaust manifolds. The bearing housings are cooled by the cooling circuit and lubricated by the engine oil circuit.

The turbochargers draw in fresh air via the air filters at the compressor intakes and direct it via the compressor outlets into the charge air pipes upstream of the charge air coolers.

The high rotational speed of the compressor impellers and the resultant high volumetric flow rates compress the air in the charge air pipes.

To regulate the boost pressure, the exhaust streams that drive the turbine wheels are diverted via bypasses (wastegates) by opening the wastegate flaps. The wastegate flaps are opened by the vacuum cells via linkages, opening up the bypasses.

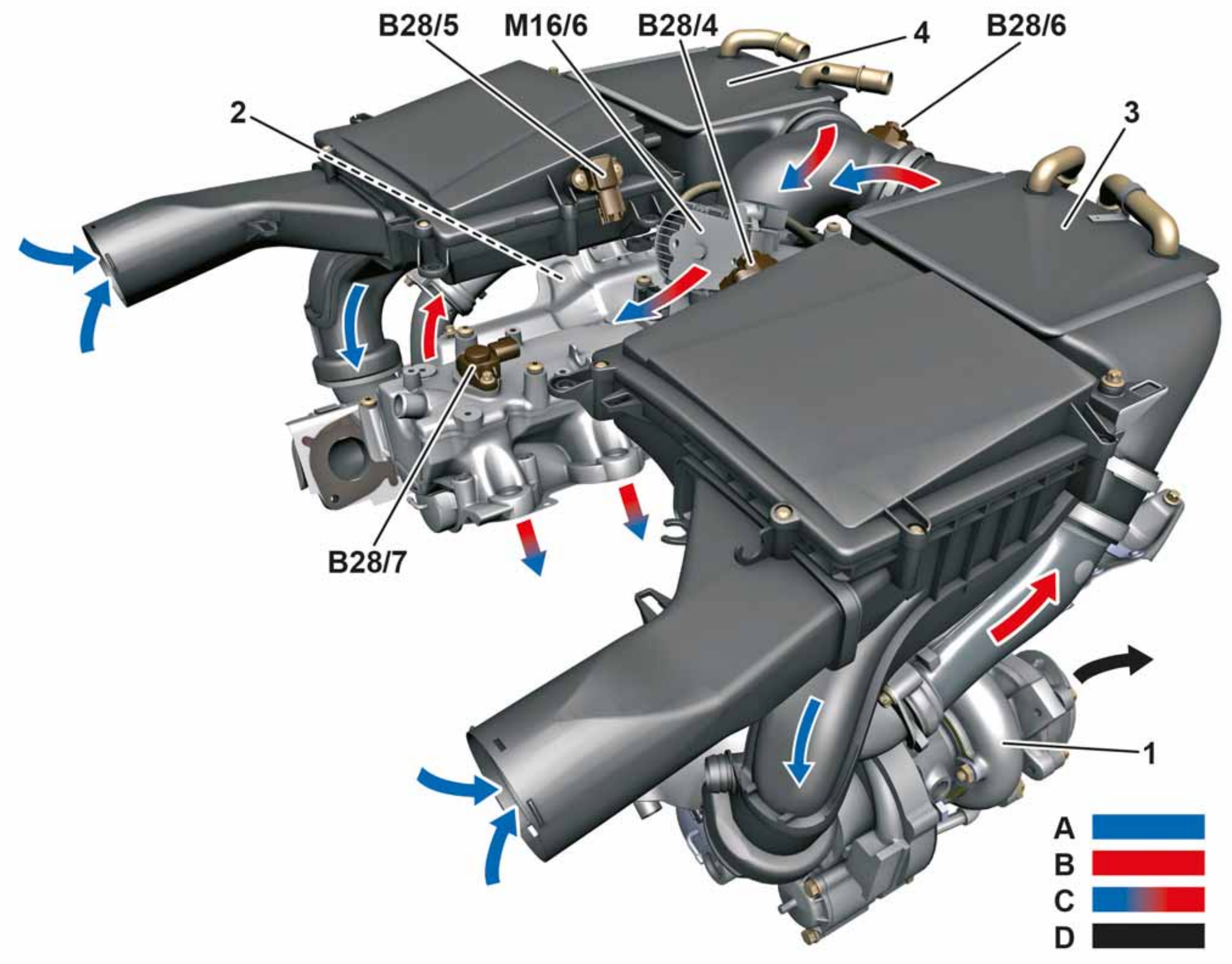


Sectional view of left turbocharger

1 Exhaust manifold
2 Vacuum cell
3 Blow-off valve
4 Turbine wheel
5 Compressor impeller
6 Shaft
7 Bearing housing
8 Wastegate flap

B Exhaust gas
D Intake air (downstream of air filter)
E Charge air

Charging



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Flow pattern of intake air/charge air

B28/4	*Pressure sensor downstream of air filter, left cylinder bank*
B28/5	*Pressure sensor downstream of air filter, right cylinder bank*
B28/6	*Pressure sensor upstream of throttle valve*
B28/7	*Pressure sensor downstream of throttle valve*
M16/6	*Throttle valve actuator*

1	*Left turbocharger*
2	*Right turbocharger*
3	*Charge air cooler, left cylinder bank*
4	*Charge air cooler, right cylinder bank*
A	*Intake air*
B	*Charge air*
C	*Cooled charge air*
D	*Exhaust gas*

Bypass air

Due to the inertia of the shafts, compressor impellers and turbine wheels, the turbochargers rotate slightly behind at the start of deceleration and continue to produce charge pressure against the closed throttle valve.

These pressure spikes in the turbochargers (brief howling noise) are prevented by the bypass air switchover valve. When the ME-SFI control unit receives the signals from the accelerator pedal sensor indicating the transition from load to deceleration mode, the bypass air switchover valve is actuated with a ground signal.

This causes vacuum from the vacuum reservoir to be applied to the blow-off valve at the relevant turbocharger. The blow-off valve opens a bypass so that the head pressure occurring downstream of the compressor when the throttle valve is closed/closing can escape back to zone in front of the compressor impeller. This prevents an undesirable braking of the compressor due to the high head pressure.

When the bypass air switchover valve is not actuated (in charging mode), the diaphragm chambers of the blow-off valves are connected with the charge air distributor. The blow-off valves are closed by the integral springs and by the boost pressure in the charge air distributor. If a blow-off valve fails to close, less boost pressure is produced.

Note on the illustration below:

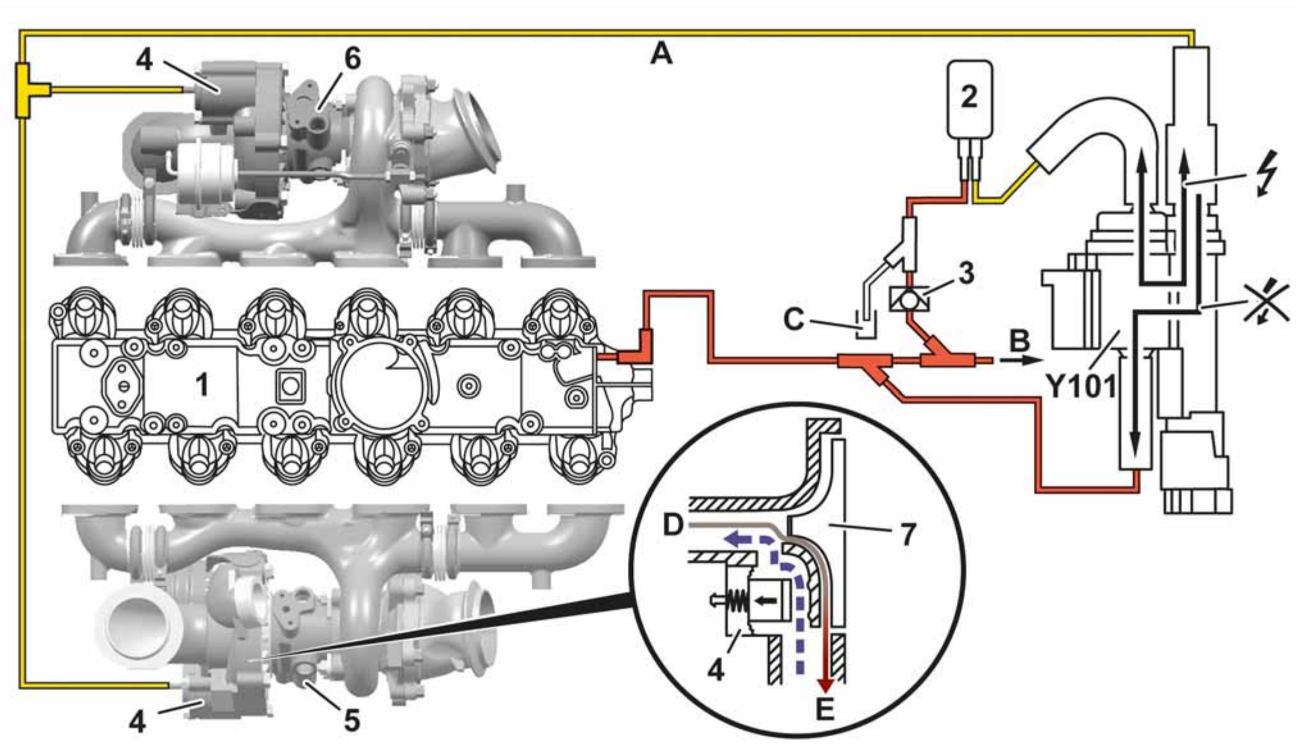
The intake air "D" flows to the compressor impeller (7), is compressed and travels as charge air "E" to the charge air cooler. When the blow-off valve (4) is open, the charge air flows back in front of the compressor impeller (shown as a broken line) and the pressure is dissipated.

Note

Vacuum is built up in the vacuum reservoir when the engine is in naturally aspirated mode and in deceleration mode.

For this, the check valve (under vacuum) opens the line between the charge air distributor and the vacuum reservoir.

Charging



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Bypass air

1	*Intake manifold*
2	*Vacuum reservoir*
3	*Check valve (vacuum)*
4	*Blow-off valve*
5	*Left turbocharger*
6	*Right turbocharger*
7	*Compressor impeller*
A	*Vacuum from bypass air switchover valve to blow-off valve*
B	*Vacuum to air pump 1 switchover valve and air pump 2 switchover valve*
C	*Bypass air test connection*
D	*Intake air (downstream of air filter)*
E	*Charge air*
Y101	*Bypass air switchover valve*

Fuel supply

The fuel supply system provides the fuel injection valves with a sufficient quantity of filtered fuel from the fuel tank as a sufficient pressure under all operating conditions.

Fuel pump control

The fuel pump is switched on when the ground signal "Fuel pump ON" transmitted by the ME-SFI (motor electronics) control unit is received by the fuel system control unit.

The current fuel pressure is registered by the ME-SFI control unit by means of the voltage signal from the fuel pressure sensor.

To control the fuel pump the ME-SFI control unit evaluates the fuel pressure and the load requirement and transmits the pulse width modulated signal (PWM signal) "Specified fuel pressure" to the fuel system control unit. This evaluates the PWM signal and actuates the fuel pump with 3 phase-shifted PWM signals so that the actual value of the fuel pressure matches the specified value.

Depending on the fuel requirement, the fuel pressure is thus varied from approx. 3.0 to 5.2 bar (relative). At engine start the fuel pressure is raised to 6.0 bar (relative).

Fuel feed

The fuel pump draws the fuel through the fuel strainer at the bottom of the fuel feed module and pumps it through the fuel filter with fuel pressure regulator to the fuel distribution rail (single-line system, without return line). The fuel pressure regulator restricts the fuel pressure to approx. 6.2 bar (relative).

The fuel returning from the fuel pressure regulator flows back into the fuel feed module and drives a suction jet pump, which fills the fuel feed module with fuel if the fuel level is low.

Safety fuel shutoff

The ME-SFI control unit controls the safety fuel shutoff on the basis of the following sensors and signals:

- Crankshaft Hall sensor, engine speed
- Throttle valve actuator, throttle valve position
- Supplemental Restraint System control unit, direct crash signal
- Supplemental Restraint System control unit, indirect crash signal via chassis CAN 1

The safety fuel shutoff function is activated by the ME-SFI control unit under the following conditions:

- Mechanical faults in the throttle valve actuator
- Absence of the engine speed signal
- Crash signal

Fuel system

Fuel pressure regulator

The fuel pressure regulator limits the fuel pressure by adjusting the fuel return quantity. When the set fuel pressure is exceeded, the diaphragm in the fuel pressure regulator is pressed against the compression spring and the valve attached to the diaphragm opens the hole for the fuel return.

When the fuel pressure drops below the set pressure, the valve is closed again by the compression spring.

Fuel filter

The fuel filter element is integrated into a plastic housing. The fuel flows through from the outside to the inside. Impurities are trapped by the filter.

There is a check valve in the feed point of the fuel filter which prevents reduction of the fuel pressure when the fuel pump is switched off.

i Note

The idle speed control function prevents the purging process from causing changes to the engine speed at idle. The fuel/air mixture is leaned out accordingly depending on the amount of fuel vapor in the activated charcoal canister.

Purging

Fuel vapors must not be allowed to escape into the atmosphere when the fuel tank is vented.

The fuel vapors are stored in the activated charcoal canister and later burned in the engine.

When the engine is running, the fuel vapors stored in the activated charcoal canister are drawn off via the purge switchover valve and burned in the engine.

To regulate the purge quantity, the switchover valve is actuated by the ME-SFI control unit at the ground end by means of a PWM signal with a frequency of 10 Hz to 30 Hz.

The constant opening and closing of the purge switchover valve with on/off cycles of varying lengths determine the purge quantity.

Purging (with code (494) USA version)

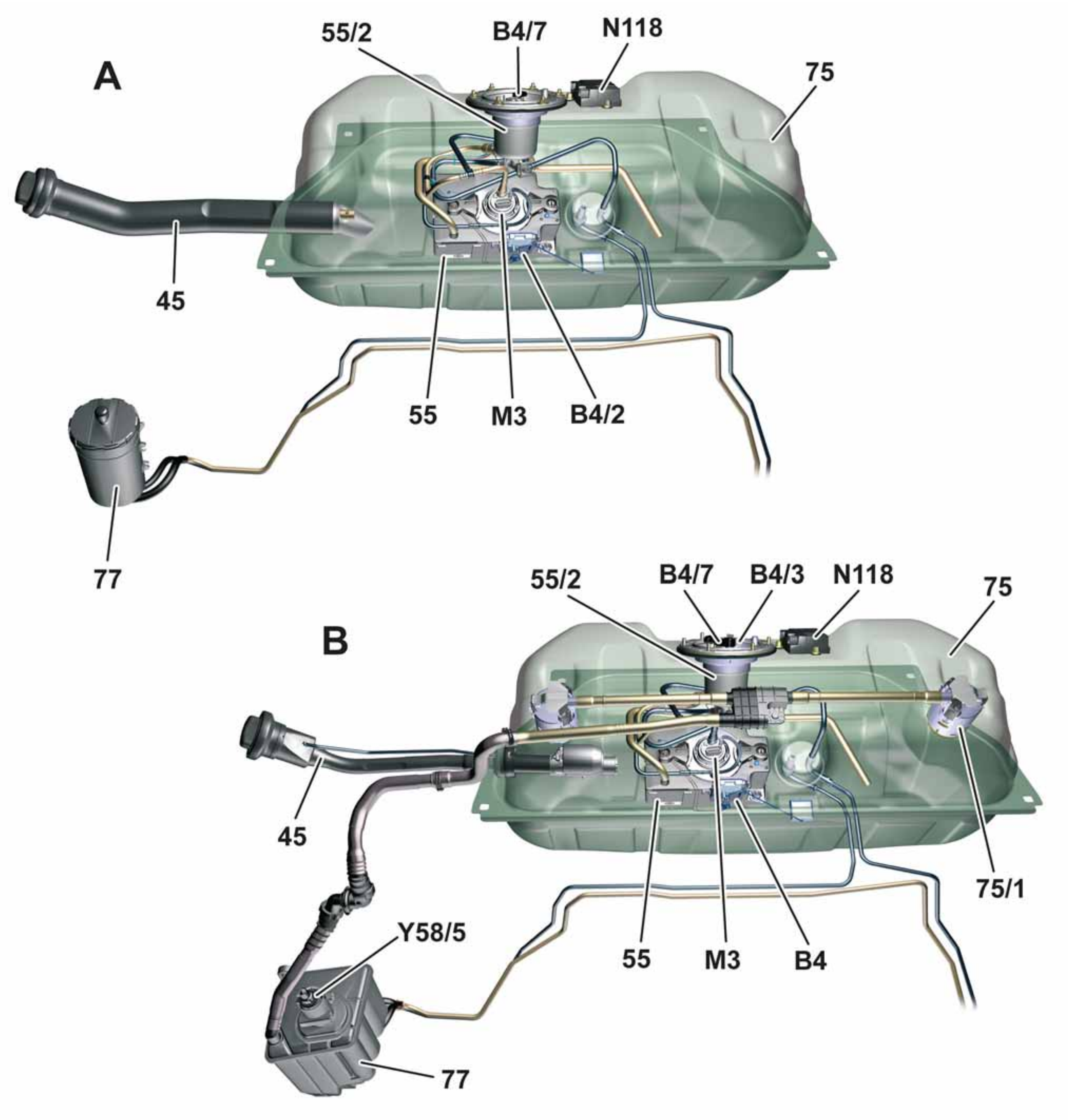
Activated charcoal canister shutoff valve

The activated charcoal canister shutoff valve is actuated by the ME-SFI control unit to close the ventilation connections of the activated charcoal filter. This is necessary in order to perform the leak test of the purging system that is required by law.

When the activated charcoal canister shutoff valve is closed, the mechanical safety valve is responsible for ventilating the activated charcoal filter.

OBD pressure sensor

The OBD pressure sensor registers the internal pressure in the fuel tank for the leak test. The OBD pressure sensor is located on the purge line below the filler neck.



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Fuel tank

A	*ECE version*	*B4*	*Fuel tank fill level sensor fuel level indicator*
B	*USA version*	*B4/3*	*Fuel tank pressure sensor (USA only)*
45	*Fuel filler neck*	*B4/7*	*Fuel pressure sensor*
55	*Fuel feed module*	*M3*	*Fuel pump*
55/2	*Fuel filter*	*N118*	*Fuel system control unit*
75	*Fuel tank*	*Y58/4*	*Activated charcoal canister shutoff valve (USA only)*
75/1	*Refueling, limiting and vent valve (USA only)*		
77	*Activated charcoal canister*		

Fuel system

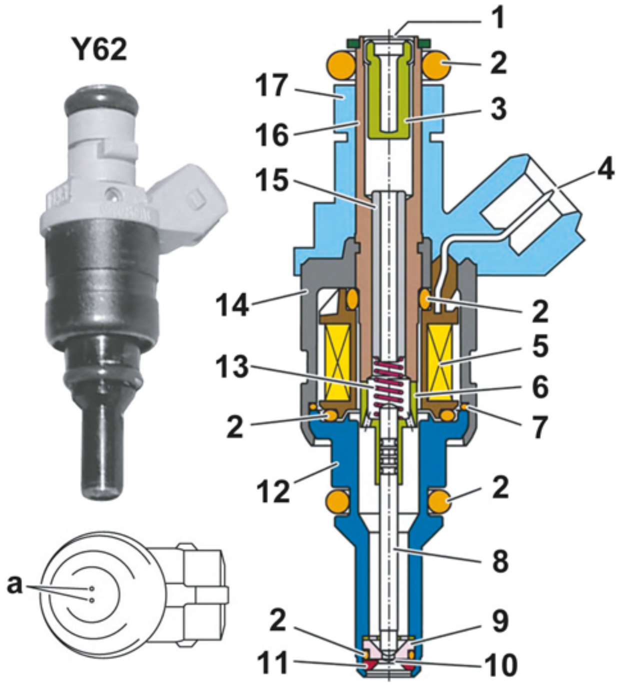
Injection valves

The injection valves spray a calculated quantity of finely atomized fuel into the intake port of the relevant cylinder at a certain point in time.

When the solenoid coil is energized, the nozzle needle is raised approx. 0.1 mm via the solenoid armature against the force of the coil spring. The fuel emerges through the multi-hole nozzle (a) and is sprayed in finely atomized form into the intake port.

Each injection valve is actuated sequentially by ground pulses of appropriate duration directly from the ME-SFI control unit.

The voltage is supplied by "circuit 87 M1".



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1	*Fuel pressure fitting*
2	*Sealing ring (O-ring)*
3	*Filter*
4	*Electrical connection*
5	*Solenoid coil*
6	*Solenoid armature*
7	*Spacer ring*
8	*Nozzle needle*
9	*Nozzle needle seat*
10	*Outlet bore*
11	*Outlet disk*
12	*Valve body*
13	*Coil spring*
14	*Housing*
15	*Adjusting sleeve*
16	*Inner connecting pipe*
17	*Plastic connector to distribution rail*
Y62	*Injection valves*
a	*Multi-hole nozzle*

Injection control

The engine is allocated the necessary fuel quantity by the ME-SFI control unit.

The ME-SFI control unit uses a characteristics map to calculated the required injection period on the basis of the following sensors and signals:

- Coolant temperature sensor
- Charge air temperature sensor
- Pressure sensor downstream of throttle valve, engine load
- Accelerator pedal sensor, engine load request from driver
- Accelerator pedal sensor, accelerator pedal operation fast or slow
- Left and right oxygen sensors upstream of catalytic converter
- Crankshaft Hall sensor, engine speed
- Altitude pressure sensor in ME-SFI control unit, atmospheric pressure for altitude adaptation

In addition, the requirements of the engine torque request function are also taken into account.

The ME-SFI control unit regulates the injection period under the following operating conditions:

- Partial-load operation
- Full-load operation
- Acceleration
- Idling and purging

Partial-load operation

In partial-load operation with the engine warm, the ME-SFI control unit calculates the actuation time of the injection valves according to the lambda control and the requested engine torque.

Full-load operation

In full-load operation with the throttle valve wide open, the ME-SFI control unit extends the actuation time of the injection valves in order to provide the maximum engine torque.

Acceleration

Rapid changes in the accelerator pedal position cause rapid opening or closing of the throttle valve. Because of this, the fuel mixture briefly becomes too lean or too rich.

To prevent this, the ME-SFI control unit adjusts the fuel/air mixture by lengthening or shortening the actuation time of the injection valves according to a characteristics map. This stops the vehicle from juddering.

Exhaust system

Exhaust treatment

The task of the exhaust treatment system is to reduce exhaust emissions.

To do so, the catalytic converters, for example, must be quickly brought up to operating temperature so that exhaust emissions during cold starting are reduced.

The following components and subsystems are involved in exhaust treatment:

- Firewall catalytic converters
- Secondary air injection
- Transmission shift delay
- Monitoring of catalytic converter efficiency

Firewall catalytic converters

The pollutants in the exhaust gases emitted by the engine are chemically converted by the near-engine mounted firewall catalytic converters (three-way catalytic converters) at λ=1.

By oxidation carbon monoxide is converted into carbon dioxide (CO_2) and hydrocarbon into water (H_2O) + carbon dioxide.

By chemical reduction the nitrogen oxides are converted into nitrogen (N_2) + carbon dioxide.

Secondary air injection

Secondary air injection is a measure for ensuring that emissions limits are complied with during (cold) engine starts.

Function requirements for secondary air injection

- Coolant temperature >-10 °C and <35 °C
- Coolant temperature >7 °C and <35 °C (with code (494) USA version)
- Engine speed <2500 rpm
- Engine at idle or partial load

Secondary air injection heats the firewall catalytic converters to their operating temperature more quickly after engine start, thereby improving the exhaust emission values during warm-up.

The ME-SFI control unit controls the secondary air injection on the basis of the following sensors:

- Pressure sensor downstream of throttle valve, engine load
- Coolant temperature sensor
- Crankshaft Hall sensor, engine speed
- Charge air temperature sensor

The injected air is provided by the electric air pump, which is actuated by the ME-SFI control unit via the secondary air injection relay.

When the air pump 1 and 2 switchover valves are actuated by a ground signal from the ME-SFI control unit, they allow the vacuum from the variable intake manifold to pass through to the air shutoff valves. These open and the injected air from the electric air pump is injected into the exhaust ports of the cylinder heads.

The injected air reacts with the hot exhaust gases in the exhaust ports and firewall catalytic converters. The carbon monoxide and hydrocarbon are oxidized (afterburning).

This afterburning causes an increase in the exhaust temperature (exothermic reaction), which additionally heats the firewall catalytic converters.

For secondary air injection the air pump 1 and 2 switchover valves and the electric air pump are actuated simultaneously by the ME-SFI control unit for max. 90 s after engine start.

After secondary air injection has been actuated, it is disabled until the coolant temperature has reached >60 °C and has subsequently cooled to <40 °C. This gives the electric air pump sufficient time to cool down too.

Note

Secondary air injection may be enabled for diagnosis with Xentry Diagnostics for max. 120 s (less if the engine is warm).

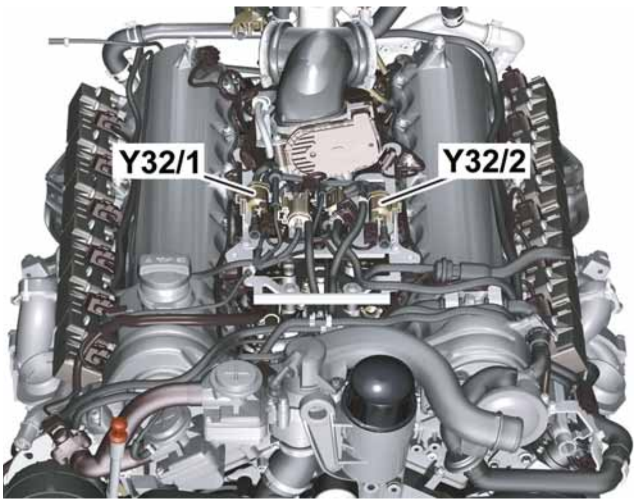
A cooling period of 30 min must be observed before the next actuation otherwise the electric air pump will be damaged (overheated).

Air pump switchover valves

The air pump 1 and 2 switchover valves actuate the air shutoff valves with vacuum from the intake manifold in order to inject air.

When air injection is enabled, the switchover valves are actuated directly by the ME-SFI control unit with a ground signal. The voltage is supplied by "circuit 87 M2".

A check valve ensured that vacuum builds up and is maintained in the switchover valves.
This guarantees that the air shutoff valves can be actuated with vacuum in all operating states.



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Y32/1 Air pump 1 switchover valve
Y32/2 Air pump 2 switchover valve

Exhaust system

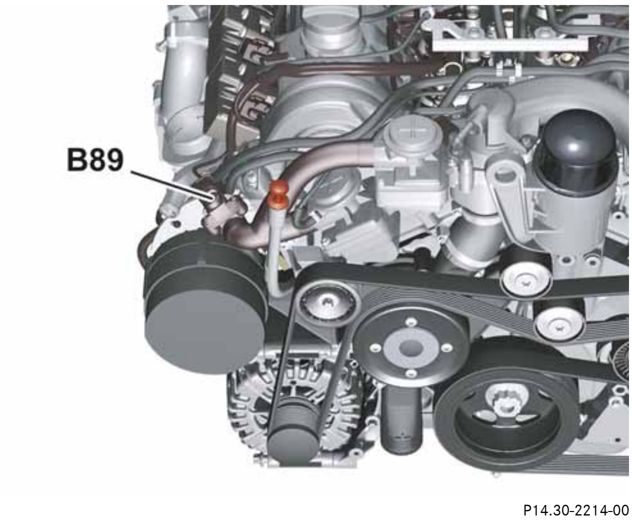
Secondary air pressure sensor

Diagnosis of the secondary air injection must occur before the oxygen sensors are ready to operate.

To accomplish this, a pressure-based diagnosis function has been introduced in the M 279 AMG. When the engine is started cold and heating of the catalytic converters is required, the pressure generated by the secondary air injection pump when the secondary air valves are open is measured with the secondary air valves closed. After the normal secondary air injection period of the secondary air injection pump, the pump continues to be actuated for the alternating valve check and the leak test of the secondary air valves. For this, one valve is opened and one valve closed alternately, and the pressure rise is measured and evaluated. Then both valves are closed for the leak test, and again the pressure rise is measured and evaluated.

As soon as the coolant temperature has exceeded a value of 40 °C, the secondary air system and the pressure-based diagnosis function are inoperative in the following driving situations:

- Driving
- Engine starts by the start/stop function
- Brief stops with subsequent restarts



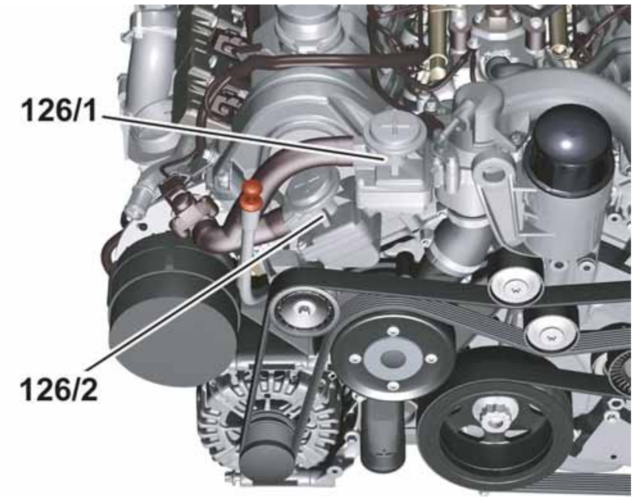
B89 Secondary air pressure sensor

Air shutoff valves

When air injection is actuated, the air shutoff valves open the path for the injected air. With air injection switched off, they prevent exhaust gas stream from drawing air into the exhaust ports.

When air injection is enabled, the left air shutoff valve is actuated via the air pump 1 switchover valve and the right air shutoff valve via the air pump 2 switchover valve using vacuum from the intake manifold. This causes the air shutoff valves to open and the injected air from the electric air pump can flow into the exhaust ports of the cylinder heads.

The integral check valves prevent the exhaust gas from entering the air shutoff valves when air injection is off, and thereby protect them against contamination and thermal damage.



126/1 Left air shutoff valve
126/2 Right air shutoff valve

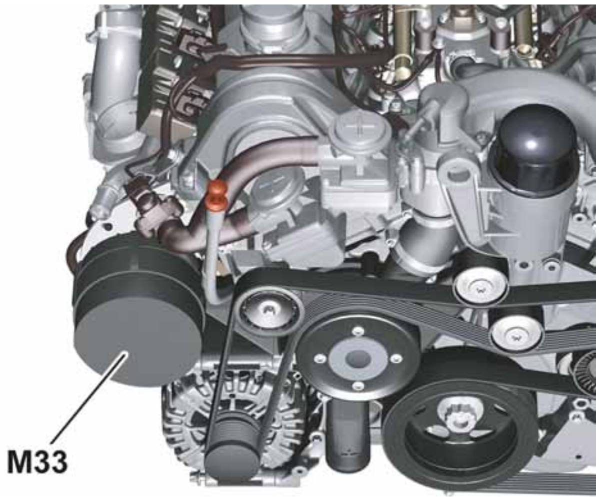
Electric air pump

The electric air pump injects fresh air into the exhaust ports of the cylinder heads.

This secondary air injection produces afterburning in the exhaust ports and firewall catalytic converters, which accelerates the warming of the firewall catalytic converters to their operating temperature after a cold start.

The electric air pump is actuated for max. 90 s at the same time as the air pump 1 and 2 switchover valves via the secondary air injection relay when air injection is enabled.

The electric air pump draws filtered injection air from the right air filter housing and pumps it via two pressure fittings through the air shutoff valves to the exhaust ports.



M33 Electric air pump

Exhaust system

Exhaust system

The task of the exhaust treatment system is to reduce exhaust emissions:

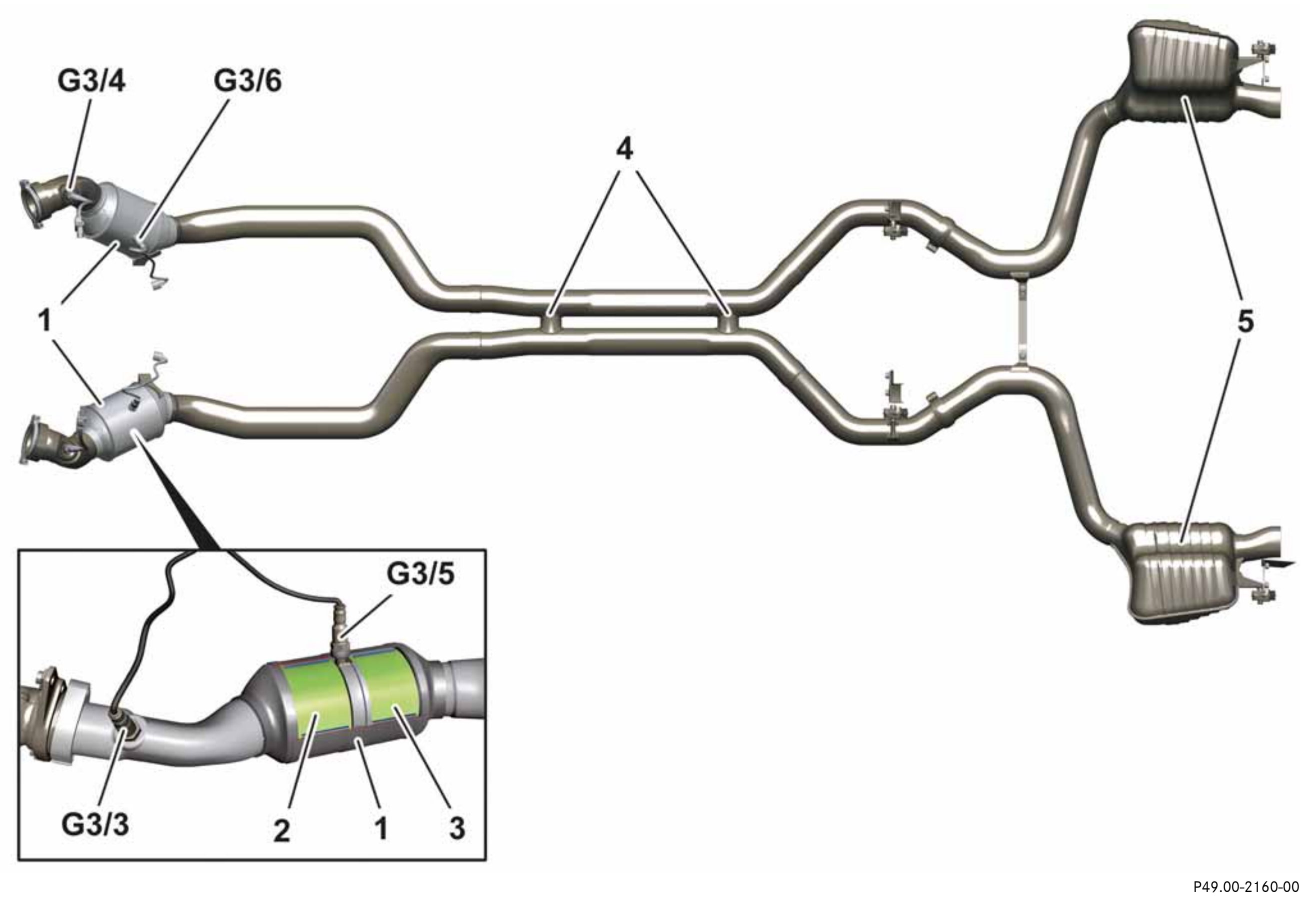
- Nitrogen oxides (NOx)
- Hydrocarbon (HC)
- Carbon monoxide (CO)

The near-engine location of the firewall catalytic converters ensures that operating temperature necessary for optimum emissions reduction is reached as quickly as possible.

The twin-pipe exhaust system consists of:

- One firewall catalytic converter with two "monoliths" for each pipe
- O_2 sensors upstream and downstream if the first monolith
- Switchover valve
- One rear muffler for each pipe

Ultimately the exhaust system provides the emotional and typical AMG sound.



Exhaust system

1 Firewall catalytic converter
2 Monolith inlet
3 Monolith outlet
4 Switchover valve
5 Rear muffler

G3/3 Left O2 sensor upstream of catalytic converter
G3/4 Right O2 sensor upstream of catalytic converter
G3/5 Left O2 sensor downstream of catalytic converter
G3/6 Right O2 sensor downstream of catalytic sconverter

In order to guarantee the maximum engine power, the engine and turbochargers must be properly cooled.

The engine oil cooler (oil/air heat exchanger) is located in the center behind the front spoiler. Air ducting provides optimum air flow and cooling output. The warm waste air flows through an opening in the underfloor paneling directly into the atmosphere.

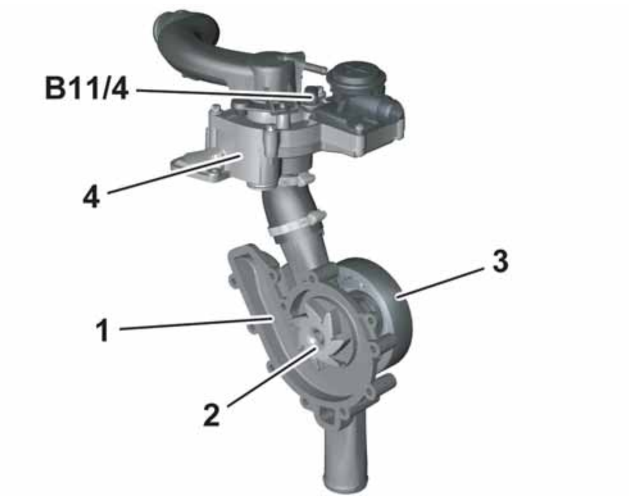
An additional engine oil cooler with fan is installed in the right front wheel arch.

The interbore bridges between the cylinders in the crankcase have three bores for cooling: two feed bores that supply coolant to the bridge, and one drain bore. The coolant flows out of the bridge via the bore in the cylinder head. Here there is one feed bore for each interbore bridge.

Coolant temperature regulation

The coolant temperature is regulated by the ME-SFI control unit on the basis of the following sensors and signals:

- Coolant temperature sensor
- Charge air temperature sensor
- Pressure sensor downstream of throttle valve, engine load
- Accelerator pedal sensor
- Crankshaft Hall sensor, engine speed
- Temperature sensor in ME-SFI control unit
- Front SAM control unit with fuse and relay module, outside air temperature
- Instrument cluster, vehicle speed
- Electronic Stability Program control unit, wheel speed
- Fully integrated transmission control controller unit, status of transmission oil temperature



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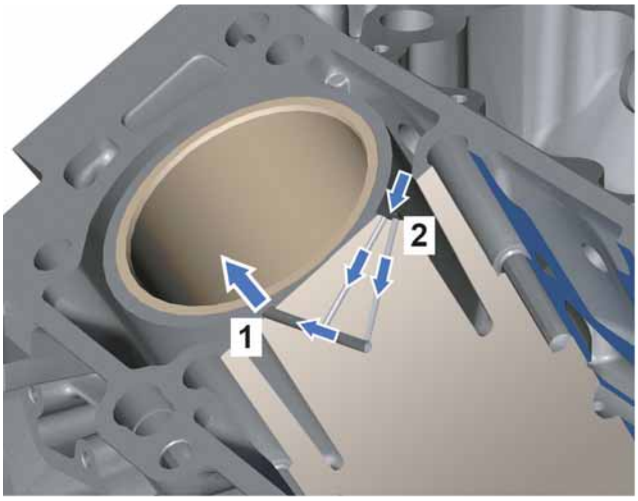
Coolant pump

1 Housing
2 Rotor
3 Belt pulley
4 Coolant thermostat

B11/4 Coolant temperature sensor



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Interbore cooling

1 Drain bore (to cylinder head)
2 Feed bore

Engine cooling

Fan control

The ME-SFI control unit actuates the engine and air conditioning electric suction fan with integrated control. The target fan speed is specified by the ME-SFI control unit by means of a pulse width modulated signal (PWM signal).

The on/off ratio of the PWM signal is between 10 and 90%.

For example:

10% fan motor "OFF"
20% fan motor "ON", minimum speed
90% fan motor "ON", maximum speed

If the actuation is faulty, the fan motor turns at the maximum speed (fan limp-home mode).

The automatic air conditioning control and operating unit transmits the status of the air conditioning to the ME-SFI control unit via the interior CAN and chassis CAN 1.

Delayed fan switch-off

After "ignition OFF" the fan motor runs on for up to 5 min if the coolant temperature or the engine oil temperature have exceeded the specified maximum values.

The on/off ratio of the PWM signal during run-on is max. 40%.

If the battery voltage drops too much during this time, the delayed fan switch-off is suppressed.

Overheating protection

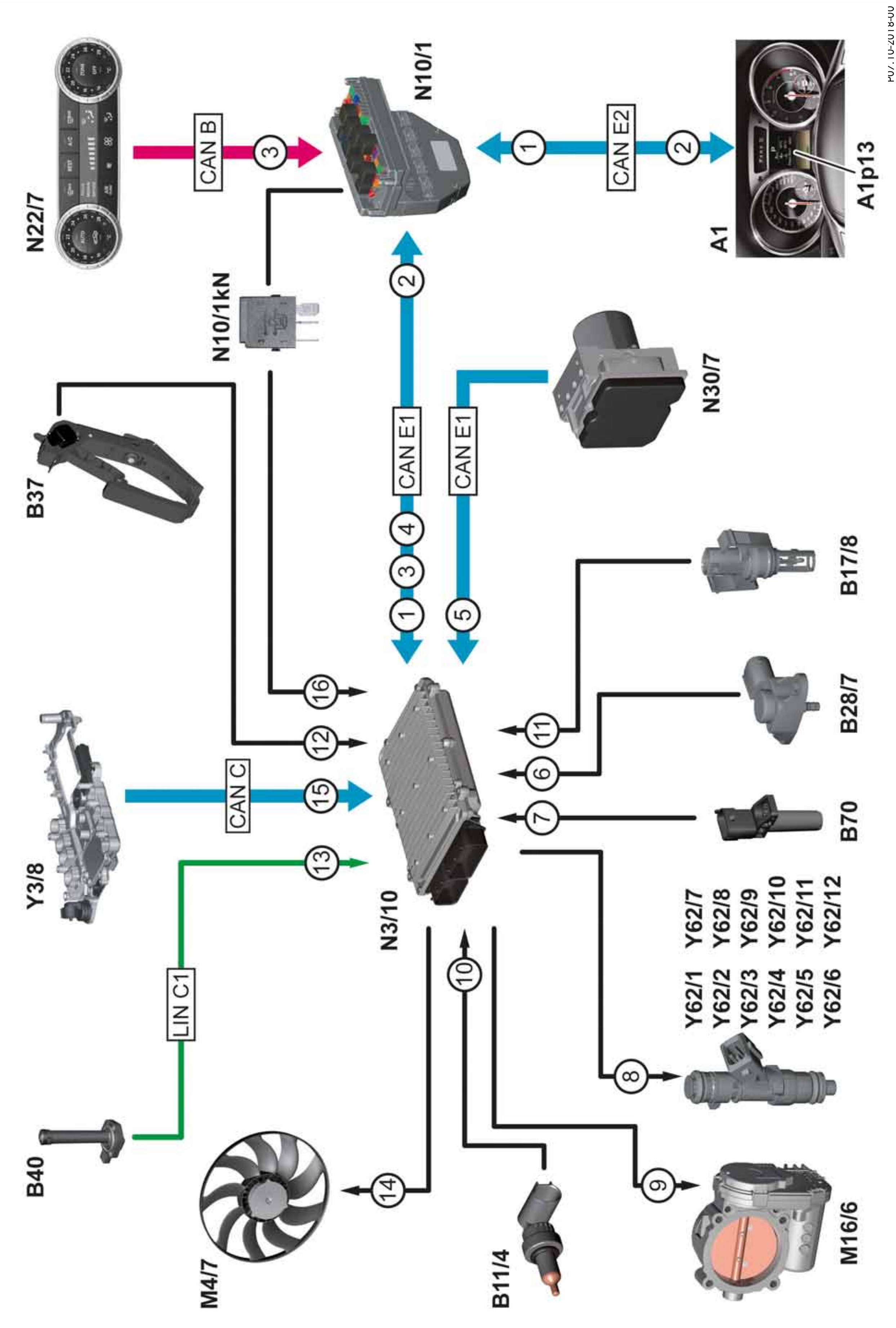
The overheating protection function provides protection against engine damage in the event of thermal overload and prevents overheating damage to the catalytic converters. If the coolant or charge air temperature is too high, the ME-SFI control unit no longer closes the boost pressure control flap completely, depending on the engine speed and load. In addition, the throttle valve of the throttle valve actuator can no longer be fully opened. The injection time of the injection valves is shortened by the ME-SFI control unit according to the reduced air mass.

New expansion reservoir for the low-temperature circuit

To improve the cooling power of the engine, the circulating coolant volume of the low-temperature circuit has been increased with the aid of an expansion reservoir. The expansion reservoir is located at the rear of the engine between the charge air coolers.

i Note

If the engine oil or coolant temperature is too high, a warning message appears in the multifunction display of the instrument cluster. For this the ME-SFI control unit sends an appropriate signal over chassis CAN 1 and chassis CAN 2 to the instrument cluster.



Function schematic of coolant temperature regulation (shown for model 231)

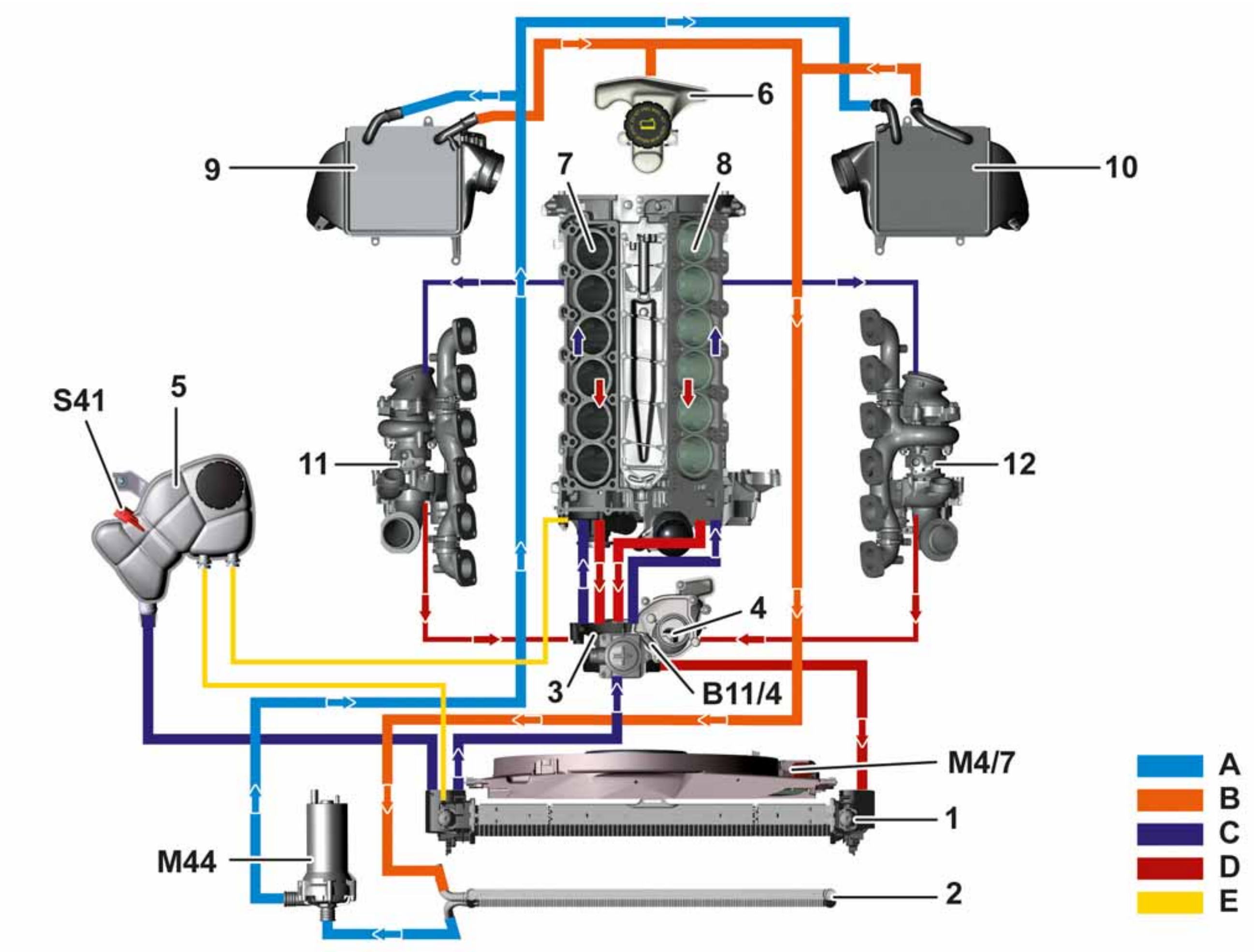
Engine cooling

A1	Instrument cluster
A1p13	Multifunction display
B11/4	Coolant temperature sensor
B17/8	Charge air temperature sensor
B28/7	Pressure sensor downstream of throttle valve
B37	Accelerator pedal sensor
B40	Oil sensor (oil level, temperature and quality)
B70	Crankshaft Hall sensor
M4/7	Fan motor
M16/6	Throttle valve actuator
N3/10	ME-SFI [ME] control unit
N10/1	Front SAM control unit with fuse and relay module
N10/1kN	Engine circuit 87 relay
N22/7	Automatic air conditioning control and operating unit
N30/7	Electronic Stability Program Premium control unit

Y3/8	Fully integrated transmission control controller unit
Y62/1	Cylinder 1 injection valve
Y62/2	Cylinder 2 injection valve
Y62/3	Cylinder 3 injection valve
Y62/4	Cylinder 4 injection valve
Y62/5	Cylinder 5 injection valve
Y62/6	Cylinder 6 injection valve
Y62/7	Cylinder 7 injection valve
Y62/8	Cylinder 8 injection valve
Y62/9	Cylinder 9 injection valve
Y62/10	Cylinder 10 injection valve
Y62/11	Cylinder 11 injection valve
Y62/12	Cylinder 12 injection valve

CAN B	Interior CAN
CAN C	Drive train CAN
CAN E1	Chassis CAN 1
CAN E2	Chassis CAN 2
LIN C1	Drive train LIN

1	Vehicle speed, signal
2	Instrument cluster, message
3	Air conditioning, status
4	Outside temperature, signal
5	Wheel speed, signal
6	Engine load, signal
7	Engine speed, signal
8	Injection valves, actuation
9	Throttle valve actuator, actuation
10	Coolant temperature sensor, signal
11	Charge air temperature sensor, signal
12	Accelerator pedal sensor, signal
13	Oil sensor, signal
14	Fan motor, specified rpm request
15	Transmission control, signal
16	Circuit 87, status



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Coolant circuit *(schematic)*

1	*Radiator*
2	*Low-temperature cooler*
3	*Coolant pump*
4	*Coolant thermostat*
5	*Expansion reservoir*
6	*Low-temperature circuit expansion reservoir*
7	*Right cylinder bank*
8	*Left cylinder bank*
9	*Right charge air cooler*
10	*Left charge air cooler*
11	*Right turbocharger*
12	*Left turbocharger*

B11/4	*Coolant temperature sensor*
M4/7	*Engine and air conditioning electric suction fan with integrated control*
M44	*Charge air cooler circulation pump*
S41	*Coolant level indicator switch*

	Charge air cooler coolant feed
	Charge air cooler coolant return
C	*Engine and turbocharger coolant feed*
D	*Engine and turbocharger coolant return*
E	*Venting*

Turbocharger cooling

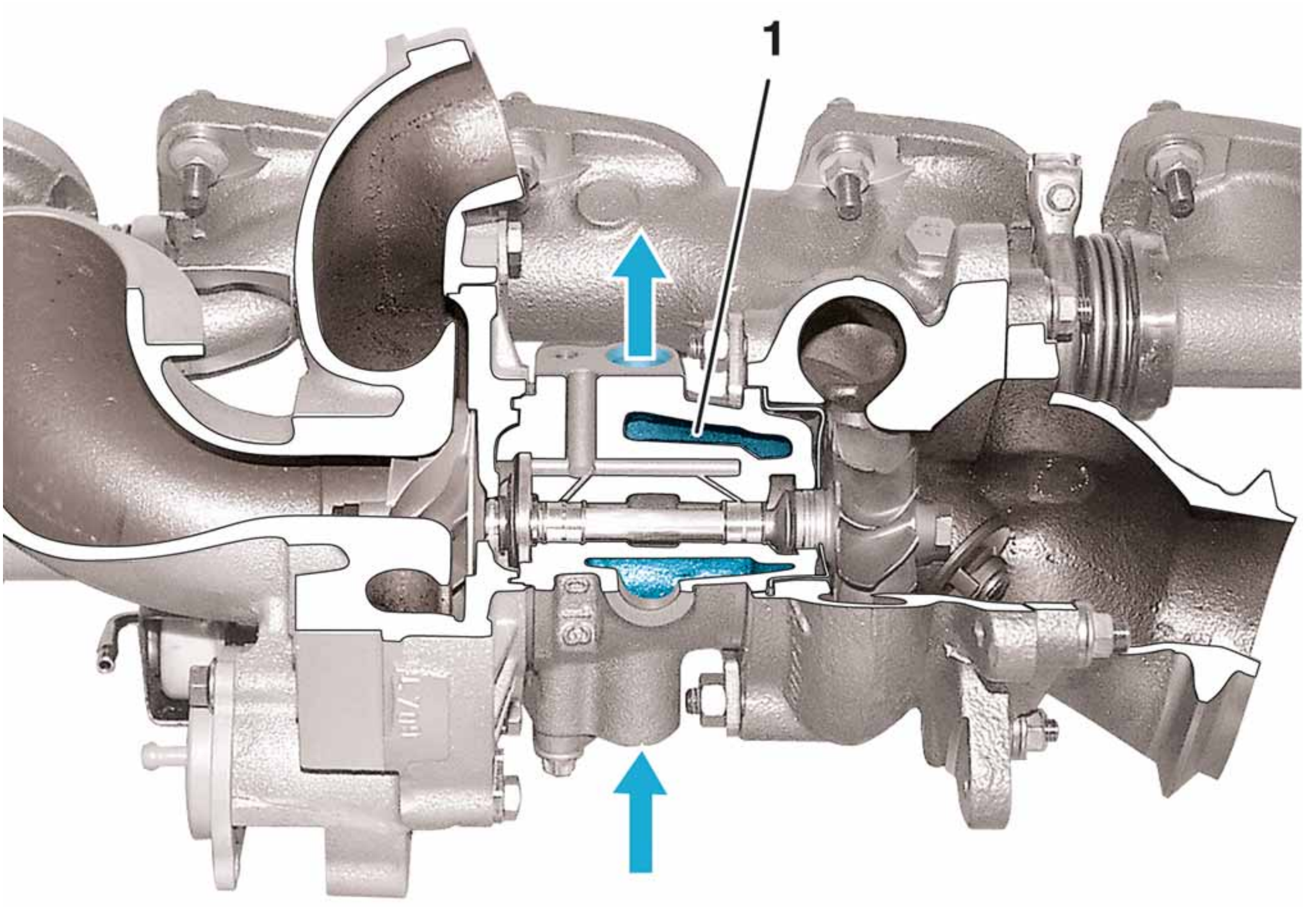
Turbocharger cooling

Coolant flows through the bearing housing of the turbochargers. The coolant flows to each of the turbochargers via a different connection in the cylinder crankcase, and passes through the bearing housings from bottom to top. The cooling streams of the two turbochargers leave the bearing housings and are fed back into the main cooling circuit at the right cylinder head.

The flow of coolant through the turbochargers is assisted by the pressure differential in the water jacket (thermosiphon principle).

i Thermosiphon principle

Due to the difference in density between warm and cold water, the warm (lighter) water experiences lift and rises upwards.



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Turbocharger cooling

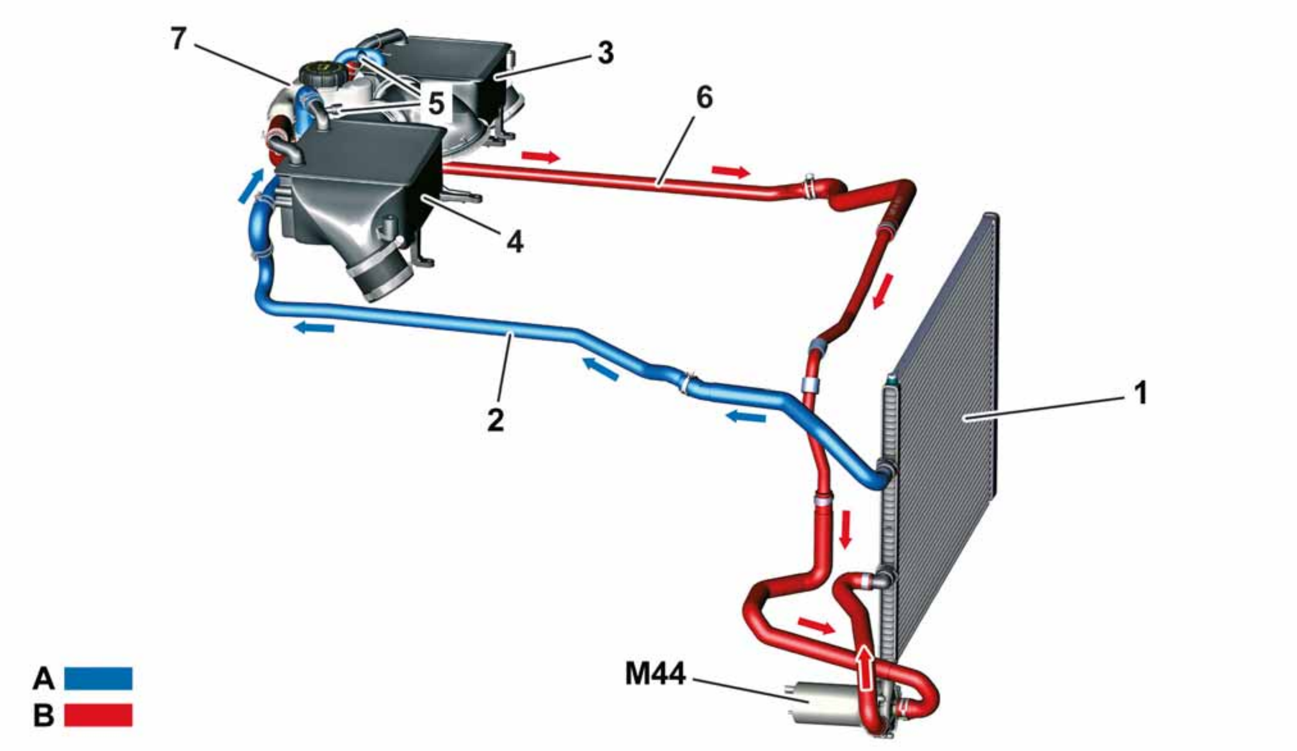
1 Bearing housing cooling jacket

One charge air cooler is installed for each cylinder bank. Both charge air coolers are connected to the low-temperature cooling circuit with low-temperature cooler, expansion reservoir and charge air cooler circulation pump.

The heated charge air surrenders its heat to the coolant flowing through the charge air cooler (air/water heat exchanger). The coolant in turn releases the absorbed heat to the ambient air in the low-temperature cooler.

The coolant is pumped through the circuit by the on-demand electric circulation pump, which is switched on and off by the engine control unit according to the charge air temperature.

The cooled sir downstream of the charge air coolers has a higher density. This increases the cylinder charge and thus the engine power. In addition, the tendency to knock is decreased and the lower exhaust temperatures reduce the formation of nitrogen oxides (NOx).



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Low-temperature cooling circuit (LT circuit)

1 Low-temperature cooler
2 Feed line
3 Left charge air cooler
4 Right charge air cooler
5 Service valves
6 Return line
7 Expansion reservoir

M44 Charge air cooler circulation pump

Charge air cooling

If the charge air temperature exceeds 45 °C, the charge air cooler circulation pump is actuated by the ME-SFI control unit via the engine coolant circulation pump relay.

When the charge air temperature drops below 35 °C, the coolant circulation pump is switched off again.

The charge air temperature is registered in the intake manifold by the charge air temperature sensor and is sent to the ME-SFI control unit with a voltage signal.

Note

For the charge air cooling system to operate correctly, it is absolutely essential that the low-temperature circuit is filled without bubbles!

For this purpose there is the special tool "vacuum-type cooling system filler" and work instructions in WIS describing the bleeding procedure in detail.

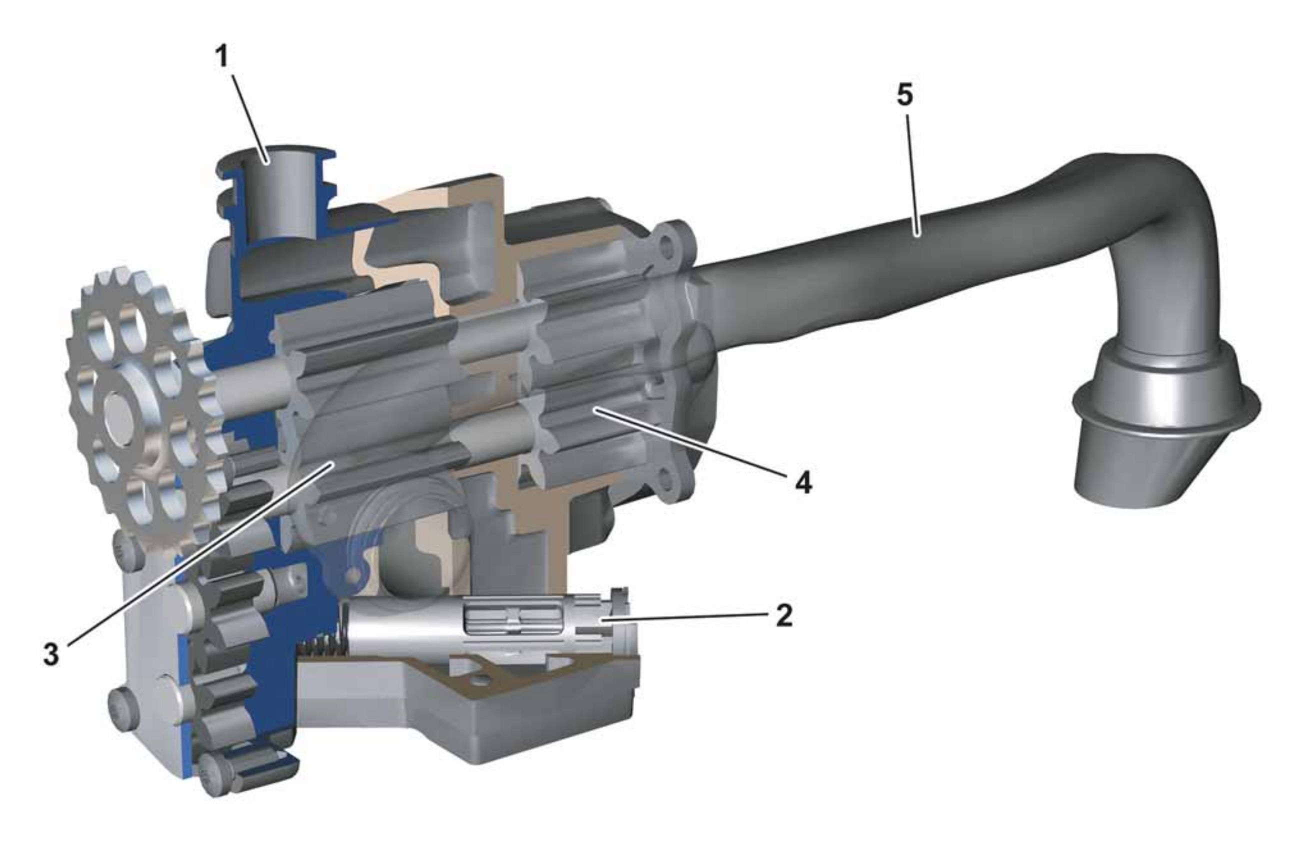
Note

The cap of the low-temperature circuit may only be opened when the engine is cold (ambient temperature).

If the cap is opened while the engine is warm, coolant escapes and air enters the low-temperature circuit. This results in a considerable power loss, and the low-temperature circuit must then be bled!

Engine oil pump

The engine oil pump is a compound pump with two suction levels for the returning oil from the turbochargers.

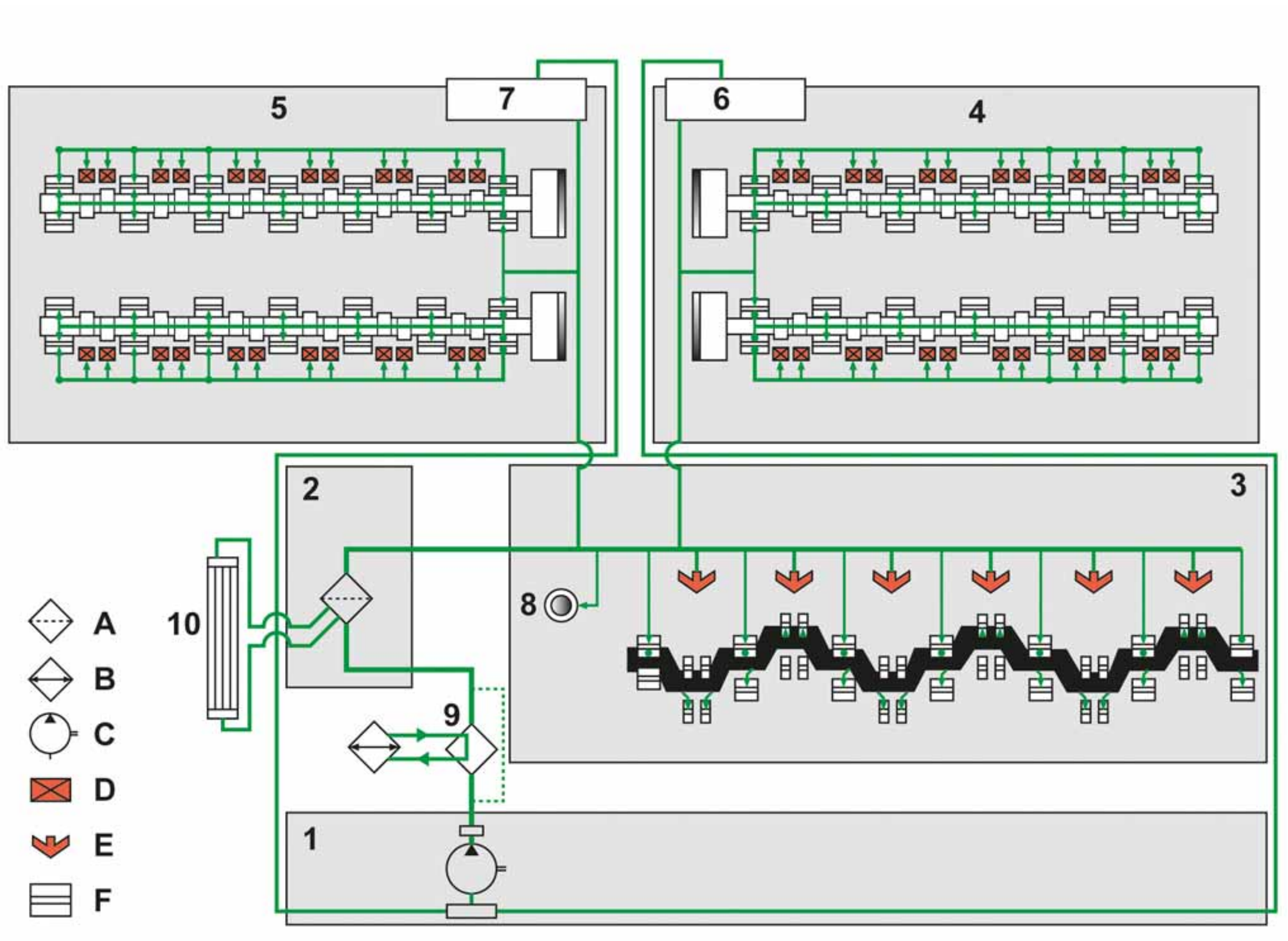


Engine oil pump

1 Pressure connection
2 Pressure regulating valve
3 Delivery stage 1
4 Delivery stage 2
5 Intake connection

Engine lubrication

Oil circuit



Oil circuit diagram, M 279 AMG

1 Oil pan
2 Timing case cover
3 Cylinder crankcase
4 Left cylinder head
5 Right cylinder head
6 Left turbocharger
7 Right turbocharger
8 Timing chain guide pulley
9 Thermostat with bypass
10 Engine oil cooler

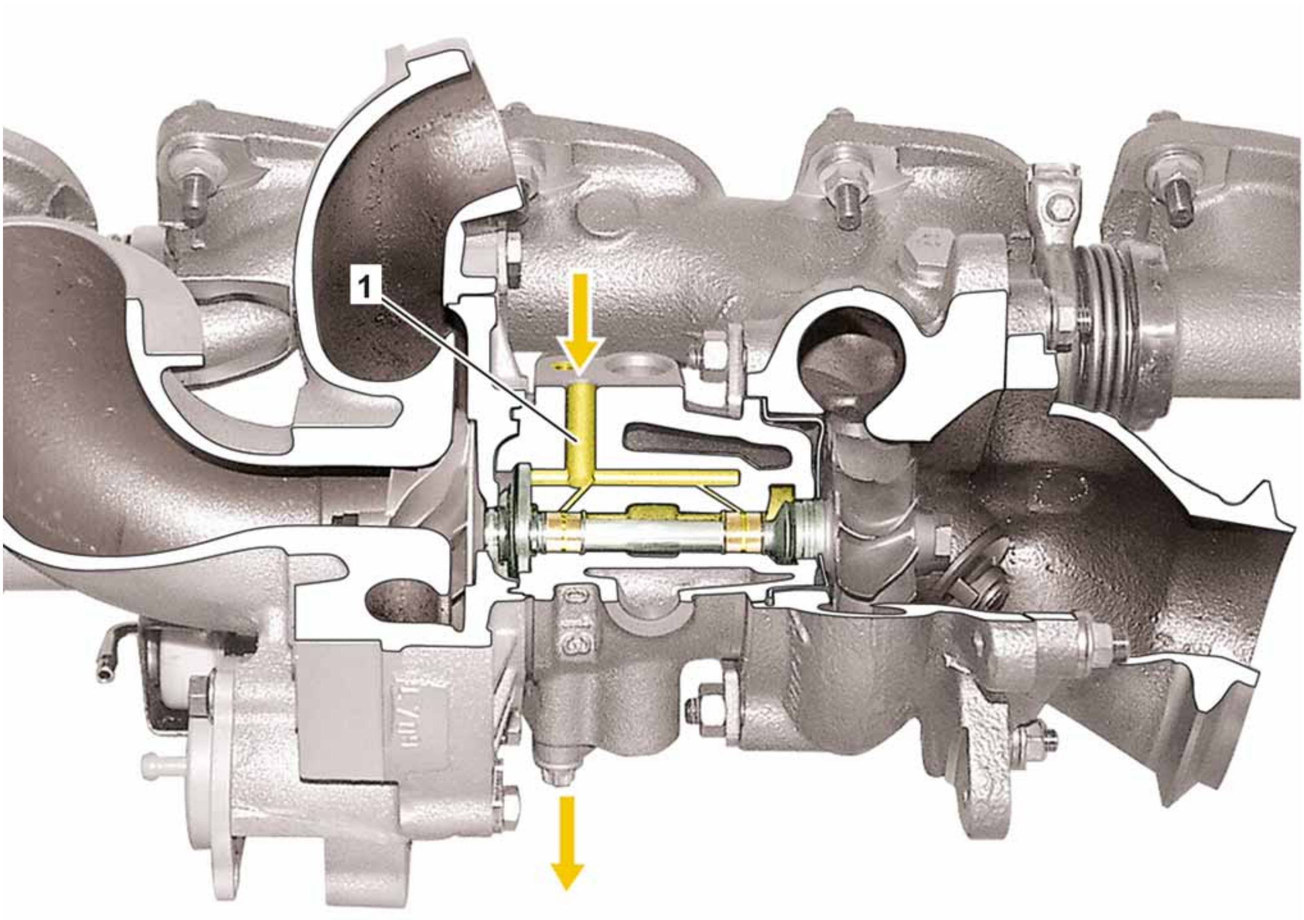
A Oil filter
B Engine oil cooler (oil/air heat exchanger)
C Oil pump
D Valve compensating elements
E Oil spray nozzles
F Plain bearing

Turbocharger

The shaft of the turbocharger with the turbine wheel and compressor impeller is supplied with oil via the engine's oil circuit. The oil flows in the opposite direction to the coolant.

The lubricating oil is taken from the main oil duct of the cylinder crankcase, flows through the bearing housing and is extracted individually for each turbocharger from the engine oil pump.

The oil feed and drain routes for lubricating the turbocharger are designed not to interfere with the lubricating oil circuit of the engine.



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Turbocharger lubrication

1 Lubricating oil feed

Engine control

ME-SFI [ME] control unit

The ME-SFI control unit is located on the left in the rear of the engine compartment in the control unit box on the driver side.

The housing of the ME-SFI control unit is made of die-cast aluminum and the cover is corrosion-protected sheet steel. The ME-SFI control unit is waterproof and dustproof. Inside is the 32-bit measurement and control circuitry of the engine control.

Variants

Variant coding allows e.g. the following vehicle versions and equipment packages to be coded using Xentry Diagnostics:

- Vehicle model
- National version
- Exhaust aftertreatment variants
- Transmission version

It is not necessary to replace the ME-SFI control unit.

Task

The ME-SFI control unit performs the following tasks:

- Control of the basic engine functions
- Reading of sensors and signals
- Evaluation of input factors
- Output of signals and actuation of components

The ME-SFI control unit also acts as an interface (gateway) between the linked CAN bus systems.

N3/10 ME-SFI [ME] control unit

Important!

Make sure that the ignition is switched off and that the processor run-on has finished before unplugging the connector from the ME-SFI control unit.

This prevents irreparable damage to the ME-SFI control unit and prevents faults from being logged by the control units involved in the CAN network.

Engine control ME 17.7.8

The gasoline injection and ignition system forms the engine control system "ME17.7.8" in the electrical group with the sensors and actuators of engine 279 KE (port injection).

The engine control system reads in sensor data directly and, via the CAN network, indirectly and actuates the respective actuators. The ME-SFI control unit controls and coordinates the individual functions and systems of the engine control.

The ME-SFI control unit exchanges data over the connected drive train CAN and chassis CAN 1 with other control units which are integrated in the CAN network.

The ME-SFI control unit also acts as an interface (gateway) between the two CAN bus systems.

The engine control is composed of the following systems:

- Basic functions
- Engine system
- Injection system
- Ignition system
- Exhaust system

The **basic functions** include:

- Control unit diagnosis
- Fault memory
- On-Board Diagnosis II (OBD II)
- Diagnosis via CAN
- CAN network
- Flash programming
- Variant coding
- Drive authorization system stage 4 (DAS 4)
- Torque coordination
- Alternator interface
- Maximum speed limit

Engine control

The **engine system** comprises the following functions:

- Starter relay actuation
- Throttle valve control
- Safety fuel shutoff
- Transmission overload protection
- Secondary air injection
- Electronic Stability Program (ESP) assistance
- Electronic transmission control (EGS) assistance
- Start-off torque limiting
- Fan control
- Throttle valve calibration
- Boost pressure control (wastegate)

The **injection system** controls and regulates the following functions:

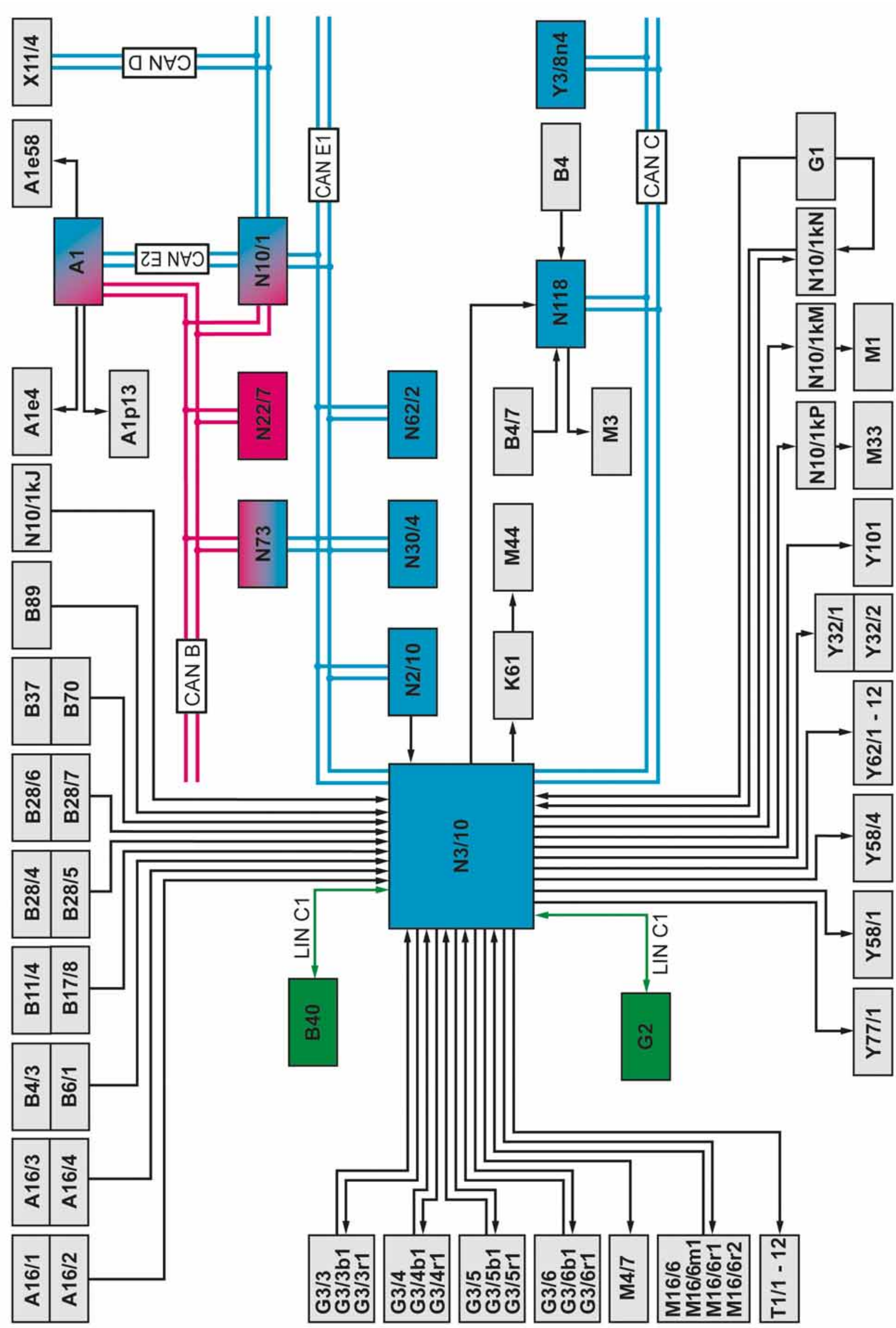
- Cylinder-selective port injection
- Start, post-start and acceleration enrichment
- Warm-up control
- Idle speed control
- Limp-home function
- Air conditioning rpm increase
- Deceleration fuel shutoff
- Fuel pump pressure specification
- Altitude adaptation
- Load change function
- Rpm limiting

The **ignition system** comprises:

- Single-spark/multi-spark ignition
- Ignition map
- Rpm limiting
- Knock control
- Synchronization of camshaft and crankshaft positions

The **exhaust system** includes:

- Catalytic converter heating
- Oxygen sensor heater control
- Linear lambda control



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Block diagram of ME-SFI engine control

Engine control

A1	Instrument cluster
A1e4	Fuel reserve warning lamp
A1e58	Engine diagnosis indicator lamp
A1p13	Multifunction display
A16/1	Knock sensor 1
A16/2	Knock sensor 2
A16/3	Knock sensor 3
A16/4	Knock sensor 4
B4	Fuel tank fill level sensor fuel level indicator
B4/3	Fuel tank pressure sensor (with code (494) USA version)
B4/7	Fuel pressure sensor
B6/1	Camshaft Hall sensor
B11/4	Coolant temperature sensor
B17/8	Charge air temperature sensor
B28/4	Pressure sensor downstream of air filter, left cylinder bank
B28/5	Pressure sensor downstream of air filter, right cylinder bank
B28/6	Pressure sensor upstream of throttle valve
B28/7	Pressure sensor downstream of throttle valve
B37	Accelerator pedal sensor
B40	Oil sensor (oil level, temperature and quality)
B70	Crankshaft Hall sensor
B89	Secondary air pressure sensor
G1	On-board electrical system battery
G2	Alternator

G3/3	Left oxygen sensor upstream of catalytic converter
G3/3b1	Sensor element of left oxygen sensor upstream of catalytic converter
G3/3r1	Heater of left oxygen sensor upstream of catalytic converter
G3/4	Right oxygen sensor upstream of catalytic converter
G3/4b1	Sensor element of right oxygen sensor upstream of catalytic converter
G3/4r1	Heater of right oxygen sensor upstream of catalytic converter
G3/5	Left oxygen sensor downstream of catalytic converter
G3/5b1	Sensor element of left oxygen sensor downstream of catalytic converter
G3/5r1	Heater of left oxygen sensor downstream of catalytic converter
G3/6	Right oxygen sensor downstream of catalytic converter
G3/6b1	Sensor element of right oxygen sensor downstream of catalytic converter
G3/6r1	Heater of right oxygen sensor downstream of catalytic converter
K60	Engine coolant circulation pump relay
L6/1	Left front axle rpm sensor
L6/2	Right front axle rpm sensor
L6/3	Left rear axle rpm sensor
L6/4	Right rear axle rpm sensor
M1	Starter
M3	Fuel pump
M4/7	Fan motor
M33	Electric air pump
M45	Coolant circulation pump
M16/6	Throttle valve actuator

N2/10	Supplemental Restraint System control unit
N3/10	ME-SFI [ME] control unit
N10/1	Front SAM control unit with fuse and relay module
N10/1kJ	Circuit 15 relay
N10/1kM	Starter circuit 50 relay
N10/1kN	Engine circuit 87 relay
N10/1kP	Secondary air injection relay
N22/7	Automatic air conditioning control and operating unit
N30/4	Electronic Stability Program control unit
N62/2	Video and radar sensor system control unit with code (233) DISTRONIC PLUS with code (237) Active Blind Spot Assist with code (238) Active Lane Keeping Assist

N73	Electronic ignition lock control unit
N80	Steering column tube module control unit
N118	Fuel system control unit
S9/1	Brake light switch
S40/4	Cruise control lever
T1/1	Cylinder 1 ignition coil
T1/2	Cylinder 2 ignition coil
T1/3	Cylinder 3 ignition coil
T1/4	Cylinder 4 ignition coil
T1/5	Cylinder 5 ignition coil
T1/6	Cylinder 6 ignition coil
T1/7	Cylinder 7 ignition coil
T1/8	Cylinder 8 ignition coil
T1/9	Cylinder 9 ignition coil
T1/10	Cylinder 10 ignition coil
T1/11	Cylinder 11 ignition coil
T1/12	Cylinder 12 ignition coil

X11/4	Diagnostic connector
Y3/8	Fully integrated transmission control controller unit
Y32	Air pump switchover valve
Y58/1	Purge switchover valve
Y58/4	Activated charcoal canister shutoff valve (with code (494) USA version)
Y62/1	Cylinder 1 injection valve
Y62/2	Cylinder 2 injection valve
Y62/3	Cylinder 3 injection valve
Y62/4	Cylinder 4 injection valve
Y62/5	Cylinder 5 injection valve
Y62/6	Cylinder 6 injection valve
Y62/7	Cylinder 7 injection valve
Y62/8	Cylinder 8 injection valve
Y62/9	Cylinder 9 injection valve
Y62/10	Cylinder 10 injection valve
Y62/11	Cylinder 11 injection valve
Y62/12	Cylinder 12 injection valve
Y77/1	Boost pressure control pressure transducer
Y101	Bypass air switchover valve

CAN B	Interior CAN
CAN C	Drive train CAN
CAN D	Diagnostic CAN
CAN E1	Chassis CAN 1
CAN E2	Chassis CAN 2
LIN C1	Drive train LIN

Ignition system

Ignition system

The ME-SFI control unit transmits the signal for the dwell time of the relevant operating point to the ignition coil over the actuation line (circuit 3). The corresponding ignition coil interrupts the primary circuit by means of an integrated fuse when the dwell time has elapsed. From the ignition coil the ignition voltage travels to the two spark plugs at each cylinder and causes arcing in the gap between the center and ground electrodes.

Note

The ignition angles can only be checked using Xentry Diagnostics.

Operating modes of the ignition coil

Singlespark – Single-spark ignition

Usually the ignition coil is charged and an ignition spark is generated once in each ignition cycle when the engine is warm.

In order to reliably ignite the mixture during a cold start, high-energy ignition coils are used which provide a long spark duration.

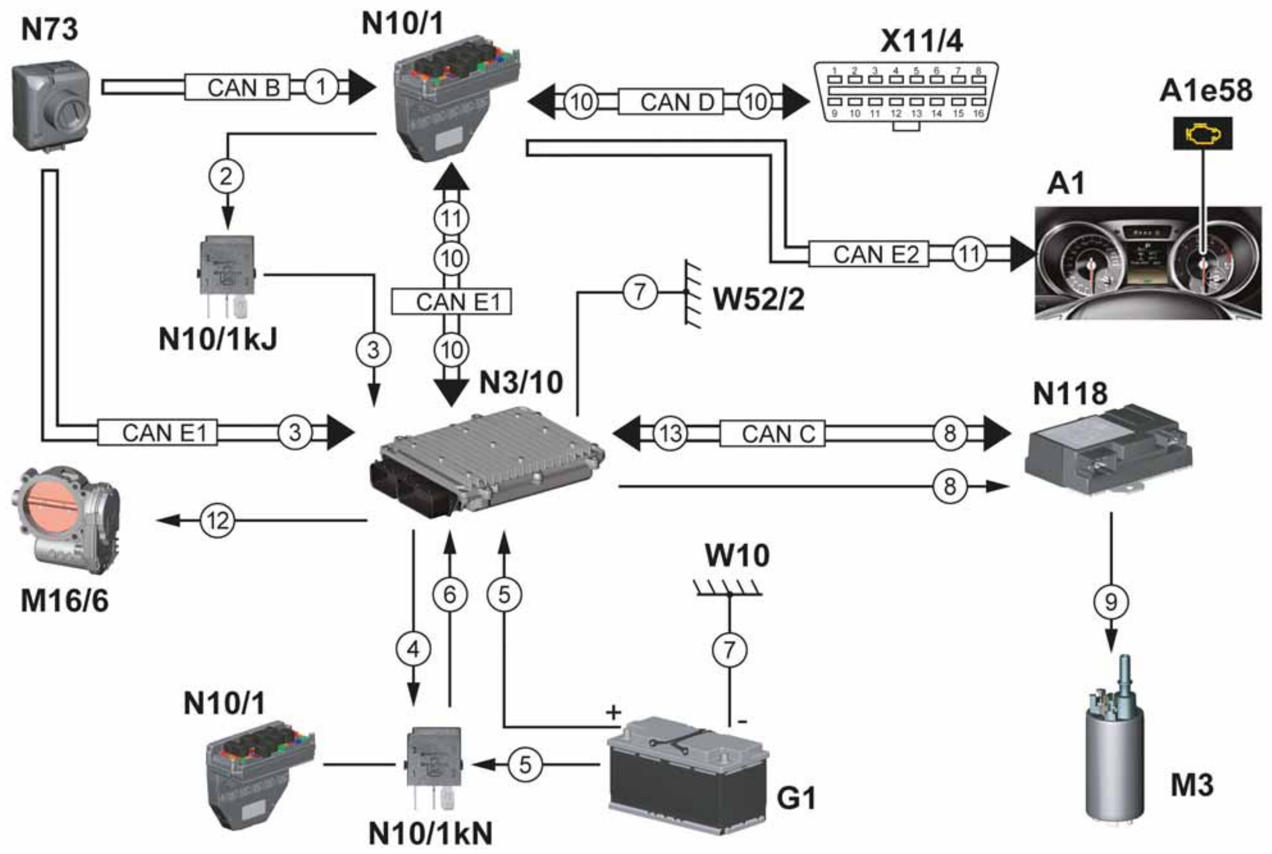
It is also possible to use several sparks per ignition cycle instead of just one. This system is referred to as multi-spark ignition.

Multispark – Multiple-spark ignition

In contrast to the single-spark mode, several sparks are generated in multi-spark operation. Rather than producing a succession of sparks by the single-spark method, the coil is recharged in the meantime in order to provide sufficient energy for more sparks.

A multi-spark ignition cycle begins in the same way as a single-spark cycle. The coil is initially charged to a desired target primary current. At the firing point the charging current is switched off, producing the ignition spark. However, in multi-spark mode the coil is not discharged completely.

The secondary current, which is directly dependent on the charge level of the coil, is measured in the coil. If it drops below the secondary current threshold, the coil's electronic control reopens the power amplifier and the charging current flows again. The level of the primary current is also monitored. When the primary current threshold is reached, the power amplifier opens the primary circuit and high voltage is generated once more. This causes another spark to be produced. Subsequent sparks are generated in the same way.



Function schematic of ignition system

A1	*Instrument cluster*
A1e58	*Engine diagnosis indicator lamp*
G1	*On-board electrical system battery*
M3	*Fuel pump*
M16/6	*Throttle valve actuator*
N3/10	*ME-SFI [ME] control unit*
N10/1	*Front SAM control unit with fuse and relay module*
N10/1kJ	*Circuit 15 relay*
N10/1kN	*Engine circuit 87 relay*
N73	*Electronic ignition lock control unit*
N118	*Fuel system control unit*
W10	*Right front battery ground point*
W52/2	*Ground point 2 (right front longitudinal member)*
X11/4	*Diagnostic connector*
CAN B	*Interior CAN*
CAN C	*Drive train CAN*
CAN D	*Diagnostic CAN*
CAN E1	*Chassis CAN 1*
CAN E2	*Chassis CAN 2*

1	*Circuit 15, request on*
2	*Circuit 15 relay, actuation*
3	*Circuit 15, status on*
4	*Engine circuit 87 relay, actuation*
5	*Circuit 30, status*
6	*Circuit 87, status*
7	*Circuit 31, status*
8	*Fuel pump, request on*
9	*Fuel pump, actuation*
10	*Correction programming, communication*
11	*Engine diagnosis indicator lamp, actuation*
12	*Throttle valve actuator, actuation*
13	*Fuel pressure, status*

On-board diagnosis

OBD system

The new M 279 AMG uses an on-board diagnosis system of the second generation (OBD II). In Europe the OBD II system is referred to as European On-Board Diagnosis (EOBD) with appropriate modifications for the European market.

The OBD system is integrated in the ME-SFI control unit and constantly monitors all the emissions-relevant components and systems in the vehicle.

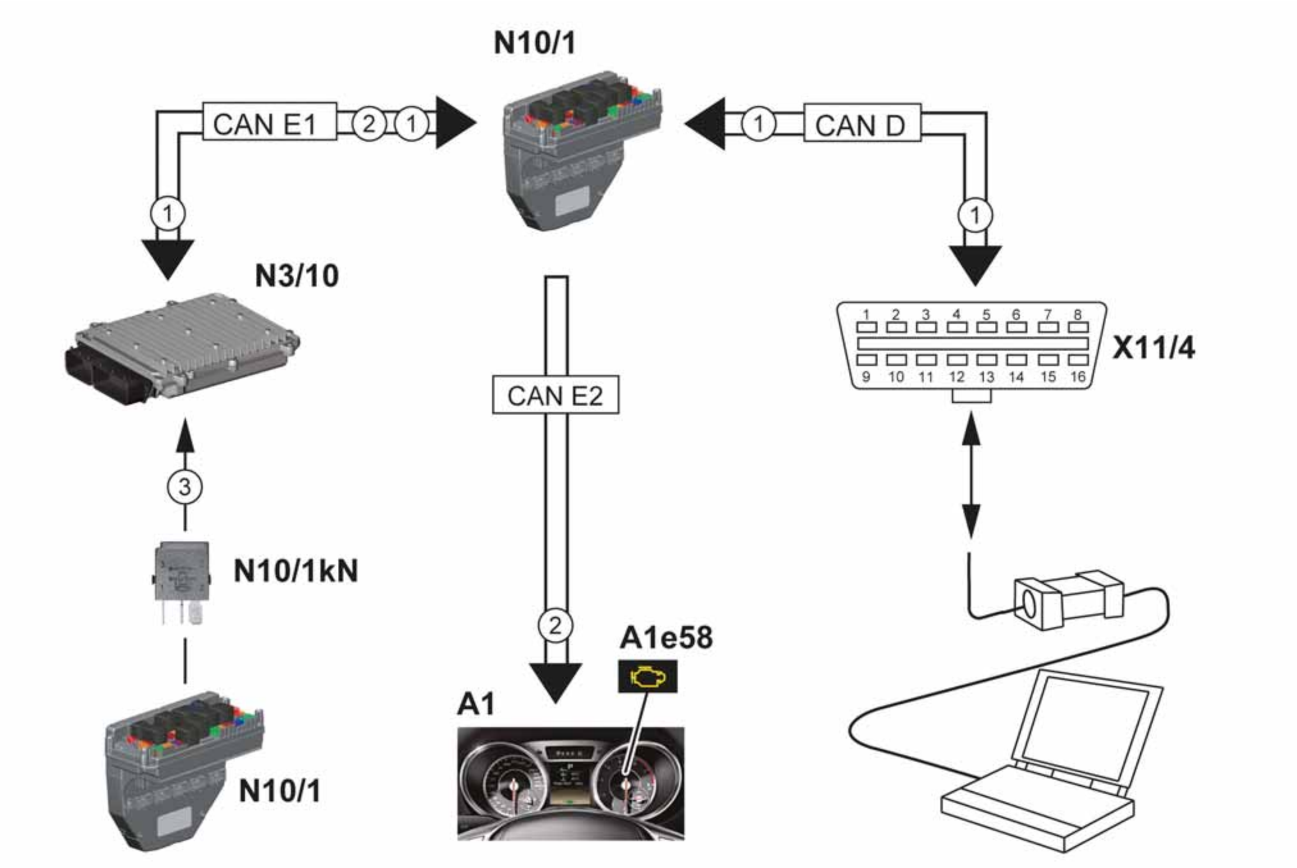
The tasks of the OBD are as follows:

- Monitoring emissions-relevant components and systems while driving
- Detecting and storing malfunctions
- Displaying malfunctions by means of a warning lamp (engine diagnosis indicator lamp)
- Transmitting detected faults over a standard interface (diagnostic connector) to a diagnostic unit (e.g. Xentry Diagnostics)

The aim of OBD is to guarantee consistently low exhaust emissions and to protect components at risk (such as catalytic converters) against backfires.

The following components and systems are monitored:

- Oxygen sensors
- Efficiency of catalytic converters (catalyst function)
- Catalytic converter heating
- Purging
- Smooth running analysis (detection of combustion misfiring)
- Other emissions-relevant components or components the failure of which would prevent diagnosis of another component



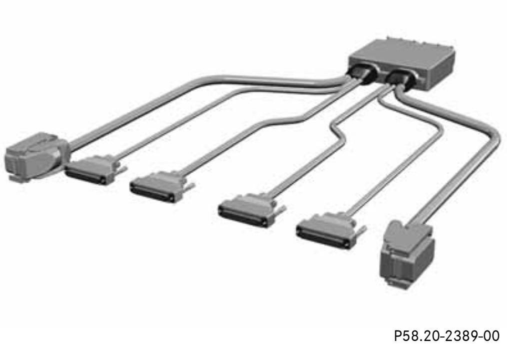
Function schematic of on-board diagnosis (OBD)

A1	*Instrument cluster*	*CAN D*	*Diagnostic CAN*
A1e58	*Engine diagnosis indicator lamp*	*CAN E 1*	*Chassis CAN 1*
N3/10	*ME-SFI [ME] control unit*	*CAN E 2*	*Chassis CAN 2*
N10/1	*Front SAM control unit with fuse and relay module*	*1*	*Engine control diagnosis, communication*
N10/1kN	*Engine circuit 87 relay*	*2*	*Engine diagnosis indicator lamp, actuation*
X11/4	*Data link connector*	*2*	*Circuit 87, status*

Electrical/mechanical components

196-pin adapter cable

Use	Adapter cable for testing the wiring harness at the engine control unit.
MB number	W279 589 00 63 00
FG	07
Set	B
Category	Mercedes-Benz Car – Special Operation
Note	In combination with the test box W 000 589 00 21 00



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Lifting device

Use	Lifting device for removing/installing the engine with transmission.
MB number	W279 589 00 62 00
FG	01
Set	B
Category	Mercedes-Benz Car – Special Operation

P58.20-2390-00

Abbreviations

ABC

Active Body Control

CAN

Controller Area Network

CARB

California Air Resources Board

CCR

California Code of Regulation

EGS

Electronic transmission control

EOBD

European On-Board-Diagnosis

ESP

Electronic Stability Program

EU 5

EURO 5 (exhaust emission regulation)

FBS

Drive authorization system (DAS)

IHU

Internal high-pressure forming

KE

Port injection (CFI-E)

LIN

Local Interconnect Network

ME

Motor electronics (ME-SFI)

NOx

Nitrogen oxide

NT

Low temperature

OBD

On-board diagnosis

OHC

Overhead camshaft

PWM

Pulse width modulated

ROZ

Research octane number (RON)

SAM

Signal acquisition and actuation module

ULEV

Ultra Low Emission Vehicle

WIS

Workshop Information System

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