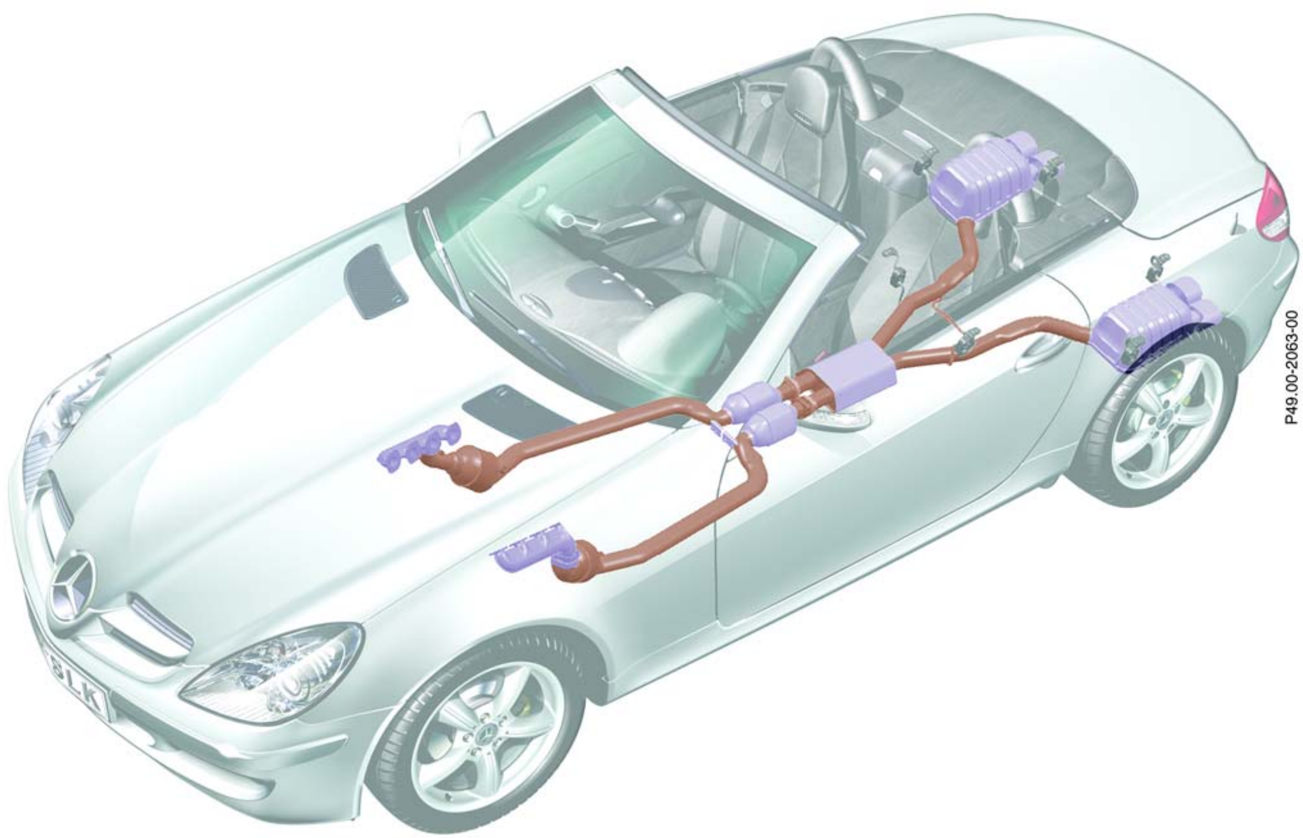
Engine 113 - Exhaust system

AMG exhaust system

The AMG sports exhaust system in the SLK 55 AMG satisfies the US emissions limits and is perfectly tuned in terms of function and sound to the AMG 5.5 l V8 engine. The near-engine mounted bulkhead catalytic converter is coated with palladium/rhodium while the underfloor catalytic converter is platinum/rhodium-plated. The longevity of the exhaust system is provided by the use of stainless steel throughout.

The catalytic converter system incorporates one bulkhead and one underfloor catalytic converter (both made from thin-wall ceramic) in each exhaust stream. Downstream of the separation point of the two catalytic converter systems, the exhaust streams are combined in the center muffler. Further on, the exhaust flow continues in twin pipes to the two rear mufflers.

The AMG sports exhaust system ends in two chrome-plated twin tailpipes bearing the AMG logo.



Exhaust system

Engine 272 - Overview

New V-6 engine generation 272

Engine series

Model 171 SLK350 will be the first vehicle equipped with the new engine 272.

The new six cylinder V-6 engine features variable adjustment of intake and exhaust camshafts.

Lightweight construction

As a result of its consistent light-weight construction the weight gain in comparison to its predecessor the M 112 has been slightly reduced.

This is despite the use of a solid four-valve system with four camshafts and camshaft adjust-ment and the two-level intake module with turbulence flaps in the inlet ports.

High power

With a displacement of 3498 CC the new V6 engine delivers 268 hp (200 kW) at 6000 rpm. This yields a volumetric efficiency of 57 kW/ 78 bhp—a top value in this displace-ment class. The torque of 350 Nm is available right from 2500 rpm and remains constant up to 5000 rpm.

Performance

Acceleration from 0 to 100 km/h:

- 5.5 secs.[1] (with manual transmission)
- 5.6 secs.[1] (with automatic transmission)

Maxuimum speed:

250 km/h (with manual or auto-matic transmission, electronically governed)

Turbulence flaps

Turbulence flaps are fitted in the intake ports. At part-throttle they are extended and increase the turbulence of the intake air in the combustion chambers. At higher revs the turbulence flaps are fully lowered in the induction pipe.

Exhaust gas

All the individual measures combine to yield a powerful and free-revving engine with exhaust emissions within US limits:

- Variable camshaft adjustment
- Turbulence flaps in the intake ports
- Internal exhaust recirculation
- Secondary air injection
- Catalytic converters fitted close to engine

Internal exhaust gas recirculation

The engine timing can be altered precisely by means of the variable intake and exhaust camshafts. The variable overlap times permit mixing of fresh gas and exhaust gas.

Heat management

An intelligent heat management system also helps to reduce fuel consumption. A new kind of elec-tronic map-controlled thermostat, which is active in all the engine's operational modes, guides the flow of coolant into the six-cylinder engine in such a way that the engine oil and coolant always stay at the optimium temperature.

A heating element allows active control of the triple-plate thermo-stat, causing the coolant to remain short circuited inside the engine during the warm-up period of the engine.

[1] Stated rates of acceleration are based upon manufacturer's track results and may vary depending upon model, environmental and road surface conditions, driving style, elevation and vehicle load.

Engine 272 - Overview

At-a-glance

Target	Measures
Comfort-optimisation through	Balance shaft for smooth engine running
	Greater rigidity in crankcase with full cross-bolting of main bearing cap
	Wider crankshaft bearings
	More rigid engine mounting with larger cross sections
	Reduced moving mass as result of lightweight construction throughout (pistons, con rods)
	Valve cover with integrated camshaft bearing
	Twin cartridge air filter with integrated resonators to reduce intake noise
Consumption-optimisation through	Optimised combustion chamber geometry and valve arrangement
	Reduced friction
	New type of heat management in cooling cycle
	Performance-optimised oil and water pump drive
	Turbulence flaps
	Power steering pump with pressure regulating valve
Exhaust emissions limits fulfilled through	Camshaft adjustment
	Optimised-flow air intake with turbulence flaps
	Optimised combustion chamber geometry and valve arrangement
	Secondary air injection into the exhaust manifold ports
	High-volume catalytic converters close to engine

Engine 272 - Overview

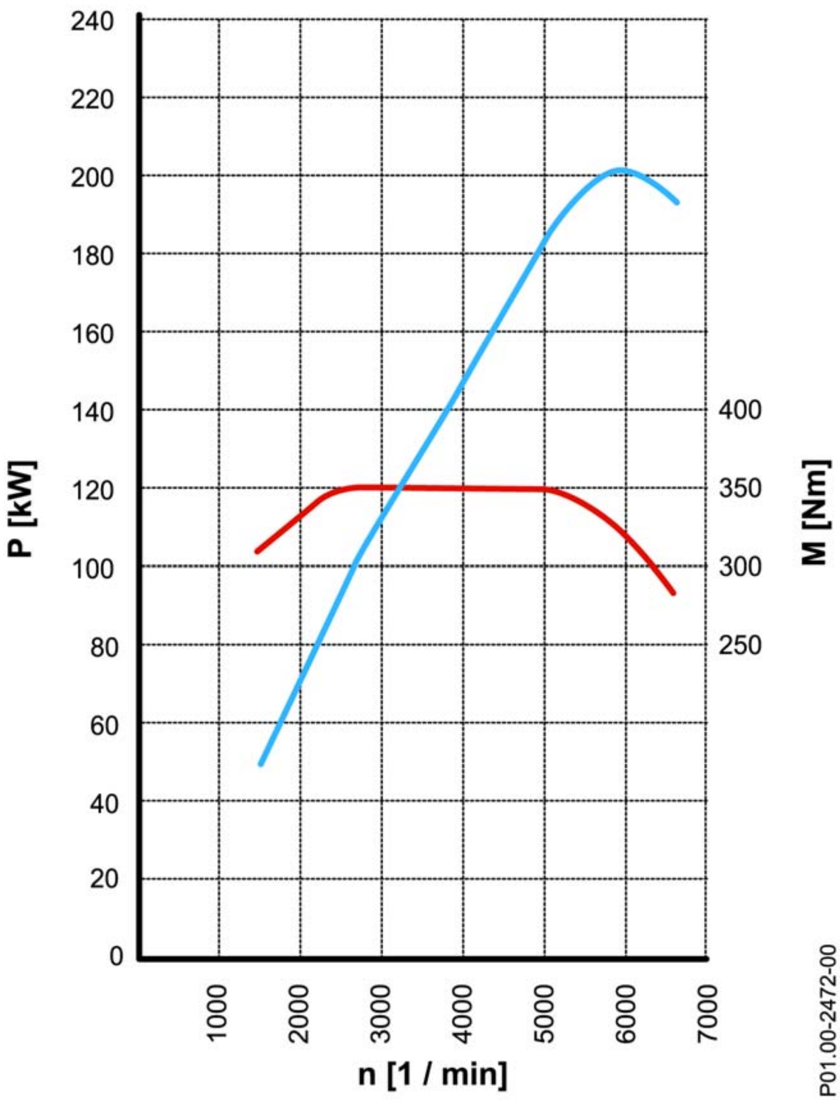
Engine data

		M 272.963 (SLK 350)	M 112.947 (SLK 320)
Engine designation		M 272	M 112
Cylinder-arrangement/angle		V6/90°	V6/90°
Rated power at rpm	kW/hp at rpm	200/268 6000	160/215 5700
Rated torque at rpm	Nm at rpm	350 2400-5000	310 3000-4600
Max. mean pressure	bar	12.6	12.38
Specific power	kW/l PS/l	57 78	50 68
Specific torque	Nm/l	100	97
Compression	ε	10.5:1	10.0:1
Cylinder distance	mm	106	106
Displacement	cm^3	3498	3199
Bore	mm	92.9	89.9
Stroke	mm	86.0	84.0
Con rod length	mm	148.5	148.5

Engine 272 - Overview

		M 272.963 (SLK 350)	M 112.947 (SLK 320)
Main bearing diameter approx.	mm	64	64
Con rod bearing diameter approx.	mm	52	52
Intake/exhaust valve head diameter	mm	39.5/30	36/41
Intake/exhaust valve shaft diameter	mm	6	7
Valve stroke intake and exhaust valves	mm	10	10
Valve angle, intake valve	degrees	16.5	23
Valve angle, exhaust valve	degrees	12.0	12.5
Firing order		1-4-3-6-2-5	1-4-3-6-2-5
Maximum continuous speed	rpm	6300	6000
Weight (approx.)	kg	165	149

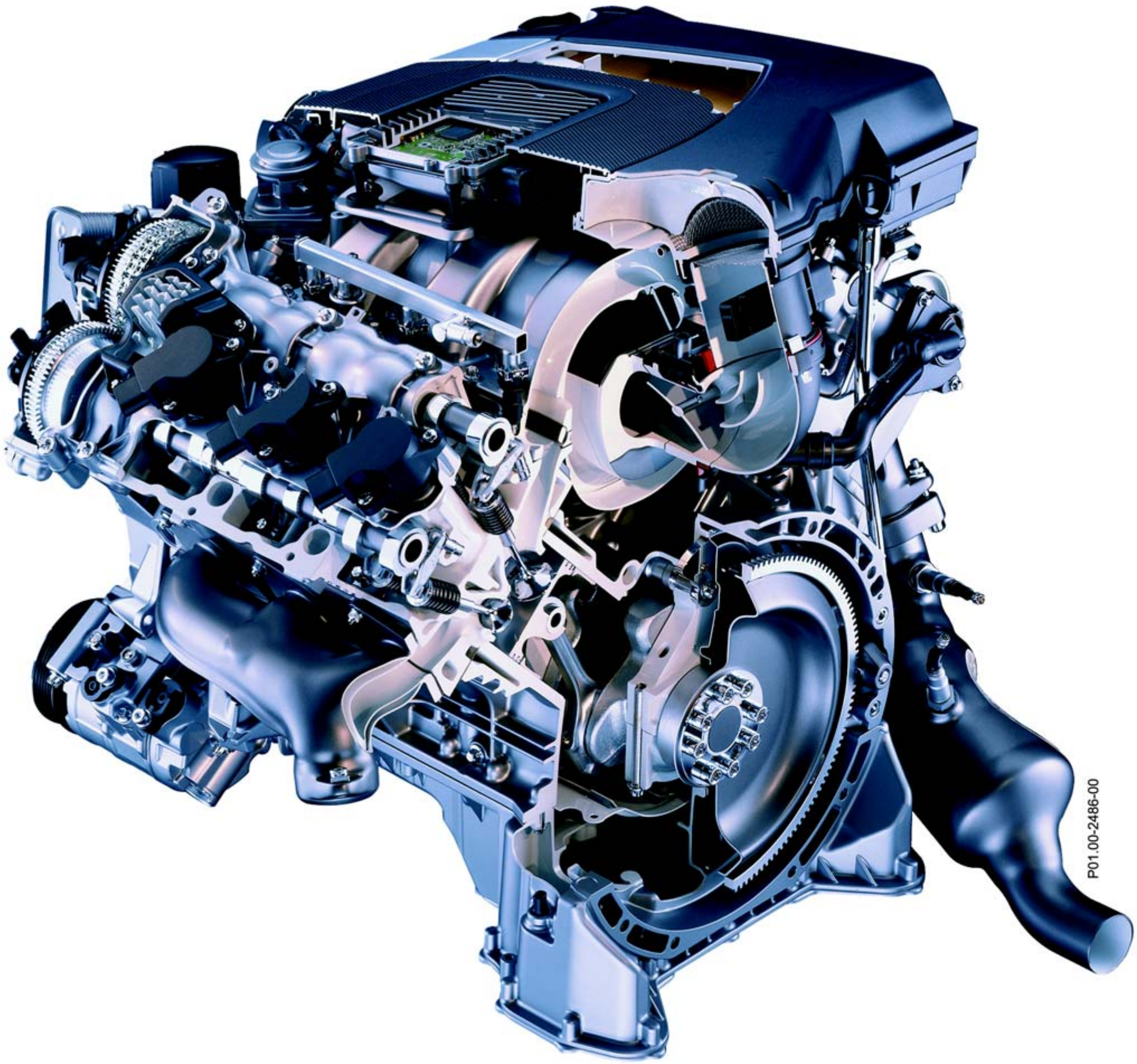
Engine 272 - Overview



M 272.961

(blue line)	*P*	*Power*
(red line)	*M*	*Torque*
	n	*rpm*

Engine 272 - Overview



Motorenwerk Stuttgart Bad-Cannstatt

The new M 272 is produced in the engine factory in Stuttgart, Bad-Cannstatt.

Engine 272 - Mechanical

Cylinder crankcase

As in the M 112, the M 272 has a cylinder angle of 90°. The cylinder distance of 106 mm has also been retained.

The increase in the displacement has been achieved by increasing the stroke to 86.0 mm and the bore diameter to 92.9 mm.

The cylinder crankcase is made from HPDC aluminium. The crank-case is now even more rigid as a result of the cross-bolting of the bearing cap.

Cylinder liners

The cylinder liners are made from a spray-compacted aluminium-silicon alloy (Silitec) which has already proven its worth in the predecessor, the M 112.

This yields weight savings of roughly 0.5 kg/cylinder in comparison to grey cast iron liners, while offering improved heat flow.

i HPDC background information

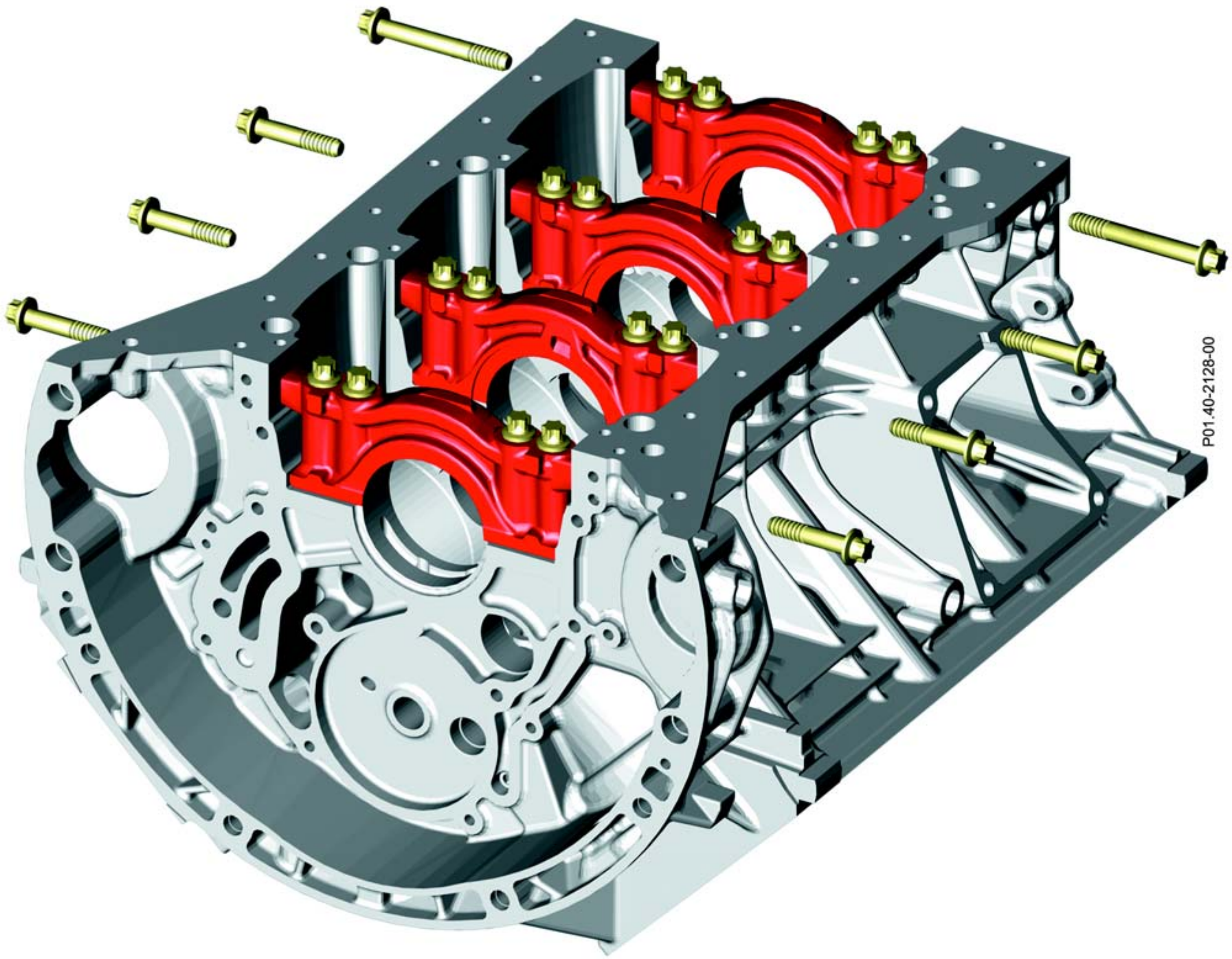
HPDC = **H**igh **P**ressure **D**ie **C**asting

In this technique the liquid metal is forced at great pressure and at high speed (between 50 and 100 m/secs.) into the casting mold. This requires careful pre planning of the casting process; this is simulated in the computer and takes the flow of the metal and the escape of the gases into consideration to prevent occlusions (local formation of shrinkage cavities, microprocessor).

Advantages of this method:

- high degree of precision
- possibility to cast complex components which, using other production methods, would otherwise have to be assembled from several individual parts
- smooth surfaces and sharp contours
- reduced weight through thin-walled cast parts
- pre and finished casting of bore holes, slits, toothing, recesses and penetrations - plus lettering and numbering
- reduced post-processing costs

Engine 272 - Mechanical



Cylinder crankcase with cross-bolted main bearing caps

Engine 272 - Mechanical

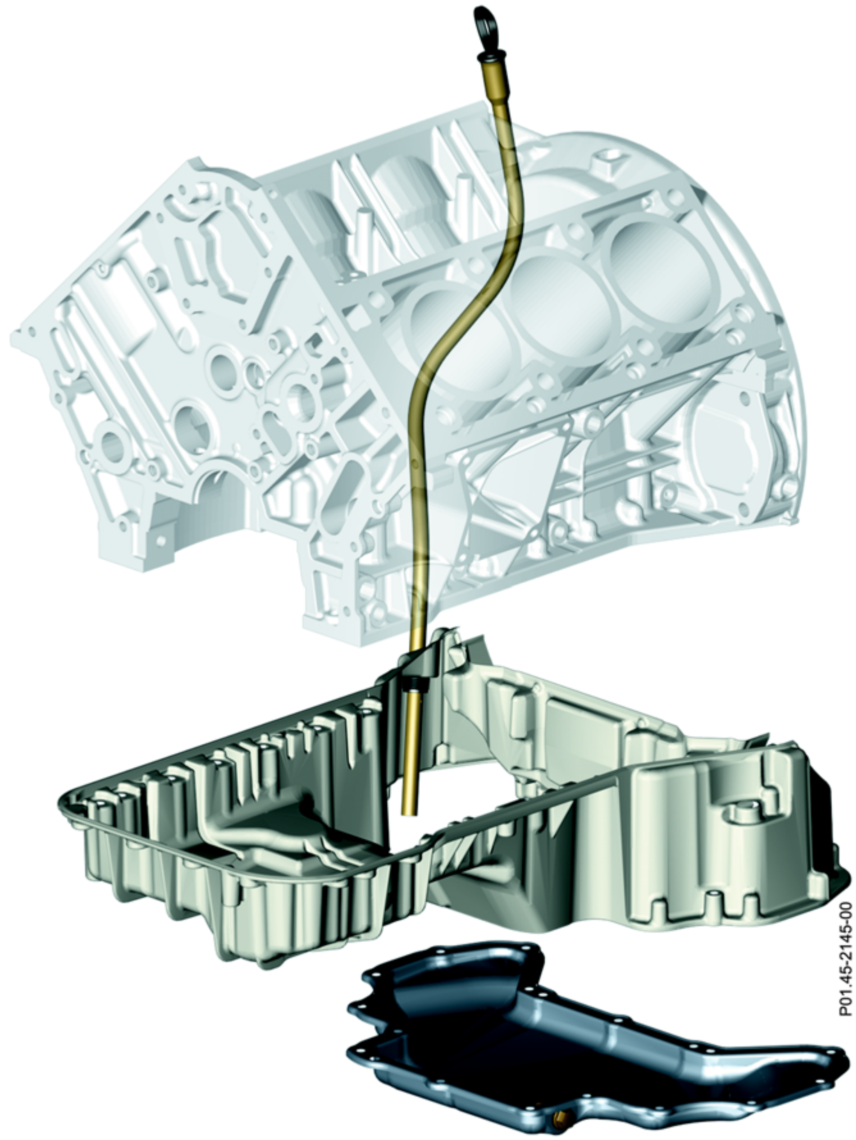
Oil sump

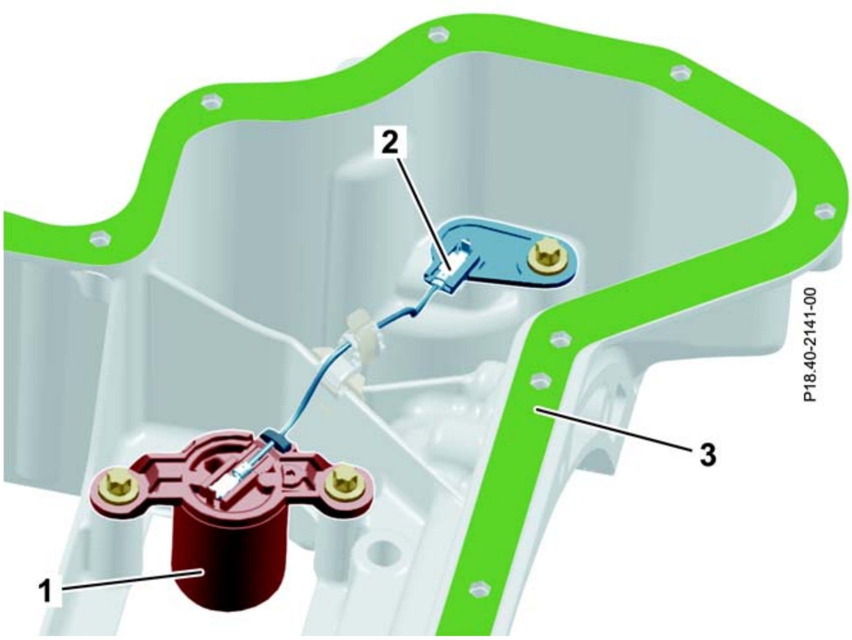
The M 272 has an oil dipstick and an oil level check switch (S43). There is no oil level sensor.

The top section of the oil sump is made from aluminium. The silicon-sealed bottom section of the sump is made from sheet steel.

Bottom section of oil sump

To facilitate pushing the lower section down from the top section, a nut is welded onto the sheet metal sump.





Switch: oil level check (S43)

1 *Float housing*
2 *Plug contact*
3 *Gasket, oil sump lower section*

Oil pump

The lubricating oil is supplied in the M 272 by an internal gear pump. The oil pump is driven by a simplex chain.

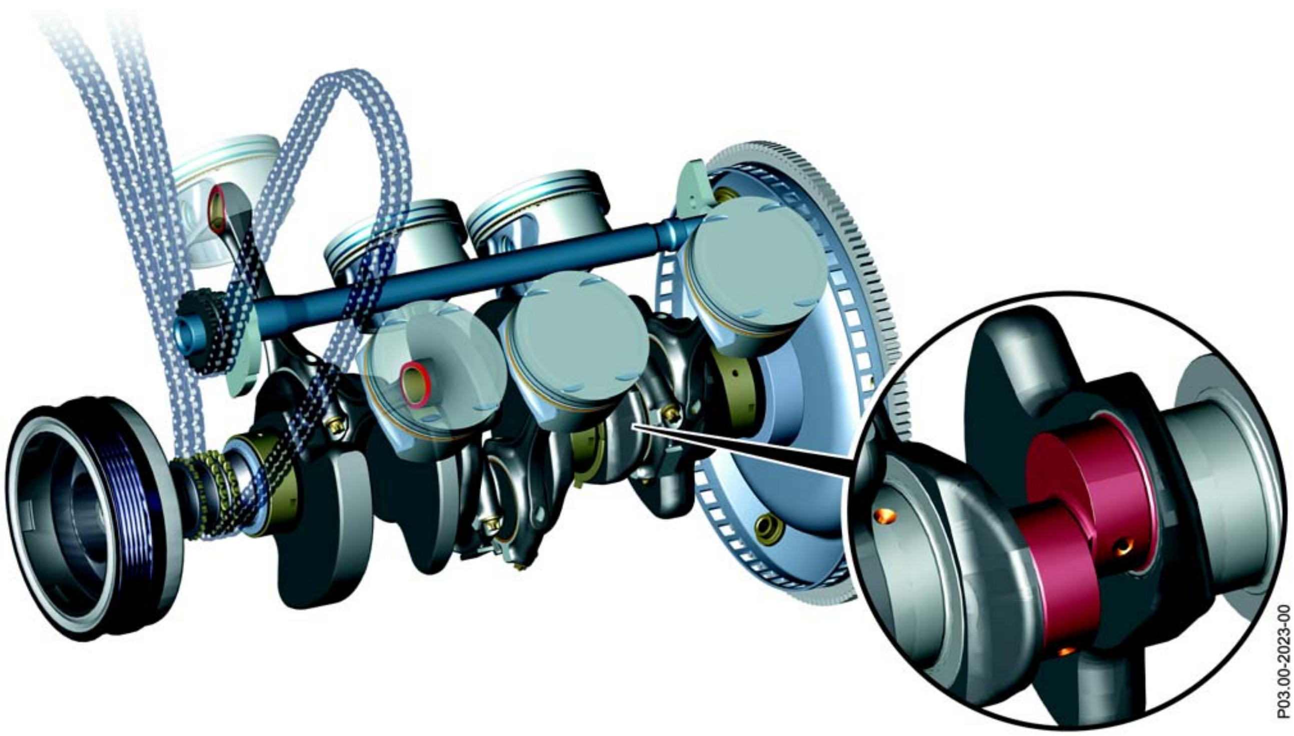
The advantages of this type of pump design are:

- smooth running thanks to "soft" tooth engagement
- even pump flow at sufficiently high pressure
- long life due to minimum running wear

Internal gear pump

Engine 272 - Mechanical

Crankshaft drive



Crankshaft drive with balancer shaft

The moving masses of the crankshaft drive have been reduced. This leads to:

- minimized fuel consumption
- less vibration
- more agile response

Crankshaft

The forged crankshaft has four bearings and four counterweights. The crankshaft bearings have been widened, thereby reducing engine vibration. The connecting rod pins are offset by 30° which permits an even firing angle of 120°.

Connecting rod

The forged steel connecting rods weigh 20 % less, resulting in improved running characteristics. The upper con rod eye is slanted, which reduces weight. It also improves the lubrication of the piston pin.

Pistons

The cast pistons are made from iron-coated aluminium. In conjunction with the valve angle of 28.5 degrees the piston crown creates a combustion chamber with a high compression ratio of 10.5:1. The nitrided steel piston rings are designed for lower friction.

Balancer shaft

A balancer shaft is used between the cylinder banks to balance the free mass forces necessitated by the design of a V6 engine with a 90° cylinder angle. This shaft rotates counter to the crankshaft, but at the same speed as the crankshaft.

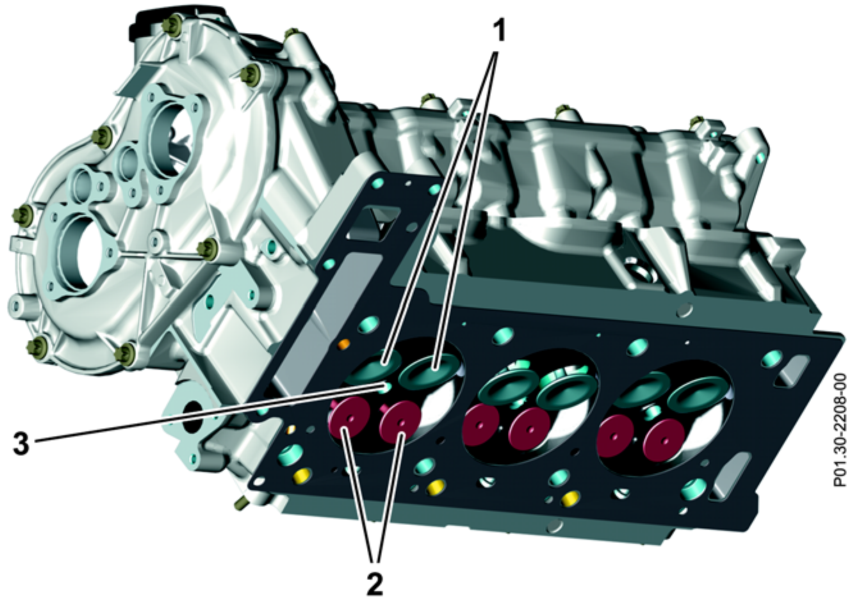
Cylinder head

The cylinder head of the M 272 is produced using a permanent mold aluminium casting technique. The spark plugs are located centrally between the four valves. Directly above them are the coils of the map-controlled direct coil ignition.

The bearings of the camshafts are integrated in the valve covers. If the valve covers are removed during servicing, auxiliary bearing caps are needed. Viewed from the front, the second camshaft bearing serves as the thrust bearing.

The vacuum pump used in some engine versions is driven by the left intake camshaft. The right exhaust camshaft drives the centrifugal oil separator.

The combustion chamber geometry is designed for fast combustion rates, especially at full-throttle. The result is lower knock sensitivity.

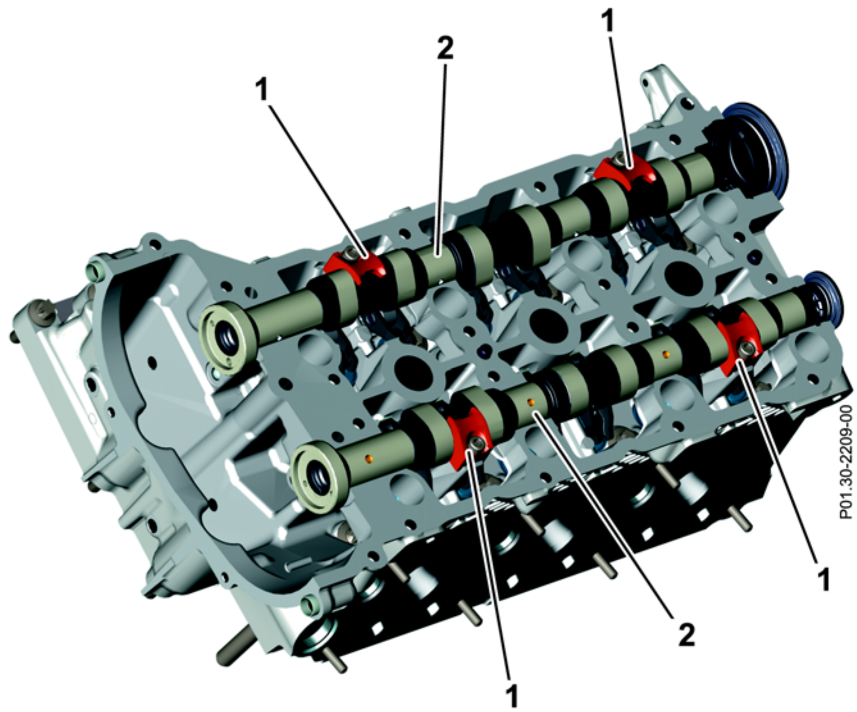


Cylinder head M 272 (right)

1 Intake valves

2 Exhaust valves

3 Spark plug bore

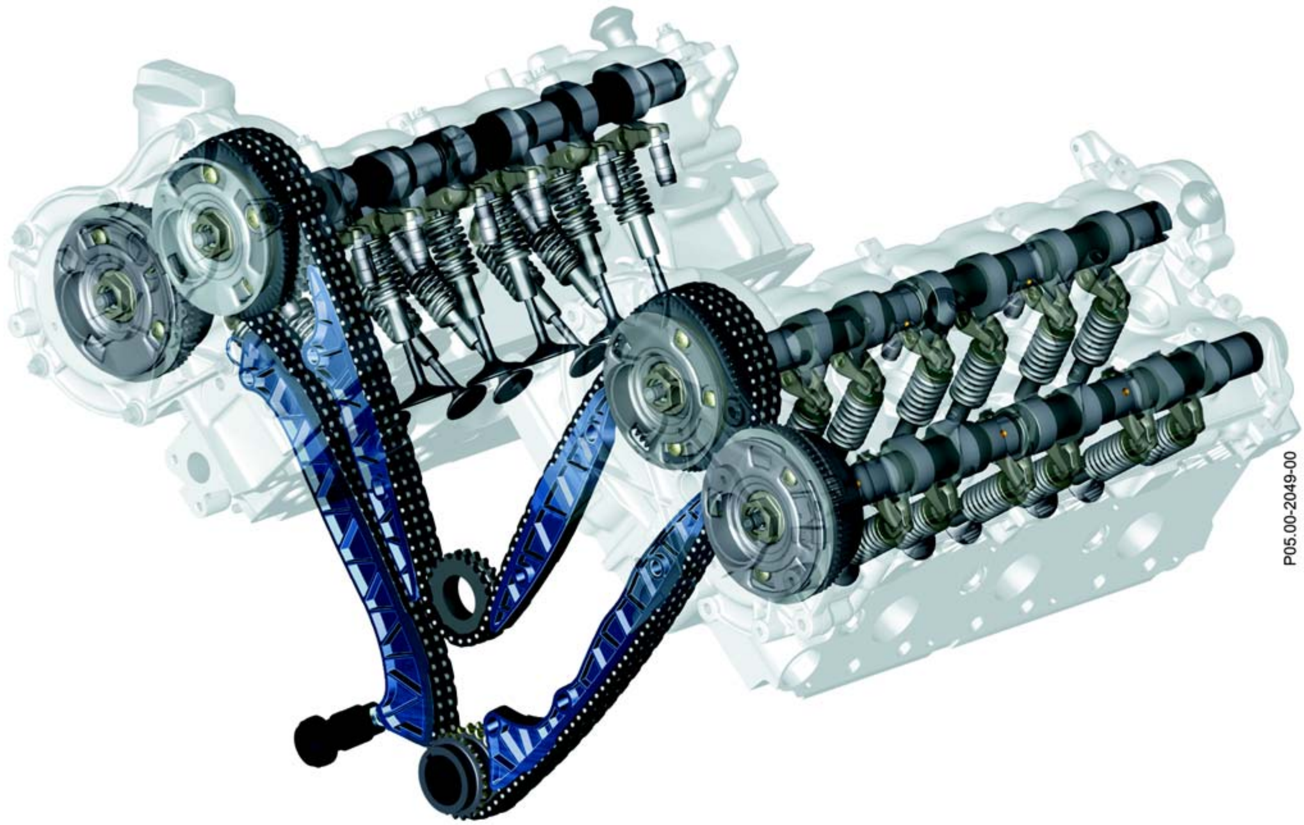


Auxillary bearing cap with valve cover removed (left)

1 Auxillary bearing cap

2 Thrust bearing

Engine 272 - Mechanical



Valve train

General

A double bushing roller chain drives the intake camshafts. The exhaust camshafts are driven directly by the intake camshafts via a spring tensioned spur gear. The chain tensioner is designed as a timing chain tensioner.

The valve train is designed to avoid any free chain run sections. All sections are guided by tensioning and slide rails. This has a positive impact on the dynamism and the noise response of the timing drive.

The M 272 has a low-friction roller cam follower.

Four valve system

In contrast to the predecessor, the M 112, which had 3 valves per cylinder, the M 272 has 4 valves per cylinder. This arrangement allows the single spark plug to be positioned centrally, yielding optimum combustion.

Exhaust valves made from high-temperature resistant Inconel steel. Both the intake and exhaust valves have a shaft diameter of 6 mm (M 112 has 7 mm). This only restricts the flow in the ports to a minimum extent and, as a result of fewer moving masses, this produces a low-friction and free-revving valve train.

The center position of the valves differs in the various displacement versions and is adapted in line with the individual bore diameter. This means that the intake and exhaust valves can be optimally positioned for each bore diameter.

i Inconel

Inconel is a material consisting mainly of nickel and chrome plus the alloy components molybdenum, iron and small quanitities of aluminium and other elements.

Characteristics: high degree of tensile strength, toughness and resistance to oxidation, corrosion and heat.

Variable valve timing

The intake and exhaust camshafts can be adjusted continuously by 40 degrees.

The infinitely variable adjustment of the camshafts is carried out by patented, electrohydraulically operated vane adjusters mounted on the front ends of the camshafts, with integrated control valves (similar to the 271).

Camshaft adjuster

Advantages of variable valve timing

Internal exhaust gas recirculation possible:

- less energy lost during charge change in the cylinders
- better exhaust emissions

Good volumetric efficiency:

- Adjustment of valve overlap in line with revs
- Optimised cylinder filling
- Increased power and torque

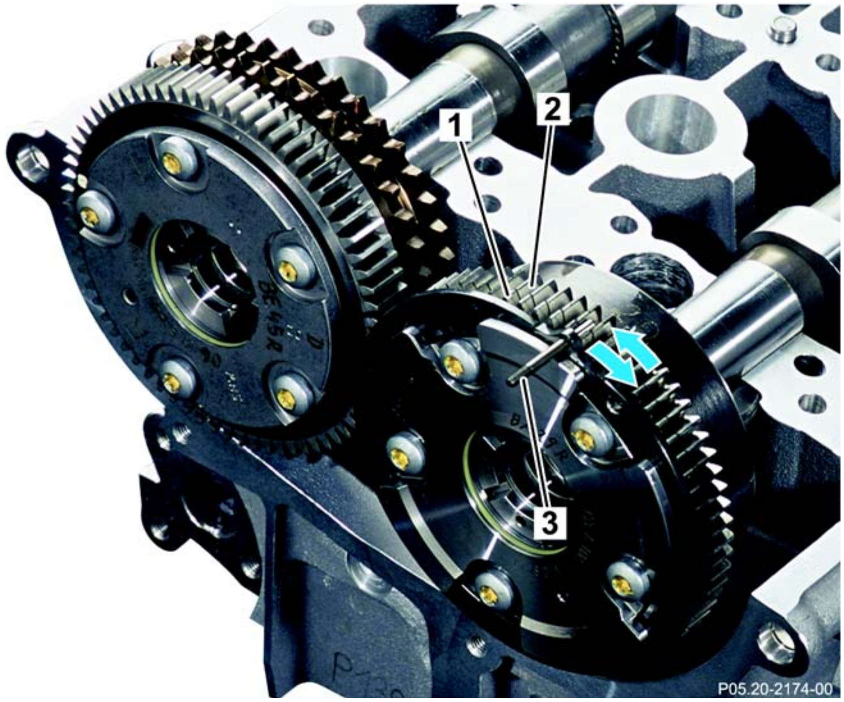
Engine 272 - Mechanical

Tooth backlash compensation

The spur gear toothing of the exhuast camshaft adjuster is gripped between the front gear (1), the grip gear and the rear gear (2) of the main toothing.

The grip force of the spring pushes the spur gears of the exhaust camshaft adjuster away from each other, thereby pressing them, free of backlash, onto the tooth flanks of the spur gear of the intake camshaft adjuster.

The gripped gears help reduce engine noise, above all when idling.



Tooth backlash compensation

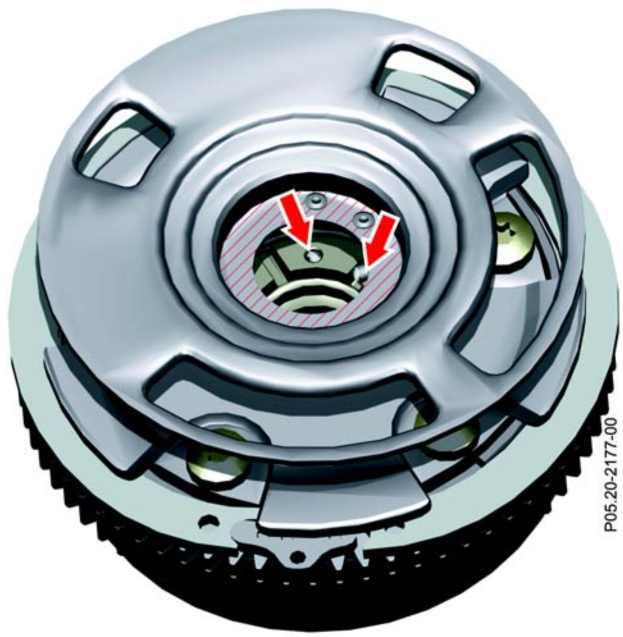
1 Front gear
2 Rear gear
3 Pin

Note WIS repair instructions!

Before removing the exhaust camshaft adjuster, a pin must be inserted in the bore of the support element. Lever and lateral forces **must** be avoided. Otherwise the camshaft adjuster could be damaged.

Pulse wheels

The pulse wheels are attached to the camshaft adjusters. They are needed to register the position of the camshafts.



Used pulse wheel: Shorn pins (arrows) Score marks and flattening (hatching).

Note WIS repair instructions!

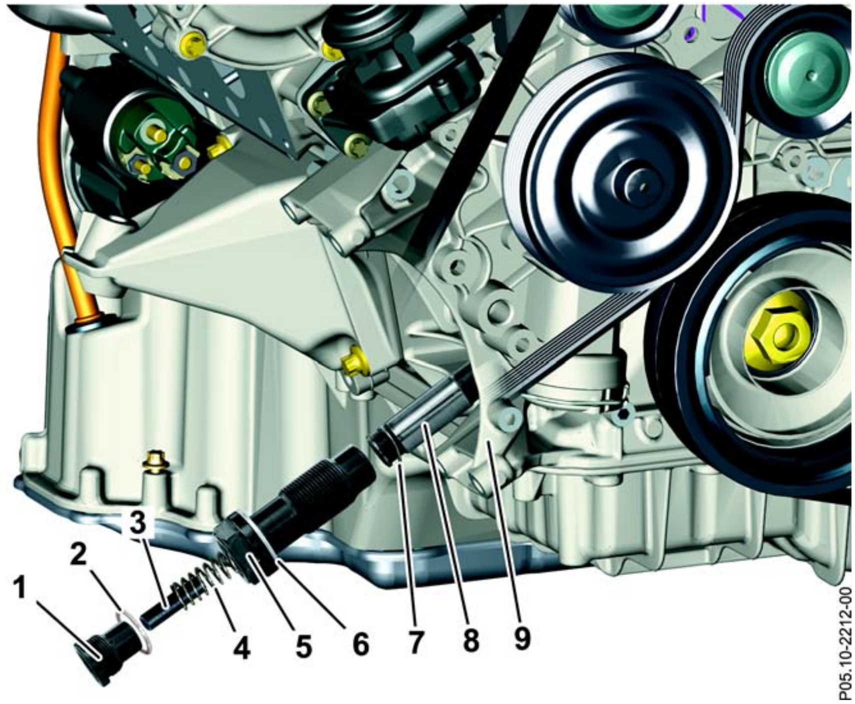
Pulse wheels should only ever be fitted once! Otherwise there is a risk of the pins shearing off.

Engine 272 - Mechanical

Timing chain tensioner

Note WIS repair instructions!

If the assembly sequence of the timing chain tensioner described in the WIS is not observed, this can result in engine damage through torn timing chains.

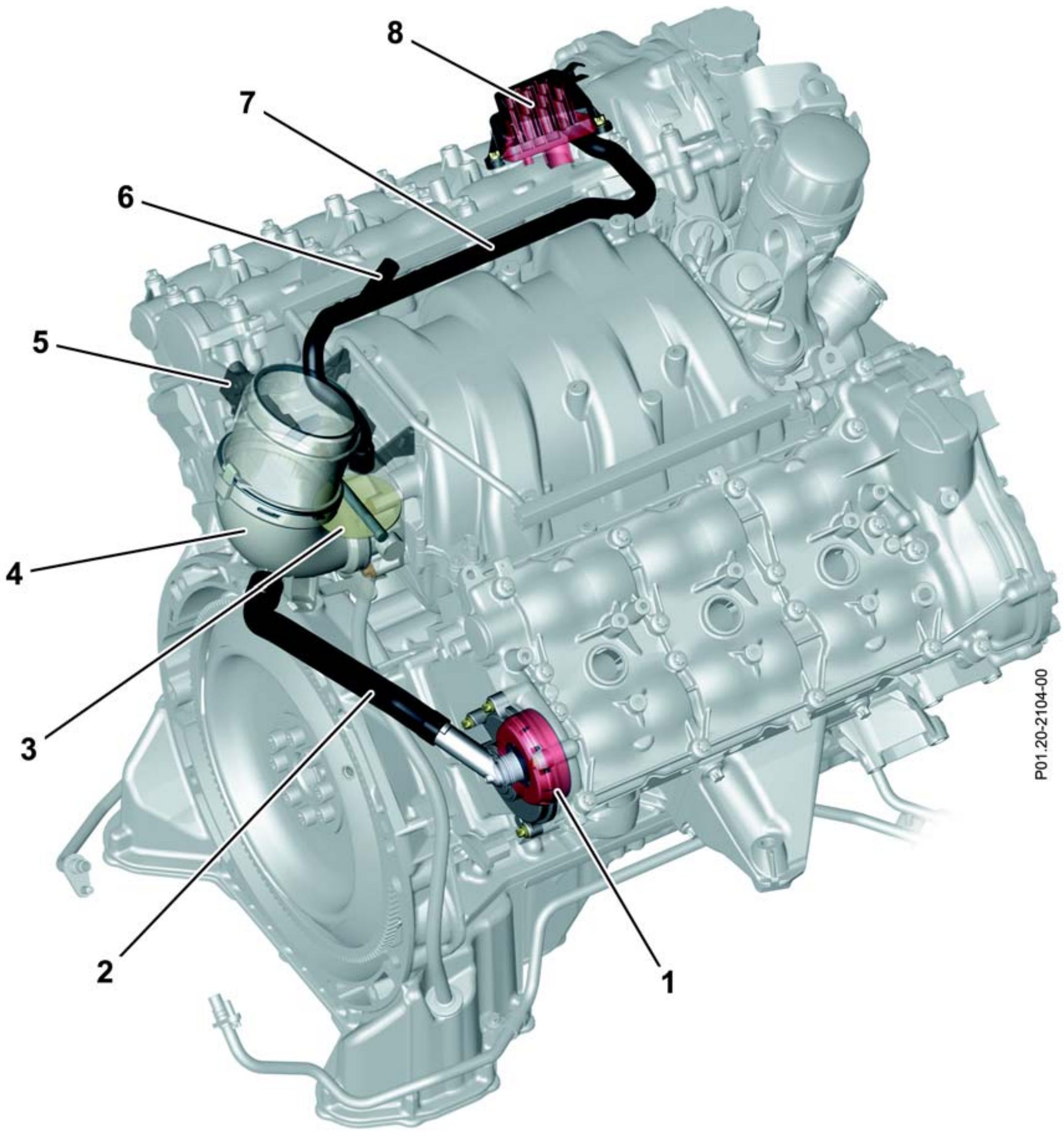


Timing chain tensioner (exploded view, not the assembly sequence!)

1 End piece
2 O-ring
3 Filler piece
4 Compression spring
5 Chain tensioner housing
6 O-ring
7 Locking spring
8 Pressure bolt
9 Timing cover

Engine 272 - Mechanical

Engine venting



Oil separation

1	*Centrifugal oil separator*
2	*Full-throttle vent line*
3	*Throttle valve*
4	*Air guide housing*
5	*Mass airflow meter (MAF)*
6	*Scavenging line connection*
7	*Part-throttle vent line*
8	*Oil separator*

The oil separator (8) is responsible for part-throttle venting. The oil vapor contained in the blow-by gas are separated in its labyrinth. The part-throttle vent line (7) leads to the air guide housing (4) behind the throttle valve (3).

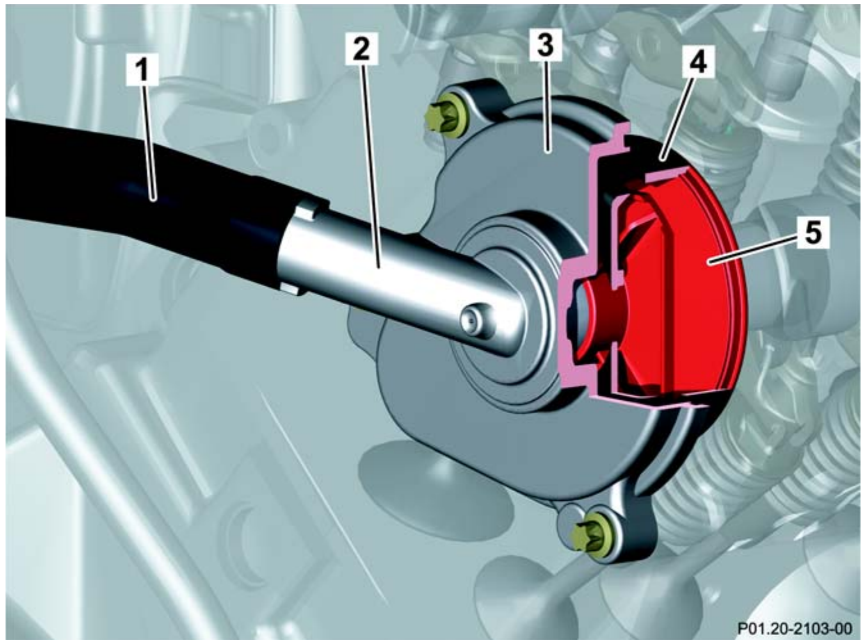
At higher load levels the centrifugal oil separator (1) is responsible for the venting.

The full-throttle vent line (2) leads between the throttle valve (3) and the mass airflow meter (5) to the induction pipe (4). The air which has had oil mist removed from it is not measured by the MAF.

Engine 272 - Mechanical

A centrifugal oil separator is used in the M 272 which is driven by the right exhaust camshaft.

Vapor containing oil mist flows from the crankcase into the centrifuge (5), which rotates at the same speed as the camshaft. This starts the vapor rotating. The oil separates out and drips through the screen filter (4) back into the crank-case. The purified air flows via the full-throttle vent line (2) to the air guide housing.



Centrifugal oil separator

1 Line to induction pipe
2 Full-throttle vent line
3 Cap
4 Screen filter
5 Centrifuge

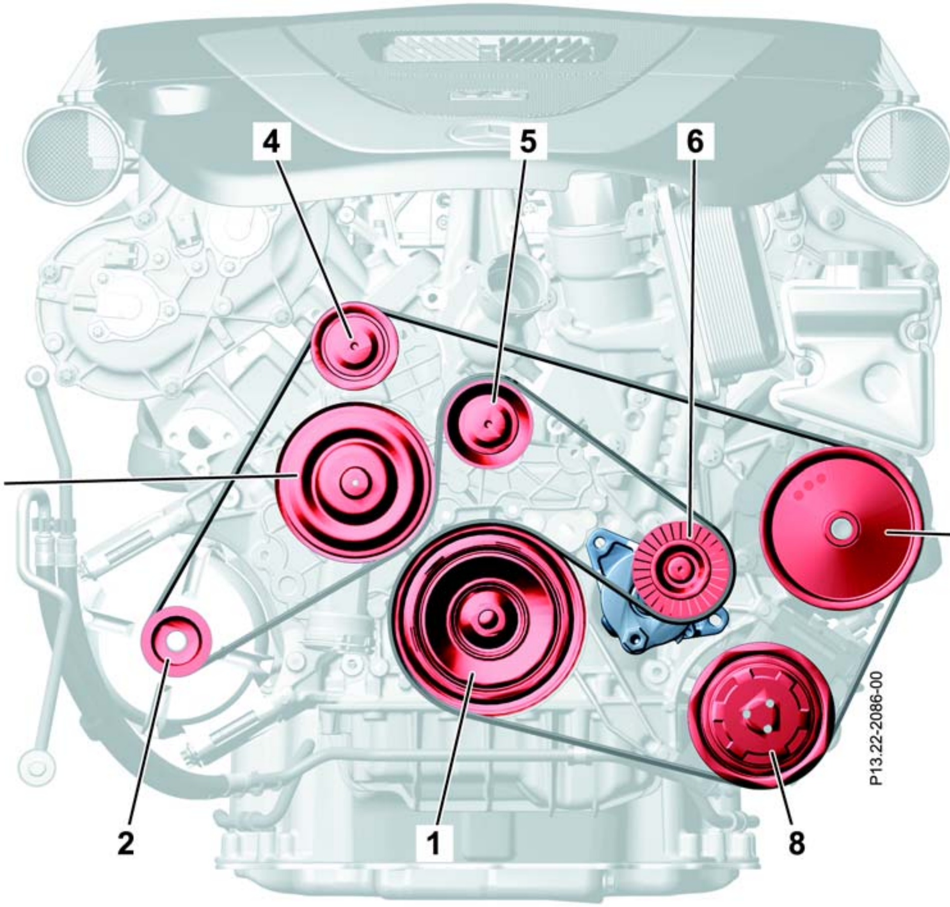
Ventilation of crankcase

In no load and part load more blowby gas is taken out via the hose from the crankcase than enters from the combustion process. The volume difference flows over the full load hose into the crankcase (fresh air ventilation). The location of the part load and full load ventilation provides for a diagonal flow of air through the motor with fresh air. In full load operation the throttle plate is wide open. Thereby the throttling effect is lost and vacuum decreases.

i Ventilation of crankcase

Ventilation of the crankcase with fresh air has a positive effect on the oil quality: the high throughput of vapor removes more water and fuel from the engine oil.

Belt drive



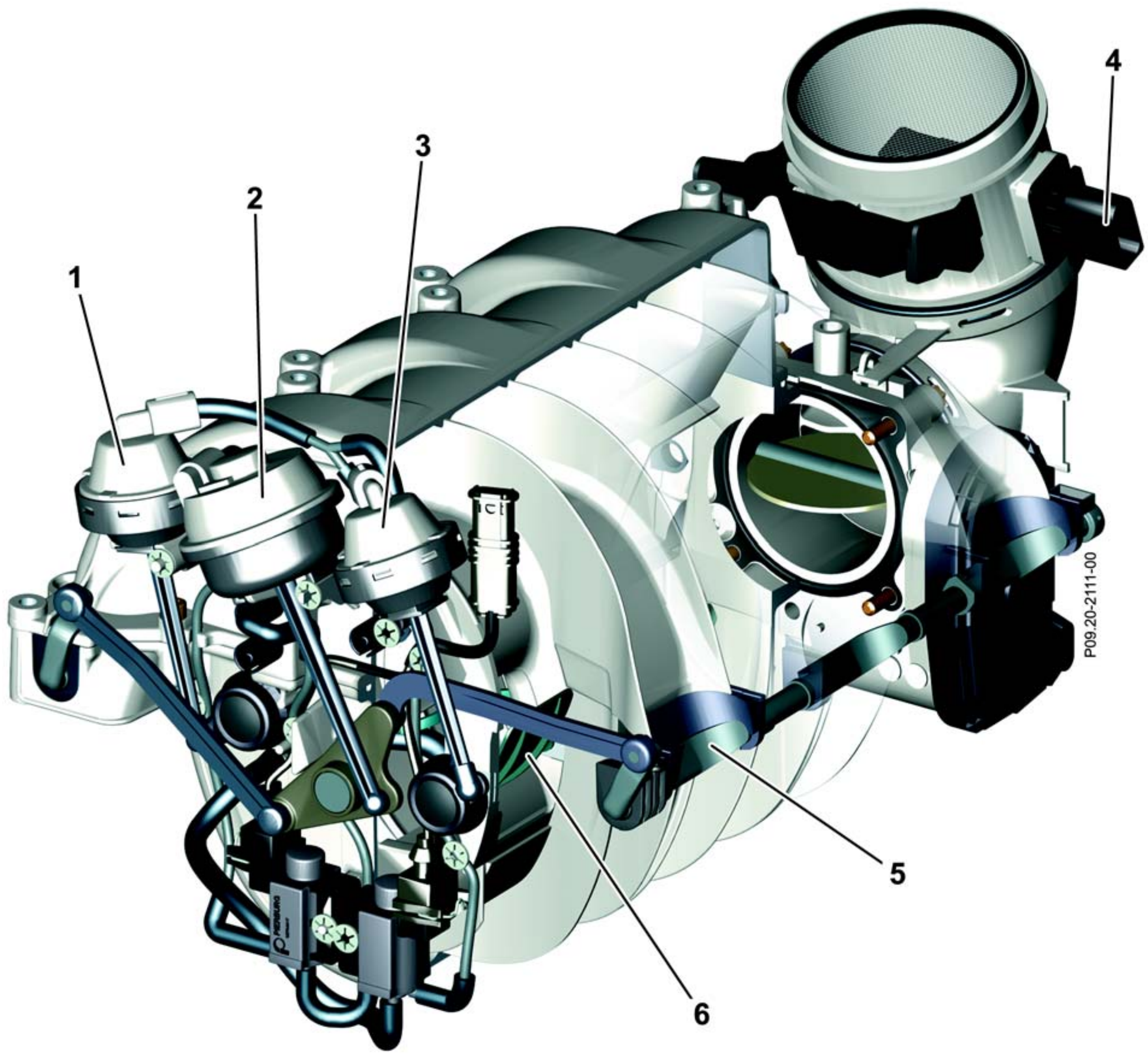
Belt routing M 272

Number of ribs: 6

1	*Pulley, crankshaft*
2	*Generator*
3	*Coolant pump*
4	*Steering roller*
5	*Steering roller*
6	*Idler*
7	*Power steering pump*
8	*A/C compressor*

Engine 272 - Combustion

Intake manifold



Intake manifold

1	*Diaphragm unit routing flaps, right cylinder bank*
2	*Diaphragm unit turbulence flaps*
3	*Diaphragm unit, routing flaps, left cylinder bank*
4	*Mass airflow meter*
5	*Turbulence flaps*
6	*Routing flaps*

The housing of the intake manifold is made from magnesium die cast parts which are joined and bonded using a tongue and groove system. In contrast to plastic, magnesium has the advantage of greater rigidity and dimensional stability which provides improved sealing in the port.

The intake pipes to the air filter are made from sound-absorbent nylon and, in contrast to the smooth surface plastic used up to now, has the advantage of making the material sound-absorbent, thereby significantly reducing the intake noise level.

Engine 272 - Combustion

Mass airflow meter (MAF)

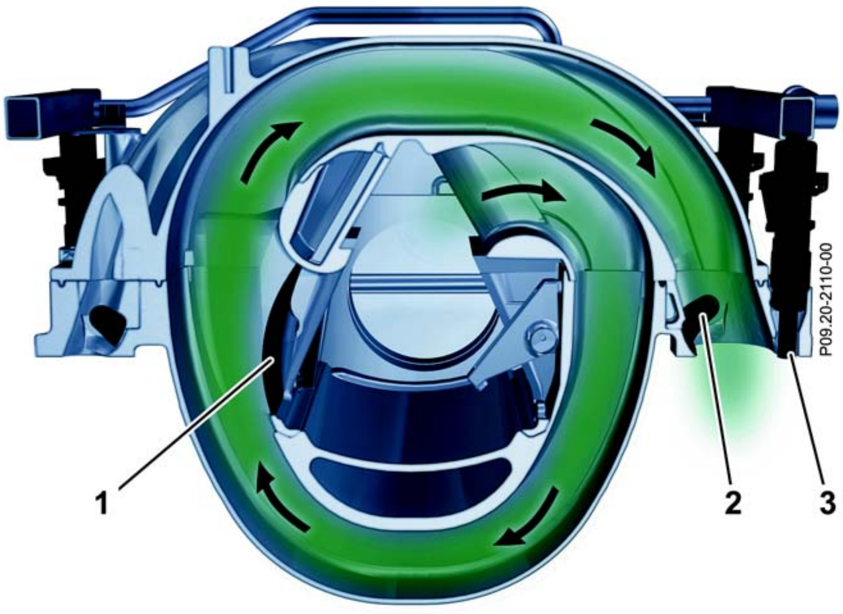
Like the entire intake manifold, the housing of the enhanced mass airflow meter (MAF 62) has been optimized in terms of flow. The housing of the mass airflow meter has a modified grating with low air resistance.

Routing flaps

The routing flaps inside the intake manifold vary the length of the intake channels. The routing flaps are opened or closed depending on the load.

At low revs the routing flaps are closed which increases the length of the intake channels. The length is calculated so that the pressure waves in the induction pipe move the combustion air towards the intake valve during the intake stroke. This increases the cylinder charge, in turn optimizing the torque band and lowering the fuel consumption and the emissions.

The routing flaps open from around 3500 rpm allowing the air to flow directly into the combustion chambers. The length of the intake channels is calculated to ensure a "supercharging" effect, even at high revs. This yields high performance at high revs.



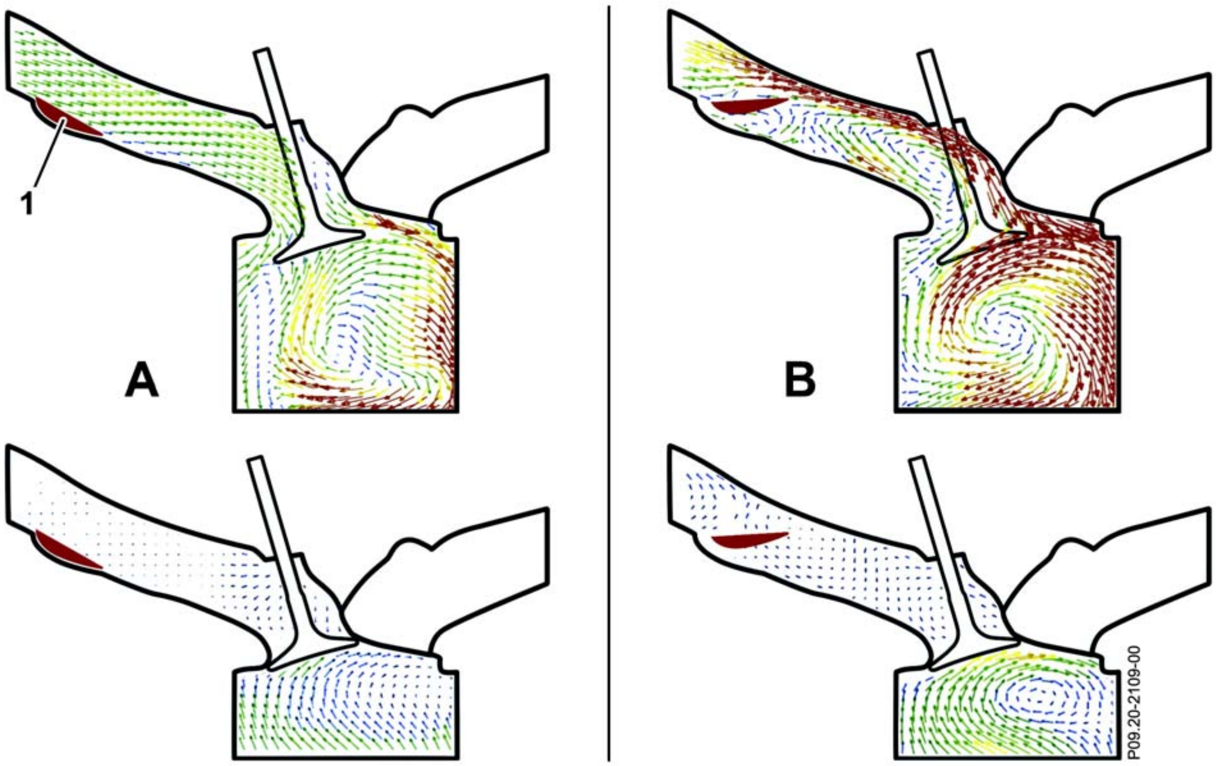
Routing flaps closed, long intake channels

1 *Routing flap*
2 *Turbulence flap*
3 *Injection valve*

Routing flaps open, short intake channels

Engine 272 - Combustion

Turbulence flaps



Charge movements

1 Turbulence flap

A Turbulence flaps lowered at higher engine load

B Turbulence flaps pivoted out at part-throttle

Turbulence flaps

Electropneumatically activated turbulence flaps are installed at the end of each intake port. The turbulence flaps have two positions: lowered or pivoted out

When pivoted out at part-throttle, the turbulence flaps increase the flow speed of the incoming air. The resulting turbulence of the fuel-air mixture in the combustion chamber yields a more even distribution of the mixture and therefore better and faster combustion.

At part-throttle, when the mixture is leaner due to the exhaust gas recirculation, the increased combustion speed helps provide lower fuel consumption.

At higher revs the turbulence flaps are fully lowered in the induction pipe; the intake process is unaffected.

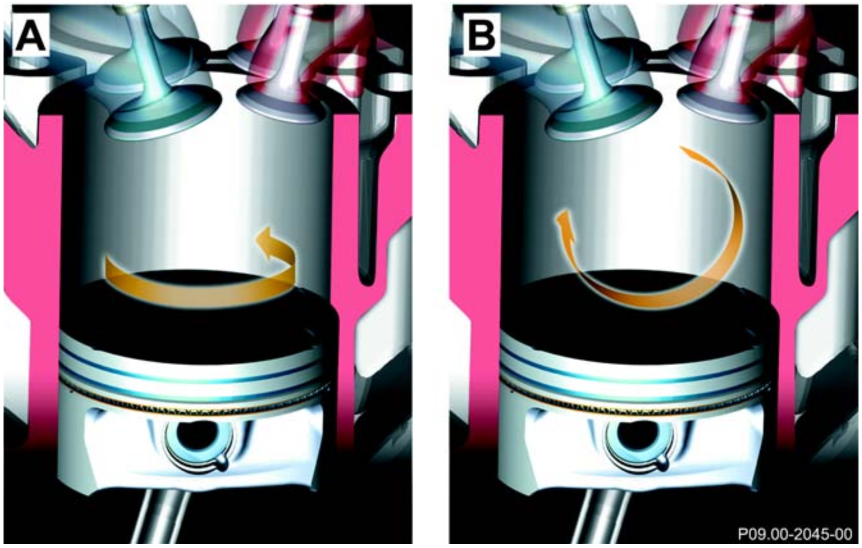
Engine 272 - Combustion

Charge movement

There are two different charge movements in the cylinder – swirl and turbulence. The swirl mirrors the action of the cylinder axle whereas the turbulence motion is perpendicular to this. The upwards movement of the piston converts the turbulence movement into self-amplifying, complex turbulence. This leads to good ignition and burn-through conditions in the mixture.

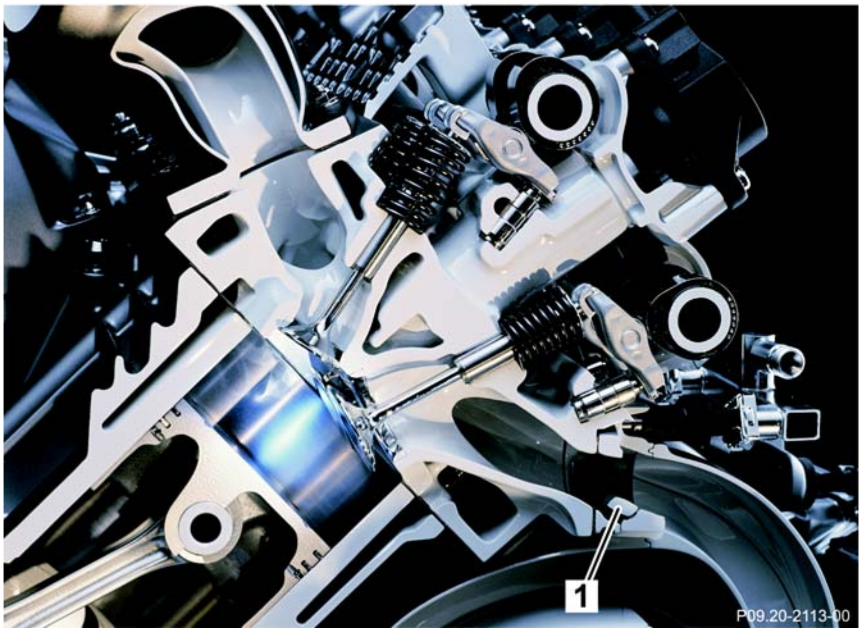
The results are:

- good ignition of the mixture made leaner by the internal EGR,
- faster and more complete combustion
- lower fuel consumption
- smoother running.



Charge movement in the cylinder

A Swirl
B Turbulence



Turbulence flap in the intake manifold

1 Turbulence flap

Engine 272 - Combustion

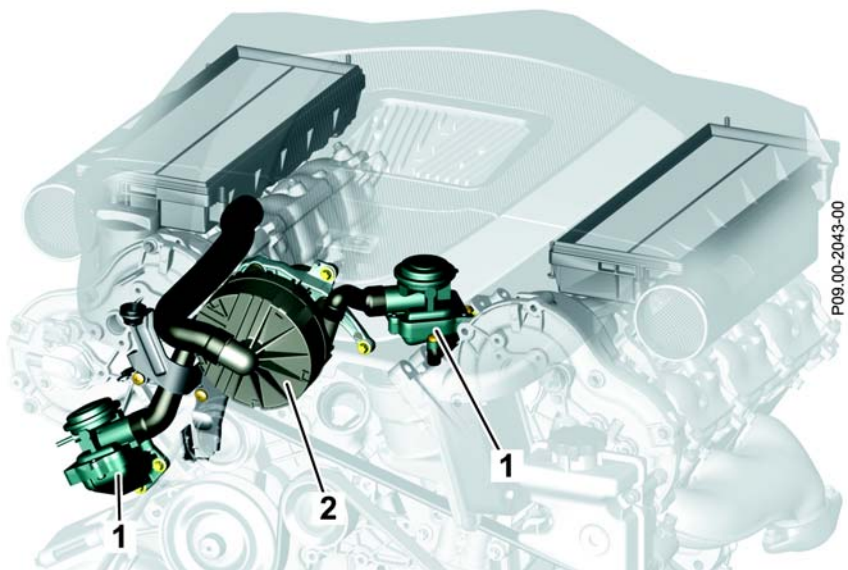
Secondary Air Injection (AIR)

The excellent exhaust emissions of the M 272 is achieved in part by secondary air injection with increased throughput.

Secondary air injection in the ports of the cavity-insulated exhaust manifold results in after burning of uncombusted gas. This raises the exhaust port temperature, bringing the catalytic converters more quickly up to operating temperature as a result.

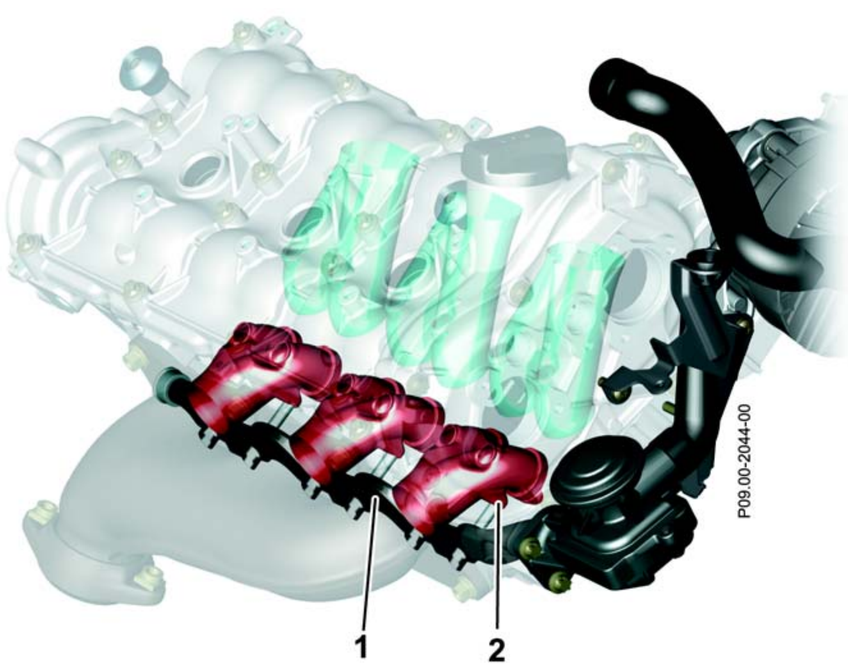
The injection points have been determined on the basis of the flow patterns in the exhaust ports of the cylinder head. This ensures more even distribution of the air to all exhaust ports in the cylinder head.

Each cylinder has one injection point per exhaust valve.



Secondary air injection

1 Secondary air injection combi-valve
2 Electric AIR pump



Injection points in the cylinder head

1 Air duct
2 Injection points

Emission controls

Environment

The elaborate measures taken for emission controls including monolith coating of the catalytic converters fulfil the LEV II limits.

The exhaust manifold has a double-flow design with two walls (cavity insulated).

Catalytic converters

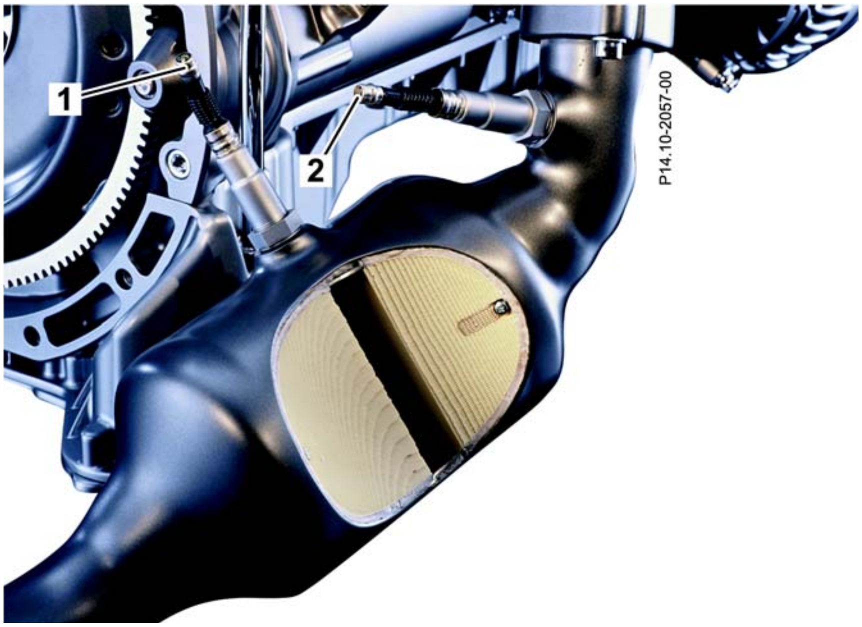
Catalytic converters fitted close to the engine, each with 1.4 l volume, have the following benefits:

- Improved light-off in the catalytic converters,
- Long catalytic service life
- Reduction of high-frequency structure-borne noise.

Oxygen sensors

Each of the two catalytic converters has a control sensor and a guide sensor.

Thanks to the linear control of the control sensor they supply the engine control module with precise data about the exhaust gas composition immediately after a cold start. The engine control module then adjusts the ignition timing so that the catalytic converters quickly reach their operating temperature.

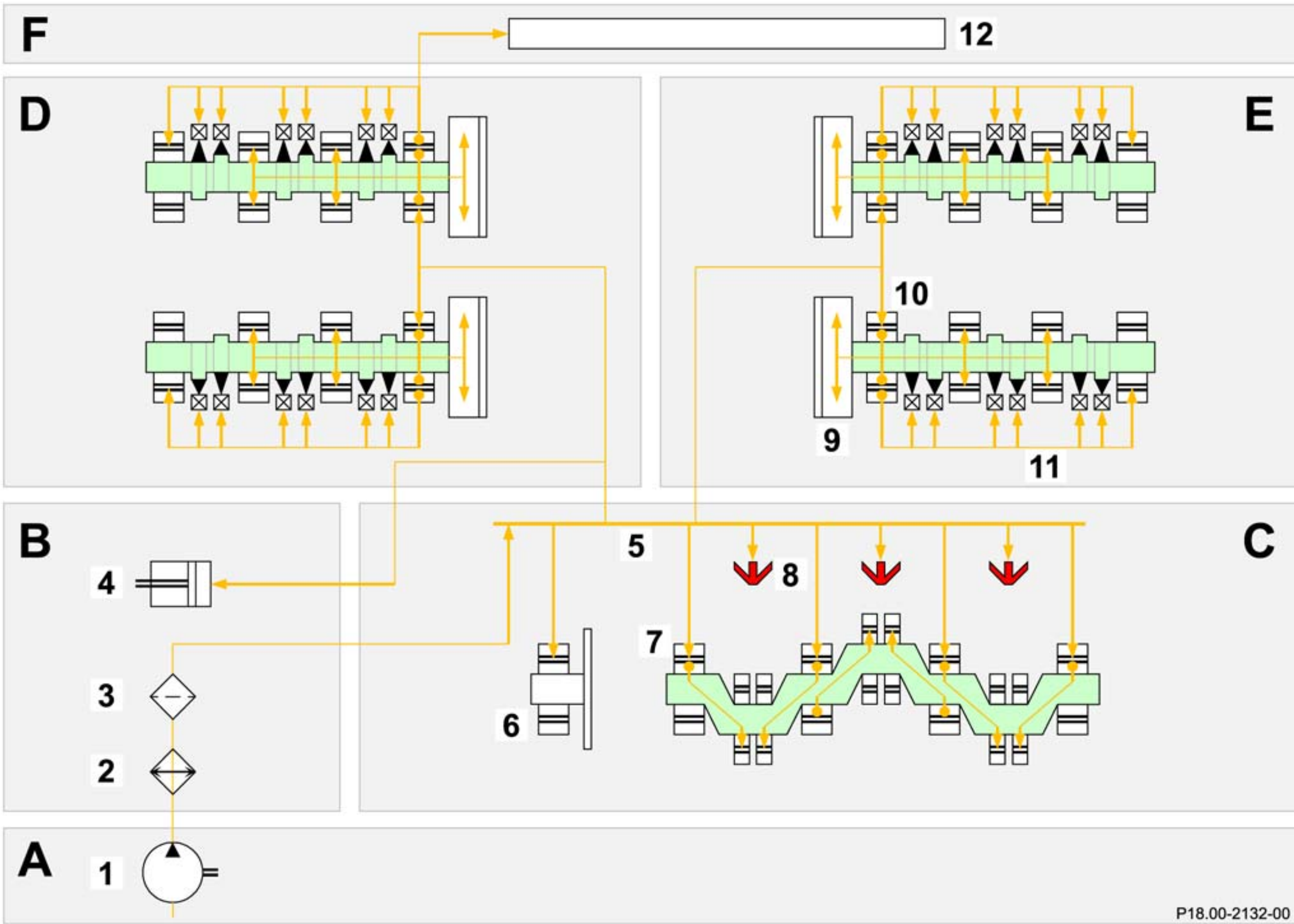


Catalytic converter mounted close to engine

1 Oxygen-guide sensor
2 Oxygen-control sensor

Engine 272 - Cooling and lubrication

Engine lubrication



Lubricating oil circulation

A	*Oil sump*
B	*Timing cover*
C	*Crankcase*
D	*Cylinder head, right*
E	*Cylinder head, right*
F	*Special units*
1	*Oil pump*
2	*Engine oil cooler*
3	*Engine oil filter*
4	*Timing chain tensioner*
5	*Main oil duct*
6	*Balancer shaft bearing*
7	*Crankshaft and con rod bearing*
8	*Oil injection jets, piston*
9	*Camshaft adjuster*
10	*Camshaft (intake/exhaust) bearing*
11	*Hydraulic valve lifters*
12	*Bearing lubrication, vacuum pump*

The camshaft is hollow inside and uses this cavity to supply the camshaft adjusters and their two center bearing points with lubricating oil. The rear bearing position is supplied via a bore hole in the cylinder head.

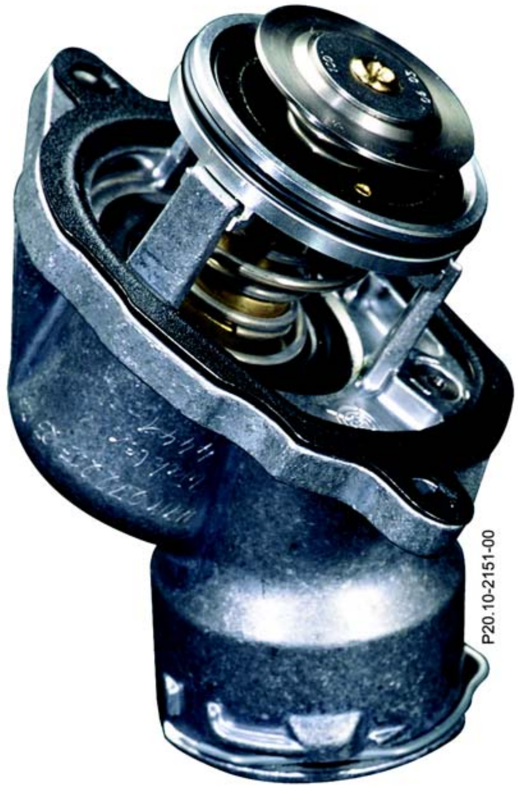
Lubricating oil is taken from the left cylinder head for the bearings of the vacuum pump which is fitted in some engine versions.

Engine cooling

Triple-plate thermostat

The new heat management system contributes to the lower fuel consumption of the M 272.

A new type of electronic map-controlled triple-plate thermostat controls the flow of coolant around the engine in all operating conditions. The opening temperature of the triple-plate thermostat can be actively controlled by a heating element in the expansion cartridge.



Triple-plate thermostat

Triple-plate thermostat (Y110)

1 Heating element with electrical connection

Engine 272 - Cooling and lubrication

Triple-plate thermostat operating modes

Short-circuited coolant

In a cold start when the duo or heating cut-off valve (depending on type) is closed, the coolant remains short-circuited in the engine in the coolant cycle. The coolant pump "stirs" the coolant.

Advantage: The engine achieves its operating temperature more quickly.

Raised coolant temperature

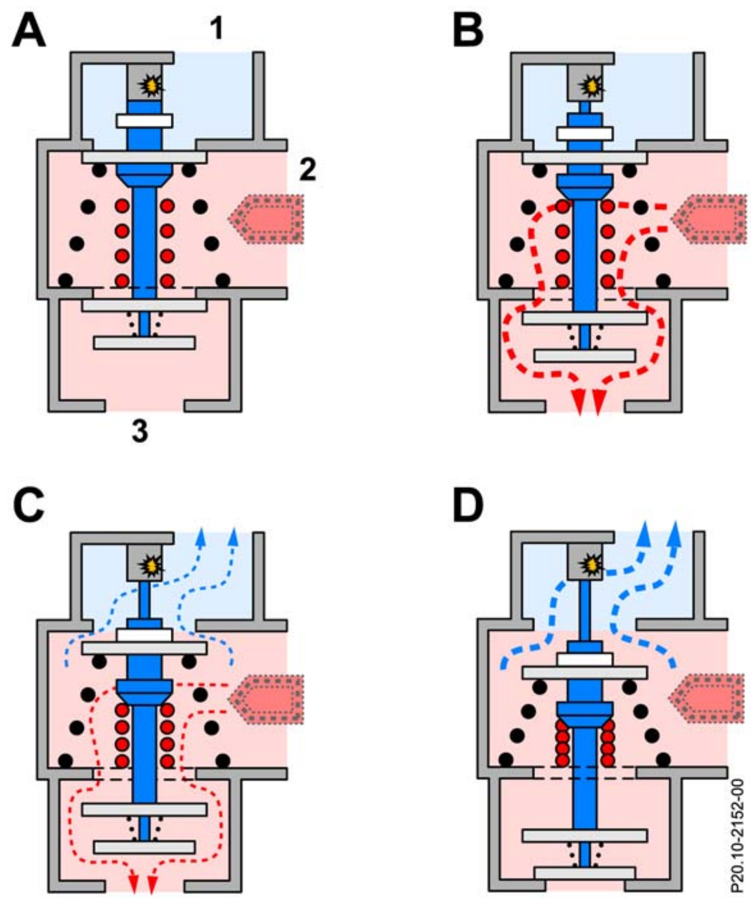
In a warm engine at part-throttle the coolant temperature can be raised to around 100 °C. At full-throttle and in temperature-critical operating conditions the coolant temperature is lowered (80 °C in summer / 90 °C in winter).

Advantage: The engine is designed to run at the optimum temperature, even at very low or very high loads.

Reducible engine short circuit

The triple-plate thermostat reduces the coolant flow through the engine to allow a greater quantity to flow through the heating system heater.

Advantage: A highly effective heating system which reacts quickly.

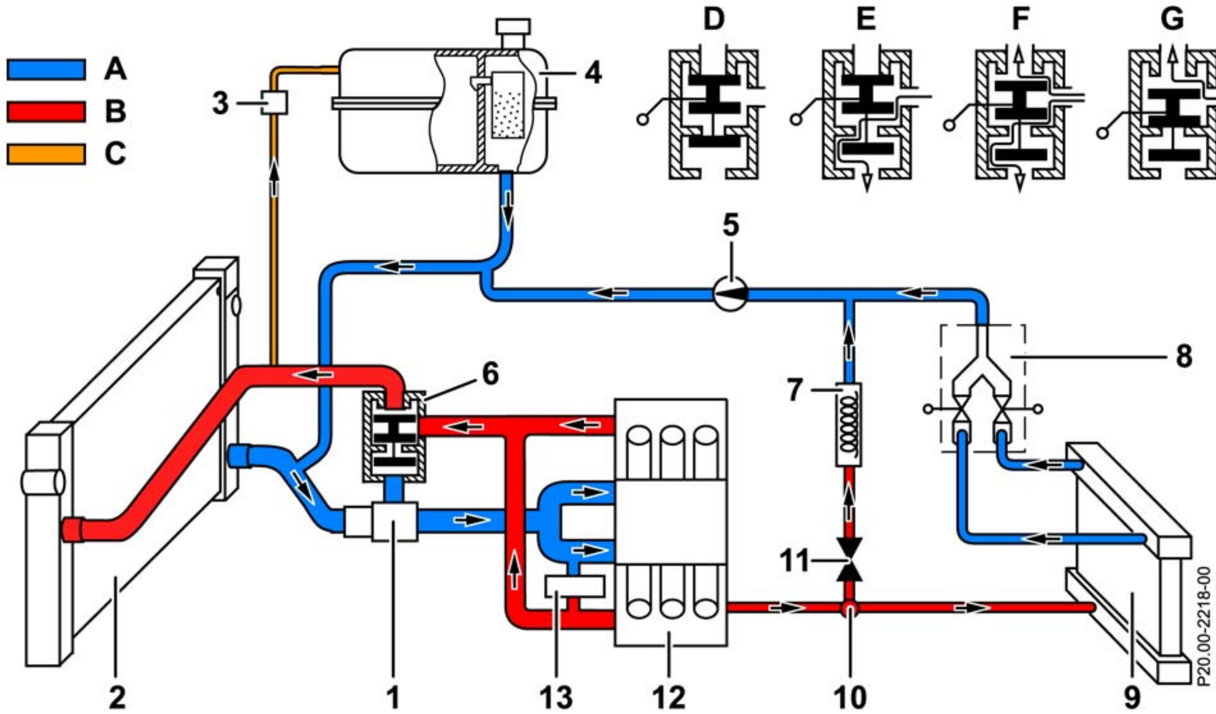


Triple-plate thermostat operating modes

A Full reduction
B Short-circuit mode
C Mixed mode
D Radiator mode

1 to the radiator
2 from the engine
3 to coolant pump (short/circuit)

Engine 272 - Cooling and lubrication



Schematic coolant cycle, based on R 171 (radiator mode shown)

1 Coolant pump
2 Engine cooling, radiator
3 Check valve
4 Coolant recovery bottle with silica gel
5 Electric coolant pump, heating circulation
6 Triple-plate thermostat
7 Washer water heating
8 Duo valve
9 Heating system heat exchanger
10 Plug coupling
11 Shut-off valve
12 Cylinder crankcase with cylinder heads
13 Engine oil cooler

A Coolant return
B Coolant feed
C Venting
D Full reduction
E Short-circuit mode
F Mixed mode
G Radiator mode

Full reduction

To speed up warming of the engine, the connections to the radiator and the coolant pump (short-circuit) are fully closed. The coolant remains stationary.

Short-circuit mode

During the warm-up phase, the connection to the coolant pump is gradually opened until it is 100 % open.

Mixed mode

The connections to the radiator and the coolant pump are partially opened depending on the degree of cooling required.

Radiator mode

For maximum cooling the connection to the radiator is opened 100 %, the connection to the coolant pump is closed.

Duo valve/heating shut-off valve

A duo or a heating shut-off valve (not shown) is fitted, depending on the engine type. These valves interrupt the supply of coolant to the heating system heat exchanger to warm up the engine more quickly.

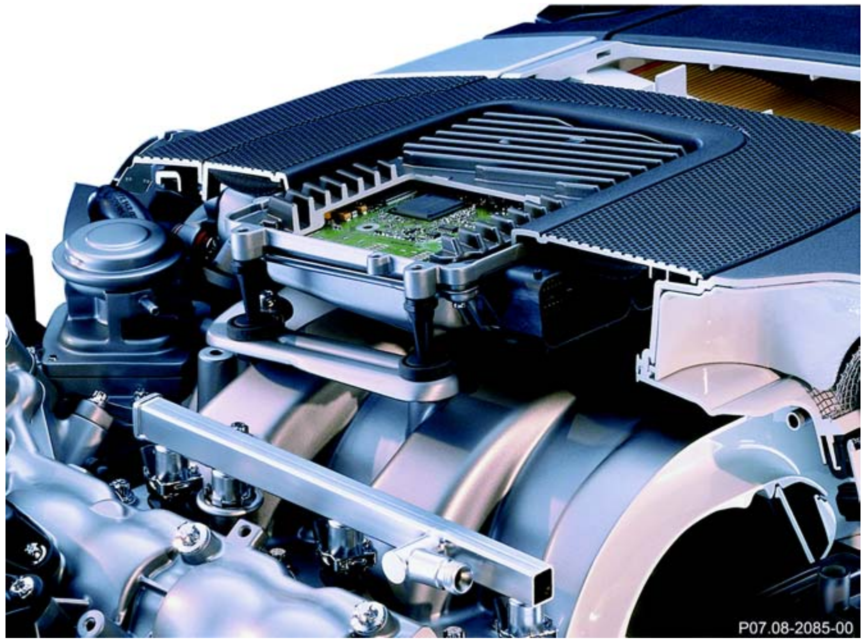
Engine 272 - Engine electrical/electronics

Engine control

Engine management of the M272 is done by the engine control module, the ME 9.7.

To help achieve short electrical paths, the engine control module is mounted on the induction pipe of the engine, i.e. it is an integral part of the engine design. The mounting of the control module on the engine also offers benefits in production.

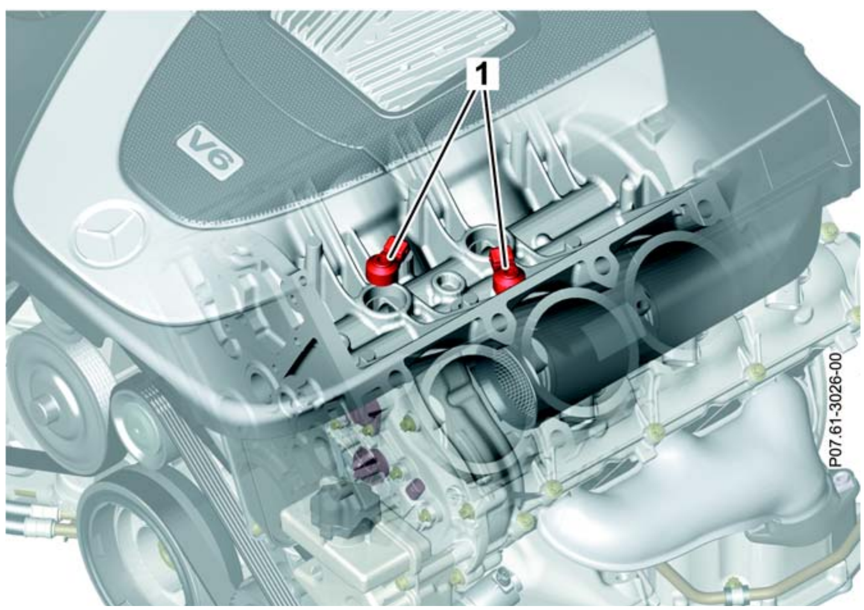
As with the M 271, the M 272 also features a two-computer design engine control module.



Engine control module mounted on intake manifold

Knock sensor

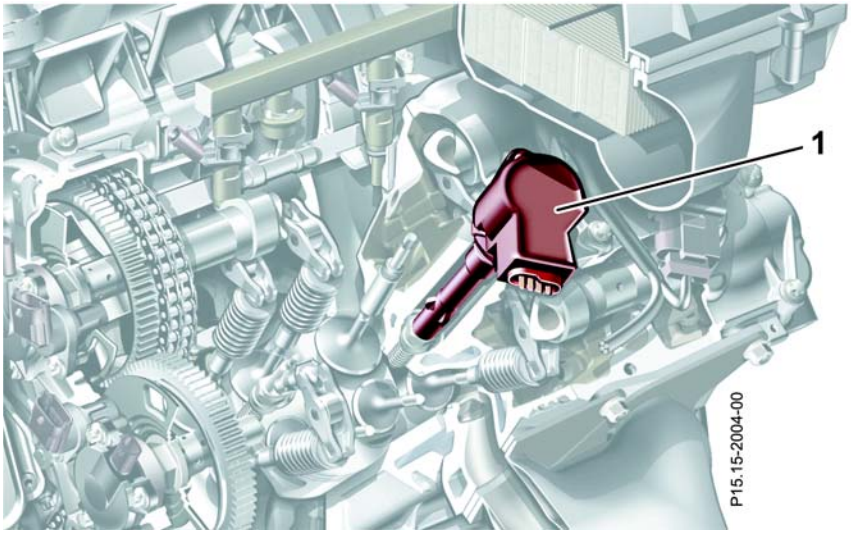
Two knock sensors, one per cylinder bank, detect any combustion knock. The sensors are piezoceramic and correct the ignition timing as required.



1 Knock sensors

Coil

Individual coils with integrated ignition output stage are used in the M 272 The coils are controlled by the engine control module via a dedicated control lead.



1 Coil

Generator interface

The generator communicates with the engine control module via the LIN bus.

This means that the engine control module can influence the control action of the generator by prescribing a target control voltage. Conversely, the generator also signals any errors to the engine control module.

LIN-bus

LIN stands for
Local **I**nterconnect **N**etwork.

The LIN bus is a bi-directional single-wire interface with a maximum transmission rate of 20 kbit/s.

The LIN bus links up intelligent engine components which do not require high data transmission rates.