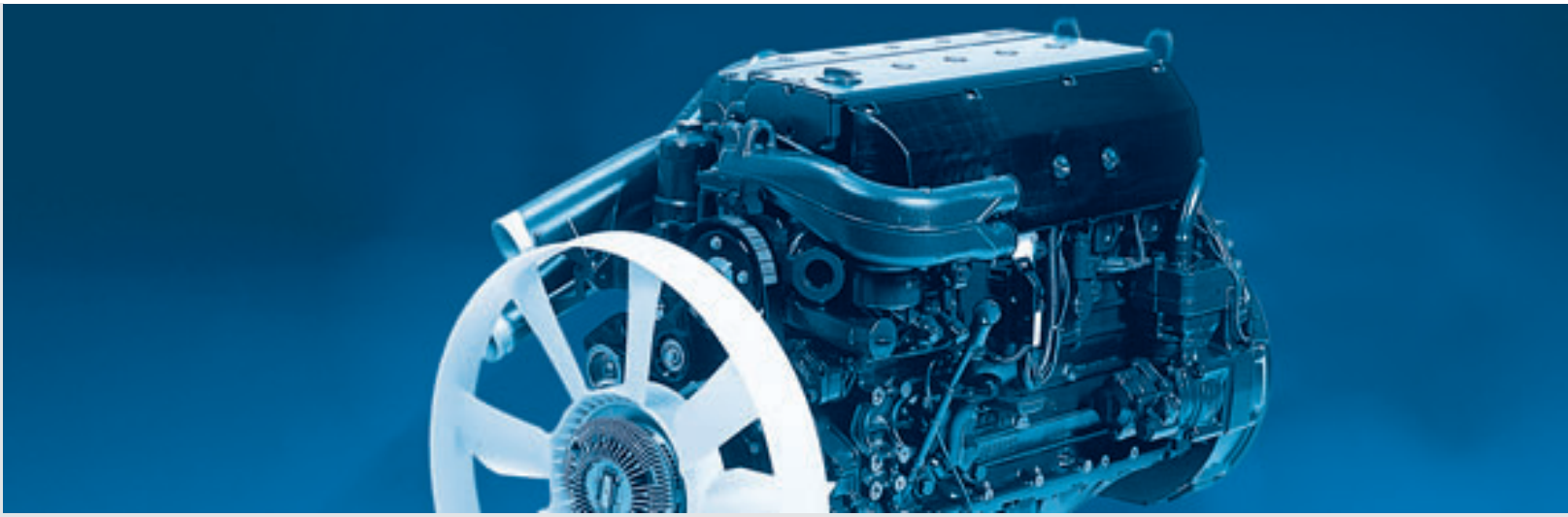


Operating Instructions
OM 904 LA – OM 906 LA – OM 926 LA
EU Level III A (EU 97/68/EC)
EPA TIER 3 (US EPA 40 CFR Part 89)

Mercedes-Benz

Symbols

*	Optional equipment
	Warning
	Environmental note
	Possible vehicle damage
	Tip
▶	Action required
▶	Sequence of actions (several ▶)
▷ ▷	Continuation symbol
▷ ▷	Continuation symbol for a warning
▷ page	Page reference
->	Term in the glossary of technical terms
Display	Displays in the multi-function display

Internet

Further information about Mercedes-Benz vehicles and about DaimlerChrysler AG can be found on the following websites:

www.mercedes-benz.com
www.daimlerchrysler.com

Editorial office

You are welcome to forward any queries or suggestions you may have regarding these Operating Instructions to the technical documentation team at the following address:

DaimlerChrysler AG, Abt. SVI, HPC: E124, 70546 Stuttgart, Germany

As at: 01.12.2005

Thank you for choosing this Mercedes-Benz engine.

Make sure that you read the Operating Instructions before using the engine for the first time. This will help you to make optimum use of the engine and avoid endangering yourself and others.

Since the scope of delivery varies depending on each specific order, the equipment of your engine may differ from certain descriptions and illustrations in these Operating Instructions. These Operating Instructions also describe items of optional equipment where their operation requires explanation.

DaimlerChrysler reserves the right to make changes to design, equipment and technology. You cannot, therefore, base any claims on the data, illustrations or descriptions in these Operating Instructions.

Your nearest Mercedes-Benz Service Centre will be happy to assist you further should you have any more queries.

The Operating Instructions and Maintenance Booklet are an integral part of the engine. You should therefore always keep them with the engine and pass them on to the new owner if you sell it.

Contents

Please also refer to the index (▷ page 113)

Contents

▼ Protection of the environment

Environmental note

DaimlerChrysler's declared policy is one of integrated environmental protection. This policy starts at the root causes and encompasses in its management decisions all the consequences for the environment which could arise from production processes or the products themselves.

The objectives are for the natural resources which form the basis of our existence on this planet to be used sparingly and in a manner which takes the requirements of both nature and humanity into account.

Operate the engine in an environmentally responsible manner and you will help to protect the environment.

Fuel consumption and engine wear depend on the operating conditions.

Therefore:

- do not warm up the engine at idle speed
- switch off the engine during periods in stationary traffic
- monitor fuel consumption
- carry out the specified maintenance work regularly

Operating safety

The operating safety of an engine primarily depends on its proper installation into the complete system (e.g. vehicle, machine, etc.). However, as the operator, you also have a direct influence on the safe operation of the engine.

Some of the requirements for operating the engine safely can be met by adhering to the specified maintenance intervals and ensuring that the required maintenance work is carried out correctly.

However, the safe functioning of the engine also depends on correct operation, which includes, for instance, checking the engine oil level at regular intervals.

Risk of accident 

Engine damage arising from incorrect operation could result in an accident.

Therefore, observe the notes on operating the engine in these Operating Instructions.

Risk of accident 

Maintenance work that is carried out incorrectly or not at all, and the failure to observe the specified maintenance intervals, may reduce the service life of the engine and cause engine damage, which could result in an accident.

Therefore, observe the notes on engine maintenance in these Operating Instructions.

Risk of accident 

Work incorrectly carried out on electronic components and their software could impair the functioning of these components. Since the electronic systems are networked, this might also affect systems that have not been modified.

For this reason, always have work on, or modifications to, electronic components carried out at a qualified specialist workshop.

DaimlerChrysler recommends that you use a Mercedes-Benz Service Centre for this purpose as it has the necessary specialist knowledge and tools for the work required.

Correct use

The engine is only designed for installation in accordance with the specifications defined in the contract.

The manufacturer of the end product is personally responsible for the complete system, and in particular for the correct installation and compatibility of this engine with the rest of the system.

The engine must not be modified. DaimlerChrysler accepts no responsibility for damage caused as the result of modifications.

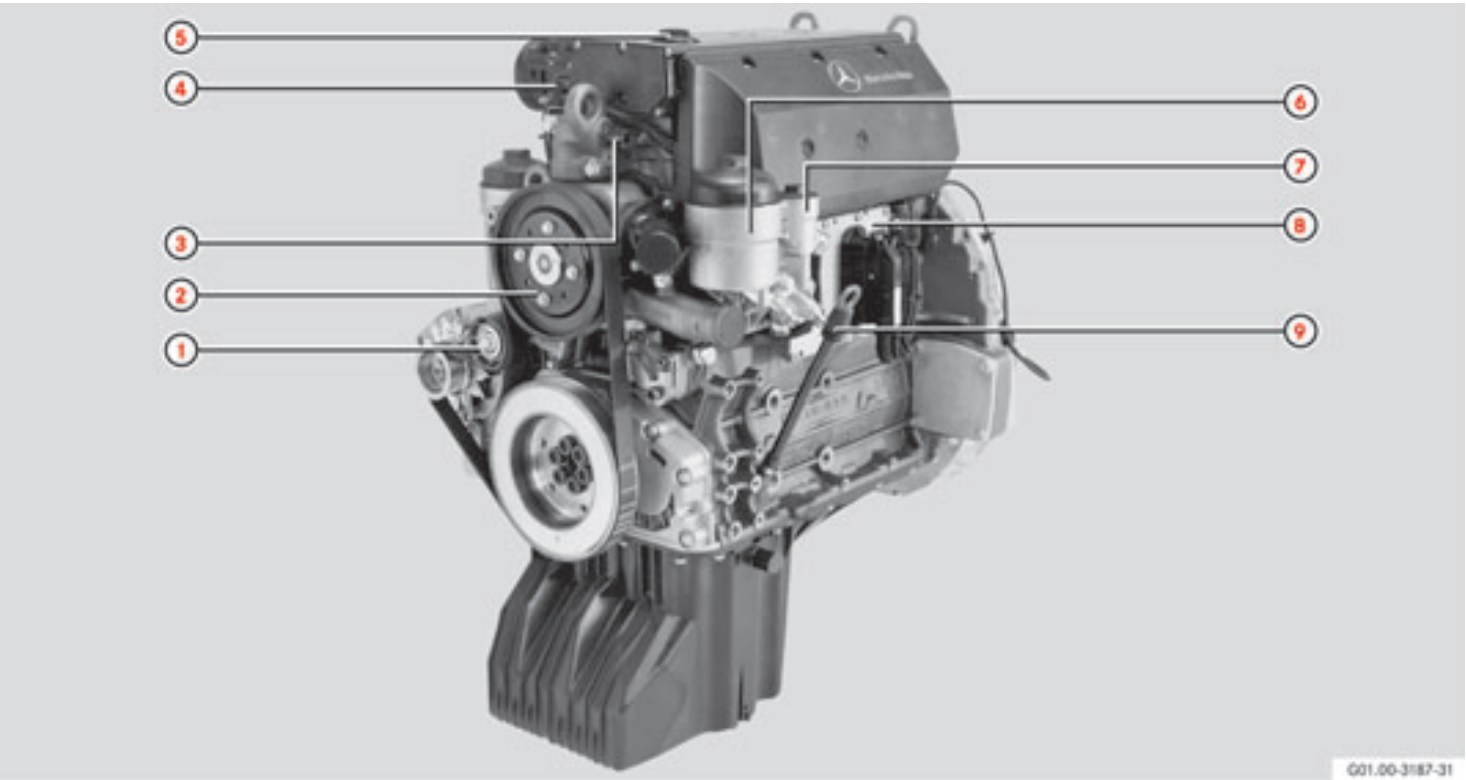
Correct use of the engine includes adhering to these Operating Instructions, adhering to the maintenance intervals and performing maintenance work correctly in accordance with these Operating Instructions.

At a glance

1

OM 904 LA overview

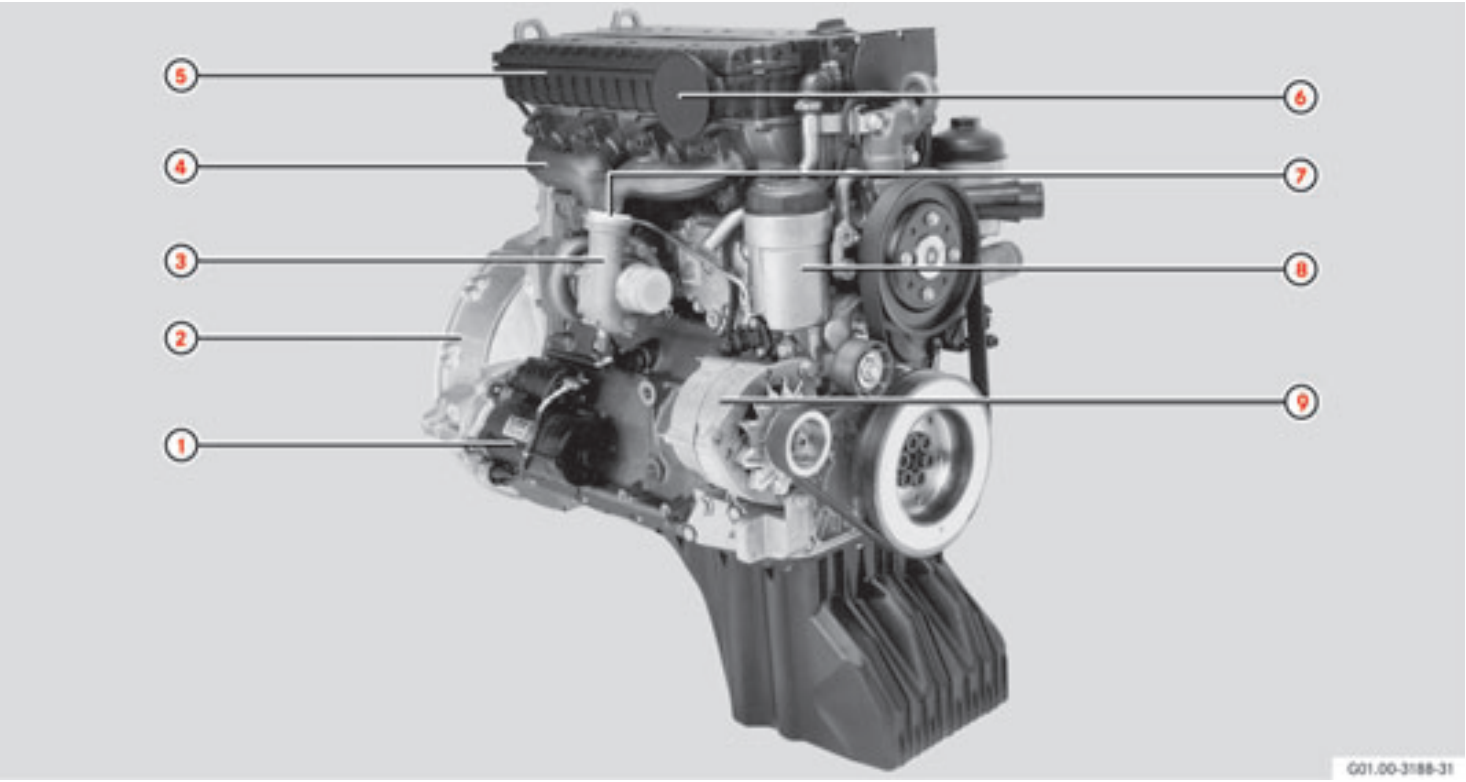
1



① Poly-V-belt tensioning pulley
② Coolant pump
③ Coolant line heater supply*
④ Crankcase breather
⑤ Oil filler opening
⑥ Fuel filter
⑦ Fuel prefilter
⑧ MR (engine control) unit
⑨ Dipstick

OM 904 LA overview

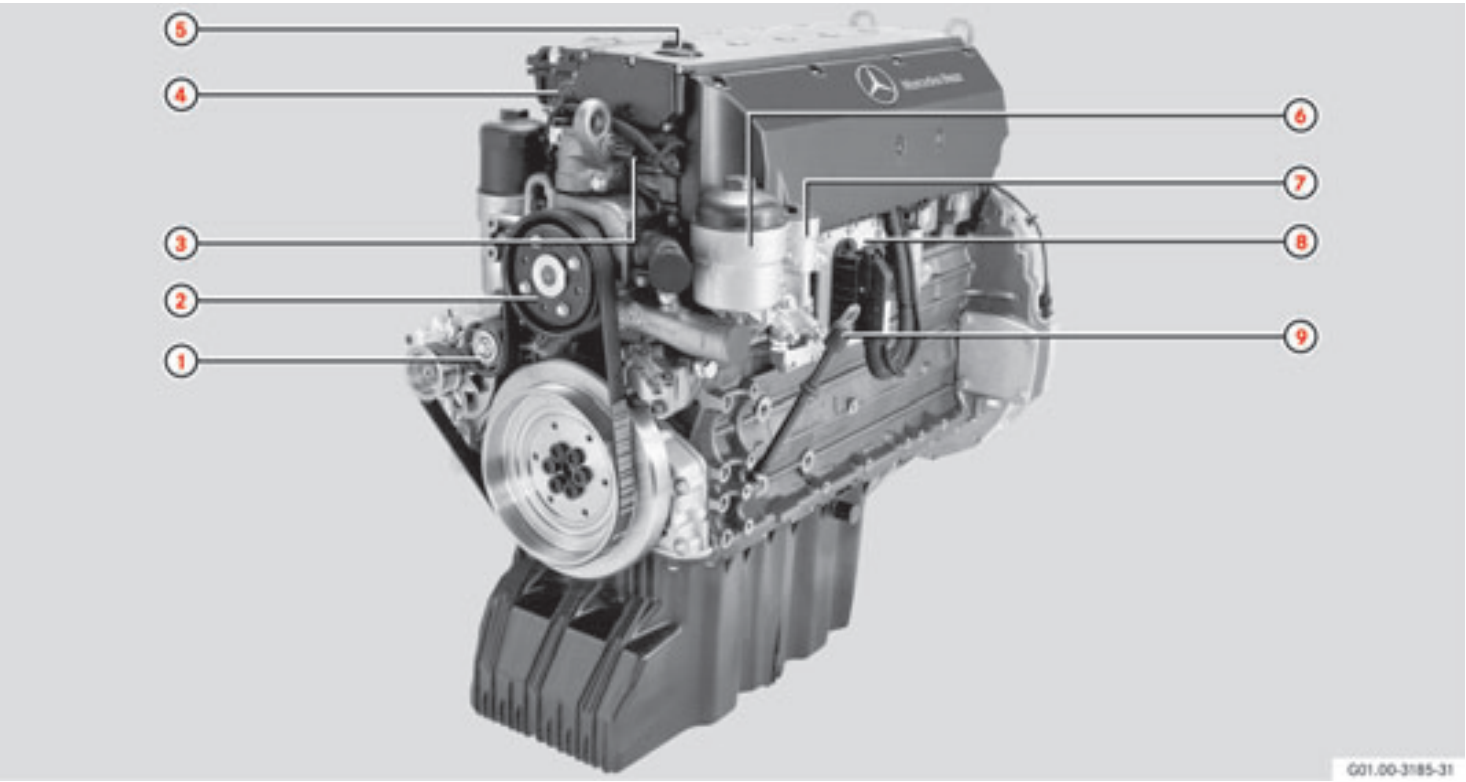
1



① Starter motor
② Flywheel housing
③ Exhaust gas turbocharger
④ Exhaust manifold
⑤ Charge-air housing
⑥ Charge-air pipe connection from the intercooler
⑦ Charge-air pipe connection to the intercooler
⑧ Oil filter
⑨ Alternator

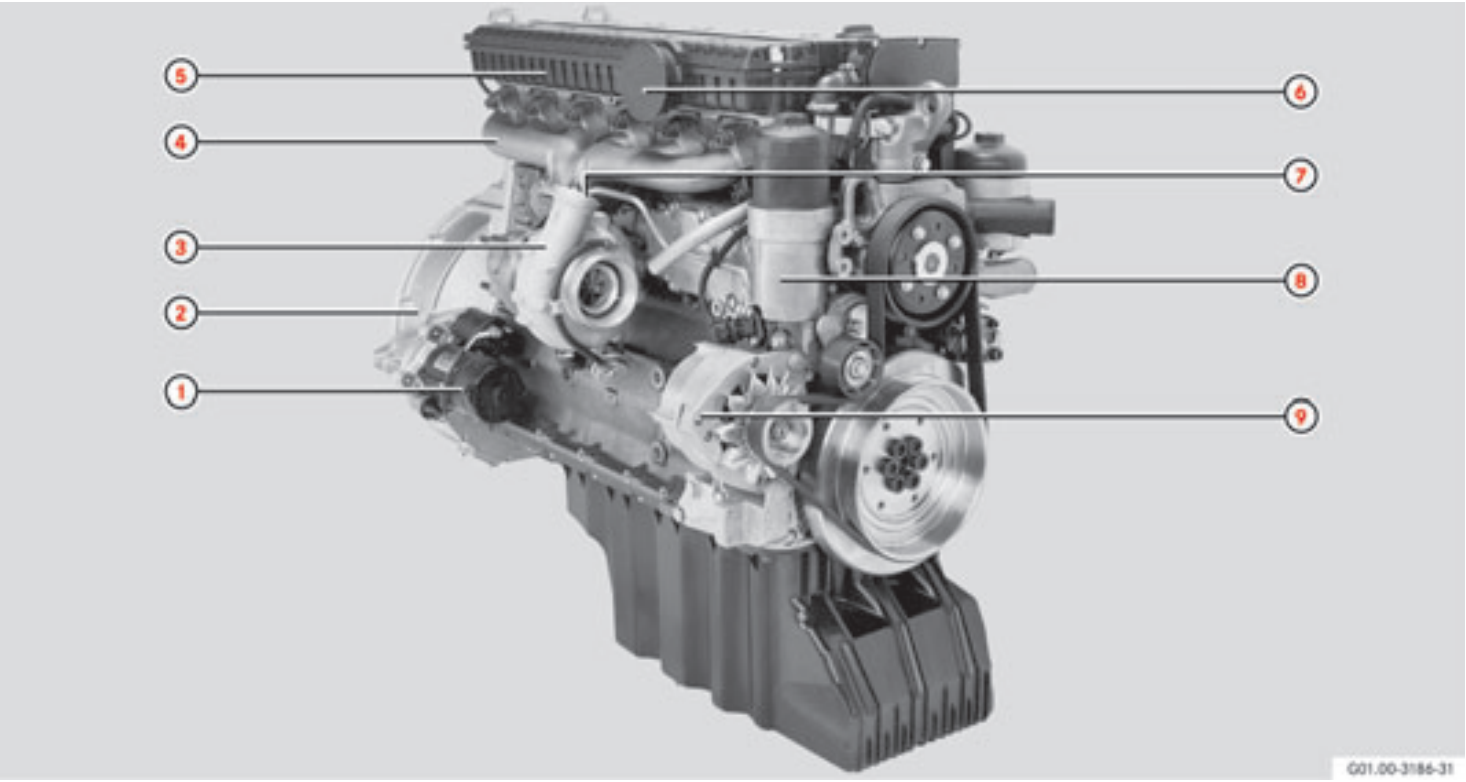
OM 906 LA/OM 926 LA overview

1



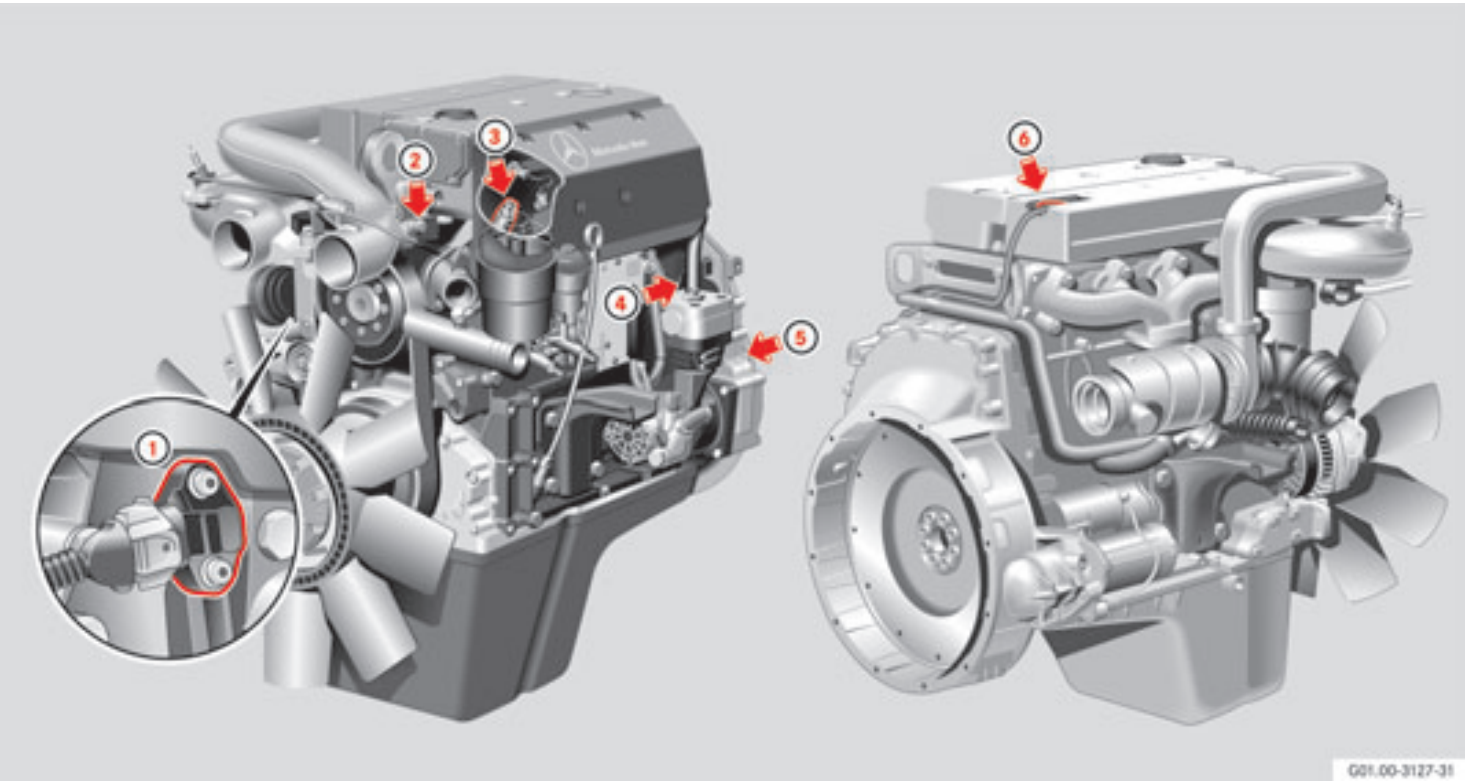
① Poly-V-belt tensioning pulley
② Coolant pump
③ Coolant line heater supply*
④ Crankcase breather
⑤ Oil filler opening
⑥ Fuel filter
⑦ Fuel prefilter
⑧ MR (engine control) unit
⑨ Dipstick

OM 906 LA/OM 926 LA overview



① Starter motor
② Flywheel housing
③ Turbocharger with wastegate valve
④ Exhaust manifold
⑤ Charge-air housing
⑥ Charge-air pipe connection from the intercooler
⑦ Charge-air pipe connection to the intercooler
⑧ Oil filter
⑨ Alternator

Location of sensors



OM 904 LA (OM 906 LA/OM 926 LA comparable)

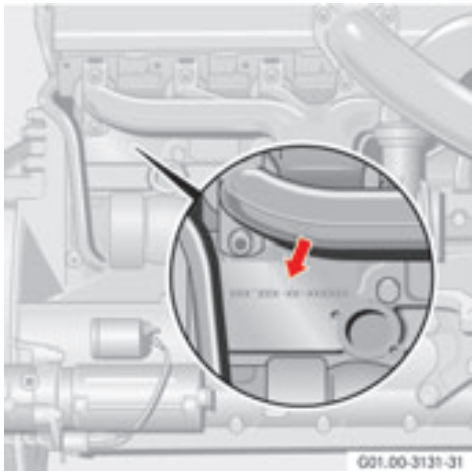
① Combined oil temperature / pressure sensor
② Coolant temperature sensor
③ Fuel temperature sensor
④ TDC sensor (on the camshaft sprocket)
⑤ Crankshaft position sensor (on the flywheel)
⑥ Combined charge-air pressure / temperature sensor

Engine number

1

Location

The engine number is located on the rear right-hand side, beneath the exhaust manifold (arrow).



Location of the engine number on the right-hand side of the engine

Information on the engine

As well as the name of the manufacturer, the following data is listed:

Information on the engine

① Engine model designation
② Engine number
③ Type approval number
④ Engine group

General information

Type designation

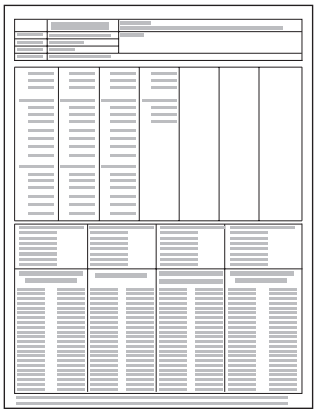
OM 9XX L A

OM			Oil engine (diesel engine)
	9XX		Engine model
		L	Intercooler
		A	Exhaust gas turbocharger

Engine data card

The engine data card (A4 sheet) forms an integral part of the documents belonging to the engine and should always be kept with the Maintenance Booklet. It contains details about the engine, including special equipment.

The engine data card must be produced for the procurement of genuine parts.



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Engine data card

The engine data card describes the scope of delivery from the DaimlerChrysler factory; later changes to the scope of delivery are not recorded on the data card.

Always keep the engine data card with the Maintenance Booklet.

Description of the engine

The OM 904 LA (four cylinder) and OM 906 LA / OM 926 LA (six cylinder) engines are water-cooled 4-stroke direct injection diesel engines.

The cylinders are arranged in-line. Each cylinder has two inlet valves and one outlet valve.

Each cylinder has a separate fuel-injection pump (unit pump) with a short high-pressure fuel injection line to the multi-hole nozzle located in the centre of the combustion chamber. The unit pumps are mounted directly on the crankcase and driven by the camshaft.

The engines are fitted with a turbocharger and intercooler as standard. The engine can be equipped with an engine brake* as an option (throttle valve and constantly-open throttle valves*).

The engines produce particularly low emissions. Injection start, injection period and injection quantity are controlled fully electronically.

The control system consists of an engine control unit mounted on the engine, the MR (engine control) module and the application-dependent FR (drive control) unit or the ADM adaptation module. All these control units are interconnected via the Controller Area Network (CAN).

Engine brake* / constantly-open throttle valves*

To increase the braking power, the engine can be equipped with an exhaust brake valve on the exhaust gas turbocharger in conjunction with constantly-open throttle valves on the cylinders.

Whereas exhaust gas backpressure, acting through the exhaust brake valves, can be used to increase the braking power, the constantly-open throttle valves cause a reduction of compression in the power stroke (3rd stroke), leaving compression (2nd stroke) practically unaffected.

The constantly-open throttle valves are valves in the cylinder head. When open, they connect the combustion chamber to the exhaust duct, which generates the required decompression in the power stroke.

Constantly-open throttle valves on the 4-cylinder engine

When the engine brake is engaged, the constantly-open throttle valves are opened pneumatically on the 4-cylinder engine and hydraulically on the 6-cylinder engine. At the same time, the exhaust brake valve on the exhaust gas turbocharger is closed.

Hydraulic constantly-open throttle valves

The constantly-open throttle valves are not actuated in the lower engine speed range between 900 and 1,300 rpm or if the engine oil temperature is less than 40 °C.

Observe these restrictions during operation.

The engine brake is controlled by the FR (drive control) unit (▷ page 29) or the ADM.

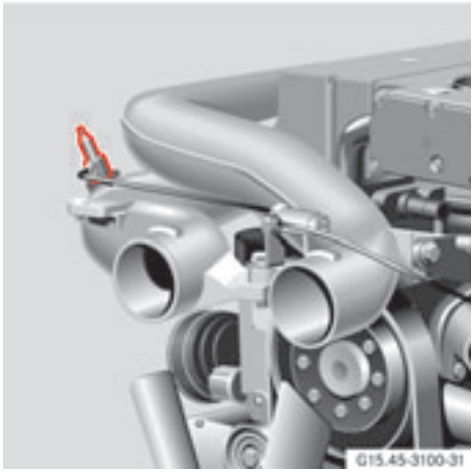
The engine brake always remains deactivated at engine speeds of below 900 rpm to prevent the engine from stalling. The engine brake is also automatically deactivated if the position sensor is triggered (e.g. if the accelerator pedal is depressed).

ⓘ

In the emergency running program (constant engine speed), the engine brake can only be activated in overrun mode at an increased engine speed. The engine brake is automatically deactivated again once a constant engine speed has been reached.

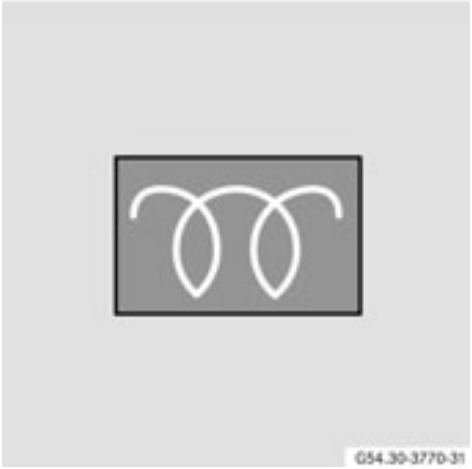
Flame-start system*

The flame-start system is a cold-start aid for when ambient temperatures are low. It reduces the emissions of white smoke once the engine has been started. The starter motor and battery are also protected as a result of the shorter start-up time.



Flame-start system

A flame glow plug is fitted in the charge pressure pipe of the intercooler. Fuel can be ignited at this flame glow plug. The fuel is supplied to the flame glow plug via a solenoid valve with a dosing nozzle.



Flame-start system indicator lamp (example)

Following the preglow time, which is dependent on the ambient temperature (maximum 20 seconds), the flame-start system is activated and the flame-start system indicator lamp goes out.

Once the engine has been started, the flame-start system is supplied with fuel by the fuel pump.

The flame-start system is only enabled if the engine is started within 30 seconds of the flame-start system indicator lamp going out.

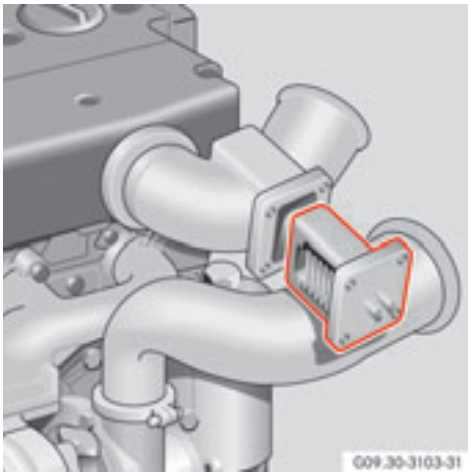
If the flame-start system indicator lamp does not go out after more than 20 seconds, there is a malfunction in the flame-start system.

For operation at low ambient temperatures, see also the “Diesel fuels” (▷ page 59) and “Coolant” (▷ page 64) sections.

Grid heater*

The grid heater is a cold-start aid for low ambient temperatures. A heating strip integrated in the intercooler charge pressure pipe preheats the charge air. The starter motor and battery are also protected as a result of the shorter start-up time.

The tendency of the engine to emit white smoke after it has been started is reduced by a subsequent heating time of up to 180 seconds.



Grid heater

Telligent® engine system

The engine has a fully electronic control system, which, in addition to the engine and associated sensors, also comprises:

- an MR (engine control) unit and
- an FR (drive control) unit and / or other vehicle-specific control units, e.g. ADM

Both are interconnected via a CAN (Controller Area Network) line, on which all the necessary data / information is exchanged.

The engine control monitors itself as well as the engine. A safety and emergency running program is selected automatically, depending on the malfunctions / system failures that occur (▷ page 37).

MR (engine control) unit (mounted on the engine)

The MR (engine control) unit is mounted on the left-hand side of the engine.

MR (engine control) unit

The MR (engine control) unit processes data from the drive control unit or the ADM, indicating for example the position of the position sensor (accelerator pedal), the engine brake* or engine start / stop, etc.

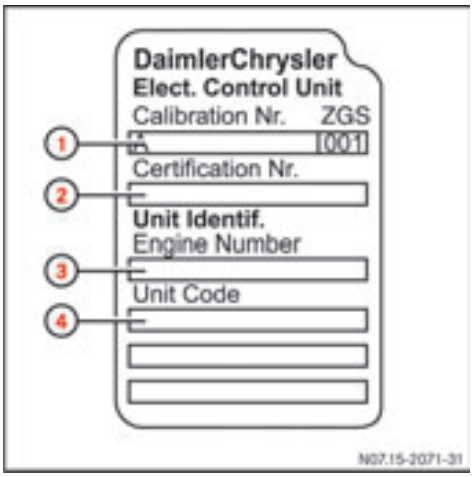
General information

This data is evaluated along with data from the sensors on the engine, such as those for:

- charge-air pressure and temperature
- coolant temperature
- fuel temperature
- oil pressure

The data is compared with the maps and characteristic curves stored in the engine control unit.

Injection timing, period and volume are calculated based on these comparisons and the solenoid valves are actuated to adjust the unit pumps accordingly.



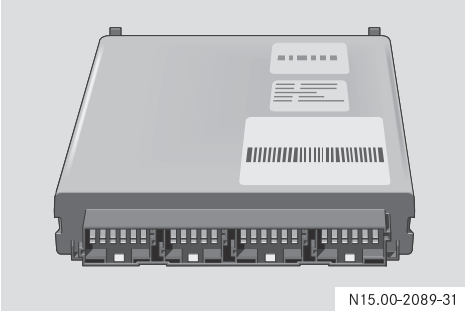
Control unit type plate

① Data record
② Certification no.
③ Engine number
④ Equipment code

All the information on the control unit type plate is required to obtain a replacement engine control unit.

FR (drive control) unit or ADM (mounted on the equipment)

The engine can be adapted to meet various application-specific requirements by means of the drive control unit or adaptation module (ADM).



FR (drive control) unit

The FR (drive control) unit or the ADM stores a range of application-specific data, such as idling speed, maximum working speed or speed limitation.

The FR (drive control) unit or the ADM receive data from the:

- operator (position of the position sensor, engine start / stop)
- engine brake switch*
- other systems (e.g. acceleration skid control system)
- MR (engine control) unit (e.g. oil pressure and coolant temperature)

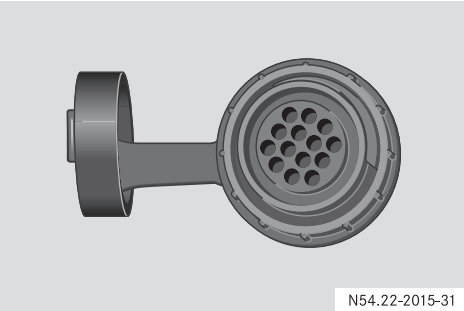
This data is used to determine the instructions for engine control (MR control unit), which are then sent to the engine control on the CAN line.

The FR (drive control) unit or the ADM controls various displays, e.g. the electronics warning lamp, the engine brake* and the constantly-open throttle valves*.

If the Telligent® engine system detects a fault, this is stored in the control units as a fault code, which can then be read using appropriate diagnostic equipment (STAR DIAGNOSIS or minidiag2).

In addition, the electronics warning lamp lights up.

The DaimlerChrysler diagnostic equipment can be connected to the equipment-mounted 14-pin diagnostic socket or using the EU-compliant service connector. This equipment can be used to read both the malfunction memory and the stored engine data.



Diagnostic socket

EU-compliant service connector

Organisational measures

Risk of injury

Before operating the engine, please read these Operating Instructions and other relevant documentation, such as the operating instructions for the vehicle or the machine the engine is installed in.

You could otherwise fail to recognise dangers and could injure yourself or others.

The Operating Instructions and Maintenance Booklet must be given to the personnel responsible for operating or carrying out work on the engine, and should be kept in an easily accessible location where the engine is used.

These Operating Instructions must be used to instruct personnel how to handle the engine. In particular, the notes concerning safety must be explained. This is especially important for personnel who only work on the engine occasionally.

All universally applicable, country-specific, legal and other mandatory regulations for accident prevention and protection of the environment must be observed in addition to these Operating Instructions.

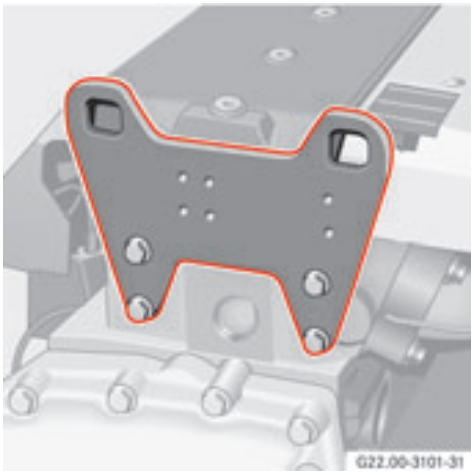
▼ Transport and installation

Transport

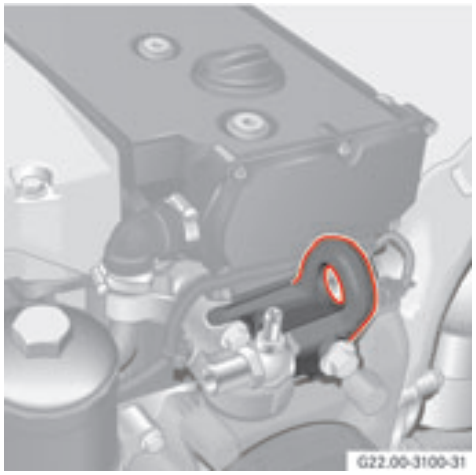
Risk of injury

The engine can break loose and cause injury to persons by overturning or falling.

- Only lift the engine by the appropriate lifting points on the engine.
- Only use transport equipment that has been approved for use by DaimlerChrysler.
- Only lift and transport the engine in the installation position. Observe the maximum angle of 30° when lifting the engine in or out of the machine or vehicle.



Lifting point, flywheel-side



Lifting point, belt-side

Installation

The engine is only designed for installation in accordance with the specifications defined in the contract.

The manufacturer of the end product is personally responsible for the complete system, and in particular for the correct installation and compatibility of this engine with the rest of the system.

Observe the “Correct use” (▷ page 7) and “Conversion parts and modifications to the engine” (▷ page 36) sections.

The “Technical data” section of these Operating Instructions contains information required for the installation of the engine.

Please consult a Mercedes-Benz Service Centre if you have any questions.

The engine is filled with engine oil at the factory.

Safety

3

Safety precautions

The safety precautions in this section must be observed to prevent injury to persons and damage to the engine, components and cable harness.

!

- Do not start the engine unless the batteries are securely connected.
- Do not disconnect the batteries with the engine running.
- Do not use a rapid charger to start the engine.
- Only perform jump-starting with separate batteries.
- Note that the battery terminals must be removed for rapid battery charging. Observe the rapid charger operating instructions.

!

- Note that for electric welding work, the batteries must be disconnected and both cables (“+” and “–”) securely connected to each other.
- The connectors for control units must not be disconnected or connected unless the electrical system is switched off.
- Incorrect polarity in the control unit power supply (e.g. caused by incorrect battery polarity) can cause irreparable damage to the control units.
- Tighten the connections on the fuel-injection system to the specified tightening torque.

!

- The control units must be removed if temperatures of over 80 °C (e.g. in the drying oven) are expected.
- Only use suitable test leads (e.g. DaimlerChrysler connection set) for taking measurements at connections.
- Telephones and two-way radios that are not connected to an exterior aerial can cause malfunctions in the vehicle electronics system and thereby jeopardise the operating safety of the engine.

▼ Staff qualifications

Risk of accident 

Maintenance and repair work to the engine carried out incorrectly can impair both its correct operation and safety, leading to accidents and personal injury.

Always have work on or modifications to the engine carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools for the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

Engines may only be operated, maintained and repaired by trained personnel instructed and authorised by the operator.

The responsibilities for operation, maintenance and repairs must be assigned by the operator.

The legal minimum age for carrying out the work specified above must be observed.

Conversion parts and modifications to the engine

Risk of accident 

Tampering with the engine to modify it can impair both its correct operation and its safety, leading to accidents and personal injury.

Always have work on or modifications to the engine carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools for the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

!

Tampering with the fuel-injection system and engine electronics may affect the performance and emission levels of the engine. It would no longer be possible to guarantee compliance with factory settings or legal environmental protection conditions.

The warranty does not cover damage arising from tampering with the engine.

▼ Safety / emergency running programs

The engine is equipped with an electronic control system that monitors both the engine and itself (self-diagnostic system).

If a malfunction is detected, it is immediately evaluated and one of the following measures is automatically initiated:

- If the engine is running, a malfunction is indicated by the electronic system warning lamp lighting up.
- The fault codes may be shown on a display on vehicles with the Telligent® engine system (vehicle diagnostics system).
- The engine is switched to the appropriate back-up function for continued (but restricted) operation (e.g. constant emergency running speed).

Risk of accident ⚠

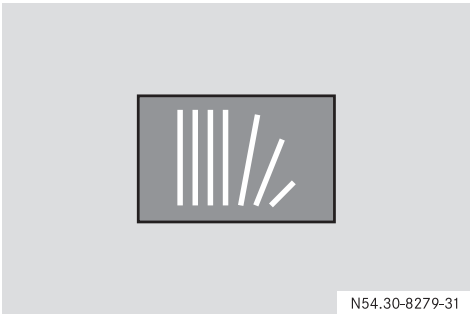
Maintenance and repair work to the engine carried out incorrectly can impair both its correct operation and safety, leading to accidents and personal injury.

Always have work on or modifications to the engine carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools for the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

ℹ

The DaimlerChrysler diagnostic equipment can be connected to the equipment-mounted 14-pin diagnostic socket or using the EU-compliant service connector. This equipment can be used to read both the malfunction memory and the stored engine data.



Electronic system warning lamp

Genuine Mercedes-Benz parts

Make sure that the replacement parts are suitable for your engine. The general operating permit will, in many countries, be invalidated by parts that lead to an engine / vehicle modification that:

- changes the type of machine / vehicle approved in the General Operating Permit
- poses a potential risk to road users, or
- causes a deterioration in exhaust gas emission levels or noise levels

The use of non-approved parts can jeopardise safety.

Environmental note

To combine cost-effective repairs with recycling, Mercedes-Benz also offers reconditioned engines and parts. These are of the same quality and have the same warranty as new parts.

Additional information about recommended conversion parts and accessories and permissible technical modifications is available from any Mercedes-Benz Service Centre.

Always quote the engine number and model designation when ordering genuine parts. You will find the numbers on the engine plate (▷ page 20) and on the engine data card (▷ page 22).

Operation

4

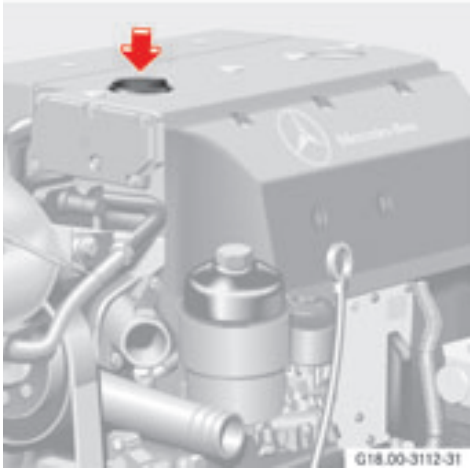
Starting the engine for the first time

Preparation

When it leaves the factory, the engine is filled with an engine oil complying with Sheet 228.5 of the Mercedes-Benz Specifications for Service Products.

These high-quality engine oils assist the running-in process, enabling the first oil change to take place in accordance with the specified oil change intervals for normal operation. This eliminates the need for special initial operation oils and the oil change otherwise required.

The extended maintenance intervals can only be observed if engine oils complying with Sheet 228.5 of the Mercedes-Benz Specifications for Service Products are used.



Oil filler opening

▶ Check the oil level and, if necessary, add engine oil via the filler opening (arrow) up to the maximum mark on the dipstick (▷ see page 72).

Adding coolant

- Coolant composition (▷ see page 64).
- Filling the cooling system (▷ see page 92).

Refuelling

Use summer or winter fuel depending on the season. See also “Diesel fuels” (▷ page 59).

When refuelling do not allow water to enter the tank, contaminating the fuel.

Bleeding the fuel system

If the fuel system is run dry, the system will be bled the next time the engine is started after refuelling. Automatic continuous bleeding takes place in the filter.

The battery must be sufficiently charged during the starting procedure to ensure that the fuel system can be bled.

Bleed the heated fuel prefilter with water separator* mounted on the vehicle or machine with the integrated hand pump.

Checking the batteries

Risk of injury

The acid contained in batteries burns skin and eyes on contact.

- Do not allow acid to come into contact with your skin, eyes or clothing.
- Wear suitable protective clothing, as battery acid can burn through normal clothing. In addition, protective gloves and safety goggles should be worn.
- Rinse acid splashes off immediately with clean water and consult a doctor if necessary.

Risk of explosion

Gases leaking from batteries may explode and therefore cause injury.

Fire, naked flames, smoking and sparks are therefore not permitted in the vicinity of the batteries.

Only use batteries that have been correctly filled and maintained. Grease the battery terminals with acid-proof grease (battery terminal grease).

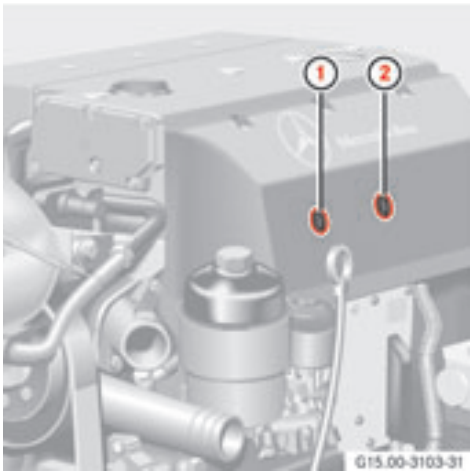
The cable cross-sections are dependent on the distance between the battery and the starter motor.

Starting the engine for the first time

Starting the engine for the first time

Carry out the work listed under “Preparation” (▷ page 40) before operating the engine for the first time.

- ▶ Switch on the operating current.
- ▶ Start the engine with the position sensor (e.g. accelerator pedal) in the idling position, e.g. by pressing START button ② on the engine (▷ see page 45).



Start / stop buttons

① STOP button
② START button

For additional safety, the Telligent® engine system is equipped with a function that only allows the engine to be started with the transmission in neutral.

Risk of injury

The engine becomes very hot while it is running and remains so for some time after it has stopped. It will cause burns if touched.

Before starting any work on the engine, allow all engine parts to cool down or wear suitable gloves and items of clothing to protect yourself against hot engine components.

Risk of injury ⚠

There is a danger of limbs being caught, entrapped, crushed or torn off by rotating engine parts. Therefore you should:

- Keep a safe distance between yourself and rotating engine parts, including when the engine is being started.
- Wait until all engine parts have stopped moving before carrying out any work on the engine.
- Wear work clothing which is fastened and close-fitting. Wear a hair net if necessary. Remove jewellery such as watches and necklaces.

Risk of injury ⚠

The cooling system is pressurised. Hot coolant can escape under pressure when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety goggles when handling coolant.

Risk of poisoning ⚠

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.

4

▶ To check the coolant level:
Run the engine at moderate speeds for about 5 minutes.

▶ If the coolant temperature is below 50 °C, check the coolant level again and add coolant if necessary. ▷▷

Starting the engine for the first time

If a heating system is connected to the cooling system, all heating system valves must be opened while the cooling system is being topped up.

Otherwise, there might be too little coolant in the cooling system after it is filled.

Only close the heating system valves once the engine has been running for a brief period and, where applicable, the coolant has been topped up.

- Check the engine for leaks.
- Check the hose fittings, hose clamps and pipe connections on the engine as well as the oil feed and return lines on the exhaust gas turbocharger for leaks and firm seating, and retighten if necessary.
- Check the engine oil level approximately 5 minutes after stopping the engine and add oil up to the maximum mark on the dipstick if necessary.
- Check brackets secured to the engine for firm seating.
- Check the securing bolts on the exhaust manifold, engine mountings, coolant pump, starter motor and air compressor for tightness.

Starting the engine

Risk of accident and injury ⚠

If not properly secured, a vehicle might accidentally be set in motion when the engine is started, knocking somebody down or trapping them. Before starting the engine:

- Prevent the vehicle from rolling away by applying the parking brake and, if necessary, by placing chocks under the wheels.
- Shift the transmission into neutral.

ⓘ

Starting the engine for the first time (▷ see page 42).

Observe the special measures to be carried out before the engine is started after it has been switched off for a long period, see the “Cleaning / protective treatment” section (▷ page 54).

ⓘ

At outside temperatures of below –30 °C, Mercedes-Benz recommends preheating the coolant (e.g. using an electrical preheating device)

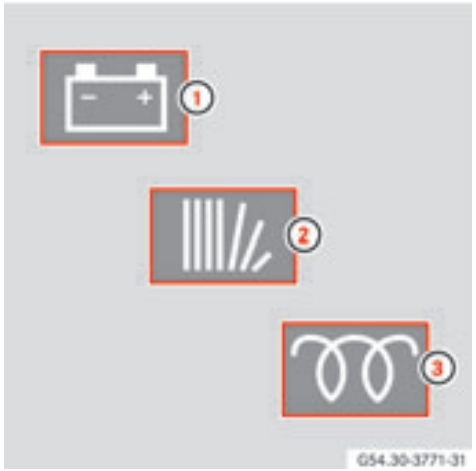
Starting procedure

For vehicle engines, always secure the vehicle against pulling away inadvertently:

▶ Apply the parking brake.

▶ Shift the transmission into neutral.

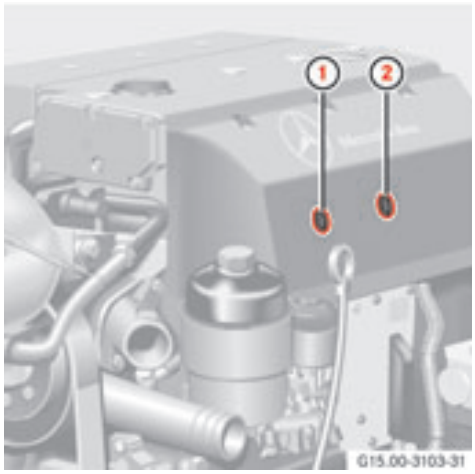
▶ Insert the key into the ignition lock and turn it to the drive position.
The following indicator lamps / warning lamps light up:



① Charge current indicator lamp
② Electronic system warning lamp
③ Flame-start system* / grid heater* indicator lamp

Starting the engine for the first time

To start the engine using the START button on the machine or on the engine:



Start / stop buttons

① STOP button
② START button

- ▶ On the engine: press START button ② on the engine.
- ▶ Monitor the oil pressure gauge immediately after starting the engine.

If the vehicle is equipped with a flame-start system* or grid heater*:

- ▶ Wait until the flame-start system* / grid heater* indicator lamp goes out.
- ▶ Start the engine within 30 seconds using the START button on the machine or engine.

!

Keep the engine running at idling speed until an oil pressure reading is displayed (do not rev the engine). If no oil pressure is displayed after approximately 10 seconds, switch off the engine. Determine the cause (▷ page 48).

If necessary, interrupt the starting procedure after a maximum of 20 seconds, and then repeat after approximately 1 minute.

!

The charge current indicator lamp and electronic system warning lamp must go out after the engine has started. If they remain lit, this indicates that there is a malfunction; (▷ see page 48) and (▷ page 49).

Flame-start system*

Depending on the ambient temperature, the flame-start system* indicator lamp lights up:

- for approximately 2 seconds (function check, flame-start system not in operation)
- for up to approximately 20 seconds (maximum preglow time)

If the flame-start system* indicator lamp does not go out after 20 seconds, there is a malfunction.

At temperatures well below zero, do not place the cold engine under full load immediately.

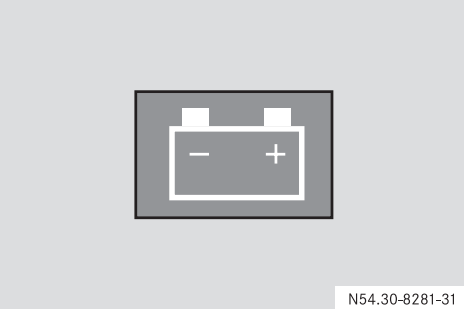
Grid heater*

The grid heater is activated by the FR or ADM control unit. The preglow time depends on the temperature of the coolant and charge air and is approximately 30 seconds. The indicator lamp lights up during the preglow time and goes out when it is finished.

At temperatures well below zero, do not place the cold engine under full load immediately.

Charge current

The charge current indicator lamp must go out after the engine has started.



Charge current indicator lamp

If the indicator lamp does not go out or if it lights up when the engine is running, stop the engine and check the poly-V-belt.

Make sure that the poly-V-belt contact surfaces are not damaged (e.g. torn), oily or glazed as this could cause the poly-V-belt to slip.

Do not run the engine without a poly-V-belt. The alternator and coolant pump would not be driven, which would result in engine damage.

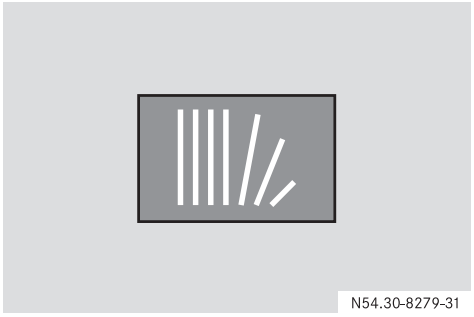
Oil pressure

After the engine has reached normal operating temperature, the engine oil pressure must not fall below:

- 2.5 bar at rated speed
- 0.5 bar at idling speed

If the oil pressure falls below these values, stop the engine and trace the cause.

Telligent® engine system



Electronic system warning lamp

The electronic system warning lamp must go out after the engine has started.

If the warning lamp does not go out or if it lights up while the engine is running, there is a malfunction in the Telligent® engine system.

Each malfunction is stored in the system with its own fault code. Temporary faults are also stored.

Fault codes can be read using DaimlerChrysler diagnostic equipment (STAR DIAGNOSIS or minidiag2 tester) (▷ see page 29). If the electronic system warning lamp lights up while the engine is running, read or determine the fault code.

Flame-start system*

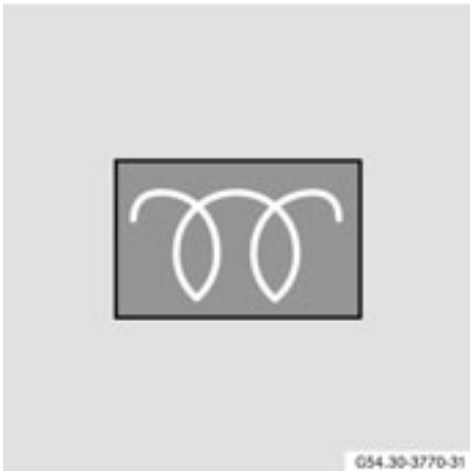
There is a malfunction in the flame-start system if:

- the flame-start system* indicator lamp lights up while the engine is running
- the flame-start system indicator lamp does not go out within 20 seconds of the engine being started

Have the flame-start system checked at a specialist workshop. DaimlerChrysler recommends that you use a Mercedes-Benz Service Centre for this purpose as it has the necessary specialist knowledge and tools for the work required.

The flame-start system is automatically deactivated if:

- the engine is not started within 30 seconds of the flame-start system indicator lamp going out
- the engine is started when the flame-start indicator lamp is lit
- the charge current indicator lamp does not go out while the engine is running
- the engine reaches a temperature at which the flame-start system is no longer required



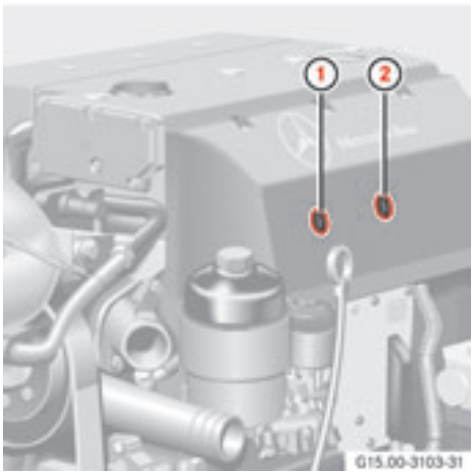
Flame-start system* / grid heater* (example)

Grid heater*

The grid heater is malfunctioning if the grid heater indicator lamp flashes.

▼ Stopping the engine

▶ Run the engine at idling speed for one or two minutes without load after operation at full power or a high coolant temperature.



Start / stop buttons

① STOP button
② START button

▶ Press STOP button ① on the engine or on the machine-mounted engine shutdown facility.

!

Stop the engine immediately if any of the following occur:

- significant drops or fluctuations in oil pressure
- falling power output and engine speed with the position sensor (accelerator pedal) in the same position
- large amounts of exhaust smoke emitted from the exhaust
- significant increases in coolant and oil temperature
- sudden, unusual noises from the engine or exhaust gas turbocharger

Winter operation

The following points should be observed at the start of the cold season:

Fuel

Risk of fire

Fuel is highly flammable. For this reason, avoid fire and naked flames and refrain from smoking when handling fuel.

Use cold-resistant diesel fuel (▷ see page 59).

Jump-starting

Risk of explosion

The use of liquid or gaseous starting aids can cause explosions. This may result in severe injuries.

- Do not use liquid or gaseous starting aids, such as ether or Startpilot to start the engine.

Engine oil

When changing the engine oil, select an engine oil that is compatible with the SAE classification and the ambient temperatures expected during the period of use (▷ see page 63).

Coolant

Risk of injury

The cooling system is pressurised. Hot coolant can escape under pressure when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety goggles when handling coolant.

Risk of poisoning ⚠

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.

Check the antifreeze protection properties of the coolant in good time and increase the antifreeze / corrosion inhibitor concentration if necessary (▷ see page 64).

Batteries

Have the batteries serviced and recharged more frequently during the cold months of the year.

Risk of injury ⚠

The acid contained in batteries burns skin and eyes on contact.

- Do not allow acid to come into contact with your skin, eyes or clothing.
- Wear suitable protective clothing, as battery acid can burn through normal clothing. In addition, protective gloves and safety goggles should be worn.
- Rinse acid splashes off immediately with clean water and consult a doctor if necessary.

Risk of explosion ⚠

Gases leaking from batteries may explode and therefore cause injury.

Fire, naked flames, smoking and sparks are therefore not permitted in the vicinity of the batteries.

Careful maintenance and low power consumption will help to maintain the full battery charge. Starting capacity is greatly reduced in cold weather; at –10 °C, for example, it is only around 60% of normal capacity. If the engine is not used for a long period of time, store the batteries in a heated place if possible. Ensure good ventilation when recharging.

Cleaning the engine

Risk of poisoning

Care and cleaning agents can be toxic and lead to severe poisoning if swallowed.

- Always keep care and cleaning agent containers closed and out of the reach of children.
- Never store care or cleaning products in containers for comestibles such as bottles so as to avoid confusion.
- Observe the instructions for using care and cleaning products.

Risk of fire and injury

Fuels are highly flammable and can constitute a health hazard. If they are used as cleaning agents, they can cause burns or skin irritation and poisoning.

Never use fuels for cleaning.

Environmental note

Observe the regulations for environmental protection.

Only clean the engine in a washing area designed for this purpose. Dispose of empty packaging and used cleaning materials in an environmentally-responsible manner.

Make sure that water does not enter the intake, ventilation or bleed ducts.

Protect the engine after cleaning. Be careful to protect the belt drive from exposure to preservative agents.

Information about suitable cleaning and preservative agents is available from any Mercedes-Benz Service Centre.

High-pressure cleaners

Observe the manufacturer's operating instructions.

!

Maintain the minimum distance between the high-pressure cleaner nozzle and the object to be cleaned:

- approximately 70 cm for round-spray jets
- approximately 30 cm for 25° flat-spray jets and concentrated power jets

Keep the water jet moving constantly while cleaning. To avoid damage, do not aim the water jet directly at:

- electrical components
- connectors
- seals or
- hoses

Cleaning the cooling system

Environmental note

Collect used coolant, cleaning solutions and detergents and dispose of them in an environmentally responsible manner in accordance with current local regulations.

▶ Blow out any foreign objects (dust, insects, etc.) from the radiator fins using compressed air or remove them by spraying water from the rear side of the radiator (against the direction of the cooling air flow).

!

Only apply moderate pressure when cleaning since the radiator fins could otherwise be damaged.

Risk of injury

The cooling system is pressurised. Hot coolant can escape under pressure when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety goggles when handling coolant.

Risk of poisoning 

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.

▶ Drain off coolant when the engine is cold (▷ page 92).

▶ If a heater is connected to the cooling system, open the regulating valves fully.

Degreasing

▶ Fill the cooling system with a 5% solution of water and a mild alkaline cleaner, e.g. “P3 Croni” (50 g cleaning agent per litre of water).

▶ Warm the engine up to approximately 80 °C (coolant thermostat starts to open) at a moderate engine speed and allow it to run for approximately 5 minutes longer.

▶ Switch off the engine and allow it to cool to approximately 50 °C.

▶ Drain off the cleaning solution completely.

▶ Immediately afterwards, fill the cooling system with clean water, warm up the engine, and drain off the water after 5 more minutes. Then repeat the procedure a second time.

▶ Fill the cooling system with new coolant (▷ page 93) and observe the notes in the “Coolant” section (▷ page 64).

Protective treatment

The special protection required will depend on the length of time the engine is to be out of use as well as the prevailing ambient conditions in the place where the engine is to be located or stored.

After cleaning the engine, store it in as dry and well-ventilated an area as possible. If this is not possible, the intervals for carrying out regular protective measures must be halved.

It is essential that the engine be protected from direct contact with water (rain / spray water).

No anti-corrosion measures are required if the engine is to be out of use for **less than 12 months** and the above storage conditions are observed.

Special protective treatment measures are required if the engine is to be out of use for **more than 12 months or there are exceptional storage and transport conditions**.

ⓘ

Information is available from any Mercedes-Benz Service Centre. Consultation is strongly recommended.

Service products

Risk of poisoning and injury

Service products can cause injury or poisoning if they come into contact with skin or are swallowed.

Observe the relevant regulations when handling, storing and disposing of service products. Service products could otherwise endanger people and the environment.

- Always wear appropriate protective clothing and a breathing mask when handling service products. Avoid inhaling vapours where possible.
- Do not allow service products to come into contact with your skin, eyes or clothing. Clean affected areas of skin with soap and water.
- If service products do come into contact with your eyes, rinse them thoroughly with clean water and consult a doctor if necessary.
- Consult a doctor immediately if a service product is swallowed.
- Keep service products out of the reach of children.

Risk of fire

There is an increased risk of fire when handling fuels and lubricants as they are highly flammable.

Avoid fire, naked flames and sparks, and refrain from smoking when handling service products.

Greases and lubricants must be compatible with engine components. For this reason, only brands that have been tested and approved by DaimlerChrysler must be used. These are listed in the Mercedes-Benz Specifications for Service Products.

Special lubricant additives are not necessary. The use of special lubricant additives may limit your warranty entitlement.

Information about service products is available from any Mercedes-Benz Service Centre.

Environmental note

Dispose of service products and parts that come into contact with service products, e.g. filters, in an environmentally-responsible manner.

Observe legal requirements.

Diesel fuels

Only use commercially available diesel fuels (EN 590). The use of other fuels is subject to official approval from DaimlerChrysler.

Fuel additives are not necessary. The use of fuel additives may limit your warranty entitlement.

If diesel fuels with a sulphur content of more than 0.3% by weight are used, the engine oil must be changed at shorter intervals. Observe the information in the Maintenance Booklet.

Filling the vehicle's fuel tank from drums or canisters may introduce impurities into the fuel system. This can lead to fuel system malfunctions. The fuel must therefore be filtered when filling the tank.

The fuel must not be mixed with water under any circumstances.

Diesel fuels in extremely cold weather

At low outside temperatures, paraffin separation may affect the flow characteristics of diesel fuel.

To prevent operating problems (e.g. as a result of blocked filters), diesel fuels with improved cold flow properties are available on the market in the winter months. Deviations are possible in individual countries and in the transition between the cold and warm seasons. In Germany, special cold-resistant winter-grade diesel fuels are available that ensure reliable operation down to approximately –20 °C. Winter-grade diesel fuel can normally be used without risk of malfunctions at the outside temperatures to be expected in the country of sale.

If summer diesel fuel or less cold-resistant winter diesel fuel is used, only add a specific quantity of flow improver or kerosene suitable for the outside temperatures.

Risk of explosion ⚠

Adding petrol reduces the flash point for the diesel fuel and increases the risk of fire and explosion.

- For this reason, do not mix petrol with the diesel fuel under any circumstances.
- For this reason, you must avoid fire, naked flames and sparks, and refrain from smoking when handling these service products.
- Observe the relevant safety regulations.

Service products

There is a risk of serious engine damage if petrol is mixed with diesel.

For this reason, do not mix petrol with the diesel fuel under any circumstances.

Mix the additive with the diesel fuel in good time, before the flow properties of the diesel are affected by paraffin separation. Malfunctions caused by paraffin separation can only be remedied by warming up the entire fuel system.

Do not mix additives with special cold-resistant winter diesel fuels as the cold-flow properties of the fuel could deteriorate.

Flow improvers

The effectiveness of flow improvers cannot be guaranteed with all fuels. Observe the manufacturer's recommendations. Information about approved flow improvers is available from any Mercedes-Benz Service Centre.

Kerosene

Add only as much as is required for the prevailing outside temperatures. The addition of 5% by volume of kerosene improves the cold-resistance of diesel fuel by approximately 1 °C. Do not exceed the maximum mixing ratio of 50% kerosene.

There is a risk of engine damage if kerosene is permanently mixed with diesel.

It is therefore not permissible to mix kerosene with diesel on a permanent basis.

Run the engine for a while to ensure that the additive reaches all parts of the fuel system.

Risk of explosion 

Adding kerosene reduces the flash point of the fuel, increasing the risk of fire and explosion.

- For this reason, avoid fire and naked flames and refrain from smoking when handling these service products.
- Only mix kerosene with diesel in the fuel tank.
- First add the kerosene and then the diesel fuel.
- Observe the relevant safety regulations.

FAME fuels

The 900 series engines are suitable for operation with FAME fuel (bio-diesel fuel) complying with EN 14214.

The following effects arise from operation with FAME fuel:

- slight increase in fuel consumption
- slightly reduced engine power output
- increased white smoke development after a cold engine start

Before operation with any FAME fuel, a Mercedes-Benz Service Centre **must be consulted** to clarify the precise procedures for use (e.g. maintenance intervals).

Observe the following points for operation with FAME fuel:

- The fuel filter and engine oil filter must be replaced approximately 200 operating hours following conversion to FAME fuel.
- The oil and fuel filter must be replaced with every engine oil change.
- FAME fuels reduce the service life of a conventional fuel filter.
- The engine oil change and filter replacement intervals are significantly reduced. The engine oil change and filter replacement must be carried out at least once a year.

- Only use FAME fuels complying with EN 14214. Special additives are not permitted. The use of fuels that do not comply with the EN 14214 standard or the addition of special additives may lead to malfunctions or damage to the engine.
- FAME fuels attack painted surfaces. Immediately rinse off the FAME fuel with water before it has time to react with the paintwork. Use only engine oils complying with Mercedes-Benz Specifications for Service Products sheet number 228.5 or 228.3.

- FAME fuels may cause components in the fuel system to stick if the engine is left switched off for long periods. For this reason, always use up the amount of FAME fuel remaining in the fuel tank and refuel with conventional diesel fuel before the engine is switched off for long periods. Run the engine for at least one hour before the vehicle is parked up.
- The quality of hoses adjacent to the engine, and connected either to the vehicle or machine, must satisfy the requirements of FAME fuels.

- Based on negative experiences, DaimlerChrysler does not accept the use of pure vegetable oils as an alternative to diesel or FAME fuels. The use of pure vegetable oils can lead to engine damage arising from coking and oil sludge forming as well as deposits in combustion chambers.

Environmental note

If you operate your vehicle using bio-diesel fuel, please consult your disposal firm as to whether the engine oil must be collected separately. Not all manufacturers of rerefined products (lubricants manufactured from used engine oils) are able to process engine oil contaminated with bio-diesel fuel.

Observe the special notes and national regulations on the disposal of engine oils. Information is available from any qualified specialist workshop or Mercedes-Benz Service Centre.

Mercedes-Benz does not accept warranty claims for damage if:

- the cause of the damage is in any way connected to the use of a FAME fuel that does not comply with the EN 14214 standard
- the regulations of sheet number 135 of the Mercedes-Benz Specifications for Service Products concerning operation with FAME fuels have not been observed
- malfunctions or consequential damage (e.g. paint damage) arise from the handling of or operation with FAME fuels

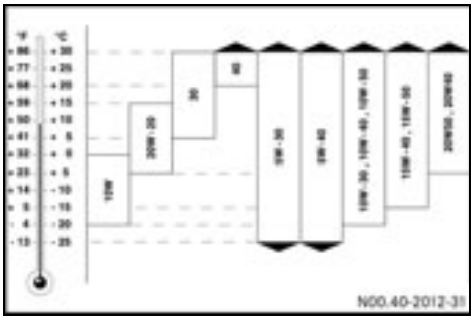
FAME fuels (bio-diesel fuels) at low temperatures

FAME fuels are reliable down to outside temperatures of approximately –20 °C in accordance with EN 14214.

Flow improvers

The addition of flow improvers or kerosene has no effect on the cold stability of FAME fuels.

Engine oils



SAE engine oil classes

Engine oils are specially tested for their suitability for use in our engines. For this reason, only use engine oil brands approved by Mercedes-Benz. These are listed in the Mercedes-Benz Specifications for Service Products. Observe the information in the Maintenance Booklet.

The use of non-approved engine oil brands may limit your warranty entitlement.

The oil change intervals will change if engine oils of a different quality grade are used. Information is available from any Mercedes-Benz Service Centre. Select the SAE engine oil class in accordance with the outside temperature.

When maintenance work is carried out, confirmation of the engine oil change is entered in the Maintenance Booklet along with the engine oil brand, its grade and its SAE class.

The properties of the engine oil deteriorate if a lower grade is used to top up the engine oil level; the engine oil change and filter replacement must therefore be carried out at shorter intervals.

Only use engine oils of the same quality grade and SAE class when topping up.

Coolant

Coolant is a mixture of water and antifreeze / corrosion inhibitor. To protect against corrosion and raise the boiling point, coolant must remain in the cooling system all year round.

Risk of poisoning

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.

The effectiveness of the coolant's anti-corrosion protection decreases over time.

You should therefore replace the coolant, depending on the antifreeze / corrosion inhibitor used, every 3 or 5 years (see Mercedes-Benz Specifications for Service Products).

Water

Water without additives is not permitted as a coolant, even if antifreeze properties are not necessary.

The coolant water must satisfy certain requirements which are not always fulfilled by drinking water.

If the water is not of sufficient quality, it must be treated.

Information is available from any Mercedes-Benz Service Centre.

Antifreeze / corrosion inhibitor

Observe the following to prevent damage to the cooling system:

- Only use an approved corrosion inhibitor / antifreeze. Information is available from any Mercedes-Benz Service Centre.
- When topping up (after a loss of coolant), a corrosion inhibitor / antifreeze concentration of 50% by volume must be ensured (antifreeze protection down to –37 °C).

> **!**
> If the concentration is too low, there is a risk of engine damage as a consequence of corrosion / cavitation.

- Do not use an antifreeze / corrosion inhibitor concentration of more than 55% by volume (maximum antifreeze protection). Above this concentration, antifreeze protection deteriorates and heat dissipation is less effective.

Coolant mixing ratio:

Antifreeze protection down to °C	**–37**	**approx. –45**
Water % by vol.	50	45
Corrosion inhibitor / antifreeze % by vol.	50	max. 55

In exceptional cases, when no antifreeze / corrosion inhibitor is available and / or no antifreeze protection is required (in tropical zones), use an approved coolant additive without antifreeze properties (see Mercedes-Benz Specifications for Service Products).

> **!**
> In this case, the coolant must be renewed every year.
>
> Information is available from any Mercedes-Benz Service Centre.

Disposal

Environmental note

The coolants described are biodegradable substances. Observe the legal requirements and waste water regulations in the country concerned when disposing of used coolants.

We recommend that you consult the relevant local water authority for advice on the disposal of coolant.

Due to the complex tasks that a modern coolant must perform, improper “recycling” consisting simply of mechanical pre-cleaning must be categorically rejected.

Maintenance

5

Maintenance instructions

This section describes all maintenance work to be carried out on the engine.

Risk of injury

Before having maintenance or repair work carried out, please make sure that you read the relevant sections of the technical documentation relating to maintenance and repair measures, e.g.:

- the Operating Instructions and workshop information.

Familiarise yourself with the relevant legal regulations before starting work, e.g.:

- health as well as safety as well as accident prevention regulations.

You could otherwise fail to recognise dangers and could injure yourself or others.

Risk of accident

Faulty maintenance work or failure to carry out maintenance work, e.g. not changing the oil filter or not observing maintenance intervals, can cause engine damage. Engine damage can lead to an increased risk of an accident.

Therefore, observe the notes on engine maintenance in these Operating Instructions.

All maintenance intervals and maintenance work refer to genuine Mercedes-Benz parts and accessories that have been expressly approved for the engine by DaimlerChrysler.

The scope of maintenance and frequency of maintenance work depend on the different operating conditions and are listed in the Maintenance Booklet.

Have work that is carried out confirmed with an entry in the Maintenance Booklet. This proof of regular maintenance is always required for any warranty claims.

Please also observe the maintenance instructions for special accessories.

Change the engine oil filled at the factory, which complies with Sheet 228.5 of the Mercedes-Benz Specifications for Service Products, if more than 24 months have elapsed before the engine is operated for the first time.

▼ Work schedule overview

Maintenance service

Engine:
Oil change and filter replacement

ⓘ

For operation with diesel fuel:

- Change the engine oil and replace the oil filter **at least every two years**.

If operated with FAME fuel (bio-diesel fuel):

- Change the engine oil and replace the oil filter **at least** once **every year**.

Poly-V-belt:
Check condition

Checking for leaks and general condition

Check for points of abrasion and incorrect positioning.

Engine:
Lines and hoses on the engine
Intake pipe between the air cleaner and engine
Cooling and heating system

Checking and correcting fluid level

If more fluid is lost than can be accounted for by normal consumption, trace the cause and rectify it

Engine cooling system:
Check and correct fluid level and antifreeze / corrosion inhibitor concentration

Additional work

Valve clearance:
Check and adjust

ⓘ

The valve clearance must be adjusted during the first maintenance service and then during the 3rd, 5th, 7th maintenance services and so on.

Additional work with every third maintenance service

Fuel filter:
Replace filter

Fuel prefilter with water separator:
Replace filter element

ⓘ

If operated with FAME fuel:

- Replace the fuel filter together with engine oil change and filter replacement.

Engine brake*:
Check condition and setting

Coolant:
Renew

ⓘ

Renewal interval depends on the coolant additive used (see Mercedes-Benz Specifications for Service Products).

Engine: checking for leaks and general condition

▶ Visual inspection of the engine for signs of leakage.

Sealing points which are slightly damp can be ignored.

!

More significant leaks involving constant oil loss must be rectified immediately.

Lines and hoses on the engine: checking for leaks and general condition

▶ Visual and aural check for leaks from lines and hoses. Also check that all lines and hoses are undamaged, routed in such a way that there will be no chafing and secured correctly.

Risk of injury ⚠

The engine becomes very hot while it is running and remains so for some time after it has stopped. It will cause burns upon contact.

- Before starting any work on the engine, allow all engine parts to cool down or wear suitable gloves and items of clothing to protect yourself against hot engine components.

Risk of injury ⚠

There is a danger of limbs being caught, entrapped, crushed or torn off by rotating engine parts. Therefore you should:

- Keep a safe distance between yourself and rotating engine parts, including when the engine is being started.
- Wait until all engine parts have stopped moving before carrying out any work on the engine.
- Wear work clothing which is fastened and close-fitting. Wear a hair net if necessary. Remove jewellery such as watches and necklaces.

Engine: oil change and filter replacement

Only change the engine oil when the engine is at normal operating temperature.

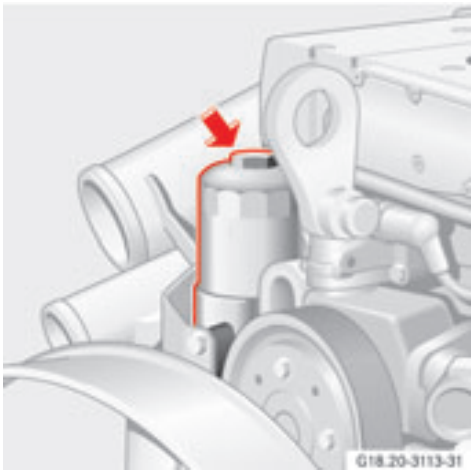
Risk of injury

Hot engine oil escaping under pressure can scald your skin and eyes.

Wear suitable protective gloves, protective clothing and safety goggles.

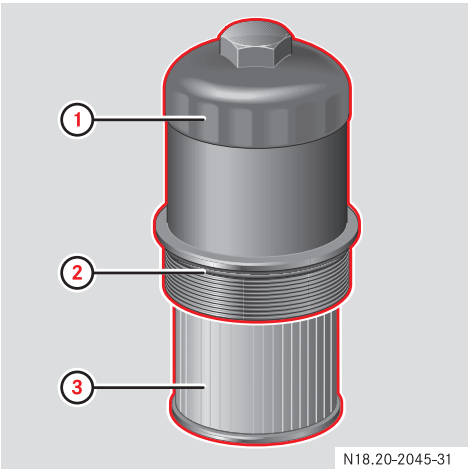
Make sure that no foreign objects enter the filter housing. Never wipe the filter housing out because lint or dirt can enter the oil circuit.

Oil filter replacement



Oil filter cap

▶ Unscrew oil filter cap ① using the socket spanner insert (WAF 36). Allow the oil to drain from the filter housing.



Oil filter cap with oil filter element

① Cap
② Sealing ring
③ Oil filter element

▶ Unscrew oil filter cap ① with oil filter element ③ and unclip oil filter element ③ from the cap by pressing on the sides of the bottom edge. ▷▷

- Replace sealing ring ② on cap ① with a new one. The sealing ring must be lightly greased.
- Insert new oil filter element ③ into cap ① and press until it clips into place.
- Screw on cap ① with the oil filter element and tighten.
  Tightening torque: 40 Nm.

Siphoning and draining engine oil

Environmental note

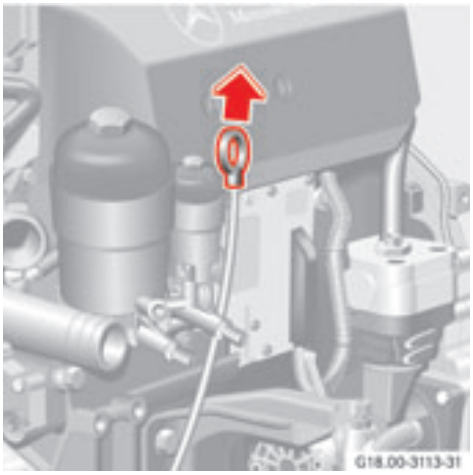
Dispose of engine oil and filters in accordance with the regulations in force where the engine is operated.

To siphon:

- Siphon off the engine oil through the dipstick guide pipe.
- To do this, pull out the dipstick and insert an extractor unit sealed with an O-ring into the dipstick guide pipe (arrow).

!

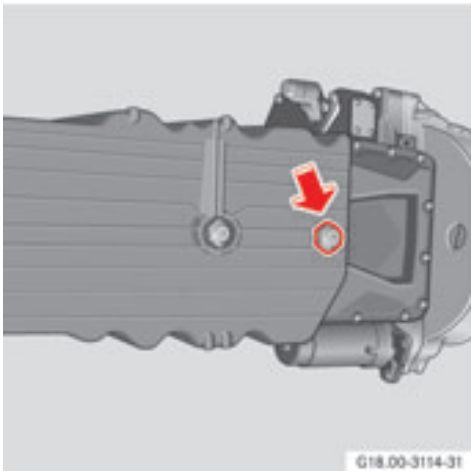
Observe the operating instructions for the engine oil extractor unit.



Dipstick guide pipe

To drain:

- Place a suitable collecting receptacle under the oil drain plug (arrow) on the underside of the oil sump.
- Unscrew the oil drain plug carefully and allow the oil to drain out.



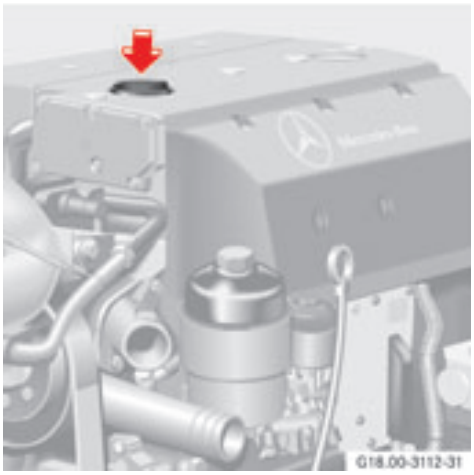
Oil drain plug

▷▷

▶ Screw the oil drain plug back in with a new sealing ring and tighten
Tightening torque:
M20 x 1.5 – 60 Nm
M26 x 1.5 – 85 Nm

Adding engine oil

▶ Add new engine oil to the engine via the oil filler opening up to the maximum mark on the dipstick.



Oil filler opening

▶ Start the engine and run it at idling speed (with the position sensor in the idling position) and monitor the oil pressure gauge.

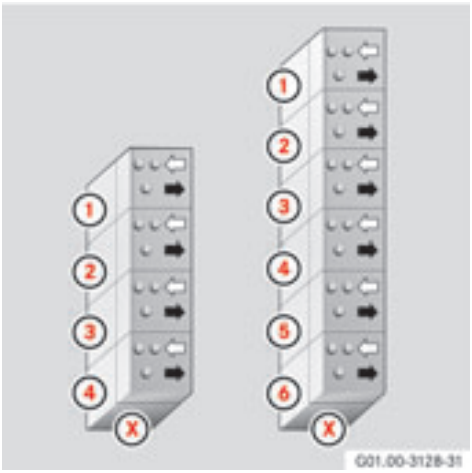
!

Keep the engine running at idling speed until an oil pressure reading is displayed. If no oil pressure is displayed after approximately 10 seconds, switch off the engine. Determine the cause.

▶ Check the oil filter and drain plug for leaks.

▶ Stop the engine. Check the oil level after approximately 5 minutes. Top up the oil to the maximum mark on the dipstick if necessary.

Adjusting the valve clearance



Layout of cylinders and valves

⇦ = intake valve
➡ = exhaust valve
X = flywheel end

Special tools

Turning tool 904 589 04 63 00
Valve adjustment tool 422 589 00 11 00

Valve clearance

Intake valves	= 0.40 mm
Exhaust valve	= 0.60 mm

Adjust the valve clearance when the engine is cold (at least 30 minutes after stopping the engine, even if it was only operated for a brief period).

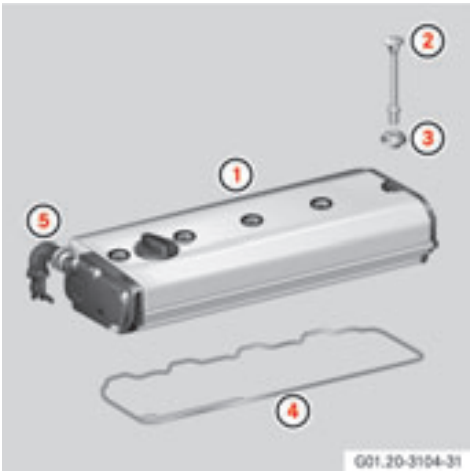
Clean very dirty cylinder head covers before removal.

Risk of accident

If not properly secured, a vehicle might accidentally be set in motion, knocking somebody down or trapping them or causing an accident and injuring you or others.

- Always prevent the vehicle from rolling away by applying the parking brake and, if necessary, by placing chocks under the wheels.
- Shift the transmission into neutral.
- Only turn the engine over using the rotation device provided for this purpose.

Removing and fitting the cylinder head covers



Cylinder head cover

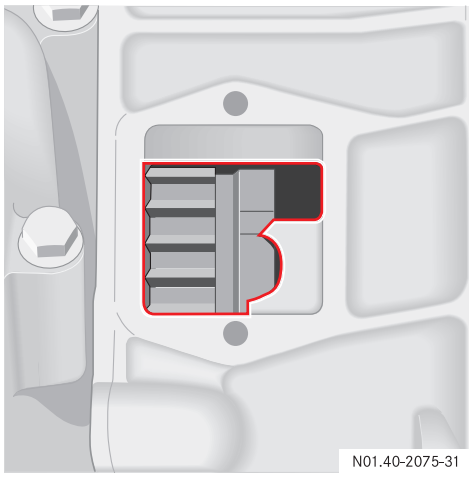
① Cylinder head cover
② Hexagon socket screw
③ Sealing washer
④ Seal
⑤ Engine ventilation hose

Removal:

- ▶ Remove engine ventilation hose ⑤ from cylinder head cover ①.
- ▶ Unscrew hexagon socket screw ② from cylinder head cover ① with sealing washers ③.
- ▶ Remove cylinder head cover ①.

Installation:

- ▶ Clean the sealing surfaces of the cylinder head and cylinder head cover ①.
- ▶ Always replace seal ④ between cylinder head cover ① and the cylinder head.
- ▶ Attach cylinder head cover ①.
- ▶ Insert hexagon socket screw ② with new sealing washers ③ and tighten: Tightening torque: 30 Nm.



Flywheel inspection hole

- ▶ Unscrew the cap from the inspection hole in the flywheel housing.
- ▶ Fit turning tool 904 589 04 63 00 to the flywheel housing inspection hole.

Work schedules

Checking and adjusting the valve clearance

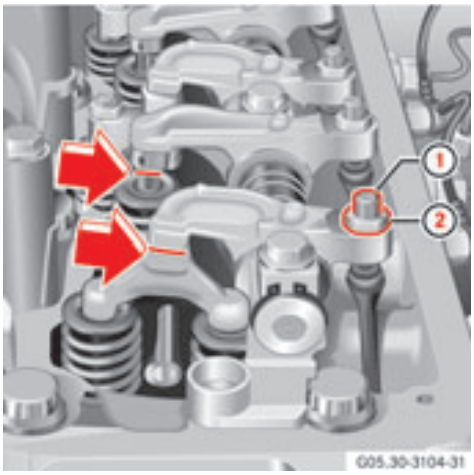
Engine	Crankshaft position	Cylinder / valves to be adjusted					
		1	2	3	4	5	6
OM 904	4th cylinder valve overlap	I / E	I	E	-		
	1st cylinder valve overlap	–	E	I	I / E		
OM 906 / 926 LA	6th cylinder valve overlap	I / E	I	E	I	E	-
	1st cylinder valve overlap	–	E	I	E	I	I / E

I – intake valve

E – exhaust valve

Adjust all valve clearances in 2 crankshaft positions. ▷▷

- ▶ Use the turning tool to turn the crankshaft until the 4th or 6th cylinder is at overlap TDC. (1st cylinder at ignition TDC). Then turn the 1st cylinder to overlap TDC (4th or 6th cylinder at ignition TDC).
- ▶ Check and adjust the valves in accordance with the table above.
- ▶ Measure the valve clearance between the rocker arm and valve stem (outlet valve) or valve bridge (inlet valve) using a feeler gauge (arrow).
  It must be possible to pull the feeler gauge through with only light resistance.
- ▶ Loosen counternut ② to permit adjustment of the valve clearance. Adjust the valve clearance by turning adjustment screw ①.



① Adjustment screw
② Counternut

- ▶ Retighten the counternut.
  Tightening torque: 25 Nm.
- ▶ Check the valve clearance again and readjust if necessary.

Concluding work

- ▶ Refit the cylinder head cover (▷ see page 75).
- ▶ Remove the turning tool from the flywheel housing inspection hole.
- ▶ Seal the inspection hole with the cap.
  Tightening torque: 25 Nm

Fuel prefilter: cleaning the filter element

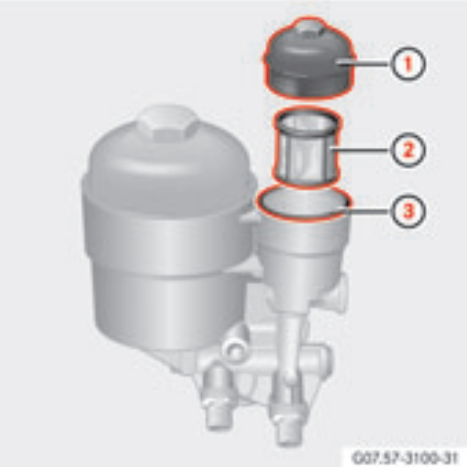
Risk of fire

There is an increased risk of fire when handling fuels as they are highly flammable.

Avoid fire, naked flames and sparks, and refrain from smoking when handling fuels.

Environmental note

Dispose of used filter elements, seals and fuel residue in accordance with relevant local regulations.



Fuel prefilter

① Cap
② Filter element
③ Sealing ring

- ▶ Open the tank cap to reduce excess pressure in the fuel tank.
- ▶ Clean the outside of the fuel prefilter and cover any hoses / lines underneath the prefilter.
- ▶ Unscrew oil filter cap ① and filter element ② out of the filter housing.
- ▶ Clean oil filter cap ① and filter element ②.

Replace a heavily soiled or damaged filter element.

- ▶ Check sealing ring ③ for the oil filter cap and replace if necessary.
- ▶ Insert the filter element into the oil filter cap and screw the oil filter cap onto the filter housing.
  Tightening torque: 25 Nm.

Heated fuel prefilter with water separator*: replacing the filter element

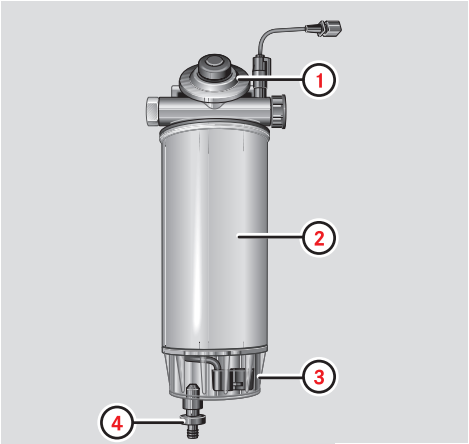
Risk of fire

There is an increased risk of fire when handling fuels as they are highly flammable.

Avoid fire, naked flames and sparks, and refrain from smoking when handling fuels.

Environmental note

Dispose of used filter elements, seals and fuel residue in accordance with relevant local regulations.



Heated fuel prefilter with water separator

① Fuel hand pump
② Filter housing
③ Water separator
④ Water drain valve

▶ Open water drain valve ④ and the bleed screw. Collect the fuel / water mixture from the filter element in a container.

▶ Unscrew filter housing ②.

▶ Unscrew water separator ③ from filter housing ② and clean or replace as necessary.

▶ Refit in the reverse order. Use new seals.

!

Screw filter housing ② onto the filter head tightly by hand.

▶ Close the drain valve and fill the prefilter using fuel hand pump ①. Then close the bleed screw.

▶ Start the engine and bleed the fuel system.

Run the engine for approximately 1 minute. The fuel system bleeds automatically. If the engine stalls or does not start, bleed the fuel system manually.

▶ Start the engine, check the prefilter for leaks.

Replacing the fuel filter element

Risk of fire

There is an increased risk of fire when handling fuels as they are highly flammable.

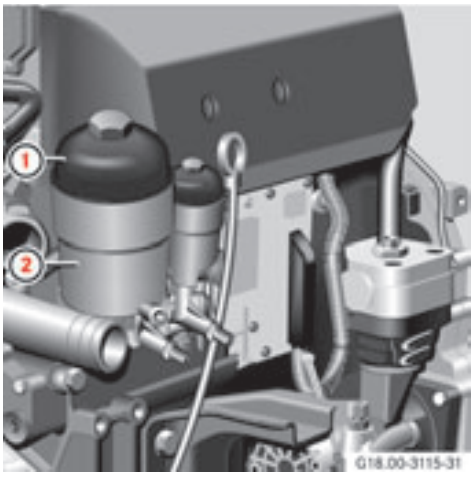
Avoid fire, naked flames and sparks, and refrain from smoking when handling fuels.

Environmental note

Dispose of used filter elements, seals and fuel residue in accordance with relevant local regulations.

The fuel prefilter is fitted on the machine or vehicle.

Observe the operating and maintenance instructions in the machine / vehicle operating instructions for the fuel prefilter.



Replacing the fuel filter element

① Cap
② Sealing ring
③ Filter element

▶ Open the tank cap to prevent excess pressure in the fuel tank.

▶ Unscrew fuel filter cap ① using the socket spanner insert (WAF 36).

▶ Pull cap ① with the filter element out of filter housing ③ slightly. Allow the fuel to flow out.

① Cap
② Sealing ring
③ Filter element
④ Dirt collecting container
⑤ Filter housing

▶ Remove the cap and filter element. Unclip the filter element by pressing the sides of the lower edge of the filter element.

▶ Pull dirt collecting container ④ by the retainers out of the filter housing.

!

Dirt and water must not be allowed to enter the filter housing; Do not empty dirt collecting container ④ in the filter housing.

▶ Clean oil filter cap ① and dirt collecting container ④.

▶ Replace sealing ring ② (lightly grease new sealing ring ② and the seals of the filter element).

▶ Clip new filter element ③ into oil filter cap ①.

▶ Insert dirt collecting container ④ into filter housing ⑤; make sure it is installed correctly. ▷▷

▶ Screw on the oil filter cap with filter element and tighten
Tightening torque: 25 Nm.

▶ Start the engine and bleed the fuel system.

To bleed the fuel system, there must be sufficient battery capacity available during the starting procedure, as the fuel system must first be replenished with fuel.

Run the engine for approximately 1 minute. The fuel system bleeds automatically.

If the engine stalls or does not start, bleed the fuel system manually.

▶ Check the fuel filter for leaks with the engine running.

To bleed the system manually, the machine or vehicle must be equipped with a hand pump, e.g. on a fuel prefilter.

Environmental note

If the diesel fuel level (fuel tank) is above engine height, the feed line must be closed when the filter is replaced. Diesel fuel could otherwise flow out.

Intake pipe between air cleaner and engine: checking for leaks and general condition

- ▶ Check the rubber sleeves, intake pipes and connection hoses for damage and leaks.
- ▶ Check the hose clamps, flanged joints and intake manifold for firm seating.

Poly-V-belt: checking condition

Risk of injury 

Faulty poly-V-belts may tear and parts or all of the belt may be thrown off, thereby causing injury to others.

- Always observe the specified maintenance intervals for poly-V-belts.
- If damage is detected, replace the poly-V-belt concerned immediately.

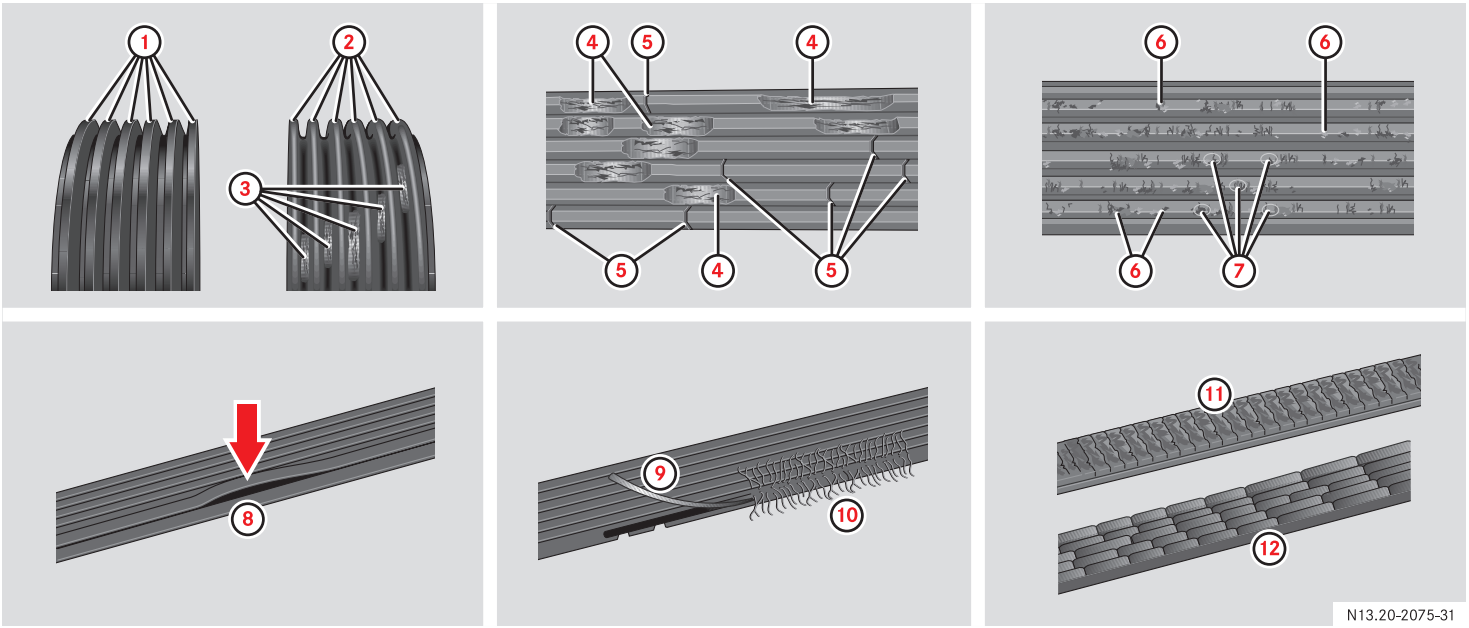
Special tools

Turning tool: 904 589 04 63 00

- ▶ Fit the turning tool to the flywheel housing inspection hole.
- ▶ Make a chalk mark on the poly-V-belt.
- ▶ Check the poly-V-belt for damage section by section; to do this, turn the engine or poly-V-belt gradually using the turning tool until the chalk mark is reached again.

Replace the poly-V-belt if one of the damage patterns shown on the next page is detected. For information on fitting and removing the poly-V-belt (▷ see page 85).

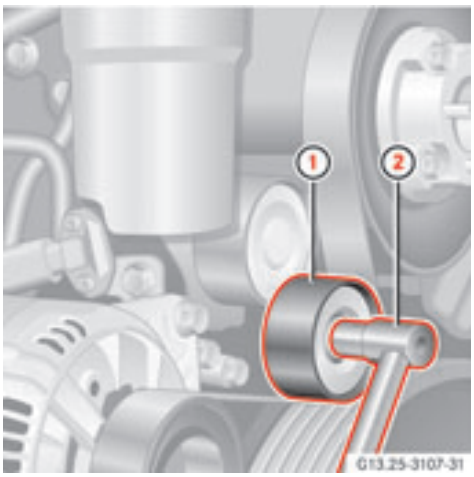
- ▶ Remove the turning tool.
- ▶ Screw the cap back into the inspection hole in the flywheel housing. Tightening torque: 25 Nm.



Damage patterns

① Condition as new (as reference: trapezoidal ribs)
② One-sided wear: wedge-shaped ribs
③ Cord visible at the base of the ribs
④ Ribs split
⑤ Transverse cracks in several ribs
⑥ Rubber nodules at the base of the belt
⑦ Deposits of dirt or stones
⑧ Rib detached from the base of the belt
⑨ Cord torn out at the side
⑩ Outer cord frayed
⑪ Transverse cracks on the back of the belt
⑫ Transverse cracks in several ribs

Removing and fitting the poly-V-belt



Clamping handle with extension in the tensioning device

Risk of injury

The tensioning device is spring-tensioned. When it is loosened or tightened, there is a risk of injury from crushing or entrapment in pretensioned parts.

- For this reason, always carry out work on the tensioning device with extreme care.
- Make sure that the tool is handled correctly.

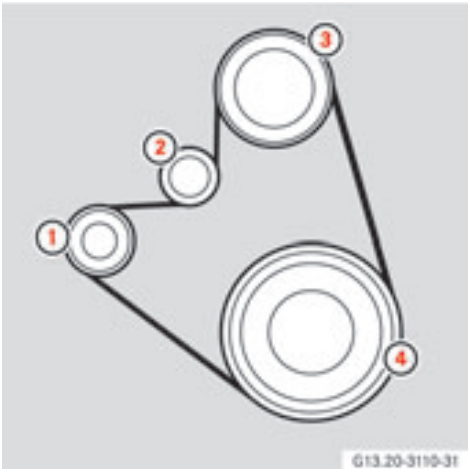
▶ Fit the spanner with extension element and socket spanner insert 15 mm into the tensioning device.

▶ Swing the tensioning pulley upwards and remove the poly-V-belt.

▶ Swing back the tensioning device. ▷▷

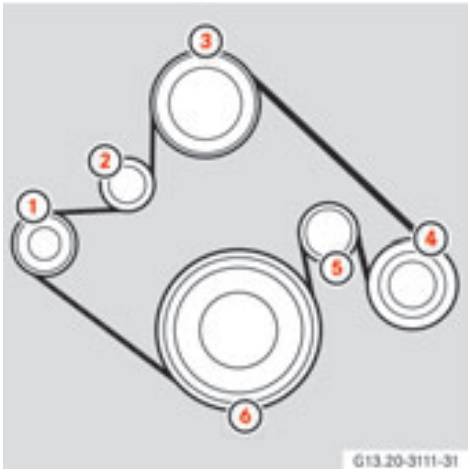
- ▶ Check that both the tensioning device and the belt pulley are in perfect condition (e.g. check for worn bearings on the tensioning device, tensioning pulley and guide pulleys as well as for wear on belt pulleys); replace parts if necessary.
- ▶ Lay the poly-V-belt (new) on all belt pulleys, except for the tensioning pulley (see illustrations for poly-V-belt routing).
- ▶ Swing the tensioning pulley upwards using the lever, lay the poly-V-belt on the tensioning pulley and swing the tensioning pulley back.
- ▶ Remove the clamping handle and check for correct seating of the poly-V-belt on the belt pulleys.

Poly-V-belt routing (engine without refrigerant compressor)



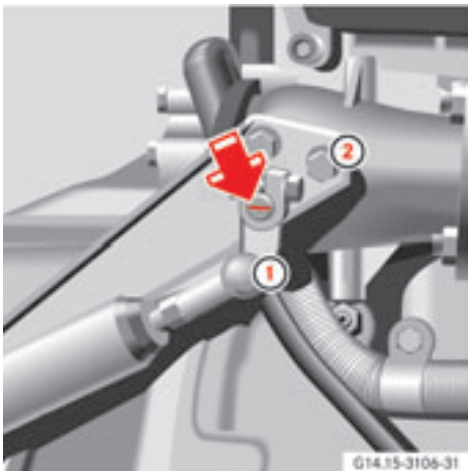
① Alternator
② Tensioning pulley
③ Coolant pump
④ Crankshaft

Poly-V-belt routing (engine with refrigerant compressor)



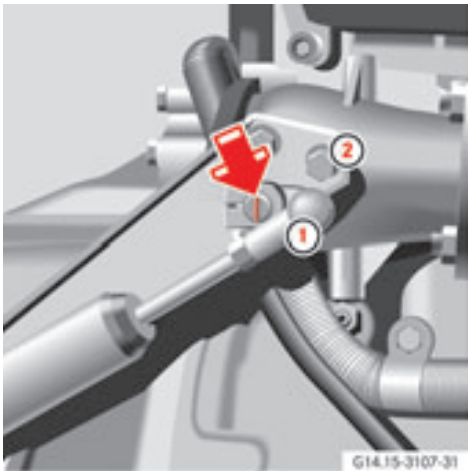
① Alternator
② Tensioning pulley
③ Coolant pump
④ Refrigerant compressor
⑤ Guide and leading pulley
⑥ Crankshaft

Engine brake*: checking condition and setting



Throttle valve lever in inactive position

① Throttle valve lever
② Retainer



Throttle valve lever in active position

① Throttle valve lever
② Retainer

Checking condition

- ▶ Remove the wire circlip from the engine cylinder ball socket.
- ▶ Prise off the ball socket from throttle valve lever ① ball neck.
- ▶ Check the engine brake cylinder, ball neck and ball socket as well as the throttle valve shaft for wear.
- ▶ Check the throttle valve lever on the throttle valve shaft for firm seating and retighten the clamping screws if necessary.
- ▶ Lubricate the ball socket with the specified grease.
- ▶ Press the ball socket back onto the ball neck.
- ▶ Insert the wire circlip. ▷▷

Checking adjustment

When the engine brake is applied, throttle valve lever ① must make contact with retainer ② when the throttle valve lever is in its active position (cylinder extended).

The throttle valve lever must also make contact with the retainer when the engine brake cylinder is in its inactive position (cylinder retracted); if this is the case the return spring pretension of the engine brake cylinder is adequate.

Check the position of the throttle valve shaft: when the engine brake is inactive, the slot (▷ page 87, illustration on left) must be horizontal. When the engine brake is in the active position, the slot (▷ page 87, illustration on right) must be vertical.

Engine cooling system: checking and correcting the fluid level and the antifreeze / corrosion inhibitor

Risk of injury

The cooling system is pressurised. Hot coolant can escape under pressure when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety goggles when handling coolant.

Risk of poisoning

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.

Only use service products approved by DaimlerChrysler (▷ see page 64).

Only check and correct the coolant level when the coolant temperature is below 50 °C. Check the antifreeze / corrosion inhibitor concentration before correcting the coolant level. Only use a prepared coolant for topping up with an antifreeze / corrosion inhibitor concentration of 50% by volume.

- ▶ Open the engine cooling system cap slowly, relieving the excess pressure.
- ▶ Check the antifreeze / corrosion inhibitor concentration using a testing device. The specified antifreeze / corrosion inhibitor concentration of 50% by volume is present if antifreeze protection is ensured down to –37 °C. If less antifreeze protection is displayed, correct the mixing ratio.

If the concentration is too low, there is a risk of engine damage as a result of corrosion / cavitation in the cooling system.

Avoid antifreeze / corrosion inhibitor concentrations of more than 55% by volume, otherwise maximum antifreeze protection down to –45 °C will not be achieved. Heat dissipation and antifreeze protection deteriorate at higher concentrations.

- ▶ Check the coolant level.
  The cooling system is correctly filled if the coolant reaches the mark in the filler neck.

Cooling and heating system: checking for leaks and general condition

The “Engine cooling system: checking and correcting the fluid level and antifreeze / corrosion inhibitor” operation must have already been carried out.

- ▶ Carry out a visual inspection of the radiator for leaks and damage.

If damage / faults are detected, repair the radiator or replace it.

- ▶ Check the radiator for external dirt. The fins must not be dirty. ▷▷

- ▶ Check the radiators, coolant pump, engine oil radiator and engine cap for leaks.
- ▶ Check that all cooling and heating system lines and hoses are undamaged, that they are routed in such a way that chafing is avoided and that they are secured in accordance with regulations.

Risk of injury ⚠

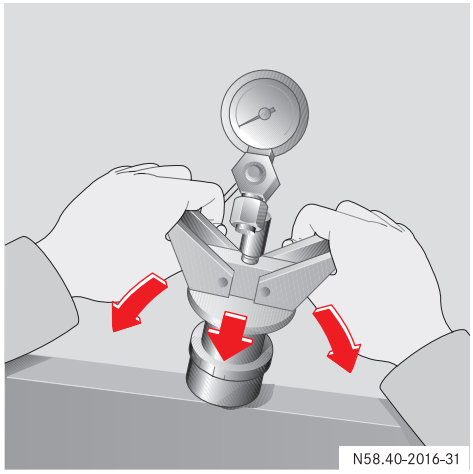
The cooling system is pressurised. Hot coolant can escape under pressure when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety goggles when handling coolant.

Risk of poisoning ⚠

There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.



Pressure tester special tool

Special tool:

Pressure tester 001 589 83 21 00

- On heating systems: open the regulating valves and shut-off valves.
- Remove the coolant expansion tank cap.
- Fit the pressure tester.
- Connect the compressed-air hose with tyre inflator connection to the valve and build up a test pressure equal to the cooling system opening pressure.

The cooling system opening pressure can be determined from the code on the cap or pressure relief valve.

Example: code 70 = 0.7 bar overpressure.

The cooling system pressure tester has a built-in pressure relief valve so that a pressure of 1.2 bar cannot be exceeded.

Renewing coolant

Risk of injury

The cooling system is pressurised. Hot coolant can escape under pressure when the cooling system is opened and scald your skin and eyes.

- Only open the cooling system at coolant temperatures below 90 °C.
- Unscrew the cap slowly and release any excess pressure completely before opening the cap fully.
- Wear suitable protective gloves, protective clothing and safety goggles when handling coolant.

Risk of poisoning

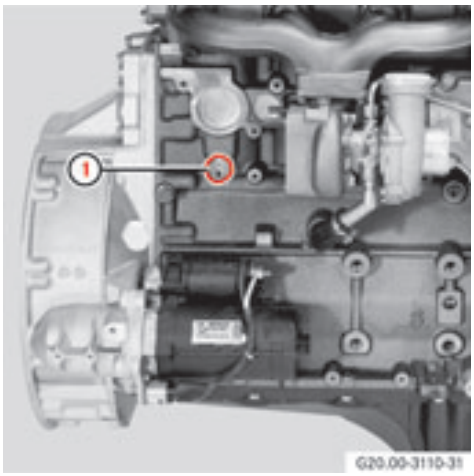
There is a risk of poisoning if coolant is swallowed.

- Never swallow coolant.
- Never store coolant in containers normally used for beverages.
- Store coolant out of the reach of children.

Only use antifreeze / corrosion inhibitor approved by Mercedes-Benz, (see specifications for service products).

Before renewing the coolant, check the cooling and heating system for leaks and condition. Have the coolant renewal confirmed in the Maintenance Booklet.

Draining coolant



① Coolant drain plug

▶ Open the engine cooling system cap slowly, relieving the excess pressure, and remove it.

▶ On heating systems: open the heating temperature selectors (regulating valves). ▷▷

- ▶ Connect the drain hose to the coolant drainage connection on the radiator and drain the coolant.
- ▶ Connect the drain hose to coolant pressure release screw ① on the engine block and drain the coolant.

ℹ
First cover the lines, etc., under the drain plugs and place a suitable receptacle underneath, large enough to collect the amount of coolant in the engine.

Environmental note

Dispose of used coolant in accordance with current local regulations (▷ see page 65).

- ▶ Clear blocked drainage openings of deposits.

Adding coolant

- ▶ Start the engine and run it at varying speeds for approximately 1 minute.
- ▶ Add coolant of the specified composition until it reaches the lower edge of the filler neck.
- ▶ Switch off the engine and seal the cooling system again.

ℹ
Observe any further information in the operating instructions from the machine / vehicle manufacturer.

Malfunctions, causes and solutions

While careful operation and maintenance of the engine are essential, it is also important that malfunctions be remedied in good time. You will find further information on the measures described under “Solution” in the “Maintenance” or “Tests and other work for remedying problems” sections.

You can rectify certain faults yourself (▷ page 97).

Have faults that you cannot remedy yourself rectified at a qualified specialist workshop.

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DaimlerChrysler recommends that you use a Mercedes-Benz Service Centre for this purpose as it has the necessary specialist knowledge and tools for the work required. In particular, work relevant to safety or on safety-related systems must be carried out at a qualified specialist workshop.

Risk of accident 

Maintenance and repair work to the engine carried out incorrectly can cause engine damage. Engine damage can lead to an increased risk of accidents.

Maintenance and repair work on the engine may only be carried out by personnel who have undergone the appropriate training.

Always have work on or modifications to the engine carried out at a qualified specialist workshop which has the necessary specialist knowledge and tools for the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

General troubleshooting

Malfunction	Cause	Solution
Starter pinion does not turn or turns too slowly	Battery is not sufficiently charged	▶ Charge the battery
	Connecting cable to the starter motor is loose	▶ Tighten the cable on the terminal. If necessary, solder on a new terminal
	Starter motor solenoid switch malfunction or starter motor malfunction	▶ Have it checked at a qualified specialist workshop
Engine does not start or stalls again immediately	Fuel tank empty	▶ Refuel
	Fuel filter blocked	▶ Replace the filter element (▷ page 80)
	Water separator, prefilter or fuel filter blocked	▶ Clean / replace
	Fuel system or filter leaking	▶ Replace the seals
	Fuel not resistant to cold	▶ Clean the prefilter (▷ page 79), ▶ Replace the fuel filter, ▶ Use winter fuel (▷ page 59)

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Engine does not start or stalls again immediately	Incorrect engine oil viscosity	▶ Alter the engine oil viscosity to the conditions of use
Engine starts poorly	MR (engine control) unit malfunction	▶ Read out the MR (engine control) unit, have it checked at a qualified specialist workshop
	Leaks or insufficient pressure in the low-pressure fuel circuit	▶ Check for leaks (visual check); have the pressure tested at a qualified specialist workshop
Engine stops inadvertently	MR (engine control) unit malfunction (total failure)	▶ Have it checked at a qualified specialist workshop
	Power supply to the MR / ADM control units interrupted or short circuit in wiring	▶ Have it checked at a qualified specialist workshop
	Leaks or insufficient pressure in the low-pressure fuel circuit or a fuel delivery pump drive malfunction	▶ Check for leaks (visual check); have the pressure tested at a qualified specialist workshop

Malfunction	Cause	Solution
Engine in emergency running mode	Data flow interruption MR / ADM control units	▶ Read out the malfunction memory of the control units and have them checked at a qualified specialist workshop
Engine surges, vibrates or runs irregularly	Crankshaft position sensor or camshaft position sensor faulty or no signal	▶ Visit a qualified specialist workshop
	Malfunction in the fuel system	▶ Read out the fault code, have it checked at a qualified specialist workshop
Poor engine output (lack of power)	Air cleaner dirty or blocked	▶ Replace the air cleaner element
	Charge-air temperature too high due to dirty intercooler or radiator	▶ Clean the outsides of the intercooler and radiator
	Coolant temperature too high	▶ Check temperature sensor and replace if necessary, check fan speed; visit a qualified specialist workshop
	Fault in the fuel system (blocked, leaking)	▶ Visual check for leaks; visit a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Poor engine output (lack of power)	Charge-air system leaking, hose clamp on charge-air hose loose or faulty	▶ Check for leaks by a qualified specialist workshop
	Charge-air pressure sensor malfunction	▶ Check with diagnostic equipment and replace if necessary; visit a qualified specialist workshop
	Engine brake flap* is faulty or stuck	▶ Function test or visual check
Interruption in tractive power	Increased voltage drop to MR / ADM control unit (loose contact)	▶ Check the battery terminal clamps and the connectors on the MR / ADM control unit for firm seating and corrosion
Poor engine braking power	Engine brake flap* malfunction or fault in the control	▶ Function test / visual check; visit a qualified specialist workshop
Fuel consumption too high	Connection points (unit pump – line and injectors) leaking	▶ Check for tightness at a qualified specialist workshop
	Misfiring	▶ Have the engine checked at a qualified specialist workshop

Malfunction	Cause	Solution
Engine cuts off too early (maximum engine speed cannot be reached)	FR or ADM control unit defective or incorrectly programmed	▶ Visit a qualified specialist workshop
Engine gets too hot (according to coolant temperature gauge)	Not enough coolant in the cooling system	▶ Top up, bleed (▷ page 93)
	Coolant temperature sensor or display faulty	▶ Replace sensor or display
	Poly-V-belt damaged	▶ See “Replacing the poly-V-belt” (▷ page 85)
	Fan does not switch on correctly	▶ Visit a qualified specialist workshop
	Radiator dirty on inside or choked with limescale; radiator very dirty on outside	▶ Clean or remove limescale
	Thermostat malfunction	▶ Check, replace if necessary; visit a qualified specialist workshop

Malfunctions, causes and solutions

Malfunction	Cause	Solution
Charge current indicator lamp does not light up while the engine is not running	Bulb defective or supply line interruption	▶ Replace bulb or repair interruption
Charge current indicator lamp lights up when the engine is running	Poly-V-belt too slack	▶ Check belt tensioner for proper operation
	Poly-V-belt torn	▶ Replace the poly-V-belt (▷ page 85)
	Alternator or regulator malfunction	▶ Check; visit a qualified specialist workshop
Engine emits black smoke	Air cleaner dirty or blocked	▶ Replace the air cleaner element
	Engine brake faulty	▶ Visit a qualified specialist workshop
	Turbocharger faulty	▶ Visual check; visit a qualified specialist workshop
	Misfiring, injector faulty	▶ Visit a qualified specialist workshop

Malfunction	Cause	Solution
Exhaust fumes are blue	Oil level in the engine too high; crankcase ventilation system faulty, engine oil entering combustion chamber	▶ Correct the oil level, have the crankcase ventilation system checked at a qualified specialist workshop
Exhaust fumes are white	Coolant entering combustion chamber	▶ Locate damaged cylinder using pressure loss test; visit a qualified specialist workshop
Engine “knocks”	Misfiring	▶ Visit a qualified specialist workshop
Knocking noise from the bearings	Bearing damage	▶ Visit a qualified specialist workshop
Abnormal noises	Leaks in intake pipe and exhaust pipe causes whistling noise	▶ Repair leaks, replace seals if necessary
	Turbine or compressor wheel is scraping against the housing; foreign objects in the compressor or turbine; seized bearing in rotating parts	▶ Have the exhaust gas turbocharger checked at a qualified specialist workshop
	Valve clearance too great	▶ Check the valve clearance, adjust if necessary

Jump-starting

If the battery is discharged, the engine can be started using jump leads and a donor battery .

Risk of injury

The acid contained in batteries burns skin and eyes on contact.

- Do not allow acid to come into contact with your skin, eyes or clothing.
- Wear suitable protective clothing, as battery acid can burn through normal clothing. In addition, protective gloves and safety goggles should be worn.
- Rinse acid splashes off immediately with clean water and consult a doctor if necessary.

Risk of explosion

Gases leaking from batteries may explode and therefore cause injury.

Fire, naked flames, smoking and sparks are therefore not permitted in the vicinity of the batteries.

Make sure that the batteries have the same nominal voltage. A battery could otherwise be irreparably damaged.

Do not place any metal objects on the batteries. There is a risk of short circuit.

Only use insulated jump leads (cable cross section approximately 70 mm^2) and insulated terminal clamps. There is a risk of short circuit.

A discharged battery can freeze at about –10 °C; it must have thawed out before jump-starting.

When jump-starting the engine, the maximum on-board voltage of 28 V must not be exceeded (as this would cause electronic damage to the control unit).

▶ Connect the positive terminals first and then the negative terminals of the battery.

▶ Start the engine (▷ see page 45) and run it for a short while.

▶ Remove the jump leads in the reverse order.

Technical data

Engine data

Test values and adjustment values

Tightening torques

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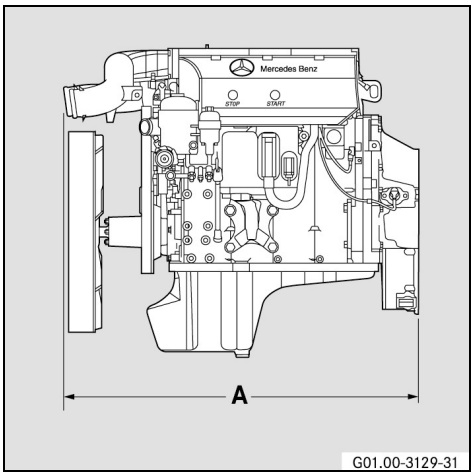
Engine data

Dimensions in mm:

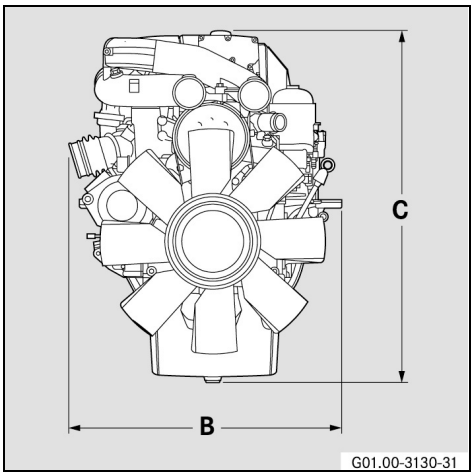
(standard version, other versions on request)

	OM 904 LA
A = Engine length	830 mm
B = Engine width	645 mm
C = Engine height	925 mm

	OM 906 LA OM 926 LA
A = Engine length	1,078 mm
B = Engine width	645 mm
C = Engine height	940 mm



OM 904 illustrated



OM 904 illustrated

Weights

	OM 904 LA	OM 906 LA / OM 926 LA
Engine, without fluids	395 kg	530 kg
Engine, with fluids	420 kg	573 kg

General data

Type	In-line engine with exhaust gas turbo-charger and intercooler
Type of cooling system	Forced circulation cooling
Combustion principle	4-stroke diesel direct injection
Number of cylinders	
OM 904 LA / OM 924 LA:	4
OM 906 LA / OM 926 LA:	6
Cylinder bore	
OM 904 LA / OM 906 LA	102 mm
OM 924 LA / OM 926 LA	106 mm
Piston stroke	
OM 904 LA / OM 906 LA	130 mm
OM 924 LA / OM 926 LA	136 mm

Engine data

General data continued

Displacement	
OM 904 LA:	4,250 cm^3 / 4,800 cm^3
OM 906 LA / OM 926 LA:	6,370 cm^3 / 7,200 cm^3
Direction of rotation of engine when looking at flywheel side of engine	Anti-clockwise
Starter	Electric
Coolant capacity of engine without intercooler	
OM 904 LA:	8.5 l
OM 906 LA / OM 926 LA:	12.5 l
Engine oil capacity including oil filter	
OM 904 LA:	minimum 13 litres; maximum 16 litres
OM 906 LA / OM 926 LA:	minimum 24 litres; maximum 29 litres

Data: Starter motor, battery and alternator (standard)

Starter motor	
Voltage	24 V
Output	4.0 kW
Battery (not in scope of delivery)	
Voltage	12 / 24 V
Cold test current in accordance with DIN 72311	maximum 450 A
Cold start ability without jump-starting and 75% battery charge down to	maximum –20 °C
Alternator	
Voltage	28 V
Current rating	80 A

Test values and adjustment values

Engine oil pressure (minimum)

at idling speed	0.5 bar
at rated speed	2.5 bar

Valve clearance

Intake valve	0.4 mm
Exhaust valve	0.6 mm

▼ Tightening torques

All threads on mechanical parts and related contact surfaces must be clean, smooth and lubricated with engine oil; other lubricants require significantly different tightening torques.

Designation	Nm
Engine block	
Bolt securing cylinder head cover to the cylinder head	30
Bolt securing the oil sump to the cylinder crankcase	25
Poly-V-belt tensioning device to the cylinder crankcase / to the hydraulic pump bracket / to the support	50
Fuel / injection system	
Injection line to the unit pump pressure pipe connection	35
Banjo bolts for fuel lines	40
Cap to the fuel filter housing	25
Starter motor / alternator	
Starter motor to the timing case	50
Alternator support to the cylinder crankcase	100

Tightening torques

Designation	Nm
Alternator to the support	50
Alternator to the mounting	65
Oil circuit	
Oil drain plug to the oil sump	
M20 x 1.5 thread	65
M26 x 1.5 thread	85
Alternator mounting to the oil filter	40
Oil filter housing to the crankcase	25
Oil filter housing support to the crankcase	25
Oil filter cap to the oil filter housing	25
Oil pressure sensor to the oil filter housing	25
Valve adjustment	
Counternut to the rocker arm adjustment screw	25
Cooling circuit	
Coolant line with thermostat valve to the coolant pump	25
Coolant pump to the cylinder crankcase	25
Belt pulley to the coolant pump hub	25